

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

**Annual Report 2012**



**March**

**2013**

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Archaeological Site Monitoring,  
Donnelly Training Area**

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By

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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  
NHPA – National Historic Preservation Act  
PA – Programmatic Agreement  
SDZ – Surface Danger Zone  
SHPO – State Historic Preservation Officer  
TFTA – Tanana Flats Training Area  
USAG FWA – U. S. Army Garrison Fort Wainwright  
USARAK – U. S. Army Alaska  
USARAL – U. S. Army Alaska (historic)  
USGS – U. S. Geological Survey  
UTM – Universal Transverse Mercator  
XBD – Big Delta  
XMH – Mt. Hayes

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# 1. INTRODUCTION

On February 5, 2010, the U.S. 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 on the BAX in June of 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.

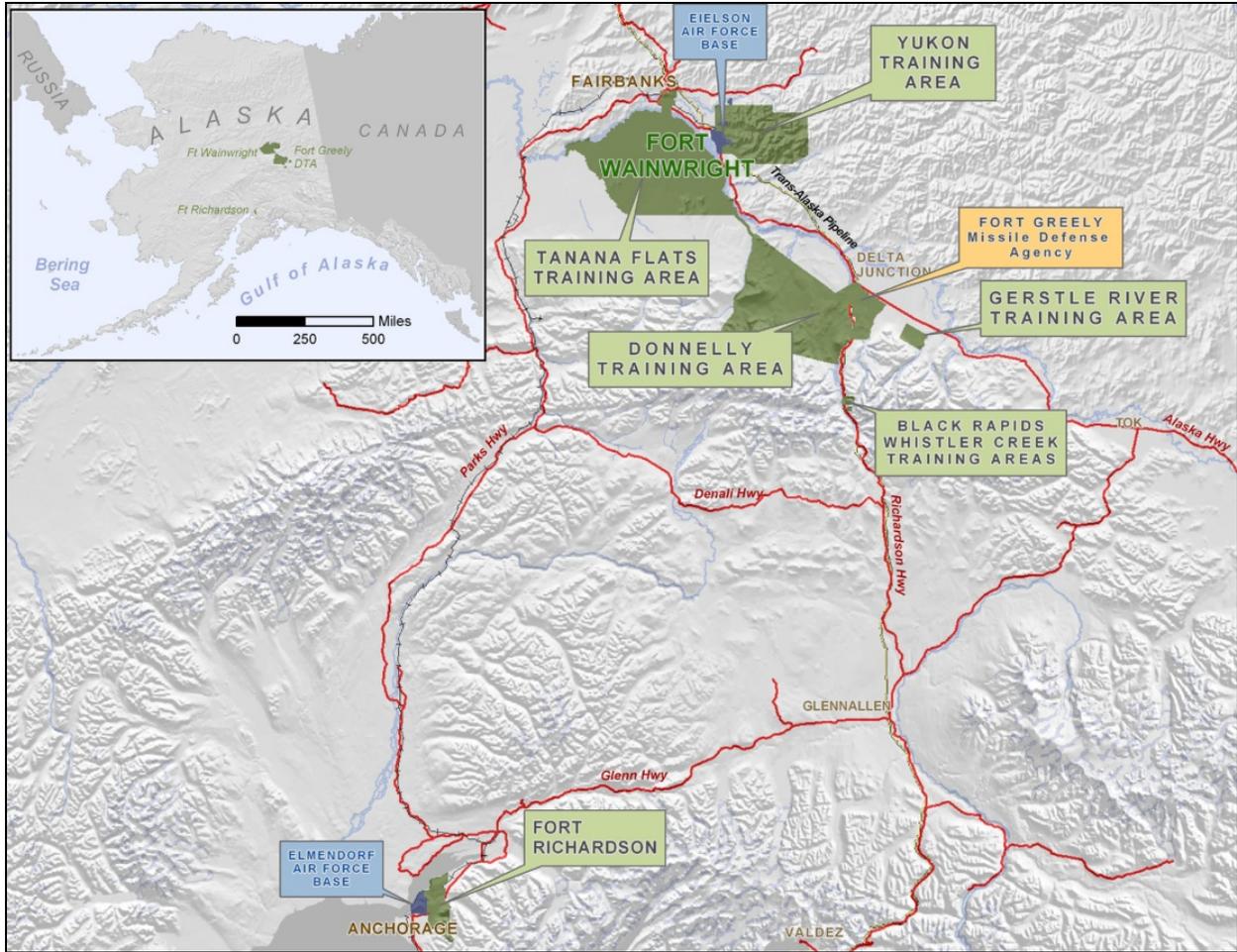
This report will detail the findings of monitoring activities for the period of June 2010 to January 2013, as well as the results of the archaeological surveys in the expanded portion of the BAX SDZ.

Site monitoring was conducted following procedures defined in *U.S. 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 U.S. 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 176<sup>th</sup> Light Infantry Brigade to the 176<sup>th</sup> 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.**

<b>Weapons System</b>	<b>Description</b>
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 (i.e., 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 (Figure 2), and (2) the establishment of a safety buffer area—the SDZ downrange of the BAX (Figure 3).

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 3). 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 3). 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 4).

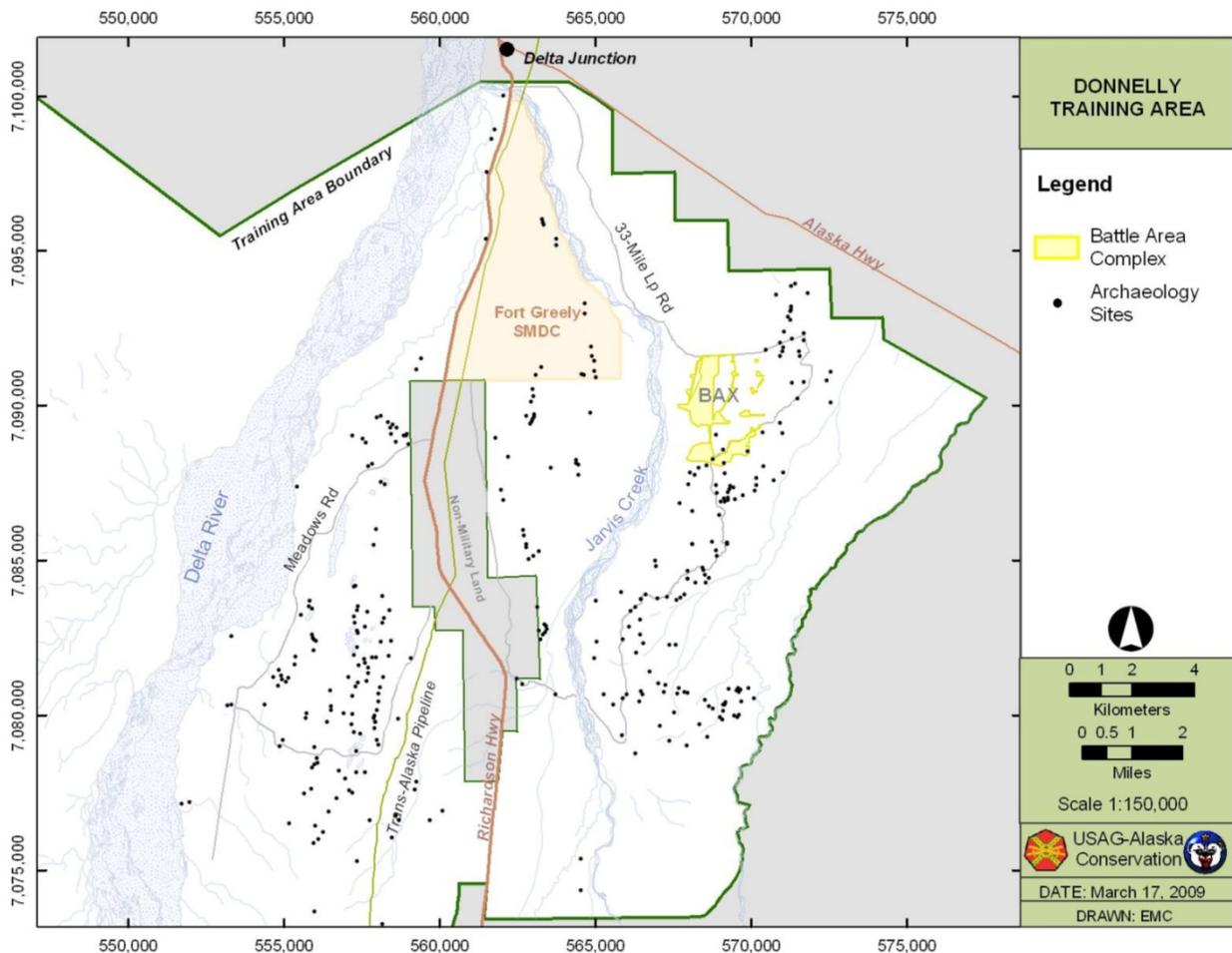
The assessment of effects of live-fire exercises in the BAX is presented in Section 5.0 of Robertson (2009:23-39). In short, it was determined that, although the sites are downrange of a live-fire training area, the potential for adverse effects from stray rounds was low to non-existent due to: (1) local 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.

