Proceedings of the 15th Biennial
Federal Columbia River Power System
Cultural Resource Program Systemwide Meeting
November 7–9, 2018
The Lodge at Whitefish Lake
Whitefish, MT

Sponsored by:
U.S. Army Corps of Engineers
Bonneville Power Administration
U.S. Bureau of Reclamation

Hosted by:
Confederated Salish & Kootenai Tribes
of the Flathead Reservation
The 15th Biennial Federal Columbia River Power System Cultural Resource Program Systemwide Meeting was held at The Lodge at Whitefish Lake in Whitefish, Montana, from November 7–9, 2018. Approximately 88 individuals representing federal, tribal, and state agencies attended the Systemwide Meeting (Attachment A). The meeting was made possible through contributions of the meeting planning committee (acknowledged on the following page), and funded by Bonneville Power Administration (BPA), U.S. Army Corps of Engineers (USACE), and the Bureau of Reclamation (Reclamation).

The first day was set aside for cooperating group meetings, followed by a poster session. The second day began with an Opening Invocation followed by the Opening Plenary Session, including an FCRPS Cultural Resource Program update and keynote speech. Reports from the eight cooperating groups were followed by an Elders Luncheon, during which elders from various tribes across the Pacific Northwest (PNW) generously shared their thoughts and memories of the river, emphasizing the importance of maintaining cultural practices through fishing and other activities. This was followed by two contractor presentations on technologies for identifying and documenting cultural resources, as well as investigating cultural resource violations. The day concluded with a poster session. On the final day, the contractors presented demonstrations of those technologies.

Meeting participants represented a variety of backgrounds and a diversity of views. The views expressed by any individual or organization should not be construed to represent a common understanding or agreement between parties on a particular view, and are not necessarily the views of the USACE, BPA, or Reclamation.

Requests for additional information about topics presented and discussed at the meeting should be directed to session facilitators. General inquiries about the FCRPS Cultural Resource Program should be addressed to one of the following Federal Agency Program Managers:

- Mike Flowers, FCRPS Cultural Resource Program Manager, USACE, michael.a.flowers@usace.army.mil
- Kevin Cannell, FCRPS Cultural Resource Program Manager, BPA, kgcannell@bpa.gov
- Sean Hess, Regional Archeologist/FCRPS Program Manager, PNW Region, shess@usbr.gov
Acknowledgements

The 15th Biennial FCRPS Cultural Resource Program Systemwide Meeting would not have been possible without the generous commitment of time, energy, and resources made by numerous individuals and organizations. We want to extend a special thank you to our gracious host, the Confederated Salish & Kootenai Tribes, whose members and staff contributed to planning and facilitation.

The Planning Committee members also deserve recognition for their work to develop the agenda and locate a host facility. Planners included Allie Taylor, Kayley Bass, John Matt, and Chris Casserino with the Spokane Tribe of Indians, Derek Beery from Reclamation, Jennifer Bertolani, contractor with BPA, Brenda Covington and Arrow Coyote of the Confederated Tribes of the Colville Reservation (CCT), John Pouley with the Oregon State Historic Preservation Office (SHPO), Gail Celmer with the USACE Northwestern Division, Alana Mesenbrink with USACE Libby Dam, Liz Oliver with the USACE Portland District, and Ashley Dailide, Alaina Harmon, Kara Kanaby, and Matt Punke with the USACE Seattle District.

Finally, thanks to our presenters and participants Dr. John Welch from Simon Fraser University; Brent Krober and Martin McAllister from Northland Research, Inc.; Alex Schwab from EthnoTech, LLC; Kyle Felsman for Hungry Horse Cooperating Group; Grey Johnson for Libby Cooperating Group; Kendra Maroney for Albeni Falls Cooperating Group; Derek Beery for Lake Roosevelt – Mainstem Cooperating Group; Chris Casserino for Lake Roosevelt – Spokane Arm Cooperating Group; Adam Rorabaugh and Matt Punke for Chief Joseph Cooperating Group; Arrow Coyote and Scott Hall for Payos Kuus Cuukwe Cooperating Group (PKC); and Liz Oliver for Wana Pa Koot Koot Cooperating Group (WPKK). We also thank the staff from the USACE, BPA, and Reclamation who volunteered their time and expertise to facilitate the sessions and presentations.
Notes on the Identification of Participants

Meeting notes are not meant to be a verbatim transcription. Note takers attempted to capture and summarize discussion content as accurately as possible. Individual speakers are identified by their general affiliation as “Tribal Speaker” or “Tribal Staff member,” along with tribal affiliation, if known. Others are indicated by agency affiliation.
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<td>Advisory Council on Historic Preservation</td>
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Cooperating Group Meetings
November 7, 2018

The following cooperating groups held a cooperating group meeting at the Systemwide Meeting.

Wana Pa Koot Koot Cooperating Group
Libby Cooperating Group
Payos Kuus Cuukwe Cooperating Group
Hungry Horse Cooperating Group
Welcome and Opening Invocation
November 8, 2018

Kyle Felsman, Confederated Salish & Kootenai Tribes, offered an invocation to start the meeting.
Presentation is Attachment B.

The Plenary Session provides meeting participants with an overview of the work completed by the FCRPS Cultural Resource Program to address effects to cultural resources resulting from the operation and maintenance of the FCRPS. This session also offers an opportunity to review issues that may influence future Program direction.

The FCRPS is a unique partnership that is responsible for managing multipurpose dams/Projects along the Columbia River and its tributaries. Within the FCRPS, the goal of the Cultural Resource Program is to manage cultural sites that may be impacted by the operation and maintenance of 14 FCRPS dams and reservoirs by three Federal agencies: USACE Northwest Division (12 Projects), Reclamation PNW Region (2 Projects), and BPA (markets and distributes hydropower produced by the Projects). Almost 4,500 recorded archaeological sites, thousands of other locations that also have traditional cultural value, and about 1,000 places determined eligible for the NRHP are addressed by the Program.

The Program operates on a legal framework based on Section 106 of the National Historic Preservation Act (NHPA), which requires agencies to assess the impact of their operations on cultural resources, identify, evaluate, and resolve adverse effects, and consult with States and Tribes. Program work also intersects compliance with other laws, including the Native American Graves Protection & Repatriation Act (NAGPRA), Archaeological Resources Protection Act, and Section 110 of NHPA (directs agencies to have an inventory of the historic properties that they manage).

The FCRPS Systemwide Programmatic Agreement (SWPA) immerged from a commitment made by the agencies during the System Operations Review in the mid-1990s, and the SWPA went into effect in October 2009. Current signatories include three Lead Federal Agencies, four States, five Tribes, three other federal land-managing agencies, and Advisory Council on Historic Preservation (ACHP), all of which continue to consult with groups that have not signed on, yet. In the future, the agencies are tasked with preparing and implementing project specific Programmatic Agreements that tailor the Section 106 compliance of the SWPA to each specific project.
Cooperating Groups include Lead Federal Agencies, other land-managing federal agencies, SHPOs, and tribes. These Groups are the primary means of communication between tribes and agencies, and where most of the work happens on deciding the steps that should be taken to manage cultural resources.

Fiscal Year 2018 Program funding totaled $11,000,000, with $6,600,000 going to USACE and $4,400,000 going to Reclamation projects.

