



Using LiDAR imagery to locate historic-era homesteads and irrigation features of the Mormon Row, Antelope Flats, and dry farms historic landscapes, Grand Teton National Park, Teton County, Wyoming

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Abstract GIS analysis of LiDAR imagery facilitated a modified NHPA Section 110 Class II survey and inventory performed in the summer of 2016 resulting in the identification of hundreds of fragmentary, relict, and extant cultural resources located in the vicinity of the Mormon Row Historic District (MRHD; 48TE1444) between June 6 and August 10, 2016. Correct identification and association of newly located cultural resources with persons, historic-era homesteads, and historic events is a complex and lengthy process requiring thorough artifact analysis and substantial background, ethnologic, and archival (contextual) research to make recommendations of significance, eligibility, and/or inclusion as contributing elements or not to the MRHD. Moving from the artifact scale to the site, feature, or historic district scale is a scalar process. Once at the site or historic district scale, it may be appropriate to ask whether the cultural resources can be addressed at a landscape scale, and ask new research questions such as: What if one were to consider *all* the cultural resources—prehistoric, historic, and natural—together? Are there theories and/or methodologies that can accommodate multiple layers of cultural resources and time frames and result in interpretations that are meaningful for present and future cultural resources management praxis?

Introduction

Periodic cultural resources reconnaissance, surveys, and inventories keep the National Park Service (NPS) or any federal land management agency abreast of prehistoric and historic-era artifacts, sites, features, properties, and landscapes under their purview. Cultural resources are defined as “physical evidence or [a] place of past human activity: site, object, landscape, structure; or a site, structure, landscape, object or natural feature of significance to a group of people traditionally associated with it” 50 years old or older (NPS, 2016) with a few exceptions (cf. National Register Bulletin No. 15 (NRB15); NPS, 1998). Cultural resources commonly located within National Parks include (NPS, 2016):

- **Archeological resources:** The remains of past human activity and records documenting the scientific analysis of these remains;
- **Historic structures:** Material assemblies that extend the limits of human capability;
- **Cultural landscapes:** Settings we have created in the natural world;
- **Ethnographic resources:** Sites, structures, landscapes, objects or natural features of significance to a traditionally associated group of people;
- **Museum objects:** Manifestations of human behavior and ideas.

Since the last cultural resource survey or project in a National Park, additional cultural resources may have

achieved an age of 50 years or older. Their identification and documentation may lead to recommendations that the newly identified cultural resources are potentially significant to broad patterns of American history and may or may not be eligible for listing on the National Register of Historic Places (NRHP; NPS, 1998) or added to previously established historic districts or site boundaries. Improved technology and methods previously unavailable to cultural resources investigators that can facilitate the location of “new” cultural resources may also have emerged since the last cultural resources survey or inventory. Harmon et al. (2006) utilized Light Detection and Ranging (LiDAR) and Geographic Information Systems (GIS) to qualitatively and orthographically visualize New England gardens at a landscape scale, thus enabling “the entire site” to become the focus of analysis (649). Their aim was “to test whether maps and images derived from LiDAR data could be used to accomplish these goals, and thus support interpretations of garden landscapes” (652). Such is the case at and within the Grand Teton National Park (GRTE). Light Detection and Ranging (LiDAR) imaging was performed and processed for the entire GRTE, and LiDAR data was made available for Geographic Information Systems (GIS) utilization in 2014.

Mr. Schroeder was approved for an Archaeological Resources Protection Act (ARPA) permit to perform GIS analysis of LiDAR imagery and locate and document potentially significant and previously unmapped and un-inventoried cultural resources in the vicinity of the Mormon Row Historic District (MRHD; 48TE1444). LiDAR imagery was made available to William Schroeder, M.S., R.P.A., a PhD student in Historical Archaeology and Cultural Anthropology at the University of Montana—Missoula (UM) in the summer of 2016 through an Archaeological Internship and GRTE Science and Resource Management (SRM) GIS Office with the GRTE. The summer internship was facilitated by the University of Wyoming (UW), UM, and the UW-NPS Research Station located within the Park. **No subsurface excavation or artifact collection is or was authorized for this project.**

Preliminary results of the modified Class II survey

and inventory performed in the summer of 2016 are promising. GIS analysis of LiDAR imagery facilitated the recordation of Global Positioning System (GPS) Universal Transverse Mercator (UTM) coordinates (points, lines, polygons) with a Trimble GPS unit owned by the GRTE SRM GIS Office. Thousands of fragmentary, relict, and extant cultural resources were located in the vicinity of the MRHD between June 6 and August 10, 2016. To identify correctly and associate newly located cultural resources with persons, historic-era homestead properties, and historic events is a complex and lengthy process requiring thorough artifact analysis and substantial background, ethnologic, and archival (contextual) research. Processing and post-processing of the fieldwork data is ongoing.

To make recommendations of significance, eligibility, and/or inclusion as contributing elements or not to an historic district, e.g. MRHD; 48TE1444, requires technical, logistical, and theoretical maneuvers. Moving from the artifact scale to the site, feature, or historic district scale is a scalar process. Once at the site or historic district scale, it may be appropriate to ask whether the cultural resources can be addressed at a landscape scale, and ask new research questions such as: What if one were to consider all the cultural resources—prehistoric, historic, and natural—together? Are there theories and/or methodologies that can accommodate multiple layers of cultural resources and timeframes and result in interpretations that are appropriate and meaningful for present and future cultural resources management (CRM) praxis?

Historical context

It is known from ethnographic records and archaeological sites that tribal people of the Greater Yellowstone Ecosystem region (GYE; including Yellowstone and Grand Teton National Parks as well as the John D. Rockefeller, Jr. Memorial Highway and surrounding National Forests and Wilderness areas) gathered in large groups at particular times in the year (Walker Jr. and Graves, 2007). Most often, these larger sites were situated in sheltered locations such as canyons or valleys near water, food, and fuel. Win-

ter encampments are often termed villages, but may or may not have been occupied year-round. Camas processing camps have been located in the northern portion of Jackson Lake, but are inundated below the current lake level. The Lawrence Site is an example of an extensive camas processing location with numerous hearths and ovens, sometimes called camas lids in other areas which also collected and processed camas bulbs for long-term storage and trade. It is estimated that people began using the area known by archaeologists as The Lawrence Site starting about 8,000 years BP. Campsites are typically categorized as shorter-term occupation sites in the archaeological record, and were similarly located near resources. Tool, lithic debitage sites, or quarries are other types these sites may represent given the impermanence of plant and animal remains versus the persistence of mineral resources in the archaeological record. Sweat bath sites, trade sites, trails, encampments, and of course tipi rings are still evident on the landscape if one is careful to identify them as such. It is not always conclusive if an alignment of quartzite cobbles is in fact a tipi ring without Tribal consultation. A tipi ring was recorded on the southern foothills of Blacktail Butte along with associated lithic artifacts as 48TE401 by Gary Wright in 1974. The site has been revisited periodically by other surveyors, and was revisited in 2016, but no evidence of a tipi ring was located. Given the timeliness of prehistoric land-use in the region, there is an imminent potential for surface and subsurface Native American cultural resources in the project area. Indeed, numerous prehistoric lithic artifacts and a few informal and formal lithic tools were located while searching for evidence of former homestead structures and relict irrigation network features.

