Citizen Potawatomi Nation's GIS Drone Program

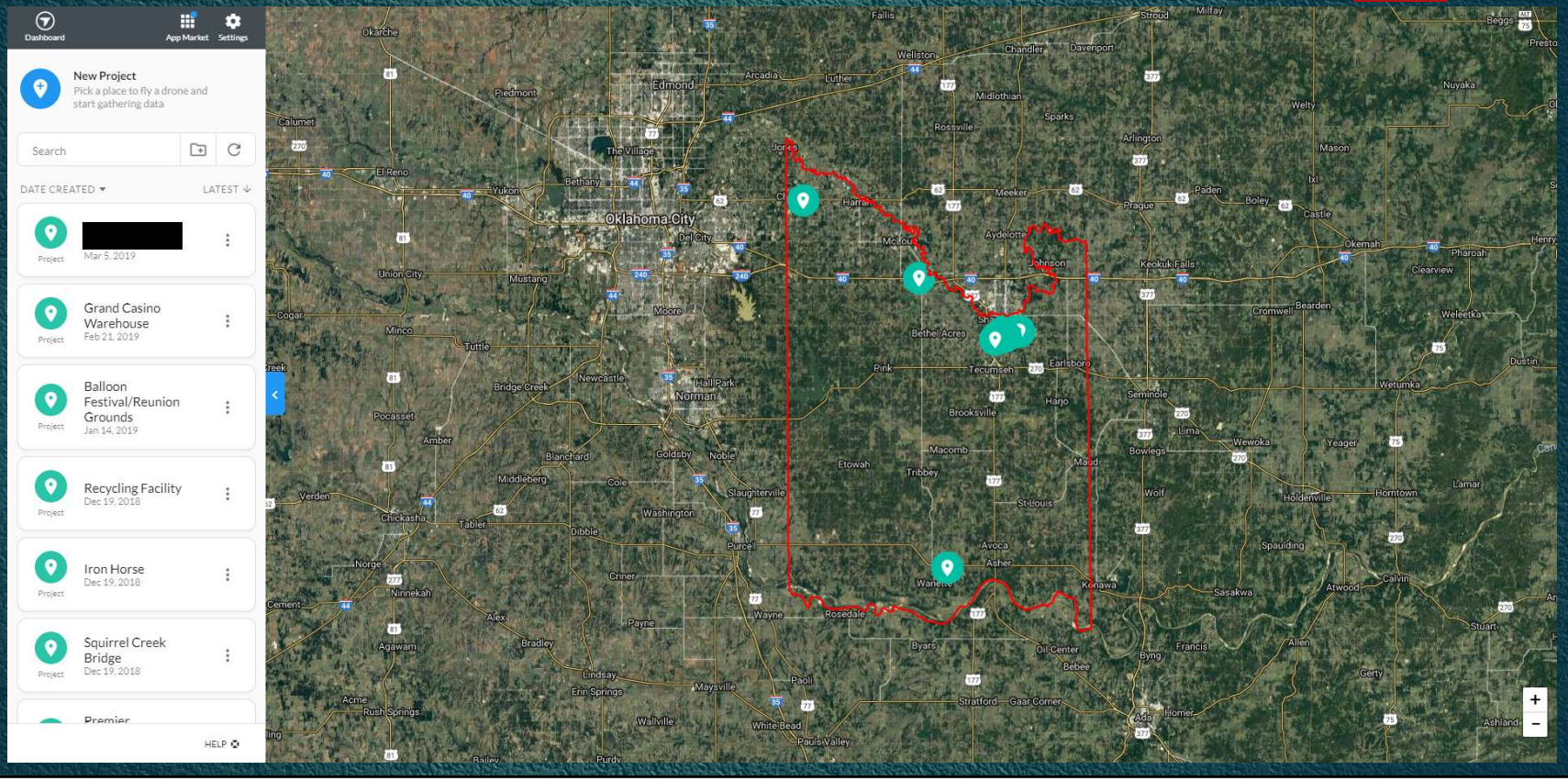
Zachary Davis
GIS Specialist

PROGRESS OF YEAR 2 WITH A DRONE PROGRAM

Hello, my name is Zachary Davis. Last year I gave a presentation on the Process and Progress of Citizen Potawatomi Nation's GIS program. I discussed the obstacles that our department overcame and the routes we chose (Software, Licensing, Drone Products, etc..)

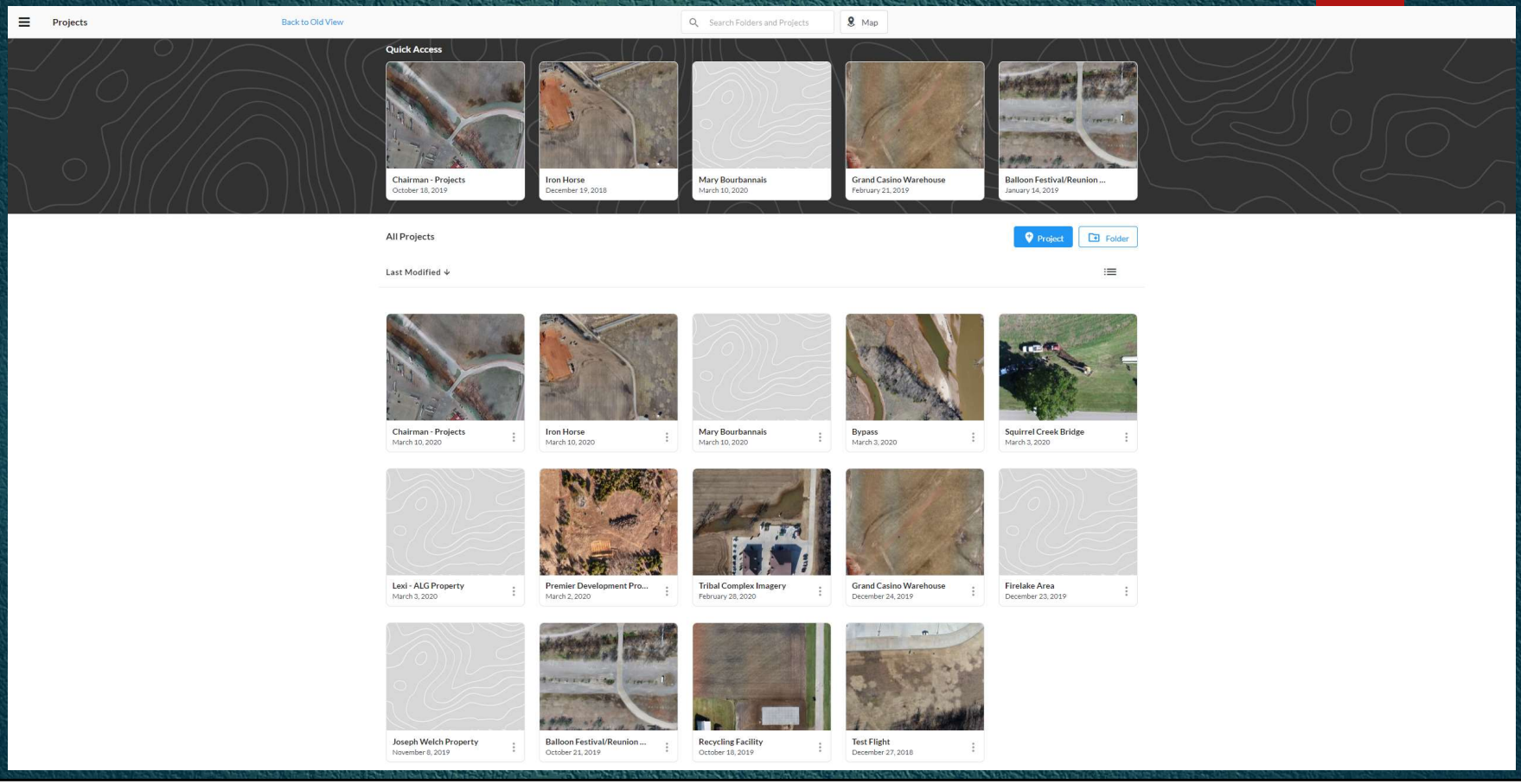
In this powerpoint, I will update you on the Tribe's progress in its 2nd year of flying drones for the Environmental/Roads department.

