Draganflyer
Spot Light

Great Basin Unified Air Pollution Control District
California, U.S.

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Introduction:

In 1913, a 200 mile long aqueduct was completed to transport water from the Owens Valley located on the east side of the Sierra Nevada mountains in California to the City of Los Angeles. With abundant water available, Los Angeles grew and prospered, while the rich farmland of the Owens Valley went largely fallow. The Owens River was the primary source of water for Owens Lake.

Since the entire flow of the river was diverted to the aqueduct the lake was starved of water. By 1926, the 110 square mile Owens Lake had mostly disappeared exposing a lake bed that would become the largest single source of air pollution in the United States. The soil of the barren lake bed was highly susceptible to wind erosion and created enormous dust storms that would affect downwind areas causing air pollution that was more than 400 times higher than federal standards for particulate matter less than 10 microns in size. These dust particles are less than one tenth the diameter of a human hair and can easily be inhaled deep into the lungs, causing severe health effects to the elderly, children, and people with heart and lung diseases.

Tillage BACM, Owens Lake, Ca.

BrineSpy Sensor

The Great Basin Unified Air Pollution Control District (the District) is responsible for enforcing federal, state, and local air quality regulations and for ensuring that air quality standards are met in the Owens Valley. Through a series of legal battles with the City of Los Angeles (the City), the District ordered the City to implement dust controls on the lake bed.

Background:

Since 2001, the City has implemented dust controls on 45 square miles of the lake bed primarily using three methods, which are termed Best Available Control Measures (BACM). These included managed vegetation, gravel cover, and shallow flooding (75% wet or saturated water cover). These control measures can reduce dust emissions by more than 99%.

In 2014, the air pollution control district agreed to add two new control methods that would provide substantial water savings to the City. The first method is Tillage with BACM Back-up (TWB^2) and is nothing more than doing deep agricultural tilling (3+ feet) that would raise large clods of non-erodible clay to the surface. It is expected that over time the tilled soils will breakdown and become emissive again. Because of this, a way to monitor the TWB^2 areas was needed to determine if surfaces were changing and if an area needed maintenance, or possibly re-flooding to revert the area back to shallow flood BACM. The second new method uses highly saline water collected from areas down-gradient from the large shallow flood controls to create a stable brine crust. The brine control areas also require a method to determine if the surface has become unstable and if so, the areas would be reverted to shallow flood BACM.

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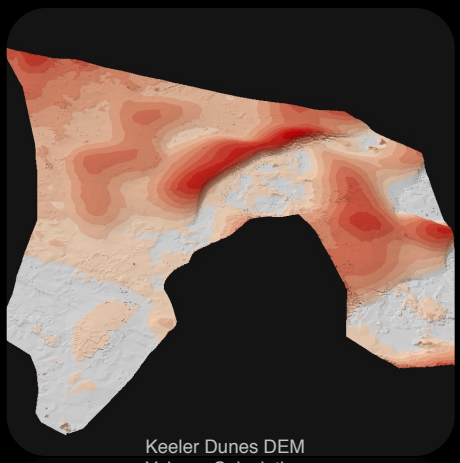
IPET and Sand Motion Monitoring Site

The Project:

This is where the Draganfly system comes into play. There are currently about 1.5 square miles of brine control areas and 4 square miles that are controlled with the TWB^2 method. The tillage is very deep and difficult to navigate on foot. The District developed a test to remotely visit areas using the Draganflyer to determine if the surfaces were changing or becoming emissive.

The method developed to determine if a TWB^2 area is potentially emissive is known as the Induced Particulate Emissions Test or IPET. The Draganflyer is flown over the surfaces of these tilled areas between 1.5 and 3 feet to see if the down force of the UAV produces any visible dust emissions. If any is seen then the District can order the area to have maintenance, or to be re-flooded if necessary. The flight height is calibrated for different payload weights and for other multi-rotor UAVs to create a reference wind speed on the surface that is the same for each UAV configuration. To aid in the IPET monitoring the District created a sensor that can read the real-time particulate matter concentration created by the UAV, GPS location, and height above ground. A small onboard computer was added to collect IPET data and to provide a PM measurement to go with visual observations.



Keeler Dunes DEM
Volume Calculation

The IPET method is also used to determine if Brine control areas have become unstable and must be re-flooded. In addition to IPET, the District uses the Draganfly system to create digital elevation models of the terrain, especially in TWB^2 areas, which must meet certain roughness criteria, and to monitor vegetation establishment using spectral imaging.

Lessons Learned:

When the District first started looking into UAVs to monitor areas on the Owens Playa we used hobby grade systems that were not designed for daily use, carrying payloads, or any kind of mapping ability. As these hobby grade UAVs broke and we spent more time repairing than flying, it became clear to us that a better UAV was needed. Draganfly met all our needs; professional grade, larger payloads, mapping systems, ability to work with RedEdge and other cameras, and flexibility to customize payloads with ease.

Future Plans:

With the Draganfly airframe design, long flight times, and payload capacity, future plans and ideas continue to develop. We will continue to do traditional UAV work (vegetation surveys, mapping, and aerial photo/video) along with the continued development of other onboard sensors to measure compliance on the Owens Lake.

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