At the time of the first settlers in Jackson Hole, the Manifest Destiny ethos held that natural resources were unlimited and were, in a phrase, ripe for the picking. The reality of any landscape is that resources are not unlimited, and are furthermore unequally distributed (Skirbekk, 1994). Indeed some places are simply better, i.e. more productive or contain more and different commodities/resources than others. This plays directly into the mechanisms of capitalism which is driven by surpluses and deficits,

values and costs, labor and production of surplus values. The labor expended extracting raw materials from the environment is factored into natural resources and environmental values (O'Connor, 1998). Cassity (2010b:105) finds "the distance [to markets], the topography, and the inconvenience of traveling over mountain passes worked to keep the valley relatively enclosed and isolated" which affected the local economy.

Richard White (1991) brings attention to the Mormon project, which is an exception to the historical progression of Capitalism in the Western United States at the turn of the 20th Century. White finds that:

Outside of some small utopian colonies, the Mormons made the only sustained attempt among incoming whites to avoid incorporation into the world markets. Joseph Smith, the founder of Mormonism, had enunciated a law of consecration and stewardship which presaged Karl Marx's dictum, "From each according to his abilities, to each according to his needs." Early attempts to put this law of consecration and stewardship into practice failed, but when the Mormons settled in Utah, Brigham Young tried once again. Young imagined a nearly self-sufficient Utah with an economy based on cooperation rather than competition. [240]

Mormons "engaged in the most systematic attempt at community creation in the West" (301). Because of the Mormon faith's

cohesive, homogeneous communities organized around the church...[their] settlements [reminded] settlers that brotherhood and cooperation should characterize their efforts and that they were engaged in a religious as well as secular pursuit. They often cooperatively built schools, canals, irrigation ditches, meeting houses, and homes and distributed the land. [301-302]

Cassity (2010b) reports an opposing viewpoint on the arrival of settlers in the Great Basin, in that the

'colonization' effort, however, was not en-

tirely organized and coordinated and it was only superficially a church endeavor. The church in Salt Lake City never endorsed it and it was accompanied by none of the tight-knit structure and planning and discipline that characterized other LDS emigrations and settlements. [2010*b*:106]

This observation comes from an admonition by Charles Lindsay (1932) who found that for the Mormon settlers to the Big Horn Basin,

it was each man for himself until he got there; then there was some co-operation. No arrangements had been made for either land titles or water rights prior to their reaching the Basin. This, again, was not characteristic of church supervision. [164].

Two cornerstones of the Mormon Row community were church and school. Two other cornerstones were dairy cattle and hay. Surplus milk was processed into cheese and butter which was traded for other staples the homesteaders were unable to produce themselves (Cassity, 2010*b*:103). Agricultural surpluses offered some a form of capital for which other commodities could be acquired; eggs could be traded for other goods at the general store in Kelly, WY (Moulton, 2007). The goal may not have been to acquire extensive capitalist surpluses, but rather to acquire landed freedom and prepare the land for the Second Coming as prophesied in Revelations.

John Freeman (2008:14) discusses Elwood Mead's contribution to irrigation practices in the West. Mead, a professor, politician, and an irrigation engineer, headed the US Bureau of Reclamation from 1924 until 1936—critical years in American agriculture during the infamous Dust Bowl era. Ditches were predominantly engineered to follow topographical contours in the best circumstances and in inefficient straight lines following the Public Land Survey System (PLSS) of land management in more challenging scenarios (see also Church, 2002). Irrigation systems were constructed out of the local earth they traversed, they were unlined for the most part, and were subject to erosion and corrasion. Ditch embankments were constructed from a few shovels full of earth or

a series of passes using a ditch plow. Water for the Mormon Row, Antelope Flats, and Dry Farms settlers came from the Gros Ventre River and Ditch Creek.

Water resources increase the value of land, a sentiment John Wesley Powell echoed, whereby “water had to be diverted from its natural channel many miles from the lands where it was to be used and moved there through artificial canals. White (1991:401) and Freeman (2008) find that under English common law, the Doctrine of Riparian Rights, as applied in the United States, reserves “rights to water accompanied rights to the land along a riverbank: all landowners who bordered a stream had a right to use water flowing past their lands” (54-57). When a natural stream is diverted into irrigation ditches, the water becomes a commodity and a public good or common pool resource; it is subsequently subject to overuse if not carefully monitored. It was and is incumbent upon land owner(s) and water rights user(s) that no one diminishes, contaminates, or otherwise alters the natural stream flow so as not to interfere with other water users downstream. Unchecked excess flow can result in rapid down-cutting and can turn a limpid lateral into a full-blown arroyo. To cope with this situation, water rights needed to be severed from natural channels “. . . (and) attached to the lands where the water was used” (Freeman, 2008:57). Colorado was the first US State to adopt a prior appropriation doctrine in its constitution in 1876, and the Wyoming Territorial Legislature adopted a doctrine of prior appropriation, drafted by Elwood Mead, as Article 8 of the Wyoming Constitution in November, 1889 (59). Article 8 established that water was the property of the state, and must be held accountable by a state engineer and superintendents of the water division of the state government. Irrigation districts were formed in an effort to construct and monitor water use in a fair and equitable manner. The MRHD and nearby settlers did not form a formal water district with the State of Wyoming; they managed their own ditches and the State of Wyoming granted water rights to users.

Born of this historical context, the Reclamation Act of 1902 established the United States Reclamation Service (later known as the United States Bureau of Reclamation—the agency Elwood Mead headed

from 1924 to 1936), to administer lands and construct irrigation systems in the West. The Federal Irrigation District Act of 1916, sometimes referred to as the Irrigation Smith Act, placed the Federal government as the principle guarantor of debt for the construction and operation of large-scale irrigation systems which serve local municipalities or counties. Wooden, poured concrete, and metal water control features were introduced in later years of the Mormon Row-Antelope Flats-Dry Farms community in response to nuisances caused by excessive water passage through open-air earthen ditch systems. Remediation and repair of damaged water control features was accomplished with group effort because an over-running ditch was everyone's problem (Moulton, 2007). This method of resource sharing works well when there is an adequate supply of water. When there is a dearth or deluge of water, different strategies were or are applied. The Mormon Row-Antelope Flats-Dry Farms community used excess irrigation ditch water to flood the sagebrush-laden fields during and after the turn of the 19th Century to kill the sagebrush (Daugherty, 1999; Moulton, 2007), and cleared their parcels for improvements per the Homestead Act of 1862 (Public Law 37-64; 12 Stat. 392), the Enlarged Homestead Act of 1909 (35 Stat. 639, as amended), and other land granting programs and acts (Bureau of Land Management [BLM], 2016). The community of settlers near Blacktail Butte dug their own ditches and laterals. After the flood of 1927 when the earthen Gros Ventre Slide dam broke, state and federal assistance facilitated the clearing out of clogged irrigation ditches, the enlargement of Savage Ditch into the Mormon Row Ditch, as well as the completion of formerly attempted ditches and facilitated recuperation of the community (Moulton, 2007, 221).