Drone Deploy



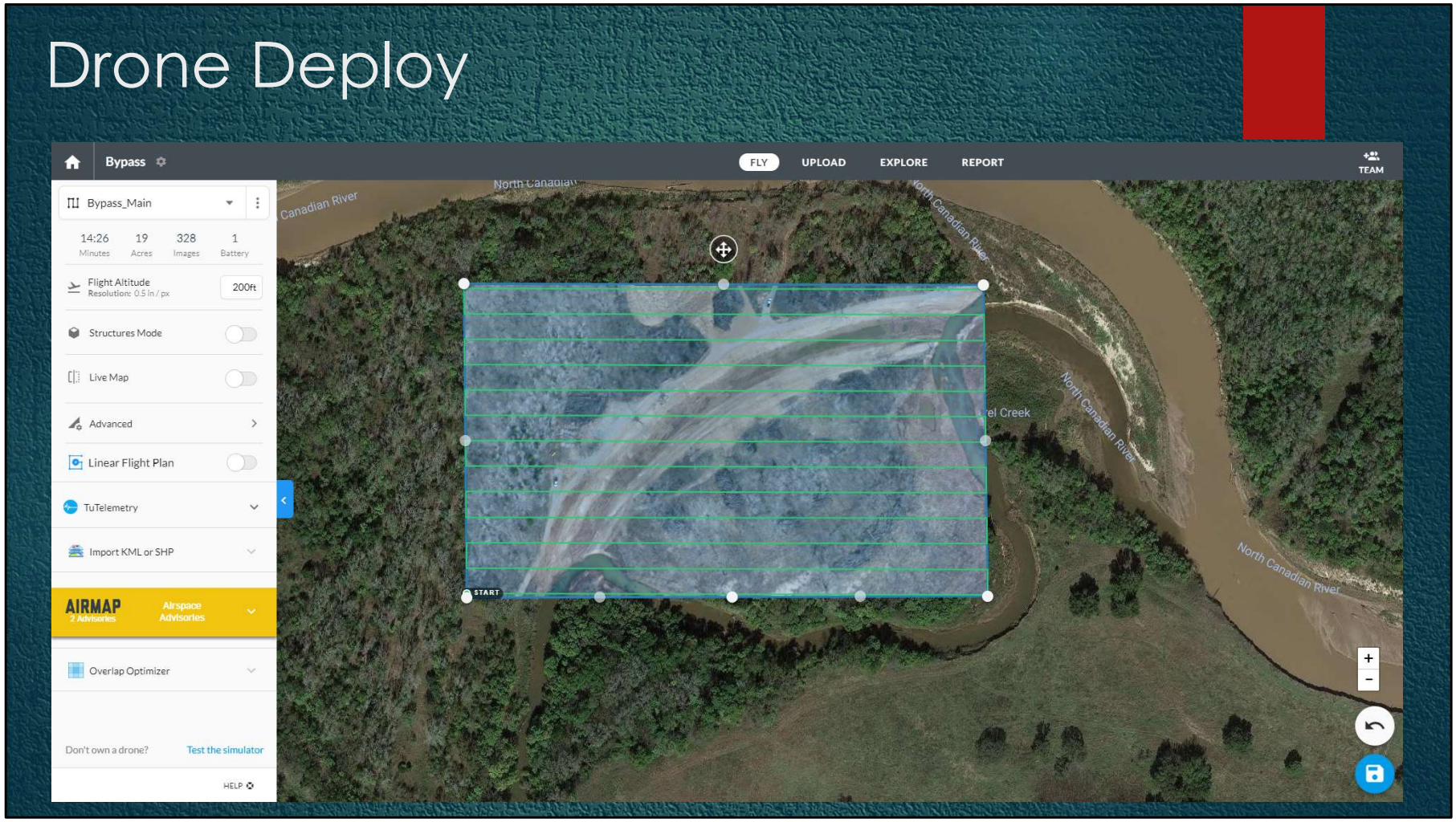
This slide is a duplicate slide from last year. It shows our tribal jurisdictional boundary and the projects we currently work on. The program we use for our aerial imagery is called Drone Deploy. Drone Deploy was developed for pre-flight, flight, and post-flight processing.