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

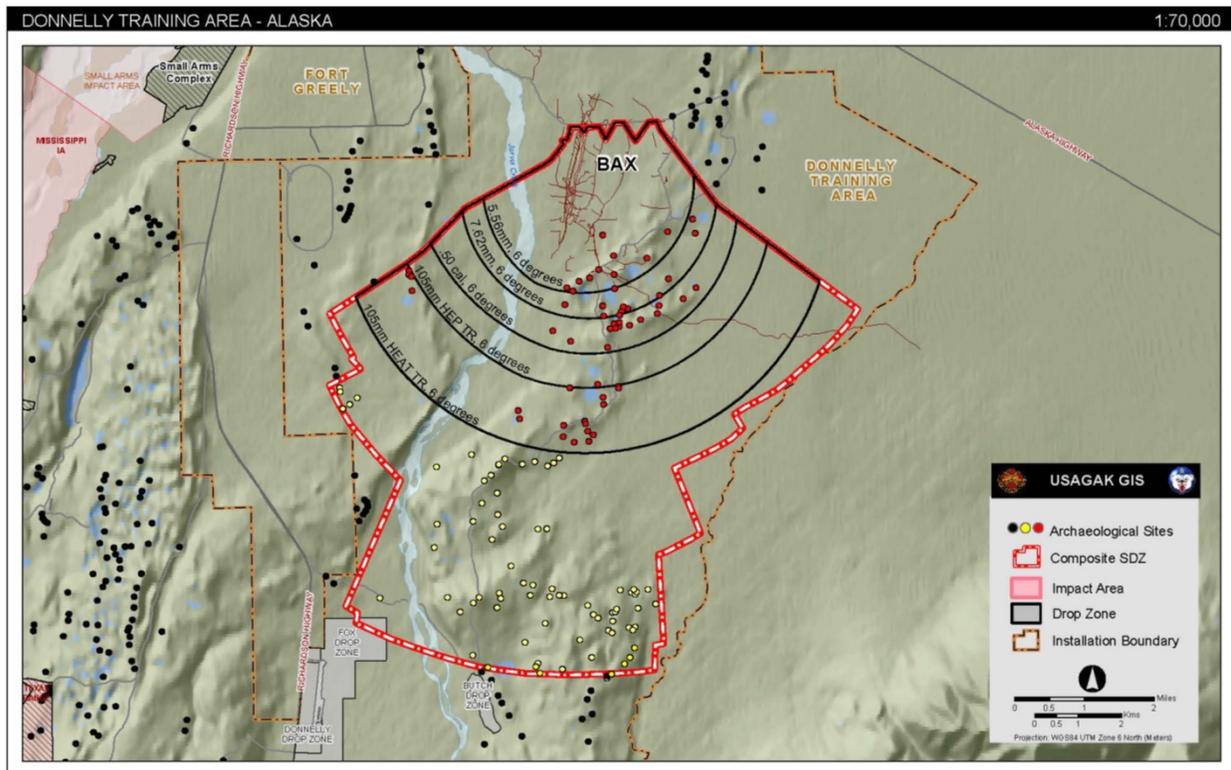
Robertson 2005; Robertson et al. 2006). On March 17, 2006, USARAK released the BAX/CACTF Supplemental Draft EIS, and USAG FWA and the SHPO entered into Section 106 consultation to mitigate adverse effects of the BAX undertaking, resulting in a Memorandum of Agreement (AK-MOA-227).

Survey for the BAX expansion began in 2012 and will continue during the 2013 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.



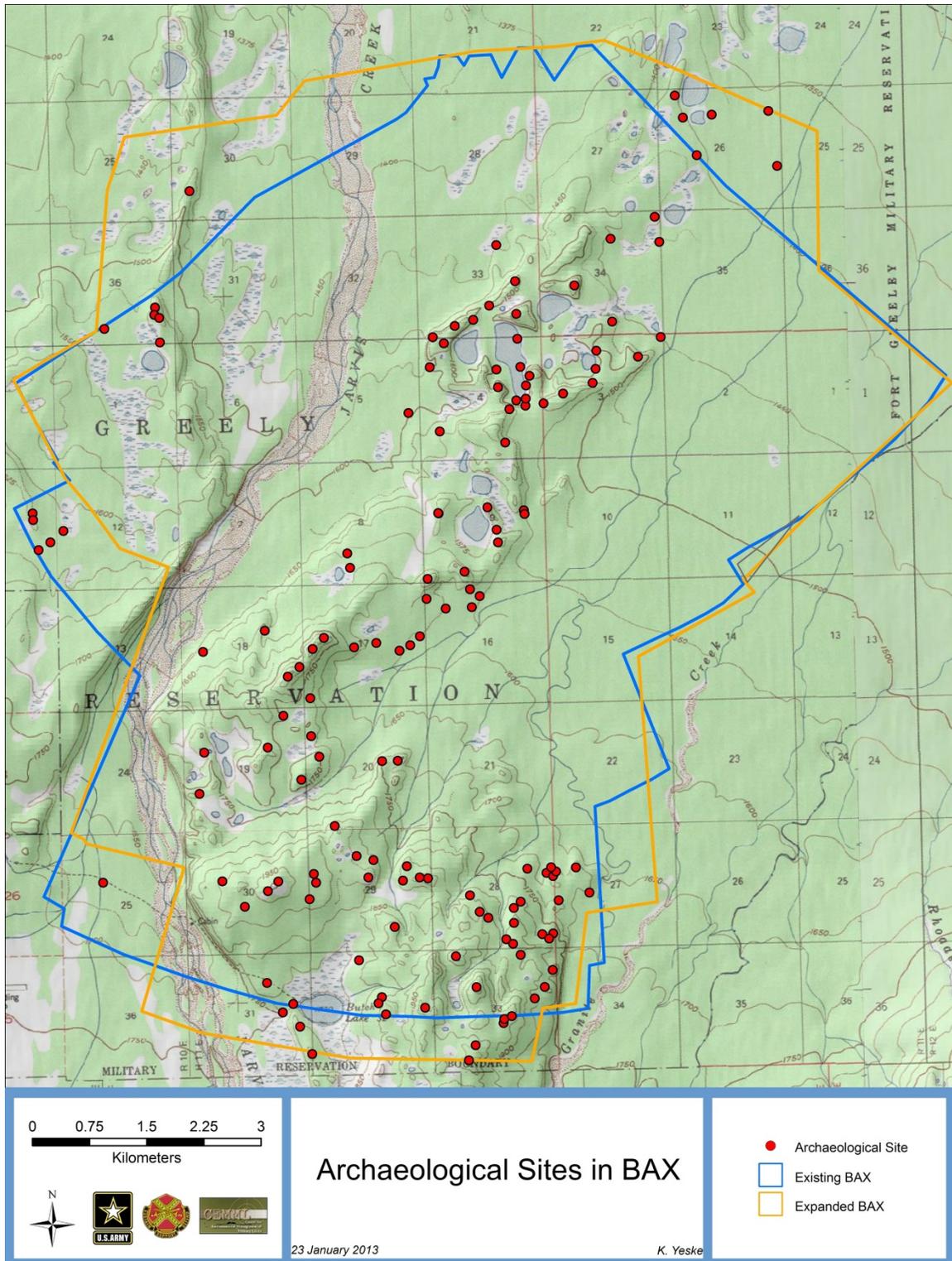
**Figure 2. The location of the BAX in eastern DTA.**



**Figure 3. BAX SDZ.**

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).



**Figure 4. Original and expanded BAX footprint with archaeological site locations.**

## **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 city 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 19<sup>th</sup> and early 20<sup>th</sup> centuries, and the military development of the Interior during the middle of the 20<sup>th</sup> 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<sup>1</sup>), 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 (Bigelow and Powers 2001), Walker Road (Bigelow and Powers 2001), Swan Point (Bigelow and Powers 2001), Mead (Bigelow and Powers 2001), and Broken Mammoth (Bigelow and Powers 2001). 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 (Bigelow and Powers 2001) 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<sup>2</sup> (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 just 5 km southeast of the Tanana Flats Training Area (TFTA), for example, demonstrates that hunter-gatherers in Interior Alaska 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]). 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.

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<sup>1</sup> All dates are given in calendar years *before present*.

<sup>2</sup> Anderson called it the "American Palaeoarctic Tradition," but most researchers use the shortened version.

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-scrapers, 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-2043) 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-277, XMH-277, XMH-283, XMH-303, XMH-309, XMH-874, XMH-950, XMH-1130, XMH-1168, XMH-1300, Robertson et al. 2004, Raymond-Yakoubian and Robertson 2005.) Several sites (XBD-270, XMH-915, XMH-925), including the excavated Banjo Lake site in DTA (XMH-874), 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 recently found in a buried context at DTA (XBD-272) (Robertson et al. 2009).

The Athabaskan Tradition includes late prehistoric and proto-historic cultures generally believed to be the ancestors of Athabaskan 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).

Athabaskan 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 Athabaskan 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 (McKenna 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-335) 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 19<sup>th</sup> 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 (McKenna 1981; Andrews 1975; Mishler 1986). Historical accounts document traditional settlement patterns that were focused on a highly 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 (McKenna 1981).

