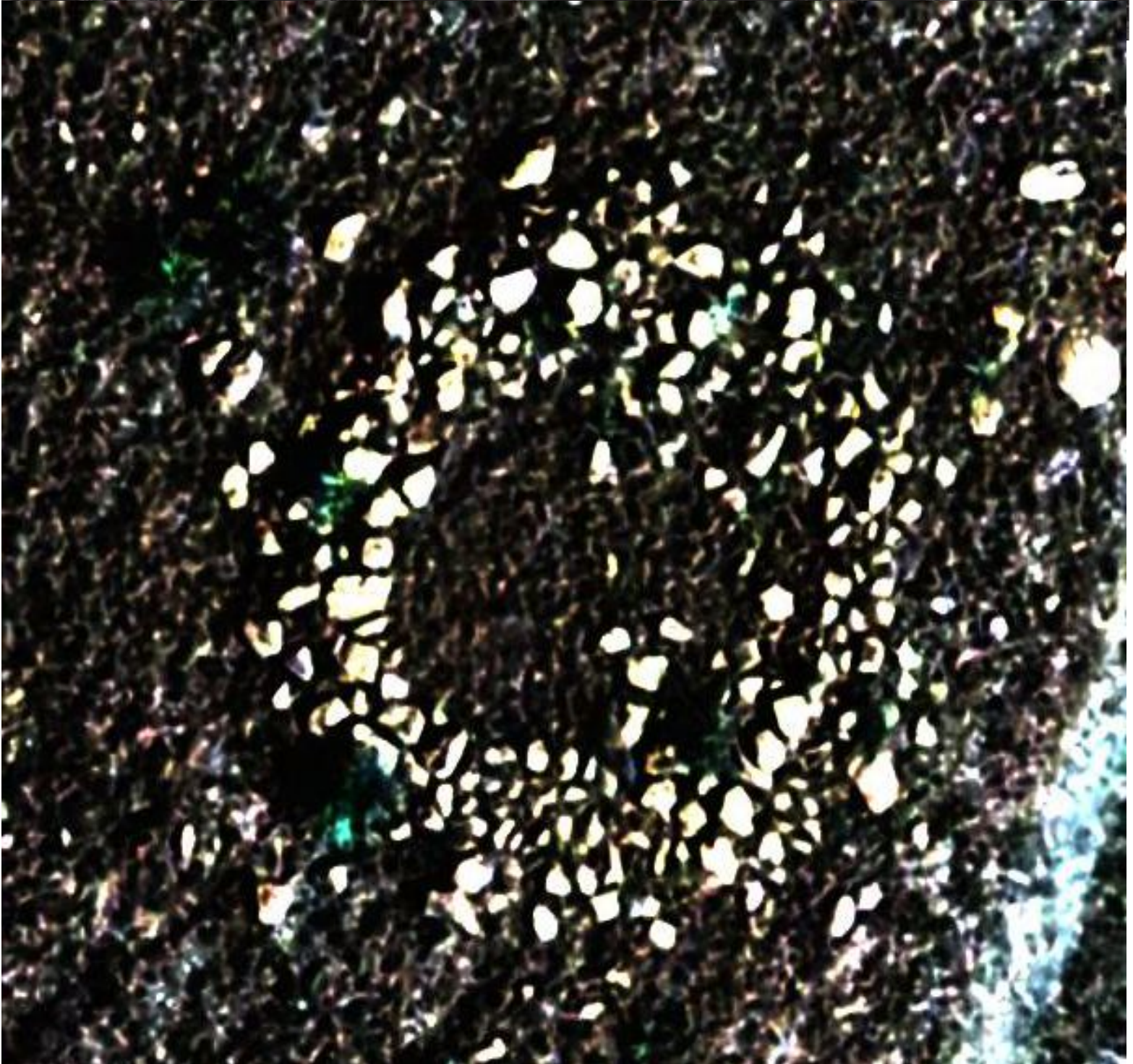# Cultural Resource Cases

2014-2017, Bureau of Land Management

1 UAS Cultural Resource Summary 2014-2017

2014:

Project Title: 2014 Cultural Site Unmanned Aerial System (UAS), Cottonwood Idaho

Background:
Archeological sites in the Lower Salmon River canyon contain contributing resources to the Lower Salmon River ACEC. These sites are also contributing properties to the Lower Salmon River Archeological District, which is listed on the National Register of Historic Places. Determining the extent of the archeological site features on these sites, and impacts to the sites proves to be challenging due to accessibility problems. Impacts may result from livestock use, recreation use from whitewater rafting, OHV use, and high flows of the Salmon River.