Drone Deploy



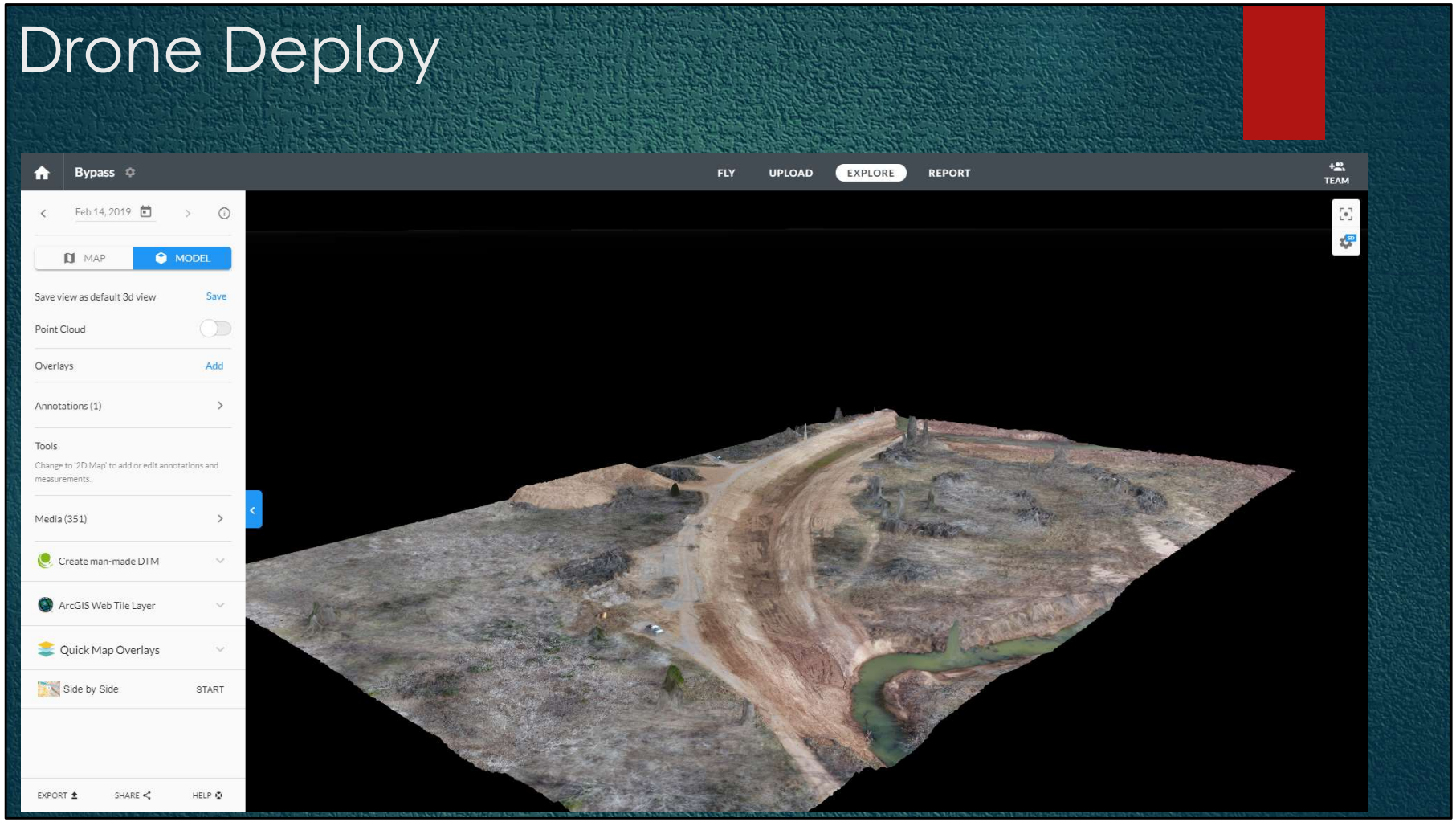
This is Drone Deploy's new project dashboard. As you can see it's vastly different from a year ago. This is what I like the most about this software. They constantly update and expand their software. We were glad to join in 2018. So much has been added since then.

Drone Deploy



This is what Drone Deploy's pre-flight tab looks like. This is another duplicate slide from last year. The square is your flight area. The green lines within the flight are the flight pattern or lanes that your drone will fly. The list on the left side is the editing portion of your pre-flight (Height, speed, resolution, overlaps). The top of the list shows your flight time, flight area size, estimate of images to be taken, and Number of batteries that it will take to complete this mission.

Drone Deploy



This is an example of the post-flight data that comes from Drone Deploy. If you so choose during your pre-flight, you can allow the drone to fly longer at different angles in order to achieve 3-dimensional imagery. This is handy to have if you are looking at drainage issues or wanting to understand the elevation of an area.

Last year, I discussed the start of our drone program began with the Squirrel Creek Bypass project. This is something we wanted to monitor from start to finish and then some. October 2018 was the first time we got to experience Drone Deploy. It's done nothing but impress us with every update.

319 Wetlands Progress

February 2019

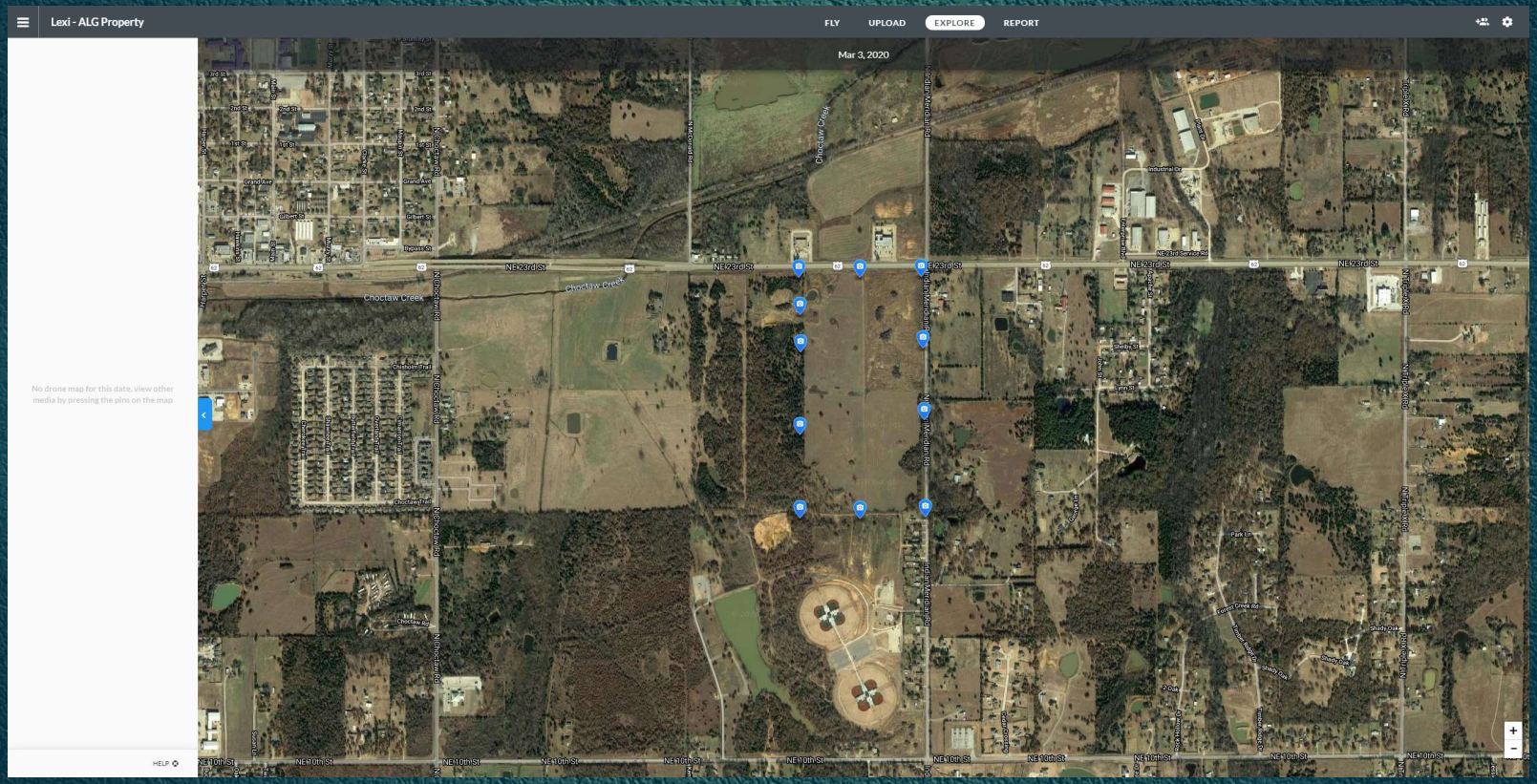
By march 2019 we completed our final drone coverage of the bypass. We flew the bypass, north of the bypass, and the outlet east of the bypass. I then pieced them together in ArcMap and overlayed aerial imagery flown in 2016 as a background image to compare the current. You can notice on the southeast portion of this map that the current imagery differs from the 2016, showing that the river's margins continue to change due to erosion.