As Euro-American traders, miners, missionaries, and explorers moved into the Tanana River Valley, the traditional life ways of local Athabaskan 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 (McKenna 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, Athabaskan 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 19<sup>th</sup> century. The towns established by Euro-American settlers at the turn of the 20<sup>th</sup> 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 20<sup>th</sup> 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 20<sup>th</sup> 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 20<sup>th</sup> 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 Donnelly Training Area. 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 and Robertson 2007; Esdale et al. 2012a, 2012b, 2012c; Espenshade 2010; Bradley et al. 1973; Gaines 2009; Gaines et al. 2010, 2010; Hedman et al. 2003; Higgs et al. 1999; Holmes 1979a, 1979b; 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 2009, 2010; Robertson et al. 2004, 2006, 2007, 2008, 2009; Staley 1993) and several scientific papers (Holmes and Anderson 1986; West 1967, 1975).

Fort Wainwright and its training lands contain 640 known archaeological sites and 4 archaeological districts. Fifty-nine sites are eligible for the National Register, 509 sites have not been evaluated, and 72 additional sites have been determined ineligible for the National Register. Of the eligible or un-evaluated sites, 11 are historic sites and 557 are prehistoric sites.

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-5) 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 1980, 1980, 1982, 1982, 1983, and 1983), and Georgianne Reynolds surveyed the Donnelly Dome area in 1988, locating one more (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, 453 archaeological sites have been identified within DTA. Forty-eight sites have been found to be eligible for the National Register, and 53 were found not eligible. An additional 352 sites remain to be evaluated. Historic archaeology sites are poorly represented in this region, with only six currently known to exist. The Donnelly Ridge District (XMH-388) encompasses Denali 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 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-874 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 recently 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 major part 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.

### 2.1 2012 Archaeological Surveys in BAX SDZ

Comprehensive survey efforts undertaken by USAG FWA in 2012 covered 920 acres of land in the expanded BAX SDZ (Figure 5) and discovered two new archaeological sites. An additional 1,950 acres of land in the BAX SDZ are scheduled for survey in the 2013 and 2014 field seasons.

### 2.2 New Archaeological Sites in BAX SDZ

Two new archaeological sites were discovered in the BAX SDZ since the original surveys. One site was discovered during collections research. A bag with coordinates placing the artifact within BAX was discovered among other archaeological material. The date of the find is unknown. The isolated artifact was given a site number (XMH-01487) and is described below. In 2013, the coordinates will be revisited for more thorough survey in hopes of discovering the site. A second site (XMH-01493) was found during survey in 2012.

#### XMH-01487

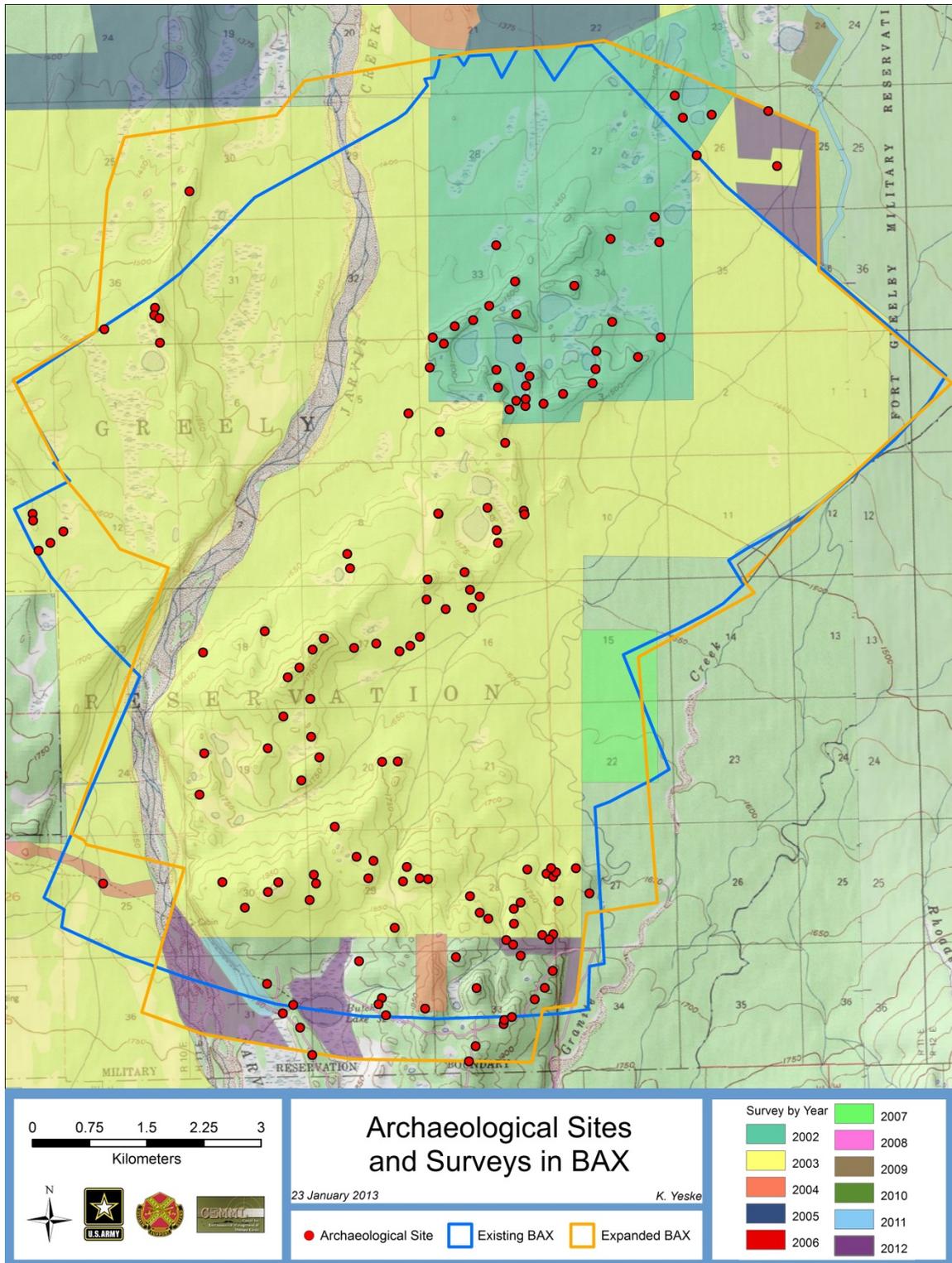
[REDACTED]

An isolated basalt projectile point fragment was found along an ATV trail west of Dot Lake in DTA East and approximately 4 km from the Alaska Highway. The point appears to have been a notched point, but it broke across the top of the notches and only the beginning of one notch is visible (UA2011-434-1).

#### XMH-01493

[REDACTED]

This site is located on a moraine in the southern portion of the BAX SDZ in DTA East. A gray rhyolite biface fragment, a rhyolite flake, and a dark gray chert flake were found on the ground surface. The moraine rises 5 m above the surrounding terrain. Surface visibility is high (80%), and no vegetation obstructs the view in any direction (Figure 6). The Granite Mountains are visible to the east and Donnelly Dome is visible to the southeast. Only the biface fragment was collected (UA2012-102-1).



**Figure 5. Archaeological surveys in the BAX SDZ by year.**



**Figure 6. View of XMH-01493 and surrounding area.**

### **2.3 Archaeological Sites in BAX SDZ**

There are 124 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. Fieldwork for DOEs has been conducted for many of the other sites, and DOEs will be submitted to the SHPO in 2013-2015.

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

<b>Site</b>	<b>NRHP Status</b>	<b>Year of DOE</b>	<b>Size (m2)</b>	<b>Site</b>	<b>National Register Status</b>	<b>Year of DOE</b>	<b>Size (m2)</b>
XMH-00274	Not Evaluated		1	XMH-01105	Not Evaluated		400
XMH-00277/00879	Eligible	2004	50	XMH-01106	Not Evaluated		100
XMH-00278	Not Evaluated		875	XMH-01107	Eligible	2005	800
XMH-00279/00918	Eligible	2005	700	XMH-01108	Not Evaluated		120
XMH-00284/00882	Eligible (excavated)	2004	300	XMH-01109	Eligible	2005	120
XMH-00292/00885/00886	Eligible	2005	2800	XMH-01110	Eligible	2005	100
XMH-00322	Not Evaluated		50	XMH-01111	Not Evaluated		100
XMH-00323/00893	Not Evaluated		5	XMH-01114	Not Evaluated		3500
XMH-00874	Eligible (excavated)	2002	3400	XMH-01115/01117	Eligible	2005	3200

