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AWAITING THE CALL: HISTORIC SITES MONITORING AND PRESERVATION AT FORT
CHARLOTTE (21CK7), GRAND PORTAGE NATIONAL MONUMENT, MINNESOTA

by

Andrew E. LaBounty

A THESIS

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AWAITING THE CALL: HISTORIC SITES MONITORING AND PRESERVATION AT FORT
CHARLOTTE (21CK7), GRAND PORTAGE NATIONAL MONUMENT, MINNESOTA

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University of Nebraska, 2010

Adviser: Peter Bleed

Undisturbed archeological deposits at Fort Charlotte—a component of Grand Portage National Monument, Minnesota—reflect the daily activities and social dynamics of the Canadian fur trade. These remains are threatened by both natural and human factors, and the park has sought methods to monitor the site, protect its archeological resources from destruction, and maintain the potential for significant research into all aspects of the fur trade. This thesis explores the potential of Fort Charlotte as a significant archeological site, discusses trends and current attitudes toward historic preservation, and offers recommendations for the preservation of 21CK7. Specifically, this thesis introduces an archeological monitoring plan, drawing from both environmental and geological management strategies, to protect, preserve, and study archeological remains at Fort Charlotte. Preliminary implementation of a monitoring plan was completed during the summer of 2010, and some positive impacts of the strategy are already apparent.

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TABLE OF CONTENTS

Chapter 1: Introduction.....	1
Chapter 2: Preservation.....	19
Chapter 3: Fort Charlotte	50
Chapter 4: A Monitoring Plan.....	75
Chapter 5: Implementation and Impact	115
Chapter 6: Data Management	143

LIST OF FIGURES

Figure 1. Maps of Minnesota and Grand Portage National Monument.....	5
Figure 2. Map of Grand Portage National Monument.....	51
Figure 3. Dewey Albinson’s Map of Fort Charlotte, 1922.....	58
Figure 4. Dewey Albinson’s map of Fort Charlotte, 1922 (digitized)	59
Figure 5. MWAC field map of Fort Charlotte (Jones 1980).....	63
Figure 6. Numbered cultural features (CF) at Fort Charlotte.....	119
Figure 7. Map depicting features relocated in 2010.....	120
Figure 8. Map depicting primary area of visitor-use.....	124
Figure 9. Map depicting threatened features at Fort Charlotte	125

Chapter 1: Introduction

Historical archeology, a discipline focused on the physical collection of material remains, is becoming more sensitive. This is true in the power and nuance of its interpretations, but also in its susceptibility to information-loss through ground disturbance. In addition to studying the past through tools, food remains, structures, and other material culture, the research foci of North American archeologists now include power relationships, class distinctions, symbolic capital, and other social elements that often have no direct material analogue (e.g., Di Zerega Wall 1991, Fitts 2002, McGuire and Walker 1999, Payner 2000, Purser 1991, Seifert 1991, Wurst 1999, Wurst and Fitts 1999). As such, it is not sufficient merely to study a set of recovered and well-preserved objects in a vacuum. The ephemeral and fundamental elements of society that are now of interest to archeology are rather created, shaped, and mirrored by everyday physical objects as they interact in defined contexts. Modern archeologists' interests can thus often be explored using samples of 'mundane' artifacts rather than one-hundred percent excavation, and archeologists are giving appropriately increased attention to all forms of context (Deetz 1977, Hicks and Beaudry 2006). We understand that artifacts are not always a direct result of discreet activities, but are a reflection, however vague, of an entire social environment. Therefore, this thesis pursues the topic of historic sites preservation, building on the observation that artifacts by themselves are an incomplete data source, dependent on the integrity of their context in every sense of the word (e.g.,

spatial, social, temporal). Indeed, only an understanding of context can give artifacts their interpretive meaning, and an awareness of this fact is a critical difference between professional and avocational archeologists. Today, as intact archeological sites become rarer and historical archeology becomes more focused on past social environments, the preservation of context has risen to such levels of importance within the profession that disturbance of any kind (including excavation) may be considered inappropriate, unnecessary, or even intolerable without a strong research orientation and the means to disseminate increased knowledge to archeologists and to the public (Lipe 2000). In the academic world, for example, when specific research questions are not served by the collection of artifacts, some archeologists would argue that artifacts are better left *in situ* (King 1971, King and Lyneis 1978). From a resource management and compliance standpoint, excavation often occurs only when no preservation alternatives are possible (Henry 1993, King 2008). Thus, the increasingly prevalent point of view is that cultural remains with the potential to reflect past human behavior should be preserved in context, unless and until archeologists are theoretically and methodologically equipped to derive knowledge from the deposit and to present new interpretations to the public (Lipe 2000).

One of the more ironic issues archeologists face in this modern paradigm is the apparent lack of doing archeology—what can we learn, after all, from never excavating a site? Are we meant to save sites for future archeologists indefinitely? This thesis will address these issues by placing site preservation within a problem-oriented context, and by building theory around the process of preservation, suggesting ways that preservation

activities can benefit from, and even advance, archeological understanding. This thesis will further approach the issue practically, by focusing on preservation at Grand Portage National Monument, Minnesota, and will offer methodological recommendations for site monitoring strategies at the site of Fort Charlotte. It should be made clear early on, however, that preservation is a means, not an end, for archeological study. Damage to archeological resources and the temptation *never* to investigate them are both equal failures of any preservation strategy (Lipe 2000). As various archeological monitoring strategies are explored therefore, they will be differentiated from strictly preservation-oriented actions (such as site reburial or shoreline stabilization) in that "monitoring" refers to a process by which data are systematically and consistently gathered pertaining to threats and impacts to an archeological site without hindering future archeological investigations. Any specific actions taken to preserve or study the site will then be informed by the collection of these data. Moreover, these data can be applied to (or help create) specific research questions. Schiffer (1983), for example, compels us to consider site formation processes and their effects on artifacts as a first step to social interpretations—such a research orientation would doubtless benefit from an understanding of subtle and ongoing site formation processes beforehand. Thus, after developing an understanding of why preservation is important and what archeologists can derive from the process, I will provide particular recommendations for a monitoring strategy at Grand Portage National Monument, leading to better-informed preservation decisions in the future, and better-informed archeological research.

History of the Grand Portage National Monument

This thesis focuses on the preservation of Fort Charlotte, a component of Grand Portage National Monument, Minnesota, that relates directly to the activities of the North West Company from 1784 to 1803 during the Canadian fur trade. The North West Company was a Montreal-based conglomeration of smaller trading outfits, established circa 1784 in direct competition with the Hudson's Bay Company (Gilman 1992, Hanson 2005). These "Nor'westers," who would later become some of the most influential groups of the fur trade, established their primary depot on the western shore of Lake Superior at the "grand portage" or "great carrying place," an eight-and-a-half mile canoe portage that linked the lakeshore depot with Fort Charlotte, and bypassed the impassable terrain of the Pigeon River as it approached Lake Superior (Gilman 1992, White 2005; see Figure 1). The North West Company's Grand Portage depot was the primary hub of fur trade activity on the western shore of Lake Superior, and along with Fort Charlotte on the Pigeon River to the north, acted as the staging area for all the North West Company's business ventures in the interior. From 1784 to 1803, the North West Company maintained a year-round presence at Grand Portage, and at least in the summer, many Ojibwe families were present to fish and to trade (Gilman 1992, White 2005). Today, the historic site of the Grand Portage Bay depot is occupied by the reconstructed great hall and palisade, and is maintained by the National Park Service as the Grand Portage National Monument. Seventeen buildings have been identified within the post, including the great hall, kitchen, and storage buildings, as well as a surrounding palisade and a pier

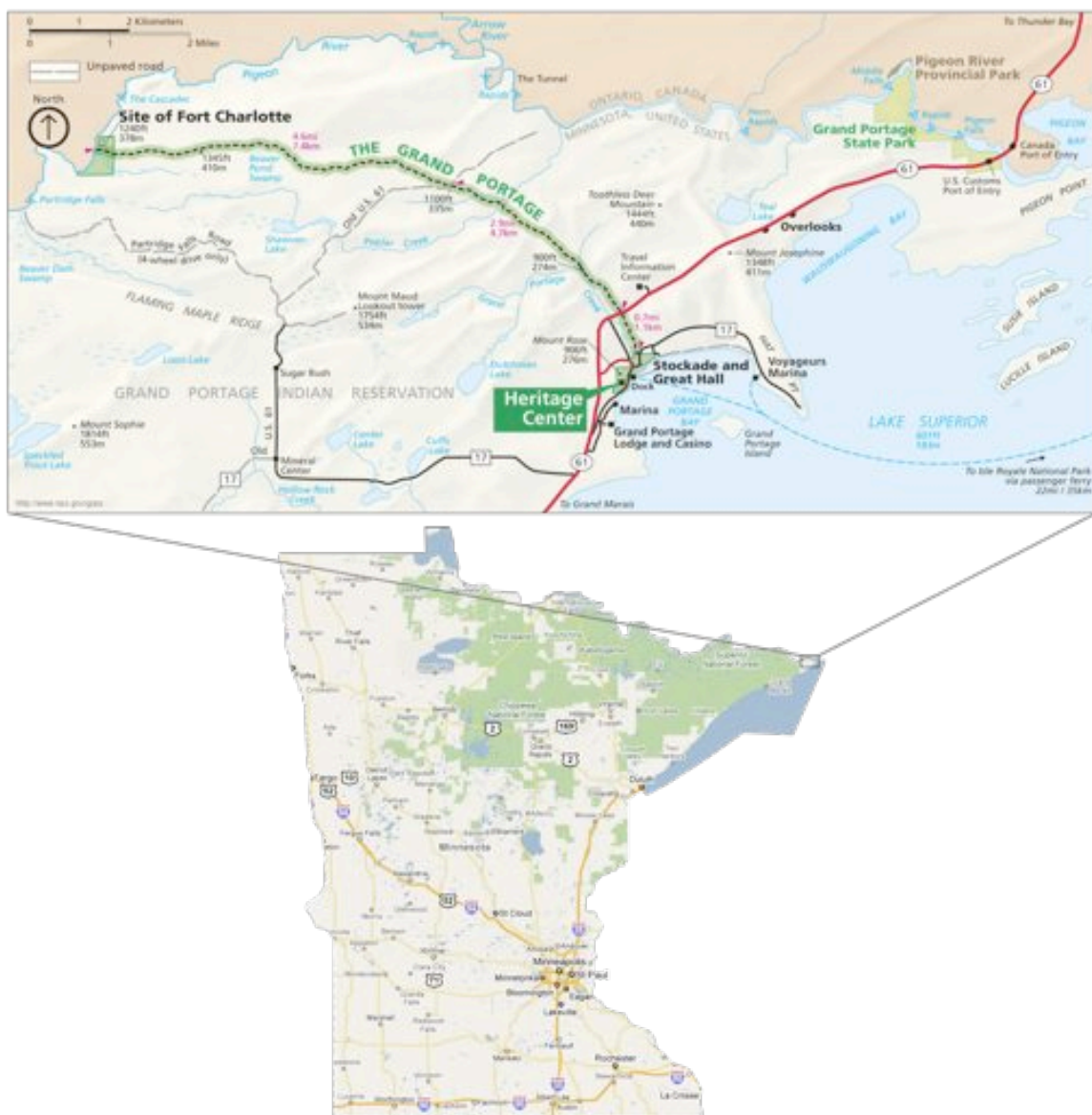


Figure 1. Maps of Minnesota (maps.google.com) and Grand Portage National Monument (nps.gov).

that extends into Grand Portage Bay (Woolworth 1982). Additional work conducted by the National Park Service includes geophysical investigations and minor testing for the installation of utility lines and interpretive trails (Birk 2005, Hamilton et al. 2005, Woolworth 1993), but the largest and most salient artifact collections made at Grand

Portage National Monument continue to be Woolworth's excavations with the Minnesota Historical Society from 1962 until 1971, now housed at the recently built Grand Portage National Monument interpretive center (Woolworth 1975; Woolworth and Woolworth 1982).

Grand Portage National Monument (park service acronym GRPO) was established in 1958 according to Public Law 85-910, and consists of two districts encompassing the Grand Portage Bay depot and Fort Charlotte, connected by a narrow strip of land following the 8.5 mile historic portage (NPS 2003). The park is considered significant as an area of "cultural persistence" for the Minnesota Chippewa Tribe, its "well preserved archeological remains," and the "fundamental interrelationship of Ojibwe heritage and fur trade history" (NPS 2003:4). As such, GRPO is closely affiliated with local Chippewa government and works closely with the band in every aspect of park management. According to Public Law 85-910, which officially established Grand Portage National Monument in the state of Minnesota, the park is also required to give preferential privileges to the Minnesota Chippewa Tribe in providing accommodations and services for guests, employment, business operations, travel, and other situations (NPS 2003). Although the stated purpose of the Grand Portage National Monument is "to delineate, commemorate, and preserve a premier site and route of the 18th century fur trade" (NPS 2003:4), its establishment within the sovereignty of the Minnesota Chippewa Tribe has led the park to include within its statement of purpose "to work with the Grand Portage Band in preserving and interpreting the heritage and lifeways of the Ojibwe

people" (NPS 2003:4). Grand Portage National Monument is thus a park dedicated to preservation, remembrance, and to the needs and desires of the surrounding community of which it is a part.

Given its mandate to preserve the historic site of the Grand Portage, the two associated fur trade posts, and aspects of the heritage of the Ojibwe people, Grand Portage National Monument has developed a series of "Service Mission Goals" according to the National Park Service Strategic Plan (NPS 1998). These goals are as follows:

National and cultural resources and associated values are protected, restored, and maintained in good condition and managed within their broader ecosystem and cultural context (Service Mission Goal Ia).

Grand Portage National Monument contributes to knowledge about natural and cultural resources and associated values; management decisions about resources and visitors are based on adequate scholarly and scientific information (Service Mission Goal Ib).

Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of the facilities, services, and appropriate recreational opportunities (Service Mission Goal IIa).

National monument visitors and the general public understand and appreciate the preservation of parks and their resources for this and future generations (Service Mission Goal IIb).

Grand Portage National Monument uses current management practices, systems, and technologies to better preserve resources and to better provide for public enjoyment (Service Mission Goal IVa).

Grand Portage National Monument increases its managerial resources through initiative and support from other agencies, organizations, and individuals (Service Mission Goal IVb).

[NPS 2003]

In part to help achieve these goals, the Grand Portage National Monument has prepared the Final General Management Plan / Environmental Impact Statement (NPS 2003). This document clearly indicates the park's commitment to improve the visitor experience within the confines of public opinion, preserve natural and cultural resources within the park, and support Chippewa sovereignty. Of particular note for this thesis are Service Mission Goals I and IVa, focused on preservation, "adequate scholarly and scientific information," and modern management practices and technology. The monitoring and preservation plan proposed by this thesis will provide support for these two goals in particular by adding new methods and technologies to the pursuit of more

complete knowledge of archeological deposits and site formation processes, with the ultimate goal to preserve archeological resources associated with Fort Charlotte at the Grand Portage National Monument. It is hoped the park and the surrounding community will benefit most from the preservation strategies herein, and that the field of archeology, too, will find some value in the systematic, thoughtful preservation of rare intact historic sites.

GRPO's Needs

Grand Portage consists of two districts with very different management needs. These are (1) the lakeshore depot on Lake Superior, and (2) Fort Charlotte to the north, at the other end of the Grand Portage trail. Although this thesis will focus on the need to preserve the archeological resources of Fort Charlotte, the more visible of these two districts is the reconstructed fur trade depot on Grand Portage Bay, termed in the General Management Plan the "Interpretive Historic Zone" (NPS 2003). This zone constitutes only one percent of total park area, or approximately 7.7 acres, and receives the greatest visitation, development, and interpretation. By contrast, the second district of Grand Portage National Monument, historic Fort Charlotte, consists primarily of land zoned as "Resource Trust." In total, the various "Resource Trust" zones within Grand Portage National Monument constitute 96.6% of the park, or 686 acres. Fort Charlotte is also associated with nearby "Recreation" zones, which entail primitive campgrounds and visitor use areas. The park's desire to maintain Fort Charlotte as an undeveloped

archeological site stems from the assertion that it represents an "archeological data bank" (NPS 2003:36) that is in proximity to increasing visitor use and is thus in potential danger. Plans to reconstruct Fort Charlotte have been discussed and rejected, owing to the disturbance such a project would cause to archeological remains in the area, the cost of providing staff for the site, and the remoteness of the site (NPS 2003:67). In short, the park deliberately considers Fort Charlotte an important archeological resource worthy of protection, and the site has been zoned as such. In keeping with the idea of a "Resource Trust" and the overall goals of the Grand Portage National Monument to preserve the archeology, history, and heritage of the Ojibwe community, the park recognizes the threats of visitor use, erosion, and other potential damaging effects to Fort Charlotte, and has plans to monitor the site for its protection. This thesis will explore the methods and theory of such a plan, and provide recommendations for its implementation.

At present, the site is overgrown and difficult to access or delineate. Minimal interpretive signage maintained by the park suggests the general location of Fort Charlotte, but no specific information is given that would facilitate artifact collection by visitors. Nevertheless, David Cooper, Chief of Resource Management at Grand Portage National Monument until 2010, has reported that erosion along the boat launch at Fort Charlotte occasionally exposes small artifacts (Cooper 2009). A survey conducted by the Midwest Archeological Center (MWAC) in 2009 revealed that palisade lines, pit features, and mound structures are often visible on the surface, albeit heavily overgrown in the full vegetation of the summer. So far, because of thick vegetation and tree falls, visitor use of

nearby primitive campsites have not been detrimental to the archeological resources at Fort Charlotte, despite their proximity. In other words, Fort Charlotte is 'hidden' from visitors by a veil of vegetation and shallow soils, but is fragile and formally unprotected, given its remote location. The park now wishes to implement a monitoring strategy that will provide information on how extensively and in what ways the site is being threatened or damaged, and to facilitate an understanding of visitor traffic flows, potentially increased by the construction of the new visitor center at the lakeshore depot where Fort Charlotte is interpreted for visitors in greater detail.

Goals for this Plan

This proposed management strategy will suggest specific methods for monitoring Fort Charlotte, which will serve the park's needs to preserve the "Resource Trust" at Grand Portage National Monument. Specific technological and methodological aspects of monitoring will be introduced and discussed, and a systematic method for understanding the status of Fort Charlotte's archeological remains will be developed. This monitoring strategy must be consistent and thorough, but must be simple and cost-effective enough to continue for many years even beyond the careers of current park staff. Simultaneously, as an academic thesis, this plan will consider the ramifications and research potential of monitoring historic sites more generally. For example, given an understanding of a site's environment and the threats it experiences, effective and salient research questions can be tailored accordingly. At a minimum however, monitoring

strategies can supply archeologists with information that will help prevent damage to a site, and will guide any necessary recovery of materials before they are lost. Maximally, an understanding of site formation and modification processes can lead to deeper understandings of context, and ultimately influence interpretations of the archeological deposit itself.

This thesis will thus take a problem-oriented approach to monitoring Fort Charlotte, applying the principles of preservation whenever possible to historic sites in general. It is hoped that this thesis may serve in some way to heighten archeologists' appreciation of site preservation, reveal the ways such a process can be tailored to benefit academic studies, and serve as an experimental prototype for tailored monitoring programs at other historic sites. The foremost goal of this thesis, however, is contributing to the preservation of Fort Charlotte in the face of mounting threats from unauthorized collection and environmental changes. If no other goals, academic or practical, are achieved here, the research potential of Fort Charlotte as it exists now will be maintained.

Preservation Within Archeology

Site preservation has been a central issue to archeologists for at least the last sixty years, and a general picture of the related trends is worth considering. These and related issues will be discussed in more depth in chapter two, but a brief introduction sets the stage appropriately. As early as 1944,

...archeological materials were recognized as one of the country's natural, cultural resources. It was believed that the government was responsible for their preservation. In addition, it was true that federal projects were the major cause of destruction, and...salvage work must be included as part of the construction project. [Johnson 1966:1595]

This recognition of the importance and the fragility of archeological resources led to the joint Smithsonian / National Park Service River Basin Surveys, categorized by Johnson (1966) as "Archeology in an Emergency." Since then, with the advent of culture resource management (CRM) in the 1960s, divisions over preservation *in situ* versus salvage (i.e. "emergency archeology") have arisen within the field. As King (1971) suggests, recovering artifacts is not, in and of itself, the goal of archeology.

[Salvage archeology] does seem to presuppose that 'doing archaeology' involves a rather mechanical application of expertise to a given field situation, resulting in the recovery of data that will, post hoc, enable us to 'refine our knowledge.' This assumption stands in marked contrast to Binford's call for methodological reform. [King 1971:255]

That is, salvage archeology, at its conception, was an inherently inductive form of preservation (gather artifacts and record context first, ask questions later), while the New

Archeology at the time strove for a more deductive process. Of course, not everyone agreed with King's assessment. Gruhn comments gravely on King's (1971) paper, arguing that King's "more-scientific-than-thou" attitude hinders the prospect of cooperation between CRM and academic archeologists (O'Neal et al. 1972). The point is, "salvage" (inductive) archeology has been at odds with "scientific" (deductive) archeology for several decades, and the concept of site preservation *in situ* became central to the struggle as a kind of ideal 'middle ground.' King also suggests that "while it may not be possible to follow a deductive methodology within the framework of salvage, it is possible to conduct salvage within a deductive research program" (King 1971:259). Although the first clause of King's statement is debatable today, this thesis will look to the second half of the assertion, understanding that salvage is an extreme form of preservation. Site preservation *in situ*, rather than a means to avoid the inductive properties of salvage archeology, should be framed within research questions and can provide valuable scientific insight.

By the 1980s, archeologists were slowly becoming aware that preservation *in situ* was an attractive alternative to salvage, made possible by new federal programs and laws (Barnes 1981). By 1989, sociologists were also interested in the ramifications of preservation, including the inherent reflections of class structure and social mapping (Barthel 1989). In the 1990s, many archeologists were keenly aware of opportunities to borrow preservationist technology and methods from other fields, including physics, chemistry, engineering, geology, and computer sciences (Williamson and Warren-Findley

1991). More recently, the Association for Preservation Technology hosted an international panel to discuss historic preservation in the United States, Mexico, Australia, and others in order to broaden our understanding of the potential for preservation (Reich 2006). The rising current of preservation around the world has led archeologists to seek new technologies and new methods, all of which aim, ultimately, to prevent a clash of academic versus "emergency archeology" by preventing the "emergency." Although the sophistication of the methods has developed into modern times, preservation can still be considered a tenuous fix that prevents either inductive or deductive processes from ever occurring; in other words, preservation does not currently lead to an increase in archeological knowledge. A monitoring program designed within a deductive framework for the purposes of site preservation, however, facilitates the development of research questions, and directs preservation actions (including possibly salvage) according to specific research goals. This and the history of preservation will be more fully addressed in chapter two.