Property Aerial Updates

This is another slide from last year just to illustrate all that can be done with a drone. We captured the aerial imagery for this property after an unmarked grave was discovered.

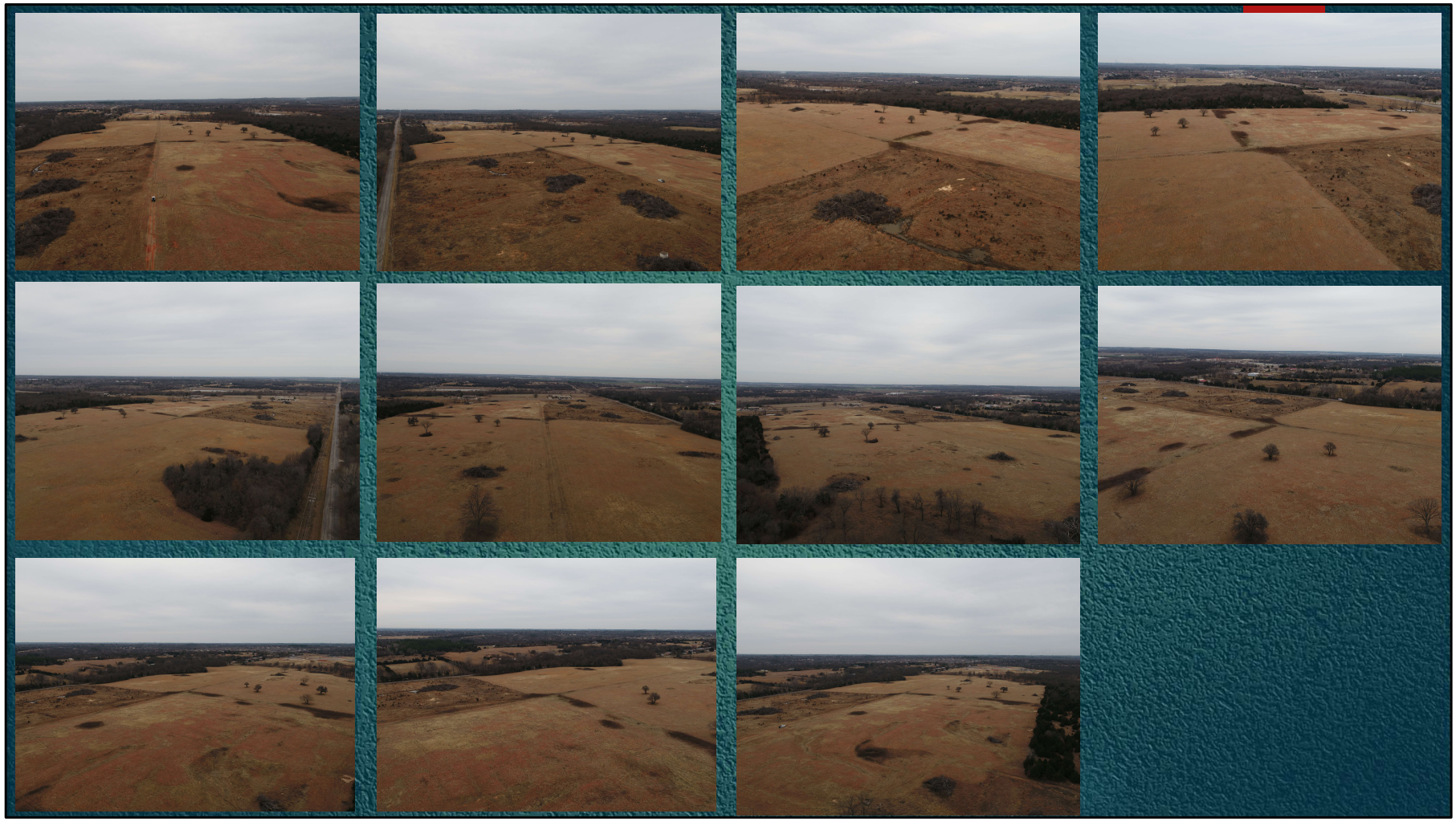
Took mitigation measures. Contacted cultural agencies and excluded the grave site from our survey of the property