Project Objectives:
This project assisted in determining the extent of the archeological site boundaries, features located w/n the sites and potential impacts. Examples of different site types included in the test areas ranged from prehistoric pit house depressions, open surface prehistoric sites, hydraulic mine cutbanks, tailing piles, mine ditches, and small rock foundations associated with historic 1880s Chinese mining.

Objectives were to test techniques and capabilities of the Raven and T-Hawk unmanned aerial system (UAS) at various altitudes for mapping and to determine what type of digital imagery might be best used to located site features. For example, prehistoric pithouses have higher organic content in the floors of the depressions that have since been filling naturally with either wind-blown or water deposited sediments. On occasion at certain points in the year the grassland vegetation begins to dry. However, the depressions, because of their higher organic content, retain moisture just slightly longer thus allowing subtle changes in the green color of the plant before it dries like its surrounding neighbors. UAS can help identify these sometimes subtle features. Historic resources such as small rock foundations or mine ditches are difficult to discern in traditional aerial imagery, however, the UAS can collect data from oblique angles, which can be better utilized to identify features with the collection of low level data.

Justification and Advantages of UAV methods in relation to cultural resources:

Collected imagery allowed BLM to easily pick out OHV use, recreation trails, pit houses, hydraulic mining, historic can scatters, historic rock structures, etc. Resolution was quite good and resulted in cultural feature and impact identification. Photos received were georeferenced and allowed for quick and accurate mapping of cultural resource locations.

Photo 1: Historic Wood Frame Structure, Cottonwood Field Office

2015 & 2016:

Project Title: Henry Smith Prescribed Fire and UAS Aerial Inventory, Malta, Montana

Background:
The Henry Smith site is located in the Big Bend of the Milk Cultural Area of Critical Environmental Concern (ACEC), which encompasses close to 2000 acres in North Central Montana. The location is dominated by the presence of a buffalo kill location, prehistoric drivelines, ground figure (both anthropomorphic and zoomorphic), habitation sites and medicine wheels. Prior to the UAS project, an all-encompassing map of these locations did not exist due to extreme difficulties in mapping these large scale and complex locations from the ground. Aerial inventory and recordation allowed for better management and protection of these unique national Register of Historic Places (NRHP) eligible properties.

Project Objectives:
UAS allowed for the establishment of an accurate map of Henry Smith site. Total UAS flight time was less than 20 hrs. Traditional Archaeological methods would have taken approximately 90-120 days or 720-960 hrs. per crew member to record the features and would not have provided the quality of data.

UAS provided a proof-of-concept and effectiveness study for future use of UAS for Cultural Resource inventories in relation to large-scale prehistoric cultural complexes.

UAS also created accurate ground based close range photogrammetry of all locations within the ACEC and achieved long range management objectives from the Resource Management Plan (RMP)

Justification and Advantages of UAV methods in relation to cultural resources:
Traditional Class III cultural resource inventory was inadequate to record all aspects of large-scale cultural properties, especially when vegetation and topographic constraints are present. Use of UAV improved the accuracy and enabled detailed inventory and mapping which was accomplished much faster and at a significantly reduced cost.

As an alternative, use of personnel in helicopters in a prolonged low level hovering flight profile to map cultural resource locations would produce results but only allows for a one-time recordation of sites as identified by personnel during the flight. Helicopters have been used in the past but are not the most cost effective avenue due to the excessive cost and risk. BLM utilized LIDAR and visible spectrums from aircraft as a comparative technology within the same site boundary; in all cases, the UAS provided a better product at a fraction of the cost.