XMH-00878/00908	Eligible	2005	9000	XMH-01116	Eligible	2005	450
XMH-00881	Eligible	2002	1200	XMH-01118	Not Evaluated		25
XMH-00887	Eligible	2002	450	XMH-01119	Not Evaluated		375
XMH-00890	Eligible	2002	600	XMH-01120	Not Evaluated		25
XMH-00891	Eligible	2002	900	XMH-01121	Not Evaluated		25
XMH-00894	Not Evaluated		100	XMH-01122	Not Evaluated		150
XMH-00902	Not Evaluated		1500	XMH-01123	Not Evaluated		25
XMH-00903	Not Evaluated		5	XMH-01124	Not Evaluated		25
XMH-00904	Eligible	2005	200	XMH-01125	Not Evaluated		25
XMH-00905	Not Evaluated		375	XMH-01126	Not Evaluated		4800
XMH-00906	Not Evaluated		375	XMH-01128	Not Evaluated		120
XMH-00907	Not Evaluated		200	XMH-01129	Not Evaluated		120
XMH-00909	Not Evaluated		25	XMH-01130	Not Evaluated		7000
XMH-00910/00911	Not Evaluated		8450	XMH-01131/01132	Not Evaluated		0
XMH-00913	Not Evaluated		0	XMH-01133	Not Evaluated		120
XMH-00914	Not Evaluated		300	XMH-01134	Not Evaluated		25
XMH-00915	Not Evaluated		9600	XMH-01135	Not Evaluated		0
XMH-00917	Not Evaluated		120	XMH-01136	Not Evaluated		0
XMH-00919	Not Evaluated		200	XMH-01137	Not Evaluated		25
XMH-00920	Eligible	2005	150	XMH-01138	Not Evaluated		25
XMH-00921	Not Evaluated		200	XMH-01139	Not Evaluated		25
XMH-00923/00922	Not Evaluated		3400	XMH-01140	Not Evaluated		120
XMH-00924	Not Evaluated		552	XMH-01141	Not Evaluated		120
XMH-00925	Not Evaluated		875	XMH-01143	Not Evaluated		5
XMH-00926	Not Evaluated		150	XMH-01144	Not Evaluated		120
XMH-00927	Not Evaluated		100	XMH-01145	Eligible	2005	1300
XMH-00928	Not Evaluated		800	XMH-01146	Eligible	2005	750
XMH-00929	Not Evaluated		1200	XMH-01147	Not Evaluated		25
XMH-00945	Eligible	2005	300	XMH-01148	Not Evaluated		100
XMH-00983	Not Evaluated		25	XMH-01149	Not Evaluated		200
XMH-01070	Not Evaluated		5	XMH-01150	Not Evaluated		1184
XMH-01071	Not Evaluated		1	XMH-01151	Not Evaluated		900
XMH-01074	Not Evaluated		200	XMH-01152	Not Evaluated		100
XMH-01075	Not Evaluated		400	XMH-01162	Not Evaluated		150
XMH-01076	Not Evaluated		25	XMH-01163	Not Evaluated		140
XMH-01077	Not Evaluated		100	XMH-01175	Not Evaluated		25
XMH-01084	Not Evaluated		120	XMH-01176	Not Evaluated		120
XMH-01085	Not Evaluated		25	XMH-01303	Eligible	2006	1400
XMH-01086	Not Evaluated		25	XMH-01333	Not Evaluated		1
XMH-01087	Not Evaluated		100	XMH-01360	Not Evaluated		100
XMH-01088	Not Evaluated		25	XMH-01361	Not Evaluated		120
XMH-01089	Not Evaluated		240	XMH-01362	Not Evaluated		10
XMH-01090	Not Evaluated		25	XMH-01363	Not Evaluated		10
XMH-01091	Not Evaluated		100	XMH-01364	Not Evaluated		5

XMH-01092	Eligible	2005	120	XMH-01365	Not Evaluated	1
XMH-01093	Eligible	2005	100	XMH-01366	Not Evaluated	1
XMH-01095/01142	Not Evaluated		100	XMH-01367	Not Evaluated	40
XMH-01096	Not Evaluated		100	XMH-01368	Not Evaluated	100
XMH-01097	Not Evaluated		25	XMH-01377	Not Evaluated	7000
XMH-01098	Not Evaluated		25	XMH-01378	Not Evaluated	100
XMH-01099	Not Evaluated		900	XMH-01384	Not Evaluated	150
XMH-01100	Not Evaluated		100	XMH-01487	Not Evaluated	1
XMH-01104	Not Evaluated		25	XMH-01493	Not Evaluated	1

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### 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.

The intensity of monitoring is correlated to the likelihood of potential site impacts resulting from BAX use. Three monitoring profiles were created in the original PA: (1) aggressive, (2) frequent, and (3) standard. This schedule was followed from June 2010-June 2012.

(1) *Aggressive* monitoring was conducted on the 17 sites in closest proximity to the BAX. These sites are within the 6 degree SDZs of 5.56 mm and 7.62 mm munitions. Sites in the aggressive monitoring profile were visited six times a year for the first two years. Visits took place twice in the winter, once in the late spring after break-up, twice in the summer, and once in the fall. If no adverse effects were noted within the first two years, the monitoring schedule would be modified to three site visits per year—once in the spring after break-up, once during mid-summer, and once in the fall.

The following 17 sites were included in the aggressive monitoring profile: XMH-00279/00918, XMH-00842, XMH-873, XMH-00875, XMH-00877, XMH-00878/00908, XMH-00904, XMH-00905, XMH-00906, XMH-00907, XMH-00909, XMH-00910/00911, XMH-00912, XMH-00914, XMH-00916, XMH-00945, and XMH-01303.

(2) *Frequent* monitoring was conducted on the 35 sites located beyond the 6 degree SDZ of 5.56 mm and 7.62 mm but within the 6 degree SDZs of .50 cal. and 105 mm munitions. Sites in the frequent monitoring profile were visited three times a year for the first two years. Visits took place once in the spring, once in the summer, and once in the fall. If no adverse effects were noted within the first two years, the monitoring schedule would be modified to two visits per year—once in the early summer and once in the fall.

The following 35 sites were included in the frequent monitoring profile: XMH-00278, XMH-00292/00885, XMH-00886, XMH-00887, XMH-00889, XMH-00890, XMH-00891, XMH-00894, XMH-00913, XMH-00915, XMH-00917, XMH-00919, XMH-00920, XMH-00921, XMH-00923/00922, XMH-00924, XMH-00925, XMH-00926, XMH-00927, XMH-00928, XMH-00929, XMH-01074, XMH-01075, XMH-01076, XMH-01077, XMH-01085, XMH-01086, XMH-01087, XMH-01088, XMH-01092, XMH-01095/01142, XMH-01101, XMH-01102, XMH-01122, and XMH-01161

(3) *Standard* monitoring occurred on 79 sites that lie at the far end of the BAX SDZ past the 6 degree 105 mm SDZ. Sites in the standard monitoring profile were visited once a year.

The following 79 sites were included in the standard monitoring profile: XMH-00277/00879, XMH-00284/00882, XMH-874, XMH-00880, XMH-00881, XMH-00882, XMH-00883, XMH-00884, XMH-00888, XMH-00983, XMH-01070, XMH-01078, XMH-01084, XMH-01089, XMH-01090, XMH-01091, XMH-01093, XMH-01094 XMH-01096, XMH-01097, XMH-01098, XMH-01099, XMH-01100, XMH-01103, XMH-01104, XMH-01105, XMH-01106, XMH-01107, XMH-01108, XMH-01109, XMH-01110, XMH-01111, XMH-01112, XMH-01113, XMH-01114, XMH-01115/01117, XMH-01116, XMH-01118, XMH-01119, XMH-01120, XMH-01121, XMH-01123, XMH-01124, XMH-01125, XMH-01126, XMH-01127, XMH-01128, XMH-01129, XMH-01130, XMH-01131, XMH-01132, XMH-01133, XMH-01134, XMH-01135, XMH-01136, XMH-01137, XMH-01138, XMH-01139, XMH-01140, XMH-01141, XMH-01144, XMH-01145, XMH-01146, XMH-01147, XMH-01148, XMH-01149, XMH-01150, XMH-01151, XMH-01152, XMH-01162, XMH-01163, XMH-01172, XMH-01175, XMH-01176, XMH-01361, XMH-01362, XMH-01363, XMH-01367, XMH-01368, and XMH-01384.

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 a year. Forty-seven sites are included in the annual and after-training monitoring schedule (Table 3). Seventy-seven 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-01107	XMH-01133	XMH-01163
XMH-00277/00879	XMH-01108	XMH-01134	XMH-01175
XMH-00284/00882	XMH-01109	XMH-01135	XMH-01176
XMH-00874	XMH-01110	XMH-01136	XMH-01360
XMH-00881	XMH-01111	XMH-01137	XMH-01361
XMH-00983	XMH-01114	XMH-01138	XMH-01362
XMH-01070	XMH-01115/01117	XMH-01139	XMH-01363
XMH-01084	XMH-01116	XMH-01140	XMH-01364
XMH-01089	XMH-01118	XMH-01141	XMH-01365
XMH-01090	XMH-01119	XMH-01143	XMH-01366
XMH-01091	XMH-01120	XMH-01144	XMH-01367
XMH-01093	XMH-01121	XMH-01145	XMH-01368
XMH-01096	XMH-01123	XMH-01146	XMH-01377
XMH-01097	XMH-01124	XMH-01147	XMH-01378
XMH-01098	XMH-01125	XMH-01148	XMH-01384
XMH-01099	XMH-01126	XMH-01149	XMH-01487
XMH-01100	XMH-01128	XMH-01150	XMH-01493
XMH-01104	XMH-01129	XMH-01151	
XMH-01105	XMH-01130	XMH-01152	
XMH-01106	XMH-01131/01132	XMH-01162	

Site monitoring was conducted under the supervision of a person or persons meeting the *Secretary of the Interior's Professional Qualifications Standards* (48 FR 44738- 44739).

A USAG FWA site monitoring form was filled out, documenting: (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 was also conducted. The form provided a place for logging digital photos. Photographs and previous site descriptions and maps were used to compare current conditions with those visible during previous monitoring episodes.