Current challenges for the Program include continued loss of experienced people, including Elders, leadership, and staff. Institutional memory is being lost, and the agencies are trying to adapt. There are also financial challenges at BPA, as power generation is competitive and market-based. Despite those challenges, the Program remains well-funded. In addition, it continues to be a challenge to implement mitigations that benefit living communities. The “easy” sites have been stabilized, but the hard/large ones remain. The agencies are striving to foster creative mitigations within their legal authority.
Plenary Session
Program Keynote
November 8, 2018
"Landscape, Consultation, Archaeology, and the Promise of
Full-Spectrum Cultural Resource Management"

Presenter: Dr. John Welch, Simon Fraser University, British Columbia, Canada,
Professor & Director of the Professional Master’s Program in Heritage
Resource Management in the Department of Archaeology &
School of Resource and Environmental Management

Note taker: Ed McCorkindale, Contractor

John R. Welch is a professor, jointly appointed in the Department of Archaeology and the School
of Resource and Environmental Management at Simon Fraser University (SFU) in British
Columbia. Welch works with Native Nations on projects at the interface of Indigenous peoples’
sovereignty-rights and responsibilities derived from authority over people and territory-and-
stewardship-sustainable and broadly beneficial uses of sociocultural and biophysical
inheritances. He has published widely in Apache history and applied archaeology, and directs
SFU Archaeology’s online Professional Graduate program in heritage Resource Management.
Welch served as the archaeologist and historic preservation officer for the White Mountain
Apache Tribe from 1992 to 2005, and continues this work as a member of the board of the Fort
Apache Heritage Foundation. Welch also serves as the registrar for the Register of Professional
Archaeologists and the director of the Site and Landscape Preservation Program for
Archaeology Southwest, the Tucson-based non-profit dedicated to the preservation,
investigation, and exploration of the heritage places of Arizona, New Mexico, Colorado, and
Utah.
The first session of the program includes a report from each cooperating group on their progress in meeting the SWPA and other goals discussed in the various cooperating groups. Major projects that were initiated or completed over the past two years in the effort to protect, preserve, perpetuate the histories and cultural properties at FCRPS Projects and reservoirs were highlighted.
Hungry Horse Cooperating Group
The Hungry Horse Cooperating Group covers FCRPS Cultural Resource Program activities along the South Fork of the Flathead River, which was dammed in the early 1950s to create Hungry Horse Reservoir. The Grand Coulee Power Office of Reclamation operates this facility. The Hungry Horse Cooperating Group is composed of BPA, Reclamation, the Confederated Salish & Kootenai Tribes, the Flathead National Forest, and the Montana SHPO.

Presentation is Attachment C.

Libby Cooperating Group
The Libby Cooperating Group covers FCRPS Cultural Resource Program activities along the Kootenai River, which was affected by the construction of Libby Dam. The USACE Seattle District operates the dam. The participants in this group include BPA, USACE, the Confederated Salish & Kootenai Tribes, the Montana SHPO, and the Kootenai National Forests.

Presentation is Attachment D.

Albeni Falls Cooperating Group
The Albeni Falls Cooperating Group covers FCRPS Cultural Resource Program activities along the Pend Oreille River and over the stretch affected by the operations and maintenance of Albeni Falls Dam. The USACE Seattle District operates this dam. The participants in this group include BPA, USACE, the Coeur d’Alene Tribe, the Confederated Salish & Kootenai Tribes, the Kalispel Tribe, the Kootenai Tribe of Idaho, the Idaho State Historical Society, and the Idaho Panhandle National Forest.

Presentation is Attachment E.

Lake Roosevelt – Mainstem Cooperating Group
The Main Stem Lake Roosevelt Cooperating Group covers FCRPS Cultural Resource Program activities on Lake Roosevelt, the reservoir created by impounding the Columbia River behind Grand Coulee Dam, which is operated by Reclamation. The participants in this group include BPA, Reclamation, CCT, National Park Service (NPS) Lake Roosevelt National Recreation Area (LARO), and Washington Department of Archaeology & Historic Preservation (DAHP).

Presentation is Attachment F.
Lake Roosevelt – Spokane Arm Cooperating Group
The Spokane Arm Lake Roosevelt Cooperating Group covers FCRPS Cultural Resource Program activities on Lake Roosevelt, but its focus is on the Spokane River, which was affected by the construction of Grand Coulee Dam. The group also covers the Main Stem of the Columbia River from about Hunters Creek to Hawk Creek. The participants in this group include BPA, Reclamation, CCT, DAHP, and NPS LARO.

Presentation is Attachment G.

Chief Joseph Cooperating Group
The Chief Joseph Dam Cooperating Group covers FCRPS Cultural Resource Program activities on the reservoir behind Chief Joseph Dam, which is operated by the USACE Seattle District along the upper Columbia River. The participants in this group include BPA, USACE, CCT, Bureau of Land Management (BLM), and DAHP.

Presentation is Attachment H.

Payos Kuus Cuukwe Cooperating Group
PKC continues to guide Section 106 compliance for FCRPS operations at six Projects managed by the USACE Walla Walla District. These Projects extend from McNary Dam in the Columbia River to Dworshak Dam in the Clearwater River. Five Tribes – Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Nez Perce Tribe (NP), CCT, and the Wapanum Band – and two Federal agencies (BPA, USACE) and the SHPOs of WA, ID, and OR work cooperatively to manage and protect cultural resources in the six operating Projects: McNary, Ice Harbor, Little Goose, Lower Granite, Lower Monumental, and Dworshak.

Presentation is Attachment I.

Wana Pa Koot Koot Cooperating Group
WPKK covers FCRPS Cultural Resource Program activities on the Bonneville, The Dalles, and John Day reservoirs, which are operated by the USACE Portland District in Oregon and Washington on the Columbia River. Its members are the USACE Portland District, BPA, Yakama Nation, CTUIR, the Confederated Tribes of the Warm Springs Reservation of Oregon, NP, Oregon SHPO, DAHP, Bureau of Indian Affairs, and U.S. Forest Service Columbia River Gorge National Scenic Area

Presentation is Attachment J.
The Elders’ Luncheon is an opportunity to share a meal, and honor the tribal elders who generously contribute to the FCRPS Cultural Resource Program by sharing their memories of life on the Columbia River and its tributaries.

Ken Johnston gave an introduction, noting that agency staff work together every day, and work often with tribal staff, but don’t have enough opportunities to hear from tribal elders. Many agency staff don’t ever get that opportunity, so we must bring information back to them.