Potential Needs

Modern archeology's sensitive interests require more than simply a collection of artifacts. The studies conducted today make use of a wide variety of information sources, and rely on maximizing our knowledge of sites as a whole, requiring increasingly sophisticated methods of site-preservation. Nevertheless, if preservation does not lead to archeological research, it may ultimately mean a great loss for North American

archeology. In obvious ways, site preservation *in situ* prevents the loss the knowledge either to the environment or to the perceived inadequacies of salvage, but it also prevents both inductive and deductive archeology except, potentially, through the limited abilities of remote sensing technologies. Given the increasing sophistication and frequency of site preservation, at least within the National Park Service (Kelly 2007; Lynott 1989; Soukup 2007; Thorne 1991, 1989, 1988), it is becoming critical that archeologists embrace preservation, and carefully consider what we preserve, why, and to what end. Citing 'future excavation' is an unsatisfying reason for preservation, yet preservation is increasingly what archeologists are called to do. Furthermore, preservation is an archeological activity with consequences. Intuitively, preservation entails many benefits, but archeologists are increasingly aware that what we excavate may be biased, let alone what we choose to preserve (Barthel 1989). For example, Wobst (2005) suggests that archeologists are drawn to high artifact concentrations, and thus define sites without justifying the dismissal of 'non-sites.' From the perspective of preservation then, this begs the question, what information and biases may we be preserving for future (and theoretically more advanced) archeologists? According to Wobst, indigenous ways of reading the land will be lost unless 'non-sites' are also preserved. In order to preserve research potential as opposed to mere objects then, archeologists (with research agendas in hand) must take conscious responsibility for the appropriate method and degree of preservation—or for the recommendation thereof to land managers and other concerned parties.

This thesis is explicitly centered on the proposal of a monitoring plan for the purpose of preservation. Such a monitoring plan will provide valuable information that allows archeologists to involve themselves in the preservation of a site's research potential, based (preemptively) on threats to the site and the surrounding area. Since any kind of preservation is a decision with consequences, archeologists should have a firm grasp of what materials will be preserved, and the research-based reasons for it. This may also include an associated natural environment and 'non-sites' rather than just archeological deposits. Thus, the first question of preservation should ask what kinds of research potential should be preserved. Then, it will be necessary to know what part of it is being destroyed and how. This is the point at which a monitoring plan becomes invaluable, tailored specifically in this case to Fort Charlotte. In the absence of monitoring data, artifacts observed eroding out of a river bank may induce a certain level of panic in land managers, leading to site burial, diversion of rivers, erection of fences, or in extreme cases, collection of artifacts, saving the artifacts but essentially harming the integrity of the site in terms of the local environment, the spatial context, or the general "feeling" (cf. King 2008). Most of the time, the loss of context in these extreme cases is necessary and carefully mitigated by archeology's professional workforce, but a suite of site monitoring data allows for careful preparation, threat-tracking, and decision-making rather than plunging archeologists into emergency action. To be precisely focused and effective with preservation activities, including salvage, archeologists must set informed goals of what should be preserved, and then respond appropriately to immediate threats.

An efficient and thorough monitoring plan is essential to that end, and may be a valuable addition to a wide variety of prehistoric and historic sites.

Conclusion

This chapter has introduced the topic of a monitoring plan and briefly discussed the development of preservation ideals within archeology. This thesis will provide recommendations for a technologically, methodologically, and theoretically sensitive monitoring plan specifically for the site for Fort Charlotte at Grand Portage National Monument, Minnesota. Preservation is currently designed to prevent information loss either to the environment or to the perceived inadequacies of salvage archeology, but it can be leveraged to provide research-oriented data, and it must be conducted within a theoretical framework that precisely addresses research questions going into the future. In other words, preservation (salvage or something less destructive), should preserve research potential rather than only physical materials, and that requires more thought and more precise information regarding threats and disturbances to the site. A monitoring plan, as proposed here, is one component of a more sensitive approach to preservation, but such a program will need to be tailored to individual research agendas to be fully effective. In the following chapters, a research agenda for Fort Charlotte will be developed, and an efficient, effective monitoring plan will be proposed.

Chapter 2: Preservation

"Preservation" describes a remarkably broad spectrum of activities. Archeologists often look to artifact recovery to remove objects from an environment in which they may be damaged. Another extreme form of preservation eliminates human interaction with archeological sites, leaving context undisturbed. Between these extremes lie any number of preservation, protection, and damage mitigation strategies, and this chapter will outline some of the ways these strategies have been expressed in the United States and around the world. This discussion will use only a loose definition of preservation, incorporating a variety of examples and principles that will serve as background for preservation activities at Grand Portage National Monument, Minnesota. Simply put, any activity that maintains an archeological site in its original state (i.e. as deposited) can be considered a form of preservation. This definition considers artifacts, their context, and the matrix (or environment) in which artifacts are deposited all to be parts of an archeological site. Note that any one part can be independently preserved, as in the case of artifact recovery and curation.

Other terms deserve definition at the outset as well, particularly "preservation" versus "protection." "Preservation" traditionally includes strategies such as site burial, installation of filter fabric, and other attempts to prevent damage to a site from natural or inadvertent sources (Thorne 1991, 1989, 1988). "Protection" refers to more aggressive responses to impending disturbance, often with legal recourse, and relies on government

policy and federal laws such as the Archeological Resources Protection Act (Henry 1993). Because both "preservation" and "protection" strategies serve to maintain sites, both will be discussed here without making any further distinction. It should be emphasized, however, that any preservation strategy often has to interface with the law or rely on federal support. Thus federal programs that deal only obliquely with site preservation, such as the National Register of Historic Places, will be addressed here alongside techniques such as site burial. The term "site" is likewise redefined alternately in legal and academic circumstances, but for the purposes of this thesis, "site" will be used rather fluidly to mean the physical location of archeological resources, and should not be seen as a judgement of the condition, data potential, affiliation, value, or any other measure of the resource. Finally, "context" will also receive broad treatment in this thesis, and refers to the holistic conditions of any site (or individual artifact), which includes natural environment, ecological setting, association with features or artifacts, spatial setting, and the soil matrix. These broad, vague definitions are used by design, as this thesis is meant to provide an overview of site preservation, followed by recommendations for the treatment of a specific historic site. However one defines a "site" or "context," and however one refers to the actions taken to maintain these things, the principles introduced here will remain relevant.

As a wide variety of preservation activities are presented and discussed, and the trajectory of North American archeological preservation becomes clear, I will argue that even more can be done. A monitoring plan, such as that implemented at Fort Charlotte, is

an extension of a long history of preservation within North American archeology that began as early as the 1906 Antiquities Act. Archeologists are certainly aware of preservation issues and have worked for more than 100 years to improve our stewardship of the archeological record. Now, with the many preservation options and modern technologies to be explored here, as well as the backing of federal law, it is possible to move preservation activities into a problem-orientation that supports archeological research in new ways. Carefully designed site monitoring programs, based on sound archeological research questions, offer a practical means to gather data prior to aggressive preservation, and allows managers to prevent (or more effectively react to) would-be disturbance effects. Further, it will be noted that most of the following preservation activities stem from a focus on future study, and seek to maintain the research-potential of the site in question. Preservation activities grounded in established research questions stand a much better chance of succeeding, because they are able to preserve (or defend, in some cases) the salient context of the site, rather than merely the objects. Based on the review that follows, archeology is evidently moving in that direction.

Cultural Resource Legislation in the United States

This thesis will outline archeological preservation since circa 1940, but pertinent federal law has existed far longer, and has alternately influenced and enforced preservation in the United States. The law will now be discussed separately for several reasons. First, federal law applies only to land owned and managed by the United States

government under agencies such as the Departments of the Interior, Agriculture, and Army, or to any undertaking benefiting from federal funding or permitting. These jurisdictional limitations make federal law a poor indicator of overall archeological thought in the United States. Second, federal law is both complex and precise, and tends not to reflect the practical realities of preservation or necessarily contribute to the overall picture. In other words, federal law is informed by, but does not necessarily follow from, academic archeological thought. Finally, federal law is the basis for preservation at Grand Portage National Monument—the focus of this thesis—and therefore requires special emphasis and careful attention.

The generalized preservation of antiquities has been a national concern since 1906 with the passing of the American Antiquities Act (16 U.S.C. 431-433, available online). The Antiquities Act was the first federal law protecting any kind of cultural resource, giving the president the authority to set aside areas for protection as national monuments and imposing fines for unauthorized artifact collection or vandalism (Ellis 2000). Section 3 of the Antiquities Act specifically addresses archeological work, and requires that excavations be undertaken only by permission from the secretaries of the departments charged with managing the land, and then only if those excavations are undertaken for the benefit of "reputable museums, universities, colleges, or other recognized scientific or educational institutions" (16 U.S.C. 431-433, Section 3). Although the Antiquities Act was passed more than a century ago, "this assertion of public interest and concern

continues to the present and is the basis for the federal government's efforts to protect archeological sites from looting and vandalism" (Ellis 2000).

The National Historic Preservation Act (16 U.S.C. 470, available online) became law in 1966, and is designed to "foster conditions under which our modern society and our prehistoric and historic resources can exist in productive harmony" (16 U.S.C. 470, Section 2 (1)). Overlapping in purpose somewhat with the National Historic Landmark program set forth some years earlier in the Historic Sites Act of 1935, Title 1 of the National Historic Preservation Act establishes the National Register of Historic Places (NRHP) and the State Historic Preservation Officer (SHPO) to guarantee a review process for sites that may be affected by federal undertakings (triggered by federal funding, permitting, or land ownership). In combination, the NRHP, the SHPO, and cultural resource specialists identify and evaluate historically significant sites at the federal, state, and local levels by demonstrating historical significance under a number of criteria. Federal agencies and the SHPO then work with shareholders to consider the effects of an undertaking on the property, and may develop approaches to minimize the effects of federally funded undertakings (King 2008). Specifically, Section 106 of the NHPA requires that all federal agencies allow the SHPO—and the Advisory Council on Historic Preservation (ACHP), if necessary—to comment on any undertakings that affect properties eligible for the NRHP. (For sites designed National Historic Landmarks by the Secretary of the Interior under the Historic Sites Act, consultation with the ACHP is mandatory, and preservation of these sites is more strenuously pursued through the

mitigation of adverse effects.) Practically then, Section 106 requires archeological investigation of historic properties to determine their significance (and eligibility to the NRHP) prior to any other ground disturbance, which has led to "tens of thousands of archeological investigations since the mid-1970s" (Ellis 2000). Under this legislation, "significance" may refer to (a) an association with broad patterns of national history, (b) an association with an important person, (c) an object of artistic value (e.g., architecturally), or (d) resources likely to yield information important to our nation's past. Properties deemed historically significant and eligible for the National Register of Historic Places are not necessarily protected, but they are identified and planned for (King 2008). In some cases, this has led to the total excavation of archeological resources prior to land-development, a process often referred to as "salvage archeology" (King 1971). As will be discussed, in the 1960s, "salvage archeology" was distressing to many archeologists because it was not carried out with specific research goals. In this case, federal law contributes to King's "conflict of values" (King 1971) by encouraging archeological investigation without a priori research questions, which has led professional and academic archeologists to consider more carefully the goals and benefits of preservation.

In 1974, congress passed the Archeological and Historic Preservation Act (16 U.S.C. 469-469c-2, available online), an outgrowth of the Reservoir Salvage Act of 1960 that led to the "River Basin Salvage Program" discussed below (see Johnson 1966). This revised act extends responsibility for salvaging archeological sites from the Corps of

Engineers and the Bureau of Reclamation (the departments responsible for the reservoirs) to all federal agencies (Ellis 2000). This statute does not reflect contemporary views on *in situ* preservation, but is explicitly "in the tradition of 'salvage archaeology'" (Ellis 2000). Thus again, at least on federal lands, King's (1971) concern over archeological salvage sans research-orientation was well founded and was, in fact, mandated. Nevertheless, preservation by excavation was favored over certain destruction, and continues to be so today.

The Archeological Resources Protection Act (16 U.S.C. 470aa-mm, available online) was established shortly thereafter in 1979, designed to protect archeological resources in cases where the Antiquities Act was too vague (Ellis 2000). The act includes a variety of pertinent sections: Section 4 lists the requirements for excavation permits. Section 5 details the requirements for curation, later amended by 36 CFR 79. Sections 6 through 8 list prohibited actions with archeological resources, including trafficking, and the punishments thereof. Sections 10 and 11 allow (and sometimes require) land managers to work with avocational and professional archeologists to adequately protect sites, and to educate the public on the significance of archeological sites in order to minimize casual damage. Thus, ARPA is devoted to the protection of archeological resources both through prosecution and education. This stands in contrast to the more general and historically oriented preservation of the NHPA, and to the salvage-oriented AHPA. In 1990, 36 CFR 79 (Curation of Federally Owned and Administered Archeological Collections) established retroactive regulations for curation of cultural

material, increasing the standards of maintaining archeological collections. This act also acknowledged the cost of curation and placed the burden of funding on the federal agency that manages the land (NPS 2007). In effect, 36 CFR 79 provides additional incentive for preservation *in situ* rather than salvage, which costs significantly more and requires indefinite curation. Thus ARPA and 36 CFR 79, combined with the other legislation presented here, forms the basis by which archeological resources are investigated, curated, preserved, and protected on federal land.

History of Preservation

The Early Years through the 1970s: The Conceptual Development of Preservation

Even as the above federal laws were passed and amended, academic archeology was consistently concerned with the preservation and protection of archeological resources, although often in different ways. Preservation of sites has been a concern of archeologists since at least the 1940s, as suggested by Johnson's (1966) paper describing the practice of "Archeology in an Emergency." Even then, as today, the federal government was central to the protection of archeological sites, while simultaneously serving as a source of funding for their destruction:

...archeological materials were recognized as one of the country's natural, cultural resources. It was believed that the government was responsible for their preservation. In addition, it was true that federal projects were

the major cause of destruction, and...salvage work must be included as part of the construction project. [Johnson 1966:1595]

Out of this attitude eventually came the National Park Service's dedication to preserving cultural heritage. More immediately, the National Park Service partnered with the Smithsonian Institution to conduct the "River Basin Salvage Program" in the late 1940s, which defined the National Park Service's salvage program for at least 20 years (Johnson 1966). Under these survey programs, government agencies (such as the U.S. Army Corps of Engineers) and public organizations (such as universities) worked together to excavate and record otherwise unknown sites in areas that would soon be flooded by dam construction projects. The efficacy of this program was such that as of 20 years later, "it will be years before some of the material collected is fully understood" (Johnson 1966:1596).

Although the River Basin Surveys were often successful in their attempts to rescue sites from certain destruction, it was not long before archeologists began to question the wisdom of total excavation as a response to impending construction projects. In particular, King (1971) refers to a "conflict of values" between 'salvage' archeology and 'academic' archeology. Given Binford's call to more rigorous research design, King argues that salvage archeology lacks the necessary attention to context and detail that comes from a set of a priori hypotheses.

[Salvage archeology] does seem to presuppose that 'doing archaeology' involves a rather mechanical application of expertise to a given field situation, resulting in the recovery of data that will, post hoc, enable us to 'refine our knowledge.' This assumption stands in marked contrast to Binford's call for methodological reform. [King 1971:255]

In other words, artifacts do not equal knowledge. Rather, 'academic' archeologists argue that it is both the details of context and the controlled process of excavation that allows archeologists to test hypotheses and generate ideas about the past. King (1971) proposes that regional research questions be developed, within which salvage archeology can be beneficial to academia. One year later, Gruhn admonishes the "self-righteous, more-scientific-than-thou attitude of the new archeologists" and gravely comments that academic archeologists are reluctant to dig without a clear hypothesis (O'Neil et al. 1972:354). Meanwhile, Davis (1972) identifies a lack of funds combined with increasing rates of site destruction as "the crisis in American archeology." This crisis has not been fully resolved almost 40 years later, and King's (1971) call for regional research questions has gone unanswered, but the emergent situation would lead to a new kind of archeology, termed culture resource management (CRM).

By 1978, CRM was considered "a developing focus of American archaeology" (King and Lyneis 1978). Perhaps grudgingly, King and Lyneis admit that "anthropological and preservation [i.e. academic and salvage] archaeology share a

common, central concern with explicit definition of research values" (1978:880). The authors suggest, however, that preservation does not necessarily equate to salvage (King and Lyneis 1978:876-877). They tacitly argue instead for preservation *in situ*, applied to all kinds of historic cultural resources. Their further observations follow:

By requiring that all types of historic properties be dealt with, preservation pushes archaeologists into unfamiliar situations that demand the application of theory and method unusual in archaeology. Sites must be evaluated in regional contexts, with reference to a diversity of research problems, if their whole range of values is to be responsibly considered.

[King and Lyneis 1978:890]

Today, as preservation continues to be "a developing focus of American archaeology," archeologists are increasingly called to apply "unusual" theory and methods to rapidly disappearing archeological resources. This thesis will carry an old idea forward then, and attempt to develop a "diversity of research problems" for Fort Charlotte to responsibly direct its preservation. For the present discussion though, it should be noted that as early as 1978, archeologists have been concerned with ways to preserve sites responsibly, and in a way that will benefit our understanding of the past. To illustrate, Crosby (1978) provides a contemporary example of preservation and the explicit goals of one park's preservation strategies.

Tumacacori National Monument consists of a mission established circa 1753. The building suffered from moisture damage, but while "periodic stabilization by National Park Service personnel was the norm... These stabilization efforts were responses to immediate problems, while the actual causes of excessive deterioration remained unknown" (Crosby 1978:51). To rectify the problem, National Park Service personnel installed a monitoring system designed to pinpoint the causes of damage and preserve the site for public use. Many complex measurements and devices have been experimentally used in the monitoring program at Tumacacori National Monument, such as hygrothermographs, psychrometers, electronic crack monitoring gauges, and internal wall moisture sensors, but after describing the successes and failure of these systems, Crosby nicely summarizes the attitude of preservation at this site: "Regardless of the range of equipment necessary, the most important aspect of a monitoring system is an organized approach to find answers to specific preservation questions about the cause-effect relationship of deterioration" (Crosby 1978:75). Thus, at Tumacacori National Monument in the 1970s, preservation dealt with efficient and effective maintenance of sites largely for preservation's sake. Tensions certainly existed between CRM and academic ideologies in theory, but in practice, *in situ* preservation was pursued at Tumacacori in thoughtful and creative ways simply to maintain an historic landmark. By the beginning of the 1980s, archeologists were looking for more ways to pursue *in situ* preservation by a variety of methods...

The 1980s: Refining the Techniques of Preservation

Divisions by decade are of course arbitrary, but if the 1970s were concerned with the reasons and the potential for preserving archeological sites, the following decade was more concerned with techniques of preservation, both legal and practical. Barnes (1981), for example, presents readers of *American Antiquity* with a series of options for site preservation. In his words, "the purpose is to inform the archaeological community of some of the possibilities available to them beyond recovering data or losing the site" (Barnes 1981:611). These options focus on acquiring land on which sites are found, making use of research easements and the National Historic Preservation Act of 1966 to match funds for the purchase of land for future research. Barnes also presents a variety of local and private means to set aside land for future study, all centered on the need to preserve archeological sites without disturbance (Barnes 1981:613-616). Thus, in the early 1980s, archeologists were invited to make use of local and federal support for preservation *in situ*.

Around the same time, Ebert (1984) introduces the application of aerial photography to archeology, specifically as a nondestructive method of investigation and analysis. He discusses the limitations (technological, economical, environmental) and the potentials of various methods of photographic interpretations, concluding that remote sensing "may be performed by the individual archaeologist in pursuance of a cultural resource management or explanatory archaeological problem" (Ebert 1984:350). All the specific potentials and drawbacks of remote sensing are not relevant to this chapter, but

Ebert's work demonstrates that archeologists were receptive to alternative methods of investigation, giving consideration to preservation and nondestructive techniques. Later, other sciences become involved in examining archeological sites. Mathewson's (1989) edited volume presents the results of an interdisciplinary workshop in the "Physical-Chemical-Biological processes" that affect archeological sites. Out of this workshop came a detailed study of the effects of soil types and processes on various site components, as well as models of site decay based on forest succession models (Mathewson 1989). In this volume, Haas (1989) recommends that standardized and representative modules be created to simulate artifacts, one buried on the site and one kept in a dry cool environment, to compare later for soil and preservation-condition changes (Mathewson 1989:141). Again, this suggestion illustrates that archeologists are concerned with the possibility of profitable data-collection without the need to collect artifacts. Similarly, at the University of Nebraska - Lincoln, the Department of Physics and Astronomy became involved with non-destructive archeological investigations at Fort Charlotte (the very same as the focus of this thesis). Huggins and Weymouth (1979) conducted a magnetic survey of select areas within Fort Charlotte using a proton magnetometer, and determined that "some features of the original trading posts...have sufficient magnetic response to be detectable" (7). Specifically, supposed fireplaces and furrow lines appeared most strongly as magnetic anomalies (Huggins and Weymouth 1979). Again, as early as 1979, academic archeologists began to team up with other

sciences to investigate archeological resources using non-destructive methods for the purposes of preservation.

In the late 1980s, archeological preservation also begins to draw more conceptual attention. Barthel (1989) provides a sociological analysis of historic preservation, with a comparison between the United States and Great Britain, to illustrate what we preserve and why. She suggests that preservationism is "part social movement, part organization, part generalized malaise" (Barthel 1989:87), arguing that preservation is a reaction to the damaging effects of industrialization by "those who most clearly perceive impending loss" (an identity I would extend to archeologists). She argues, as have many social scientists after her, that class structure, "social mapping of time and place," and other aspects of society influence what we preserve (Barthel 1989:87-88, 100). As an example, Barthel argues that much of what the United States preserves is based on patriotism and national identity: "when interest in preserving Indian ruins arose at the turn of the century, it was because they were viewed as providing the missing antiquity: parks such as the Mesa Verde would substitute for Athens and Rome," and for that reason, "the United States has been more willing to plumb the recent past, including the commercial past" (99). The salient point for this thesis is also made by Barthel, that "while preservationists today present themselves as guardians of the past, they are also involved in shaping the future. Through selectively communicating the past, they in some measure control the present" (102). In other words, preservation in archeology is part of a larger social framework. Archeologists and sociologists understood, as we do today, that

preservation is an active decision that essentially biases the archeological and historical record of the future, based on our "social mapping of time and space" as Barthel suggests. Modern archeologists continue to be keenly aware of these aspects of preservation, and studying the use of the past is a strong thread in archeology around the world (see Hall 2006, Hicks and Beaudry 2006, Kohl 1998, and many others); thus, preservation is to be undertaken thoughtfully, following the concepts established 20 years ago.

For this thesis, perhaps the most profound impact of the 1980s lies in the pioneering techniques of site preservation. Thorne (1991, 1989, 1988) provides a series of technical briefs that outline the National Park Service's techniques for preservation, including those developed by the U.S. Army Corps of Engineers (1988). The first of these is filter fabric, a protective layer of woven or non-woven fabric laid over a site, forming a protective layer "resistant to wave, rain and surface water erosion" (Thorne 1988:1). Thorne suggests that with careful selection of fabric, this treatment of a site is cost-effective and simple. Filter fabric has been applied at a variety of sites, and has thus far worked well for stabilizing shorelines in combination with riprap (Thorne 1988, Lynott 1989). The second common technique employed to preserve sites since the 1980s is intentional site burial (Thorne 1989:1). Thorne presents the sequence of events for such a treatment: site components must first be evaluated and defined to understand how "a site's artifact and ecofact components have reacted to their physical and chemical environments through time" (Thorne 1989:2). Such data is crucial to developing an effective preservation plan that does not further degrade the site. Next, the impacts of site

burial must be assessed in relation to the goals of protection; this analysis should involve a multidisciplinary team of specialists to determine how best to cover a site, given future plans for research and/or development. Finally, predictions must be made regarding the decay process at any given site, and monitoring strategies should be employed to ensure the site being appropriately preserved. In theory, intentionally burying a site appropriately should protect it from unauthorized collecting, natural processes, and even subsequent land development (Thorne 1989:3-4). In the final brief of the series, Thorne (1991) provides archeologists with a list of sources for preservation methods and assistance, including the U.S. Army Corps of Engineers and the National Clearinghouse for Archaeological Site Stabilization. Thorne argues that that information exchange "is part of the goal to foster interaction among governmental agencies, professionals, and the private sector" (1991:1), an idea that has persisted today as preservation becomes increasingly prevalent in archeology.