***Data Recording***

During the first visit, several photo points were established. These points will serve as fixed points of reference that will be utilized to consistently document the site over time. The number of photo points will vary by size and complexity of the site. Two to three photo points were established. More photo points were used for larger sites. Upon all subsequent visits to the site, digital photographs will be taken from each photo point.

### ***Recorded Impacts on Cultural Resources***

If an adverse effect is noticed through site monitoring, then all impacts will be recorded on the site monitoring forms. Location, extent, and the nature of impacts will be recorded on site maps. Photographs and measurements will be taken of any impacts. If the impact is subsurface in nature, then the depth of the impact and associated effects to underlying strata will be assessed and recorded. Salient information, such as whether the impacts extend to cultural strata, will be recorded. Any impact to artifacts and features will also be recorded.

### ***Reporting***

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

## 4. MONITORING RESULTS

From June of 2010 to December 2012, the 47 sites located closest to the BAX targets in the BAX SDZ were visited 6-12 times each (Table 5, Table 6). No effects from live fire have been discovered at any of the sites (photos in Appendix 1). The 77 more distant sites have each been visited once annually from June 2010 through December 2012 (Table 7). No effects from live fire have been discovered at any of the sites (photos in Appendix 2). USAG FWA determines that the 124 prehistoric archaeological sites located within the BAX SDZ continue to not be adversely affected from live-fire training activities.

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

**Table 5. Forty-seven sites monitored after training Spring 2010-Spring 2011.**

Site	Spring 2010	Summer 1 2010	Summer 2 2010	Winter 1 2011	Winter 2 2011	Spring 2011
XMH-00278	6/3/10		8/9/10		1/12/11	6/20/11
XMH-00279/00918	6/2/10	7/7/10	8/9/10	12/6/10	1/12/11	6/16/11
XMH-00292/00885/00886	6/4/10		8/3/10		1/13/11	6/20/11
XMH-00322			not relocated			
XMH-00323/00893			not monitored until 2012			
XMH-00878/00908	6/1/10	7/6/10	8/5/10	12/6/10	1/12/11	6/16/11
XMH-00887	6/3/10		8/3/10		1/13/11	6/21/11
XMH-00890	6/3/10		8/4/10		1/13/11	6/21/11
XMH-00891	6/8/10		8/4/10		1/13/11	6/21/11
XMH-00894	6/4/10		8/4/10		1/14/11	6/22/11
XMH-00902			not monitored until 2012			
XMH-00903			not monitored until 2012			
XMH-00904	6/7/10	7/6/10	8/12/10	12/6/10	1/12/11	6/16/11
XMH-00905	6/7/10	7/6/10	8/12/10		1/14/11	6/15/11
XMH-00906	6/2/10	7/6/10	8/5/10	12/6/10	1/13/11	6/15/11
XMH-00907	6/1/10	7/6/10	8/5/10	12/6/10	1/12/11	6/15/11
XMH-00909	6/1/10	7/6/10	8/10/10	12/6/10	1/13/11	6/14/11
XMH-00910/00911	6/1/10	7/6/10	8/10/10	12/6/10	1/13/11	6/15/11
XMH-00913	6/1/10		8/10/10		1/13/11	6/22/11
XMH-00914	6/1/10	7/6/10	8/5/10	12/6/10	1/12/11	6/16/11
XMH-00915	6/3/10		8/9/10		1/13/11	6/22/11
XMH-00917	6/2/10		8/9/10		1/13/11	6/22/11
XMH-00919	6/3/10		8/9/10		1/13/11	6/21/11

XMH-00920	6/3/10		8/4/10		1/13/11	5/24/11
XMH-00921	6/1/10		8/10/10		1/12/2011	5/24/11
XMH-00923/00922	6/2/10		8/5/10		1/12/11	5/24/11
XMH-00924	6/2/10		8/5/10		1/12/11	5/24/11
XMH-00925	6/1/10		8/10/10		1/12/11	6/22/11
XMH-00926	6/1/10		8/10/10		1/13/11	6/22/11
XMH-00927	6/2/10		8/5/10		1/13/11	6/20/11
XMH-00928	6/2/10		8/3/10		1/12/11	6/21/11
XMH-00929	6/3/10		8/4/10		1/12/11	6/26/11
XMH-00945	6/1/10	7/6/10	8/5/10	12/6/10	1/12/11	5/24/11
XMH-01071			not monitored until 2012			
XMH-01074	6/9/10		8/2/10		1/14/11	6/26/11
XMH-01075	6/9/10		8/2/10		1/14/11	6/26/11
XMH-01076	6/9/10		8/2/10		1/14/11	6/27/11
XMH-01077	6/9/10		8/2/10		1/14/11	6/20/11
XMH-01085	6/4/10		8/3/10		1/12/11	6/20/11
XMH-01086	6/4/10		8/3/10		1/12/11	6/20/11
XMH-01087	6/4/10		8/3/10		1/12/11	6/20/11
XMH-01088	6/4/10		8/3/10		1/12/11	6/21/11
XMH-01092	6/2/10		8/5/10		1/12/11	6/20/11
XMH-01095/01142	6/2/10		8/2/10		1/13/11	6/20/11
XMH-01122	6/3/10		8/4/10		1/13/11	6/21/11
XMH-01303	6/8/10	7/7/10	8/11/10	12/6/10	1/12/11	
XMH-01333			not monitored until 2012			

**Table 6. Forty-seven sites monitored after training Summer 2011- 10/9/12.**

<b>Site</b>	<b>Summer 1 2011</b>	<b>Summer 2 2011</b>	<b>Winter 2 2012</b>	<b>5/19/12 Training</b>	<b>8/16/12 Training</b>	<b>10/9/12 Training</b>
XMH-00278	7/14/11	9/7/11	3/13/12	6/25/12	8/29/12	snow
XMH-00279/00918	7/25/11	8/31/11	3/12/12	6/25/12	8/31/12	snow
XMH-00292/00885/00886	7/14/11	9/1/11	3/12/12	6/27/12	8/30/12	snow
XMH-00322			not relocated			
XMH-00323/00893				7/3/12	10/4/12	snow
XMH-00878/00908	7/25/11	8/31/11	3/12/12	6/26/12	8/30/12	snow
XMH-00887		9/1/11	3/13/12	6/28/12	8/30/12	snow
XMH-00890		9/1/11	3/13/12	6/28/12	8/29/12	snow
XMH-00891		9/1/11	3/12/12	6/26/12	8/30/12	snow
XMH-00894		9/7/11		6/28/12	10/4/12	snow
XMH-00902				7/30/12	10/4/12	snow
XMH-00903				7/30/12	10/4/12	snow

XMH-00904	8/2/11	8/31/11		6/28/12	8/31/12	snow
XMH-00905	8/2/11	8/31/11		6/28/12	8/31/12	snow
XMH-00906	7/25/11	8/31/11	3/12/12	6/25/12	8/31/12	snow
XMH-00907	7/25/11	8/31/11	3/12/12	6/26/12	9/3/12	snow
XMH-00909	7/25/11	8/31/11	3/12/12	6/25/12	8/29/12	snow
XMH-00910/00911	7/25/11	8/31/11	3/12/12	6/25/12	8/29/12	snow
XMH-00913		9/7/11	3/12/12	6/25/12	8/29/12	snow
XMH-00914	7/25/11	8/31/11		6/25/12	9/3/12	snow
XMH-00915		9/7/11	3/13/12	6/25/12	8/29/12	snow
XMH-00917		9/7/11	3/12/12	6/25/12	8/29/12	snow
XMH-00919		9/7/11		6/25/12	9/29/12	snow
XMH-00920		9/7/11		7/30/12	9/3/12	snow
XMH-00921		9/7/11	3/12/12	6/25/12	8/29/12	snow
XMH-00923/00922		9/7/11	3/12/12	6/25/12	8/30/12	snow
XMH-00924		9/7/11	3/12/12	6/25/12	8/30/12	snow
XMH-00925		9/7/11	3/12/12	6/25/12	8/29/12	snow
XMH-00926		9/7/11	3/12/12	6/25/12	8/29/12	snow
XMH-00927		9/7/11		6/25/12	8/29/12	snow
XMH-00928		9/1/11	3/12/12	6/28/12	10/4/12	snow
XMH-00929		9/1/11		6/28/12	8/30/12	snow
XMH-00945	7/25/11	8/31/11		6/26/12	8/30/12	snow
XMH-01071				7/3/12	8/29/12	snow
XMH-01074		9/6/11	3/13/12	7/3/12	8/29/12	snow
XMH-01075		9/6/11	3/13/12	7/3/12	8/29/12	snow
XMH-01076		9/6/11	3/13/12	7/3/12	8/29/12	snow
XMH-01077		9/6/11	3/13/12	7/3/12	8/29/12	snow
XMH-01085		9/6/11		6/28/12	10/4/12	snow
XMH-01086		9/6/11		6/28/12	10/4/12	snow
XMH-01087		9/6/11		6/28/12	10/4/12	snow
XMH-01088		9/6/11		6/28/12	10/4/12	snow
XMH-01092		9/7/11		6/28/12	8/31/12	snow
XMH-01095/01142		9/6/11		6/28/12	10/4/12	snow
XMH-01122		9/7/11		7/30/12	9/3/12	snow
XMH-01303	7/25/11	8/31/11	3/13/12	6/25/12	8/29/12	snow
XMH-01333				7/30/12	10/4/12	snow