Several Elders spoke:
- Johnson Meninick, Yakama Nation
- Adele Guyer, CTUIR
- Linda Jones, CTUIR
- Claudette, CCT
- Clam Nicholas, CCT

Tribal staff commented on the memories/issues shared by Elders:
- Nakia Williamson, NP
- Mike Durglo Jr., Confederated Salish & Kootenai Tribes

Three federal agency leads also spoke:
- Dan James, BPA Deputy Administrator: Reaffirmed the commitment of BPA to the FCRPS Cultural Resource Program, which is a priority. He is available to facilitate any specific conversations and questions with BPA staff and managers.
- Coleman Smith, Reclamation: The FCRPS Cultural Resource Program surveys and studies that Reclamation has supported at Hungry Horse and Grand Coulee are not an end point, but they are an opportunity to focus on other parts of the Section 106 process, like treatments and mitigations. Reclamation, along with other Federal agencies, have been asked to look internally to improve their processes, so this is a great time to make changes. Reclamation requests feedback and ideas for how to do things better.
- Col. Mark Geraldi, USACE, Seattle District: Reaffirmed the commitment of USACE to FCRPS.
Unmanned Aerial Systems (UAS, aka drones and their supporting software) are quickly becoming an indispensable technology in the archaeologist’s toolkit. UAS provide a flexible and efficient remote sensing platform capable of producing spatial products such as 1cm resolution aerial imagery, 3D models and digital surface or terrain models. These products can be leveraged with spatial analysis, and can be viewed and leveraged in an online environment, making it easier for organizations or agencies to consume. To highlight the utility of UAS, this presentation covers three main topics: a discussion of how the technology functions, what software is required, and the regulations that govern its use; its potential applications in reservoir archaeology, with case studies as examples; and, its applications to archaeology in general, also with case studies as examples.

UAS is a host of technologies working together, including image processing software. Images are not maps, so they must be processed in order to do measurements. There are two types of vehicles. Fixed wing vehicles are gas powered, so they have longer flight times and can cover more area in each flight. However, they have lower resolution, are not self-stabilizing, and are not suited for 3D inspection. Rotary vehicles have shorter flight times, but higher resolution, are self-stabilizing, are really the only option for 3D.
There are several types of sensor technology used by UAS:

- **RGB**: Cannot penetrate vegetation (i.e., only digital surface modeling), and has high processing times and large datasets.
- **Thermal**
- **Light Detection And Ranging (LiDAR)**: More expensive, heavier, and needs more precise locations (i.e., more expensive drones). Some of these units are relatively large, but Belladyne just developed one that is 500 grams, though it still requires very precise bits per second. Can penetrate vegetation (i.e., can produce a digital terrain model), and has a larger scan view (i.e., fewer transection necessary). A full unit is about $60,000, plus specialized hardware, software, and expertise.
- **Multispectral**: Primarily for agricultural use.

Advantages of UAS include the ability to do web mapping, which doesn’t require specialist software to access the data. Further, data can be password protected. However, there are also several limitations: weather (i.e., shadows can impact logistics and images), costs (software and LiDAR), they are best suited for small areas, data/image processing limitations, and the use of large data sets (i.e., storage needs).

The use of UAS also involves working through multiple kinds of regulations, including those for airspace, land ownership, licensing (i.e., Part 107), safety plans, public awareness, and Federal Aviation Administration registration.

There are three phases for UAS projects. The first is flight planning, which involves ensuring that you know the terrain and identifying what the product will be. Second is flight execution. Consideration for execution include: ground control points which help the computer compensate for topographic changes (i.e., the ground is not flat), weather, lighting, equipment settings, software quirks (i.e., some packages will change elevation based on topographic but some won’t), and data storage and backup. The third phase is data processing, which requires you to consider which software packages are appropriate (e.g., Drone2Map, which works with all ESRI products, Px4D, Agisoft), processing times, storage, processing settings (there are a lot of them), and the output products that are desired. There are several types of models that can be produced using UAS: digital surface model, digital terrain model, orthomosaic, 3D point cloud (.las), 3D scene layer, and/or a combination of models done over time to see changes.

UAS have potential applications by FCRPS to benefit living communities, including: erosion monitoring, site mapping/monitoring/mitigation, feature extraction (i.e., determining edges and creating polygons), image classification, and field data collection. Other applications include use of cut/fill, which cuts and fills areas of changes in elevation between images by subtracting one digital surface model from another, and using multispectral sensors to observe vegetation stress/health in order to sense subsurface map features.
More broadly, UAS has the potential to help us better understand and quantify reservoir erosion, and assist with site mapping and monitoring, particularly in a time series, and can be used as a mitigation tool. LiDAR can map bare earth terrain and may be particularly relevant for areas with dense vegetation. UAS can facilitate more informed management through a better understanding of the processes affecting sites.

**Question and Answer:**

**Q** Observed that this same technology could be used by looters.

**A** As the regulations improve, hopefully there will be a better system for monitoring the use of drones. Drones are conspicuous, and hopefully people are aware of when they are being used. Due to the expertise necessary to use the hardware and software, and the costs involved, it would be difficult for most looters to use them to locate resources that they don’t already know are there.

**Q** Can UAS be used to locate burials?

**A** Hasn’t seen it used this way, yet. The only way that buried features can be identified is through the multispectral vegetation stress scanning, and in those cases it is due to large underground features. Burials are unlikely to cause significant vegetation stress.

**Q** Observed that drones could be used for monitoring for sites that might only be accessible by boat.

**A** Absolutely. Drones can be launched from a boat. One application of UAS is to look at very steep areas where the drone can get very close, where a pedestrian cannot. Thermal can also be used at night to observe looters.

**Q** Can a sensor see through a rock cairn?

**A** No, sensors cannot penetrate rock.
Brent Kober is a Forensic Archaeologist with the Heritage Protection and Emergency Management Team of Northland Research, Inc. He has been a professional archaeologist for 22 years. He has performed archaeological damage assessments, and has taught forensic archaeological methodology throughout the United States alongside nationally recognized expert Martin McAllister for the last five years.

Martin McAllister is a Forensic Archaeologist on the Heritage Protection and Emergency Management Team of Northland Research, Inc. He is the recognized national expert on the assessment of damages to cultural resources, and has worked in this area since 1977. In 2018, he received the Society for American Archaeology Lifetime Achievement Award for his cultural resource protection efforts.

Climate change and natural process have a significant impact on cultural/heritage resources. However, the impact from looting is even more dire. All incidents involving what appears to be significant damage to cultural resources should be investigated as potential felony violations of federal law and, in some cases, State law. The federal statute of limitations is five years. In these cases, standard felony investigation procedures should be followed. Some “new” technologies (i.e., technologies that may have been around for some time, but are underutilized for investigations) are options. These technologies include: video surveillance systems, impression casting with cast stone, forensic sedimentology, 3D laser scanning of damage, use of drones for aerial perspective and 3D laser scanning, and photogrammetry.

The best places to use outdoor video surveillance systems are for resources that are, or are likely to be, vulnerable targets for unauthorized damage. The systems can range a lot, from trail cameras to sophisticated systems used by the military. One point of variety is the type of sensor activation. One example is Intellicam, which works with legacy sensors (i.e., older sensors that agencies might currently have), is small and easy to conceal, has good battery life, and has a diversity of programming options.
Casting of impressions of footwear, tire treads, tools, weapons, and even things such as clothing and handprints can provide conclusive evidence of the presence of a suspect at a site. In one actual case, the complete serial number of a handgun involved in the violation was obtained from a cast. Cases should be made using dental stone, referred to by forensic supply companies as “cast stone.” Do not use plaster of Paris.

Forensic sedimentology involves high resolution analysis of soil chemistry and microscopic soil particle size to compare soil samples from looted cultural resource sites with soil samples obtained from items such as artifacts, tools, and clothing seized from suspects. This method can show, conclusively, if the soils from the sites are the same or not the same as the soils from seized items. This method is expensive.