The efficacy of these preservation strategies are addressed by Lynott (1989), who documents the successful treatment of a shoreline site at Voyageur's National Park. Survey conducted at Voyageur's National Park from 1976 to 1986 revealed that twentieth-century dam construction had caused lake levels to rise, flooding and destroying shoreline sites on many islands within the park (Lynott 1989). The first two sites selected for preservation were the Clyde Creek site, a late Initial Woodland occupation (500 - 750 AD), and Sweetnose Island, a long-term intermittent occupation (500 - circa 1900 AD). Initial survey and subsequent monitoring suggested that these two sites were large,

significant, and in danger of erosion from increasing lake levels. Thus, in March 1984 and February 1985, these sites were stabilized according to measures outlined by Thorne (1989, 1988) and the U.S. Army Corps of Engineers (Lynott 1989). Sediment was imported to the site over ice roads (to minimized ground disturbance), and the site was reburied. On top of this protective layer, filter fabric was used to stabilize the shoreline and to prevent disturbance to the underlying archeological deposit. More sediment was placed on the filter fabric, and grass seed was spread over it. A rubber turf stabilization mat was cut and placed on top of the grass seed to allow vegetation to take root. Finally, riprap was placed at the foot of the slope, protecting the newly constructed shoreline from wave action. In July of 1984, National Park Service personnel returned to the site to evaluate the condition of the stabilization, and to make any necessary repairs. By 1988, the stabilization had apparently succeeded, and the site is now both protected from erosion and hidden by native vegetation (Lynott 1989). In his conclusions, Lynott considers the preservation of these two sites to be a cost-saving endeavor, but also in line with the mandate of the National Park Service to preserve nonrenewable resources, stating, "it is apparent that future generations will be able to derive far more from the archaeological resource base than is possible today" (1989:800).

Given the brief history of preservation presented above, archeologists have been concerned with preservation and have refined their techniques (e.g., Ebert 1984, Huggins and Weymouth 1979, Lynott 1989, Thorne 1989). Far from the beginnings of salvage archeology, the 1980s have carried archeologists toward *in situ* preservation and study.

Remote sensing, soil analysis, and the conceptual nature of preservation have come to fore, even as sites are protected more-or-less permanently by creative and successful means (Huggins and Weymouth 1979, Lynott 1989). As this review moves into current approaches to preservation, archeologists turn their attention to the threat of concerted looting activities, and start to look for even more precise and technologically oriented methods of protection.

The 1990s: New Techniques for New Concerns

From at least 1986, the National Park Service's Southeast Archeological Center (SEAC) was actively struggling against site looting, and had implemented a monitoring system based on remote metal detectors, leading to numerous arrests (DesJean and Wilson 1990). In 1990, this and other anti-looting preservation programs were compiled into an edited volume entitled *Coping with Site Looting*, which discussed the topic at length, and brought site looting to archeologists' immediate attention (Ehrenhard 1990). Information ranges from the diagnosis of looting—shallow pits, scratching, trenches, mining, etc.—to the use of remote sensing and partnerships with avocational archeologists (DesJean and Wilson 1990, Elmendorf 1990). The various techniques of protection and monitoring will be discussed in detail in chapter four, but it is evident that the 1990s saw rising concern with anthropogenic disturbances. This concern was also addressed by the evolution of older federal laws such as the Archaeological Resources Protection Act (ARPA) and the National Historic Preservation Act (NHPA) through 36

CFR 79 (Curation of Federally-Owned and Administered Archeological Collections), passed in 1990 (NPS 2007). These laws remain active today, and serve as the foundation on which many archeological sites are protected even now, including Fort Charlotte. In general then, the 1990s saw archeologists turning their attentions from natural disturbances to the effects of looting, development, excavation, and curation.

As archeologists took steps to prevent illegal excavation, increasingly sophisticated technology added to the efforts. Williamson and Warren-Findley (1991) review the wide array of technologies and fields contributing to archeological preservation as of 1991. Remote sensing for example, such as aerial photography and neutron or gamma-ray spectroscopy, has allowed preservationists to gather data and monitor site integrity without destroying features or structures (Williamson and Warren-Findley 1991:18-20). Advances in computer analysis allow us to recognize and predict trends in decay, and to respond appropriately. Additionally, archeology has gleaned knowledge from physics and geophysics, chemistry, zoology and botany, geology, metallurgy, and engineering to stabilize sites and structures (Williamson and Warren-Findley 1991: 28-29). At nearly the same time, in 1988 and 89, the Association for Preservation Technology (APT)—established in 1968 between Canada and the United States—incorporated and moved its offices to the United States, establishing a new five-year plan:

APT has moved from the study of the history of building technology, to the study of approaches to the conservation of materials and systems, and now, without abandoning either of these previous interests, to a desire to share its knowledge with all those whose work on older buildings could improve - or diminish - the quality of the built environment we inhabit.

[Stovel 1989 in Waite and Shore 1998:10]

That is to say, interdisciplinary approaches to preservation (always well-known to archeologists) had become integral to the process by this time, as new and highly specialized technologies became available. Aside from teaming with other scientific fields, archeologists began to form international ties with everyone who "works on older buildings." It should be emphasized, however, that most of these technologies focus on the stabilization of built structures; preservation of undisturbed archeological sites remained mostly limited to reburial and shoreline stabilization, with some unusual use of remote metal detectors in SEAC's case (see DesJean and Wilson 1990).

Henry (1993) provides a straightforward summary of the National Park Service's contemporary views on site preservation. She defines four kinds of value for archeological sites: (1) a site's inherent information, (2) its ability to answer important scientific questions, (3) the interpretive and educational value, and (4) a site's community or traditional cultural value. Some sites are further "rooted in the community's history and are important in maintaining the continuing cultural identity of the

community" (Henry 1993:10), meaning that any investigation or damage to these sites could be deeply offensive or destructive to the groups that value them. (Incidentally, this approach to traditional cultural properties is reflected by Grand Portage National Monument's establishment of "resource trusts" under Ojibwe sovereignty (NPS 2003).) Henry goes on to provide a list of recognized disturbance factors, including natural effects (erosion, weather, vegetation, animals, etc.), human factors (looting, recreation, noise, etc.), and institutional practices (excavation, agriculture, development, etc.) (1993:11). Of these, looting is perhaps the most damaging; between 1980 and 1987, Henry reports that Navajo lands experienced a 1000% increase in looting incidents (1993:12). Henry explicitly suggests, as did Lynott (1989:800), that sites are to be preserved until they can be properly excavated, but she also argues that "not all sites should be excavated" (1993:14). Preservation is then, in many cases, the terminus of modern archeological investigation in that sites are preserved indefinitely for reasons other than eventual research. As Henry (1993) has stated, these reasons are often based on continuous traditional values rather than scientific data, which has led to legally categorizing these areas as traditional cultural properties eligible for protection under the National Register of Historic Places (see King 2008). Thus, in the 1990s, the National Park Service existed in an environment of sophisticated preservation strategies and information-sharing, and directed their resources to the preservation of sites for future archeologists and for the preservation of traditional cultural values. Of course, it should

also be remembered that in many cases, preservation *in situ* is undertaken because it is more cost-effective than adhering to the curation standards set forth in 36 CFR 79.

One of the new techniques for preservation and monitoring in use at this time was photogrammetric mapping, an outgrowth of the remote sensing described by Ebert (1984). By this technique, multiple maps of a site are produced through aerial imagery, and are then compared to examine changes to archeological sites or ruins. These maps are thus potentially valuable to the "ongoing effort to stabilize the site and monitor the locality for looting" (Creamer et al. 1997:285). Although archeologists have understood photogrammetric mapping since 1975, it had not been extensively used for preservation or research until relatively recently (Creamer et al. 1997). The technique continues to be improved today, and was undertaken by the Society for American Archaeology (2000) to monitor the condition of the earthworks at Hopewell Culture National Historical Park in Ohio. Unfortunately, the project also demonstrates the need for more advancement, as Ebert & Associates, Inc. conclude that "aerial photographs taken through time at a single site are not very comparable, and are not showing progressive deterioration in the sites which have been the subject of research" (SAA 2000:32-33). Nevertheless, photogrammetric mapping was used to investigate the "nature of prehistoric structures, and other archeological sites visible by virtue of soil and crop marks" (SAA 2000:5). The advantages and disadvantages of preservation and monitoring through aerial imagery will be further addressed in chapter four. Despite its questionable success however, the

project demonstrates a continuing effort to refine preservation techniques, with an added focus on the prevention of looting and anthropogenic disturbances.

Thus, given the review above, the 1990s saw the rise of new technologies designed to detect and react to anthropogenic disturbances (DesJean and Wilson 1990, Elmendorf 1990, Creamer et al. 1997). Rather than a conflict between "salvage archeology" and "academic archeology" as in earlier years, preservation has become an interdisciplinary endeavor to preserve sites both for future archeologists and for the sake of traditional group identities (Henry 1993, Lynott 1989). In many cases then, preservation has become the end of archeological investigation (Henry 1993). Further, technologies have been developed and refined since the 1980s to detect disturbances previously unknown or invisible, without disturbance to the site (DesJean and Wilson 1990, Huggins and Weymouth 1979).

Contemporary Preservation: Exploring the Diversity of Disturbances

With an understanding of both the history of preservation within academic archeology and the pantheon of laws pertaining to cultural resources preservation in the United States, I turn now to a brief commentary on modern preservation work since 2000. Continuous with the concern of the 1990s over anthropogenic destruction of cultural resources, twenty-first century preservation focuses on understanding and preventing disturbance factors. At Drayton Hall in Charleston, South Carolina, Mills and Fore (2000) report particularly illustrative treatments of a historic structure. They begin by

identifying specific vectors of deterioration in the historic structure of Drayton Hall, such as paint loss, ceiling damage from moisture, etc. Second, Mills and Fore (2000) develop hypotheses regarding the source and possible treatments of the observed damage. Third, and most importantly, a monitoring system is designed to test these hypotheses, making use of modern technology such as temperature and humidity monitors, soil tests, strain-gauges, and electronic crack-monitors, all of which are described thoroughly and implemented appropriately (Mills and Fore 2000:67). The authors propose 200 unique monitoring points designed to take one or more of these specialized readings, of which 100 are implemented. Twenty-one of these hundred were "special-purpose" and focused on particularly elusive sources of damage (Mills and Fore 2000:65). When the results of these monitoring stations were collected and analyzed, the team was able to identify previously unknown sources of damage and propose treatments, including the reinstallation of nineteenth century shutters to protect the interior paint from ultraviolet radiation. This study perfectly captures the essence of twenty-first century preservation. It is rigorous, problem-oriented, data-driven, and seeks to find efficient, long-term solutions to specific vectors of disturbance. Is archeological preservation following suit?

Given its history of preservation, it seems that American archeology has developed an approach that seeks to understand and prevent disturbances of all kinds. It may even be possible to label this a "problem-oriented" approach to preservation. Although the Society for American Archaeology's (2000) study in photogrammetric mapping has been discussed above, it is worth revisiting. The goal was to use aerial

photographs to monitor the conditions of earthworks at Hopewell Culture National Historical Park over time, but the investigators suggest that "what we are seeing in the aerial photos from date to date is probably patterning in vegetation and soils that changes qualitatively between photos" (SAA 2000:32). In other words, photogrammetric mapping did not work, but was nevertheless an attempt at data-driven preservation strategies. Other attempts at monitoring and preventing degradation of archeological sites can be seen in the National Park Service's technical briefs (Kelly 2007). Technical Brief 22 is devoted to archeological site stewardship programs, and suggests that "with consistent monitoring, the effects of environmental and human degradation are regularly observed and recorded, a basic requirement for developing a protection plan" (Kelly 2007:5). Further, "site stewardship programs are 'watch-dogs' for archeological sites" (Kelly 2007:6) that make use of volunteers and the educated public to deter looters. Rather than burying a site to protect it more-or-less permanently (e.g., Lynott 1989), archeology tends to focus today on more precise methods of preservation that target specific and known disturbance factors. In some cases, however, "extreme preservation" is the only option. At Fort Drum, New York, small lithic scatters are subject to disturbance by the heavy use of tanks and other military equipment. Moreover, "'Off Limits by Order of the Commander' signs can become the equivalent of 'Dig Here for Artifacts'" (Rush et al. 2008:151). To combat the effects of both looters and military tanks, the cultural resources management team uses a combination of filter fabric, buried

fabric warning signs, layers of sand and gravel, chain link fences, and natural landscaping in heavily used areas (Rush et al. 2008:251).

More-so than tanks however, looters are of particular concern to archeologists in the twenty-first century, and are a vector of disturbance illustrated by a cursory search through online auctions (www.ebay.com, search term "fur trade," for example). Although it is more subtle, damage to sites by casual visitor-use is also being recognized and prevented. Hallowell-Zimmer (2003) defines "low end looting" as disturbing or collecting artifacts with a limited or nonexistent market (i.e. for 'scientific' or personal reasons rather than economic). This includes hobbyists, site visitors, and inappropriately trained archeologists (Hallowell-Zimmer 2003:46). In the same volume, LaBelle (2003) comments that archeologists should be open to a dialogue with "low end looters," as they often have a working knowledge of the site. Hallowell-Zimmer similarly argues that we need "ethnographies of looting" (2003:52) to adequately understand the threat, and gather information about how supply and demand are created and maintained. Hallowell-Zimmer and LaBelle also agree that education is the best way to prevent low end looting; if the public understands the value of archeology, casual damage to sites will be minimized. This stance has already been mandated by the National Park Service through Section 10(c) of ARPA (Appendix D), which requires land managers to "establish a program to increase public awareness of the significance of the archeological resources located on public lands and Indian lands and the need to protect such resources." Indeed,

the entirety of the Archeological Resources Protection Act is explicitly designed to protect archeological sites from looting and more casual disturbance.

Through ARPA and other federal legislation, the United States Army Corps of Engineers (2005) has prepared a "Cultural Site Monitoring and Enforcement Plan." This document presents the requirements for archeological site monitoring, including an inherent knowledge of traditional cultures and practices, as well as anthropological, historical, architectural, engineering, information management, curation, and conservation expertise (USACE 2005:1). With the necessary background, site monitors are to establish a baseline using GPS to record the relative and current levels of disturbance. Subsequent monitoring will be based on GPS and photographic documentation, all of which is reported annually to the central office. "The sites will be monitored so that looting activity can be identified, documented and stopped. The information collected will be used for eventual prosecution activities." The plan also establishes a "Cultural Resource Enforcement Task Force" and a hotline for use by the general public (USACE 2005:8-9). Given the examples above, archeologists are taking a strong stance against looting in the twenty-first century, and both academic and government archeologists are explicitly working toward a greater understanding of the threats to archeological sites (Hallowell-Zimmer 2003, Kelly 2007, Rush et al. 2008, USACE 2005).

Modern preservation is also a worldwide concern. In 2006, the Association for Preservation Technology held an international panel on historic structures preservation

(Reich 2006). Five countries attended this conference: the United States, Canada, Mexico, France, and Australia, and all offered different perspectives on historic preservation and the role of their respective governments. These are summarized only briefly by Reich (2006), but they demonstrate the international nature of preservation today. Brodie and Gill (2003) also take an international approach, and examine looting worldwide: they report that 95% of antiquities for sale today lack archeological context, and are now sold primarily online (Brodie and Gill 2003:33). Thus, it would seem that in the last 50 years, preservation has become a globally recognized and legislated topic. Our understanding of threats continues to grow, as does our ability to combat them. Today, the battle is fought on a global stage by dedicated individuals and governments alike.

Preservationist Archeology

Why do we preserve archeological sites? In 1993, Susan Henry is clear: "Protecting archeological sites in place creates a bank of sites for future investigation using even more sophisticated technologies that will further increase our knowledge of the past" (14). This is immediately qualified with the understanding that "not all sites should be excavated" (Henry 1993:14), meaning those with traditional cultural value, the investigation of which violates the purpose of "resource trusts" in association with Native groups. In many instances, however, sites are not associated with contemporary Native groups, and are preserved simply for future scientific investigation (Henry 1993; Thorne

1991, 1989, 1988; Lynott 1989). Occasionally (as in cases dealing with traditional cultural properties), preservation is often the end of foreseeable investigation, and sometimes may only forestall destruction of the site. Lynott's (1989) stabilization of sites in Voyageur's National Park, for example, can only be permanent as long as conditions remain stable. If lake levels continue to rise, erosion will begin again. This need not be an inevitable loss of information, however. Certainly, Lynott's closing comments are promising in that "future generations will be able to derive far more from the archaeological resource base than is possible today" (1989:800). Indeed, we are now approaching an opportunity to derive more information from the archeological record. The key, I would argue, is in a research-oriented monitoring strategy, a trend already underway in modern preservation activities (e.g., SAA 2000).

Similar to King's (1971) suggestion that we should conduct salvage archeology within a deductive framework, I would argue preservation can be more profitably conducted in a deductive framework, driven by a sensitive monitoring program that gathers data and tests hypotheses regarding vectors of site disturbance. The conservation of Drayton Hall (Mills and Fore 2000) is an excellent example of the advances made in historic structures preservation, and represents a model that can be adapted to archeology. By detecting and monitoring disturbances as or before they occur, sources of damage can be identified and dealt with accordingly. At Fort Charlotte, for example, natural disturbances may be obvious (e.g., tree falls, erosion, or beaver activities), but the potentially more disastrous effects of looting and visitor may go undetected. These

concerns call for a preservation plan that archeologists are increasingly well-equipped to provide.

To preserve research potential, I would argue that archeologists must know exactly what they aim to preserve, and why. The following chapter will present the history of Fort Charlotte and the Grand Portage depot, and outline a series of potential research goals. With a research agenda in place, a preservation plan can be implemented that elegantly protects the site and all of its relevant context. Reburying Fort Charlotte, for example, is an expensive and impractical solution that preserves artifacts, but destroys visible features such as palisade lines and renders the site insufficient to the needs and expectations of park visitors. A preservation plan based on a research agenda ensures that the site is preserved as efficiently and effectively as possible. Furthermore, a sensitive and well-designed monitoring plan can gather the necessary data to support and direct preservation strategies, including (in extreme cases) salvage archeology.

This chapter has shown that archeology has become more sophisticated and more adept in the realm of preservation. Beginning humbly with salvage activities, archeology has advanced its methods and its concerns through modern technology and legislation. Today, numerous federal laws protect archeological sites, and anthropogenic disturbances have received global attention. Going into the future, archeology can actively use preservation strategies for the advancement of our knowledge of the past, and continue to send an even better bank of archeological information to future generations.

Chapter 3: Fort Charlotte

This chapter will focus on the site of Fort Charlotte (21CK7), comprising the western end of the historic Grand Portage trail now contained within the Grand Portage National Monument, Minnesota (Figure 2). While much research has been done on the North West Company's primary lakeshore depot (Birk 2005, 2006; Clark 1999; Cooper 2004, 2007; Gilman 1992; Hamilton 2005; Thompson 1969; Volf 2002; White 2004, 2005; Woolworth 1964, 1968, 1969, 1975, 1993; Woolworth and Woolworth 1982) very little is known about Fort Charlotte beyond its role as a staging area for traders headed to or from the interior of Canada (for references to Fort Charlotte, see: Birk 2005, Gilman 1992, Tanner 1830, Thompson 1969, White 2005, Woolworth 1993). In this chapter, the historical background specific to Fort Charlotte will be presented, along with a summary of pertinent archeological research. This will be followed by a summary of potential research opportunities at Fort Charlotte, building upon previous work done throughout the park.

A brief synopsis of the fur trade provides context for the establishment of the North West Company's Grand Portage depot, and specifically for Fort Charlotte. The fur trade was initially undertaken by the French as an economic enterprise in the new world, bringing them eventually to Grand Portage (in present-day northern Minnesota), and facilitating contact with the Iroquois, Algonquian, Huron, Ottawa, Dakota, and the Ojibwe by the seventeenth century (Birk 2005, Gilman 1992, Thompson 1969, White



Figure 2. Map of Grand Portage National Monument (nps.gov/GRPO).

2005). The fur trade enterprise was later continued by British traders operating directly out of London (e.g., the Hudson's Bay Company) or British traders based in Montreal (e.g., the Northwest Company) (Bishop 1974, Innis 1962). Primarily concerned with animal pelts for sale back home, early French "voyageurs" and later British or Canadian traders ventured into the interior of what is today southern Canada "[stimulating] expansion into the area, first by small groups of Ojibwa exploiting new fur and food sources, and later by competing traders who vied for the Indian's furs" (Bishop 1974:228).

One such expansion was at Grand Portage, a shallow bay on the western shore of Lake Superior approximately 10 miles southeast of the outlet of the Pigeon River, which now forms the boundary between the United States and Canada. Named for the 8.5 mile canoe portage from the shore of Lake Superior to the Pigeon River to the west, Grand Portage gained fame as one of the three river routes into the interior of Canada (Birk

2005, Thompson 1969, White 2005). The first (and longest) route took advantage of the St. Louis River and multiple portages, arriving eventually at Rainy River. Route two relied instead on the Kaministikwia River further north in present day Thunder Bay, and was the primary route used by early French traders (Thompson 1969). Later, it was discovered that although the first 20 miles of the Pigeon River are impassable, a "grand portage" westward from Lake Superior to a point further up the Pigeon River makes this route the most direct of the three (Thompson 1969, White 2005). Although the Grand Portage route had probably been known for some time by secretive *coureurs de bois* (Birk 2005), it was not widely used until Pierre Gaultier de la Vérendrye pioneered the route in 1731, and made improvements to the trail one year later as he began to trade with the Native Americans in the interior (Birk 1975, Birk 2005, Thompson 1969, Woolworth 1993). From 1731 onward, Grand Portage would be the site of complex cultural interactions taking place at both ends of the long trail, and was home to one of the most influential fur trade companies of the 18th century.

Around the same time, the Ojibwe made their own inroads to the interior of Canada. Coming originally from as far east as the Atlantic Ocean ahead of French traders, the Ojibwe at this time were seasonally mobile hunters and gatherers organized into loosely affiliated and diffuse bands (Richner 2002). Clark (1999) suggests that the westward move of the Ojibwe probably occurred over 300-500 years as part of their seasonal round, and following 1680, was also by design to improve their position in the fur trade. As reported by Richner (2002:56): "It is apparent that the Chippewa [i.e. the

Ojibwe] were utilizing a large variety of plants and traveling around the region to find them." Clark (1999:47) continues by saying, "what is clear is that the creation of what became Ojibwe was an additive process of different groups through time." In any case, the effects of the fur trade were felt by established western Native populations well before the physical arrival of Europeans. Although the Ojibwe had contacted French traders directly by the mid-seventeenth century, extensive preexisting trade networks among native populations ensured that European goods were circulating throughout region of southern Canada well before that time (Gilman 1992, Birk and Richner 2004). Indeed, Birk and Richner (2004) report that in Voyageurs National Park where fur traders are archeologically invisible, or perhaps not physically present at all, fur trade goods are nearly ubiquitous. The Huron, for example, were very experienced in trading meat with neighboring tribes, and merely "grafted" French traders into their exchange traditions (White 2005). It was apparently through these systems of exchange that the Ojibwe eventually discovered French traders at Sault Ste. Marie in northern Michigan (White 2005). From there, both the fur trade and the Ojibwe people would slowly continue westward until they met again in the eighteenth century at Grand Portage (Gilman 1992, Warren 1974). It is worth noting that the exact dates of these events are not known with certainty. In many cases, authors disagree not only on the prehistoric timeline, but on the historical events as well (Thompson 1969 vs. Birk 2005 on the arrival of the French, for example). These chronological mysteries are one of the many ways the material remains

now preserved at Fort Charlotte can contribute to our understanding of the fur trade (see Appendix A).