**Table 7. Sites monitored annually Spring 2010-Summer 2012.**

Site	Spring 2010	Summer 1 2011	2012 Annual
XMH-00274			8/6/12
XMH-00277/00879	6/9/10	6/29/11	8/9/12
XMH-00284/00882	6/4/10	6/29/11	8/6/12
XMH-00874			6/27/12
XMH-00881	6/4/10	6/29/11	8/6/12
XMH-00983	6/4/10	6/29/11	8/6/12
XMH-01070	6/9/10	7/18/11	10/4/12
XMH-01084	6/10/10	7/18/11	8/29/12
XMH-01089	6/3/10	6/18/11	8/28/12
XMH-01090	6/3/10	6/29/11	8/28/12
XMH-01091	6/3/10	7/18/11	8/28/12
XMH-01093	6/7/10	7/18/11	10/4/12
XMH-01096	6/4/10	7/19/11	missed
XMH-01097	6/7/10	6/29/11	8/9/12
XMH-01098	6/8/10	6/29/11	8/9/12
XMH-01099	6/7/10	7/19/11	8/9/12
XMH-01100	6/7/10	6/29/11	8/9/12
XMH-01104	6/8/10	7/18/11	8/9/12
XMH-01105	6/9/10	7/18/11	8/31/12
XMH-01106	6/8/10	6/30/11	8/31/12
XMH-01107	6/9/10	6/30/11	8/9/12
XMH-01108	6/8/10	6/30/11	10/4/12
XMH-01109	6/8/10	6/30/11	8/31/12
XMH-01110	6/7/10	6/30/11	10/4/12
XMH-01111	6/8/10	7/18/11	10/4/12
XMH-01114	6/10/10	7/18/11	8/9/12
XMH-01115/01117	6/10/10	7/11/11	8/9/12
XMH-01116	6/10/10	7/11/11	8/9/12
XMH-01118	6/17/10	7/11/11	8/7/12
XMH-01119	6/17/10	7/11/11	8/7/12
XMH-01120	6/7/10	6/30/11	10/4/12
XMH-01121	6/7/10	7/14/11	10/4/12
XMH-01123	6/15/10	7/14/11	8/28/12
XMH-01124	6/15/10	7/19/11	8/28/12
XMH-01125	6/15/10	7/19/11	8/28/12
XMH-01126	6/17/10	7/11/11	8/8/12
XMH-01128	6/16/10	7/11/11	8/28/12
XMH-01129	6/16/10	7/17/11	8/27/12
XMH-01130	6/16/10	7/14/11	8/8/12

XMH-01131/01132	6/15/10	7/11/11	8/28/12
XMH-01133	6/15/10	7/11/11	8/28/12
XMH-01134	6/15/10	7/11/11	8/23/12
XMH-01135	6/16/10	7/11/11	8/27/12
XMH-01136	6/16/10	7/11/11	8/27/12
XMH-01137	6/16/10	7/11/11	8/28/12
XMH-01138	6/15/10	7/20/11	8/28/12
XMH-01139	6/15/10	7/11/11	8/28/12
XMH-01140	6/9/10	7/11/11	8/9/12
XMH-01141	6/9/10	7/11/11	8/9/12
XMH-01143			8/29/12
XMH-01144	6/10/10	7/20/11	8/29/12
XMH-01145	6/10/10	7/14/11	8/29/12
XMH-01146	6/10/10	7/7/11	8/29/12
XMH-01147	6/10/10	7/14/11	8/29/12
XMH-01148	6/17/10	7/18/11	8/21/12
XMH-01149	6/17/10	7/18/11	8/21/12
XMH-01150	6/16/10	7/18/11	8/21/12
XMH-01151	6/16/10	7/11/11	8/21/12
XMH-01152	6/15/10	7/11/11	8/9/12
XMH-01162	6/10/10	7/11/11	8/29/12
XMH-01163	6/17/10	7/11/11	8/27/12
XMH-01175	6/10/10	7/18/11	8/9/12
XMH-01176	6/17/10	7/11/11	8/7/12
XMH-01360			8/6/12
XMH-01361	6/15/10	5/24/11	8/6/12
XMH-01362	6/17/10	7/11/11	8/7/12
XMH-01363	6/15/10	7/14/11	8/7/12
XMH-01364			8/7/12
XMH-01365			8/7/12
XMH-01366			8/7/12
XMH-01367	6/16/10	7/14/11	8/7/12
XMH-01368	6/16/10	7/14/11	8/7/12
XMH-01377			8/28/12
XMH-01378			8/28/12
XMH-01384	6/16/10	7/14/11	8/7/12
XMH-01487		new for 2013	
XMH-01493		new for 2013	

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## APPENDIX 1: Forty-Seven Sites Monitored After Training

**XMH-00278**



Figure 7. XMH-00278, Point 1, 6/3/10 (SW)

**XMH-00279/00918**



Figure 9. XMH-00279, Point 1, 6/2/10 (NE)

**XMH-00292/00885/00886**



Figure 11. XMH-00292/00885/00886, Point1, 6/4/10 (S)



Figure 8. XMH-00278, Point 1, 6/25/12 (W)



Figure 10. XMH-00279, Point 1, 8/31/12 (E)



Figure 12. XMH-00292/00885/00886, Point1, 6/27/12 (N)

**XMH-00323/00893**



Figure 13. XMH-00323/00893, Point 1, 7/3/12 (S)



Figure 14. XMH-00323/00893, Point 1, 10/4/12 (S)

**XMH-00878/00908**



Figure 15. XMH-00878/908, Point 1, 6/1/10 (N)



Figure 16. XMH-00878/908, Point 1, 6/26/12 (N)



Figure 17. XMH-00878/908, Point 3, 6/1/10 (SW)



Figure 18. XMH-00878/908, Point 3, 6/26/12 (W)

**XMH-00887**



Figure 19. XMH-00887, Point 1,  
6/2/10 (N)



Figure 20. XMH-00887, Point 1,  
6/28/12 (N)

**XMH-00890**



Figure 21. XMH-00890, Point 1,  
6/3/10 (N)



Figure 22. XMH-00890, Point 1,  
6/28/12 (NW)

**XMH-00891**



Figure 23. XMH-00891, Point 2,  
6/8/10 (N)



Figure 24. XMH-00891, Point 2,  
6/26/12 (N)

**XMH-00894**



Figure 25. XMH-00894, Point 1, 6/4/10 (W)



Figure 26. XMH-00894, Point 1, 6/28/12 (W)

**XMH-00902**



Figure 27. XMH-00902, Point 1, 7/30/12 (N)



Figure 28. XMH-00902, Point 1, 10/4/12 (N)

**XMH-00903**



Figure 29. XMH-00903, Point 2, 7/30/12 (N)



Figure 30. XMH-00903, Point 2, 10/4/12 (N)

**XMH-00904**



Figure 31. XMH-00904, Point 1, 6/7/10 (NW)



Figure 32. XMH-00904, Point 1, 8/31/12 (N)

**XMH-00905**



Figure 33. XMH-00905, Point 1, 6/7/10 (NW)



Figure 34. XMH-00905, Point 1, 8/31/12 (N)

**XMH-00906**



Figure 35. XMH-00906, Point 1, 6/2/10 (N)



Figure 36. XMH-00906, Point 1, 8/31/12 (N)

**XMH-00907**



Figure 37. XMH-00907, Point 1, 6/1/10 (N)



Figure 38. XMH-00907, Point 1, 6/26/12 (N)

**XMH-00909**



Figure 39. XMH-00909, Point 1, 6/1/10 (NW)



Figure 40. XMH-00909, Point 1, 8/29/12(SSW)

**XMH-00910/XMH-00911**



Figure 41. XMH-00910/911, Point 1, 6/1/10 (NNE)



Figure 42. XMH-00910/911, Point 1, 6/25/12 (N)



Figure 43. XMH-00910/911, Point 2, 6/1/10 (N)



Figure 45. XMH-00910/911, Point 4, 6/1/10 (SW)

### **XMH-00913**



Figure 47. XMH-00913, Point 1, 6/1/10 (NNW)



Figure 44. XMH-00910/911, Point 2, 6/25/12 (N)



Figure 46. XMH-00910/911, Point 4, 6/25/12 (W)



Figure 48. XMH-00913, Point 1, 6/25/12 (NW)

**XMH-00914**



Figure 49. XMH-00914, Point 1,  
6/1/10 (S)



Figure 50. XMH-00914, Point 1,  
8/31/12 (S)

**XMH-00915**



Figure 51. XMH-00915, Point 1,  
6/3/10 (NE)



Figure 52. XMH-00915, Point 1,  
6/25/12 (NE)



Figure 53. XMH-00915, Point 2,  
6/3/10 (SW)



Figure 54. XMH-00915, Point 2,  
6/25/12 (W)

**XMH-00917**



Figure 55. XMH-00915, Point 3,  
6/3/10 (SSW)



Figure 57. XMH-00917, Point 1,  
6/2/10 (SE)

**XMH-00919**



Figure 59. XMH-00919, Point 1,  
6/3/10 (SW)



