Battle Area Complex Surface Danger Zone Archaeological Site Monitoring, Donnelly Training Area

Annual Report 2014

Colorado State University

Battle Area Complex Surface Danger Zone Archaeological Site Monitoring, Donnelly Training Area Annual Report 2014

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LIST OF ACRONYMS

APE – Area of Potential Effect
BAX – Battle Area Complex
BP – Years Before Present
CACTF – Command Action Center Tactical Facility
CEMML – Center for Environmental Management of Military Lands
DOE – Determination of Eligibility
DTA – Donnelly Training Area
FAI – Fairbanks
ICRMP – Integrated Cultural Resources Management Plan
m – meter
mm – millimeter
MOA – Memorandum of Agreement
mph – miles per hour
NHPA – National Historic Preservation Act
PA – Programmatic Agreement
SDZ – Surface Danger Zone
SHPO – State Historic Preservation Officer
TFTA – Tanana Flats Training Area
USAG FWA – US Army Garrison Fort Wainwright
USARAK – US Army Alaska
USARAL – US Army Alaska (historic)
USGS – US Geological Survey
UTM – Universal Transverse Mercator
XBD – Big Delta
XMH – Mt. Hayes

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1. INTRODUCTION

On February 5, 2010, the US Army Garrison Fort Wainwright (USAG FWA) entered into a Programmatic Agreement (PA; FWA-PA-1003) with the Alaska State Historic Preservation Officer (SHPO) to monitor 131 prehistoric archaeological sites within the Battle Area Complex (BAX) Surface Danger Zone (SDZ) in order to continue a finding of "no adverse effect" to said sites. Live-fire training activities began in the BAX in June 2010. Archaeological site monitoring activities began during the same month and continue through the present.

On September 11, 2012, this PA was updated to incorporate an additional 3,252 acres downrange of the BAX, established in 2012 as part of the Joint Pacific Alaska Range Complex restricted airspace expansion. This additional acreage would be surveyed for archaeological sites within five years of the PA. This PA also removed ineligible sites from the monitoring schedule and corrected the number of sites that are or may be eligible for listing in the National Register of Historic Places (National Register). Additional changes were made to the monitoring schedule (see Section 3 below) in order to tie monitoring more closely to the BAX usage schedule.

This report will detail the findings of monitoring activities for the period of June 2010 to January 2015, as well as the results of the archaeological surveys in the expanded portion of the BAX SDZ.

Site monitoring was conducted following procedures defined in *US Army Alaska's Monitoring and Data Recovery Plan for Cultural Resources within the Battle Area Complex Surface Danger Zone, Fort Wainwright, Donnelly Training Area, 2009* (Robertson 2009).

Archaeological field crews, comprised of employees of Colorado State University's Center for Environmental Management of Military Lands (CEMML), monitored sites in areas potentially impacted (directly and indirectly) by the live-fire training activities. Three crews of two to three archaeologists conducted the fieldwork.

1.1. BAX and Undertaking

The BAX is a live-fire range constructed by US Army Alaska (USARAK) and USAG FWA on lands at Fort Wainwright's Donnelly Training Area (DTA) (Figure 1). With the transformation of the Army's Alaska-based 176th Light Infantry Brigade to the 176th Stryker Brigade in 2003, USARAK and USAG FWA needed new ranges to meet the needs of Stryker vehicle-mounted weapon systems. The largest of these new ranges is termed the BAX. The BAX is designed for gunnery training of crew-served, vehicle-mounted weapons systems and dismounted infantry platoon tactical live-fire operations (Table 1).

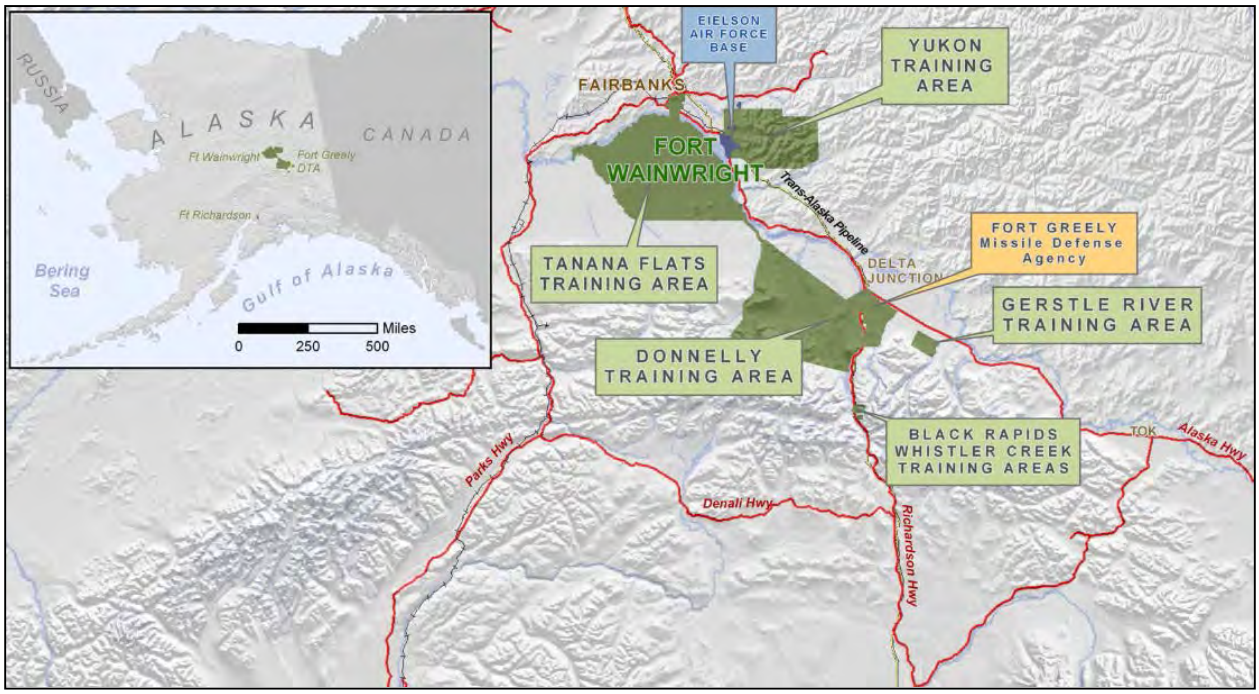

Figure 1. Location of Fort Wainwright, Alaska.

Table 1. BAX weapons systems.

Weapons System	Description
Small Arms	Man-portable, individual, and crew-served weapons systems used mainly against personnel and lightly armored equipment. Ammunition for small arms includes all ammunition up to and including 40 mm.
Artillery/Indirect Fire Systems	Self-propelled, man-packed or towed, large caliber (60 mm or larger) tube-launched or rocket-propelled munitions.
Vehicle	A weapon that is integral to the vehicle on which it is mounted and intended for use from the vehicle (e.g., the MK-19 40 mm automatic grenade launcher on the Stryker or the main gun (105 mm) on the mobile gun system).

Primary features of the BAX include course roads, stationary armor targets, moving armor targets, stationary infantry targets, moving infantry targets, machine gun bunkers and breaching obstacles. In addition to the range, the BAX includes an after-action review facility, ammunition breakdown building, ammunition loading dock, operations/storage building, arctic latrines, bleacher enclosure, bivouac, unit

staging area, covered mess area, building information systems, electric service, water and septic system, storm drainage and general site improvements.

The BAX undertaking consisted of two components, both of which warranted consideration under stipulations provided in Section 106 of the National Historic Preservation Act: (1) construction of the BAX , and (2) establishment of a safety buffer area—the SDZ downrange of the BAX (Figure 2).

For the purposes of implementing a cultural resources management strategy, it is important to emphasize the difference between the BAX and the BAX SDZ. The BAX includes the maneuver areas, firing points, and targets that will be utilized for training (Figure 2). The BAX SDZ is an area of risk that extends lengthwise from the firing point to the ultimate ballistic distance or maximum range of munitions utilized at the range (Figure 2). No construction or training activities associated with the BAX will occur within the BAX SDZ. No targets will be located in the BAX SDZ. Essentially, the BAX SDZ is a downrange safety buffer zone that covers the maximum distance stray rounds may travel, established for the purposes of protecting human health and safety.

Establishing the SDZ is simply a matter of restricting access to downrange areas of risk associated with the BAX. Establishment of the BAX SDZ is mandated by the possibility of stray rounds resulting from live-fire exercises in the BAX. SDZs are created to ensure the safety of the public and military personnel. They represent where rounds could potentially go in extreme circumstances. They do not indicate where rounds will most likely go; rather, they buffer all possible places where they could go in a completely flat landscape (which the BAX SDZ is not). Different calibers and different munitions have different effective and maximum ranges. Thus, the BAX SDZ is a composite SDZ that incorporates the SDZs from all the different types of munitions that will be used—from 5.56 mm to 105 mm.

The original BAX SDZ is an irregular, fan-shaped area roughly 12 km north to south and 12 km east to west at its widest point (Figure 2). It entails 23,741 acres found on the USGS Mount Hayes D-4 topographic map. The expanded BAX SDZ includes an additional 3,252 acres, mainly downrange of the current footprint (Figure 2).

The assessment of effects of live-fire exercises in the BAX is presented in Section 5.0 of the BAX data recovery plan (Robertson 2009:23-39). In short, it was determined that, although the sites are downrange of a live-fire training area, the potential for adverse effects from stray rounds was low to non-existent due to: (1) local topography protecting the sites, (2) target placement deliberately coordinated to prevent stray rounds, and (3) the types of weapons systems used (e.g., non-explosive and short-range rounds) minimize the potential for damage to the sites.

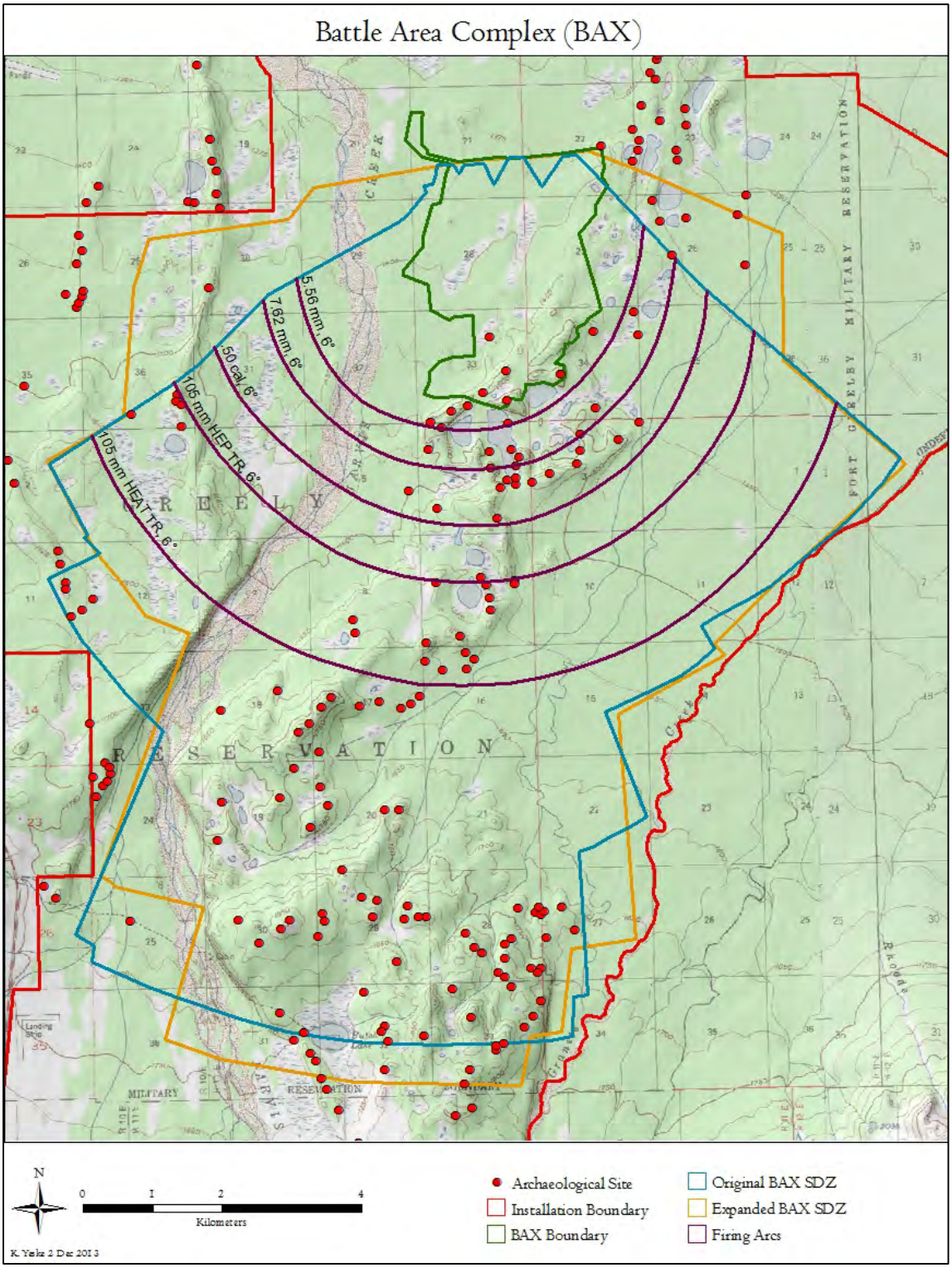

Figure 2. The location of the BAX in eastern DTA with original and expanded SDZ boundaries.

Survey for the construction footprints of the BAX was conducted in 2002 and 2003 (Hedman et al. 2003; Robertson et al. 2004). Site evaluations and determinations of eligibility (DOEs) for listing in the National Register were conducted in 2004 and 2005 (Raymond-Yakoubian and Robertson 2005; Robertson et al. 2006). On March 17, 2006, USARAK released the BAX/CACTF Supplemental Draft EIS, and USAG FWA and the SHPO entered into Section 106 consultation to mitigate adverse effects of the BAX undertaking, resulting in a Memorandum of Agreement (AK-MOA-227).

Survey for the BAX expansion began in 2012 and will continue during the 2015 field season.

There were originally 136 archaeological sites identified within the entire BAX Area of Potential Effect (APE), which consists of the range and SDZ. Five of these sites—XMH-00290, XMH-00873, XMH-00874, XMH-00877 and XMH-01160—are located in the BAX construction footprint. Four of these—XMH-00290, XMH-00873, XMH-00877, and XMH-01160—were determined ineligible for listing in the National Register. Mitigation of adverse effects, consisting of an archaeological excavation to recover data from XMH-00874, began in July 2006 and was completed in 2007. The mitigation agreement is detailed in the MOA between USAG FWA and the SHPO signed on July 12, 2006. Section 106 requirements have been completed for the construction footprint of the BAX.

Section 106 consultation for the establishment of the SDZ began in March 2006. There are no archaeological sites located in the direct line-of-fire for BAX targets. However, there are 131 archaeological sites downrange within the SDZ. USAG FWA and the Alaska SHPO determined that application of the Criteria for Adverse Effect [36 CFR 800.5(a)] indicates a conditional "no adverse effect" finding for 131 archaeological sites located within the boundaries of the SDZ. USAG FWA recognizes the remote possibility of stray round impacts to archaeological sites located downrange from the BAX within the SDZ. The finding of "no adverse effect" was conditioned upon an ongoing, comprehensive monitoring strategy to ensure that there would, in fact, be no adverse effects to archaeological sites located within the SDZ due to stray round impacts including any of the following: (1) physical destruction or damage to all or part of an archaeological site, (2) alteration of all or part of an archaeological site, (3) change in the character of an archaeological site, or (4) damage to the integrity of an archaeological site. The second agreement, FWA-PA-1003, was entered into to formalize the comprehensive monitoring strategy and to fulfill USAG FWA's Section 106 responsibilities.

The amended FWA-PA-1003 from September 2012 requires monitoring only of sites that are eligible or potentially eligible for the National Register and includes sites known from the expanded BAX SDZ. A total of 122 sites were monitored in 2012. Two new sites were located during that field season, bringing the total number of archaeological sites in the BAX SDZ to 124 (23 sites are eligible for the National Register and 101 have not yet been evaluated).

In 2012, DOE fieldwork was completed for one archaeological site in the BAX SDZ. XMH-983 was evaluated because the lone artifact found at the site was determined to not to be cultural when examined in the lab. No further cultural materials were discovered during intensive subsurface investigations. The site was found ineligible for the NRHP in the Army's 2012 Section 110 Report (Esdale

et al. 2013). The SHPO concurred with this finding on December 19, 2013. Further data refinement demonstrated that two sites that were monitored in 2012, XMH-1084 and XMH-1184, are not located within the SDZ and therefore are not subject to the terms of the MOA.

1.2. Setting and Environment

DTA is located in central Alaska, north of the Alaska Range in the Tanana River Valley (Figure 1). The post lies 120 miles south of the Arctic Circle near the town of Delta Junction. DTA consists of the West and East training areas and three outlying training sites: Gerstle River Training Area, Black Rapids Training Area, and Whistler Creek Rock Climbing Area. DTA West is an 894-square-mile parcel bounded by the Delta River to the east and the Little Delta River to the west. It covers approximately 571,995 acres. The East Training Area is an 81-square-mile parcel stretching east of the Delta River to Granite Creek. It covers approximately 51,590 acres.