History of the Grand Portage Depot and Fort Charlotte

William Warren, a Métis (or person of mixed Native and European heritage) writing in 1852, suggests that an early French trading post was built at Grand Portage, owing to the friendliness of the Natives and the nearby quantity of beaver (Warren 1974). Such a post has not been established archeologically, but it is clear that French traders occupied Grand Portage from as early as 1615, and certainly by the early 1700s (Thompson 1969, Birk 2005, Woolworth 1993). In 1731, as discussed, Vérendrye officially pioneered the Grand Portage, and it is likely that French traders occupied the area until they were forced to withdraw in 1760 in favor of the British (Birk 1975, Woolworth 1993). Shortly thereafter, in 1767, British traders receive legal permission to spend winters in the interior with their Native customers, thus establishing the need for a "home base," so to speak, where goods may be unloaded and repackaged (Woolworth 1993). It was around this time (1768) that independent British traders began to form the nucleus of the North West Company at Grand Portage Bay, and Birk (2005) further speculates that a post may have already been erected at the far end of the portage—what would become known as Fort Charlotte. In support of this, by 1772, "pork eaters" (traders bringing goods to Grand Portage from Montreal), were required to carry six packs over the portage before returning home (Woolworth 1993), suggesting some

means of storage and a system of inventory at the far end of the portage. Although the exact date of the construction of Fort Charlotte is unclear, the establishment of the North West Company itself is better documented. By 1784, independent traders—concerned with the implications of the American Revolution—had consolidated under Simon McTavish and the Frobisher brothers of Montreal to form the North West Company, protecting their trading operations (Birk 2005, Birk 2006, Thompson 1969, Cooper 2004, Woolworth 1993, Gilman 1992). By 1799, a second substantial post was built on the far end of the portage, this belonging to the rival XY Company (Birk 1975, 2006; Gilman 1992, Woolworth 1993). From this point, company records pertaining to Fort Charlotte and the XY post provide some small evidence of their use and character (see Appendix A for complete timeline).

By no later than 1785, Fort Charlotte was considered an "old fort" by a competing Montreal company (Woolworth 1993). More evidence of Fort Charlotte's age is given by a Mr. Macdonnell, visiting Fort Charlotte in 1793, who refers to the nickname of "the Governor" for the manager of the post "having been so long in charge" (Thompson 1969, White 2006, White 2004, Woolworth 1993). There is also evidence that the North West Company used the location of Fort Charlotte and its association with the Grand Portage trail to combat rival companies and thwart independent traders. In one colorful story, an experienced trader named MacKay approached the Pigeon River only to find the trail blocked by recent competitive activity at Fort Charlotte (in his words, the North West Company had "Shut up the Road with Picketts"), at which point he used his "tomahawk"

to force his way to the river (Birk 2006:11, White 2005:73). A number of years later, circa 1800, Thompson (1969) reports that instructions were sent to Fort Charlotte to repair the pickets that were constructed close to rival buildings (designed to deny any extra land to rival companies), and to begin plowing and planting on the nearby land for the same reason. Note that agriculture has never been attempted successfully—at least for food-getting reasons—in the Grand Portage area, despite the North West Company's earlier attempts (Cooper 2007).

A few clues as to Fort Charlotte's actual appearance at this time come from visitors to the site. The earliest is attributed to John Macdonald, sent by the North West Company to relieve the post manager in 1794 (Thompson 1969, Woolworth 1993). When he arrives at Fort Charlotte, however, Macdonald merely describes it as "a general depot having 'extensive Stores for Furs & Goods as outfits'" (Thompson 1969:71). Eight years later, in 1802—as the North West Company was in the process of abandoning Grand Portage and moving to the Kaministikwia River following American claims on the area—trader George Nelson discusses drinking outside "our Stores" at the XY post across snow creek (Woolworth 1993:58). This account refers to a palisaded fort south of Snow Creek belonging to the XY Company, and demonstrates that it was still in use by 1802, but sheds no light on its interior arrangement or its relationship to Fort Charlotte. Between 1804 and 1806, George Heriot describes Fort Charlotte as "a stockaded quadrangle, with buildings and stores within it" (Heriot 1807, in Woolworth 1993). Interestingly, this description comes after the accepted date of the North West Company's

withdraw to Fort William on the Kaministikwia River in 1803 (Birk 1975, Birk 2005, Birk 2008, Gilman 1992). It is therefore possible that the XY Company took over the operation of Fort Charlotte briefly in 1803, just before their merger with the North West Company (and their departure from Grand Portage) in 1804 (Birk 2005, Thompson 1965, Woolworth 1993). Woolworth (1993) also notes several more visitors, with equally little information to provide. In 1823, Major Delafield describes the area as a clear field, with a few wild roses and sweet pea growing (Woolworth 1993). He also suggests that the North West Company's dock was still intact. Many years later, in 1899, the Minnesota state archeologist could still see foundations and "evidence" of the dock (Woolworth 1993). Another visitor, a local guide and hunter, described the site in 1922. In a description sent to the Minnesota Historical Society, he reported palisade outlines, a cellar, and two wells, and expressed his hope that the MSHS would take steps to preserve the site (Woolworth 1993). That same year, the MSHS sent a group to examine the site, including Dewey Albinson, who drew the best known map of Fort Charlotte (Birk 2005, Woolworth 1993). On this map, Albinson depicts still-visible palisade lines and foundations, which have provided guidance for much of the Midwest Archeological Center's work at the site. Albinson's 1922 map of Fort Charlotte, including the XY Company post, is included here as Figure 3, along with a digitized copy (Figure 4).

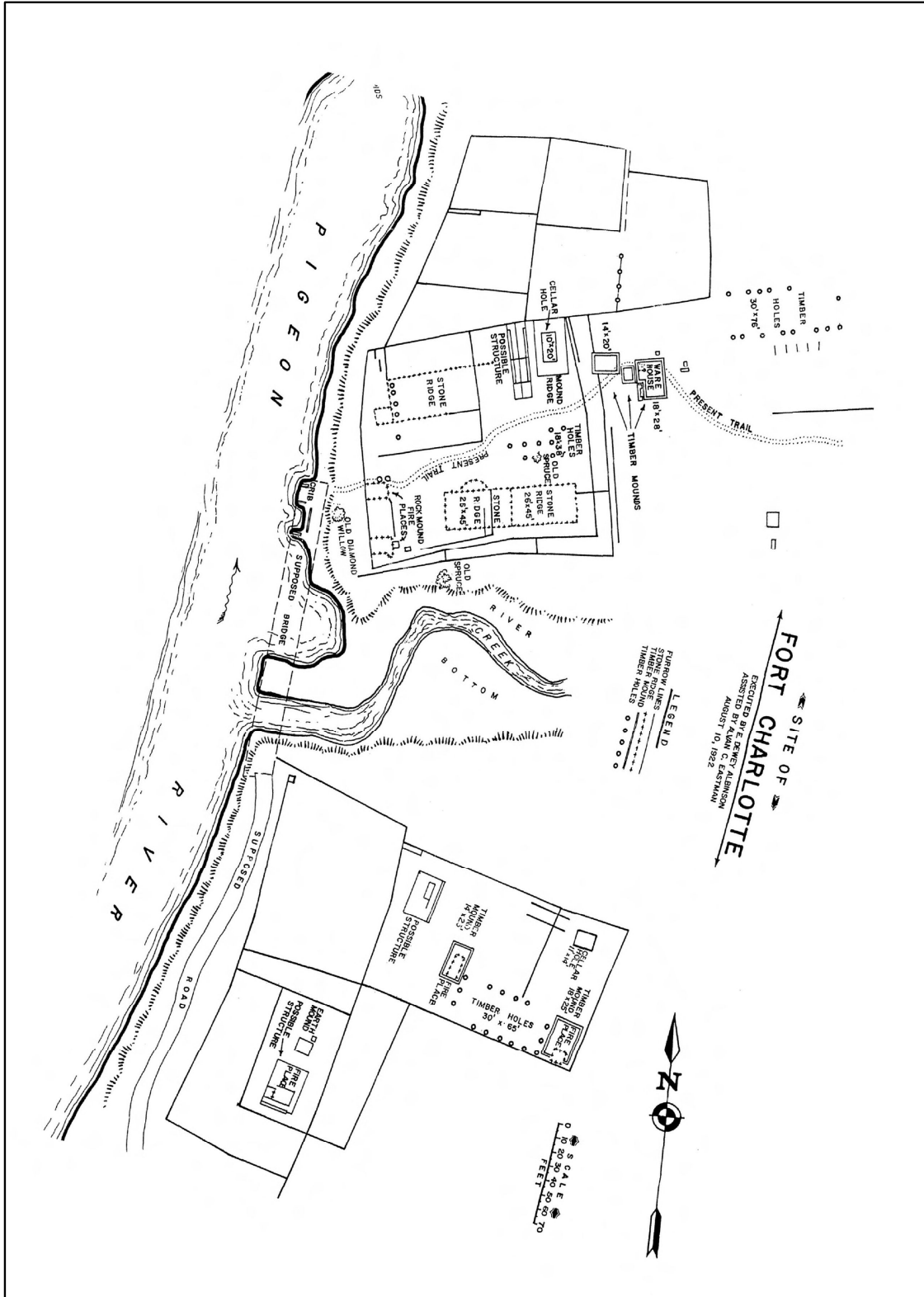


Figure 3. Dewey Albinson's Map of Fort Charlotte, 1922 (nps.gov/GRPO).

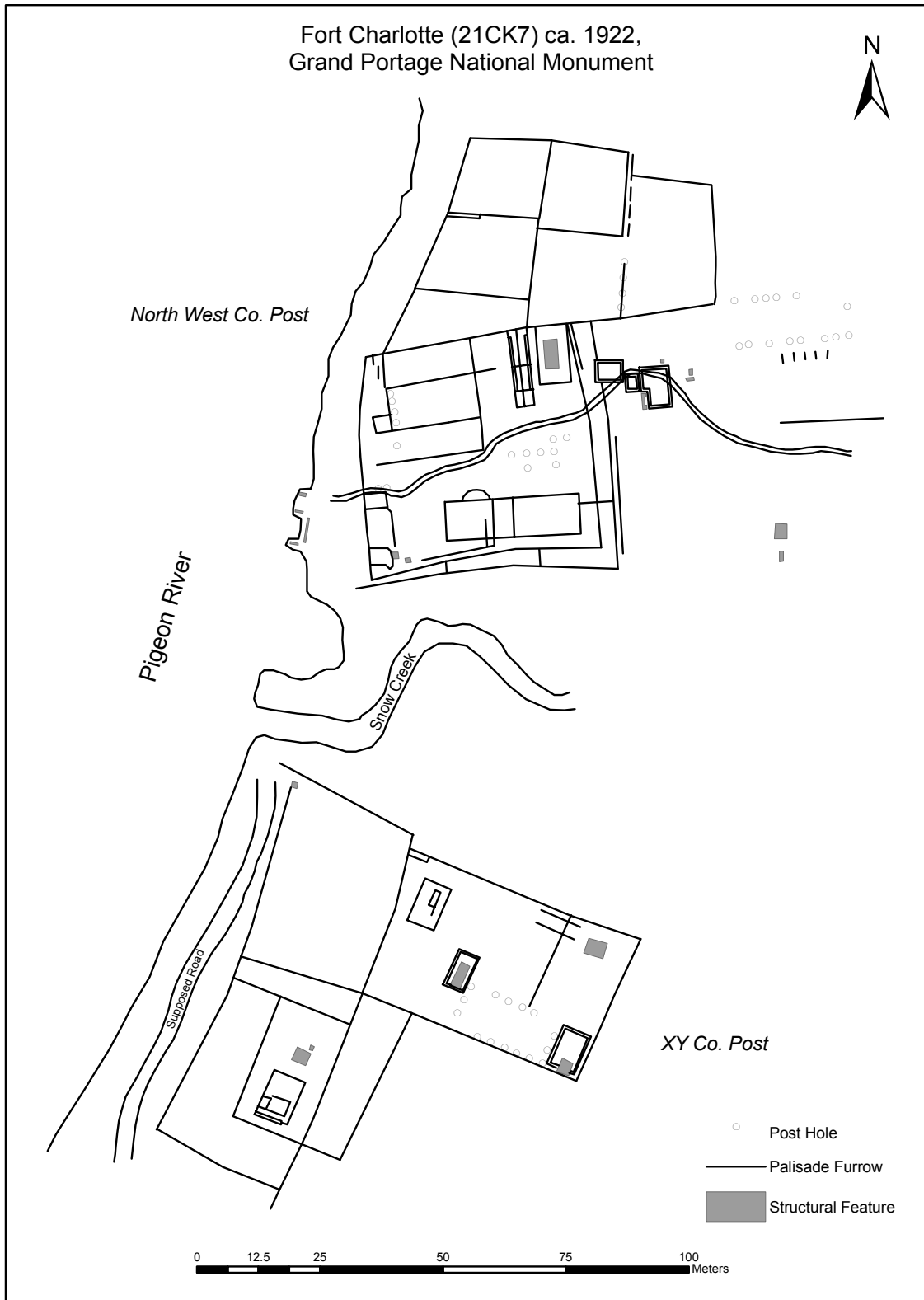


Figure 4. Dewey Albinson's map of Fort Charlotte, 1922 (digitized)
(Produced from data at the Midwest Archeological Center, Lincoln, Nebraska).

Archeological Investigations at Grand Portage National Monument

After the North West Company vacated the Grand Portage area in 1804 (Birk 2008, Gilman 1992), the portage continued to be used by various independent traders and the American Fur Company until approximately 1860 (Birk 1975). Fort Charlotte itself had apparently fallen into disuse, or may have been intentionally destroyed, well before 1823 (Woolworth 1993:59). The first-hand accounts presented above do little to further our understanding of the site, but archeological investigations beginning in the 1930s have filled in some of the gaps.

As early as 1936, the Civilian Conservation Corps conducted archeological projects in the Grand Portage area under the supervision of the Minnesota Historical Society (MHS) (Birk 2005, Hamilton et al. 2005, Woolworth 1964). These investigations consisted of trenches placed within the depot to expose palisade and foundation lines, and were not driven by research or interpretation (Birk 2005). The results of these investigations, while not conducive to modern anthropological analysis, were instrumental in establishing the Grand Portage National Monument 1958 (NPS 2003), and subsequent archeological investigations focused on aiding reconstruction activities (Birk 2005). From 1961 to 1963, excavations were conducted in and around the palisade at the bayside depot to further explore the archeological potential of the area (Birk 2005; Hamilton et al. 2005; Woolworth 1993, 1968, 1969). In 1963, very brief MSHS underwater surveys were conducted at Fort Charlotte, but the results of these investigations were minimal (Birk 2005, Woolworth 1993). The next year, a road was

installed leading close to Fort Charlotte, despite concern that access to the site would increase the possibility of looting. Plans to excavate the site prior to its destruction were entertained, but dismissed (Birk 2005). Meanwhile, work continued at the primary depot with the excavation of the now-reconstructed canoe warehouse northwest of the palisade (Hamilton et al. 2005).

In 1969, a fire consumed the reconstructed Great Hall within the depot and necessitated a series of investigations designed to clear the site and install improved utilities, as well as gather as much information as possible to build a more accurate reconstruction (Birk 2005). It was during these investigations from 1970 to 1972 that a kitchen was discovered north of the Great Hall, which has since been reconstructed as the third major building at the park (Birk 2005; Hamilton et al. 2005; Woolworth 1993, 1975). During the activity in 1971, another day-long underwater survey was conducted at Fort Charlotte, providing the impetus for Birk's more extensive underwater archeological investigation in 1972-1976 (Birk 2005, 1975, Woolworth 1993). This underwater project comprises the most intense research at Fort Charlotte, and recovered over 12,500 artifacts, many of which were well-preserved organic remains (Birk 2005, 1975). The final report is currently nearing completion, and the archeological remains have been curated and analyzed by the park for the last 40 years.

Until this time, archeological investigations in the Grand Portage National Monument were conducted as explorations rather than research-driven excavations. Power-assisted trenching was often used, and investigations were designed to be

conducted rapidly (Birk 2005; Woolworth 1964, 1968, 1969, 1975). Hamilton et al. (2005) suggests that these methods limit the usefulness of the data to modern research goals, but Birk (2005:7(11)) counsils that "there is an enduring potential for the discovery of previously unknown or undetected archeological materials or loci." In 1977, the Grand Portage National Monument was listed on the National Register of Historic Places (later updated by Birk 2005), and archeological investigations necessarily became less extensive (Birk 2005). From 1978 to 1980, the Midwest Archeological Center conducted various geophysical surveys, shovel tests, and mapping projects at both the depot and at Fort Charlotte (Birk 2005, Huggins and Weymouth 1979, Jones 1980a, Volf 2002, Woolworth 1993). The geophysical investigations at both loci were inconclusive due to geological conditions (Huggins and Weymouth 1979). The shovel tests placed in the periphery of Fort Charlotte in 1979 were similarly negative (Birk 2005). Meanwhile, Jones' (1980a) map of Fort Charlotte was highly successful in demonstrating that the site has remained largely intact since Albinson's visit in 1922 (Figure 5). In 2001, another round of geophysical work was conducted within the lakeside depot (Hamilton et al. 2005). During this project, the nature of the foundations at the depot were found to be ephemeral, excepting the Great Hall and chief clerk's quarters, but no new buildings were discovered (Volf 2002). Continuing geophysical investigations conducted in 2008 focused on the area to the northeast of the palisade, and determined the area to be highly disturbed and relatively sterile (DeVore and LaBounty, in press). Finally, the most recent investigations within the Grand Portage National Monument were conducted at Fort

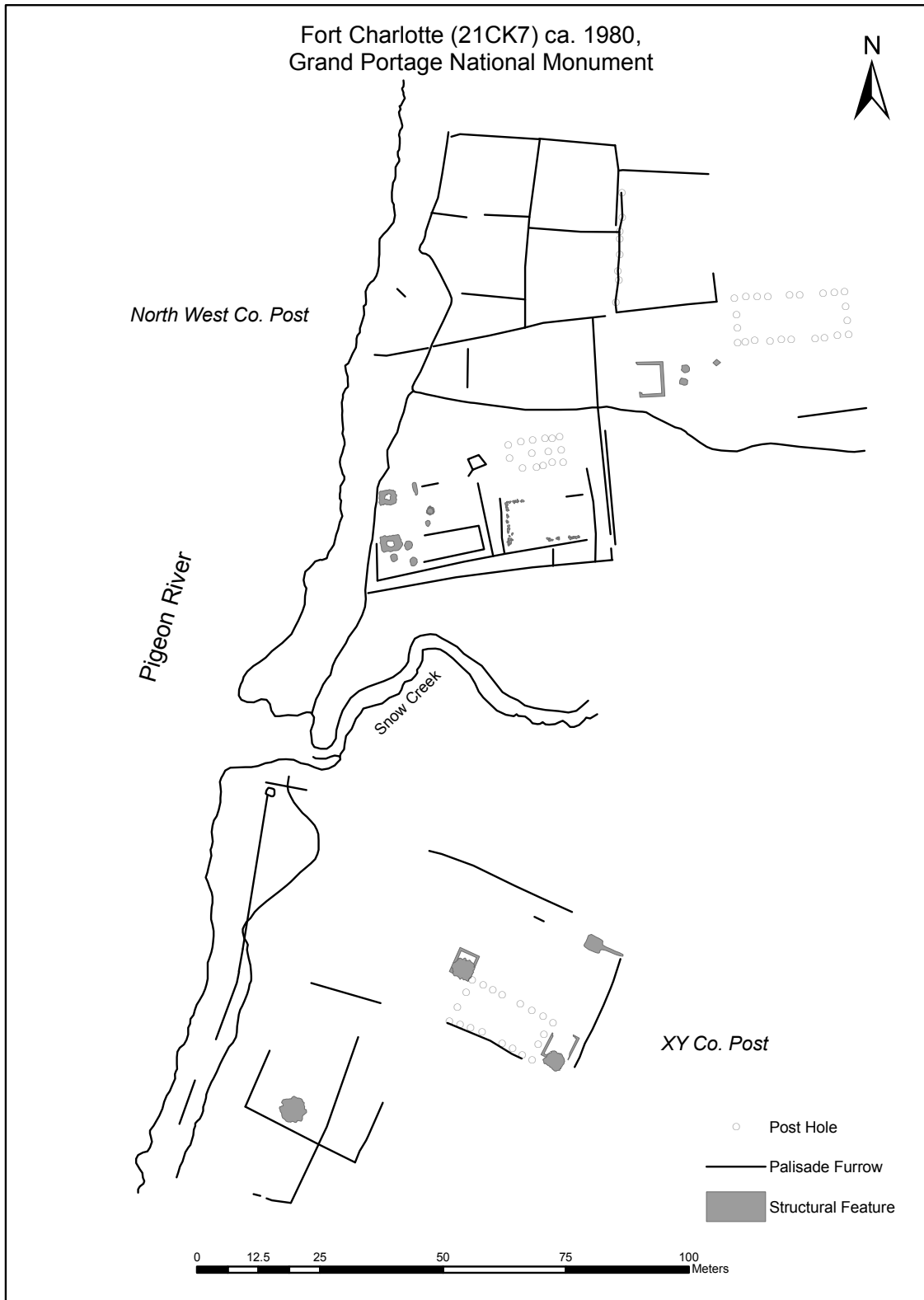


Figure 5. MWAC field map of Fort Charlotte (Jones 1980)
(Archived at the Midwest Archeological Center, Lincoln, Nebraska).

Charlotte in 2009 (Sturdevant, report in progress). The project was undertaken by MWAC and GRPO to determine the extent and condition of Fort Charlotte and the XY Post. This thesis represents one outcome of the project. Archeological remains recovered on the periphery of both Fort Charlotte and the XY Post are well-preserved, and suggest that both loci are undisturbed. These loci, shallow and fragile as they are (typically ~1 cm below the surface), represent significant sources of information regarding Grand Portage, the North West and XY Companies, and the regional fur trade.

Potential Research Directions at Fort Charlotte

The administration at Grand Portage National Monument has no intentions to actively investigate Fort Charlotte, and plans only to preserve the site *in situ* for future research (Birk 2005, NPS 2003). Fort Charlotte, however, consists of a shallow deposition of artifacts, most of which are 0-5 centimeters beneath the surface. The slowly developing soil that made it possible for Albinson to map archeological features in 1922 has also left the site vulnerable to surface collections. Given the significant and fragile nature of the site, this thesis will present a monitoring plan designed to understand and prevent damage by natural and human factors (e.g., erosion and looting). In the climate of modern anthropology, chapter 2 asserts that such a plan will be most successful if tailored to a specific site according to a strong research orientation. Thus, in order to establish a series of research questions for Fort Charlotte, this chapter will present a few possible interpretive approaches to archeological remains at the Grand

Portage National Monument. Certainly, research orientations are limitless, but the possibilities presented here represent the range of context that archeologists may need to access during future investigations. Considering a range of archeological investigations will enhance the capabilities and success of an archeological monitoring plan.