Property Aerial Updates



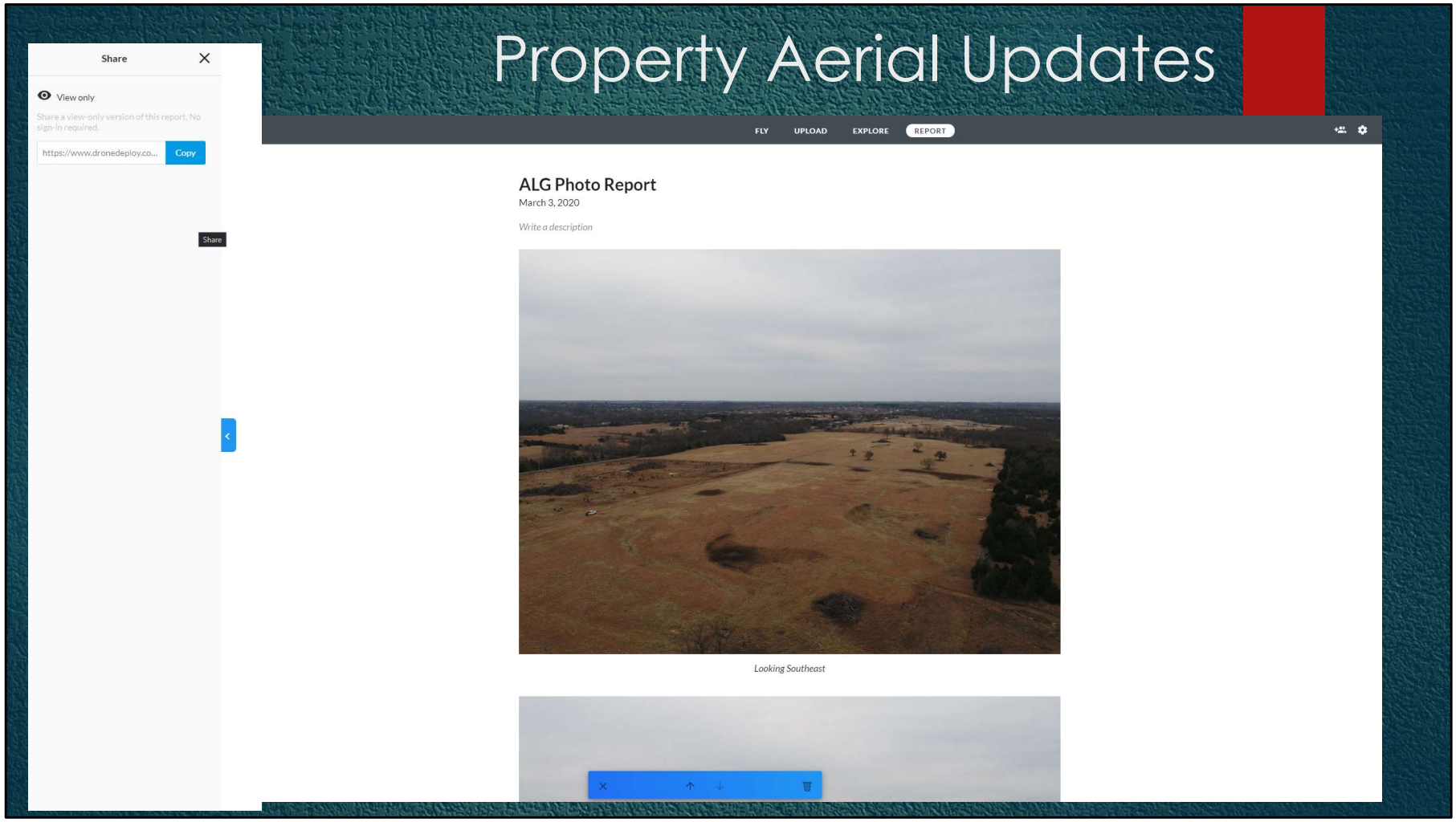
A new feature that has been added to drone deploy is the progress report photos. This is different from aerial imagery. You can choose a focal point for the camera to focus on during flight and the drone will adjust to the angle required to cover the area.

The feature is handy for construction progress photos.



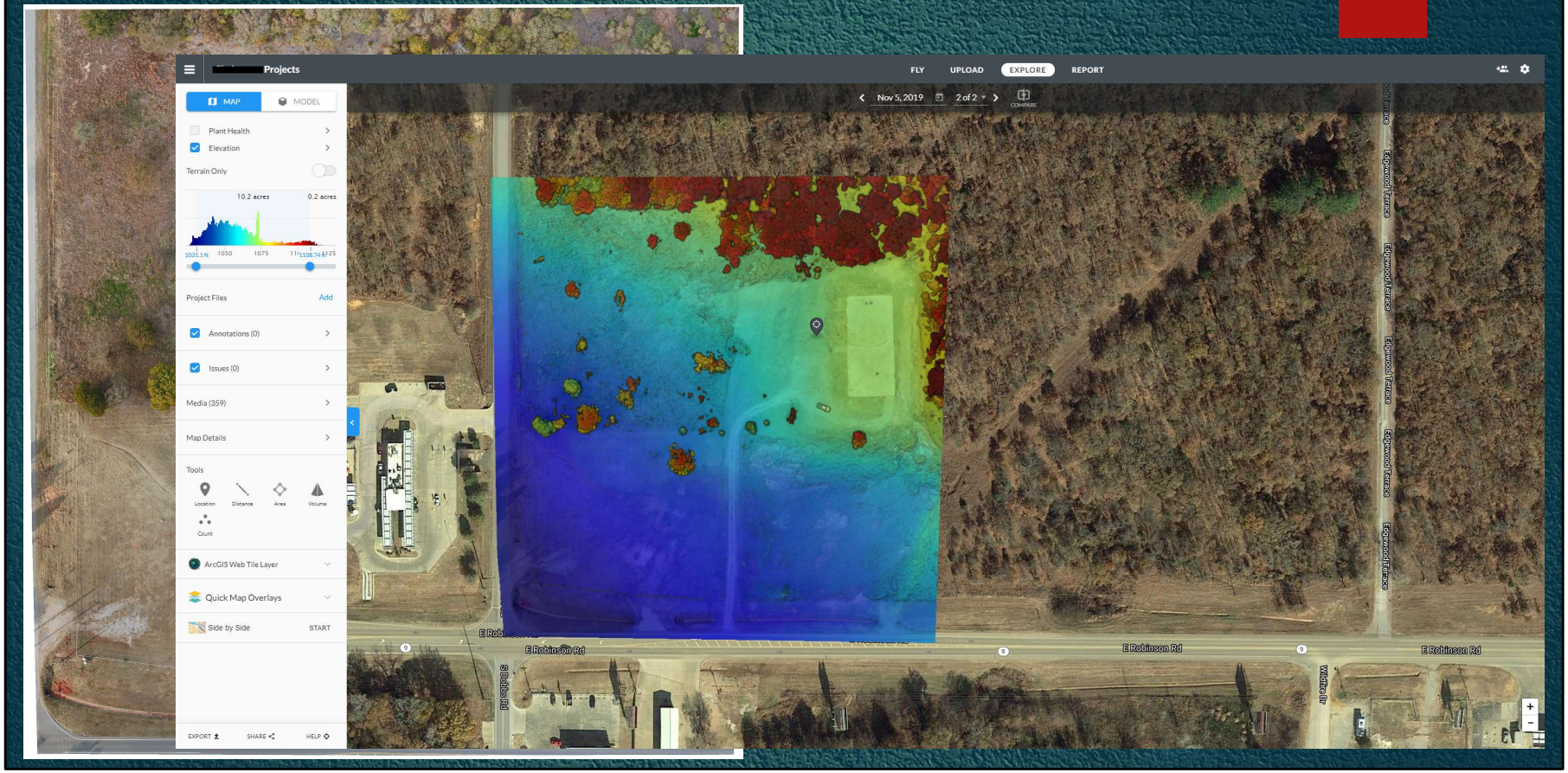
This is an example of the progress photos feature. The flight is set to take 11 photos. The focal point is at the center of the property and the drone flies in around the area and gets a photo at the direction you choose. You can alter these settings during the pre-flight setup.