DTA has the northern continental climate of Interior Alaska, which is characterized by short, moderate summers; long, cold winters; and low precipitation and humidity. Weather is influenced by mountain ranges on three sides that form an effective barrier to the flow of warm, moist maritime air during most of the year. Surrounding upland areas tend to aid drainage and the settling of cold arctic air into the Tanana Valley lowlands (Natural Resources Branch 2001).

The Alaska Meteorological Team at the Central Meteorological Observatory, Fort Greely and Donnelly Training Area, monitors weather at the post. Average monthly temperatures range from -6.4°F in January to 60.0°F in July, with an average annual temperature of 27.4°F. The record low temperature is -63°F, and the record high is 92°F. The average frost-free period is 95-100 days (based on 27 years of data).

Prevailing winds are from the east-southeast from September through March and from the west, southwest, or south from April through August. Average wind velocity is 8.2 miles per hour (mph). The greatest wind speeds occur during winter, with a high of 104 mph recorded in the month of February. Winds are 5 mph or less only 13.6 percent of the time, and wind speeds greater than 60 mph have been recorded in every month. Thunderstorms are infrequent and occur only during summer (based on 20 years of data) (Natural Resources Branch 2001).

Average annual precipitation is 11.12 inches, which falls over 90.4 days, mostly during summer and early fall. Average monthly precipitation ranges from a low of 0.24 inches in April to a high of 2.38 inches in June. Average annual snowfall is 40.5 inches, with a record 99.7 inches in 1945 (based on 27 years of data) (Natural Resources Branch 2001).

1.3. Prehistoric Context

Interior Alaska has been continuously inhabited for the last 14,000 years, and evidence of this continuum of human activity has been preserved within and around Fort Wainwright's training lands. Interior Alaska's ice-free status during the last glacial period provided a corridor connecting the Bering Land Bridge and eastern Asia to North America. This allowed small bands of nomadic peoples to

colonize Alaska and the rest of the continent and began a period of habitation in Interior Alaska that has persisted through the entire Holocene, the arrival of European traders in the late 1810s, the Klondike Gold Rush of the late 19th and early 20th centuries, and the military development of the Interior during the middle of the 20th century. Fort Wainwright's cantonment and training lands comprise a vast and still relatively unsurveyed region with areas of high potential for yielding evidence of this activity.

Alaska has long been regarded as the gateway to the Americas and has held archaeological interest as the possible location for the oldest archaeological sites in the New World. This is due to more than Alaska's proximity to Asia and ice-free condition at the end of the Pleistocene. Similarities between archaeological assemblages in Siberia and Alaska and the discovery of lanceolate projectile points in the muck deposits around Fairbanks in the early 1900s (which bore a resemblance to Clovis points of some antiquity in the American Southwest) also sparked interest in Alaska as a source area for all Native Americans.

After initial colonization, archaeologists generally divide Interior Alaska's prehistory into three broad archaeological themes: the Paleoarctic Tradition (12,000-6,000 years ago[1]), the Northern Archaic Tradition (6,000-1,000 years ago), and the Athabaskan Tradition (1,300-800 years ago) (Potter 2008). Archeological materials from these cultures are generally limited to lithic artifacts such as projectile points, cutting tools, scrapers, waste flakes from tool manufacturing, faunal remains, and hearths.

Reconstructions of paleoecological evidence suggest that the end of the Pleistocene was marked by a warming trend in Interior Alaska that may have contributed to initial colonization of the area (Bigelow and Powers 2001). Several sites in areas surrounding Army lands demonstrate that people began living in Interior Alaska 14,000 years ago. Significant sites in the Tanana Valley dating between 14,000-12,000 years ago include Healy Lake (Cook 1996), Walker Road (Goebel et al. 1996), Swan Point (Holmes et al. 1996), Mead (Holmes 2001), McDonald Creek (Goebel et al. 2014), and Broken Mammoth (Holmes 1996). There are no sites in Alaska, however, that predate the oldest sites in the contiguous United States, nor do Alaska's oldest sites resemble the Clovis culture (Bigelow and Powers 2001). The Younger Dryas cooling event from 13,000-12,000 years ago may have led to a temporary population decline (Potter 2008) in the Interior before permanent colonization.

The Paleoarctic Tradition is a term now generally used by archaeologists to refer to the earliest settled people known from all over Alaska. It was originally defined by Anderson[2] (Anderson 1968, 1970) as the earliest microblade-using tradition in the American Arctic, with a proposed relationship to northeast Asian, late Pleistocene cultures based on similarities in these distinctive artifact types. Archaeological evidence indicates that early settlers camped on terraces, lakeshores, buttes, and bluffs. By using these locations on high ground, they could locate and track prey that included large mammals such as mammoth and bison. Evidence from the Upward Sun River Site, located on the south side of the Tanana River between Army training areas, for example, demonstrates that hunter-gatherers in Interior Alaska

[1] All dates are given in calendar years *before present*.

[2] Anderson called it the "American Palaeoarctic Tradition," but most researchers use the shortened version.

were concentrating on bison and wapiti at the end of the Pleistocene (the Upward Sun River Site is also known for one of the earliest burials in the Americas [Potter 2008; Potter et al. 2008; Potter et al. 2011]). The nearby 14,000-year-old McDonald Creek site on Army land had artifacts in association with bison, waterfowl, and small game (Esdale et al. 2012c; Gaines et al. 2011; Goebel et al. 2014). It is likely that the treeless environment and nomadic nature of these peoples had a direct impact on the kinds of tools they fashioned. Stone, bone, antler, and ivory provided the most abundant material for manufacturing weapons and cutting tools. Artifacts typically associated with this culture include small stone microblades, microblade cores, bifacial projectile points, and unifacial scraping tools.

In Interior Alaska, this tradition historically included two cultural divisions called the Nenana and Denali complexes. The Nenana Complex was identified by Powers and Hoffecker from sites in the Nenana Valley (Powers and Hoffecker 1989). This complex began approximately 11,000 years ago with an artifact assemblage that included triangular or teardrop-shaped, bifacially worked projectile points ("Chindadn" points [Cook 1969, 1975; Holmes and Cook 1999]); large unifacial chopper-like tools; and flake tools. The Nenana Complex is defined as lacking microblades, microblade cores, and burins, and was proposed to predate the microblade-rich Denali Complex. Many Nenana Complex archaeological sites are located in the Tanana Valley, adjacent to Fort Wainwright training lands (Broken Mammoth [Holmes 1996; Yesner et al. 1999], Chugwater [Lively 1996], Donnelly Ridge [West 1967, 1996; Donnelly Ridge is located in DTA], Healy Lake [Cook 1989], Mead [Holmes 2007] and Swan Point [Holmes et al. 1996; Holmes 1998, 2007]).

The Denali Complex, dated roughly to 10,500 to 8,000 years ago, was originally defined by West (West 1967, 1975) and includes distinctive wedge-shaped microblade cores, core tablets and their derivative microblades, large blades, biconvex bifacial knives, certain end-scraper forms, and burins. West later defined the Denali Complex as a regional variant of the American Paleoarctic Tradition (West 1981). Denali sites in the vicinity of Fort Wainwright's training lands include Mt. Hayes (West 1996), Swan Point (Holmes et al. 1996; Holmes 1998, 2007), and Gerstle River (Potter 2001). At least one site in TFTA (FAI-02043) has also been dated to this period.

The relationship between the proposed Nenana and Denali complexes is as of yet unresolved. As discussed above, some researchers view the Nenana Complex as a bifacial industry that predates the microblade-based Denali Complex. However, current research at sites such as Swan Point and Broken Mammoth indicates that microblades and burins were used by the earliest known cultures in Interior Alaska, with a later co-occurrence with Chindadn points—the defining artifact type of the Nenana Complex. Although some archaeologists still believe that there is a cultural distinction between the Nenana and Denali complexes (e.g., Dumond 2001), the general understanding from Interior Alaskan archaeologists is that there is a behavioral explanation for the presence or absence of microblades in different assemblages (Holmes 2001; Potter 2008; Yesner and Pearson 2002). Moreover, both Nenana and Denali technology persist in central Alaska throughout the Holocene (Bever 2006).

Site density declined in the areas around Fort Wainwright in the early Holocene, suggesting a slight depopulation during a period of climate change that initiated the widespread establishment of spruce forests (Potter 2008). The boreal forest in Interior Alaska was established by 8,000 years ago (Bigelow and Powers 2001). Sites from this time period are less well publicized than the older sites, but include Houdini Creek (circa 8,600 years old), Hurricane Bluff (c. 9,800 years old), Lucky Strike (c. 8,500 years old), Gerstle River (c. 10,000 years old), and the Campus Site (c. 7,700 years old) (Pearson and Powers 2001; Potter et al. 2007; Potter 2008). Bison, wapiti, and birds were the most important subsistence game during this period (Potter 2007, 2008).

Site density increased again after about 6,000 years ago in Interior Alaska (Potter 2008). This population increase coincides roughly with the Northern Archaic Tradition and the appearance of side-notched projectile points. Anderson originally defined the Northern Archaic Tradition to specifically address notched point-bearing stratigraphic horizons that did not contain microblades at the Onion Portage site in northern Alaska (Anderson 1968). Alaskan notched points were generally similar to Archaic-age dart points in the contiguous United States. Time has shown middle Holocene assemblages in Alaska to be quite diverse, however, and it is questionable whether this trait is related to southern forms or if it is a reliable indicator of cultural affiliation (Clark 1992; Cook and Gillespie 1986). Artifact assemblages associated with this culture can vary but generally contain myriad tools ranging from bifacial knives and microblades to end scrapers and side-notched points. Middle Holocene hunter-gatherers had a subsistence economy focused on seasonally abundant game including caribou, fish, and moose (Potter 2008). Notched point assemblages occur in many sites in Interior Alaska, including over one dozen on Army lands (XBD-00277, XMH-00277, XMH-00283, XMH-00303, XMH-00309, XMH-00874, XMH-00950, XMH-01130, XMH-01168, XMH-01300.) Several sites (XBD-00270, XMH-00915, XMH-00925), including the excavated Banjo Lake site in DTA (XMH-00874), have also produced middle Holocene dates from hearth charcoal. The 6,300-6,700-year-old dates from Banjo Lake were also associated with a microblade component (Robertson et al. 2008).

Utilization of microblade and burin-based industries appears to continue through the middle and late Holocene in Interior Alaska (Esdale 2008; Potter 2004). By the late Holocene, archaeologists see a shift from seasonal large mammal hunting with a nomadic lifestyle to a focus on seasonally over-abundant resources, use of storage, and more permanent settlements (Potter 2008b). Artifact assemblages do not drastically change until the last millennium of the Holocene when microblades disappear from the archaeological record (Potter 2008).

Linguistic evidence suggests that the Athabaskan culture may have appeared in the Tanana Valley as early as 2,500 years ago. Through ethnography, oral history, and a broad array of cultural items, much has been learned about Athabaskan culture and history in the region. Artifacts associated with the Athabaskan culture are exceptionally diverse and include bone and antler projectile points, fishhooks, beads, buttons, birch bark trays, and bone gaming pieces. In the Upper Tanana region, copper was available and used in addition to the traditional material types to manufacture tools such as knives, projectile points, awls, ornaments, and axes (Clark 1981). A late prehistoric Athabaskan occupation is recognized at several sites in and around Fort Wainwright's training lands (Andrews 1975; Andrews

1987; Cook 1989; Mishler 1986; Sheppard et al. 1991; Shinkwin 1979; Yarborough 1978). Of particular interest in this regard is a copper projectile point found in a buried context at DTA (XBD-00272) (Robertson et al. 2009).

The Athabaskan Tradition includes late prehistoric and proto-historic cultures generally believed to be the ancestors of Athabascan tribes who currently inhabit Interior Alaska. Excavated Athabaskan sites are rare, but the limited body of evidence allows for several generalizations. Raw material usage was reorganized in the Athabaskan Tradition, which de-emphasized stone tool-making and increased the emphasis on the manufacture of items from native copper and organic materials (Dixon 1985). Assemblages include ground and pecked stone artifacts and an increased use of expedient tools. There was a broadening and diversifying of the resource base at this time to include small mammal and freshwater marine animals such as fish and mollusks (McFadyen Clark 1981; McFadyen Clark 1996; Ream 1986; Sheppard et al. 1991; Shinkwin 1979). Athabaskan sites tend to occur in resource-rich areas near lakes, streams and rivers and are generally characterized by large house pit and cache pit features. Proto-historic Athabaskan assemblages include Euro-American trade goods such as glass beads and iron implements. Sites of this time period reflect an increased reliance on outside trade and include log cabins co-occurring with traditional house pits, as well as a change in site location to maximize trading opportunities (Andrews 1975; Andrews 1977; Andrews 1987; McFadyen Clark 1981; VanStone and Goddard 1981).

Athabascan settlement patterns depended greatly on the availability of subsistence resources, and Interior bands lived a nomadic lifestyle. They often traversed vast areas to support themselves and spent considerable time engaged in subsistence activities. It was often necessary for bands to divide into smaller groups to find game, and preserved fish were used as a staple of the diet in addition to fresh game (Andrews 1975).

Four Athabascan linguistic and geographic groups have inhabited the Tanana Valley: the Upper Tanana, Tanacross, Tanana and Koyukon. Each group is further distinguished according to geographic location. Bands of the Tanana and Tanacross groups are historically associated with the geographic area that embodies Forts Wainwright and Greely. Salcha, Chena, Wood River, Goodpaster, and Healy Lake bands have inhabited the region since protohistoric times and possibly even prehistoric times (Andrews 1975). Use of the region varied from one band to the next. The Salcha, Chena, Goodpaster, and Wood River bands of the Tanana Athabascans and the Healy Lake band of the Tanacross Athabascans used certain parts of what are now Forts Wainwright and Greely (McKennan 1981). Several villages have been reported on or near Fort Wainwright. One occupied by the Wood River band is said to have been located in the southern part of Fort Wainwright but has not been found (Dixon 1980; Reynolds 1986). The Blair Lakes Archaeological District (FAI-00335) on Fort Wainwright may relate to the prehistory of the Athabaskan Tradition. Euro-American historic archaeological sites are also present (Gamza 1995; Phillips 1984).

1.4. Historic Context

With the beginning of Euro-American contact in Interior Alaska in the early 19th century, trade influences and influxes of new populations began to change life in the region. Land use patterns shifted from traditional indigenous uses to activities based on Euro-American economic and political systems. Fort Wainwright's training lands fall within an area occupied at the time of Euro-American contact by Lower-Middle Tanana Athabascans, including bands described generally as the Salcha, Big Delta-Goodpaster, Wood River, and Chena bands (McKennan 1981; Andrews 1975; Mishler 1986). Historical accounts document traditional settlement patterns that were focused on a widely mobile seasonal round, with the fall caribou hunt playing a pivotal role in subsistence preparations for the winter and summer activities focused at fish camps, berry and root collecting, and in sheep hunting. These activities were frequently communal, with several local bands connected by common interest, geography, and intermarriage. Despite anthropological attempts to define boundaries for the peoples living in the lower Tanana River Valley, natural terrain served as the only definable boundary to settlement patterns (McKennan 1981).

As Euro-American traders, miners, missionaries, and explorers moved into the Tanana River Valley, the traditional life ways of local Athabascan groups were disrupted. Access to trade goods and the development of the fur trade not only affected traditional material culture, but also began to dramatically affect subsistence activities and settlement patterns. Similarly, the arrival of missionaries in the Alaskan Interior profoundly influenced traditional social organization. The introduction of mission schools for Native children and the doctrine of new religious beliefs contributed to an erosion of traditional practices (McKennan 1981).

Russian fur traders began settling Interior Alaska starting in the 1810s, establishing a post at Nulato on the Yukon River and one at Taral on the Copper River. British traders established Fort Yukon in 1847. Trade goods from these posts may have passed to Tanana Athabascans and Upper Tanana Athabascans through intra-Native trade networks. Direct contact between Tanana Athabascans and white traders increased after the 1860s. With the U.S. purchase of Alaska in 1867, control of trading stations and the fur trade passed to Americans. Through the 1880s, American traders established several additional posts on the Yukon and Tanana rivers, including locations at Nuklukayet (modern-day Tanana), Belle Isle (modern-day Eagle), and Fort Yukon.

Trade goods introduced by Euro-American settlers influenced the Native lifestyle. Clothing, staples, tools, and other necessities could be obtained through trade. Guns allowed hunters to obtain game with greater efficiency. Gradually, Athabascan Native groups began to alter their traditional nomadic patterns in favor of more permanent settlements. However, while significant, this contact would not have as dramatic an impact on the region as the discovery of gold in the Interior during the last decades of the 19th century. The towns established by Euro-American settlers at the turn of the 20th century, in response to the Klondike Gold Rush and the eventual military development of the region, would rapidly and permanently change the demography and economy of Interior Alaska.