3D laser scanning combines high speed lasers (i.e., recording 500,000 points/second) with high resolution digital color photography to create a “virtual reality-quality” computer model of damage to cultural resource sites; this is LiDAR. These models have a number of very useful internal mark-up and measurement tools and can be used with computer-aided design software to generate 2D and 3D products, such as maps and 3D surface models. These methods assist with assigning values to damage (e.g., precise volume of holes). This method is expensive because of the need to keep up with technology updates. 3D laser scanning products allow a jury to “go” to the crime scene.

Photogrammetry utilizes a series of photographs taken of archaeological sites or artifacts, which are stitched together using specialized software to create a 3D model that allows measurement and analysis of resources and damage to them. Photographs can be taken from drones, the ground, or underwater. Agencies should be creating 3D models of all standing architecture that they manage, in case there is ever any damage. Drones provide higher resolution/quality images of structures than archaeologists can provide through normal methods.

**Question and Answer:**

**Q** What is the practicality of these methods? Aren’t they expensive?

**A** Generally, they are not. They can be less expensive than using a traditional archaeological crew, and the information obtained is better quality. However, a full felony investigation is expensive, and using some of these technologies can still be expensive for an individual program.

**Q** What is an approximate cost of the 3D laser scanning example from the presentation (Chief’s Mound)?

**A** $10,000 to $12,000.
Q  Observed that video surveillance could be considered invasive, or could draw attention to an area.
A  There are always tradeoffs. A significant part of cultural resource preservation and protection is consultation. For sites that are certain to be looted, video surveillance may be more acceptable/preferred. The day of the violation is a bad time to begin the consultation process.

Q  How do things play out in court when cases are prosecuted, such as when there is an obvious looter, or the looter is unidentified?
A  There are different degrees of violations. Sometimes the person is unknowingly doing what they are doing, and that could be an issue in court. An important part of the investigative case report is the damage assessment. There is also a determination of the type of prosecution. Cases that can’t be prosecuted criminally can still be pursued civilly. There is a decision-making matrix for prosecutors and investigators for how to go about this, and the decision is not made by archaeologists. It may only be feasible to do a full-scale damage assessment in cases with a suspect.
The cooperating groups prepared posters that highlight accomplishments of their group and research topics relevant to the FCRPS program.


“Bank Stabilization and Creating Habitat for Pollinators at Albeni Falls Dam and Lake Pend Oreille,” by Kara Kanaby and Betsy Hull, Army Corps of Engineers, Seattle District.

“Results of the 2016-2017 45OK247 Excavations, Chief Joseph Dam,” by Adam Rorabaugh, PhD, History/Archaeology Program, Confederated Tribes of the Colville Reservation.

“Skolaskin Church Rehabilitation,” by Arrow Coyote, Confederated Tribes of the Colville Reservation.

“The Traditional Cultural Plants Project,” by the Confederated Tribes of the Colville Reservation Plant Team.

“Traditional Cultural Places Named for Plants,” by the Confederated Tribes of the Colville Reservation Plant Team.
Demonstration 1
November 9, 2018
"New Technologies for Investigating Cultural Resource Violations"


Facilitator:  Liz Oliver, Archaeologist/WPKK Program Manager, USACE, Portland District
Note taker:  Liz Oliver, Archaeologist/WPKK Program Manager, USACE, Portland District

Krober and McAllister presented videos and illustrations demonstrating how a laser scanner scans an area, and the final results of the scans. The products include 2D images of the scan (similar to archaeological profiles) as well as 3D videos and renderings of archaeological sites and rock images.

The demonstration included examples from two sites: Red Elk Rock Shelter, Idaho and Lake Owyhee Landing Strip Site (35ML1975), BLM land, Oregon.

Question and Answer:

Q  What is the distance limit of the survey scanner?
A  A few hundred feet. You can scan and then move the scanner to capture additional areas. One day of scanning can result in weeks of processing.

Q  Are there restrictions on the use of scanning in Canada?
A  Not sure. It depends on government regulations.

Q  How much does it cost to do a scan?
A  $10k–$15k, depending on the size of the area.
Demonstration 2  
November 9, 2018  
"Applications of Unmanned Aerial Systems to Reservoir Archaeology and Beyond"

Presenter: Alex Schwab, Archaeologist/Remote UAV Pilot/GIS Analyst, EthnoTech, LLC  
Facilitator: Greg Anderson, Archaeologist/Cultural Resource Project Manager, BPA  
Note taker: Liz Oliver, Archaeologist/WPKK Program Manager, USACE, Portland District

Schwab demonstrated the use of UAS using a preprogramed flight path over the Lakeside Lawn at the Lodge at Whitefish Lake. Following the UAS demonstration, he answered questions inside.

Question and Answer:

Q How much larger drone is needed to also capture LiDAR?  
A The DJI Matrice series drones is a larger LiDAR-capable drone (2x size of Phantom 4), but is more expensive.

Q What is the payload of the drone used for the demonstration?  
A It can carry the weight of a hand held camera.

Q Does it have multispectral use?  
A It allows you to look at red edge, which is useful for vegetation health; can also identify buried features. Used in Phoenix area with canals and to find housepits in Alaska Delta.

Q How about mapping cultural plants?  
A One possibility is to identify camas during blooming season (looking for purple flowers). It could also be used for land classifications by capturing vegetation height.

Q Multispectral camera versus Landsat 8?  
A Landsat 8 does not the spectral resolution necessary to detect small buried features. Also, it’s not very flexible on when it collects imagery so you may not get data from the ideal time of year.

Q Able to do moisture stress?  
A Yes, UAS has sophisticated agricultural uses.

Q Are National Parks restricted airspace?  
A Yes, NPS has strict drone regulations.

Q What about using for trails?  
A It could be used but there are some logistical issues for long trails. You could do a localized test.
Closing
November 9, 2018

Mike Durglo Jr. of the Confederated Salish & Kootenai Tribes closed out the meeting.
Attachment A: 15th Biennial FCRPS Cultural Resource Program Systemwide Meeting Attendance List
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Attachment B: Plenary Session, Program Update
(Slide Presentation)
14 Federal Dams and Reservoirs

Federal Dams

- Reclamation
- Corps

15th Biennial FCRPS Cultural Resource Program Systemwide Meeting, November 7-9, 2018
THREE AGENCY PARTNERSHIP (LEAD FEDERAL AGENCIES)

- U.S. Army Corps of Engineers, Northwestern Division – 12 Projects
- Bureau of Reclamation, Pacific Northwest Region – 2 Projects
- Bonneville Power Administration – markets & distributes hydro power

CULTURAL RESOURCES ADDRESSED

- Almost 4500 recorded archaeological sites
- 1000s of other locations that also have traditional cultural value
- About 1000 places determined eligible for the National Register
LEGAL FRAMEWORK

Section 106 of the National Historic Preservation Act
• Requires consideration of effects – identify, evaluate, resolve adverse effects
• Requires consultation with states and tribes

Program work facilitates compliance with other laws
• Native American Graves Protection & Repatriation Act
• Archaeological Resources Protection Act
• Section 110 of the National Historic Preservation Act

SYSTEMWIDE PROGRAMMATIC AGREEMENT

Commitment from the System Operation Review in mid-1990s
Went into effect in October 2009

Current Signatories
• 3 Lead Federal Agencies
• 4 States
• 5 Tribes
• 3 Other Federal Land-Managing Agencies
• Advisory Council on Historic Preservation

Project-Specific PAs will tier off the SWPA over the coming years
COOPERATING GROUPS