Study Area

The proposed research area extends to the north, east, and south of the established Mormon Row Historic District (MRHD; 48TE1444) in portions of Township 43 North, Range 115 West, Sections 14, 15, 20-24, 26-29, 32-35 and Township 42 North, Range 115 West, Sections 1-5 and 7-11, a project and study

area of ca. 35 mi². Grand Teton National Forest, United States Fish and Wildlife Service, Lower Valley Power & Light, Kelly Substation parcels and 27 other private inholdings, e.g. Moulton Ranch LP, Craighead subdivision parcels, the Teton Science School property, and the Town of Kelly, WY will not be surveyed during the course of this project. Bobcat Lane parcels, some of which are GRTE property, are not associated with the Mormon Row/Grovont, WY community and will not be included. The Gros Ventre Campground concession will also not be surveyed or inventoried. See Figure 1 for a parcel map using GIS layers and property ownership information available at <http://www.tetonwyo.org/GIS/> in the survey and inventory project area. Note: State School Lands, Sections 16 and 36, T 43 N, R 115 W in Figure 1 were technically transferred to the GRTE by 1950 and are no longer the property of the State of Wyoming.

Summary of Objectives, Proposed Field Methods, and Theoretical Approaches

An overarching objective of the GRTE and the National Park Service (NPS) in general is to preserve natural and historic resources within Park boundaries for present and future generations of Park visitors and researchers to enjoy and to interact with. Natural and historic resources must first be identified before they can be managed with this and other objectives in mind.

Objectives

- Assist Grand Teton National Park (GRTE) in National Historic Preservation Act (NHPA) Section 110 compliance and update NHPA Section 106 eligibility recommendations for the Mormon Row Historic District (MRHD; Grovont, WY) settlement.
- Research settlement history and water rights in and around the MRHD/Grovont, WY settlement to understand the context of the irrigation networks.
- Perform Geographic Information Systems (GIS) analysis of Light Detection and Ranging (LiDAR) imagery as it relates to the location of previ-

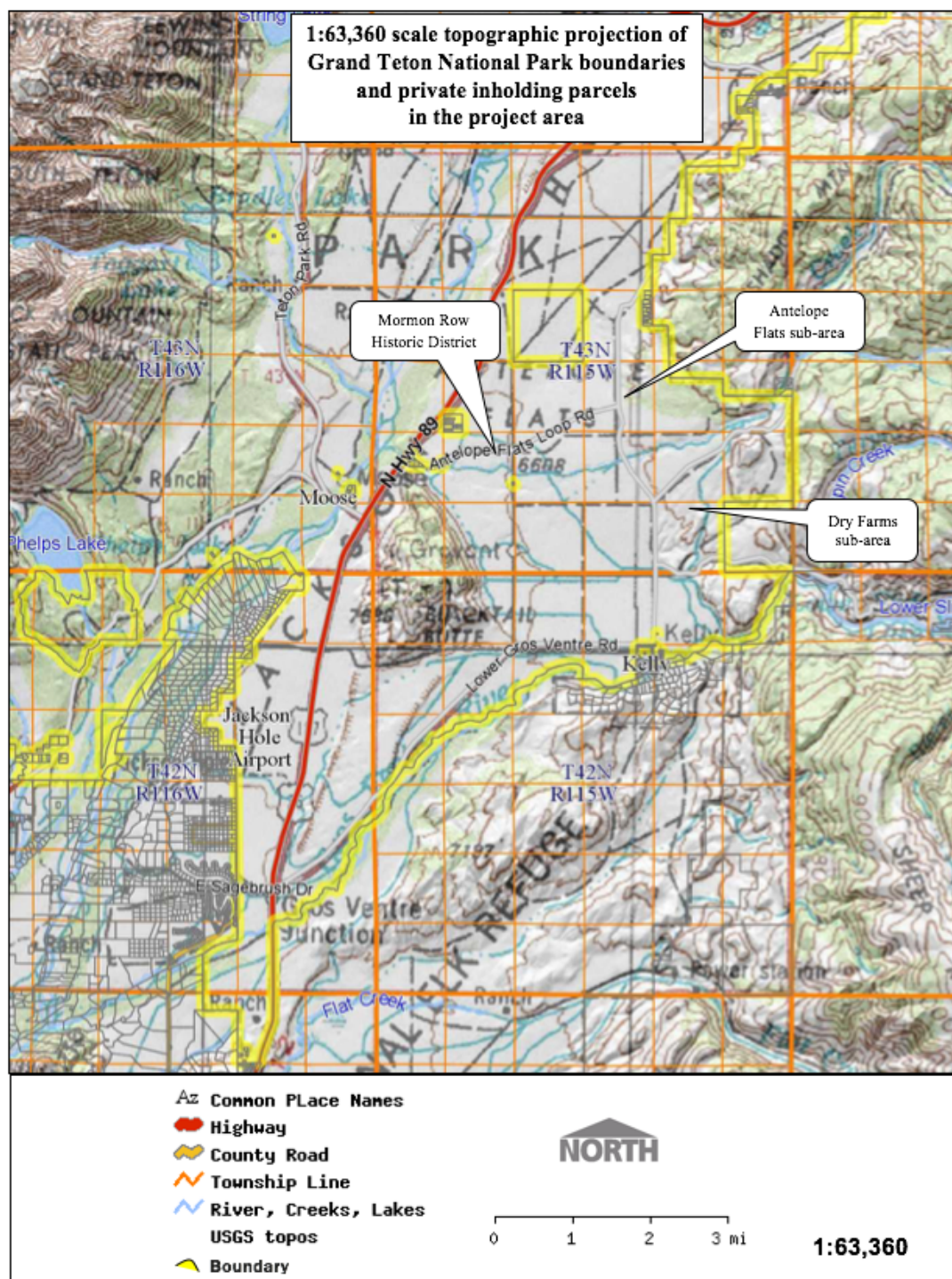


Figure 1. Annotated topographic projection of Grand Teton National Park and private inholding parcels; parcel map generated using the Teton County Geographic Information System website at <http://www.tetonwyo.org/GIS/>.

ously un-mapped and un-inventoried cultural resources.

- Survey locations of non-extant structures to as-

sess, photograph, and map surviving features and artifacts such as foundations and debris scatters.