Gold strikes in the Fortymile River region, Birch Creek area, and the Canadian Klondike began drawing miners and prospectors north in the 1880s and 1890s. In response to this gold rush, E.T. Barnette established a trading post on the Chena River in 1901. The following year, prospector Felix Pedro discovered gold nearby, and a new gold rush soon led to the founding of Fairbanks at the site of Barnette's original trading post. Most mining activities in the region occurred on creeks north of Fairbanks, with the town serving as a supply center. Agricultural and other commercial activities, such as logging, also developed to support mining activities in the Fairbanks area. Homesteads existed on parts of what is today the main post of Fort Wainwright as early as 1904.

In 1898, the discovery of gold in the Tanana uplands began a rush of Euro-American settlement into the Tanana River Valley. As the economic importance of the Tanana Valley increased, the need for reliable transportation routes and communication systems rose in tandem. Existing trails, such as the Bonnifield, Donnelly-Washburn, and Valdez-Fairbanks trails, saw increased use and development in the first decade of the 20th century. This increase in activity also resulted in the establishment of several roadhouses and posts. In 1906, Congressional appropriations led to improvement of the Valdez-Fairbanks Trail, crossing the Alaska Range south of Delta Junction, following the Tanana River to Fairbanks. Completion of the Alaska Railroad in 1923 was followed two decades later by construction of the Alaska Highway in 1942, firmly tying the Alaskan Interior to the outside.

As Fairbanks grew in the first decade of the 20th century, several agricultural homesteads were developed on lands now encompassed by sections of the Fort Wainwright cantonment. These homesteads provided Fairbanks with a variety of agricultural products and wood for fuel but were subsumed when lands were withdrawn for the creation of Ladd Field, which later became Fort Wainwright (Price 2002).

Riverboats were the primary means of getting people and supplies into the Interior at the turn of the 20th century. The Fairbanks town site was located at the upper limit of navigation for stern-wheeler riverboats on the Chena River. Upriver from that point, residents navigated the river using shallow-draft boats in summer and sleds in winter. As commerce in the area increased, roads and trails were constructed, sometimes following earlier indigenous routes. The major overland route to the coast was the Valdez-Fairbanks Trail, which began as a military trail from Valdez to Eagle in 1899.

Transportation and communication networks, including the Alaska Railroad, were developed to serve new settlements in Interior Alaska. A branch of the railroad route was extended to Fairbanks in 1904. Roadhouses along the route catered to travelers. Some were located on what are now Fort Wainwright training lands. One property was on the Bonnifield Trail in TFTA, and two roadhouses and a seasonal tent operation existed along the Donnelly-Washburn Trail in the current DTA. Secondary routes connected Fairbanks to the surrounding mining districts.

By 1910, most of the easily accessible placer gold deposits were exhausted, and capital-intensive technologies became necessary to extract remaining deposits. These methods were not possible with the existing transportation infrastructure. The completion of the Alaska Railroad in 1923 expanded

transportation options for the region, connecting Fairbanks to Seward and making large-scale dredging operations economically feasible. Aviation also became a key component of Interior transportation, beginning in earnest in the 1920s. However, it was not until 1931 that Weeks Field, originally constructed in 1923, was officially dedicated as an airfield. Industrialized corporate activity became the hallmark of the region's mining in the remaining years before World War II.

Development in the Alaskan Interior increased dramatically with the advent of World War II and subsequent military build-up in Alaska. Of particular significance was the development of airfields near Delta Junction (Fort Greely), Fairbanks (Ladd Field, later Fort Wainwright), and North Pole (Eielson Air Force Base). These locations began as Lend-Lease bases and cold weather testing centers, but soon expanded with the increased need for military support during World War II and later during the Cold War.

Full historic contexts of early mining, transportation, and homesteads on Fort Wainwright have been completed. These studies have determined that there are no properties eligible for the National Register under these contexts. Several village sites associated with the early contact period have been reported near Fort Wainwright. One was reported near Wood River Buttes, two just northwest of the installation's boundary, and one near Fairbanks (Reynolds 1986). None have been reported or located on the Main Post.

1.5. Status of Archaeological Resources

Archaeological research on Fort Wainwright training areas has resulted in numerous technical reports (Bacon 1979; Bacon and Holmes 1979; Dixon et al. 1980; Esdale et al. 2014, 2013, 2012a, 2012b, and 2012c; Esdale and McLaren 2014, 2013; Esdale and Robertson 2007; Espenshade 2010; Bradley et al. 1973; Gaines 2009; Gaines et al. 2010, 2010; Hedman et al. 2003; Higgs et al. 1999; Holmes 1979; Johnson and Bozarth 2008; Marshal 2007; Potter 2005; Potter et al. 2000; Rabich and Reger 1978; Raymond-Yakoubian 2006; Raymond-Yakoubian and Robertson 2005; Robertson et al. 2013; Robertson 2010; Robertson et al. 2004, 2006, 2007, 2008, 2009; Staley 1993) and scientific papers (Holmes and Anderson 1986; West 1967, 1975).

Fort Wainwright and its training lands contain 673 known archaeological sites, one traditional cultural property, and four archaeological districts. Seventy-six sites are eligible for the National Register, 502 sites have not been evaluated, and 103 additional sites have been determined ineligible for the National Register. Of the eligible or un-evaluated sites, 9 are historic sites, 571 are prehistoric sites, and one is a traditional cultural property.

Archaeological investigations in what is now the Donnelly Training Area began in the 1960s, when Frederick West was searching for sites related to the first Americans (West 1967). He excavated the Donnelly Ridge site (XMH-00005) in 1964 and found an assemblage containing microblade core technology similar to early Holocene Denali Complex sites. Several surveys of Fort Greely and adjacent training lands in the late 1970s documented 64 new sites (Rabich and Reger 1977; Bacon 1979; Holmes 1979; Bacon and Holmes 1979). Julia Steele surveyed various locations in DTA from 1980-1983, finding

four additional new sites (Steele 1980a, 1980b, 1982a, 1982b, 1983a, 1983b), and Georgianne Reynolds surveyed the Donnelly Dome area in 1988, locating one more site (Reynolds 1988). Investigations in DTA from 1992-2002 were made by D. Staley (Staley 1993), T. Gamza (Gamza 1995), A. Higgs (Higgs et al. 1999), and D. Odess (Odess 2002). Sixteen new sites were found during this decade of fieldwork, and attempts were made to relocate old sites.

Concentrated efforts to expand survey coverage of DTA East began with CEMML archaeologists in 2002. Over 200 new sites were located in the Texas Range, Donnelly Drop Zone, and Eddy Drop Zone in the first half of the decade. In 2007, one site was found in the northernmost portion of DTA West by Ben Potter and others during survey for the Alaska Railroad Northern Rail Extension Project (Potter et al. 2007). In recent years, CEMML research aimed to evaluate many known archaeological sites in DTA for inclusion in the National Register in conjunction with use of the BAX and its SDZ. Sites have also been discovered during surveys for road and trail maintenance. Potential expansions into DTA West, west of the Delta River, prompted 2011 and 2012 surveys into new areas such as Molybdenum Ridge, where 21 new sites were discovered in 2011. Because of its remote setting, however, the archaeology of Donnelly West is still poorly understood and represents a gap in USAG FWA's inventory of cultural properties. The Cold Regions Test Center (CRTC) has also contracted with CEMML and others since the last Integrated Cultural Resources Management Plan (ICRMP) to survey areas in DTA West, east of the Little Delta River, and many new archaeological sites have been recorded (Espenshade 2010).

To date, 452 archaeological sites have been identified within DTA. Fifty-five sites have been found to be eligible for the National Register, and 63 were found not eligible. An additional 329 sites remain to be evaluated. Historic archaeology sites are poorly represented in this region, with only four currently known to exist. The Donnelly Ridge District (XMH-00388) encompasses Denali Complex sites, identified by Frederick West, south and west of Donnelly Dome. Future archaeological studies in DTA will concentrate on completing survey of 100% of the land in DTA East, conducting DOEs on archaeological sites in high traffic areas, and exploring parts of DTA West that are opening up for expansion of military training activities.

Despite its incomplete nature, the archaeological record known from DTA represents all of the currently recognized prehistoric cultures of the Alaskan Interior. Of significance is the role played by sites located on DTA in the definition of the Denali Complex of the American Paleoarctic Tradition (Anderson 1970; West 1967, 1981). The oldest date for human habitation at DTA is roughly 10,100 years at site XBD-00167 (Higgs et al. 1999); however, undisturbed stratigraphic deposits that are 12,800-12,930 years old indicate the potential for intact archaeological occupations of this age. Sites yielding Northern Archaic side-notched points are common (Robertson et al. 2004, 2005; Raymond-Yakoubian and Robertson 2005). At DTA, site XMH-00874 yielded an AMS date of 5720 ± 50 BP from hearth charcoal associated with a microblade component (Robertson et al. 2008). A late prehistoric Athabaskan occupation is recognized at several sites (e.g., Andrews 1975, 1987; Cook 1989; Mishler 1986; Sheppard et al. 1991; Shinkwin 1979; Yarborough 1978). Of particular interest in this regard is a copper projectile point found

in a buried context at DTA at site XBD-00272 (Robertson et al. 2009). Euro-American historic archaeological sites are also present (Gamza 1995; Phillips 1984).

2. CULTURAL RESOURCES

The majority of the BAX SDZ was surveyed in 2003, with additional surveys during 2007. During 2006, USAG FWA decided that consideration of effects for sites in the BAX SDZ would not be included in the 2006 BAX construction MOA. This would allow USAG FWA time to conduct Phase II evaluations of sites located within the SDZ and determine possible adverse effects from munitions planned for use in the BAX. Site evaluations and determinations of eligibility (DOEs) for listing in the National Register for sites located in the BAX SDZ were conducted during 2008. Additional surveys in BAX took place to cover the expanded area in the 2012 amended MOA. Surveys took place during the 2012-2014 field seasons and should be completed in 2015.

2.1 2014 Archaeological Surveys in BAX SDZ

Comprehensive survey efforts undertaken by USAG FWA in 2014 covered 2,009 acres of land in the expanded BAX SDZ (Figure 3) and discovered three new archaeological sites. Of the total acreage, the 1,336 acres in the far eastern area of the BAX are remote and mainly wetlands. They were surveyed for probable site locations by air. The 678 accessible acres at the southern portion of the BAX were surveyed by pedestrian transects. The remaining 301 acres of land in the BAX SDZ are scheduled for survey in 2015.

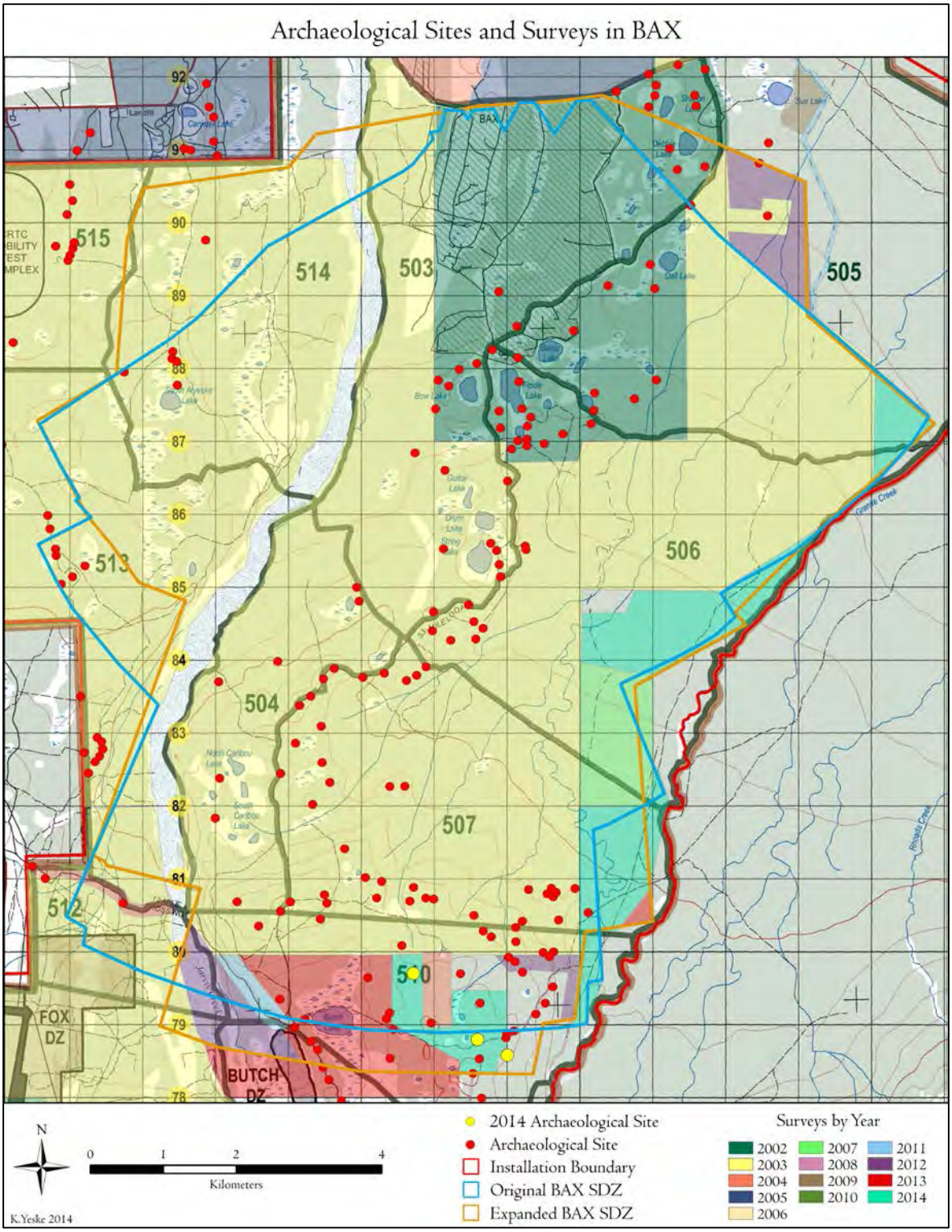

Figure 3. Archaeological surveys in the BAX SDZ by year.

2.2 2013 New Archaeological Sites in BAX SDZ

Three new archaeological sites were discovered in the BAX SDZ during the 2013 survey of the expanded SDZ area (Figure 3). Both sites were surface scatters. No subsurface cultural material was detected.

XMH-01511

[redacted]

Determination of Eligibility: Not Evaluated

This site is located on glacial outwash deposits 1.7 km east of Butch Lake and 24 km southwest of Delta Junction in Fort Wainwright's DTA East (Figure 3). XMH-01511 sits on a small glacial kame rising 20 m above the surrounding area (Figure 4). The nearest water source is an arid kettle lake 100 m west of the site. The viewshed includes the Granite Mountains to the east and Donnelly Dome and the Alaska Range to the south and west.

Vegetation includes crowberries, cranberries, scrub birch, and lichens (Figure 5). Additional sites surround XMH-01511 including XMH-1365 (approximately 400 m east-northeast), XMH-01126 (approximately 500 m north), XMH-01378 (approximately 250 m south) and XMH-01377 (500 m south).

A small lithic scatter was found on the surface of the site in the trail that runs north to south along the ridgeline. A single obsidian flake and four rhyolite flakes were collected (UA2014-097). The obsidian was sourced to Batza Tena in the central Koyukuk River drainage (Jeff Rasic, personal communication 2015). Two shovel tests were excavated but both were culturally sterile.

Sediments in the test pits were mottled silts reaching a depth of 30-35 cm where glacial gravels were encountered (Figure 6, Figure 7). Weak soil development was noted.