Groups focused on Corps Projects
- Wana Pa Koot Koot
- Payos Kuus Cuukwe
- Chief Joseph
- Libby
- Albeni Falls

Groups focused on Reclamation Projects
- Lk. Roosevelt Main Stem
- Lk. Roosevelt Spokane Arm
- Hungry Horse

PROGRAM FUNDING

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**CHALLENGES**

- Continued loss of experienced staff
- Financial challenges at Bonneville Power Administration

**Mitigations**

- Easy sites stabilized – hard ones remain
- Fostering creative mitigations within agency authority

**QUESTIONS?**
Attachments C–J: Cooperating Group Reports
FY2017 and FY2018 (Slide Presentations)

Hungry Horse Cooperating Group  Attachment C
Libby Cooperating Group  Attachment D
Albeni Falls Cooperating Group  Attachment E
Lake Roosevelt – Mainstem Cooperating Group  Attachment F
Lake Roosevelt – Spokane Arm Cooperating Group  Attachment G
Chief Joseph Cooperating Group  Attachment H
Payos Kuus Cuukwe Cooperating Group  Attachment I
Wana Pa Koot Koot Cooperating Group  Attachment J
Trails Multiple Properties Documentation
This is ongoing work that the CG hopes to have finalized for MT SHPO sometime in early 2019. Currently, CSKT staff is incorporating comments and ideas from CSKT Culture Committees. The ultimate goal is to present a comprehensive product on the ethnographic trails systems including their links to potentially NRHP eligible archaeological sites and TCPs of the South Fork drainage.

Figure 5. View of Upper Quinault Trail at the Base of Stans Divide.

Figure 21. Trail Landscape in Upper Aenas Creek drainage.
Ethnobotany Project w/ CSKT

In addition to the Trails MPD, another component of the Traditional Cultural Properties inventory strategy at Hungry Horse is the further development of an ethnobotanical study. CKST are leading this effort to expand an already existing regional document to focus on the Hungry Horse Project. This is to be completed in FY20 but background work has already begun.

Spring Monitoring

Ethnotech, under contract to USBR and BPA, completed site condition monitoring in 2016 and 2017 at Hungry Horse Project. The goal of monitoring is to visit up to 10 sites twice a year (Spring and Fall) during different conditions and to update the site condition data. Sites are showing little short term change and in fact seem to be accreting rather than eroding. This monitoring strategy has been a main facet for mitigating potentially eligible sites for several decades.
Fall Monitoring

In most years the site condition monitoring is completed by USDA FNF and CSKT archaeologists.

Staffing and workload constraints at FNF and CSKT prevented their participation the past three years.

BPA and USBR instead contracted with a local CRM firm since they were already performing the inventory work at HH.

FY18 monitoring did not occur- but the HHCG plans to return to FNF- and CSKT- led monitoring for FY19.

Ethnotech was able to use drone technology to record current aerial images and digital surface mapping at sites.

Inventory

Survey is complete at Hungry Horse Project.

Two contractors completely covered accessible acreage inside the APE between 2014 and 2017.

Priority Areas 1-4: HRA 2014
A, B, E & H: Ethnotech 2016
C, D, F, & G: Ethnotech 2017
The majority of new sites identified during the recent inventory efforts were historic logging resources. For this reason, the CG decided to implement a logging use study for the reservoir to provide context and background for these newly identified resources. The report, completed in FY18 by HRA, is available on the FCRPS website.

https://www.bpa.gov/efw/CulturalResources/FCRPS/CulturalResources/Program/Resources/ProgramDocuments/Grant_2018.pdf

To commemorate the completion of the inventory of project lands at Hungry Horse, BPA and USBR will contract a short capstone report collecting and summarizing the results of the recent inventories that compares the findings to the Systemwide Research Design.
The author of the article is also the historian who USBR contracted for the completion of the extensive Historic American Engineering Record for the dam. The publication was highlighted during the recent Montana Historic Preservation Roadshow with a tour stop at the dam.

**Historic Properties Management Plan**

- The Hungry Horse Project HPMP was completed in FY17. USBR and BPA officials have accepted the document and the Cooperating Group is now working on a Project Specific Programmatic Agreement (PSPA) to implement the HPMP and support the larger System Wide Programmatic Agreement for the FCRPS. The CG recently discussed the first draft and the current plan is to send the document out for signature and implementation by the end of FY19.

- The HPMP will likely need some additions in the near future. For example, shortly after the HPMP was completed, the CSKT discovered a box of field notes that had been unavailable to incorporate into the work history section. (*The CG is excited to review these notes from the mid-1990s!*). Completion of the Trails MPD may also require some additional implementation through the HPMP and PSPA.
ABORIGINAL KTUNAXA TRAIL STUDY

In Cooperation with CSKTPO, KCC, USACE, BPA, KNF

Research Goals:

Beginning early Summer 2018 CSKTPO staff begin compiling pertinent data regarding known trail systems within the Kootenai National Forest. This project is part of a cooperative effort seeking to provide traditional Ktunaxa history to the known trail network. More importantly, this project seeks to reestablishes aboriginal ecological knowledge in a way that can be beneficial to the bands and also educational to visiting groups. Representatives from Kootenai Culture Committee have played an important role in the development of this research, providing cultural nuance vital to research presented in written text.
Establishing Area(s) of Interest

Areas of interest outlined by previous studies conducted by CKTPo linking placenames to notable events throughout Ktunaxa history. Elder interviews provide the bulk of context for areas, the majority of this compilation is found in DV Tape format. The inclusion of ethnohistory provide context to the seasonal movement of local bands providing an intangible aspect to the study.

Research:

- Tasked with comprehensive review of archival database
- Compile data for areas of interest
- Place names locales (Frequency of place names helped determine AOI)
- Occupation Sites
- Mobility Strategies
  - Reasons for movement
KCC Hunting Camps/ Reestablishment of Ktunaxa Use in KNF

- Overall goal is to provide, “a greater understanding of Ktunaxa history for the public, for the cultural resource managers and most importantly for our Ktunaxa youth” (Sam, 2018).
Field Pilot: Big, Bristow and Pipe Creek

Figure 6. Overview of Wilderness near Pipe Creek

Figure 7. Salt lick along game trail

Figure 8. KCC field crew trail scouting near Bristow
Kalispel Tribe Natural Resources Department
Kendra L. Maroney, Archaeologist

Albeni Falls Dam Cooperating Group

15th Biennial FCRPS Cultural Resource Program Systemwide Meeting, November 7-9, 2018
Lemlmtš
Eden Harbor Pictograph Stabilization

- This treatment was designed by committee through the FCRPS Mainstem Cooperating Group in support of the SWPA. The Mainstem CG specifically devised this stabilization plan to treat the adverse effects at 45GR146 caused by vehicle traffic throwing rocks onto the pictograph panel that have been documented since at least 1978. The completed project reduces the erosion caused by larger rock debris and water runoff moving from the shoulder of the road onto the panel.

- **Project Goals:**
  - Protect the panel by hard surfacing the road to reduce the movement of dust and small gravel thrown by vehicles that has been demonstrated to adversely impact the pictograph,
  - Keep larger gravel and rocks from moving down the slope above the road from rolling of the shoulder onto the panel through installation of a concrete curb at the edge of the roadway, and
  - Provide an alternate runoff channel up the center of the road grade to move water away from the edge of the roadway where it flows off the shoulder and impacts the panel.
Having Burbot Site Stabilization

Temporary stabilization of four features at 45ST1163 was completed in May 2018. This effort had been planned since the site was recorded in 2016. The 2017 effort was hampered by a quick refill of the reservoir to a level above the site over Memorial Day weekend.