- Locate structural foundations of Mormon Row community homesteads or remains thereof.
- Evaluate the integrity of the irrigation network and newly recorded cultural resources.
- Re-evaluate the sufficiency of the existing historic district boundary taking into account the cultural and historical landscape, and provide recommendations on how to reconcile conflicting district boundaries or augment existing site boundaries.
- Develop management recommendations and graphically represent the extent of the original compared to the re-visited homestead community and its irrigation network for future land management purposes.
- With GRTE approval, preliminary and/or final results will be presented to the general public and/or academic/scientific community, e.g. oral presentations or posters at regional conferences, academic journal articles, or other forms of media; proposed PhD Dissertation topic.

While the primary objective of this research is to locate and understand evidence of Mormon and non-Mormon Euro-American homesteads and irrigation ditches dated between 1896 and 1950 in the vicinity of Grovont, WY, also known as the toponym Mormon Row (MRHD; 48TE1444), there are two sub-areas through which named irrigation ditches flow: Antelope Flats, and the Dry Farms east and northeast of the MRHD within the GRTE, archaeological sites and isolated finds related to Native Americans are present in the vicinity of the MRHD and must be accounted for.

Native American archaeological sites and isolated finds date as much as 8,000-11,000 years before the present (hereafter BP) in the region (Walker Jr. and Graves, 2007; Wright, 1975). The Henn Site, in the southern portion of the National Elk Refuge (NER), the federally managed wildlife area immediately south of the project area, dates between 7,000 and 3,000 years BP based on diagnostic projectile point chronologies. This suggests that people may have utilized Antelope Flats and the area around Blacktail Butte for at least 7,000 years and probably longer until their displacement in the mid-19th

Century by Euro-American settlers (Walker Jr. and Graves, 2007). Conscientious attention was afforded to the location of previously identified and unidentified Native American cultural resources within the project's survey area. In other words, the Principal Investigator was and is not solely focused on locating evidence of historic-era land use, but rather *any* past land use or cultural resource of potential significance. To understand better the archaeological record generated by individuals and groups of people who lived between Blacktail Butte and the mouths of the Gros Ventre River and Ditch Creek in prehistory and the late 19th to early the 20th Century, as well as the circumstances and choices made by residents in response to historical and natural disaster events necessitates a multivariate methodology as well as the testing of hypotheses. Theory and methodology that can reveal heretofore unexplored connections and intersections of the Mormon Row-Antelope Flats-Dry Farms community within larger historical, regional, state, and national contexts at the site, multiple property, historic district, and/or landscape scale resulting in a more holistic interpretation necessitates more than LiDAR imagery and GIS software. Indeed, if one is to attempt to decipher and deconstruct the palimpsest of prehistoric and historic-era land use practices and the resultant cultural resources located within the project area, it will require logistical and technical maneuvers found in Historical Archaeology theory, methodology, and cultural resources management (CRM) praxis. A methodology by which cultural resources data can be organized in cogent and relevant scales of analysis for consideration on the NRHP before, during, and after data collection is also required.

Preliminary post-survey archival research, biographical notes (Daugherty, 1999; Farmer, 2000; Hubber et al., 1996; Moulton, 2007), and continued examination and analysis of LiDAR imagery (Daugherty, 1999; Farmer, 2000) has returned information useful in preliminarily identifying and interpreting landscape features previously unrecognized and therefore not documented in the summer of 2016, e.g. the situs of a set location used during the filming of *Shane* in 1953 along the embankment of the Mormon Row Ditch and faint linear depressions that were

thought to be relict game trails that turn out to be seasonal-runoff-fed irrigation ditches dug by homesteaders in the 1920s; both are in the Antelope Flats sub-area. The new information has resulted in the necessity of a second field season of research and investigation within the project area to fill data gaps. Mr. Schroeder is pursuing the Boyd Evison Research Fellowship and other funding sources to continue the research already in progress in the project area.

Theory and Methods

The National Register of Historic Places (NRHP) registration form for the Mormon Row Historic District (MRHD), prepared by Hubber, Miller, and Caywood in 1996 for the National Park Service (NPS), the GRTE, and the Wyoming State Historic Preservation Office (WYSHPO), recommended in a footnote:

A more careful search might reveal the ruins of the Arthur Mahon, Edward Geck, John Riniker, and Dick Van Der Brock homesteads—once carefully aligned along the road north of Thomas Murphy's,

and

The secondary settlement extended east/west along the historic roads to Moose and to Kelly or along secondary two-track access roads. Cultivated fields stretching behind the homesites (and the lateral ditches by which these fields were watered) also conformed generally to the imposed grid; only the primary distribution ditches followed the curvilinear contours of the land. [47]

Fortunately, since the last large-scale CRM studies on the Mormon Row Historic Landscape, Historical Archaeological theories and methodologies that are capable of considering multiple variables of time, place, theme, and function concurrently have been created (Hardesty and Little, 2009:11-52; Edgeworth, 2011). Donald Hardesty and Barbara Little's Feature Systems Archaeology method (2009) facilitates the organization and management of field data for the initial inventory report, *An NHPA Section 110 Modified Class II Inventory Using LiDAR Imagery to Locate*

Historic-era Homesteads and Irrigation Features of the Mormon Row, Antelope Flats, and Dry Farms Historic Landscapes, Grand Teton National Park, Teton County, Wyoming (Schroeder in progress).

Harmon, Leone, Prince, and Snyder (2006) utilized Light Detection and Ranging (LiDAR) and Geographic Information Systems (GIS) to qualitatively and orthographically visualize New England gardens at a landscape scale, thus enabling "the entire site" to become the focus of analysis (649). Their aim was "to test whether maps and images derived from LiDAR data could be used to accomplish these goals, and thus support interpretations of garden landscapes" (652). With the assistance of LiDAR imagery and GIS software, a multitude of previously unidentified landscape features, historic-era artifacts and isolated finds related to late 19th and early 20th Century Euro-American Mormon and non-Mormon settlers, including but not limited to the homesteads of the men mentioned above, as well as numerous precontact Native American sites and isolated finds were made possible. Using Hardesty and Little's "predictive" and deductive methodology, LiDAR imagery (Harmon et al., 2006) and GIS software can be utilized to locate evidence of past technology, raw materials, and land use practices which people in the past left fragmentary artifact and relict feature traces thereof. By generating lists of known and expected cultural resources likely to be found in a historic land use context, here an agricultural community, "new" and addended prehistoric and historic-era sites and/or isolated finds, features, multiple properties, historic districts will be located.

As a modified and hybrid Class II survey and inventory, a standard system of survey transect intervals will not be employed, e.g. 20m parallel transects. Instead, destinations will be located based on indications of potential cultural resources found on current and historic USGS topographic, Cadastral, and irrigation network maps, in historic-era aerial photography, and modern LiDAR imagery, and the most efficient path will be taken to get there. Ideally a more complete inventory of the historic landscape will be accomplished in part because previous projects were limited to strict boundaries of areas of potential ef-

fect (APE) and did not have the technology available to researchers in the present. An assembly of topographic maps, GLO records, aerial photographs, and modern LiDAR imagery will initially result in phased GIS maps of former homestead allotments, primary and secondary irrigation ditches and structures, as well as their historical ownership affiliation and consideration for listing on the NRHP.