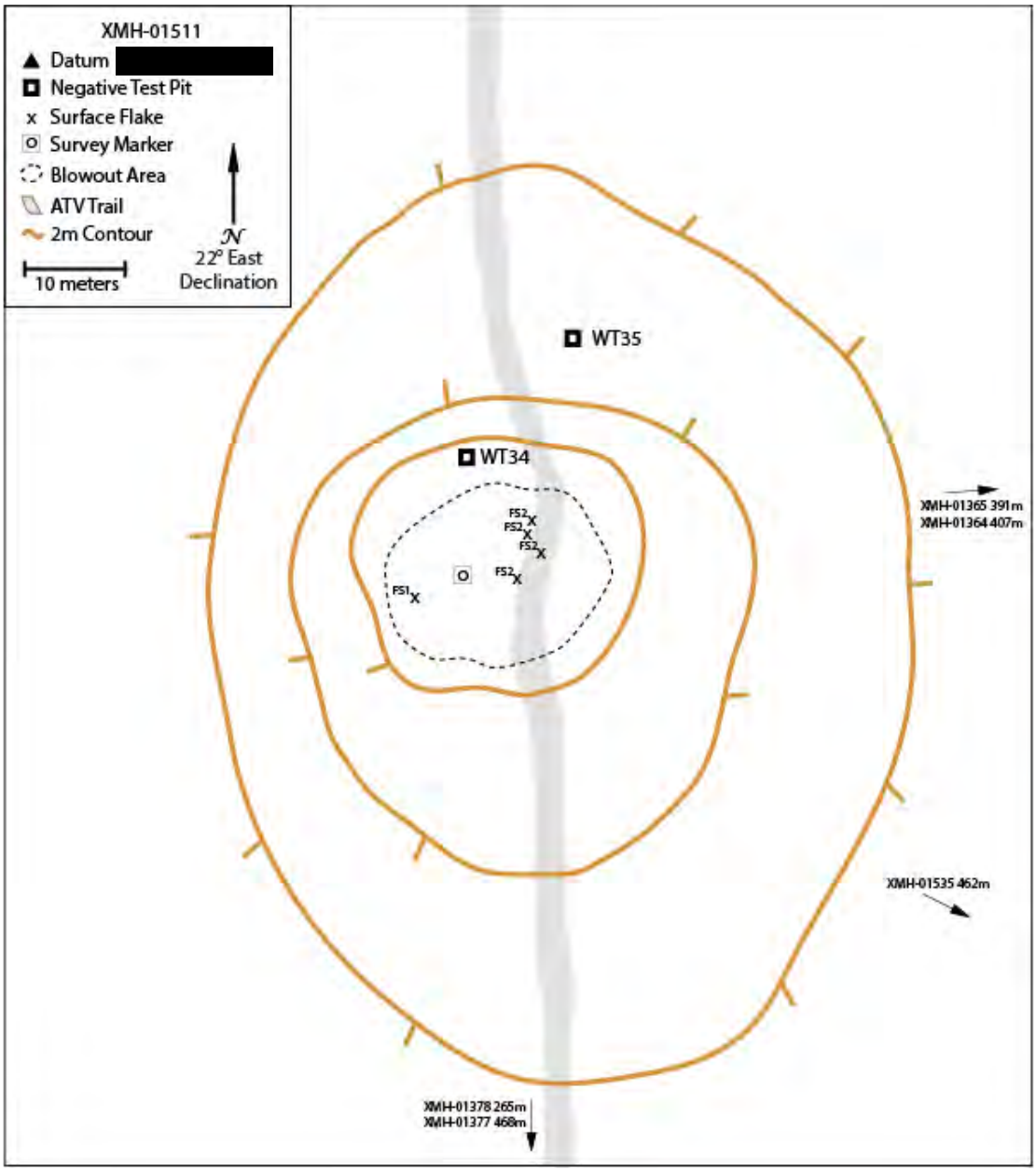

Figure 4. XMH-01511 site map.

Figure 5. XMH-01511 site overview.

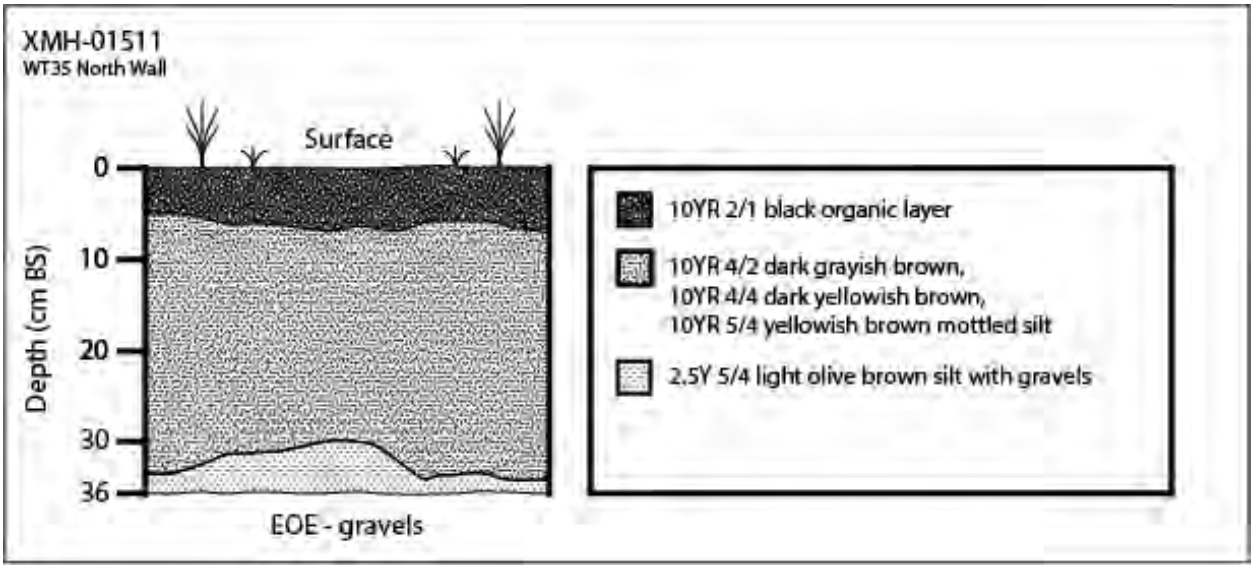

Figure 6. XMH-01511 stratigraphic profile.

Figure 7. XMH-01511 test pit.

XMH-01512

[redacted]

Determination of Eligibility: Not Evaluated

XMH-01512 was discovered on glacial outwash deposits 1 km northeast of Butch Lake and 23 km southwest of Delta Junction in DTA east (Figure 3). The site is located on a small glacial kame that rises 10 m above the surrounding area (Figure 8). The nearest water source is Butch Lake. The viewshed includes the Granite Mountains to the east and Donnelly Dome and the Alaska Range to the south and west. Vegetation includes crowberries, cranberries, scrub birch, and lichens (Figure 9).

A single chert flake was found in the one of the three test pits and collected (UA2014-098). The site appeared to be minimally disturbed by erosion and animal digging. In all three test pits, silt was overlying glacial gravels at a depth of approximately 30-35 cm (Figure 10, Figure 11). Weak soil development was evident. The only flake was discovered in the soil's B horizon.

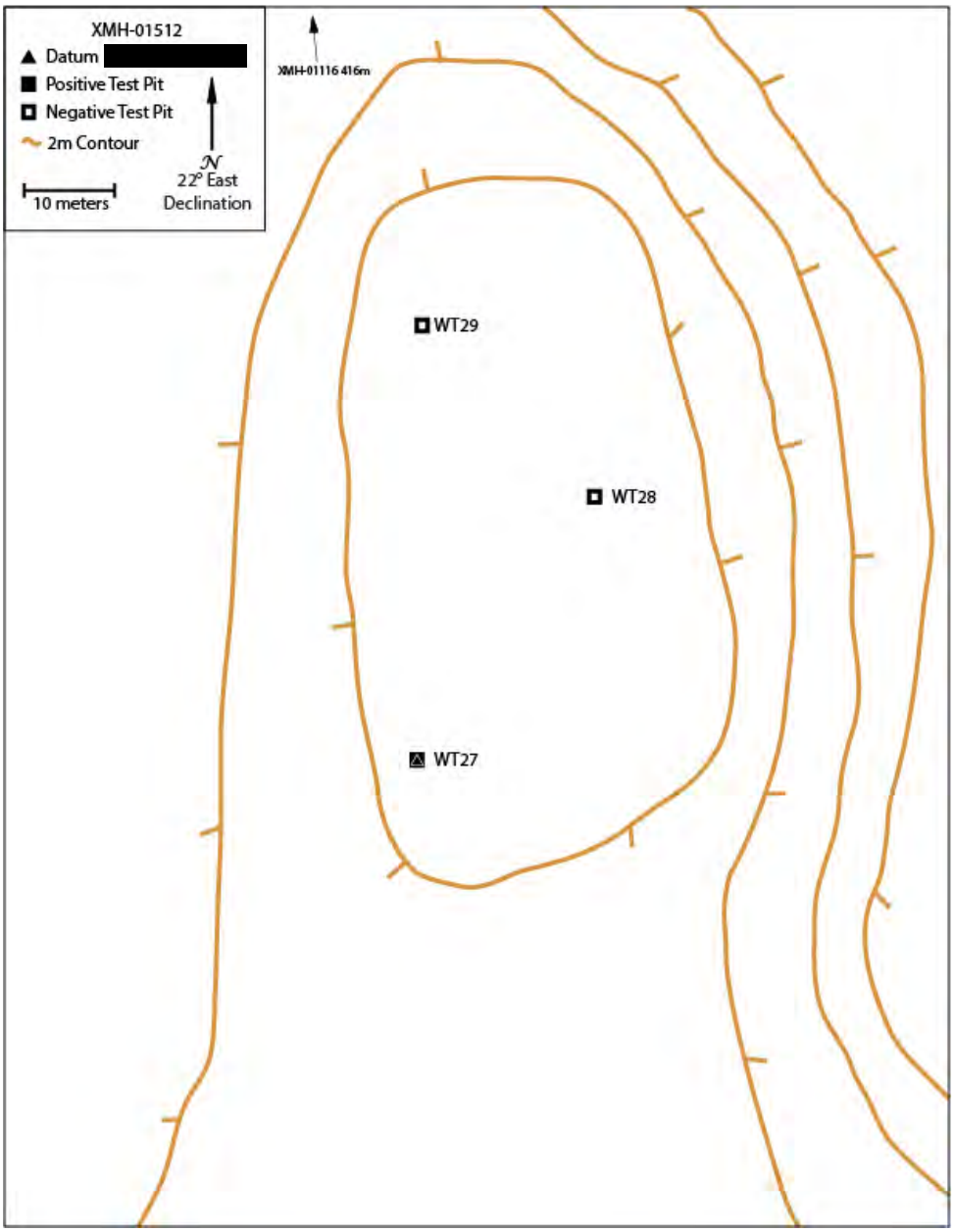

Figure 8. XMH-01512 site map.

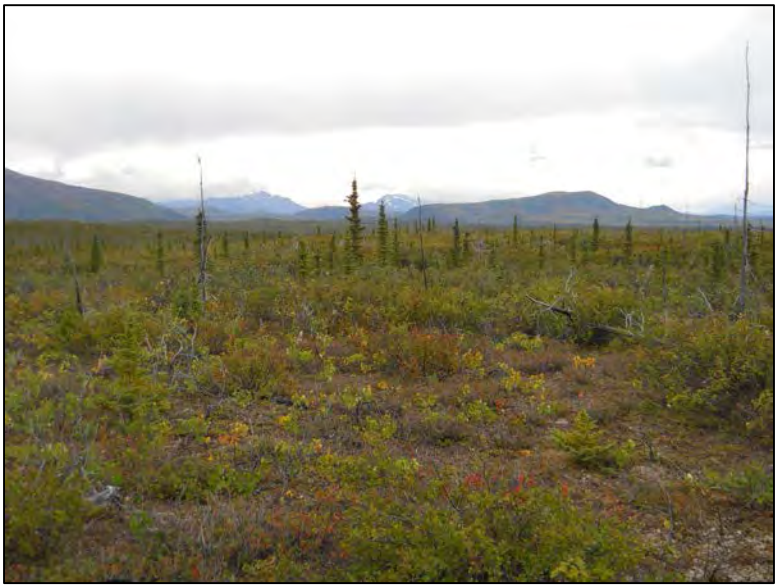

Figure 9. XMH-01512 site overview.

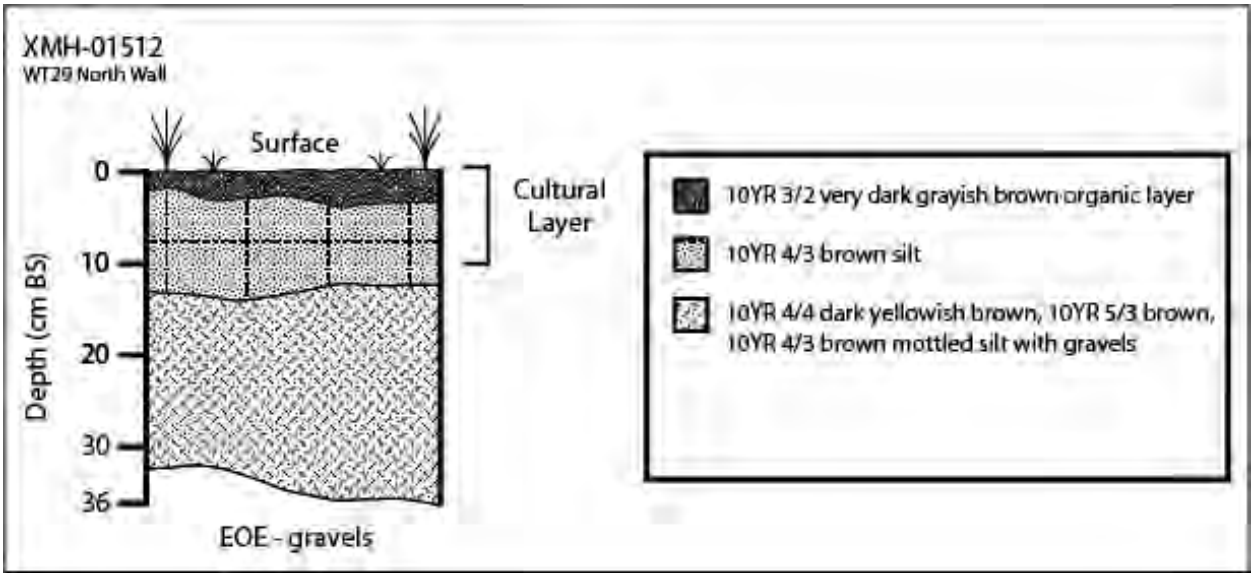

Figure 10. XMH-01512 stratigraphic profile.

Figure 11. XMH-01512 test pit.

XMH-01535

[redacted]

Determination of Eligibility: Not Evaluated

XMH-01535 was discovered in a trail on glacial outwash deposits 2.2 km east of Butch Lake and 24 km southwest of Delta Junction in DTA East (Figure 3). The site is located on a small glacial kame that rises 30 m above the surrounding area (Figure 12). It is on the eastern edge of a more prominent glacial feature that overlooks Granite Creek 500 m to the east. The viewshed includes the Granite Mountains to the east and Donnelly Dome and the Alaska Range to the south and west. Vegetation includes crowberries, cranberries, scrub birch, and lichens (Figure 13).

Three pieces of a broken chert biface fragment were found on the surface of the site (UA2014-104) (Figure 14). A single shovel test was excavated, but no cultural material was found.

Silt overlies outwash gravels to a depth of 30 cm in the test pit (Figure 15, Figure 16). Weak soil development was noted.

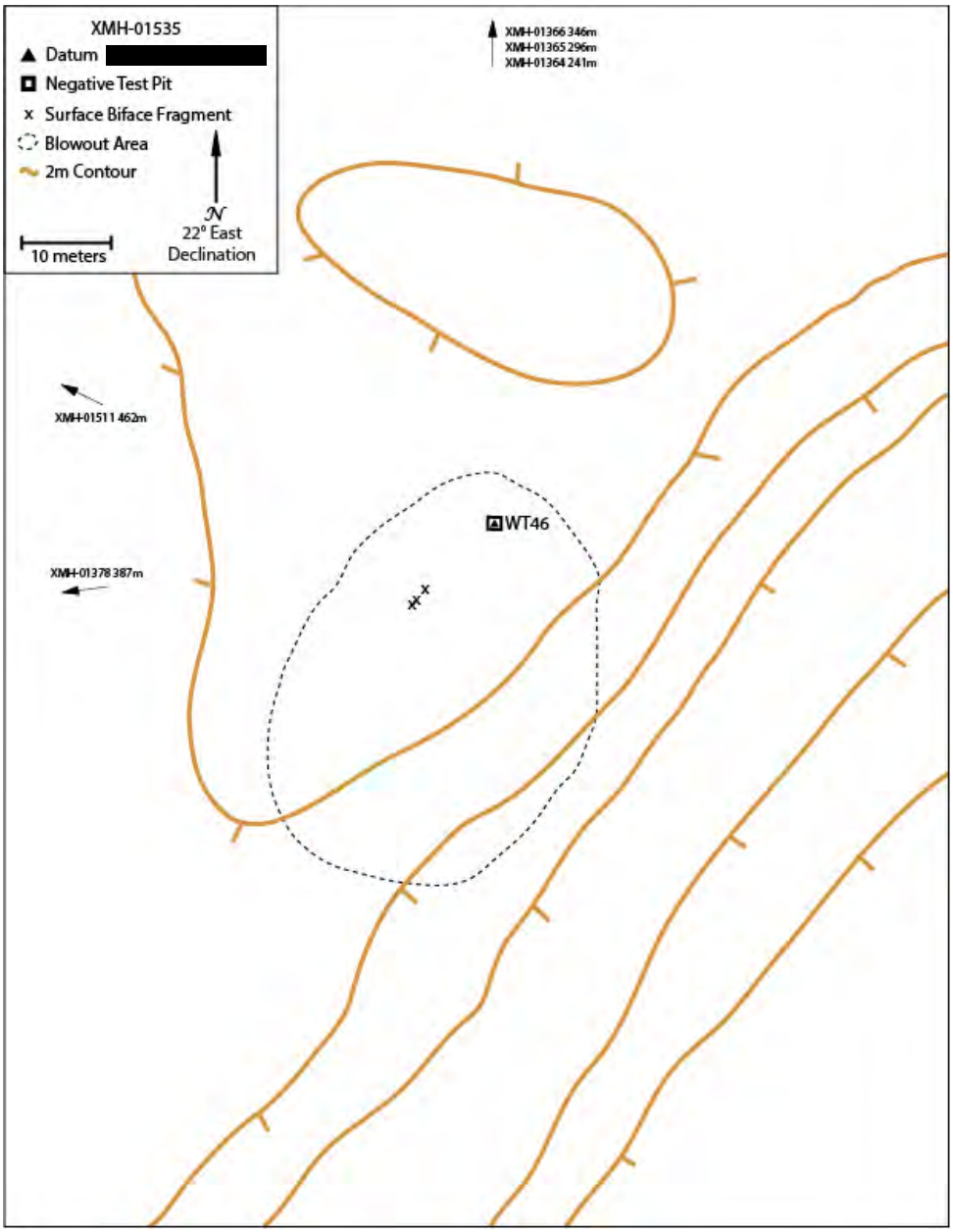

Figure 12. XMH-01535 site map.