The NPS ferried stabilization materials provided by USBR from Kettle Falls Marina to the site via motorboat. Personnel from NPS and CCT packed the materials to the features. Four features were covered with a layer of geotextile fabric, the plysood, a layer of angular gravel, and capped with rounded river cobbles. The rounded river cobbles do not entirely cover the angular gravels along the margins of the stabilization structure. In plan view, the stabilization structures are square shaped; in surface profile, they are slightly mounded in the center.

The CG is eager to see how this temporary and quick measure holds up through the next few drawdowns.

Marble Stabilization

This project is fully designed and permitted. USBR is currently preparing the project for its contract award phase. Construction is planned for Fall 2019 and Spring 2020. This large effort will protect a site that has been of great concern to the cooperating group since before 2013. A combination of gravel capped rip rap and stamped concrete walls will protect the site without detracting from an area that sees some public use by the small community of Marble, WA.
BPA, USBR, and CCT are working diligently to cover the Lake Roosevelt shoreline with modern inventory efforts.

A recent planning and mapping exercise indicates that the team is within about 3000 acres of meeting the goal of completion of accessible federal acreage within the APE.

Completion is expected for 2020!

Inventory Work

The CCT HA program continues to find many historical resources along Lake Roosevelt and interestingly, very ancient sites are the most frequent new archaeological site type being discovered.
The Rehabilitation tasks achieved in Phase III include:

- The Restoration of the Heritage Sign.
- A thorough cleansing of the interior log surfaces and tie beams (ceiling joists).
- The renewal of selected features of the historic hewn log structure.
- The construction of a new interior entry landing and steps down to the ground level.

Pia Mission Rehabilitation

PHASE III

During August 2017 the church rehabilitation was completed. The old porch was removed and the porch was reconstructed with cement landings at the steps and at the ramp (Figure 2). Everything from the interior of the Cook Shack was removed, except for the two wood stoves. All the insulation was removed and the walls were sealed from the inside. There was additional sealing around the chimney, and some added bracing in the interior corner of the walls. Nails with bits of drywall on the rafters were removed, the wasp nests were removed, interior holes in the attic area were sealed, and attic vents were screened. There was bracing in the ceiling trusses to keep the structure from swaying. The whole interior of the Cook Shack was painted. The linoleum was removed, the floor was clean, and new vinyl laid (Figure 3). The wood stoves were clean and fired, to make sure the stoves and chimneys were working properly, and a floor hearth placed under the cook stove.
TCP Studies

- 50 oral history records were updated and 30 transcripts were recorded to electronic media.
- 20 elders and practitioners were interviewed.
- Over 4,400 historic photos are entered in the Past Perfect database. Of these, 876 photos with associated information were updated.
- Distribution of a suite of interpretive products
- Ten Traditional Cultural Property Inventory Research forms
- Created GIS shapefiles for 55 unnamed TCPs within/near the Grand Coulee Project, one more is still being researched.
- Kettle Falls First Salmon Ceremony video

Three TCPs were selected for assessment of adverse impacts on the integrity: sʰâm̥kʷ [TCP #13], meaning “Roar of the wind” is the Salish name for a place now known as Camel Bluff which is now inundated by the Lake Roosevelt reservoir (George 2011:18-19). snxəl’pstwixʷtn [TCP #256], meaning “Finish line” is the Salish name for the area at the south end of Chalk Grade on the east side of the Columbia River, now inundated by Lake Roosevelt reservoir (George 2011: 79). scá’iytsup [TCP#320], meaning “Spawning grounds” the Salish name for the general area of the original Kettle Falls town site, now inundated by Lake Roosevelt reservoir (George 2011: 94).

Salvage Recovery Efforts at 45ST60

In 2018, field work was carried out over 9 days from May 1-9 when the reservoir was drawn down to 1221.9-1227.4 ft. AMSL. Site inventory and mapping resulted in documentation of 18 distinct features and numerous artifacts exposed on the ground surface. Eight artifacts were collected from the ground surface: one opal biface fragment, two andesite bifaces, two mudstone bifaces, one white CCS projectile point base, one sleigh bell, and one toy jack. Test excavations in 2018 included two 1 m x 1 m test units and 10 constant volume samples (CVS)/shovel probes. An artifact catalog containing the items collected during inventory, mapping, and excavation of test units and shovel probes lists 379 items.

A total of 18 features were identified, 10 pre contact features and 8 historic period features. Pre contact features included 5 fire modified rock (FMR) concentrations, 2 concentrations of tabular quartzite knives and 2 shell concentrations.
Eligibility Testing 45LI224

Site 45LI224 is a Pre Contact Lithic Material site relatively dated to the Coyote (sn‘k’líp) (8,000 – 4,800 B.P.), and possibly Salmon (ntitiyáʔx) (4,800 – 3,500 B.P.), periods of occupation, with evidence of at least one intact subsurface cultural material bearing deposit. The subsurface deposit is present within the Lake Roosevelt reservoir drawdown zone as well as in the intact deposits on the first terrace above the reservoir. The majority of artifacts observed at the site, to date, have been in lagged and dispersed contexts on the ground surface while 261 artifacts have come from subsurface contexts. Of those 261 artifacts, 90 have come from excavations into intact deposits. Fire modified rock encountered in situ indicates the potential for an intact subsurface feature at the site.

The artifact assemblage at 45LI224 may prove to be one of the first accepted accounts of Windust evidence of Coyote period occupation in the Lake Roosevelt reservoir.

LI224 continued

- The antiquity of the site is indicated by the artifact assemblage recovered from the ground surface and the integrity and significance is indicated by the sites location, assemblage, and intact subsurface cultural bearing deposits. Site 45LI224 has indicated an early period occupation in the Lake Roosevelt region and positive subsurface investigations indicate a strong potential for additional information important in regional prehistory. Given subsurface deposits and the existing archaeological assemblage, 45LI224 maintains integrity and significance important in regional prehistory that may prove beneficial in further refining our understanding of regional chronology.
Site 45ST45 is an almost continuous midden exposed along the slope at the terrace margin for approximately 1000 m. Artifacts, features, and an almost continuous pavement of FMR are exposed in reservoir wave cuts. Reservoir induced erosion and deflation has displaced artifacts and has likely dispersed cultural material and perhaps creates and recreates concentrations of artifacts in secondary contexts.

In total, 41 features and 5 scatters were observed and documented during 2018 fieldwork. Reservoir erosion appears to occur most prevalently along the sloping, leading edges, of the terrace risers while reservoir silts/cap is deposited along the terrace risers as well as atop the generally level terrace tops.

Observations of intact A-horizon within and surrounding features, sometimes in combination with reservoir silts obscuring a portion of the feature, suggests intact deposits, bearing cultural material, may remain at 45ST45. Of the features and scatters documented, 35 likely contain intact deposits, 3 appear lagged and deflated, and it is indeterminate at 8. Seven burials may remain at 45ST45. Of the features, 39 are pre contact and 2 are historic. Of the scatters, 2 are pre contact, 1 is pre contact and historic, and 2 are historic.