Gender and Society During the Fur Trade

Twenty years ago, Purser called for historical archeology to incorporate gender as a fundamental area of research. She suggests that archeology is "not just looking for women, but looking through gender" (Purser 1991:13), and this serves as the guiding theoretical principle of this theoretical approach. Nevertheless, at Grand Portage, "looking for women" is a legitimate place to begin, and asks necessary questions regarding the identity and role of women at Grand Portage. Archeologically, women are seen and quantified in the number of goods marketed to them by the fur traders. Brass kettles, beads, cloth, and other goods all point to the traditional roles of Ojibwe women and have been documented historically and recovered archeologically (Birk in press; Woolworth 1964, 1968, 1969, 1975). According to North West Company inventories, the most popular trade items at Grand Portage were cloth, beads, needles, awls, ribbons, jewelry, and other goods marketed to women, not the guns and axes commonly associated with European goods (Gilman 1992). The identity of the women to whom the North West Company sold their goods may be assumed to be Ojibwe, but they are often acting simultaneously as a trader's wife, providing food and services for the Montreal

traders (Bishop 1974, White 2005). Thus, Ojibwe women underwrote the fur trade both physically and economically by providing for traders "who could neither supply themselves nor the Indians" (Masson 1960 in Bishop 1974:229), and by being the foremost customers of the most popular trade items (Gilman 1992). Intact fur trade deposits that record the distribution and spatial placement of 'women's work' are therefore integral to unraveling critical dual identities, and to discovering the social mechanisms by which Montreal men survived and ultimately profited.

Another part of this theoretical perspective mirrors Wilkie's (2006) discussion of a college fraternity. In her study, the members of Zeta Psi created their environment to facilitate group identity, and adapted their own gender roles to survive (Wilkie 2006:25-32). Much like a fraternity, the Grand Portage depot was home to young men forced to fulfill gender roles in any way they could while maintaining their professional roles as Montreal traders. This leads to questions of negotiation and adaptation within the local society, and in this case, meant marriage to Ojibwe women and adaptation of male gender roles to Ojibwe society. In other words, fur traders provided for their Ojibwe families at the start of winter (like a husband), and then established a system of reciprocity in the summer to fulfill their mandate as profit-seeking fur traders (White 2005). This system of winter loans and summer payment may have been informed, to some degree, by traditional Ojibwe gender roles, but were clearly a negotiation between cultures with different goals. Thus, some of the important questions to be asked at Grand Portage deal with how Ojibwe women interacted with and influenced the fur trade, and

how Montreal men responded to their new roles as husbands and traders (or, in some cases, as single men without any support at all). Fort Charlotte derives much of its significance from the assumption that fur trade goods are well-preserved and reflect the daily goings-on at a staging area of this sort, as well as an ongoing potential to yield information about Indian peoples (Birk 2005). Our understanding of gender roles during the fur trade could be much enhanced by the careful analysis of Fort Charlotte artifacts with women and cross-cultural negotiations as the research topic. Moreover, although Fort Charlotte is only a relatively small site, the questions archeologists ask of it will help to shape the way other fur trade sites are explored, and bring significance to otherwise ignored aspects of already-excavated fur trade posts.

Causes of Change and Dynamism in the Fur Trade

Niche construction theory (NCT) has been characterized as "triple inheritance theory," building upon evolutionary anthropology's model of dual inheritance theory by adding environmental inheritance as a third leg (Laland et al. 2000). This analogy is appropriate but incomplete. Niche construction theory seeks to model the fact that all organisms pass a modified environment on to their offspring, with the resultant modification of selection pressures, and hinges on the fact that all organisms change their environment as a natural part of their evolution. Of course, ecologists and anthropologists alike have long understood that organisms modify their environment, and humans are widely credited with a greater capacity for environmental engineering (Smith

2007a, Laland et al. 1998). However, by combining the inheritance aspect of "triple inheritance theory" and the environmental modifications derived from environmental engineering, NCT makes its most important theoretical contribution: a constructed and inherited environment generates new selection pressures that influence descendant populations in a wide variety of ways. Thus, NCT introduces a variety of feedback mechanisms between the environment, genetics, and culture that have not often been addressed by anthropology.

Although this approach has had some success in exploring the proximate mystery of agriculture and domestication (Smith 2007b, Bleed 2006), it has seen little use in other areas of anthropology. As applied to the fur trade, NCT allows archeologists to ask questions about the environment (socially, culturally, and ecologically speaking). For example, NCT provides a framework to ask: How did the North West Company's physical and economic presence adapt to or change the local ecology? How was Ojibwe subsistence altered, and did this in turn affect the role of the fur trade? How did alterations in Ojibwe society (e.g., gender roles) influence material culture and vice-versa? These questions can only be investigated through multiple lines of evidence, including historical records and material remains, as well as, potentially, the local ecology itself. As an undisturbed fur trade site, Fort Charlotte offers archeologists the opportunity to examine each of these aspects of "triple inheritance theory." While it is impossible to preserve the terrain and vegetation as they were in the nineteenth century, archeologists do have an opportunity to document the changing environment of the site

today. NCT suggests that perhaps there is archeological potential in such knowledge combined with other evidence.

Beyond Fort Charlotte, Niche Construction Theory can address many aspects of change and dynamism in the fur trade. Fort Charlotte is a piece of a larger picture, and NCT is equipped to examine the fur trade as a whole by speaking to the social "evolution" of the period. That is, the Canadian fur trade, of which Fort Charlotte is a pristine snapshot, actually changed the social environment in which it operated, thereby causing 'feedback' changes in its methods and character. The introduction of liquor is one obvious example with repercussions throughout the Canadian fur trade, and an increased demand for birchbark canoes is another, as the production of canoes was (before the fur trade at least) a highly gender-oriented and traditional activity (White 2005). Fort Charlotte represents a source of data relevant to these sweeping and dynamic social changes, but the topics can be carried to many other sites.

Emergence of the Métis: Cultural Identity and Political Shifts

By 1815, the first Métis national identity arose from the mixed-blood children raised by the French, but this identity was not created by the Métis themselves. Rather, the first Métis national identity was essentially invented by the leaders of the Montreal-based North West Company "who skillfully brought it into being and exploited it for their own ends" (Giraud 1945:408). Duncan Cameron, a spokesman for the North West Company—which had, by then, moved its operations from Grand Portage to Fort William

in Ontario—argued that the North West Company had raised and understood the Métis; they were family (Giraud 1945:407-8). This propaganda was designed in the twilight years of the North West Company's power over Grand Portage and the Canadian interior, and was meant to mobilize the Métis as a nation hostile to traders other than the North West Company, particularly the Hudson's Bay Company. Of the newly formed Métis nation, Giraud (1945:408-9) writes, "Based on this simple idea, and ignoring the more soundly based rights of the Indians, these feelings would show themselves, when they were put to the test, tenacious enough to prove their sincerity." Six years later, the North West Company merged with the Hudson's Bay Company (Gilman 1992), 'abandoning' the Métis at large just as individual traders had sometimes done in the past (see Giraud 1945 for an in-depth history of the Métis).

Today, the Métis National Council (MNC) in Canada fights for its rights, and in 1982 was recognized as one of Canada's three distinct Aboriginal groups. In a telling move, the MNC has since broken away from the pan-Aboriginal "Native Council of Canada," to form its own governing body (Métis National Council 2009: "Who Is the MNC?"). Interestingly, the MNC considers itself an international organization of all Native people of mixed European and Native ancestry—a claim the necessarily encompasses a multitude of traditions and tribes and reflects Giraud's (1945:409) concern that the Métis national identity was neither their own idea, nor the undertaking of a homogenous group with similar ideals. Throughout their history since the formation of a national identity, the Métis in Canada have made no claims to homogeneity on any level,

but have nevertheless been apparently unwilling to associate with either colonialists or Native people. Hanson (2005:196), who calls the Métis "the greatest and most lasting contribution of the fur trade," briefly describes the Riel Rebellion, a Métis uprising in Canada that attempted to establish their own local government in response to the establishment of the Dominion of Canada. Such corporate actions reify and unite the cultural identity of the Métis, but do not in themselves bring us closer to understanding the origins or essence of their cultural identity. Although the detailed trials of modern Métis people in Canada is beyond the scope of this thesis, the present situation of the Métis can be regarded as an extension of the sudden creation of a distinct culture that finds its roots in a latent biological identity since the earliest French fur traders. The North West Company created the Métis, in both the physical and cultural senses to varying degrees, and then supplied them with an identity based on opposition to rival traders. Although this identity was seemingly shallow and short-lived, it has taken root and resulted in a unique cultural identity in Canada that persists with goals and a history of its own.

Conversely, the Métis as a cultural community never seem to have existed in Grand Portage. Although biologically speaking, virtually all Ojibwe in Grand Portage are "mixed blood," Métis is still not a recognized cultural identity today (Cooper, personal communication 2009). In a sense, the Métis identity has remained submerged beneath a Native/colonist dichotomy in the United States, likely owing to the pressures of enrollment in a federally recognized tribe (Cochrane, personal communication 2009).

This situation is reflected by the National Park Service's interpretation of the Grand Portage National Monument, which does not formally address Métis, although the topic is discussed on a per-visitor basis when interest is expressed, and a Métis sash—which is blue, rather than the traditional red—is for sale in the gift shop (Cochrane, personal communication 2009). Again, an underlying Métis identity appears to be reflected under certain circumstances, but this identity is not taken up by those it represents. Thus, the modern social context also reflects the idea that the Métis as a genealogical construct exist, but the blending of two cultures has been masked and largely disregarded from a cultural identity point of view.

The waxing and waning of Métis national identity is a topic that may be researched by a variety of means, including historical research into the language of treaties and the documents of the North West Company itself. Fort Charlotte, however, provides a first-hand archeological account of the interactions of Métis people with both Ojibwe and European-American cultures. If Métis national identity is explicitly examined through the remains at this site, Fort Charlotte takes on an international significance to at least three distinct cultural groups. Historical archeology has the opportunity to examine creolization, and perhaps ethnogenesis, through material remains, and has the tools to address the attitudes of the agents themselves through time. At Grand Portage, "Métis" has never been a banner around which the Ojibwe rally, but other lines of evidence suggest that an underlying potential identity was there, and this potential is expressed archeologically through a mixing of material culture, masked by two dominant

and separate cultures, as interpreted through a historical lens. Additional archeological data in known and well-defined contexts, and thus sites like Fort Charlotte, clearly remain important sources of information regarding the process of identity creation and power relationships in the fur trade.

The Future of Fort Charlotte: Threats and Opportunities

Fort Charlotte is currently under threat from a variety of sources. Visitor-use has increased in recent years, as the park's new visitor center draws attention to the portage and to the possibility of visiting the fort at the far end. Although Fort Charlotte has not been reconstructed and only minimally interpreted, visitor-use may take its toll in the form of erosion due to foot traffic, and to the casual collection of artifacts. Closely related to visitor-use originating at the depot, visitors may also arrive at Fort Charlotte from the interior as they paddle the Pigeon River. Under these circumstances, visitors often use boat landings opportunistically, damaging the shoreline and eroding nearby vegetation. Additionally, campgrounds have been established (a short distance north of the greatest known extent of Fort Charlotte) to accommodate these short-term visitors. A nearby latrine was built by the park in the 1980s (Birk 2005), and has been occasionally moved, potentially disturbing archeological remains.

Natural factors also influence the integrity of Fort Charlotte. As reported by Woolworth (1993), visitors to the site have noted progressively vegetated and deteriorating conditions at Fort Charlotte since the early 1820s. MWAC investigations in

2009 noted tree falls that can result in deep pits and the final destruction of any remaining foundations. Several chimneys are evident on the site, and many of these are overgrown by trees that threaten to eventually fall, taking archeological features with them. Beavers are also active on the site, and have built a beaver dam on snow creek (running between the XY post and Fort Charlotte, emptying into the Pigeon River). As this beaver dam grows, a reservoir is formed upstream that introduces new erosional pressures on each bank. Additionally, as the dam periodically fails, water rushes down snow creek and cuts into the bank beneath Fort Charlotte where ceramic fragments (interpreted as fireplace sweepings) have been recovered in 2009.

Despite these potential threats, Fort Charlotte has remained relatively well-protected due to its remote location, overgrown vegetation, and careful park stewardship. For almost a hundred years, the site has remained intact but shallowly buried—most artifacts are found ~1 or 2 centimeters under the slowly-developing soil—and palisade lines, cellars, chimney falls, and pit features are still visible where Albinson mapped them in 1922 (Figure 3). Given the site's significance and the park's mandate to keep Fort Charlotte intact as an archeological "resource trust," the Park Service plans to monitor the site in order to suggest potential stabilization actions and to prevent concerted looting. With potential research directions extending from the archeological objects themselves to the surrounding ecology of the site, a monitoring plan will be presented, designed to preserve Fort Charlotte according to the modern standards of anthropological archeology.

Chapter 4: A Monitoring Plan

A monitoring plan for Fort Charlotte includes the surrounding geographical area and possibly the local ecology, as has been indicated by the foregoing discussion of potential research opportunities. This is because natural features often correspond to historical narratives (notably the poses along the Grand Portage trail [Birk and Cooper, in press]), and may be valuable to future research, if not culturally produced per se. Archeological features like palisade lines, depressions, and chimney falls are valuable to our understanding of the physical layout of the post, and the literature on looting indicates that these visible features are particularly vulnerable to vandalism (DesJean and Wilson 1990). Other less visible features may be equally valuable or vulnerable for a range of reasons, including those resources of traditional cultural value (Henry 1993). The National Park Service already conducts regular site condition assessments on a schedule of 5, 10, or 20 years in order to identify, study, document, preserve, and protect archeological sites on park land, as well as to support visitor-use and development through informed planning (NPS 2006). Indeed, the National Park Service feels that "a current condition assessment is critical for making decisions about treatments that are necessary for the long term preservation and protection of sites" (NPS 2006:1). Park managers that wish to go beyond these guidelines, however, have little direction or established procedure that would make a consistent (or constant) monitoring plan tenable over the long term (Cooper personal communication). Thus, this thesis will suggest

adapting the procedures already in place, adding to site condition assessments with a more intense sub-assessment of smaller sample areas, and placing each of these "sample plots" on a rotating visitation schedule (cf. Noss 1990, Sanders et al. 2008). Monitoring a different small plot each year (for example), in addition to general condition assessments, would be a relatively light strain on park resources, and provide more specific information than only broad annual assessments. In addition to regular site condition assessments and intensive sample assessments, some site aspects—such as visible features, areas of high visitor use, and areas prone to erosion—may require regular surveillance, potentially with the use of technological instrumentation (cf. Crosby 1978, Mills and Fore 2000, Santucci et al. 2009). Instrumentation may range from simple camera traps (such as those employed at Buffalo National River) to various higher-technology devices such as those described by the U.S. Army Corps of Engineers Archeological Sites Protection and Preservation Notebook (Nickens 1992), or remote geophysical instrumentation such as that employed by the South East Archeological Center (DesJean and Wilson 1990). In combining general, sampled, and instrument-aided monitoring strategies, both the general site condition assessments and the more intensive sample assessments will be equipped to note elevated risk factors and implement more intense monitoring strategies as necessary (cf. Noss 1990, Santucci et al. 2009). For example, if visitor use is seen to increase in a given area, surveillance resources (whether man-power or equipment) may be reallocated to monitor that area

more regularly—up to near-constantly—which will serve to trigger and facilitate appropriate, informed preservation action or law enforcement.

This chapter will present a series of potentially useful technologies and techniques to be employed at Fort Charlotte, and will describe their use at other National Park units. Monitoring strategies employed by other disciplines, such as geology and biology, will also be addressed and examined for their usefulness to archeological site monitoring. I will then return to Fort Charlotte, and given its various research potentials, I will discuss the prevalent threats and the specific foci of a monitoring plan. This thesis will then provide specific recommendations for a sampling strategy and monitoring procedure at Fort Charlotte, given the range of possibilities described throughout this chapter.

General Techniques and Technologies for Site Monitoring

Because there is such a wide variety of methods for monitoring archeological sites *in situ*, it is useful to separate them into categories based on intensity and cost (Young and Norby 2009). Some monitoring methods, such as photography or the installation of rebar for monitoring erosion, require very little training and a minimum of equipment. Other, more technologically oriented strategies may require substantial training or capital to establish and maintain. The more intense, costly, and sophisticated methods of site monitoring should likely be reserved for particularly endangered resources, or those of special interest to the park. Despite the high cost of implementation, some of even the most extreme strategies will be presented here briefly, up to military-grade surveillance

equipment, should the park deem it a necessary expense. Nevertheless, this section is primarily meant to expose the wide variety of technological possibilities to enhance site monitoring techniques. More 'mainstream' strategies currently in use by National Park Service units and other scientific disciplines will be presented in a later section.

The U.S. Army Corps of Engineers (USACE) utilizes two general categories of strategies and technology to preserve archeological sites *in situ*: "Camouflage and Diversionary Tactics" and "Site Surveillance" (Nickens 1992). The first of these consists of relatively simple and easily-implemented strategies, such as signage and barricades. To some degree, Fort Charlotte experiences this kind of protection naturally, due to the overgrowth and remoteness of the site. The effectiveness of this kind of protection has also been demonstrated by the U.S. Army Corps of Engineers (1988). At Fort Hood, Texas, 81 sites were treated with wire, signs, burial, brush, and different combinations of these. Later evaluation of these sites suggests that about half of the untreated sites were deemed in worse condition, while approximately 80% of protected sites were maintained in their original condition (USACE 1988:6). The continued preservation of Fort Charlotte with minimal park intervention supports these results as well.

Although the USACE "Camouflage and Diversionary Tactics" are effective in protecting archeological sites, they do not afford continuous data-collection and information gathering, and are thus not suitable to comprise a monitoring strategy as such. Further, although it has been shown to be relatively effective at Fort Hood, Rush et al. (2008:151) suggest that signage "can become the equivalent of 'Dig Here for

Artifacts," encouraging casual looting by clearly delineating sites. Thus, we turn to the USACE "Site Surveillance" strategies as the next logical step at Fort Charlotte, in hopes of gathering useful archeological information in addition to enhancing site protection. Unfortunately, the last strictly archeological assessment of military-grade site surveillance technologies was conducted over 20 years ago, and has since fallen out of date. The Southeast Archeological Center (SEAC) has since experimented with the placement of remote metal detectors, leading to arrests at the Big South Fork National River and Recreation Area in Tennessee and Kentucky (DesJean and Wilson 1990:7). SEAC's success suggests opportunities for using other kinds of geophysical instrumentation to detect, for example, metal rather than movement, minimizing the false-alarm rate due to local wildlife. If only to record visitor presence, a data-logger could also be attached to a discreetly-placed metal detector and later downloaded for analysis (<http://www.kellycodetectors.com/lorenz/datalogger.htm>, \$4299.95). Instruments may also be activated briefly by a motion or seismic detector (Caven Clark personal communication).

The most common monitoring technique appears to be repeat photography (Young and Norby 2009, USACE 2005, Smith 1985). This has a variety of benefits, but its primary advantage is its low cost. Simple photography can be undertaken by relatively untrained personnel, and requires a minimum of data-processing and interpretation. Moreover, photographs can be easily curated and kept in association with standard site condition assessment forms, allowing for a visual record of site changes

through time (Santucci et al. 2009, Smith 1985). Because of the ease and cost-effectiveness of repeat photography, it is typically the first (and sometimes the only) component of site monitoring programs (Young and Norby 2009, USACE 2005, Smith 1985). The present use of repeat photography in National Park units will be discussed below, as well as the specific procedures for data-collection and curation.

The second common monitoring technique, at least for archeological sites and vegetation monitoring, uses the global positioning system (GPS). Like repeat photography, collecting GPS data can be conducted with minimal training and is routinely used in many contexts to monitor site degradation (Sanders et al. 2008, Rush et al. 2008, USACE 2005). Although such data does require processing, GPS data collected to sub-meter accuracy can be combined with geographic information systems (GIS) to produce detailed maps for planning and monitoring purposes, and is specifically useful for monitoring erosion and for relocating sites (Globevnik et al. 2003, Rush et al. 2008). The ease-of-use and low cost of both GPS and GIS make these techniques promising at Fort Charlotte, and like repeat photography, they will be revisited as part of the recommendations section.

Other monitoring techniques include various forms of aerial photography. While useful for delineating features or locating sites not visible on the ground, these techniques have had limited success in monitoring archeological site degradation (Creamer et al. 1997, SAA 2000). A project undertaken by the Society for American Archaeology at Hopewell Cultural National Historical Park to investigate the utility of aerial photography

to archeological site monitoring found that "aerial photographs taken through time at a single site are not very comparable, and are not showing progressive deterioration in the sites which have been the subject of research" (SAA 2000:32-33). In other words, aerial photography is difficult to collect consistently, and does not facilitate detailed site monitoring. Vegetation monitoring has meanwhile experienced the benefits of satellite imagery to detect disturbance and recovery both within parks and more regionally (Gafvert and Kirshbaum 2009). Unfortunately, even satellite imagery is not always comparable through time. According to Gafvert and Kirshbaum (2009:7), "Even the best cover maps are usually only ~80% accurate." Aside from the questionable accuracy of remote photography for the purposes of site monitoring, these techniques do not show promise at Fort Charlotte due to the overgrown nature of the site. Satellite and aerial imagery are unable to penetrate the thick vegetation, and are therefore unsuitable to monitoring archeological features at this site. While remote imaging may apply to archeological research--such as revealing the "nature of prehistoric earthen structures" at Hopewell Culture (SAA 2000:5)--it has not yet advanced enough to lend itself to very detailed and consistent archeological site monitoring and protection.

Programs in the National Park Service and the U.S. Army Corps of Engineers

Having briefly outlined a range of possible monitoring techniques, it will be beneficial to examine what has actually been adopted by National Park Units and the U.S. Army Corps of Engineers within the United States. Following this investigation, this

thesis will propose expansions to these ideas by borrowing from other disciplines, including biological and geological monitoring.

In a general sense, all National Park units (meaning national monuments, parks, historic parks, recreation areas, battlefields, etc.) have an established monitoring procedure in the form of Federally mandated site condition assessments. A site condition assessment consists of a brief form with supporting documents, including a site map, photographs, and GPS information (NPS 2006). The form itself is a one-page series of blanks and checkboxes recording the qualitative condition of the site (i.e. good, fair, poor, uncertain, not relocated, or destroyed; all of which are defined by the NPS), as well as a means to recommend a visitation schedule (i.e. 5, 10, or 20 years). An archeologist conducting the assessment may also record observed or predicted threats and disturbances. A "threat" in this context is defined as "a detectable condition that will predict disturbances" (NPS 2006). That is, threats are potentially harmful effects to a site's integrity. A "disturbance" (or "impact") is "a detectable result of natural forces or human activities that has had a negative effect on the integrity or data potential/scientific research value of the site" (NPS 2006). Both threats and disturbances should be noted on the standard site condition assessment form. Site condition assessments are a useful and necessary way for the National Park Service to keep track of archeological sites and conditions, but do not offer a rigorous way to monitor at-risk sites.