Figure 13. XMH-01535 site overview.

Figure 14. XMH-01535 biface fragment.

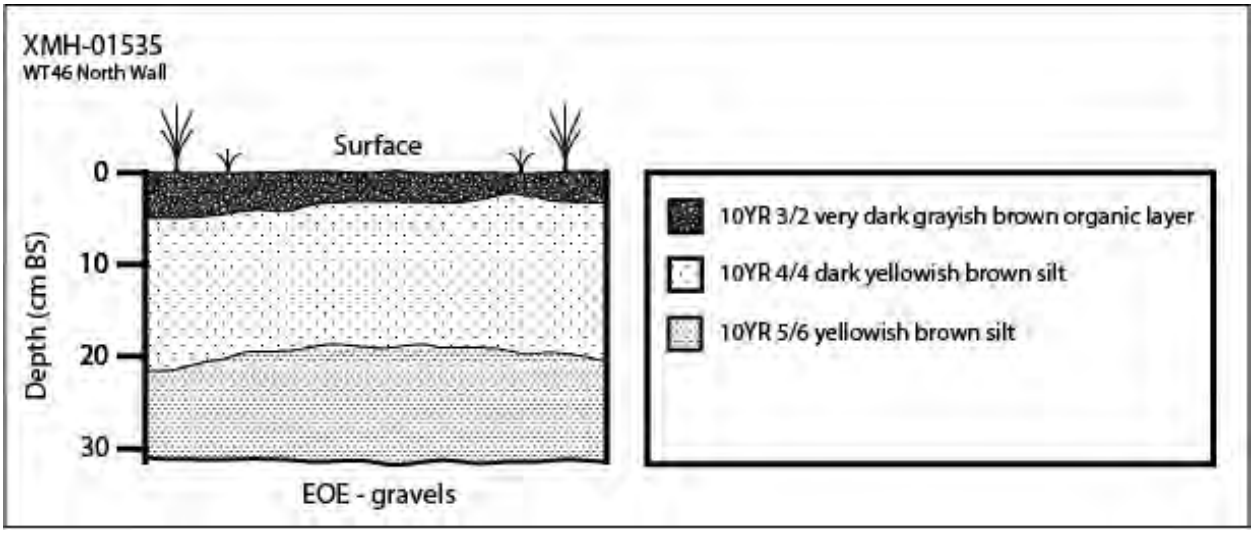

Figure 15. XMH-01535 stratigraphic profile.

Figure 16. XMH-01535 test pit.

2.3 Archaeological Sites in BAX SDZ

There are 126 archaeological sites in the BAX SDZ (Table 2). Twenty-three sites, including two excavated sites (XMH-00284 and XMH-00874), have been determined eligible for the National Register.

Table 2. List of archaeological sites located in the BAX SDZ.

Site	NRHP Status	Year of DOE	Size (m^2)	Site	NRHP Status	Year of DOE	Size (m^2)
XMH-00274	Not Evaluated		1	XMH-01108	Not Evaluated		120
XMH-00277/00879	Eligible	2004	50	XMH-01109	Eligible	2005	120
XMH-00278	Not Evaluated		875	XMH-01110	Eligible	2005	100
XMH-00279/00918	Eligible	2005	700	XMH-01111	Not Evaluated		100
XMH-00284/00882	Eligible (excavated)	2004	300	XMH-01114	Not Evaluated		3500
XMH-00292/00885/00886	Eligible	2005	2800	XMH-01115/01117	Eligible	2005	3200
XMH-00322	Not Evaluated		50	XMH-01116	Eligible	2005	450
XMH-00323/00893	Not Evaluated		5	XMH-01118	Not Evaluated		25
XMH-00874	Eligible (excavated)	2002	3400	XMH-01119	Not Evaluated		375
XMH-00878/00908	Eligible	2005	9000	XMH-01120	Not Evaluated		25
XMH-00881	Eligible	2002	1200	XMH-01121	Not Evaluated		25
XMH-00887	Eligible	2002	450	XMH-01122	Not Evaluated		150
XMH-00890	Eligible	2002	600	XMH-01123	Not Evaluated		25
XMH-00891	Eligible	2002	900	XMH-01124	Not Evaluated		25
XMH-00894	Not Evaluated		100	XMH-01125	Not Evaluated		25
XMH-00902	Not Evaluated		1500	XMH-01126	Not Evaluated		4800
XMH-00903	Not Evaluated		5	XMH-01128	Not Evaluated		120
XMH-00904	Eligible	2005	200	XMH-01129	Not Evaluated		120
XMH-00905	Not Evaluated		375	XMH-01130	Not Evaluated		7000
XMH-00906	Not Evaluated		375	XMH-01131/01132	Not Evaluated		0
XMH-00907	Not Evaluated		200	XMH-01133	Not Evaluated		120
XMH-00909	Not Evaluated		25	XMH-01134	Not Evaluated		25
XMH-00910/00911	Not Evaluated		8450	XMH-01135	Not Evaluated		0
XMH-00913	Not Evaluated		0	XMH-01136	Not Evaluated		0
XMH-00914	Not Evaluated		300	XMH-01137	Not Evaluated		25
XMH-00915	Not Evaluated		9600	XMH-01138	Not Evaluated		25
XMH-00917	Not Evaluated		120	XMH-01139	Not Evaluated		25
XMH-00919	Not Evaluated		200	XMH-01140	Not Evaluated		120
XMH-00920	Eligible	2005	150	XMH-01141	Not Evaluated		120
XMH-00921	Not Evaluated		200	XMH-01143	Not Evaluated		5
XMH-00923/00922	Not Evaluated		3400	XMH-01145	Eligible	2005	1300
XMH-00924	Not Evaluated		552	XMH-01146	Eligible	2005	750
XMH-00925	Not Evaluated		875	XMH-01147	Not Evaluated		25
XMH-00926	Not Evaluated		150	XMH-01148	Not Evaluated		100

XMH-00927	Not Evaluated		100
XMH-00928	Not Evaluated		800
XMH-00929	Not Evaluated		1200
XMH-00945	Eligible	2005	300
XMH-00983	Not Eligible	2012	25
XMH-01070	Not Evaluated		5
XMH-01071	Not Evaluated		1
XMH-01074	Not Evaluated		200
XMH-01075	Not Evaluated		400
XMH-01076	Not Evaluated		25
XMH-01077	Not Evaluated		100
XMH-01085	Not Evaluated		25
XMH-01086	Not Evaluated		25
XMH-01087	Not Evaluated		100
XMH-01088	Not Evaluated		25
XMH-01089	Not Evaluated		240
XMH-01090	Not Evaluated		25
XMH-01091	Not Evaluated		100
XMH-01092	Eligible	2005	120
XMH-01093	Eligible	2005	100
XMH-01095/01142	Not Evaluated		100
XMH-01096	Not Evaluated		100
XMH-01097	Not Evaluated		25
XMH-01098	Not Evaluated		25
XMH-01099	Not Evaluated		900
XMH-01100	Not Evaluated		100
XMH-01104	Not Evaluated		25
XMH-01105	Not Evaluated		400
XMH-01106	Not Evaluated		100
XMH-01107	Eligible	2005	800
XMH-01149	Not Evaluated		200
XMH-01150	Not Evaluated		1184
XMH-01151	Not Evaluated		900
XMH-01152	Not Evaluated		100
XMH-01162	Not Evaluated		150
XMH-01163	Not Evaluated		140
XMH-01175	Not Evaluated		25
XMH-01176	Not Evaluated		120
XMH-01303	Eligible	2006	1400
XMH-01333	Not Evaluated		1
XMH-01360	Not Evaluated		100
XMH-01361	Not Evaluated		120
XMH-01362	Not Evaluated		10
XMH-01363	Not Evaluated		10
XMH-01364	Not Evaluated		5
XMH-01365	Not Evaluated		1
XMH-01366	Not Evaluated		1
XMH-01367	Not Evaluated		40
XMH-01368	Not Evaluated		100
XMH-01377	Not Evaluated		7000
XMH-01378	Not Evaluated		100
XMH-01384	Not Evaluated		150
XMH-01487	Not Evaluated		1
XMH-01493	Not Evaluated		1
XMH-01495	Not Evaluated		1
XMH-01496	Not Evaluated		5
XMH-01511	Not Evaluated		100
XMH-01512	Not Evaluated		5
XMH-01535	Not Evaluated		50

3. MONITORING METHODOLOGY

USAG FWA developed a site monitoring program in consultation with the Alaska SHPO to detect any possible impacts that the operation of the BAX may have on sites downrange in the SDZ. In order to ensure a continued finding of "no adverse effects," USAG FWA implemented systematic, comprehensive monitoring of all sites within the SDZ. By definition, monitoring requires observation at regular intervals in order to determine status or condition. In this program, monitoring is conducted specifically to identify changes in the condition of archaeological sites or features through active field inspections. These inspections, occurring at regularly scheduled intervals, are intended to identify the nature and location of impacts, any changes to the site since last visited, and a general determination of site

condition. In 2014, 123 sites were monitored. In 2015, the three new sites will be added to the monitoring program, bringing the total to 126 sites.

The intensity of monitoring is correlated to the likelihood of potential site impacts resulting from BAX use. A three tiered monitoring schedule was followed from June 2010 to June 2012. With the changes to the PA in 2012, only two monitoring schedules are now followed: (1) annual and (2) after-training. Sites closest to the target areas (previously in the *aggressive* and *frequent* monitoring schedules) are visited annually and after each BAX training activity to a maximum of six times per year. Forty-seven sites are included in the annual and after-training monitoring schedule (Table 3). Seventy-nine sites are visited only once annually (Table 4).

Table 3. Sites on the annual and after-training monitoring schedule.

Site	Site	Site	Site
XMH-00278	XMH-00904	XMH-00921	XMH-01076
XMH-00279/00918	XMH-00905	XMH-00923/00922	XMH-01077
XMH-00292/00885/00886	XMH-00906	XMH-00924	XMH-01085
XMH-00322	XMH-00907	XMH-00925	XMH-01086
XMH-00323/00893	XMH-00909	XMH-00926	XMH-01087
XMH-00878/00908	XMH-00910/00911	XMH-00927	XMH-01088
XMH-00887	XMH-00913	XMH-00928	XMH-01092
XMH-00890	XMH-00914	XMH-00929	XMH-01095/01142
XMH-00891	XMH-00915	XMH-00945	XMH-01122
XMH-00894	XMH-00917	XMH-01071	XMH-01303
XMH-00902	XMH-00919	XMH-01074	XMH-01333
XMH-00903	XMH-00920	XMH-01075	

Table 4. Sites on the annual monitoring schedule.

Site	Site	Site	Site
XMH-00274	XMH-01109	XMH-01135	XMH-01360
XMH-00277/00879	XMH-01110	XMH-01136	XMH-01361
XMH-00284/00882	XMH-01111	XMH-01137	XMH-01362
XMH-00874	XMH-01114	XMH-01138	XMH-01363
XMH-00881	XMH-01115/01117	XMH-01139	XMH-01364
XMH-01070	XMH-01116	XMH-01140	XMH-01365
XMH-01089	XMH-01118	XMH-01141	XMH-01366
XMH-01090	XMH-01119	XMH-01143	XMH-01367
XMH-01091	XMH-01120	XMH-01145	XMH-01368
XMH-01093	XMH-01121	XMH-01146	XMH-01377
XMH-01096	XMH-01123	XMH-01147	XMH-01378
XMH-01097	XMH-01124	XMH-01148	XMH-01384

XMH-01098	XMH-01125	XMH-01149	XMH-01487
XMH-01099	XMH-01126	XMH-01150	XMH-01493
XMH-01100	XMH-01128	XMH-01151	XMH-01495
XMH-01104	XMH-01129	XMH-01152	XMH-01496
XMH-01105	XMH-01130	XMH-01162	XMH-01511
XMH-01106	XMH-01131/01132	XMH-01163	XMH-01512
XMH-01107	XMH-01133	XMH-01175	XMH-01535
XMH-01108	XMH-01134	XMH-01176	

Site monitoring is conducted under the supervision of a person or persons meeting the *Secretary of the Interior's Professional Qualifications Standard*s (36 CFR §61).

A USAG FWA site monitoring form is completed for each site visit and documents: (1) the present condition of the site; (2) the nature and character of all observable impacts to the integrity of the site; (3) extent, character, and nature of any damage observed at the site; and (4) the presence of new artifacts. High quality photo documentation is also conducted, and the form provides a place for logging digital photos. Photographs and previous site descriptions and maps are used to compare current conditions with those visible during previous monitoring episodes.

During the first round of site visits, several photo points were established. These specific locations serve as fixed points of reference used to consistently document each site over time. The number of photo points at each site varies by the site's size and complexity. There are two to four photo points at each site; more photo points are used for larger sites. Upon subsequent site visits, digital photographs are taken from each photo point.

If an adverse effect is noticed through site monitoring, it will be recorded on site monitoring forms. Location, extent, and the nature of impact will be recorded on site maps and photographed. If the impact is subsurface in nature, the depth of impact and associated effects to underlying strata will be assessed and recorded.

Any adverse effect to a site will be reported to the SHPO directly. All findings from monitoring are reported in a USAG FWA annual monitoring report.

4. MONITORING RESULTS

Monitoring of all sites occurred twice during 2014, taking place during two sessions. The sites requiring only annual monitoring were examined before any training started in June and July 2014. The BAX was used for training August 1-25, 2014 (Table 5). After this training period, sites requiring after-training monitoring were examined. The BAX was used again from September 11 to November 8, 2013. After this period of training, a significant amount of snow was on the ground and sites were not visible for monitoring. These sites will be visited when snow melts in the spring of 2015.

From June 2010 to December 2014, the 47 sites located closest to the BAX targets were visited 6-14 times each (Table 6). No effects from live fire have been discovered at any of these sites (photos Appendix 1). The 76 more distant sites were each visited once annually from June 2010 through December 2014 (Table 7). No effects from live fire have been discovered at any of these sites (photos Appendix 2). USAG FWA determines that the 123 prehistoric archaeological sites located within the BAX SDZ before the 2014 field season continue to not be adversely affected from live-fire training activities.

Table 5. BAX usage schedule 2014.

Event Name	Event Category	Start Date	End Date
STRYKER MGS LIVE FIRE	FIRE	8/4/2014 9:00	8/15/2014 13:37
STRYKER RWS LIVE FIRE I	FIRE	9/2/2014 8:00	9/14/2014 17:00
GUNNERY TABLE VII	FIRE	9/29/2014 8:00	10/11/2014 17:00

USAG FWA has determined that no historic properties have been adversely affected by live-fire training activity in the BAX SDZ for the period of June 2010 to December 2014, based on the results of field observations and monitoring activities conducted during this period. This satisfies the stipulations of FWA-PA-1003 as amended in 2012.

Table 6. Forty-seven sites monitored after training, spring 2010-December 2014.