North Gorge and the surrounding area are being targeted by the same illicit artifact looter/collector(s) year after year. In 2016, evidence of illicit excavation, targeted transects, methodical searching, flipping artifacts over, moving artifacts, and screening of fill were observed at four (4) sites: 45ST44, 45ST55, 45ST211. Posted signs, ARPA patrolling, archaeological monitoring, and NPS surveillance of the North Gorge area has not deterred the illegal activity of the brazen individual(s) leaving behind footprints, Marlboro Menthol cigarette butts, buckets, improvised screens, piled artifacts, excavated holes and associated fill.

As of Late 2017 NPS has an active ARPA case with an individual of interest! The case is active and no further details are available.
Table 1 – Lake Roosevelt Reservoir Elevations as Measured at the Forebay

<table>
<thead>
<tr>
<th>DATE</th>
<th>GCL FB*</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/18/2017</td>
<td>1232.5</td>
</tr>
<tr>
<td>4/19/2017</td>
<td>1232.7</td>
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<td>4/20/2017</td>
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<tr>
<td>4/21/2017</td>
<td>1232.5</td>
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<tr>
<td>4/22/2017</td>
<td>1232.7</td>
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<td>4/23/2017</td>
<td>1232.8</td>
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<td>4/24/2017</td>
<td>1233</td>
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<td>4/25/2017</td>
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<td>4/27/2017</td>
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<td>4/28/2017</td>
<td>1232.8</td>
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<td>4/29/2017</td>
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<td>1234.8</td>
</tr>
<tr>
<td>5/10/2017</td>
<td>1234.6</td>
</tr>
</tbody>
</table>

By maintaining a tribal repository, as part of the History/Archaeology Program, the CCT warrants their active participation in an additional aspect of the documentation, preservation, care, and research of the tribe’s cultural resources. Since 1984, the History/Archaeology Program has worked diligently with agencies, universities, and private contractors in order to locate and transfer to the Repository archaeological collections from sites within the traditional lands of the CCT.

CCT curates 95% of collections on Columbia River from Canada to Rock Island. Collections date to work completed in the 1940’s through the present.

As of 2017 the CCT Repository curates 1,380 cubic feet of artifacts and 247 linear feet of records for Reclamation and BPA as part of their annual FCRPS contract. Reclamation contracts curation of an additional 109,065 objects and 11,853 records at the Repository from pre-FCRPS Program work at Lake Roosevelt.

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Historic Properties Management Plan

Reclamation and BPA, along with their partners in the FCRPS Mainstem and Spokane Arm Cooperating Groups have completed a three volume HPMP for the Lake Roosevelt APE. The HPMP is under review by NPS. The next step is to gather signatures to enact the plan.
District Nominations

- Cayuse Mountain Archaeological District
  - Composed of 31 archaeological sites
    - related by geography, site type
    - documented time depth as early as 8000 years b.p.

- West End Archaeological District
  - Composed of 14 archaeological sites and TCPs
    - related by community, geography
    - documented time depth as early as 2000 years b.p.; significant historic component

Cayuse Cove Stabilization

- Protection from erosion due to wave action
- Accomplished: design
- Accomplished: shovel testing
- Hurdles
  - Access road washout x2
  - Staging area?
  - Costs rising
Salvage Data Recoveries

- Mill Creek Site (2017)
  - the first radiocarbon dates
    - Middle and Late Archaic (3000-150 years b.p.)
- Sand Bar Site (2018)
  - the first radiocarbon dates
    - Late Archaic to ethnographic (< 500 years b.p.)
    - obsidian from 4 sources
    - diversity of artifacts (awl, pipe, scrapers, projectile points, antler tool)
Burial Monitoring

HHRDD In Action

• VIDEO REMOVED
Chief Joseph Dam
FY 2018 Accomplishments

CJ DPA Wildlife Areas
Subsurface Testing

Adam N. Rorabaugh, PhD
History/Archaeology Program
Colville Confederated Tribes
### Array Monitoring

**Array Monitoring**

**Subsurface Testing**

**Site 11**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Sediment Description</th>
<th>Zone</th>
<th>Easting</th>
<th>Northing</th>
<th>Excavator</th>
<th>Cultural Materials</th>
<th>Notes</th>
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<tbody>
<tr>
<td>58</td>
<td>0-83 cm BS: 10 YR 5/1 silty sand with 1% subrounded gravels. Impasse at 83 cm BS due to cobble.</td>
<td>11U</td>
<td>323000</td>
<td>5324648</td>
<td>DS</td>
<td>CCS flakes (N=2, 70 cm BS)</td>
<td>N/A.</td>
</tr>
</tbody>
</table>
Payos Kuus Cuukwe
Cooperating Group

- Confederated Tribes of the Colville Reservation
- Confederated Tribes and Bands of the Yakama
- Nez Perce Tribe
- Confederated Tribes of the Umatilla Indian Reservation
- Wanapum
- WA, OR, ID SHPOs
- BPA
- US Army Corps of Engineers, Walla Walla District

Designed to Stabilize and Protect 3000 feet of shoreline
Using Environmentally friendly Geo-textile bags
Awarded $2+ million dollar project to be constructed in Winter 2018

Columbia Park

Artifact Concentration
Shell Midden
Burials
Shell Midden
Shell Midden
Shell Midden

45BN52 Shoreline Stabilization
Profiling Feature at 45FR04
WANA PA KOOT KOOT

October 2016 - September 2018 (FY17-18) accomplishments

People Working Together on the River

Wana Pa Koot Koot looks at impacts to cultural resources at Bonneville, The Dalles, and John Day pools.

- 4 federal agencies
- 4 tribes
- 2 state historic preservation offices
### Numbers as of September 2017

<table>
<thead>
<tr>
<th></th>
<th>Acres Inventoried</th>
<th>Recorded Sites</th>
<th>Sites eligible for the National Register</th>
<th>Sites listed on the Register</th>
<th>Sites monitored in FY2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonneville</td>
<td>1,534</td>
<td>130</td>
<td>15</td>
<td>11*</td>
<td>27</td>
</tr>
<tr>
<td>The Dalles</td>
<td>2,296</td>
<td>289</td>
<td>56</td>
<td>3</td>
<td>38</td>
</tr>
<tr>
<td>John Day</td>
<td>26,181</td>
<td>602</td>
<td>28</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>30,011</td>
<td>1,021</td>
<td>99</td>
<td>16</td>
<td>87</td>
</tr>
</tbody>
</table>

* Bonneville Lock & Dam is a National Historic Landmark

### 2018 survey areas

3,081 acres of USACE lands surveyed

6 new sites in The Dalles Project

19 new sites in the John Day Project
FY 17 Site monitoring

Elders Tour, October 2017

Visited locations in The Dalles Project:
45KL65, a petroglyph
45KL88, Bear Paw petroglyphs
45KL65, petroglyph
45KL88, Bear Paw site

Maryhill petroglyph, March 2018
Maryhill petroglyph move, 45KL344

Maryhill petroglyph move, 45KL344
Maryhill petroglyph move, 45KL344

3D Structures in Motion, Bear Paw site
Video Removed
Attachment K: Applications of Unmanned Aerial Systems to Reservoir Archaeology and Beyond (Slide Presentation)
Applications of UAS
To Reservoir Archaeology and Beyond

Roadmap

What will be covered:
What are Unmanned Aerial Systems?