Figure 56. XMH-00915, Point 3,  
6/25/12 (SW)



Figure 58. XMH-00917, Point 1,  
6/25/12 (S)



Figure 60. XMH-00919, Point 1,  
6/25/12 (SW)

**XMH-00920**



Figure 61. XMH-00920, Point 1, 6/3/10 (S)



Figure 62. XMH-00920, Point 1, 7/30/12 (S)

**XMH-00921**



Figure 63. XMH-00921, Point 1, 6/1/10 (NNE)



Figure 64. XMH-00921, Point 1, 6/25/12 (N)

**XMH-00922/XMH-00923**



Figure 65. XMH-00922/00923, Point 1, 6/2/10 (SE)



Figure 66. XMH-00922/00923, Point 1, 6/25/12 (E)



Figure 67. XMH-00922/00923, Point 2, 6/2/10 (SW)



Figure 69. XMH-00922/00923, Point 3, 6/2/10 (SW)



Figure 71. XMH-00922/00923, Point 4, 12/6/10 (NNW)



Figure 68. XMH-00922/00923, Point 2, 6/25/12 (S)



Figure 70. XMH-00922/00923, Point 3, 6/25/12 (W)



Figure 72. XMH-00922/00923, Point 4, 6/25/12 (W)

**XMH-00924**



Figure 73. XMH-00924, Point 1,  
6/2/10 (ESE)



Figure 74. XMH-00924, Point 1,  
6/25/12 (E)

**XMH-00925**



Figure 75. XMH-00925, Point 1,  
6/1/10 (W)



Figure 76. XMH-00925, Point 1,  
6/25/12 (S)

**XMH-00926**



Figure 77. XMH-00926, Point 1,  
6/1/10 (SSE)



Figure 78. XMH-00926, Point 1,  
6/25/12 (E)

**XMH-00927**



Figure 79. XMH-00927, Point 1,  
6/2/10 (W)



Figure 80. XMH-00927, Point 1,  
6/25/12 (W)

**XMH-00928**



Figure 81. XMH-00928, Point 1,  
6/2/10 (N)



Figure 82. XMH-00928, Point 1,  
6/28/12 (N)

**XMH-00929**



Figure 83. XMH-00929, Point 1,  
6/3/10 (N)



Figure 84. XMH-00929, Point 1,  
6/28/12 (N)

**XMH-00945**



Figure 85. XMH-00945, Point 1,  
6/1/10 (S)



Figure 86. XMH-00945, Point 1,  
6/28/12 (S)

**XMH-01071**



Figure 87. XMH-01071, Point 1,  
7/3/12 (S)



Figure 88. XMH-01071, Point 1,  
8/29/12 (S)

**XMH-01074**



Figure 89. XMH-01074, Point 1,  
6/9/10 (W)



Figure 90. XMH-01074, Point 1,  
8/29/12 (W)

**XMH-01075**



Figure 91. XMH-01075, Point 1, 6/9/10 (S)

**XMH-01076**



Figure 93. XMH-01076, Point 1, 6/9/10 (NE)

**XMH-01077**



Figure 95. XMH-01077, Point 1, 6/9/10 (S)



Figure 92. XMH-01075, Point 1, 8/29/12 (S)



Figure 94. XMH-01076, Point 1, 8/29/12 (N)



Figure 96. XMH-01077, Point 1, 8/29/12 (W)

**XMH-01085**



Figure 97. XMH-01085, Point 1, 6/4/10 (N)

**XMH-01086**



Figure 99. XMH-01086, Point 1, 6/4/10 (S)

**XMH-01087**



Figure 101. XMH-001087, Point 1, 6/4/10 (S)



Figure 98. XMH-01085, Point 1, 10/4/12 (N)



Figure 100. XMH-01086, Point 1, 10/4/12 (S)



Figure 102. XMH-01087, Point 1, 10/4/12 (S)

**XMH-01088**



Figure 103. XMH-01088, Point 1, 6/4/10 (NW)

**XMH-01092**



Figure 105. XMH-01092, Point 1, 6/2/10 (S)

**XMH-01095/01142**



Figure 107. XMH-01095/01142, Point 1, 6/2/10 (N)



Figure 104. XMH-01088, Point 1, 10/4/12 (N)



Figure 106. XMH-01092, Point 1, 8/31/12 (S)



Figure 108. XMH-01095/01142, Point 1, 10/4/12 (N)

**XMH-01122**



Figure 109. XMH-01122, Point 1, 6/3/10 (SW)

**XMH-001303**



Figure 111. XMH-001303, Point 1, 6/8/10 (W)

**XMH-001333**



Figure 113. XMH-001333, Point 1, 7/30/12 (S)



Figure 110. XMH-01122, Point 1, 7/30/12 (W)



Figure 112. XMH-001303, Point 1, 6/25/12 (W)



Figure 114. XMH-001333, Point 1, 10/4/12 (S)

## APPENDIX 2: Seventy-Seven Sites on Annual Monitoring Schedule

**XMH-00274**



Figure 115. XMH-00274, Point 2,  
8/6/12 (S)

**XMH-00277/00879**



Figure 116. XMH-00277/00879, Point  
1, 6/9/10 (SW)



Figure 117. XMH-00277/00879, Point  
1, 8/9/12 (SSW)

**XMH-00284/00882**



Figure 118. XMH-00284/00882, Point 1, 6/4/10 (S)



Figure 119. XMH-00284/00882, Point 1, 8/6/12 (S)

**XMH-00874**



Figure 120. XMH-00874, Point 2, 6/27/12 (W)

**XMH-00881**



Figure 121. XMH-00881, Point 1, 6/4/10 (S)



Figure 122. XMH-00881, Point 1, 8/6/12 (S)

**XMH-00983**



Figure 123. XMH-00983, Point 1,  
6/4/10 (NW)



Figure 124. XMH-00983, Point 1,  
8/6/12 (W)

**XMH-01070**



Figure 125. XMH-01070, Point 2,  
6/9/10 (N)



Figure 126. XMH-01070, Point 2,  
10/4/12 (N)

**XMH-01084**



Figure 127. XMH-01084, Point 2,  
6/10/10 (NW)



Figure 128. XMH-01084, Point 2,  
8/29/12 (W)

**XMH-01089**



Figure 129. XMH-01089, Point 1, 6/3/10 (NW)

**XMH-01090**



Figure 131. XMH-01090, Point 1, 6/3/10 (SW)

**XMH-01091**



Figure 133. XMH-01091, Point 1, 6/3/10 (S)



Figure 130. XMH-01089, Point 1, 8/28/12 (N)

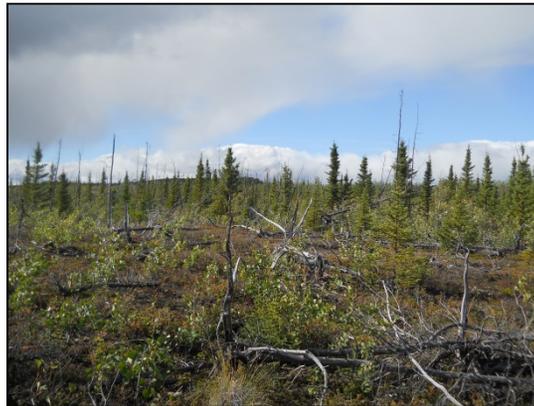


Figure 132. XMH-01090, Point 1, 8/28/12 (W)



Figure 134. XMH-01091 Point 1, 8/28/12 (SW)

**XMH-01093**



Figure 135. XMH-01093, Point 2, 6/7/10 (NE)

**XMH-01096**



Figure 137. XMH-01096, Point 1, 6/4/10 (SW)

**XMH-01097**



Figure 139. XMH-01097, Point 2, 6/4/10 (NE)



Figure 136. XMH-01093, Point 2, 10/4/12 (N)



Figure 138. XMH-01096, Point 1, 7/19/11 (SW) (missed 2012)



Figure 140. XMH-01097, Point 2, 8/9/12 (E)

**XMH-01098**



Figure 141. XMH-01098, Point 2,  
6/8/10 (SE)

**XMH-01099**



Figure 143. XMH-01099, Point 1,  
6/7/10 (SW)

**XMH-01100**



Figure 145. XMH-01100, Point 1,  
6/7/10 (N)



Figure 142. XMH-01098, Point 2,  
8/9/12 (E)



Figure 144. XMH-01099, Point 1,  
8/9/12 (S)



Figure 146. XMH-01100, Point 1,  
8/9/12 (N)

**XMH-01104**



Figure 147. XMH-01104, Point 1, 6/8/10 (SE)

**XMH-01105**



Figure 149. XMH-01105, Point 2, 6/9/10 (NNE)

**XMH-01106**



Figure 151. XMH-01106, Point 1, 6/8/10 (NE)



Figure 148. XMH-01104, Point 1, 8/9/12 (S)



Figure 150. XMH-01105, Point 2, 8/31/12 (N)



Figure 152. XMH-01106, Point 1, 8/31/12 (E)

**XMH-01107**



Figure 153. XMH-01107, Point 3,  
6/9/10 (NW)

**XMH-01108**



Figure 155. XMH-01108, Point 2,  
6/8/10 (S)

**XMH-01109**



Figure 157. XMH-01109, Point 1,  
6/8/10 (N)