Site	Spring 2010	Summer 1 2010	Summer 2 2010	Winter 1 2011	Winter 2 2011	Spring 2011	Summer 1 2011	Summer 2 2011	Winter 2 2012	5/19/12 Training	8/16/12 Training	Summer 2013	Summer 2014	8/29/14 Training
XMH-00278	6/3/2010		8/9/2010		1/12/2011	6/20/2011	7/14/2011	9/7/2011	3/13/2012	6/25/2012	8/29/2012	8/19/2013	7/2/2014	9/16/2014
XMH-00279/00918	6/2/2010	7/7/2010	8/9/2010	12/6/2010	1/12/2011	6/16/2011	7/25/2011	8/31/2011	3/12/2012	6/25/2012	8/31/2012	8/19/2013	7/2/2014	9/16/2014
XMH-00292/00885/00886	6/4/2010		8/3/2010		1/13/2011	6/20/2011	7/14/2011	9/1/2011	3/12/2012	6/27/2012	8/30/2012	8/26/2013	7/1/2014	9/17/2014
XMH-00322	not relocated								not relocated					9/16/2014
XMH-00323/00893	not monitored until 2012									7/3/2012	10/4/2012	8/28/2013	7/2/2014	9/16/2014
XMH-00878/00908	6/1/2010	7/6/2010	8/5/2010	12/6/2010	1/12/2011	6/16/2011	7/25/2011	8/31/2011	3/12/2012	6/26/2012	8/30/2012	8/26/2013	7/2/2014	9/17/2014
XMH-00887	6/3/2010		8/3/2010		1/13/2011	6/21/2011		9/1/2011	3/13/2012	6/28/2012	8/30/2012	8/26/2013	7/1/2014	9/17/2014
XMH-00890	6/3/2010		8/4/2010		1/13/2011	6/21/2011		9/1/2011	3/13/2012	6/28/2012	8/29/2012	8/27/2013	7/1/2014	9/17/2014
XMH-00891	6/8/2010		8/4/2010		1/13/2011	6/21/2011		9/1/2011	3/12/2012	6/26/2012	8/30/2012	8/27/2013	7/2/2014	9/16/2014
XMH-00894	6/4/2010		8/4/2010		1/14/2011	6/22/2011		9/7/2011		6/28/2012	10/4/2012	8/27/2013	7/1/2014	9/17/2014
XMH-00902	not monitored until 2012									7/30/2012	10/4/2012	8/28/2013	7/3/2014	9/16/2014
XMH-00903	not monitored until 2012									7/30/2012	10/4/2012	8/28/2013	7/2/2014	9/16/2014
XMH-00904	6/7/2010	7/6/2010	8/12/2010	12/6/2010	1/12/2011	6/16/2011	8/2/2011	8/31/2011		6/28/2012	8/31/2012	8/28/2013	7/2/2014	9/16/2014
XMH-00905	6/7/2010	7/6/2010	8/12/2010		1/14/2011	6/15/2011	8/2/2011	8/31/2011		6/28/2012	8/31/2012	8/28/2013	7/2/2014	9/16/2014
XMH-00906	6/2/2010	7/6/2010	8/5/2010	12/6/2010	1/13/2011	6/15/2011	7/25/2011	8/31/2011	3/12/2012	6/25/2012	8/31/2012	8/26/2013	7/3/2014	9/19/2014
XMH-00907	6/1/2010	7/6/2010	8/5/2010	12/6/2010	1/12/2011	6/15/2011	7/25/2011	8/31/2011	3/12/2012	6/26/2012	9/3/2012	8/26/2013	7/2/2014	9/17/2014
XMH-00909	6/1/2010	7/6/2010	8/10/2010	12/6/2010	1/13/2011	6/14/2011	7/25/2011	8/31/2011	3/12/2012	6/25/2012	8/29/2012	8/26/2013	7/1/2014	9/19/2014
XMH-00910/00911	6/1/2010	7/6/2010	8/10/2010	12/6/2010	1/13/2011	6/15/2011	7/25/2011	8/31/2011	3/12/2012	6/25/2012	8/29/2012	8/26/2013	7/1/2014	9/19/2014
XMH-00913	6/1/2010		8/10/2010		1/13/2011	6/22/2011		9/7/2011	3/12/2012	6/25/2012	8/29/2012	8/26/2013	7/1/2014	9/19/2014
XMH-00914	6/1/2010	7/6/2010	8/5/2010	12/6/2010	1/12/2011	6/16/2011	7/25/2011	8/31/2011		6/25/2012	9/3/2012	8/26/2013	7/2/2014	9/19/2014
XMH-00915	6/3/2010		8/9/2010		1/13/2011	6/22/2011		9/7/2011	3/13/2012	6/25/2012	8/29/2012	8/19/2013	7/2/2014	9/16/2014
XMH-00917	6/2/2010		8/9/2010		1/13/2011	6/22/2011		9/7/2011	3/12/2012	6/25/2012	8/29/2012	8/19/2013	7/2/2014	9/16/2014
XMH-00919	6/3/2010		8/9/2010		1/13/2011	6/21/2011		9/7/2011		6/25/2012	9/29/2012	8/19/2013	7/2/2014	9/16/2014
XMH-00920	6/3/2010		8/4/2010		1/13/2011	5/24/2011		9/7/2011		7/30/2012	9/3/2012	8/26/2013	7/2/2014	9/17/2014
XMH-00921	6/1/2010		8/10/2010		1/12/2011	5/24/2011		9/7/2011	3/12/2012	6/25/2012	8/29/2012	8/26/2013	7/1/2014	9/19/2014

XMH-00923/00922	6/2/2010		8/5/2010		1/12/2011	5/24/2011		9/7/2011	3/12/2012	6/25/2012	8/30/2012	8/26/2013	7/1/2014	9/19/2014
XMH-00924	6/2/2010		8/5/2010		1/12/2011	5/24/2011		9/7/2011	3/12/2012	6/25/2012	8/30/2012	8/27/2013	7/1/2014	9/19/2014
XMH-00925	6/1/2010		8/10/2010		1/12/2011	6/22/2011		9/7/2011	3/12/2012	6/25/2012	8/29/2012	8/26/2013	7/1/2014	9/19/2014
XMH-00926	6/1/2010		8/10/2010		1/13/2011	6/22/2011		9/7/2011	3/12/2012	6/25/2012	8/29/2012	8/26/2013	7/2/2014	9/19/2014
XMH-00927	6/2/2010		8/5/2010		1/13/2011	6/20/2011		9/7/2011		6/25/2012	8/29/2012	8/26/2013	7/2/2014	9/19/2014
XMH-00928	6/2/2010		8/3/2010		1/12/2011	6/21/2011		9/1/2011	3/12/2012	6/28/2012	10/4/2012	8/27/2013	7/2/2014	9/17/2014
XMH-00929	6/3/2010		8/4/2010		1/12/2011	6/26/2011		9/1/2011		6/28/2012	8/30/2012	8/26/2013	9/17/2014	9/17/2014
XMH-00945	6/1/2010	7/6/2010	8/5/2010	12/6/2010	1/12/2011	5/24/2011	7/25/2011	8/31/2011		6/26/2012	8/30/2012	8/26/2013	7/2/2014	9/17/2014
XMH-01071	not monitored until 2012									7/3/2012	8/29/2012	8/28/2013	7/3/2014	9/18/2014
XMH-01074	6/9/2010		8/2/2010		1/14/2011	6/26/2011		9/6/2011	3/13/2012	7/3/2012	8/29/2012	8/28/2013	7/2/2014	9/18/2014
XMH-01075	6/9/2010		8/2/2010		1/14/2011	6/26/2011		9/6/2011	3/13/2012	7/3/2012	8/29/2012	8/28/2013	7/2/2014	9/18/2014
XMH-01076	6/9/2010		8/2/2010		1/14/2011	6/27/2011		9/6/2011	3/13/2012	7/3/2012	8/29/2012	8/28/2013	7/2/2014	9/18/2014
XMH-01077	6/9/2010		8/2/2010		1/14/2011	6/20/2011		9/6/2011	3/13/2012	7/3/2012	8/29/2012	8/28/2013	7/2/2014	9/18/2014
XMH-01085	6/4/2010		8/3/2010		1/12/2011	6/20/2011		9/6/2011		6/28/2012	10/4/2012	8/27/2013	7/1/2014	9/18/2014
XMH-01086	6/4/2010		8/3/2010		1/12/2011	6/20/2011		9/6/2011		6/28/2012	10/4/2012	8/27/2013	7/1/2014	9/18/2014
XMH-01087	6/4/2010		8/3/2010		1/12/2011	6/20/2011		9/6/2011		6/28/2012	10/4/2012	8/27/2013	7/1/2014	9/18/2014
XMH-01088	6/4/2010		8/3/2010		1/12/2011	6/21/2011		9/6/2011		6/28/2012	10/4/2012	8/27/2013	7/1/2014	9/18/2014
XMH-01092	6/2/2010		8/5/2010		1/12/2011	6/20/2011		9/7/2011		6/28/2012	8/31/2012	8/27/2013	7/2/2014	9/17/2014
XMH-01095/01142	6/2/2010		8/2/2010		1/13/2011	6/20/2011		9/6/2011		6/28/2012	10/4/2012	8/27/2013	7/1/2014	9/17/2014
XMH-01122	6/3/2010		8/4/2010		1/13/2011	6/21/2011		9/7/2011		7/30/2012	9/3/2012	8/26/2013	7/2/2014	9/17/2014
XMH-01303	6/8/2010	7/7/2010	8/11/2010	12/6/2010	1/12/2011		7/25/2011	8/31/2011	3/13/2012	6/25/2012	8/29/2012	6/4/2013	7/2/2014	9/16/2014
XMH-01333	not monitored until 2012									7/30/2012	10/4/2012	8/28/2013	7/3/2014	9/16/2014

Table 7. Seventy-six sites monitored annually 2010- 2014.

Site	2010 Annual	2011 Annual	2012 Annual	2013 Annual	2014 Annual
XMH-00274			8/6/2012	6/19/2013	6/24/2014
XMH-00277/00879	6/9/2010	6/29/2011	8/9/2012	6/17/2013	6/24/2014
XMH-00284/00882	6/4/2010	6/29/2011	8/6/2012	6/19/2013	6/25/2014
XMH-00874			6/27/2012	8/28/2013	6/26/2014
XMH-00881	6/4/2010	6/29/2011	8/6/2012	6/19/2013	6/25/2014
XMH-01070	6/9/2010	7/18/2011	10/4/2012	6/20/2013	7/2/2014
XMH-01089	6/3/2010	6/18/2011	8/28/2012	6/18/2013	6/18/2014
XMH-01090	6/3/2010	6/29/2011	8/28/2012	6/18/2013	6/18/2014
XMH-01091	6/3/2010	7/18/2011	8/28/2012	6/18/2013	6/18/2014
XMH-01093	6/7/2010	7/18/2011	10/4/2012	6/20/2013	7/3/2014
XMH-01096	6/4/2010	7/19/2011	missed	6/20/2013	6/25/2014
XMH-01097	6/7/2010	6/29/2011	8/9/2012	6/18/2013	6/25/2014
XMH-01098	6/8/2010	6/29/2011	8/9/2012	6/17/2013	6/24/2014
XMH-01099	6/7/2010	7/19/2011	8/9/2012	6/17/2013	6/24/2014
XMH-01100	6/7/2010	6/29/2011	8/9/2012	6/17/2013	6/24/2014
XMH-01104	6/8/2010	7/18/2011	8/9/2012	6/17/2013	6/24/2014
XMH-01105	6/9/2010	7/18/2011	8/31/2012	6/17/2013	6/24/2014
XMH-01106	6/8/2010	6/30/2011	8/31/2012	6/17/2013	6/24/2014
XMH-01107	6/9/2010	6/30/2011	8/9/2012	6/17/2013	6/25/2014
XMH-01108	6/8/2010	6/30/2011	10/4/2012	6/17/2013	6/24/2014
XMH-01109	6/8/2010	6/30/2011	8/31/2012	6/17/2013	6/24/2014
XMH-01110	6/7/2010	6/30/2011	10/4/2012	6/20/2013	7/3/2014
XMH-01111	6/8/2010	7/18/2011	10/4/2012	6/8/2013	6/24/2014
XMH-01114	6/10/2010	7/18/2011	8/9/2012	6/10/2013	6/24/2014
XMH-01115/01117	6/10/2010	7/11/2011	8/9/2012	6/10/2013	6/25/2014
XMH-01116	6/10/2010	7/11/2011	8/9/2012	6/10/2013	6/25/2014
XMH-01118	6/17/2010	7/11/2011	8/7/2012	6/10/2013	6/30/2014
XMH-01119	6/17/2010	7/11/2011	8/7/2012	6/17/2013	6/10/2014
XMH-01120	6/7/2010	6/30/2011	10/4/2012	6/7/2013	7/3/2014
XMH-01121	6/7/2010	7/14/2011	10/4/2012	6/7/2013	7/3/2014
XMH-01123	6/15/2010	7/14/2011	8/28/2012	6/10/2013	6/24/2014
XMH-01124	6/15/2010	7/19/2011	8/28/2012	6/17/2013	7/1/2014
XMH-01125	6/15/2010	7/19/2011	8/28/2012	6/15/2013	7/1/2014
XMH-01126	6/17/2010	7/11/2011	8/8/2012	6/17/2013	6/30/2014
XMH-01128	6/16/2010	7/11/2011	8/28/2012	6/16/2013	6/23/2014
XMH-01129	6/16/2010	7/17/2011	8/27/2012	6/16/2013	6/23/2014
XMH-01130	6/16/2010	7/14/2011	8/8/2012	6/16/2013	6/23/2014
XMH-01131/01132	6/15/2010	7/11/2011	8/28/2012	6/15/2013	7/1/2014
XMH-01133	6/15/2010	7/11/2011	8/28/2012	6/15/2013	7/1/2014
XMH-01134	6/15/2010	7/11/2011	8/23/2012	6/16/2013	6/23/2014
XMH-01135	6/16/2010	7/11/2011	8/27/2012	6/16/2013	6/23/2014
XMH-01136	6/16/2010	7/11/2011	8/27/2012	6/16/2013	6/23/2014

XMH-01137	6/16/2010	7/11/2011	8/28/2012	6/15/2013	6/19/2014
XMH-01138	6/15/2010	7/20/2011	8/28/2012	6/18/2013	7/1/2014
XMH-01139	6/15/2010	7/11/2011	8/28/2012	6/18/2013	6/19/2014
XMH-01140	6/9/2010	7/11/2011	8/9/2012	6/19/2013	6/25/2014
XMH-01141	6/9/2010	7/11/2011	8/9/2012	6/19/2103	6/25/2014
XMH-01143			8/29/2012	6/20/2013	6/26/2014
XMH-01145	6/10/2010	7/14/2011	8/29/2012	6/20/2013	6/26/2014
XMH-01146	6/10/2010	7/7/2011	8/29/2012	6/10/2013	6/26/2014
XMH-01147	6/10/2010	7/14/2011	8/29/2012	6/10/2013	6/26/2014
XMH-01148	6/17/2010	7/18/2011	8/21/2012	6/17/2013	7/1/2014
XMH-01149	6/17/2010	7/18/2011	8/21/2012	6/18/2013	7/1/2014
XMH-01150	6/16/2010	7/18/2011	8/21/2012	6/19/2013	6/19/2014
XMH-01151	6/16/2010	7/11/2011	8/21/2012	6/18/2013	6/19/2014
XMH-01152	6/15/2010	7/11/2011	8/9/2012	6/19/2013	6/25/2014
XMH-01162	6/10/2010	7/11/2011	8/29/2012	6/20/2013	6/26/2014
XMH-01163	6/17/2010	7/11/2011	8/27/2012	6/18/2013	6/19/2014
XMH-01175	6/10/2010	7/18/2011	8/9/2012	6/17/2013	6/24/2014
XMH-01176	6/17/2010	7/11/2011	8/7/2012	6/19/2013	6/30/2014
XMH-01360			8/6/2012	6/19/2013	6/24/2014
XMH-01361	6/15/2010	5/24/2011	8/6/2012	6/19/2013	6/24/2014
XMH-01362	6/17/2010	7/11/2011	8/7/2012	6/19/2013	6/10/2014
XMH-01363	6/15/2010	7/14/2011	8/7/2012	6/19/2013	6/10/2014
XMH-01364			8/7/2012	6/19/2013	6/19/2014
XMH-01365			8/7/2012	6/19/2013	6/19/2014
XMH-01366			8/7/2012	6/19/2013	6/19/2014
XMH-01367	6/16/2010	7/14/2011	8/7/2012	6/18/2013	6/19/2014
XMH-01368	6/16/2010	7/14/2011	8/7/2012	6/18/2013	6/19/2014
XMH-01377			8/28/2012	6/18/2013	6/19/2014
XMH-01378			8/28/2012	6/18/2103	6/30/2014
XMH-01384	6/16/2010	7/14/2011	8/7/2012	6/18/2013	6/19/2014
XMH-01487	Artifact found in files in 2012, site not relocated				
XMH-01493		Site found 8/21/2012		6/18/2013	7/1/2014
XMH-01495			Site found 6/12/2013		7/1/2014
XMH-01496			Site found 6/12/2013		7/1/2014
XMH-01511				Site found 8/27/2014	
XMH-01512				Site found 8/25/2014	
XMH-01535				Site found 8/28/2014	

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APPENDIX 1: Forty-Seven Sites Monitored After Training

XMH-00278

Figure 17. XMH-00278, Point 1, 6/3/10 (SW)

Figure 18. XMH-00278, Point 1, 7/2/14 (W)

XMH-00279/00918

Figure 19. XMH-00279, Point 1, 6/2/10 (NE)

Figure 20. XMH-00279, Point 1, 7/2/14 (E)

XMH-00292/00885/00886

Figure 21. XMH-00292/00885/00886, Point 1, 6/4/10 (S)

Figure 22. XMH-00292/00885/00886, Point 1, 7/1/14 (S)

XMH-00323/00893

Figure 23. XMH-00323/00893, Point 1, 7/3/12 (S)

Figure 24. XMH-00323/00893, Point 1, 7/2/14 (S)