Archaeologists and historians can read artifacts (pieces of technology) backwards if certain assumptions are accepted (Binford, 1962). One assumption is that artifacts and pieces of technology are, in some sense, determined in form and distribution by other systems including the social and ideological. Mark P. Leone (1973) finds that if one can gain access to the processes, then one can more accurately interpret the past. If it is a perversion of materialism to have as our primary concern the use of artifacts to show how they reflect other parts of an extinct or historic system, then

We might consider asking how the system of artifacts, the primary and undestroyed system of technology, caused or determined the social and ideological systems to take shape. What is there about the system of technology that either facilitated or determined parts of the social or belief systems? [194]

Material culture often leads archaeologists to interpolate political and economic reconstructions based on theories and evidence “well outside the area under reconstruction” (Church, 2002:222). Ideological, technological, and ethnological constructs that shaped land use are not as often taken into account as material cultural evidence, i.e. artifacts, features, and structures, perhaps because of their seeming intangibility (Appadurai, 1996; Harrison et al., 2008; Leone, 1973; Smith, 2006). Intangible cultural heritage may be legible if one is well-versed in the literature published on a subject, in this case Native American, Mormon, and non-Mormon land-use practices and beliefs (ideology), irrigation networks, other pragmatic problem-solving strategies, and artifacts (technology), and styles and types of domestic and agri-

cultural structures Mormons and non-Mormons constructed and employed in the American West in the late 19th and early 20th Century (ethnology or ethnography; folk architecture and custom). Thus,

To answer such questions, one cannot confine oneself to single sites, or site boundaries that encompass only architectural features and surrounding middens. It is necessary to situate sites within archaeology conducted on a regional scale,

and

In the course of diaspora, people engage in the ‘production of locality,’ which is ‘always emergent from the practices of local subjects in specific neighborhoods’ [Church, 2002:222 *pace* Appadurai, 1996].

To understand the landscape at a taskscape scale (Ingold, 1993; Appadurai, 1996), one must examine the landscape layer by layer, ideology by ideology, piece of technology by piece of technology, and ethnic or cultural group by group identity. If one can learn the vernacular of landscape transformations from the people who performed them (Daugherty, 1999; Moulton, 2007), one may better interpret the meanings of relict features, piles of dimensional lumber or cobbles, and curious patches of dark humic soil. Thus, if one understands the vernacular (Aisenbrey and United States, 1978; Leone, 1973; United States, 1967; Moulton, 2007), theoretically one should be able to read a technology, e.g. an irrigation ditch or a fence, “backwards” for what the technology can inform us about the culture that created or utilized it, and thereby read the artifacts and features on the landscape almost like a narrative. Hypothetically, if one then empirically observes the concatenation of ideology, technology, and social organization of a community in a place, and compares that data with the archaeological and/or textual record, one arrives at a greater understanding of a cultural-historical landscape. “Archaeology could profitably study both the manipulation of material culture (why and how we do what we do with technology) and the manipulating that technology does on the rest of culture” (195).

The significance of Leone's paradigm is by approaching the archaeological record from an ideological and technological angle based on data from multiple sources,

1. We would add a comparative and, hence, a more formally scientific approach;
2. We would vastly increase the temporal depth of the field and;
3. Most important, we would be studying technology within the framework of culture.

Leone's approach appears to satisfy the goals of positivist scientific method, engage the present with the past, and does not further the substantiation of false national mythology.

Ideological, technological, and ethnological constructs that shaped land use over time are not however as often taken into account as material cultural evidence (the archaeological record) perhaps because of their seeming intangibility (Harrison, Fairclough, Schofield, and John H. Jameson, Jr., 2008; Smith, 2006). Intangible cultural heritage may be legible if one is well-versed in the literature published on land-use practices and beliefs (ideology), irrigation networks and other pragmatic problem-solving strategies (technology), and styles and types of domestic and agricultural structures or features built and employed in the American West in the late 19th and early 20th Century (ethnology or ethnography; folk architecture and custom).

To test Leone's paradigm regarding the technology of Mormon fences and community planning, one must find methods of interpreting the data spread over a landscape backwards and forwards again in order to know whether or not the methodology works to reveal expected patterns in the archaeological record and whether patterns evident in the archaeological record concerning technology indeed inform us in the present about past beliefs, i.e. the ideology.

A syncretistic approach to land use, one that explores the various ideological, technological, and ethnological perspectives of those who settled upon and used it, here Native Americans, Mormons, and non-Mormons north, east, and south of the established

Mormon Row Historic District (MRHD; 48TE1444) in portions of Township 43 North, Range 115 West, Sections 14, 15, 20-24, 26-29, 32-35 and Township 42 North, Range 115 West, Sections 1-5 and 7-11 in the GRTE may be fruitful, and may well be referred to as an ideo-techno-ethnoscape perspective (*pace* Apadurai, 1996) to be applied in historical and chronological order (layers), and interpreted using information contained in primary documents, records, and texts (records). Thus the purpose of this research is to apply hybrid historical archaeological methods starting with what is known and to be expected on the landscape from historic maps and the archival, archaeological, ethnographic records concerning ideology, technology, and ethnology¹ of the time period under investigation, then using modern technology, in the form of LiDAR and GIS, on the ground in and around the Mormon Row-Antelope Flats-Dry Farms historic landscape to locate archaeological data more efficiently. In reverse, one should be able to elicit ideology, technology, and ethnology from the archival, archaeological, ethnographic records resulting in an "iteroscape"² interpretation that can test the hypotheses as well as raise new research questions germane in present and future research as well as cultural resources management plans the GRTE has for the area.

The significance of this research project is to arrive at a deeper understanding of what an iteroscape, an iterography, and iterology mean, and what an iterological methodology can facilitate for the archaeological record of the Mormon Row-Antelope Flats-

¹The difference between ethnology and ethnography here is that ethnology is the study of the characteristics of different peoples and the differences and relationships between them, while ethnography is the scientific description of peoples and cultures with their customs, habits, and mutual differences. The difference is the emphasis and scale of inquiry.

²The terms iteroscape, iterological, iterology, and iterography, used here first, have their roots in *iterum*, the Latin word for again, as in iteration, and incorporate the first letters of the three -scape approaches mentioned above plus the first letter of 'records.' The suffix, -ology, refers to an informal word, in this case, for a previously unidentified branch of knowledge. When combined, "iter-" and "-ology" result in a study of various ideological, technological, and ethnological perspectives of those who settled upon and used a landscape, here the Mormon Row-Antelope Flats-Dry Farms historic landscape within the GTNP including Native Americans, Mormons, and non-Mormons.