Figure 154. XMH-01107, Point 3,  
8/9/12 (W)



Figure 156. XMH-01108, Point 2,  
10/4/12 (S)



Figure 158. XMH-01109, Point 1,  
8/31/12 (N)

**XMH-01110**



Figure 159. XMH-01110, Point 1, 6/7/10 (S)

**XMH-01111**



Figure 161. XMH-01111, Point 2, 6/8/10 (NE)

**XMH-01114**



Figure 163. XMH-01114, Point 1, 6/10/10 (SE)



Figure 160. XMH-01110, Point 1, 10/4/12 (S)



Figure 162. XMH-01111, Point 2, 10/4/12 (E)



Figure 164. XMH-01114, Point 1, 8/9/12 (E)

**XMH-01115/01117**



Figure 165. XMH-01115/01117, Point 1, 6/10/10 (S)

**XMH-01116**



Figure 167. XMH-01116, Point 1, 6/10/10 (NNW)

**XMH-01118**



Figure 169. XMH-01118, Point 1, 6/10/10 (S)



Figure 166. XMH-01115/01117, Point 1, 8/9/12 (S)



Figure 168. XMH-01116, Point 1, 8/9/12 (N)



Figure 170. XMH-01118, Point 1, /7/12 (S)

**XMH-01119**



Figure 171. XMH-01119, Point 1, 6/17/10 (W)



Figure 172. XMH-01119, Point 1, 8/7/12 (W)

**XMH-01120**



Figure 173. XMH-01120, Point 2, 6/7/10 (SE)



Figure 174. XMH-01120, Point 2, 10/4/12 (S)

**XMH-01121**



Figure 175. XMH-01121, Point 1, 6/7/10 (S)



Figure 176. XMH-01121, Point 1, 10/4/12 (S)

**XMH-01123**



Figure 177. XMH-01123, Point 1, 6/10/10 (SE)

**XMH-01124**



Figure 179. XMH-01124, Point 1, 6/15/10 (W)

**XMH-01125**



Figure 181. XMH-01125, Point 1, 6/15/10 (S)



Figure 178. XMH-01123, Point 1, 8/28/12 (S)



Figure 180. XMH-01124, Point 1, 8/28/12 (W)

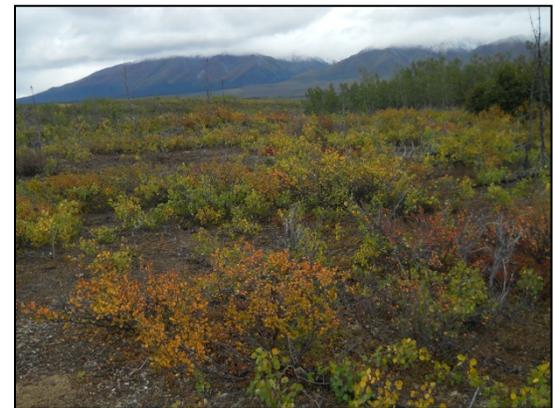


Figure 182. XMH-01125, Point 1, 8/28/12 (E)

**XMH-01126**



Figure 183. XMH-01126, Point 1, 6/17/10 (SSW)

**XMH-01128**



Figure 185. XMH-01128, Point 1, 6/16/10 (SE)

**XMH-01129**



Figure 187. XMH-01129, Point 1, 6/16/10 (S)



Figure 184. XMH-01126, Point 1, 8/8/12 (S)



Figure 186. XMH-01128, Point 1, 8/28/12 (S)



Figure 188. XMH-01129, Point 1, 8/27/12 (S)

**XMH-01130**



Figure 189. XMH-01130, Point 1, 6/16/10 (NE)

**XMH-01131/001132**



Figure 191. XMH-01131, Point 2, 6/15/10 (E)

**XMH-01133**



Figure 193. XMH-01133, Point 2, 6/15/10 (NW)



Figure 190. XMH-01130, Point 1, 8/8/12 (N)



Figure 192. XMH-01131, Point 2, 8/28/12 (W)



Figure 194. XMH-01133, Point 2, 8/28/12 (WSW)

**XMH-01134**



Figure 195. XMH-001134, Point 1, 6/16/10 (NE)

**XMH-01135**



Figure 197. XMH-01135, Point 1, 6/16/10 (SE)

**XMH-01136**



Figure 199. XMH-01136, Point 1, 6/16/10 (SW)



Figure 196. XMH-01134, Point 1, 8/23/12 (E)



Figure 198. XMH-01135, Point 1, 8/27/12 (S)



Figure 200. XMH-01136, Point 1, 8/27/12 (W)

**XMH-01137**



Figure 201. XMH-01137, Point 1, 6/15/10 (SW)

**XMH-01138**



Figure 203. XMH-01138, Point 1, 6/15/10 (NE)

**XMH-01139**



Figure 205. XMH-01139, Point 2, 6/15/10 (SW)



Figure 202. XMH-01137, Point 1, 8/28/12 (W)



Figure 204. XMH-01138, Point 1, 8/28/12 (E)



Figure 206. XMH-01139, Point 2, 8/28/12 (W)

**XMH-01140**



Figure 207. XMH-01140, Point 1,  
6/9/10 (SW)

**XMH-01141**



Figure 209. XMH-01141, Point 1,  
6/9/10 (W)

**XMH-01143**



Figure 211. XMH-01143, Point 1,  
8/29/12 (S)



Figure 208. XMH-01140, Point 1,  
8/9/12 (W)



Figure 210. XMH-01141, Point 1,  
8/9/12 (W)

**XMH-01144**



Figure 212. XMH-01144, Point 1, 6/10/10 (S)

**XMH-01145**



Figure 214. XMH-01145, Point 1, 6/10/10 (NW)

**XMH-01146**



Figure 216. XMH-01146, Point 1, 6/10/10 (S)



Figure 213. XMH-01144, Point 1, 8/29/12 (S)



Figure 215. XMH-01145, Point 1, 8/29/12 (N)



Figure 217. XMH-01146, Point 1, 8/29/12 (S)

**XMH-01147**



Figure 218. XMH-01147, Point 1, 6/10/10 (SW)

**XMH-01148**



Figure 220. XMH-01148, Point 1, 6/17/10 (NE)

**XMH-01149**



Figure 222. XMH-01149, Point 1, 6/17/10 (SE)



Figure 219. XMH-01147, Point 1, 8/29/12 (S)



Figure 221. XMH-01148, Point 1, 8/21/12 (N)



Figure 223. XMH-01149, Point 1, 8/21/12 (S)

**XMH-01150**



Figure 224. XMH-01150, Point 2,  
6/16/10 (SE)

**XMH-01151**



Figure 226. XMH-01151, Point 1,  
6/16/10 (SW)

**XMH-01152**



Figure 228. XMH-01152, Point 2,  
6/15/10 (SE)



Figure 225. XMH-01150, Point 2,  
8/21/12 (E)



Figure 227. XMH-01151, Point 1,  
8/21/12 (S)



Figure 229. XMH-01152, Point 2,  
8/9/12 (E)

**XMH-01162**



Figure 230. XMH-01162, Point 2,  
6/10/10 (SW)

**XMH-01163**



Figure 232. XMH-01163, Point 1,  
6/17/10 (SSE)

**XMH-01175**



Figure 234. XMH-01175, Point 1,  
6/10/10 (NE)



Figure 231. XMH-01162, Point 2,  
8/29/12 (S)



Figure 233. XMH-01163, Point 1,  
8/27/12 (S)



Figure 235. XMH-01175, Point 1,  
8/9/12 N)

**XMH-01176**



Figure 236. XMH-01176, Point 1, 6/17/10 (SW)

**XMH-01360**



Figure 238. XMH-01360, Point 2, 8/6/12 (E)

**XMH-01361**



Figure 239. XMH-01361, Point 1, 6/15/10 (NE)



Figure 237. XMH-01176, Point 1, 8/7/12 (S)



Figure 240. XMH-01361, Point 1, 8/6/12 (NE)

**XMH-01362**



Figure 241. XMH-01362, Point 1, 6/17/10 (N)

**XMH-01363**



Figure 243. XMH-01363, Point 1, 6/15/10 (SW)

**XMH-01364**



Figure 245. XMH-01364, Point 1, 8/7/12 (N)



Figure 242. XMH-01362, Point 1, 8/7/12 (N)



Figure 244. XMH-01363, Point, 8/7/12 (S)

**XMH-01365**



Figure 246. XMH-01365, Point 1, 8/7/12 (E)

**XMH-01366**



Figure 247. XMH-01366, Point 1, 8/7/12 (S)

**XMH-01367**



Figure 248. XMH-01367, Point 1, 6/16/10 (SW)

**XMH-01368**



Figure 250. XMH-01368, Point 1, 6/16/10 (SW)



Figure 249. XMH-01367, Point 1, 8/7/12 (S)



Figure 251. XMH-01368, Point 1, 8/7/12 (S)

**XMH-01377**



Figure 252. XMH-01378, Point 2,  
8/7/12 (W)

**XMH-01378**



Figure 253. XMH-01378, Point 2,  
8/7/12 (E)

**XMH-01384**



Figure 254. XMH-01384, Point 1,  
6/16/10 (SE)



Figure 255. XMH-01384, Point 1,  
8/7/12 (E)