UAS provides for a highly detailed and accurate noninvasive mapping technique
Extreme Cost savings , UAV total with processing $15,000 +/-, traditional methods for crew time alone would be upwards of $25,600- 33,600 per individual or $100,000 plus (4, GS-05 Archaeological Technician). Project was featured both nationally and internationally (BBC London, Smithsonian) and in countless periodicals and online publications.
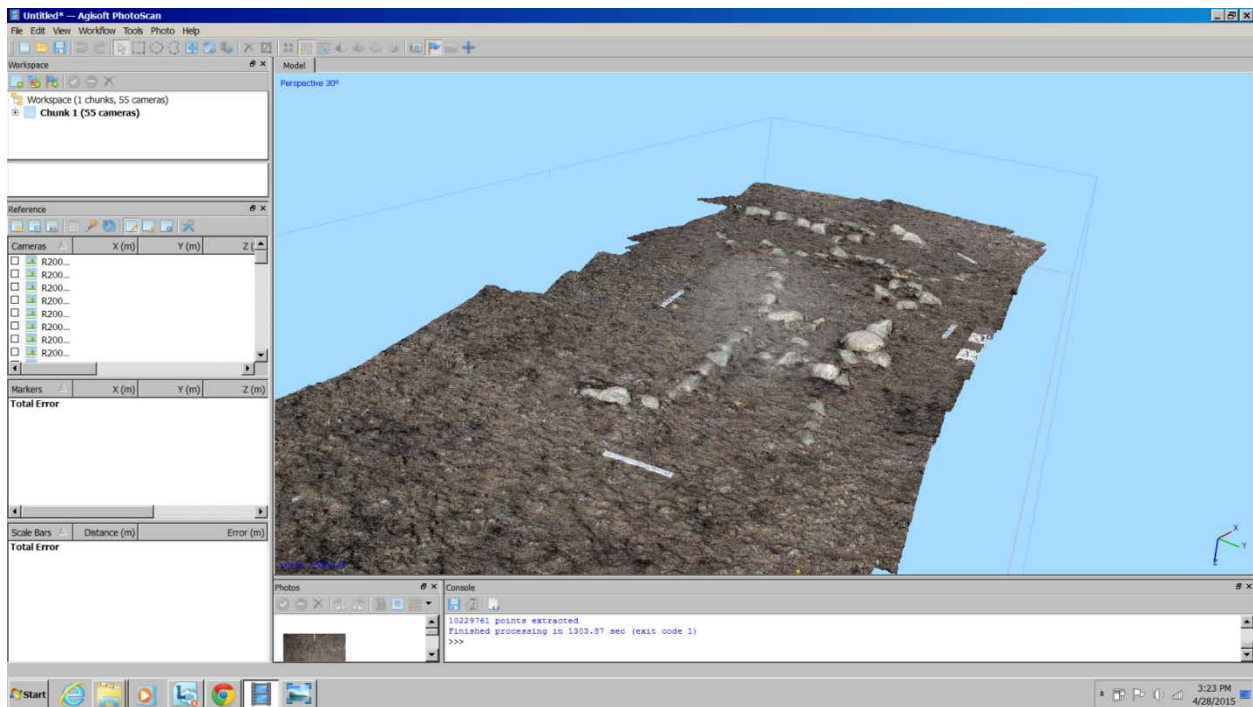
Photo 2: Photoscan (sub cm 3D model) of Human Effigy recorded at Henry Smith Site 2015

2016 & 2017:

Project Title: DTC Cultural mapping

Background:
From 1942-1944, the southern and eastern Mojave and northern Colorado Deserts of CA and AZ were transformed into the largest military training base of all time – the 20,000-square-mile Desert Training Center/The CA/AZ Maneuver Area (DTC). Although only being active from 1942 through 1944, the DTC had a profound effect on over one million soldiers and officers during their last 13 weeks of training before joining the battlefronts in North Africa, Europe and Asia. In addition to training soldiers, the center served as a foundation to develop and test various tactics, techniques and weaponry for desert warfare, which until that point was not well known to the US

Project Objectives:
The BLM Needles field office had the opportunity to utilize UAS on two occasions, in January 2016 and this past April 2017. In both cases the work served the Needles and Palm Springs field offices, as well as the District Office. Later this year, BLM also anticipates having flights conducted through a NOC contractor that will fly a much larger UAS capable of completing large and open land areas in shorter amounts of time.

Needles BLM FO's primary experience has been to utilize the UAS to collect low-altitude aerial imagery photogrammetrically of areas that were used in association with the Desert Training Center. To collect data using this method allows for th e ability to accurately map various DTC features such as the remains of divisional camps, landing strips, roadways, maneuver areas, bivouacs, and associated ruins. It also helps identify specific locations that should be examined further as it may pose a threat to the public (pit, basin, or unexploded ordnance), or may be of archaeological interest (structural remains, focused dumpsite, previously unknown use area). Because the data is collected and processed utilizing photogrammetry, a digital elevation model is generated which allows for point elevation mapping and rendering the landscape in three dimensions.