UAV Types
Several sensors are available for UAV Mapping

1. RGB Camera Zenmuse
2. Multispectral MicaSense
3. Thermal FLIR
4. LIDAR - LIDAR POD
RGB
Great for visual products like orthomosaics or inspections
Less accuracy than LIDAR for 3D, but significantly cheaper
Limited to surface models with vegetation cover
High processing time and large datasets produced

Multispectral
NDVI
Agricultural use
Archaeology
Vegetation Health

Thermal (FLIR)
Monitoring
Security
Defense
Search and Rescue

LIDAR
Exceptional Accuracy
Shorter Flights
Penetrate vegetation
Cost Prohibitive
Specialized Hardware and Software

Why use UAS for mapping?

Advantages
1. Efficient data collection
2. Cost effective
3. Flexibility
4. High spatial accuracy
5. 3D Capability
6. Numerous applications

Limitations
1. Weather
2. Shadows
3. Software costs
4. Best suited for small areas
5. Processing limitations
6. Large data sets
7. LIDAR is cost prohibitive

Regulations
1. Airspace considerations
2. Landowner regulations
3. Part 107 License
4. Safety Plans are best practice
5. Public awareness
6. Register UAV with FAA
7. Airspace considerations

The Mapping Process
Phase 1: Flight Planning
Phase 2: Flight Execution
Phase 3: Data Processing

Phase 1 Flight Planning
Considerations

- Product resolution required
- Site reconnaissance
- Product resolution required
- Safety
- Additional regulations
- Airspace restrictions
- Landowner and access
- Planning for weather
- Terrain and line of sight
Ground Sampling Distance

e.g. Spatial Resolution

Results from flight altitude, image overlap and sensor resolution

**Phase 2 Flight Execution**

Considerations
- Ground Control Points (GCP)
- Weather awareness
- Lighting
- Equipment settings
- Software quirks
- Data storage and backup
- Beware of birds

Flight Pattern is important depending on products desired
Oblique imagery is necessary for 3D flights
GCP’s!

Phase 3 Data Processing
Considerations

- Software Package
- Drone2Map, Pix4D, Agisoft
- Processing Time
- Storage
- Processing Settings
- Products required
Digital Surface Model
Digital Terrain Model
Orthomosaic
3D point cloud (.las)
3D Scene Layer

UAS for FCRPS

Applications of UAS to FCRPS
-Erosion Monitoring
-Site Mapping, Monitoring and Mitigation
-Feature Extraction
-Image Classification
-Field Data Collection

Erosion Monitoring
Surveyor Diagram 2008

Previous Output of
Site Mapping, Mitigation and Monitoring
Feature Extraction
Classification

LIDAR Point Cloud
Detects bare earth, surface features and vegetation density.
Possible with RGB sensors

Cut Fill
Cut Fill

Airbus, USGS, NGA, NASA, CGIAR, NCEAS, NLS, OS, N…

Website: https://arcg.is/1a4iCz

Cut Fill

25 Feet

25 Feet
Subtracts one DSM from another to reveal differences in elevation
Common in reclamation, mining, earthworks
Could be used to detect subtle changes in elevation due to reservoir erosion

UAS in Broader Archaeology

Peru SIGDA
Sandby Borg Ringfort
Buried Roman Architecture

Peru - Ministry of Culture
SIGDA

Comprehensive Drone Mapping Program
Oops

Sandby Borg
### Wall
- Excavation site 2016
- House 4
- House 40
- Houses
- Surface 2016

---

**Multispectral**
Buried Features

Conclusion
UAS has the potential to:

Help us better understand and quantify reservoir erosion

Assist with site mapping and monitoring and offer new insights, especially in a time series

Offer a LIDAR platform that can map bare earth terrain and may be particularly relevant for areas with dense vegetation.

Facilitate more informed management through a better understanding of processes affecting sites

Be a mitigation tool
Attachment L: New Technologies for Investigating Cultural Resource Violations (Slide Presentation)
INVESTIGATION OF CULTURAL RESOURCE VIOLATIONS

All incidents involving what appears to be significant damage to cultural resources should be investigated as potential felony violations of federal law and, in some cases state law (federal statute of limitations is five years).

Standard felony investigation procedures should be followed.

Some “new” technologies are now being utilized in these investigations.

NEW TECHNOLOGIES

1) Video surveillance systems
2) Impression casting with cast stone
3) Forensic sedimentology
4) 3D laser scanning of damage
5) 3D laser scanning from drones
6) Photogrammetry
7) Use of drones for aerial perspective on large-scale damage in open areas

“NEW”

Many of these technologies are not new, per se, they are simply underutilized in the investigation of cultural resource violations due to a variety of factors, such as lack of knowledge about them and their utilization and lack of funding.

Their use, when appropriate, should become “standard operating procedure” in investigating these violations.

VIDEO SURVEILLANCE SYSTEMS

Important cultural resources that are, or are likely to be, vulnerable targets for unauthorized damage should be monitored to detect violations.

This can be accomplished effectively using outdoor video surveillance systems.

They range in type from inexpensive trail cams to more sophisticated systems.
SENSOR ACTIVATED VIDEO SURVEILLANCE SYSTEMS

INTELLICAM:
- Oldest Manufacturer
- Wide Variety of Sensors & Accessories
- Work with legacy sensors agency already owns
- Smallest systems made, easy to conceal
- Very good battery life
- Many programming options

IMPRESSION CASTING WITH CAST STONE

Impressions of footwear, tire treads, tools, weapons, and even things such as clothing and handprints, can provide conclusive evidence of the presence of a suspect at a site.

In one actual case, the complete serial number of a handgun involved in the violation was obtained from a cast.

Casts of such impressions should be made using dental stone, referred to by forensic supply companies as “cast stone” (do not use plaster of Paris)
FORENSIC SEDIMENTOLOGY

Forensic sedimentology involves high resolution analysis of soil chemistry and microscopic soil particle size to compare soil samples from looted cultural resource sites with soil samples obtained from items such as artifacts, tools and clothing seized from suspects.

It can show conclusively if the soils from the sites are the same or not the same as the soils from the seized items.

Plots showing the relative frequency of mineral components in soil from a looted site (top) and soil from a bucket found at a suspect’s House (bottom).

Note the remarkable similarity between them.

3D LASER SCANNING OF DAMAGE

3D laser scanning uses laser scanners combining high speed lasers recording 500,000 points per second and high resolution digital color photography to create a “virtual reality-quality” computer model of damage to cultural resource sites.

These models have a number of very useful internal mark-up and measurement tools and can be used with CAD software to generate 2D and 3D products, such as maps and 3D surface models.
3D LASER SCANNING OF DAMAGE

USING 3D SPHERICAL PHOTOGRAPHY TO MEASURE THE SITE

PHOTOGRAMMETRY
Utilizes a series of photographs taken of archaeological sites or artifacts
They are stitched together using specialized software to create a 3-D model that allows measurement and analysis of resources and damage to them
Photographs can be taken from drones or from the ground (or underwater)

POINT CLOUD AND REALISTIC MODEL FROM DRONE PHOTOGRAPHY

USE OF DRONES
Drones equipped with digital video cameras can be used to document damage to cultural resource sites in open, sparsely vegetated areas