Dry Farms historic landscape. As a theoretical approach to Historical Archaeology and as management praxis, an iterological methodology may be applicable in other historical archaeological contexts. An iterological approach to land use practices in the past may positively inform land and cultural resource management policies and praxis on a landscape scale in the present and the future. Pure praxis can be defined as “behavior patterns of *work* . . . ‘required’ by the ecological context that are realized in cultural form. . . *directly derivative from the tools and resources* to which they are applied” (Sahlins, 1976:97; emphasis added).

Multiple lines of evidence from its first official mapping in 1871-1872 during the Hayden Expedition to its most recent survey and inventory in the summer of 2016 (and ideally in 2017) will be employed to interpret the suite of data to its fullest capacity. This project is undertaken with a full consideration of the past; historic and prehistoric cultural resources are seen as equal, and all potentially contribute information necessary to formulate NRHP recommendations, as well as test hypotheses generated in the course of this research.

Fragmentary artifactual evidence, too, can impart important information in the interpretation of a landscape if one can identify them accurately and place such fragments of the past in a ‘socio-technological collective’ (Latour, 2012) and historical context such as the methodology proposed here allows. Matt Edgeworth *qua* Bruno Latour investigates ways in which, “[h]ydrological, social, geomorphological, political, material, ideational, symbolic, technological and economic factors are all mixed up together, like so many streamlines merging into a single current” (2011:55). What distinguishes Edgeworth’s work from Latour’s is a focus on ways in which geomorphology has an agency when it is a product of human manipulation and how ‘socio-technical collectives’ can be discerned from archaeological contexts. Edgeworth finds that:

Ultimately the two aspects—the socio-economic and the geomorphological—are not separate but inextricably intertwined as

part of the same unfolding set of material relations. Archaeology of flow . . . is a place where these different aspects can be studied together. [54]

Hence emphasis was placed on geology, geomorphology, plants, and animals based on GIS analysis of LiDAR and other imagery along with observations and notes taken during the pedestrian survey in the Environmental Context section of the forthcoming inventory report. More, it is not just that a historic cultural resource is something 50 years old or older, it is whether or not it can be associated with a broad pattern of history significant to a local, state, or federal constituency and has enough integrity to convey this association according to the National Register Bulletin No. 15 (NPS, 1998, hereafter NRB15). Themes which the material evidence located during the 2016 pedestrian survey and inventory and previous cultural resources surveys are associated include: Crop Production, Dairy Farming, Dry Farming, Economic/Market Forces of Depression, Ethnicity, Gender and Women in Homesteading, Farming, and Ranching contexts, Homesteading, In-Migration, Out-Migration, Irrigation, Land Policy, Enclosed Cattle Raising, Transition from Horse-Drawn to Mechanized Agriculture, Settlement, Subsistence and Self-Sufficiency to name a few (Cassity, 2010a,b, 2011:13).

Hardesty and Little’s Feature Systems Archaeology methodology (2009; Figure 2) can facilitate the organization and management of field data by theme as well as the testing of hypotheses at the site- and isolated-finds-scale resulting in a more holistic interpretation that reveals heretofore unexplored connections and intersections of the Mormon Row-Antelope Flats-Dry Farms community within a larger regional and national context. Once located and documented, cultural resources related to the MRHD and vicinity might expand historic district boundaries or new historic district boundaries might be recommended. Documentation and recommendations will be provided to the GRTE, the Wyoming State Historic Preservation Office (WYSHPO), and the Wyoming Cultural Resource Information System (WYCRIS) and NRHP eligibility and Smithsonian tri-

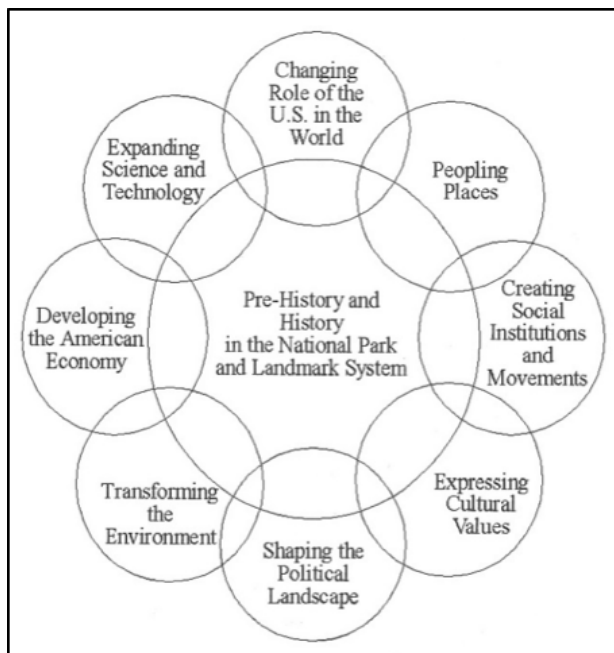


Figure 2. National Park Service Thematic Framework (Hardesty and Little, 2009:17).

nomials (site numbers) will be determined through consultation based on the documentation as well as the recommendations generated for each resource provided by the inventory.

Viewed from above (as in GIS layers and projections), placer mine claims, cattle ranches, homesteads/farmsteads, private and cooperative irrigation ditches, in-field irrigation laterals and rills among other historic-era landscape archaeological sites and features collectively constitute a palimpsest of tangible and intangible cultural expressions and heritage. If the cultural resources of the inventory area are contextually connected to one another like a patchwork quilt that blankets the Mormon Row-Antelope Flats-Dry Farms cultural-historic landscape, then metaphorically speaking, homesteads and land grant allotments, i.e. rectilinear polygons or squares; quarter Sections, are analogous to charm quilt blocks, and irrigation network ditches/laterals/rills are analogous to “stitching in the ditch” patterns of land use practices undertaken by the former homesteaders of the community.

Preliminary Results and Discussion

It was quickly discovered on the first field day that one person performing standard 20m interval linear transects in a cultural landscape which encompasses large portions of 25 Sections walking back and forth across waist-high sagebrush and hay fields searching for evidence of ca. 27 additional historic-era homesteads and the irrigation ditches and laterals which served community efforts to restore the Earth to Edenic conditions was impracticable. LiDAR technology can effectively “remove” vegetation cover to reveal “bare earth” imagery useful in landscape-scale archaeological investigations such as this. Comparisons between historic-era aerial photography, topographic maps, and anomalies evident in LiDAR imagery led the author to more precise locations of historic-era sites, landscape features, and homesteads than could ever be hoped to be accomplished during a 2 ½ month field season by one person using a standard survey method. Segments of irrigation ditches and laterals were surveyed in a “linear” fashion in the sense that the landscape features are linear, but the entire lengths of irrigation features were not walked or GPSd; only representative portions were recorded with a Trimble unit and the remainder was mapped using ArcGIS software. Lengths of some of the larger irrigation ditches were transected in order to locate any extant or relict water control features, i.e. turnouts, checkdams, culverts, diversions, or flumes where LiDAR imagery and other archival materials suggested they existed. This resulted in numerous “accidental” discoveries of cultural resources which might not otherwise have been located. The survey methodology used allowed the author to go directly to places which had a likelihood of having cultural resources, oftentimes concentrations of domestic debris or features associated with human activity such as well heads, piles of cobbles cleared from fields, and abandoned farm implements.