Property Aerial Updates



Once you have your photos, Drone Deploy then creates a PDF photo report of your imagery in which you can add a description below the picture and either save it or print it. It's good to have for meetings where coworkers who aren't familiar with imagery can see the images with a description giving them context of where they are looking.

Property Aerial Updates

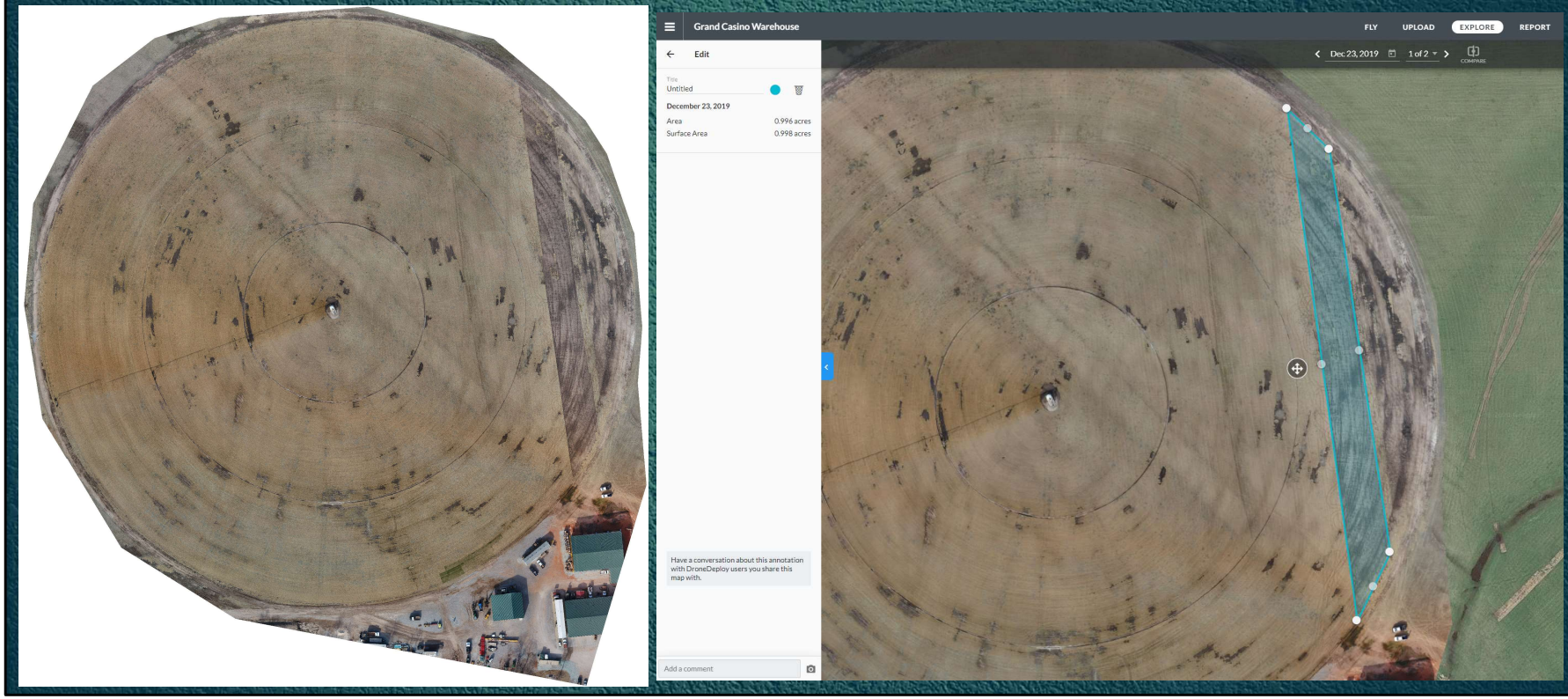


Something Drone Deploy has been working on and getting vastly better at is Elevation models. Here is an image of a property that we are in the process of determining our next step. As you can see from the colors. Red/orange is the color of the higher elevations while light blue/blue is the color of lower elevations. Trees are shown as red/orange. You can also notice that the property slopes from NE to SW. Simple aerial imagery will not help you see this. Aerial Interpretation is always about looking at it from every possible angle you can. This can deter faulty planning and unnecessary expenditures.

Property Aerial Updates

From elevation models, elevation contours are built. These can be converted to shapefiles and imported into ArcMap or converted into KMZ files and imported into Google Earth Pro. I personally like including both elevation models and contour shapefiles. Contours are extremely helpful but sometimes people don't have a good idea about how high 1005 ft is. At the same time elevation models are helpful, it's difficult to see the exact slope that an area might be.