XMH-00878/00908

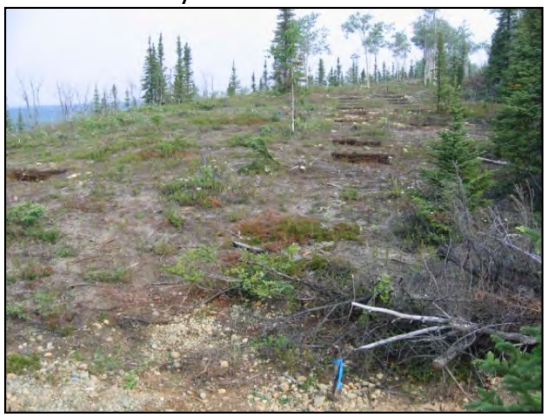

Figure 25. XMH-00878/908, Point 1, 6/1/10 (N)

Figure 26. XMH-00878/908, Point 1, 7/2/14 (N)

Figure 27. XMH-00878/908, Point 3, 6/1/10 (SW)

Figure 28. XMH-00878/908, Point 3, 7/2/14 (W)

XMH-00887

Figure 29. XMH-00887, Point 1, 6/2/10 (N)

Figure 30. XMH-00887, Point 1, 7/1/14 (N)

XMH-00890

Figure 31. XMH-00890, Point 1, 6/3/10 (N)

Figure 32. XMH-00890, Point 1, 7/1/14 (N)

XMH-00891

Figure 33. XMH-00891, Point 2, 6/8/10 (N)

Figure 34. XMH-00891, Point 2, 7/2/14 (N)

XMH-00894

Figure 35. XMH-00894, Point 1, 6/4/10 (W)

Figure 36. XMH-00894, Point 1, 7/2/14 (W)

XMH-00902

Figure 37. XMH-00902, Point 1, 7/30/12 (N)

Figure 38. XMH-00902, Point 1, 7/3/14 (N)

XMH-00903

Figure 39. XMH-00903, Point 2, 7/30/12 (N)

Figure 40. XMH-00903, Point 2, 7/2/14 (N)

XMH-00904

Figure 41. XMH-00904, Point 1, 6/7/10 (NW)

Figure 42. XMH-00904, Point 1, 7/2/14 (N)

XMH-00905

Figure 43. XMH-00905, Point 1, 6/7/10 (NW)

Figure 44. XMH-00905, Point 1, 7/2/14 (N)

XMH-00906

Figure 45. XMH-00906, Point 1, 6/2/10 (N)

Figure 46. XMH-00906, Point 1, 7/3/14 (N)

XMH-00907

Figure 47. XMH-00907, Point 1, 6/1/10 (N)

Figure 48. XMH-00907, Point 1, 7/2/14 (N)

XMH-00909

Figure 49. XMH-00909, Point 1, 6/1/10 (NW)

Figure 50. XMH-00909, Point 1, 7/1/14 (N)

XMH-00910/XMH-00911

Figure 51. XMH-00910/911, Point 1, 6/1/10 (NNE)

Figure 52. XMH-00910/911, Point 1, 7/1/14 (N)

Figure 53. XMH-00910/911, Point 2, 6/1/10 (N)

Figure 54. XMH-00910/911, Point 2, 7/1/14 (N)

Figure 55. XMH-00910/911, Point 4, 6/1/10 (SW)

Figure 56. XMH-00910/911, Point 4, 7/1/14 (W)

XMH-00913

Figure 57. XMH-00913, Point 1, 6/1/10 (NNW)

Figure 58. XMH-00913, Point 1, 7/1/14 (W)

XMH-00914

Figure 59. XMH-00914, Point 1, 6/1/10 (S)

Figure 60. XMH-00914, Point 1, 7/2/14 (S)

XMH-00915

Figure 61. XMH-00915, Point 1, 6/3/10 (NE)

Figure 62. XMH-00915, Point 1, 7/2/14 (E)

Figure 63. XMH-00915, Point 2, 6/3/10 (SW)

Figure 64. XMH-00915, Point 2, 7/2/14 (W)

XMH-00917

XMH-00919

Figure 65. XMH-00915, Point 3, 6/3/10 (SSW)

Figure 67. XMH-00917, Point 1, 6/2/10 (SE)

Figure 69. XMH-00919, Point 1, 6/3/10 (SW)

Figure 66. XMH-00915, Point 3, 9/16/14 (W)

Figure 68. XMH-00917, Point 1, 7/2/14 (S)

Figure 70. XMH-00919, Point 1, 7/2/14 (W)

XMH-00920

Figure 71. XMH-00920, Point 1, 6/3/10 (S)

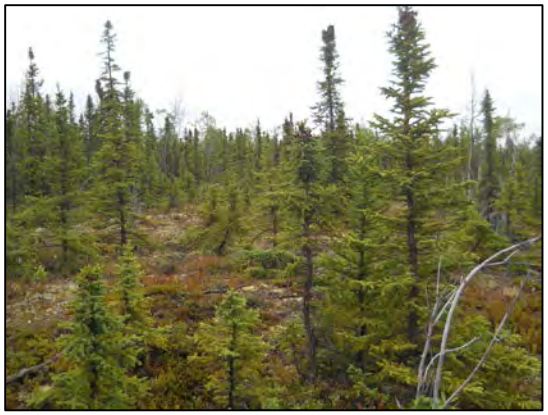

Figure 72. XMH-00920, Point 1, 7/2/14 (S)

XMH-00921

Figure 73. XMH-00921, Point 1, 6/1/10 (NNE)

Figure 74. XMH-00921, Point 1, 7/1/14 (N)

XMH-00922/XMH-00923

Figure 75. XMH-00922/00923, Point 1, 6/2/10 (SE)

Figure 76. XMH-00922/00923, Point 1, 7/1/14 (E)

Figure 77. XMH-00922/00923, Point 2, 6/2/10 (SW)

Figure 79. XMH-00922/00923, Point 3, 6/2/10 (SW)

Figure 81. XMH-00922/00923, Point 4, 12/6/10 (NNW)

Figure 78. XMH-00922/00923, Point 2, 7/1/14 (S)

Figure 80. XMH-00922/00923, Point 3, 7/1/14 (W)

Figure 82. XMH-00922/00923, Point 4, 7/1/14 (W)

XMH-00924

Figure 83. XMH-00924, Point 1, 6/2/10 (ESE)

Figure 84. XMH-00924, Point 1, 9/9/14 (E)

XMH-00925

Figure 85. XMH-00925, Point 1, 6/1/10 (W)

Figure 86. XMH-00925, Point 1, 7/1/14 (W)

XMH-00926

Figure 87. XMH-00926, Point 1, 6/1/10 (SSE)

Figure 88. XMH-00926, Point 1, 7/2/14 (E)

XMH-00927

Figure 89. XMH-00927, Point 1, 6/2/10 (W)

Figure 90. XMH-00927, Point 1, 7/2/14 (W)

XMH-00928

Figure 91. XMH-00928, Point 1, 6/2/10 (N)

Figure 92. XMH-00928, Point 1, 7/2/14 (N)

XMH-00929

Figure 93. XMH-00929, Point 1, 6/3/10 (N)

Figure 94. XMH-00929, Point 1, 9/17/14 (N)

XMH-00945

Figure 95. XMH-00945, Point 1, 6/1/10 (S)

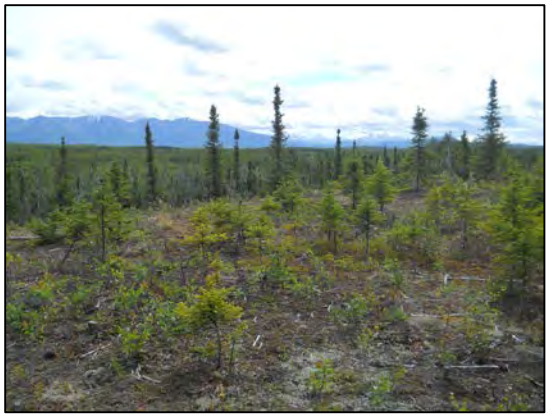

Figure 96. XMH-00945, Point 1, 7/2/14 (S)

XMH-01071

Figure 97. XMH-01071, Point 1, 7/3/12 (S)

Figure 98. XMH-01071, Point 1, 7/3/14 (S)

XMH-01074

Figure 99. XMH-01074, Point 1, 6/9/10 (W)

Figure 100. XMH-01074, Point 1, 9/18/14 (W)

XMH-01075

Figure 101. XMH-01075, Point 1, 6/9/10 (S)

Figure 102. XMH-01075, Point 1, 7/2/14 (S)

XMH-01076

Figure 103. XMH-01076, Point 1, 6/9/10 (NE)

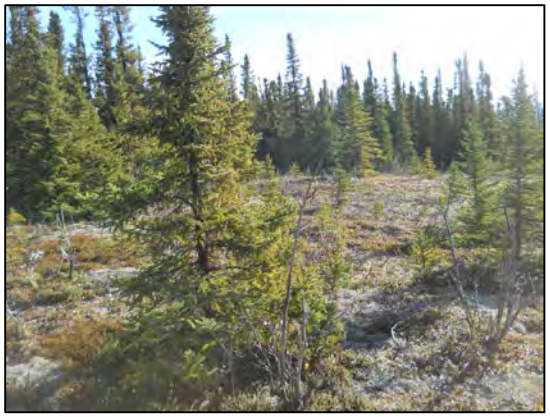

Figure 104. XMH-01076, Point 1, 9/18/14 (E)

XMH-01077

Figure 105. XMH-01077, Point 1, 6/9/10 (S)

Figure 106. XMH-01077, Point 1, 7/2/14 (S)

XMH-01085

Figure 107. XMH-01085, Point 1, 6/4/10 (N)

Figure 108. XMH-01085, Point 1, 7/1/14 (N)

XMH-01086

Figure 109. XMH-01086, Point 1, 6/4/10 (S)

Figure 110. XMH-01086, Point 1, 7/1/14 (S)

XMH-01087

Figure 111. XMH-001087, Point 1, 6/4/10 (S)

Figure 112. XMH-01087, Point 1, 7/1/14 (S)

XMH-01088

Figure 113. XMH-01088, Point 1, 6/4/10 (NW)

Figure 114. XMH-01088, Point 1, 7/1/14 (N)

XMH-01092

Figure 115. XMH-01092, Point 1, 6/2/10 (S)

Figure 116. XMH-01092, Point 1, 7/1/14 (S)

XMH-01095/01142

Figure 117. XMH-01095/01142, Point 1, 6/2/10 (N)

Figure 118. XMH-01095/01142, Point 1, 9/17/14 (N)

XMH-01122

Figure 119. XMH-01122, Point 1, 6/3/10 (SW)

Figure 120. XMH-01122, Point 1, 7/2/14 (W)

XMH-001303

Figure 121. XMH-001303, Point 1, 6/8/10 (W)

Figure 122. XMH-001303, Point 1, 7/2/14 (W)

XMH-001333

Figure 123. XMH-001333, Point 1, 7/30/12 (S)

Figure 124. XMH-001333, Point 1, 7/3/14 (N)

APPENDIX 2: Seventy-Six Sites on Annual Monitoring Schedule

XMH-00274

Figure 125. XMH-00274, Point 2, 8/6/12 (S)

Figure 126. XMH-00274, Point 1, 6/24/14 (S)

XMH-00277/00879

Figure 127. XMH-00277/00879, Point 1, 6/9/10 (SW)

Figure 128. XMH-00277/00879, Point 1, 6/24/14 (W)

Figure 129. XMH-00277/00879, Point 1, 8/9/12 (SSW)

Figure 130. XMH-00277/00879, Point 1, 6/24/14 (S)

XMH-00284/00882

Figure 131. XMH-00284/00882, Point 1, 6/4/10 (S)

Figure 132. XMH-00284/00882, Point 1, 6/25/14 (S)

XMH-00874

Figure 133. XMH-00874, Point 2, 6/27/12 (W)

Figure 134. XMH-00874, Point 1, 6/26/14 (S)

XMH-00881

Figure 135. XMH-00881, Point 1, 6/4/10 (S)

Figure 136. XMH-00881, Point 1, 6/25/14 (S)

XMH-00983

Figure 137. XMH-00983, Point 1, 6/4/10 (NW)

Figure 138. XMH-00983, Point 1, 6/24/14 (W)

XMH-01070

Figure 139. XMH-01070, Point 2, 6/9/10 (N)

Figure 140. XMH-01070, Point 2, 7/2/14 (N)

XMH-01089

Figure 141. XMH-01089, Point 1, 6/3/10 (NW)

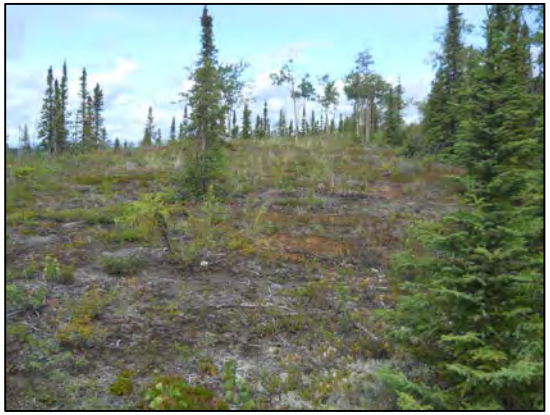

Figure 142. XMH-01089, Point 1, 6/19/14 (N)

XMH-01090

Figure 143. XMH-01090, Point 1, 6/3/10 (SW)

Figure 144. XMH-01090, Point 1, 6/19/14 (S)

XMH-01091

Figure 145. XMH-01091, Point 1, 6/3/10 (S)

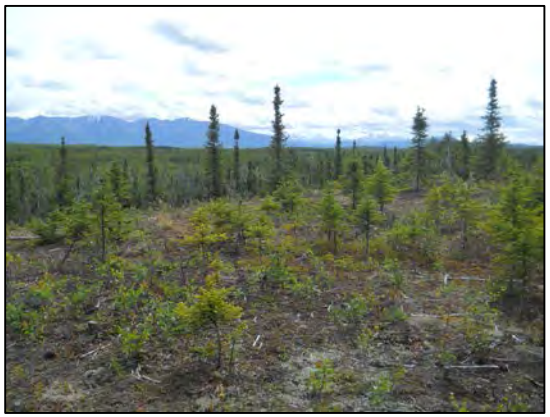

Figure 146. XMH-01091 Point 1, 6/19/14 (S)

XMH-01093

Figure 147. XMH-01093, Point 2, 6/7/10 (NE)

Figure 148. XMH-01093, Point 2, 7/3/14 (N)

XMH-01096

Figure 149. XMH-01096, Point 1, 6/4/10 (SW)

Figure 150. XMH-01096, Point 1, 6/25/14 (S)

XMH-01097

Figure 151. XMH-01097, Point 2, 6/4/10 (NE)

Figure 152. XMH-01097, Point 2, 6/25/14 (E)

XMH-01098

Figure 153. XMH-01098, Point 2, 6/8/10 (SE)

Figure 154. XMH-01098, Point 2, 6/24/14 (E)

XMH-01099

Figure 155. XMH-01099, Point 1, 6/7/10 (SW)

Figure 156. XMH-01099, Point 1, 6/24/14 (S)

XMH-01100

Figure 157. XMH-01100, Point 1, 6/7/10 (N)

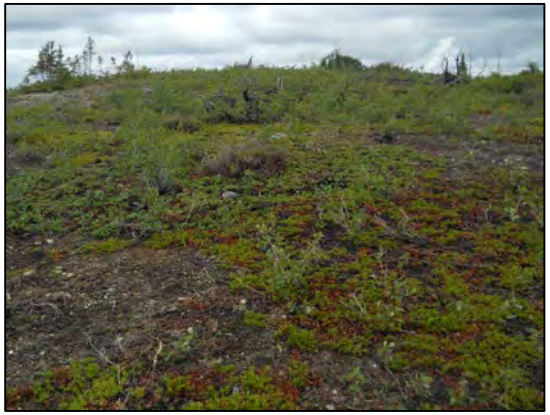

Figure 158. XMH-01100, Point 1, 6/24/14 (N)

XMH-01104

Figure 159. XMH-01104, Point 1, 6/8/10 (SE)

Figure 160. XMH-01104, Point 1, 6/24/14 (S)

XMH-01105

Figure 161. XMH-01105, Point 2, 6/9/10 (NNE)

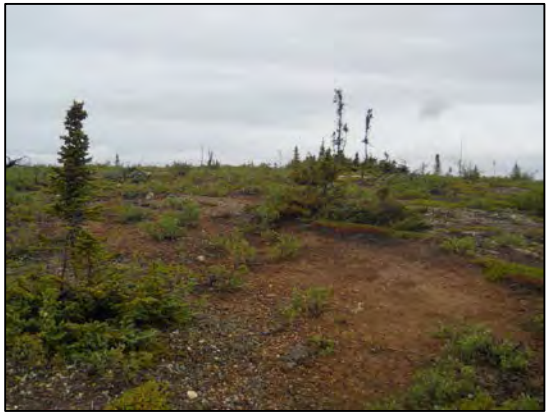

Figure 162. XMH-01105, Point 2, 6/17/14 (N)

XMH-01106

Figure 163. XMH-01106, Point 1, 6/8/10 (NE)

Figure 164. XMH-01106, Point 1, 6/24/14 (E)

XMH-01107

Figure 165. XMH-01107, Point 3, 6/9/10 (NW)

Figure 166. XMH-01107, Point 3, 6/25/14 (W)