By moving from a national ethos of Manifest Destiny in the 19th Century (Tuveson, 1968; Shackel, 2001) to an Archaeology of the Science of Technology of Mormon Town Plans and Fences in the 20th Century (Leone, 1973) compared with the cultural patterns of the Mormon Landscape in the American West (Dyal,

1981; Edgeworth, 2011; England, 2014; Fox, 1932; Francaviglia, 1978; Leone, 1973; Meinig, 1965; Scarlett, 2006; Strebel, 1965; Tuveson, 1968), allows one to make efficient use of modern LiDAR imagery and GIS software in the 21st Century (cf. Leone, 1973) that allows one to peer through dense native sagebrush and relict hay fields to locate faint traces of cultural resources and land use practices within a ca. 35 mi² project area, and synthesize and interpret the information in a useful manner for future land and resource management purposes. Preliminary post-survey archival research (post-processing) returned information useful in interpreting cultural resources previously and newly located, as well as biographical notes and clues that can assist in the location and identification of *additional* resources not observed or documented in the summer of 2016 (Daugherty, 1999; Farmer, 2000; Hubber et al., 1996; Moulton, 2007), e.g. the situs of a set location used during the filming of *Shane* in 1953 along the bank of the Mormon Row Ditch in Section 34, T 43 N, R 115 W, hence the necessity of a second field season of research and investigation within the project and study area.

Ideological and ethnographic texts regarding millennialist movements and religious groups of the 19th and early 20th centuries in the American West informs an investigator in the present about patterns and technology used in the historic period that are potentially locatable in the archaeological record. Understanding the technology available in the 19th and early 20th centuries also provides context for artifacts and/or landscape features potentially encountered during pedestrian survey, e.g. abandoned farm implements and relict water control features (see *Objectives* above). Once the archaeological records have been compiled, if one reads the artifacts and landscape features “backwards,” according to Leone (1973) *qua* Binford (1962), one should be able to discern patterns of ideology, technology, and ethnology from the archaeological record. The theory discussed here supports a methodology to accomplish just such a suite of tests: whether one can read the contexts and records forwards *and* backwards to reveal heretofore unexplored connections and intersections of the Mormon Row-Antelope Flats-Dry

Farms community within larger historical, regional, state, and national contexts at the site, multiple property, historic district, and/or landscape scale resulting in a more holistic interpretation of the past, a.k.a. an iterology. It should be noted that history and the archaeological record rarely transpired in a “straight line,” rather deviations, excursions, gaps, and anomalies are expected and part of the process of deciphering using the historical method. Ideally the iterological method proposed here will reveal patterns and deviations that will better inform us in the present about the beliefs and choices made by people in the past.

Preliminary Conclusions

Preliminarily speaking, the systematic controlled flow of irrigation water appears to have facilitated the growth and defined the boundaries of the Mormon Row (Grosvont), Antelope Flats, and Dry Farms sub-areas. Without a reliable water source, it is questionable whether any of the farms of Mormon Row, Antelope Flats, and Dry Farms areas could have produced enough fodder for livestock or grains and vegetables for the settlers to subsist on year-by-year much less produce a surplus that could be sold or traded, i.e. generate surplus values after expending labor and thereby derive capital from the landscape (O'Connor, 1998). More about the capitalistic and ideological endeavors of settlers to make a subsistence living, improve land, and make it ready for the End Times is forthcoming.

On the one hand, those who to claimed land and water rights were able to bring about landscape transformations such as digging irrigation ditches to grow food and restore the earth to Edenic conditions (Tuveson, 1968) as well as support themselves and their brethren (White, 1991:401). Fellow millennialists believed that they were in advantageous positions prior to redemption during the prophesied and impending apocalypse in the times of Revelation (Tuveson, 1968). On the other hand deviation from the ideal Plat of Zion and co-settlement with non-Mormons may have led to a weakening of the Mormon Row–Antelope Flats-Dry Farms community's cohesiveness, leading to an abandonment (or foreclosure) of farms, ranches, and homesteads in the early

20th Century. Climatic/ecological factors such as drought and the Great Depression might also have contributed to a dismantling of community cohesion.

Crop successes of those who acquired water rights and dug ditches compared to those who did not will be hypothetically tested in the Dissertation. Survivability (long-term viability) of homesteads that acquired more than 160 acres compared with those which acquired 160 acres or less will be hypothetically tested in the Dissertation. Those settlers who arrived with or acquired livestock compared to those settlers who did not raise livestock will also be hypothetically tested among other lines of inquiry. Droughts and a natural disasters also influenced the sustainability and stability of the community, and will be discussed further as more information is gathered. Economic and political variables before the community desisted in the mid-20th Century also potentially contributed to an overall flowscape of exchanges (Scarlett, 2006; see also Alexander, 2002; Bonner, 2002; Cannon, 2002; Culver, 1998; Dunbar, 1944; Edgeworth, 2011; Latour, 2012), especially the outcome of the activities of John D. Rockefeller, Jr.'s Snake River Land Company (SRLC) on the Mormon Row–Antelope Flats-Dry Farms community (Burkes, 1972a,b) will be further discusses as the Dissertation evolves. The historical timeline of events concerning the Yellowstone Timber Stands Reserve, Teton Forest Reserve, the SRLC, the “Jackson Hole Plan,” and the Jackson Hole National Monument prior to the establishment of the current GRTE park boundaries cannot go unassailed in an iterological investigation of the project area.

No exceptional cultural resources eligible under criteria considerations (a) through (g) have been located or recorded in the project area (NPS, 1998; United States, 1991:2). The Mormon Row Historic District (MRHD), listed on the NRHP since 1996-1997, has been periodically revisited for historic preservation, maintenance, surveys, and inventories, e.g. *National Park Service Cultural Landscapes Inventory 1999: Mormon Row Historic District* (Grand Teton National Park [GRTE], 2006[1999]). The same holds true for the Luther Taylor Historic District (LTHD; 48TE1160; cf. Ford, 2016), Hunter-Hereford His-

toric District (HHHD; 48TE1636), Aspen Ridge Historic District (ARHD; 48TE1162), and McCollister Residential Complex Historic District also known as Crystal Springs Historic District (CSHD; 48TE1169). Structures already listed on the NRHP were not re-surveyed in 2016, though discrete portions of the MRHD were re-visited and updated, e.g. the “swimming pool,” structural evidence of the school and church. Prior to 2016, the extensive irrigation network which crosses the landscape had not been specifically surveyed for water control features or other cultural resources, so representative portions of the irrigation ditches were visited and documented in the summer of 2016. Numerous relict water control features were located by this method.