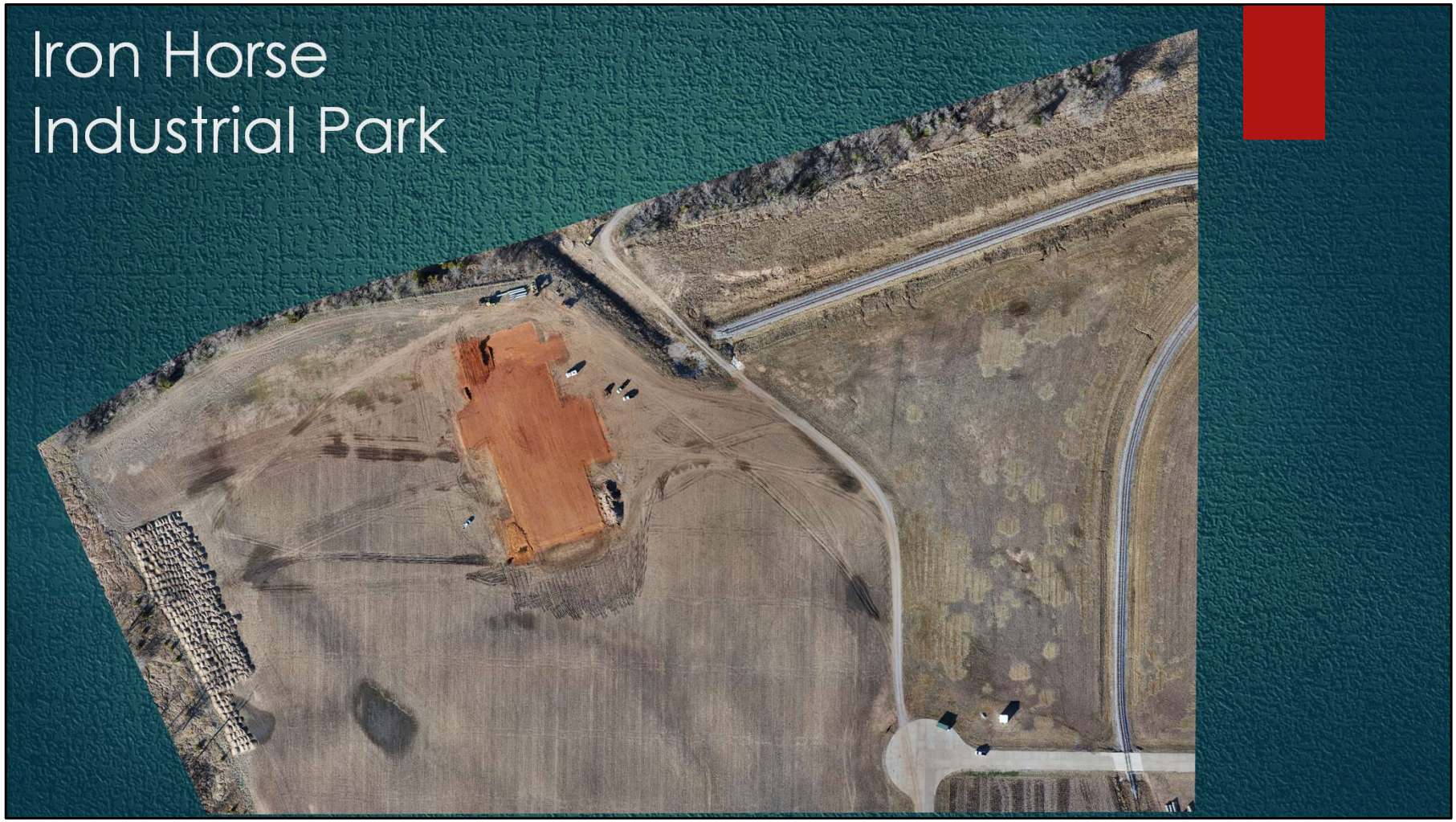
Aerial Imagery (Measurements)



Drone Deploy also has a measure feature. With this feature, you can take imagery you have captured and create a polygon boundary. This measure boundary is that of a Sod farm. The realty department was exploring other options on how to measure Sq Footage of Sod taken at a given time. I helped and showed them that although it is time consuming, using a drone to capture the imagery and measure it was very effective and useful. For this reason, the Realty department decided to purchase a Drone for their uses and the current Drone operator and I work together on many drone projects.

A project we work on quite frequently is the Iron Horse Industrial Park. In late 2018, we started capturing imagery on this park and haven't stopped since. Here is an image from December 2018 before we had any construction.

Here is an image from January 2020. As you can see, there is construction beginning for a company to move in by September 2020. With this new construction, my goal is to capture as much footage of this construction as possible.



Here is a new image of the constructed area as of March 2020. As you can see I've extended the coverage area to include a future road going into the Industrial site.

I also started a construction progress report for Iron Horse starting in December 2019

Construction progress photos February 2020

Construction Progress photos March 2020.

Pro Pipe Building Pad Construction

December 23, 2019

January 6, 2019

March 3, 2020

You can see the difference between these 3 photos taken during December, January, and March.

Pro Pipe Building Pad Construction

December 23, 2019

January 6, 2019

March 3, 2020

Another comparison of photos from different angels.

Deer Migration

A new project we started in late 2019 was adding a thermal camera to our arsenal of drone technology. Another request by the Realty department was deer monitoring. Our tribe has a vast area that are crop fields. Over the years, deer population has increased and caused our crops to decrease. For this reason, Realty wanted us to look at the areas being affected during peak hours of deer movement and capture the activity through the thermal camera. We were successful in capturing footage, however we were only successful once.

The images on these and the next few slides are from an area just North of the Iron Horse construction site.

Deer Migration

Some other benefits to note on having a thermal camera:

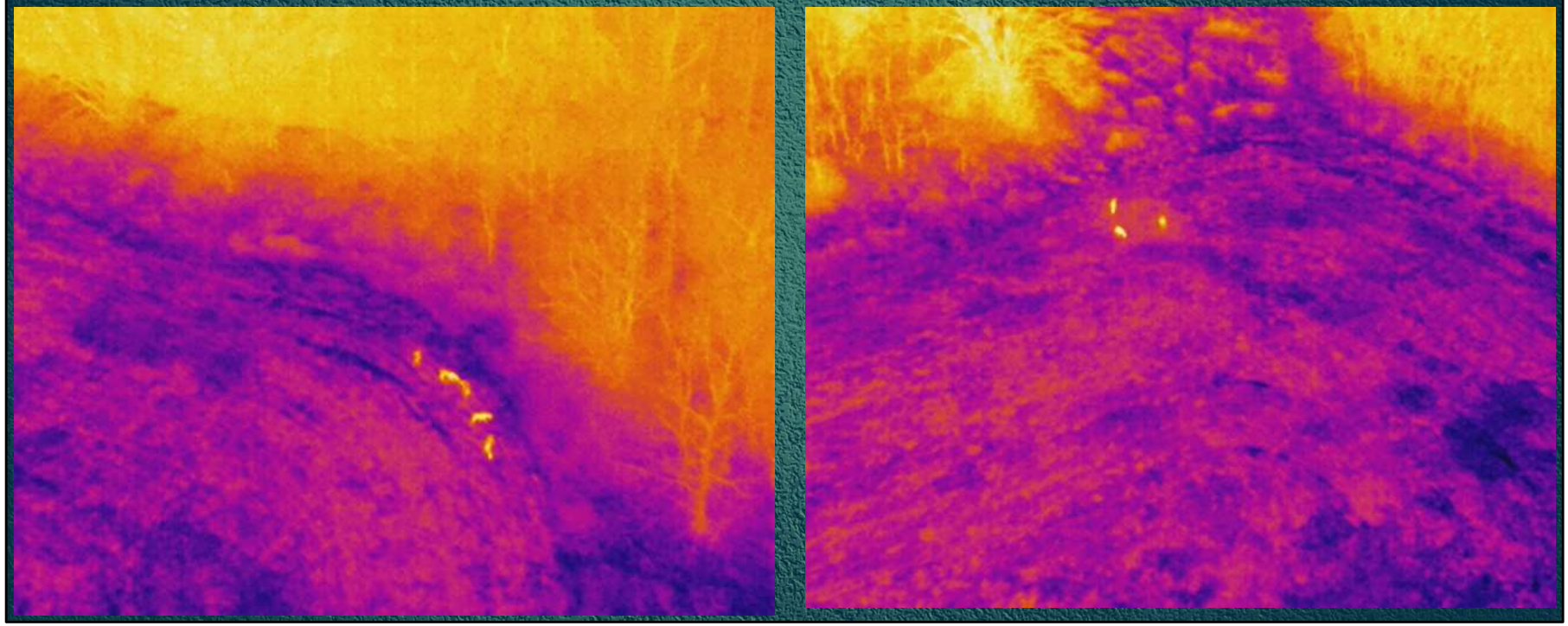
You can use thermal cameras during fires to ensure one does not get out of control or you can track the spread of a wildfire to alert nearby communities.

You can also use thermal cameras to check for natural gas leaks.

Deer Migration

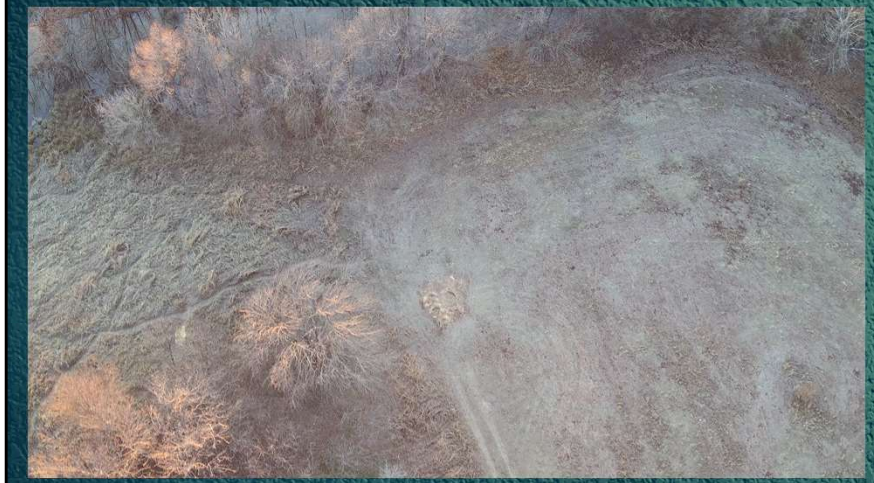
Playable video.

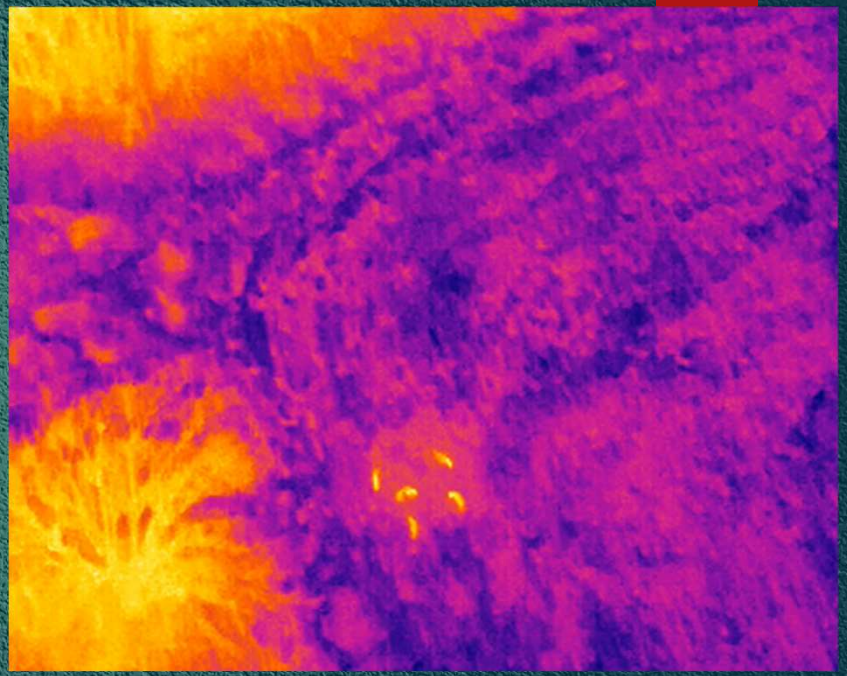
Deer Migration



This is another view of the deer migration. As you'll notice the visual is different. Thermal technology allows the viewer to change the Palette of the imagery. In some cases you'll want heat signatures to display in different colors. The tree line in the background still has heat from the sun even though the sun is setting. If the deer were in the wooded area, this palette would not be able to detect them as easily as another palette would. Once you have your thermal camera, I highly recommend performing extensive tests to see which palettes work best for different situations.

Deer Migration Cont..





Playable video.

Questions?

Zachary Davis
GIS Specialist
405-878-4829
Citizen Potawatomi Nation
Zach.davis@potawatomi.org

In closing, I'd just like to say that, although we are a young drone program starting out, I feel that we are constantly moving forward and learning new ways to expand this program to meet more needs within other departments. For 2020-2021, my goal for our Drone Program is to create a Drone group that includes Realty Department's Drone operator and Public Information's Drone Operator as well. Having 3 operators with 3 drones will enable us to tackle bigger projects and have continued success.

New projects to consider in the future are:
-Firelake Golf Course (Entire Aerial Imagery) – Able to be viewed online and produce an updated wall map with layout of the course
-Citizen Potawatomi Nation Complex (Entire Complex from Geothermal Ponds West to Admin and Transit Building East.
-Complete Aerial imagery of Iron Horse North and South of Hardesty Rd.