XMH-01108

Figure 167. XMH-01108, Point 2, 6/8/10 (S)

Figure 168. XMH-01108, Point 2, 6/24/14 (S)

XMH-01109

Figure 169. XMH-01109, Point 1, 6/8/10 (N)

Figure 170. XMH-01109, Point 1, 6/24/14 (N)

XMH-01110

Figure 171. XMH-01110, Point 1, 6/7/10 (S)

Figure 172. XMH-01110, Point 1, 7/3/14 (S)

XMH-01111

Figure 173. XMH-01111, Point 2, 6/8/10 (NE)

Figure 174. XMH-01111, Point 2, 6/24/14 (E)

XMH-01114

Figure 175. XMH-01114, Point 1, 6/10/10 (SE)

Figure 176. XMH-01114, Point 1, 6/24/14 (E)

XMH-01115/01117

Figure 177. XMH-01115/01117, Point 1, 6/10/10 (S)

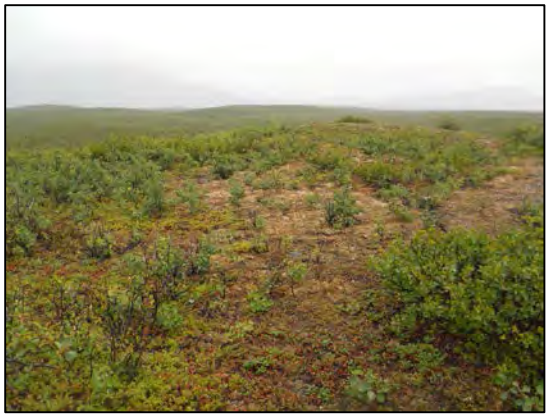

Figure 178. XMH-01115/01117, Point 1, 6/25/14 (S)

XMH-01116

Figure 179. XMH-01116, Point 1, 6/10/10 (NNW)

Figure 180. XMH-01116, Point 1, 6/25/14 (N)

XMH-01118

Figure 181. XMH-01118, Point 1, 6/10/10 (S)

Figure 182. XMH-01118, Point 1, 6/30/14 (S)

XMH-01119

Figure 183. XMH-01119, Point 1, 6/17/10 (W)

Figure 184. XMH-01119, Point 1, 6/10/14 (W)

XMH-01120

Figure 185. XMH-01120, Point 2, 6/7/10 (SE)

Figure 186. XMH-01120, Point 2, 7/3/14 (S)

XMH-01121

Figure 187. XMH-01121, Point 1, 6/7/10 (S)

Figure 188. XMH-01121, Point 1, 7/3/14 (S)

XMH-01123

Figure 189. XMH-01123, Point 1, 6/10/10 (SE)

Figure 190. XMH-01123, Point 1, 6/24/14 (S)

XMH-01124

Figure 191. XMH-01124, Point 1, 6/15/10 (W)

Figure 192. XMH-01124, Point 1, 7/1/14 (W)

XMH-01125

Figure 193. XMH-01125, Point 1, 6/15/10 (S)

Figure 194. XMH-01125, Point 1, 7/1/14 (S)

XMH-01126

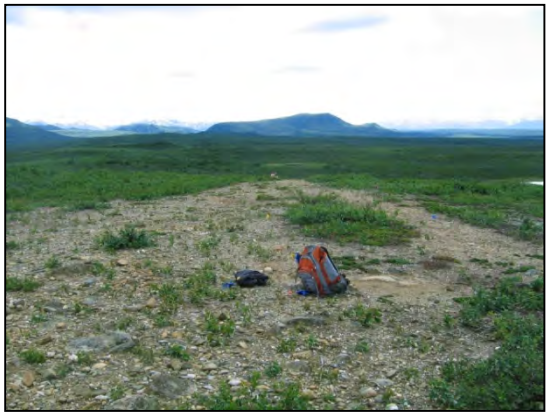

Figure 195. XMH-01126, Point 1, 6/17/10 (SSW)

Figure 196. XMH-01126, Point 1, 6/30/14 (S)

XMH-01128

Figure 197. XMH-01128, Point 1, 6/16/10 (SE)

Figure 198. XMH-01128, Point 1, 6/23/14 (S)

XMH-01129

Figure 199. XMH-01129, Point 1, 6/16/10 (S)

Figure 200. XMH-01129, Point 1, 6/23/14 (S)

XMH-01130

Figure 201. XMH-01130, Point 1, 6/16/10 (NE)

Figure 202. XMH-01130, Point 1, 6/23/14 (N)

XMH-01131/001132

Figure 203. XMH-01131, Point 2, 6/15/10 (E)

Figure 204. XMH-01131, Point 2, 7/1/14 (E)

XMH-01133

Figure 205. XMH-01133, Point 2, 6/15/10 (NW)

Figure 206. XMH-01133, Point 2, 7/1/14 (W)

XMH-01134

Figure 207. XMH-001134, Point 1, 6/16/10 (NE)

Figure 208. XMH-01134, Point 1, 6/23/14 (E)

XMH-01135

Figure 209. XMH-01135, Point 1, 6/16/10 (SE)

Figure 210. XMH-01135, Point 1, 6/23/14 (S)

XMH-01136

Figure 211. XMH-01136, Point 1, 6/16/10 (SW)

Figure 212. XMH-01136, Point 1, 6/23/14 (W)

XMH-01137

Figure 213. XMH-01137, Point 1, 6/15/10 (SW)

Figure 214. XMH-01137, Point 1, 6/19/14 (S)

XMH-01138

Figure 215. XMH-01138, Point 1, 6/15/10 (NE)

Figure 216. XMH-01138, Point 1, 7/1/14 (E)

XMH-01139

Figure 217. XMH-01139, Point 2, 6/15/10 (SW)

Figure 218. XMH-01139, Point 1, 6/19/14 (E)

XMH-01140

Figure 219. XMH-01140, Point 1, 6/9/10 (SW)

Figure 220. XMH-01140, Point 1, 6/25/14 (W)

XMH-01141

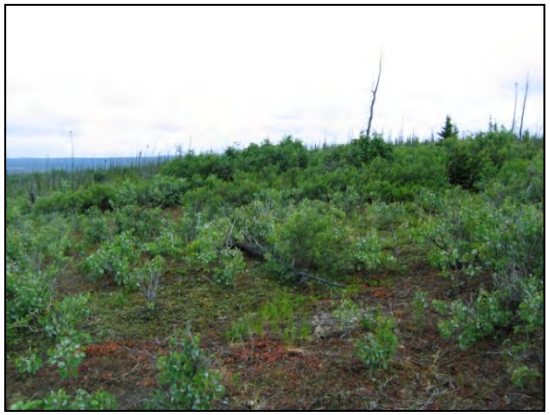

Figure 221. XMH-01141, Point 1, 6/9/10 (W)

Figure 222. XMH-01141, Point 1, 6/25/14 (W)

XMH-01143

Figure 223. XMH-01143, Point 1, 8/29/12 (S)

Figure 224. XMH-01143, Point 1, 6/26/14 (S)

XMH-01145

Figure 225. XMH-01145, Point 1, 6/10/10 (NW)

Figure 226. XMH-01145, Point 1, 6/26/14 (N)

XMH-01146

Figure 227. XMH-01146, Point 1, 6/10/10 (S)

Figure 228. XMH-01146, Point 1, 6/26/14 (S)

XMH-01147

Figure 229. XMH-01147, Point 1, 6/10/10 (SW)

Figure 230. XMH-01147, Point 1, 6/26/14 (S)

XMH-01148

Figure 231. XMH-01148, Point 1, 6/17/10 (NE)

Figure 232. XMH-01148, Point 1, 7/1/14 (N)

XMH-01149

Figure 233. XMH-01149, Point 1, 6/17/10 (SE)

Figure 234. XMH-01149, Point 1, 7/1/14 (S)

XMH-01150

Figure 235. XMH-01150, Point 2, 6/16/10 (SE)

Figure 236. XMH-01150, Point 1, 6/19/14 (E)

XMH-01151

Figure 237. XMH-01151, Point 1, 6/16/10 (SW)

Figure 238. XMH-01151, Point 1, 6/19/14 (S)

XMH-01152

Figure 239. XMH-01152, Point 2, 6/15/10 (SE)

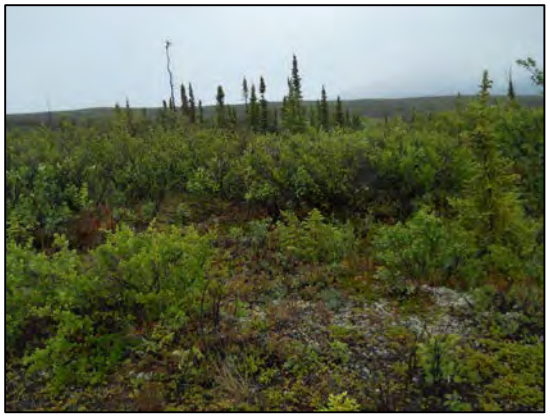

Figure 240. XMH-01152, Point 2, 6/25/14 (E)

XMH-01162

Figure 241. XMH-01162, Point 2, 6/10/10 (SW)

Figure 242. XMH-01162, Point 2, 6/26/14 (S)

XMH-01163

Figure 243. XMH-01163, Point 1, 6/17/10 (SSE)

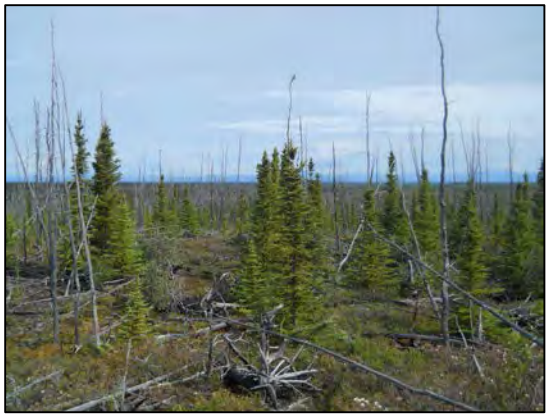

Figure 244. XMH-01163, Point 1, 6/19/14 (S)

XMH-01175

Figure 245. XMH-01175, Point 1, 6/10/10 (NE)

Figure 246. XMH-01175, Point 1, 6/24/14 (N)

XMH-01176

Figure 247. XMH-01176, Point 1, 6/17/10 (SW)

Figure 248. XMH-01176, Point 1, 6/30/14 (S)

XMH-01360

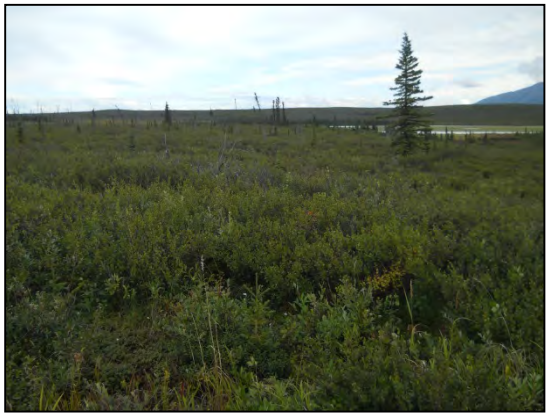

Figure 249. XMH-01360, Point 2, 8/6/12 (E)

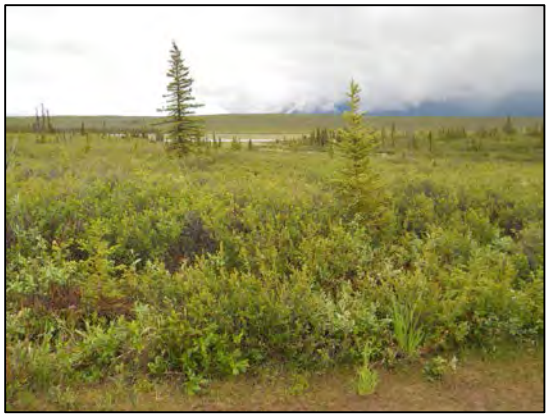

Figure 250. XMH-01360, Point 2, 6/24/14 (E)

XMH-01361

Figure 251. XMH-01361, Point 1, 6/15/10 (NE)

Figure 252. XMH-01361, Point 1, 6/24/14 (E)

XMH-01362

Figure 253. XMH-01362, Point 1, 6/17/10 (N)

Figure 254. XMH-01362, Point 1, 6/10/14 (N)

XMH-01363

Figure 255. XMH-01363, Point 1, 6/15/10 (SW)

Figure 256. XMH-01363, Point 1, 6/10/14 (E)

XMH-01364

Figure 257. XMH-01364, Point 1, 8/7/12 (N)

Figure 258. XMH-01364, Point 1, 6/19/14 (N)

XMH-01365

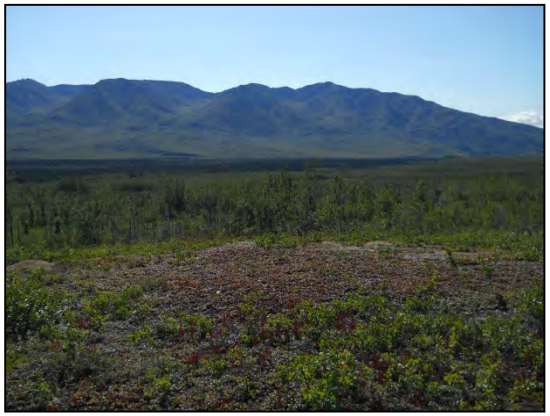

Figure 259. XMH-01365, Point 1, 8/7/12 (E)

Figure 260. XMH-01365, Point 2, 6/19/14 (E)

XMH-01366

Figure 261. XMH-01366, Point 1, 8/7/12 (S)

Figure 262. XMH-01366, Point 2, 6/19/14 (S)

XMH-01367

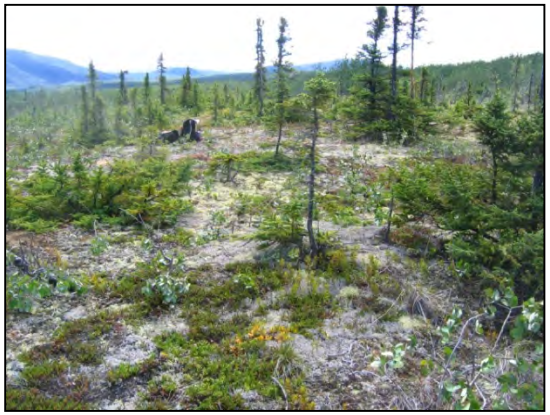

Figure 263. XMH-01367, Point 1, 6/16/10 (SW)

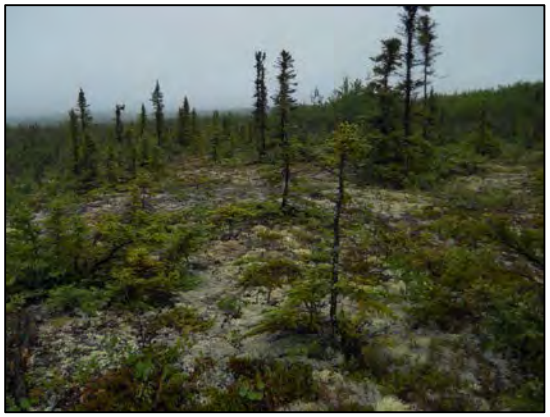

Figure 264. XMH-01367, Point 1, 6/19/14 (S)

XMH-01368

Figure 265. XMH-01368, Point 1, 6/16/10 (SW)

Figure 266. XMH-01368, Point 1, 6/19/14 (S)

XMH-01377

Figure 267. XMH-01377, Point 2, 8/7/12 (W)

Figure 268. XMH-01377, Point 2, 6/19/14 (W)

XMH-01378

Figure 269. XMH-01378, Point 2, 8/7/12 (E)

Figure 270. XMH-01378, Point 2, 6/30/14 (E)

XMH-01384

Figure 271. XMH-01384, Point 1, 6/16/10 (SE)

Figure 272. XMH-01384, Point 1, 6/19/14 (E)

XMH-01493

Figure 273. XMH-01493, Point 1, 6/18/13 (N)

Figure 274. XMH-01493, Point 1, 7/1/14 (N)

XMH-01495

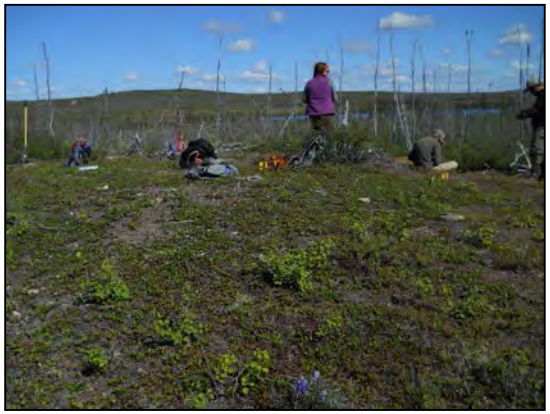

Figure 275. XMH-01495, Point 1, 6/12/14

Figure 276. XMH-01495, Point 1, 7/1/14

XMH-01496

Figure 277. XMH-01496, Point 1, 6/12/14

Figure 278. XMH-01496, Point 1, 7/1/14