The National Park Service also provides technical briefs to parks that offer advice and guidance in the protection of their resources, assisting in compliance with Federal

legislation (e.g., Archeological Resources Protection Act and the National Historic Preservation Act). Technical Brief 22 focuses on "Developing and Implementing Archeological Site Stewardship Programs" (Kelly 2007). In this brief, 12 stewardship program coordinators' expertise are compiled. According to the Society for American Archeology, one of the best defenses for an archeological site, according to current thought, is education and the cultivation of public support (Kelly 2007:3). The value of local education and cooperation has been corroborated by a variety of studies, and even appears in the text of the Archeological Resources Protection Act (Brodie and Gill 2003, DesJean and Wilson 1990, Elmendorf 1990, Hallowell-Zimmer 2003, LaBelle 2003, 16 U.S.C. 470aa-mm). Sources of damage to archeological sites include development, unintentional damage (e.g., attracting animals to a site), vandalism, looting, and mismanagement (Kelly 2007:3). First, to begin to counteract these adverse effects, the NPS requires complete and comprehensive surveys of park land. Logically, "land managers cannot adequately protect resources that they do not know are in their care" (Kelly 2007:4). Secondly, a monitoring plan should be established, the practical procedures of which are the focus of this thesis: "With consistent monitoring, the effects of environmental and human degradation are regularly observed and recorded, a basic requirement for developing a protection plan" (Kelly 2007:5). Finally, a "site stewardship program" can be implemented that makes use of volunteers and park personnel to protect sites from threats and disturbances. In the NPS' view, such a program requires leadership, funding, realistic goals, public partnerships, a healthy

suspicion of potential looters, adequate advertising, volunteer motivation, and volunteer recognition (Kelly 2007). Thirty-six states have implemented such a program, and experienced some success in deterring looting and preventing unintentional damage. Unfortunately, the process of monitoring sites is again not clear, and we turn now to an archeological site monitoring plan currently available in draft form from the U.S. Army Corps of Engineers.

The U.S. Army Corps of Engineers in 2005 developed a draft "Cultural Site Monitoring and Enforcement Plan" designed to provide structure and authority to a monitoring plan for resources on USACE land. This draft plan outlines the relevant legislation to a monitoring and enforcement program, including NHPA, NAGPRA, and 18 USC 641 (theft of government property) among others (USACE 2005:2-5). Following this background of legal authority, the Corps presents the minimum requirements for monitoring and enforcement, both in terms of personnel, education, and site significance. Generally speaking, a successful monitoring program will be sensitive to traditional cultures and practices, archeology, cultural anthropology, history, architecture, engineering, information and archive management, and museum curation and conservation (USACE 2005). It should also be noted that the USACE considers preservation to be a spectrum of activities, not necessarily always *in situ* (USACE 2005:2). Monitoring personnel in particular require training in section 106 of the NHPA, NAGPRA, and ARPA, and should have experience with GPS operations. Law enforcement personnel require an understanding of both ARPA and NAGPRA. Sites to

be monitored must be eligible for the National Register of Historic Places (i.e. conform to the standards for significance set forth by the NHPA), or they must be recommended for monitoring by interested parties, such as Native American groups (USACE 2005:7).

The U.S. Army Corps of Engineers first establishes a baseline at sites that will be monitored. Trained personnel collect GPS data and take photographs relevant to a general evaluation of the site, specifying areas of erosion; agricultural, grazing, and construction encroachment; and site vandalism and artifact collecting (USACE 2005:7). At a minimum, GPS data should be collected at all corners of the site, and pictures should be taken at these locations (USACE 2005:7). These data are only collected once, and are used as the baseline or 'original condition' of the site. Routine monitoring thereafter may be conducted by untrained personnel, and consists of GPS data and photographs that focus on observable changes to the site (USACE 2005:8). Looting and artifact collection, when identified, is documented for eventual use in prosecution activities. Aside from identification during routine monitoring, looting may also be reported by private citizens or through calls to a hotline established for the purpose (USACE 2005:8). All monitoring data are entered into the Omaha District Archeological GIS database, and a report is produced annually on that year's monitoring activities and observations (USACE 2005:9).

The USACE draft monitoring plan makes it clear that data on site change is critical to the management of archeological sites. Particularly in the enforcement of ARPA, monitoring data is crucial to formulating appropriate responses to threats and disturbances. While the USACE monitoring strategy is fairly 'low-tech,' it has been

implemented to provide information on archeological sites that goes well beyond the standard NPS site condition assessments. Nevertheless, it is possible (and often necessary) to monitor sites more frequently or in more detail than the USACE suggests, especially where looting or erosion are observed or expected. Perhaps a routine monitoring plan based on USACE procedure and incorporating a sampling strategy would allow for more intense, or even more research-oriented observations of a wider area over the long term.

The Vanishing Treasures program within the National Park Service seeks to provide guidelines for park managers to preserve architectural remains (Barrow 2009). As a component of the Intermountain Region, the Vanishing Treasures program has influenced preservation practices and research in National Park units in Arizona, California, Nevada, Colorado, New Mexico, Texas, Utah, and Wyoming. Its primary focus is on maintaining cultural connections to standing ruins, thereby preserving the physical aspects of extant or descendant cultures in the region (Barrow 2009:4). For this reason, the program has refocused the standard NPS site condition assessment to emphasize cultural connections, and monitors site condition based on local purpose, values, and resources (Barrow 2009:16-17). The Vanishing Treasures program also advocates documentation of the reasons for a condition assessment, the establishment of a baseline, and consistent data management (using a "Facility Management Software System") (Barrow 2009:17). Similar to the USACE then, the purpose of monitoring has affected the kinds of information recorded for Vanishing Treasures resources. Where the

USACE maintains documentation for law enforcement reasons, the Vanishing Treasures program focuses on cultural affiliation and continuity. A research-oriented monitoring plan designed to protect archeological sites would naturally attempt to integrate both approaches. One clear commonality between the two is the importance of consistent data-collection and management.

Case Studies: Buffalo National River and Dinosaur National Monument

Buffalo National River (BUFF) is a National Park unit in Arkansas famous in part for its ancient rock shelters, many of which are open to the public. The park has experienced severe looting of archeological resources, and the ranger staff has turned to experimentation with remote sensing to prevent further damage to sites. The park's response to these threats have been experimental, and are not published as a management plan. However, according to Caven Clark (resource manager and former chief archeologist at Buffalo National River), BUFF manages a combination of seismic sensors and cameras that are deployed as a reaction to perceived disturbances. In most cases, this equipment is spread throughout the park and is deployed according to specific needs, and may not be systematic or consistent in all cases.

BUFF has had limited success with this strategy. While arrests have been made, Clark suggests that seismic sensors routinely register animals rather than looters, responses to which represent a drain on park time and resources. Further, while photographs of looters can be significant evidence in court, Clark has found that looters

are often unidentifiable either because of camera placement (too far, wrong angle, etc.), because of equipment breakdown, or simply because there are no suspects who can be matched to the images. To alleviate some of these problems, Clark has argued that monitoring needs to be better centralized and coordinated. Additionally, when equipment is otherwise not in use, sites at high-risk should be identified and routinely monitored. Clark also reports that the natural resources division recently purchased a system by which seismic sensors trigger satellite imagery that can be sent to a cell phone; this was a response to threats to natural rather than archeological resources, and has not yet been deployed, but nevertheless may be a viable option to eliminate false-alarms. Moreover, seismic triggers in combination with imagery of any kind would be especially valuable at Fort Charlotte, which is located more than 8 miles from headquarters.

The situation at BUFF demonstrates that experimentation with monitoring strategies is one of the greatest opportunities at Fort Charlotte, and that creative combinations of remote sensing may be required to prevent looting. While research-oriented site monitoring may be accomplished with relatively simple technology and professional rigor, more active protection of at-risk resources will rely on an ability to associate unauthorized collection with a specific individual at a specific time and place (Caven Clark personal communication). In other words, halting a serious looting problem relies on actually catching looters. At Fort Charlotte, no such looting problem is yet known, but any monitoring procedure should be sensitive to the possibility. Clark stresses that patterns in one location that can be related to patterns in another are

particularly important; at Fort Charlotte, monitoring visitor use at the known points of egress (the river, the portage trail, and the nearest access road) may provide critical data to establishing patterns of use at the site itself (Caven Clark personal communication). Thus, off-site or indirect monitoring may prove equally important to on-site monitoring.

At Dinosaur National Monument (DINO), the park has taken a different approach. Wayne Prokopetz, Chief of Research and Resource Management, reports that DINO does not have a formal site monitoring program, but has attempted to involve rangers and volunteers in site monitoring procedures (Prokopetz, personal communication). Because ranger and volunteer monitoring has not been extensively developed at DINO, the park currently relies on standard NPS site condition assessments to monitoring archeological resources. Along those lines, in 1985, Catherine Smith (former seasonal park ranger for DINO), developed a monitoring plan specific to the park to help protect vulnerable sites through visitation and documentation. Although her plan has never been implemented at DINO (Prokopetz, personal communication), it is worth examining for its proposed methods and advantages over a standard site condition assessment.

Smith argues for a "systematic means of documenting, analyzing, and protecting archeological resources" (1985:1) in response to vandalism at Dinosaur, particularly to the park's rock art specimens. While Smith considers law enforcement a "strong deterrent" (1985:4), she argues that site inventory and subsequent monitoring is critical in order to provide evidence in court. According to her strategy, an inventory phase gathers data at the site, which is then evaluated in the office in order to assign a monitoring

frequency and type. Monitoring then occurs according to the results of evaluation of a site's inventory (Smith 1985:38). As the monitoring process continues, "inventory information is used as a resource base for comparative work" (Smith 1985:38). The proposed monitoring plan, which may result in stabilization actions by the park, consists of four components: site photography (both general and detailed), quantitative measurements of an affected area, mapping, and a brief form specific to rock art condition evaluation, similar in style to the now-standard NPS site condition assessment (Smith 1985:47). The combination of these four types of data is meant to show change over time, and to provide evidence of deteriorating conditions under suspicious circumstances that will aid preservation efforts. Although the plan was never adopted at DINO, Smith's monitoring strategy demonstrates the importance of systematic observation, evaluation, and comparison. Breaking the process into inventory, evaluation, and monitoring makes it clear that park managers must know what is there to protect, and take care to develop a tailored monitoring strategy.

A Geological Monitoring Strategy

In a recent edited volume entitled *Geological Monitoring* (Young and Norby 2009), Santucci and colleagues discuss the concerns, requirements, goals, and methods of a monitoring program for *in situ* paleontological resources. Used as an analogue for archeological remains, the geologically-oriented paleontological monitoring plan

presented by Santucci et al. is a valuable source for ideas and provides a strong starting point for policy at Fort Charlotte.

Santucci et al. (2009) begin by describing the nature of paleontological resources: they are not uniformly distributed, and they are irreplaceable. These are the greatest challenges in monitoring such resources. Similarly, archeological resources are not uniformly distributed, and do not lend themselves to 'sample plot' or 'control group' kinds of monitoring. Archeological and paleontological resources cannot be reproduced, nor should they be subjected to destructive experimentation toward preservation. That said, Santucci et al. argue that the rigorous collection of baseline data is essential, including the scope, significance, and distribution of the resource, as well as existing or emerging threats (Santucci et al. 2009:189). This is true for archeological resources as well, following NPS guidance that suggests "land managers cannot adequately protect resources that they do not know are in their care" (Kelly 2007:4). Further, determining significance of an archeological resource is an important component of the NHPA (available online). Finally, NPS-mandated site condition assessments provide part of the baseline information in terms of existing and emergent threats (NPS 2006). Going forward with these baseline data, threats can be more adequately traced and predicted by a systematic monitoring plan.

Santucci et al. report that for paleontological resources, land managers often establish a "desired future condition," rather than "limits of acceptable change," in establishing goals for preservation. In their words, "the concept of 'limits of acceptable

change' is not applicable to the management of nonrenewable resources" (Santucci et al. 2009:200). This may be prove to be a useful viewpoint for preserving archeological resources as well. Although an apparently minor point, approaching archeological resources as something to be accessed in the future prevents land managers from taking extreme and situationally unnecessary measures, such as site burial (as presented by Thorne 1989). A "desired future condition" further suggests an active pursuit of *in situ* preservation, whereas establishing "limits of acceptable change" presupposes that excavation will occur when conditions become too adverse. Furthermore, "desired future condition" includes the corresponding visitor experience, which is an important focus of NPS land management (Bennetts et al. 2007:62). In short, a monitoring plan is not designed as an alarm system, but as a means to preserve a resource on our terms.

Santucci et al. go on to argue that monitoring strategies must identify, understand, and evaluate threats to a site. For human-related disturbances, considerations also include (1) the proximity of developed areas, (2) visitor use and activities, (3) construction plans, and (4) factors contributing to the theft and vandalism of the resource (Santucci et al. 2009:192). A flow chart illustrates the wide variety of factors affecting paleontological resources, all of which are also applicable to archeological resources (Santucci et al. 2009:190). At Fort Charlotte, (1) developed areas include a nearby campground and the portage trail itself. (2) Visitor use is an investigable factor, which is one of the park's goals for a monitoring plan at the site. (3) Grand Portage National Monument has no plans to develop Fort Charlotte, but (4) the well preserved nature of the

site, its remoteness, and the visible features that remain (e.g., palisade lines, chimney falls) make it a potentially high-value target for looting. Given an understanding of the potential threats, Santucci et al. define "vital signs" (2009:192) for the site. These vital signs do not measure the 'health' of the resource, but rather the factors contributing to their stability. Using these vital signs, a monitoring plan establishes "thresholds that would trigger the need for some management action" (Santucci et al. 2009:192). The five vital signs presented by Santucci et al. are (1) rates of natural erosion inherent to the site (e.g., riverine sites), (2) rates of natural erosion external to the site (e.g., seasonality, freeze-thaw cycle), (3) "catastrophic" geologic processes (e.g., earthquakes), (4) hydrology and bathymetry (e.g., flooding), and (5) human impacts (e.g., looting) (Santucci et al. 2009:193-199). For each of these five vital signs, Santucci et al. present three levels of monitoring, with increasing intensity and demands on personnel or funding.

The first level of response typically consists of repeat photography, as presented elsewhere in this thesis. Monitoring a site through repeat photography is simple and cost-effective, and is used in a wide variety of situations including the standard NPS site condition assessment (NPS 2006). Repeat photography merely requires fixed photo stations that can be consistently used for the foreseeable future, as well as consistent points of reference within the photo, and archival facilities for the photographs and related documentation (Santucci et al. 2009:194). In many cases, monitoring at this level can be carried out by volunteers. Level two monitoring strategies can be characterized as

establishing fixed points of reference, either through planting stakes (as in erosion-monitoring), or through mapping using GPS data and GIS (Santucci et al. 2009).

Although these methods require more training and funding, they provide a quantitative basis by which sites can be monitored (assuming accuracy of the instrument and preservation of planted stakes). In the case of vital sign 5 (human impacts), GIS can be used to produce maps depicting public use data and visitor activity areas, leading to the identification of areas of potential impact, which facilitates future planning and development by the park (Santucci et al. 2009:199). Level three monitoring relies on technological enhancement, and at least in terms of human impacts, mirrors what is already being done in parks like Buffalo National River. Each of the five vital signs benefits from the expense inherent in level three monitoring: (1) Digital elevation and geospatial data, as well as aerial photography, are useful in tracking erosion (Santucci et al. 2009:194). (2) Combined with erosion stakes and local climatic data, these can also be used to predict the climatic variables responsible for differential erosion rates (Santucci et al. 2009:196). (3) Seismometers, cameras, GPS stations, ground motion sensors, high resolution photogrammetric monitors, etc. are readily available to assess damage and help predict "geohazards" such as volcanism or earthquakes (Santucci et al. 2009:196-197). (4) Hydrologic monitors, tidal gauges, flow meters, and GIS maps contribute to predictive modeling and threat-assessment regarding site hydrology (Santucci et al. 2009:197-198). (5) Aside from alerting the park to looters and potentially serving as evidence in an ARPA case, the installation of photographic or video

surveillance can detect increased activity on sites, leading to predictive models and GIS maps that will identify those areas most impacted by a change or increase in visitor use (Santucci et al. 2009:199).

At Petrified Forest National Park, theft and vandalism are well-known through informal monitoring, and repeat photography has demonstrated the destruction of resources (Santucci et al. 2009). The authors also report that Fossil Cycad National Monument was abolished as a monument because the salient resources were destroyed (Santucci et al. 2009:203), a situation that would represent obvious archeological loss at Fort Charlotte. Human impacts are often managed at the regulatory level, balancing public use with resource protection, and certainly the types of monitoring equipment depends on the site. At Fort Charlotte, geohazards and extreme hydrologic impacts are unlikely, but human impacts have not been assessed, and erosional issues are possible. While photography is simple and widely used, Santucci et al. (2009:200) counsel that land managers should consult all the available data (be it paleontological or archeological) prior to determining which vital signs are appropriate to monitor. Finally, if threats are found to be at a higher or lower level than predicted, intervention may be required (Santucci et al. 2009:201). The authors also support the notion of site condition assessments (called here "cyclic monitoring") to "minimize the loss of scientifically significant specimens" (Santucci et al. 2009:203). Such condition assessments, such as those in use the NPS, are carried out by qualified personnel, and may particularly focus

on resources of interest to the park while taking a more qualitative approach to the evaluation of threats and condition (NPS 2006).

Biological Monitoring Strategies

Although biological monitoring represents a new level of abstraction from archeological monitoring, useful principles can be gleaned by examining this well-developed field. According to Niemi and McDonald, "The past 40 years have seen a rapid acceleration of scientific interest in the development and application of ecological indicators" and "developing scientifically defensible indicators to establish environmental baselines and trends is a universal need at a variety of levels" (2004:90). That is to say, biological monitoring strategies have recently entered a sophisticated phase of development. Here, "indicators" refer to measurements of the response of the ecosystem to anthropogenic disturbances; they do not necessarily point to an agent of disturbance (Niemi and McDonald 2004:91). This is a slight departure from the geological term "vital sign" in which the health of the resource is not directly measured or observed (Santucci et al. 2009). In other words, where geologists measure aspects of the conditions under which resources deteriorate, biologists measure a resource's response to deteriorating conditions. From a preservation standpoint, particularly as it relates to archeology, a geologically based monitoring strategy is more proactive, allowing for changes to be predicted and perhaps mitigated or avoided. By the same token, however, monitoring the response of the resource itself reduces "information overload" and

presents opportunities to define patterns and identify the most powerful stressors (Niemi and McDonald 2004:91). Noss points out, however, that "in any monitoring program, particular attention should be paid to specifying the questions that monitoring is intended to answer and validating the relationships between indicators and the components of biodiversity they represent" (1990:355). Regardless of the measurements—be they "indicators" or "vital signs"—defining the question and establishing cause and effect will be an important component of both biodiversity and archeological monitoring.

Noss (1990) goes on to argue for a hierarchical approach to monitoring indicators of biodiversity. He defines four levels of organization for this purpose: (1) regional landscape, (2) community-ecosystem, (3) population-species, (4) genetic (Noss 1990:355). Indicators are defined for each of these levels, and starting with the most general (regional), areas of stress are identified and investigated down to the most specific level. From an archeological perspective, this leads to important principles of a monitoring program. First, archeological resources are identified at least on a site level and an artifact level. The NPS site condition assessment is a general survey of the more general level, but more intensive monitoring investigations may be brought to observed disturbances or threatened areas at the artifact (or artifact concentration) level. Second, adopting a hierarchical approach to site monitoring is cost-effective. Especially in an archeological setting, where looting is possible and legal evidence of it is desirable, technologically aided monitoring may be necessary, but cannot cover a large area without significant expense and expertise. Thus, a hierarchical monitoring strategy allows for an

efficient use of available resources to combat both natural degradation and intentional disturbance.

Noss (1990) also defines the qualifications of an "indicator." An indicator—anything that responds measurably to a stressor; usually the population of a particular species—should (1) be sensitive enough to provide early warning of change, (2) be widely applicable, (3) provide a continuous assessment over a wide range of stresses, (4) be independent of sample size, (5) be easy and cheap to measure, (6) discriminate between natural and anthropogenic stresses, and (7) be relevant to significant phenomena (Noss 1990:357-358). Niemi and McDonald (2004:93) add that ecological indicators should be (8) sensitive enough to change measurably when the system is affected, but remain predictable when it is no longer under stress. The best archeological analogue of an ecological indicator would apparently be artifact condition, but ideally a monitoring plan would predict and prevent changes in the resource rather than merely measure them. Again, because archeological resources are non-renewable, as Santucci et al. (2009) point out regarding paleontological resources, archeologists are more interested in "vital signs" that predict deterioration rather than "indicators." Nevertheless, Noss' (1990) qualifications are worth considering as park managers choose which vital signs to monitor. At an archeological site, visitor-use is a very important vital sign because, following Noss (1990), it is a likely predictor of anthropogenic stress (1 and 6), is applicable to the whole site (2), is easy to measure with minimal equipment, even perhaps as simply as providing a guest book (5), and is relevant to any observed disturbances at

the site, especially looting (7). Thus, assembling a series of indicators or vital signs for monitoring an archeological site is a strategic process in itself that contributes to the success and efficiency of the program.

Noss (1990) also provides 10 steps to a hierarchical monitoring program, adapted here to be generally applicable to archeology:

- 1.) Establish the goals of the monitoring plan.
- 2.) Gather and integrate existing data (also see Santucci et al. 2009 regarding level 1 monitoring of climatic impacts).
- 3.) Establish baseline conditions.
- 4.) Identify "hot spots" and areas of high risk, leading later to more intensive monitoring (i.e. define hierarchical monitoring).
- 5.) Formulate specific questions to be answered by monitoring, and thresholds at which action will be taken (or, following Santucci et al. 2009, define the resource's "desired future condition").
- 6.) Select indicators (or vital signs, depending on monitoring goals and semantics).
- 7.) Identify control areas for comparison (e.g., artifacts already collected) and treatments for preservation.
- 8.) Design and implement a sampling scheme (e.g., intensive monitoring of high-risk areas and/or random samples within plots)

- 9.) Validate relationships between indicators and stressors.
- 10.) Analyze trends and recommend management actions.

As Noss suggests, "monitoring has not been a glamorous activity in science, in part because it has been perceived as blind data-gathering (which, in some cases, it has been)" (1990:361). Systematically monitoring archeological resources is no more glamorous than simple data collection, but by adapting ideas from other disciplines, it can be a strategic and efficient way to provide valuable scientific information to both land managers and archeologists.

Vegetation monitoring has developed similarly to biological monitoring, at least according to the guidelines set forth by the Great Lakes Inventory & Monitoring Network. Across the Great Lakes, forests are threatened by direct and indirect stressors, prompting the development of a vegetation monitoring protocol that "will provide an early warning of undesirable trends in vegetation, allow adaptive management of forest ecosystems, and allow for inferences about the effects of the above threats on both terrestrial vegetation and overall forest health" (Sanders et al. 2008:4). As in Niemi and McDonald (2004) and Noss (1990), this plan uses key species as measurable indicators that respond to stressors, as do community structure and community composition (Sanders et al. 2008:6). Also as before, the same arguments can be made regarding indicators versus vital signs in an archeological context. To the vegetation monitoring plan, however, Sanders et al. (2008) add a powerful sample selection strategy that may be

beneficial to archeological site monitoring. After identifying stressors and their effects on chosen indicators, Sanders et al. (2008) advocate a complex sampling strategy to help ensure statistically powerful results. In short, blocks of vegetation are randomly chosen to be monitored, while eliminating site selection bias. Because there is no guarantee of salient sites being chosen, ten percent of the total sample is chosen manually and designed "index sites," which are intended to specifically address park concerns (Sanders et al. 2008:10). Sample plots are established permanently for repeat observations using pins, tags, rebar, and GPS, with the added security of "witness trees"—three notable trees that help define the location of a permanent marker, should it be either removed or impractical (Sanders et al. 2008:16).