Justification and Advantages of UAV methods in relation to cultural resources:
UAS is a technology that has many uses suitable to a land and resources management agency such as the BLM. Within the cultural resources division of the BLM, when used appropriately, UAS can reduce risks and costs while increasing the efficiency and accuracy of recording particular types of cultural resources. Any cultural resource that leaves an identifiable change on the landscape is amenable for UAS. The usefulness and cost effectiveness increase proportionately to increases in connectedness or contiguity between features, feature sizes and in the constraints associated with reaching said features. Within the BLM cultural program, the cost effectiveness would be best realized with using UAS to help record mining sites and districts, military training bases, ranching landscapes, geoglyphs and linear features such as trails, rails and roads that are otherwise not yet mapped accurately. There are a myriad of other uses that assist the archaeologist to record, monitor and protect Historic Properties, in addition to contributing still or video imagery for public interpretation products many of which are being currently established.

UAS is especially useful in helping record the DTC because soldiers meticulously utilized various rocks and other material in utilitarian and aesthetic ways to decorate the various divisional camps and some of the bivouacs and training areas.

Some utilitarian uses included the use of rocks to define the edges of roads and paths, parking and vehicle repair areas, group-use and sleeping areas. Rocks were used outside divisional camps to define bivouacs, breastworks, various offensive and defensive positions for individual gunners or larger units such as howitzers or other artillery. Some of the more aesthetic uses included using rocks to design large scale versions of their distinctive unit insignia (unit, regiment, or division symbols), general military symbols (5-point star, US Flag); to construct facades, or alters to define catholic or protestant places of worship; and, to define the perimeter of existing or planted desert vegetation, similar to defining the border of a planting box.

Photo 3: Aerial Imagery (DTC)

2016:

Project Title: WRFO Cultural Site Mapping

Background:
UAS utilization within the WRFO included reconnaissance and mapping work in the Miller Creek drainage of the Skull Creek WSA. In this environment rough, steep and rocky terrain often times make class III cultural resource inventory difficult and potentially dangerous.

Project Objectives:
The purpose of utilizing the UAS platform was to scout for rock overhangs which might house Formative Era granaries, rock art or other cultural material within the overhangs.

Justification and Advantages of UAV methods in relation to cultural resources:
UAS flights went on for several hours and resulted in the location of several rock shelters and overhangs that had some indications that there might be material present and/or some easily recognizable granaries.

The project was important in that it was a cost effective way to do some work safely in some very rugged, rocky terrain that would have made pedestrian field work very slow and costly. It gave BLM locations that could be focused on for future Class III inventory and areas where field personnel would not have to devote as much attention to the terrain trying to find places that might have been very hard to find using other methods.

The UASs have provided some basic GPS points for the various resources identified so efforts to do detailed site recording can be specifically targeted instead of searching blindly. Some of the locations appear to be quite inaccessible and would probably not have been located without the use of the UAS.

Photo 4: Granary within steep canyon

2 UAS Useage 2017 and beyond

Ongoing Projects and usage in the future:

The ability to gain an aerial perspective in order to accurately map and assess cultural resource locations has become critical in mapping and understanding large and complex landscapes. The use of UAS is in its beginning stages and will undoubtedly become more and more prevalent as operators become trained and proficient in its usage. Over its short two year lifespan (specific to Cultural Resources) the UAS program has saved hundreds of thousands of dollars and provided accurate mapping products which have paid dividends to the non-renewable resource field.

Past and future usage specific to cultural resources includes but are not limited to :

- ARPA Damage Assessments
- Large Scale Cultural Complex and/or Landscape mapping
- Small Scale site mapping
- Accurate aerial site maps
- Supplemental photography and documentation for Class III Inventory
- "Prospecting" for cultural resource where terrain is too steep or dangerous to utilize traditional methods
- Post Burn inventories
- Components of strategic inventory
- HABS/HARE/HALS Inventory
- Cultural Tourism
- Cultural Resource Education

In summary, the UAS platform(s) provides Agency Cultural Resource professionals and Managers with an indispensable tool, which can be advantageous when utilized in the appropriate context for a specific purpose. UAS is not meant to be, nor would be a replacement for traditional methods but will enable BLM to supplement existing skill sets. Long term planning objectives can be met utilizing this technology and better management decisions can be made in light of having a more accurate and cost effective end product.