In total 367 newly identified cultural resources were located during pedestrian survey between June 6 and August 10, 2016 by William Schroeder, resources which must also be evaluated as to whether they are contributing or non-contributing elements to a potentially larger Mormon Row National Historic District site boundary or deserve recordation and recommendation as stand-alone resources, multiple properties, or entirely separate historic districts (in progress). A Doctoral Dissertation proposal is in progress with the Anthropology Department at the University of Montana and will ideally result in a journal publication and/or book based on the results of this methodological inquiry and the data collected in the summers of 2016 and 2017 while the author was in residence at the UW-NPS Research Station. Funding requests and proposals are in progress as well, e.g. the Boyd Evison Research Fellowship, and will ideally help complete the fieldwork and analysis necessary to take this survey, inventory, and PhD Dissertation research to the next level.

Future Work

Preliminary results of the LiDAR- and GIS-assisted archaeological inventory in the vicinity of the MRHD (48TE1444) will be further analyzed and synthesized to make cogent and clear recommendations concerning cultural resource management in the future. The first 100 pages of *An NHPA Section 110 Modified Class II Inventory Using LiDAR Im-*

agery to Locate Historic-era Homesteads and Irrigation Features of the Mormon Row, Antelope Flats, and Dry Farms Historic Landscapes, Grand Teton National Park, Teton County, Wyoming (Schroeder in progress) has been provided to the GRTE SRM Cultural Resources Division (CRD) for preliminary review and comments. Because the data collected so far contains potentially sensitive information, site location information will not be presented in this project summary report. What if one were to consider *all* the cultural resources—prehistoric, historic, and natural—together? Are there theories and/or methodologies that can accommodate multiple layers of cultural resources and timeframes and result in interpretations that are meaningful for present and future CRM praxis? These preliminary questions have prompted Mr. Schroeder to draft a PhD Dissertation Proposal provisionally entitled, *An Iterological Inventory Approach to a Historic Landscape Utilizing LiDAR Imagery, GIS, and Primary Documents: Mormon Row-Antelope Flats-Dry Farms, Grand Teton National Park, Moose, WY*, with a goal of deciphering, deconstructing, and interpreting the archaeological data and the complex history of land use within the project area “backwards” and forwards.

Acknowledgements

The author would like to thank Shannon Dennison, Cultural Resources Branch Chief at the GRTE, for her willingness and enthusiasm to accept the author as an Archaeological Intern. The author received an outreach pamphlet as an email attachment from the Office Coordinator at the University of Montana—Anthropology Department. The deadline for applications had already passed. A quick phone conversation with Ms. Dennison set the author at ease—among the applications received, no one had yet met the required qualifications to conduct an archaeological inventory under an ARPA permit. The author meets the qualifications, and the paperwork to participate in the internship were submitted soon thereafter. Ms. Dennison arranged for the author to have access to critical GIS data and a workstation equipped with ArcGIS software, a pool vehicle, and other equipment necessary to perform the fieldwork.

Without Ms. Dennison’s assistance, the author would not have been able to accomplish what was done in the summer of 2016, nor would he have had the impetus to propose a PhD Dissertation Research Proposal based on the preliminary results of the summer internship.

The author was assisted by Breelyn Van Fleet, Park Archaeologist/Tribal Liaison at GRTE on occasion in the field. Ms. Van Fleet assisted the author with access to previously conducted CRM project reports and archaeological records. Ms. Van Fleet also assisted the author in organizing a fieldwork approach that was efficient and expeditious. Ms. Van Fleet helped the author understand protocols related to NPS cultural resources reporting standards as well as submission guidelines for the WYSHPO and WYCRIS database. The author looks forward to working through this project with Ms. Van Fleet so that a more complete inventory of cultural resources in the vicinity of the MRHD can be completed and newly identified resources can be added to the archaeological record for future investigators’ projects in the Park.

Betsy Engle, Architectural Historian and Assistant Cultural Resources Specialist with GRTE, made a visit to a former homestead on the southern foothills of Blacktail Butte in July, 2016 which a former local resident, John Daily knew of from childhood and hunting trips (personal communication, John Daily 2016). The Principal Investigator (author) returned to the location and recorded the site as Maud Smith’s homestead, (48TEXXXX; in progress). Ms. Engle is a wealth of knowledge on Jackson Hole history as well as historic structures throughout the GRTE. Together, Ms. Engle and author discovered historic-era maps and photographic images that support projects both are investigating. The author utilized Ms. Engle’s work station during times when Ms. Engle was not in the office—it was and is one of the few work stations that has a current, working ArcGIS license. The author was able to generate draft maps of project results and supplementary materials for the inventory report, and is eternally grateful for this permission and compromise.

The author would like to thank “The Bat Man” for being so darn awesome as a cabinmate. Prior to the summer of 2016, the author had not cohabitated with another person for ca. 20 years. Hunter Cole proved to be an excellent exception, and allowed the author to acclimate and adjust to the change in pattern without challenge or controversy. Even though the author owns and wears field gear older than Mr. Cole, the author was surprised and relieved to spend 10 weeks with someone so young yet so mature, dedicated, and scholarly. Plus, the author learned more about bats and raptors than he ever considered useful before, leading the author to become rather excited at the sighting of a goshawk. Without Mr. Cole’s interest in avian species which he imparted onto the author, the author would not have been able to identify a goshawk from a sea gull.

The author would like to thank the staff and interns at the UW-NPS Research Station for their willingness to host someone with “special needs.” The author has strict dietary requirements, and the AMK Research Station facilities in the Boise-Cascade, namely access to a stove and a refrigerator, allowed the author to prepare his own meals (in bulk) so that he could stay happy, healthy, and productive during the field season. Dr. Michael Dillon and his wife went out of their way to prepare food at impromptu BBQs that the author was able to eat. Occasionally there was enough left over that the author was able to take some of the BBQ/food for breakfast or lunch the next day. The author would also like to thank Dr. Harold Bergman for his interest in the author’s research and internship. Many a morning, Dr. Bergman and the author were the only ones up at 5:30AM, and the chats/conversations had were lively and informative for both. The staff at the AMK Research Station went out of their way to make the author’s experience well worth his while. The author looks forward to spending another field season at the AMK Research Station (hopefully in 2017) where he is already familiar with the facilities, the grounds, the staff, and the amenities available facilitating the end of a field day as relaxed, enjoyable, and quiet as possible. Thank you.

The author was able to check out books and other materials from the Jackson Branch of the UW Li-

braries, and read at least three theoretical texts that he brought with him in his off-time; texts which are integral to the author’s internship work and PhD Dissertation (proposal; in progress).

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