While Fort Charlotte is small enough not to necessarily require a complex sampling strategy, it may be prudent to conduct intensive monitoring on sections of the site at random intervals, if only to identify new stressors. A random sample of 'sub-site condition assessments' would thus represent the middle of a monitoring hierarchy, following Noss (1990), while more general site condition assessments conducted on a pre-defined schedule represents the general level of monitoring. Intensive monitoring of high-use or impacted areas (analogous to Sanders' et al. 2008 "index sites," and as conducted by Buffalo National River) represents the most detailed monitoring. These and other recommendations will be revisited below, but it should be clear at this point that a wide variety of strategies can be adapted and applied to a powerful and comprehensive monitoring plan for archeological sites.

Monitoring at Fort Charlotte: Summary of Research and Threats

Designing an effective and informative monitoring plan for Fort Charlotte depends upon both the research and preservation goals of the park (following previous chapters of this thesis). Research topics at Fort Charlotte include but are not limited to studies of gender and society during the fur trade, causes of change and dynamism in the fur trade, and the emergence of an international Métis cultural identity. Each of these requires archeologists to examine different forms of evidence, from ecological to artifactual, and all depend upon the preservation of context in some sense. Additionally, gathering information on rates and kinds of formation processes affecting an archeological site has bearing on archeological interpretations of the site (Schiffer 1983). Thus, a monitoring plan at Fort Charlotte should be detailed and focused enough to provide information of use to archeologists, without neglecting the larger salience of the site's context to important regional and international research questions.

As discussed in chapter 3, Fort Charlotte is currently threatened by a variety of stressors. As the most evident source of degradation, visitor-use continues to increase, but has not been quantitatively measured. Fort Charlotte has not been reconstructed and only minimally interpreted, but increased visitor-use may result in damage to visible features and the casual collection of artifacts. Closely related to visitor-use originating at the depot, visitors may also arrive at Fort Charlotte from the interior as they paddle the Pigeon River. Under these circumstances, visitors often use boat landings opportunistically, damaging the shoreline and nearby vegetation. Additionally,

campgrounds have been established (a short distance north of the greatest known extent of Fort Charlotte) to accommodate these short-term visitors. A nearby latrine was built by the park in the 1980s (Birk 2005), and has been occasionally moved, potentially disturbing archeological remains.

Natural factors also influence the integrity of Fort Charlotte. As reported by Woolworth (1993), visitors to the site have noted progressively vegetated and deteriorating conditions at Fort Charlotte since the early 1820s (see Appendix A). MWAC investigations in 2009 noted tree falls that can result in deep pits and the final destruction of any remaining foundations. Several chimneys are evident on the site, and many of these are overgrown by trees that threaten to eventually fall, taking archeological features with them. Beavers are also active on the site, and have built a beaver dam on snow creek (running between the XY post and Fort Charlotte, emptying into the Pigeon River). As this beaver dam grows, a reservoir is formed upstream that introduces new erosional pressures on each bank. Additionally, as the dam periodically fails, water rushes down snow creek and cuts into the bank beneath Fort Charlotte where ceramic fragments (interpreted as fireplace sweepings) have been recovered in 2009.

Monitoring at Fort Charlotte: Recommendations

The following proposal will be organized according to the comprehensive components of an idealized monitoring plan, as adapted from Noss 1990. Using this general outline, I will add various strategies and concepts from other disciplines, as

described above. The result is a monitoring plan tailored to archeological needs specifically at Fort Charlotte, the implementation of which will lead to strategic preservation of the site for the enjoyment of future generations, and particularly for future research.

Component 1: Goals

Given the varied and significant research questions possible at Fort Charlotte, and the known natural and human threats to the site, a monitoring plan is hereby proposed to gather data pertinent to site preservation and law enforcement. Further, data resulting from the monitoring plan will provide a body of information relevant to studying formation processes at Fort Charlotte, and will inform, predict, and in some cases, trigger archeological work. Because archeological data recovery or mitigation efforts will be informed by the monitoring plan, the features that are monitored most intensively will be dependent upon the park's research orientation and specific interests. A few of these potential research interests are outlined in Chapter 3.

Component 2: Background Research

Currently available site information includes artifacts recovered by Birk (1975) and the Midwest Archeological Center (survey in 2009-2010), and maps produced by Albinson in 1922 (Figures 3 and 4) and Jones (1980a, Figure 5). This information will be compiled into a table, and each feature (e.g., palisade segment, pit feature) will be

numbered to facilitate future comparisons. Features that cannot be relocated or that exhibit decay may then be noted by a specific designation, and other features of interest may be comparably mapped year to year. In addition, photographs from Fort Charlotte (Jones 1980b) and geophysical data (Huggins and Weymouth 1979) contribute to the park's definition of the Fort Charlotte site.

Component 3: Baseline

Following the U.S. Army Corps of Engineers (2005), a baseline will be established for monitoring cultural resources. Trained personnel will collect GPS data and take photographs relevant to a general evaluation of the site, specifying areas of erosion; agricultural, grazing, and construction encroachment; and site vandalism and artifact collecting (USACE 2005:7). At a minimum, GPS data should be collected at all corners of the site, and pictures should be taken at these locations (USACE 2005:7). Given the prevalence and cost-effectiveness of repeat photography (Santucci et al. 2009), baseline photographs may be taken relatively copiously, but areas of interest (such as visible features or areas of notable degradation) should be carefully identified using permanent markers and plotted via GPS, so that subsequent photographs will be comparable over time. Marking a repeat photography station may consist of pins, tags, rebar, and GPS, with the added security of "witness trees," should any of these permanent makers be removed, or if markers would advertise otherwise invisible archeological features (following the vegetation protocol advocated by Sanders et al. 2008:16).

Component 4: Identify Areas of High Risk

At Fort Charlotte, known areas of high risk include a canoe landing, the area along the bank of the Pigeon River, areas along the bank of Snow Creek affected by beaver activity, a visitor-use area to the north of the site, the trail to the visitor use-area through the site itself, the Grand Portage trail, and a small interpretive station in the heart of Fort Charlotte. Each of these areas represents a risk for increasingly serious damage to site context, particularly through erosion or casual artifact collection by park visitors. Other areas of risk include visible features, such as chimney falls, deeper within the site. Visible features and visitor-use areas may necessitate more intensive or constant monitoring, and represent the application of hierarchical monitoring (cf. Noss 1990).

Component 5: Desired Future Condition

The archeological record at Fort Charlotte has been shown to be intact and well-preserved by Birk's underwater excavations (1975) and recent survey by the Midwest Archeological Center (2009-2010). In order to maintain the level of preservation and undisturbed context necessary to address complex research topics (e.g., gender, social dynamism, cultural identity, and others), both artifacts and their ecological setting should be maintained in as static conditions as possible. The "desired future condition" (Santucci et al. 2009:200) of Fort Charlotte is therefore one that facilitates the investigation of these complex regional and international research questions. Because artifacts are naturally well-preserved at Fort Charlotte (based on MWAC survey and limited artifact collection),

artifacts and features will ideally be left *in situ*, unaffected by looting, erosion, or tree-falls. Thus, a monitoring plan will focus on preventing these major disturbance factors, thereby ensuring that site context remains amenable to sophisticated archeological research. Any situation in which artifacts are disturbed or removed from their matrix will thus be met with park management actions, ranging from mitigation to archeological data recovery.

Component 6: Select Vital Signs

Of the five listed by Santucci et al. (2009:193-199), the vital signs of concern at Fort Charlotte include (1) inherent rates of erosion, (2) environmental erosion factors, (4) hydrology and bathymetry, and (5) human impacts. In each case, vital signs refer to the factors contributing to artifact stability, rather than "health" of the artifacts themselves, and are thus measurable without disturbing the resource (Santucci et al. 2009). More specifically, visitor-use, types of visitor activity, visibility of features, potential tree falls, river bank position, beaver activity, and visitor-access (both from the nearby ATV trail and from the Pigeon River) represent data pertaining to the stability of archeological resources. As conditions that affect archeological resources are identified, more vital signs may be added, but the following is a current—albeit likely incomplete—list of threatening factors measurable by the park:

- 1.) Erosion (via stream action, failure of beaver dams, canoe landing, other animal movements)
- 2.) Stream movement, position, and height (namely, Pigeon River and Snow Creek)
- 3.) Numbers of visitors
- 4.) Visitor activities
- 5.) Visibility of archeological features
- 6.) Points of visitor egress

These factors can be measured by the park and reflect the conditions under which archeological resources may decay. Thus, when any of these vital signs suggest that resources are threatened, management action can take place. The vital signs that are selected, and thus the resource that are monitored, stem (or should stem) ultimately from the park's research orientation. If, for example, the interaction of fur traders with the environment, landscape, and each other is important to the research goals of local archeologists, it may be that preserving the character of Snow Creek (separating the XY and NorthWest Company posts) is particularly relevant. Thus, monitoring beaver activity may rise on the list of priorities. Similarly, the visibility of archeological features and the rates of visitor use may reflect on the decay of architectural features, and archeologists' ability to study the layout of the post itself. The selection of numerous vital signs entails

extra cost and expertise, and should be weighed against the research potential of the resource we wish to reflect and preserve.

Component 7: Control Groups

In vegetation monitoring, control groups are important in providing statistically relevant comparisons between sample plots (Sanders et al. 2008). To an archeologist and a preservationist, no resources are considered 'unimportant' enough to allow to decay naturally, however. For the purposes of an archeological monitoring plan, previously collected artifacts, historic maps, and areas outside known site boundaries represent the 'control.' That is, changes to the archeological environment are observed based on data collected thus far, notably Albinson's 1922 map (Figures 3 and 4) and Jones (1980a, Figure 5). In addition, MWAC's survey and limited artifact collection in 2009-2010 necessitated small excavation units. To maximize the research potential of these test units outside their immediate purpose, photographs were taken of them immediately after excavation, and then again several months later. Comparing photos immediately after excavation and then after a period of time suggests how quickly the ground "heals" after digging. Opportunistic experiments like these can add to our understanding of the signs of decay (in this case, looting), and in that sense, were made a 'control group' for one vital sign.

Component 8: Sampling and Implementation

Fort Charlotte is a relatively small site, and as such, benefits from routine sweeping site condition assessments such as those already prescribed by the National Park Service (2006), or intermittent walk-overs by park personnel. These assessments identify ongoing and predicted disturbances, but are not rigorously systematic or focused on features of interest to the park. This thesis therefore proposes a hierarchical monitoring strategy, with three levels of intensity: (1) NPS condition assessments, (2) rotating sample plots, and (3) intensive monitoring equipment at selected areas. Each of these focuses on the vital signs outlined in component 6. Sample plots, adapted from Sanders et al. (2008), may be randomly chosen sectors of the Fort Charlotte site, within which site condition assessments can be conducted to greater effect. These 'sub-site condition assessments' are not meant to replace an overall condition assessment or visits by park personnel, nor are they intended to monitor and prevent specific threats. Rather, inspecting and photographing small areas of the site provides more detailed information without substantial cost, and may reveal patterning or threats previously unknown to the park.

Given both general and sample-based information, the park is able to select what Sanders et al. (2008:10) call "index sites." These are locations within Fort Charlotte that are not sample based, but are chosen based on salient vital signs and the area's importance or relevance to the park's goals. Such locations potentially include the known points of egress in order to monitor visitor-use (Caven Clark personal communication),

the bank of snow creek where beaver activity is well known, the worn visitor trail leading from the canoe landing to the campground, and the canoe landing itself, which is prone to erosion and is often the location of exposed artifacts. At these and other identified threatened areas, a wide variety of monitoring options are available. Because the park operates with limited funds, these recommendations will be summarized and broken down into three tiers of increasing cost, following and adapted from Santucci et al. (2009):

Tier 1: Repeat photography. Park personnel set up permanent monitoring stations at select locations and take photographs with extensive documentation at each point, on a given schedule. These may be marked with pins, flags, or merely natural features along with GPS.

Monitoring stakes. In the case of erosion or water-level monitoring, stakes may be placed in the bank and measured on a set schedule.

Visitor registration. Monitoring visitor-use may be as simple as asking visitors if they have been to Fort Charlotte, and provide at least a rough estimate of the seasonal use of Fort Charlotte. For those paddling to and from the site via the Pigeon River, boundary waters registration may be a good source of data.

Tier 2: Digital mapping. With GPS information and GIS expertise, maps will be created on a set schedule that will visually depict changes in vital signs at select locations. Combined with data from Tier 1 and the more general or sample-based condition assessments, these maps may register anything from a change in the position of the Pigeon River to areas of increased threat within the site. Photographs may be linked to GPS points using ArcMap, and provide a comprehensive database of threats and changes in the area.

Volunteers. According to Elmendorf (1990:11), "amateurs visit 'their' sites on a regular basis," and if trained to be non-confrontational and sensitive to archeological monitoring, comprise an asset to park managers. Using volunteers to regularly and opportunistically monitor sites has been attempted to little effect at Dinosaur National Monument (Prokopetz personal communication), but education and partnership with local interested parties has been the 'modern' approach to preventing looting in other parts of the United States (LaBelle 2003, Kelly 2007, Hallowell-Zimmer 2003, Elmendorf 1990).

Tier 3: Remote sensing. The highest-cost and highest resolution method to monitor an area of interest within an archeological site is through remote sensing. Specifically, Fort Charlotte may benefit from seismic sensors combined with

stationary cameras, as at Buffalo National River (Caven Clark personal communication). Conductivity-based instruments, such as the remote metal detectors in use by the Southeast Archeological Center at Big South Fork National River and Recreation Area (DesJean and Wilson 1990:7), help to minimize false-alarms by only detecting metal. All instruments can be set up to radio information back to park headquarters, or to relay information to a satellite for use with hand-held instruments (such as a cell phone). The danger inherent in each of these instruments is that they will be stolen or vandalized. Depending on the vital signs the park has selected to monitor, it may be prudent to monitor off-site or difficult-to-access areas more intensively than areas of high public use. Monitoring points of egress to the site, for example, can allow for an identification of patterning without necessarily putting the equipment itself in harm's way (so to speak).

In summary, remote and salient portions of the site may be monitored very intensively with monitoring equipment, while more easily accessible areas may be monitored relatively regularly and efficiently by park personnel or volunteers, documented by digital mapping. Sample-based sub-site condition assessments will allow for new threats to be identified, and for monitoring resources to be moved accordingly. General site condition assessments and periodic walk-overs by park personnel will

continue as well, and provide the overall site information necessary to park planning and development.

Conclusion

Components 9 and 10: Validation, Analysis, and Refinement

Monitoring Fort Charlotte is an ongoing experiment. So far, the site has not been destroyed by either natural or human disturbances, and the Grand Portage National Monument exists to stay a step ahead of any disturbance to these important archeological resources. As such, monitoring strategies will always be revised as data are collected, analyzed, and as patterns emerge. Further, a monitoring plan will contribute to research at the site by providing information related to site formation processes, and by preserving salient portions of the site for later archeological research.

Chapter 5: Implementation and Impact

The theoretical aspects of a monitoring plan have been discussed (Chapter 2), and the justifications and goals for implementing such a plan at Fort Charlotte are numerous and hopefully compelling (Chapter 3). A monitoring plan has been advanced in general terms that borrows from a small set of related sciences, and seeks to provide the most cost-effective and efficient means of monitoring an archeological site (Chapter 4). This chapter will expand on the goals and methods of recent investigations at Fort Charlotte, and describe the concurrent implementation of a practical monitoring plan. In the process, this thesis will explore how a monitoring plan can be established in concert with the larger archeological investigation, and how it can be expected to impact site management and future research.

To review, Fort Charlotte is a component of Grand Portage National Monument, Minnesota, that relates directly to the activities of the North West Company from 1784 to 1803 during the Canadian fur trade. The North West Company was a Montreal-based conglomeration of smaller trading outfits, established circa 1784 in direct competition with the Hudson's Bay Company (Gilman 1992, Hanson 2005). These "Nor'westers," who would later become some of the most influential groups of the fur trade, established their primary depot on the western shore of Lake Superior at the "grand portage" or "great carrying place," an eight-and-a-half mile canoe portage that linked the lakeshore depot with Fort Charlotte, and bypassed the impassable terrain of the Pigeon River as it

approached Lake Superior (Gilman 1992, White 2005; see Figure 1). The North West Company's Grand Portage depot was the primary hub of fur trade activity on the western shore of Lake Superior, and combined with Fort Charlotte on the Pigeon River to the north, acted as the staging area for all the North West Company's business ventures in the interior. By no later than 1785, Fort Charlotte—used presumably as a loading/unloading and packing/repacking area—was considered an "old fort" by a competing Montreal company (Woolworth 1993). There is also evidence that the North West Company used the location of Fort Charlotte and its association with the Grand Portage trail to combat rival companies and thwart independent traders (Birk 2006:11, White 2005:73). Understanding Fort Charlotte—its layout, function, social mechanics, economy, etc.—thus promises to greatly inform studies of the Canadian fur trade, as well as larger studies in gender, change and dynamism during the fur trade, and even the emergence of the Métis as traders and as a nation (see Chapter 3).

2009-2010 Midwest Archeological Center Investigations—Methods

In 2009 and 2010, the Midwest Archeological Center (MWAC) conducted three archeological investigations at the site of Fort Charlotte (May 13-29, 2009; September 8-16, 2009; and May 10 - June 11, 2010). These three investigations were part of a two-year project to (1) delineate the extent of the historic artifact scatter, (2) to map the visible footprint of Fort Charlotte and the adjacent XY Company post, (3) to identify unknown and potentially prehistoric sites adjacent to the known location of the two trading posts,

and (4) to examine the overall nature of archeological deposits in the vicinity. Previous to 2009, archeological work at Fort Charlotte was limited to underwater excavations and shovel testing (with negative results) by the Minnesota Historical Society (Birk 1975) and site mapping combined with a small amount of geophysical prospection by Huggins and Weymouth (1979) and Jones (1980a, Figure 5). For the intervening 20 years, Fort Charlotte has been preserved as a resource trust, and any material remains of the post that exist *in situ* had remained unexplored.

The site was revisited three separate times as part of the 2009-2010 project conducted by MWAC; twice in the summer and once in the fall. Archeological survey, mapping, and excavation was carried out by crews consisting of MWAC archeologist Jay Sturdevant, GRPO chief of resource management David Cooper, and MWAC archeological technicians Andrew LaBounty, William Altizer, Curtis Sedlacek, and Anthony Bates. As listed above, two of the goals of these investigations were to delineate the site and explore the nature of the archeological record at Fort Charlotte and the adjacent XY Company post. To that end, MWAC crews used metal detectors to identify artifact concentrations, and based on perceived clusters of hits, placed a total of five 0.5 m x 0.5 m test units in select locations outside each post. These small excavations were placed outside the post walls to minimize the impact to the larger archeological site, and were designed only to demonstrate the nature of the deposit and the condition of the artifacts. Each small test unit was dug in five-centimeter increments from surface, and were associated with high concentrations of metal detector hits. The

results and precise locations of these test units will be contained in the technical report currently underway at the Midwest Archeological Center (Sturdevant in press). Palisade lines, still visible after years of decay, were simultaneously identified and correlated to Albinson's 1922 map of the site (Figures 3 and 4), and were formally re-mapped by the MWAC crew in 2010 (goal 2). Formal site mapping was completed in 2010 by assigning individual numbers to architectural features identified on historic maps by Albinson 1922 and Jones 1980a (Figure 6), which were then identified in the field. Such features as could be positively identified were carefully mapped and recorded on an individual level, using standard MWAC feature forms pre-filled with all available information for any given feature. Each feature was also plotted on a large site map using an Ushikata surveying compass and a Sonan sound-based measuring device to calculate angles and distances through thick vegetation (Figure 7). Datums established in the fall of 2009 and several older MWAC datums—established by Bruce Jones in 1980 and relocated in 2009—were used as the primary mapping datums. The vegetation density at the site required ten other temporary datums to be established in 2010.

Early in this brief series of investigations, based on the number of visible features and the well-preserved condition of the artifacts, it seemed clear that archeological deposits at Fort Charlotte were intact and significant. These features were also notably difficult to access due to dead and down trees, and were difficult to see through thick vegetation on the ground. These factors were assumed before 2009 to be the primary deterrents to looting, and seemed to account largely for the site's intact nature, but the

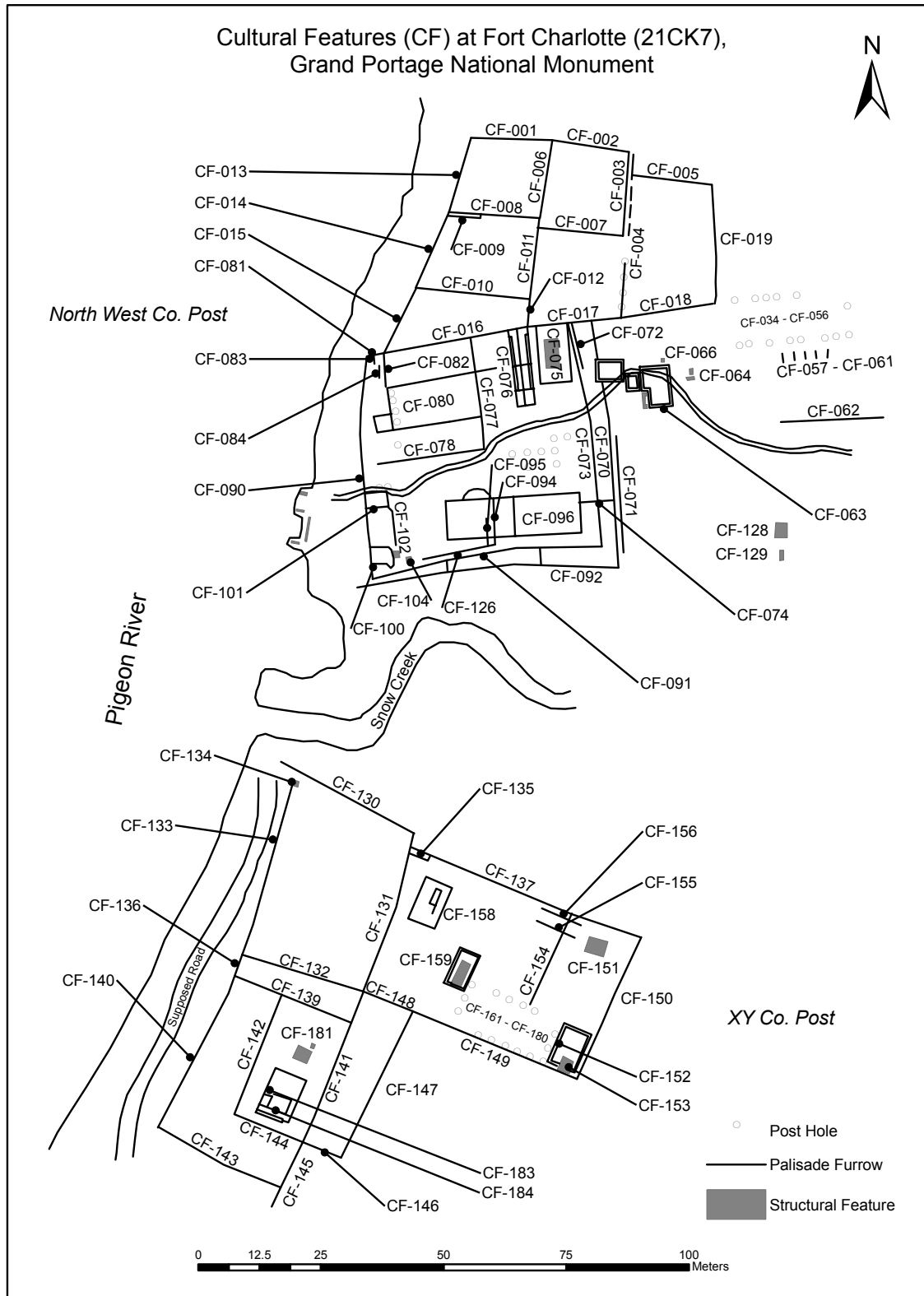


Figure 6. Numbered cultural features (CF) at Fort Charlotte, in preparation for 2010 fieldwork (Albinson 1922 map depicted).

**This figure is deemed sensitive information under the
Archaeological Resources Protection Act (16 U.S.Code 470aa-470mm),
and is not included in this version.**

Figure 7. Map depicting features relocated in 2010 (in black). Underlay (in gray) is Albinson's 1922 map for comparison.

permanence and continuing efficacy of these circumstances is now in question. During the summer of 2009, therefore, park management and MWAC archeologists identified an opportunity to use the upcoming archeological projects to develop a plan by which the site could be monitored and preserved, resulting directly in this thesis. Such a monitoring plan would require (1) a better understanding of the nature and extent of the site, as well as (2) an inventory of visible features. By 2009, that much was already underway, as it was precisely the focus of the original project goals. A responsible monitoring plan, however, would also require (3) identifying at-risk features and/or artifacts scatters, and (4) developing a method for consistently monitoring them year-to-year. Additionally, the plan would need to be (5) operationalized in a way that makes it possible to remain consistent over the careers of multiple cultural resource managers. This thesis fulfills these last three needs, and articulates with the original 2009-2010 MWAC project goals: Given the opportunity to both study and preserve the site of Fort Charlotte, the 2009-2010 MWAC project was expanded from an interest in delineating and inventorying Fort Charlotte to additionally monitoring and preserving the site, thereby contributing to the park's updated management plan for the area.

During the fall of 2009 and the spring of 2010, concurrent with ongoing inventory and mapping efforts, MWAC crews employed methods set forth by the U.S. Army Corps of Engineers and others (Niemi and McDonald 2004, Noss 1990, Santucci et al. 2009, USACE 2005) to collect baseline data and establish monitoring points in areas of high visitor use and high feature visibility. Baseline data consists of GPS readings and

photographs relevant to a general evaluation of the site, specifically areas of erosion and areas of potential site vandalism and artifact collecting (USACE 2005:7). These data are only collected once, and are used as the baseline or 'original condition' of the site.

Routine monitoring thereafter may be conducted by untrained personnel, and consists of GPS data and photographs that focus on observable changes to the site (USACE 2005:8).

At Fort Charlotte, following DesJean and Wilson (1990), areas 'relevant to a general evaluation of the site' consist of visible features most at-risk for vandalism or erasure by natural forces. As such, the condition and visibility of these features reflect one of the "vital signs" that we wish to measure at Fort Charlotte (Santucci et al. 2009). Likewise, following Noss (1990:357-358) and Niemi and McDonald (2004:93), visibility of salient features act as "indicators" that (1) are sensitive enough to provide early warning of change, (2) are widely applicable, (3) provide a continuous assessment over a wide range of stresses, (4) are independent of sample size, (5) are easy and cheap to measure, (6) discriminate between natural and anthropogenic stresses, (7) are relevant to significant phenomena and (8) are sensitive enough to change measurably when the system is affected, but remain predictable when it is no longer under stress. Thus, visible features representative of the layout and condition of Fort Charlotte were chosen as monitoring points based on their vulnerability, location, and visibility, because it is these visible and salient features that we wish to preserve, and it is these features that will exhibit damage earliest and most obviously. The identification of features was facilitated by MWAC activities to delineate site boundaries and examine the nature of the deposit. As noted,

the 2009-2010 projects led to assigning each visible site feature a number, recording it via GPS, and plotting it on the site map. A geographic information system (GIS) map was then developed for the site by MWAC staff, which has since been linked to an interactive database of artifact images, feature photographs, and research materials. Additionally, detailed maps depicting visible features have been digitized based on field observations and mapping conducted in 2010. These maps, the interactive database, and the complete list of features were assembled to fulfill the original project goals, but remain relevant (and indispensable) to facilitating a monitoring plan at Fort Charlotte. Following Santucci et al. (2009), this thesis has made additional use of these maps to highlight overlapping areas of visitor-use and cultural features to predict the most likely areas of vandalism or natural loss, which suggests additional monitoring points and trail alternatives in those areas (Figure 8). The product of these various enterprises is a series of maps depicting the locations, conditions, and vulnerability of numbered features, the most salient of which (in terms of monitoring changes to the site) are linked to specific "monitoring points" at which condition data will be regularly collected in the form of photographs and condition observations (Figure 9).

Results of 2010 Investigations

From May 10 to June 11, 2010, the Midwest Archeological Center completed archeological investigations at Fort Charlotte. After the initial surveys conducted in 2009, the purpose of the 2010 investigation had become, in part, to establish a dataset of

**This figure is deemed sensitive information under the
Archaeological Resources Protection Act (16 U.S.Code 470aa-470mm),
and is not included in this version.**

Figure 8. Map depicting primary area of visitor-use (5 meter radius from current trails). Underlay (in gray) is Albinson's 1922 map for comparison.

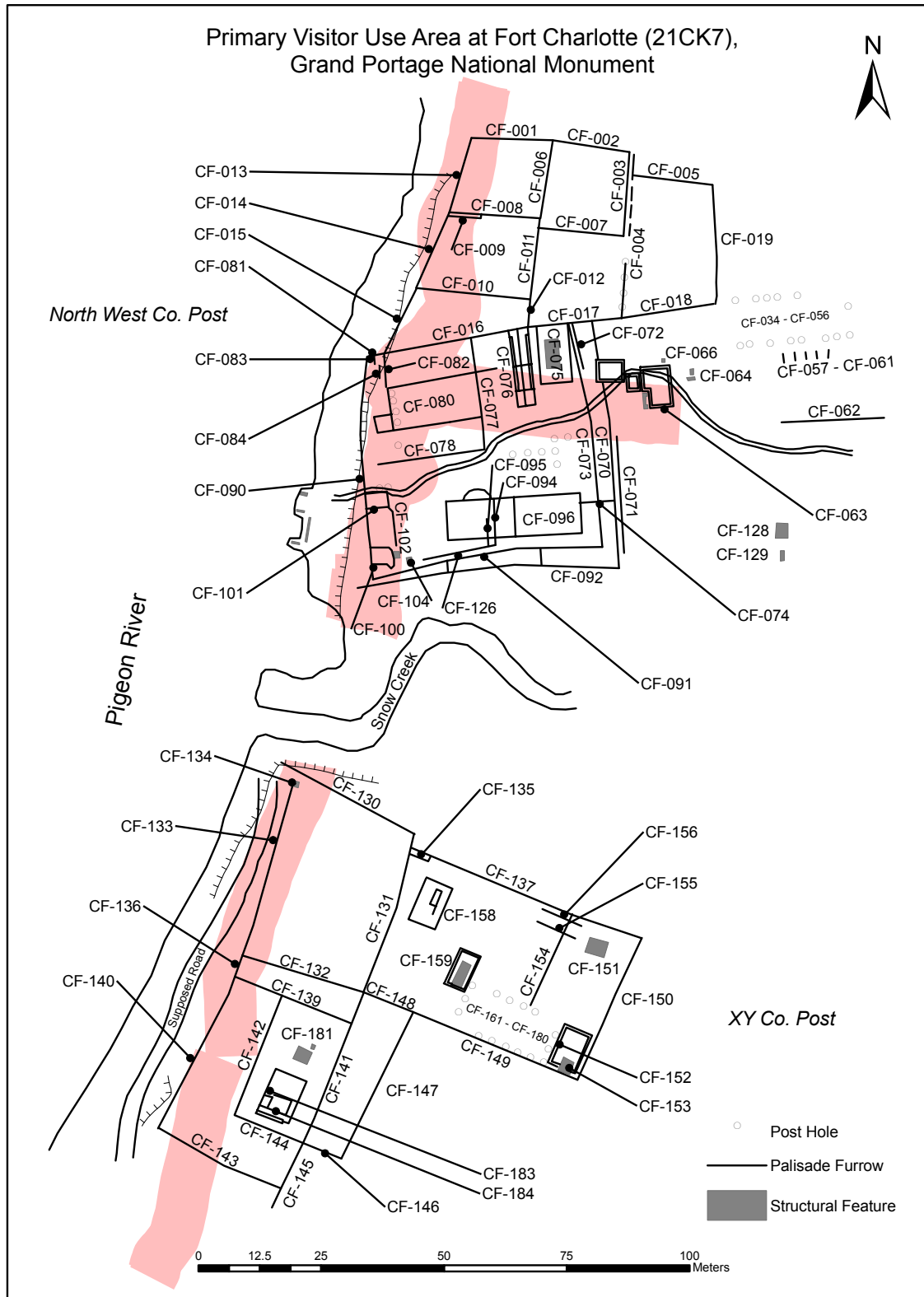


Figure 9. Map depicting threatened features at Fort Charlotte (red displays primary visitor use area; a 5 meter radius from current trails).

baseline conditions at Fort Charlotte from which changes to the site could be observed and measured. Five monitoring points were formally established. These points are marked with nails to facilitate relocation using a metal detector, and were placed specifically to be within view of very visible or vulnerable features. Photographs and general observations will be taken from these monitoring points in years to come, and should serve as consistent measures of change to the site. Temporary datums established for mapping were also recorded using GPS, and may be reused in the future as additional monitoring points. The maps produced by the MWAC crew in 2010 suggest that much of the site is intact and has remained visible since 1922; more visible, in fact, than maps produced by Jones (1980a) under less ideal conditions had suggested. For that reason, MWAC mapping datums were left in place (marked with wooden stakes) as reference points.

To further delineate the site and provide management information regarding artifacts at Fort Charlotte, the 2010 MWAC crew surveyed site boundaries with metal detectors, and established small (3m x 3m) metal detector sample plots within each post. These metal detector hits were excavated, revealing the shallow nature of the deposits (3-9 cm below surface) and the character of the artifacts. Artifacts at both Fort Charlotte and the XY Post are well-preserved, and their distribution suggests a rich collection of fur trade materials extending well beyond the known boundaries of each post. Metal detector surveys were conducted along drainages on either side of the site, and suggest that camp or dump sites are possible in these areas, and may be contemporaneous with the operation

of the fur trade companies. Although metal detector surveys demonstrated a dense pattern of metallic artifacts within and immediately surrounding each post, pedestrian survey did not reveal any artifacts eroding out of the banks on either bank of Snow Creek, which separates the two posts, and few artifacts were exposed within the posts. The shallow soils do little to cover artifacts, but heavy vegetation produces a thick layer of duff that obscures both artifacts and features within the site. During the project, Scott Bressler (Fire Management Officer at Voyageur's National Park) also assisted the crew by providing his observations regarding the fuel load on the site, and the possibilities of defending it in case of fire—that is, a "fuels and fire condition assessment" was informally conducted in 2010. Bressler's recommendations to mitigate fire damage include cutting and scattering the dead and down trees off-site to protect features from excessive heat buildup, but he adds that Fort Charlotte is essentially indefensible in case of fire.

Through archeological survey and mapping, the project successfully demonstrated the intact nature of Fort Charlotte, and provided information to which future condition assessments can be compared. Five monitoring points proposed in the fall of 2009 were relocated, mapped, and formally defined, in addition to features that were presumed destroyed. The original five monitoring points were established at the most visible or threatened of the features identified in 2009, and are described narratively below (refer to Figures 6 and 9). These five monitoring points were marked with nails and flagging tape to facilitate instrumental detection.

Monitoring Point (MP)-1: Deep depression, presumed to be a cellar in the center of the NorthWest Company post; designated cultural feature (CF)-75. In September 2009, an exploratory trench was excavated in the north wall of the feature. Two nails were placed at either end of the trench, designated MP1-1 and MP1-2, from which photographs were taken for later comparison. This feature represents one of the largest and most visible features within Fort Charlotte, and is located immediately off the Grand Portage trail, which is the historic trail to the depot on the lake. The trail is often used by park visitors getting into or out of the Pigeon River. The feature's visibility and location in a higher traffic area put it and the surrounding site at risk for casual artifact collection. Visitors curious about Fort Charlotte's actual location (which is not revealed by nearby signage) logically treat visible features like CF-75 as landmarks, and as such, CF-75 should at least be monitored for well-meaning visitor impacts.

MP-2: Visitor trail intersection with CF-130 and CF-134, a rectangular palisade outline thought to be destroyed. This monitoring point was established in the fall of 2009 and served as the basis for much of the subsequent mapping. It was easily relocated given its location immediately adjacent to the Snow Creek bridge on the northwestern bank, and a park signpost. The bridge is in a state of disrepair, however, and since the visitor trail runs directly through both the XY and NorthWest Company posts, the bridge, the trail, and the sign are liable to be

removed or otherwise altered within several years. At present, MP-2 consists of two nails placed at either edge of the trail, and are designed to illustrate any widening or other horizontal variation in the path. Mapping and photos were undertaken from the western nail. GPS and instrumental detection (e.g., a metal detector) will facilitate relocation of this monitoring station in the absence of other obvious features.

MP-3: CF-151, a deep cellar at the XY Post and location of an exploratory trench in September 2009. As one of the most visible features of 21CK7, and the XY Post in particular, the cellar represents a potential target for looting, and is one of the few features that demonstrates the location of the larger site. Additionally, this feature is at the end of a trail investigated in the summer of 2009 that is hypothesized to have been used historically by XY Company traders wishing to avoid the main road through the NorthWest Company depot. As such, the cellar acts as a landmark and an access-point used historically, then by our crew in 2009 and 2010, and potentially by visitors or vandals in the future. The feature should therefore be monitored regularly and treated as an access point to the site (following Clark, personal communication). A one-meter (?) trench, excavated in the summer of 2009, can also be monitored for how the ground "heals" after disturbance. In the summer of 2010, the refilled trench was still visible and had not been covered by duff or by new vegetation.

MP-4: Heavily eroded canoe landing, proposed for closure and blockage with deadfall.

The canoe landing has long been a concern of park staff (Cooper personal communication), as artifacts are routinely discovered eroding out of the cut bank at low water levels. This represents one of the few places on-site where artifacts are visible on the surface, and valuable finds at this location present a liability to the security of the site. Nails were placed at either end of the canoe landing where it intersects with the natural bank, and the area should be photographed and monitored for expanding impacts. Additionally, the canoe landing should be closed and moved downstream to a point away from the site, nearer the off-site campground.

MP-5: CF-153 and CF-152, a large chimney pile and distinct oven berm, respectively, in the extreme southwest corner of the XY Post. The feature is far from current trails and visitor use areas, existing in an area of less dense vegetation that makes both features highly visible. Distance from visitor-use areas minimally protects the feature from casual artifact collection, but the remoteness and visibility of the feature lends itself to potentially more focused looting, following DesJean and Wilson (1990). This feature is also notably threatened by trees growing out of the chimney fall and the surrounding berm, and has already been subjected to falling trees. The feature will benefit from the removal of these trees, and subsequent monitoring of nearby vegetation.

Further, dead and down trees in the vicinity contribute to an increased fuel load directly atop the feature, and are recommended for removal and scattering off-site (Scott Bressler personal communication).

In addition to the five monitoring points already established at Fort Charlotte, the following eight features are proposed as monitoring points either because of their representative nature, their overall visibility and ease of relocation, or their status as areas of potentially high visitor-use. These features tend to be located near 2010 mapping datums, which are marked with wooden stakes. Monitoring stations established at these locations should be marked with nails, consistent with the five established points described above. Like the five above, the following points will act as indicators of the site's condition, and will reflect the vital signs of Fort Charlotte (Noss 1990, Santucci et al. 2009). Photographs and other observations can thus be documented from consistent locations on a regular basis, and the monitoring schedule and methods of observation (e.g., photographs versus electronic surveillance) may then be modified based on these observations (see Chapter 4).

MP-6: The intersection of several palisade lines representative of features in the area and around the site: CF-131, CF-135, and CF-137, with a corner consisting of CF-130 and CF-131 a short distance to the north. In other words, this monitoring point is a relatively "generic" sample of palisade lines and local

vegetation, and tends to demonstrate the overall visibility of the XY Post.

Additionally, because palisade lines extend in three directions from this point, forming a distinctive feature useful for navigating the site, other features can be traced and monitored from this cluster. The location was also used as temporary mapping datum 2010-1 in 2010.

MP-7: CF-96, a presumed structure consisting of a rock foundation, which is visible only in small linear sections. Partially buried stones are subject to root action, and are being tipped up or displaced. The feature is near the current grand portage trail at the heart of the NorthWest Company post, and is therefore at risk for casual or recreational looting that would significantly damage a large percentage of the site. Dead and down trees also contribute to a high fuel load on the feature, and are recommended to be cleared and scattered off-site. If this is done, the feature will be open and more visible to the grand portage trail (there is minimal live vegetation in the immediate area), so routine monitoring will be increasingly important either by visitation or by electronic monitoring. Temporary mapping datum 2010-8 is located a short distance to the north.

MP-8: Three oblong pits (CF-103-105) and a mound feature (CF-100), situated immediately off the trail across from the canoe landing (MP-4). Although these feature are overgrown and not obvious from the trail itself, they are clustered

and distinct up close, and present an opportunity for efficient monitoring.

Temporary datum 2010-9 was established at the northeast corner of the mound, and may double as a monitoring point for these four features, in addition to palisades CF-90, CF-91, and CF-92, which make up the southwest corner of Fort Charlotte.

MP-9: A presumed post-in-ground structure in the middle of Fort Charlotte, consisting of 10 pit features (CF-111-121; CF-120 was not relocated). This cluster of features is north of temporary mapping datum 2010-8 and CF-76 (MP-7), and lies almost immediately south of the current Grand Portage trail. Because of its proximity to the trail, the cluster of features is at-risk for casual artifact collection. The features are more easily identified when filled with water.

MP-10: Interpretation area, and point of egress to Fort Charlotte. The small clearing contains the only interpretive signage relating to the site, and also contains the visitor sign-in station and a sign directing visitors back to the reconstructed depot along the historic Grand Portage trail. Temporary mapping datum 2010-7 was established at the west end of the clearing. Although there are no known features in the vicinity, the area is within the footprint of Fort Charlotte, and may be worth monitoring for visitor-use, since virtually all foot traffic passes by

this point. Ultimately, it is recommended that the park move all trails and signage off-site, rendering MP-10 obsolete.

MP-11: Due to deteriorating visibility, the NorthWest Company post was not fully mapped in 2010. Those features that were relocated are visible immediately off the trail, and would be easily monitored. Several meters north of mapping datum 2010-10, palisades CF-1, CF-2, CF-6, and CF-13 form the northwest corners of Fort Charlotte. The western wall of Fort Charlotte has, in fact, become the visitor trail itself, but the corner is still visible at the top of a shallow drainage. Because the corner represents the extreme northwestern boundary of the post, and because post artifacts and refuse are likely to be found in the adjacent drainage, the area is considered archeologically significant. Erosion and visitor-use threaten archeological integrity, and mitigative excavation may be warranted if vital signs deteriorate; thus, routine monitoring is recommended at this point.

MP-12: A four-way intersection of palisades CF-141, 144, 145, and 146. Mapping datum 2010-5 is located immediately to the SW of the intersection. The intersection of four palisades presents an opportunity to trace multiple features from one location, and represents a navigation landmark at the south end of the XY post. Additionally, the palisade lines are relatively obvious and

representative of palisade lines elsewhere on-site, and are located on higher-ground where natural erosion is not expected to affect their definition.

Deterioration of visibility here—potentially due to changing weather patterns or soil generation—suggests a loss of information elsewhere, so MP-12 may be considered a good indicator of overall site vital signs.

MP-13: Oven berm and chimney fall; CF-159 and CF-160, respectively. Adjacent to XY post-in-ground structure, east of MP-5 (another chimney fall / oven berm). Mapping datum 2010-3 is nearby to the southwest. As a second chimney fall located opposite MP-5, these features may provide important clues as to the function of the post-in-ground structure that separates them. Similar to the first oven berm, CF-159 is well-defined, but is entirely overgrown. Nevertheless, as a substantial rise in the ground surface, it may be at risk for more industrious looting. Further, because of the dead and down trees criss-crossing the feature, it is in extreme danger of fire damage, and should be cleared. In so doing, the feature will be exposed to other threats, including weathering, animal damage, and looting, and will require monitoring for any or all of these potentials.

These thirteen monitoring points serve as a representative sample of the larger site's condition (encompassing both the NorthWest Company's Fort Charlotte and the XY Post), and highlight the most at-risk features, either because of proximity to visitor-use

areas, or because of their inherent size and visibility. These points are to be monitored for damage (either through natural forces or vandalism) and increased visitor-use, which may prompt more continuous surveillance or administrative action—even litigation under ARPA. Other features were recorded in 2010 that could also be monitored, possibly on a rotating or random sample basis (see Chapter 4), given the large number of visible features at this site. In 2010, the MWAC crew also took extensive photographs of visible features for inventory purposes. Although not strictly associated with monitoring per se, these photographs depict palisade intersections from which multiple features can be traced, and were taken using a tripod, which supports the use of the high dynamic range (HDR) technique to improve image fidelity during processing (Long 2007). These photo points were logged, recorded with GPS, and plotted on the site map. Similar techniques may be used during monitoring, if the HDR technique proves archeologically useful. These photos were also added to the GIS database and linked to their respective features in an interactive format—meaning points can be selected using the ArcGIS software, and associated images will be displayed. In the future, as established monitoring points are used to assess site condition, GIS can be similarly employed to document and indicate both extreme and subtle changes to the site, as suggested in Chapter 4.

Looking Ahead

The monitoring plan proposed in Chapter 4 goes beyond what has been implemented at Fort Charlotte so far. Additional work to be done includes developing a

system of records management (likely involving GIS and the Archeological Sites Information Database [ASMIS]), deciding which features to monitor and how often, and deploying electronic surveillance equipment in select locations. These monitoring activities will have a variety of outcomes, incidental to generating the data necessary for planning and preservation. Conceivably negative results of archeological monitoring include diverting damage to other sites (specifically those outside of park boundaries), increasing the intensity of looting activities by inadvertently "advertising" the location of artifact-rich areas within Fort Charlotte, and introducing a bias to the archeological record in terms of what is worth protecting. These possibilities will be discussed along with positive reactions to such threats, including education, outreach, and partnerships with local parties.

Positively, a monitoring plan will provide protection for archeological resources through law enforcement, deterrence of looters, enabling efficient response by park personnel, and by supplying site condition and visitor-use data for long-term management strategies. In addition, a monitoring plan will enhance archeological research by recording changes to the site, and it will prepare archeologists to deal responsibly with emergent or inadvertent finds at Fort Charlotte. Finally, a monitoring strategy at Fort Charlotte can lead to education opportunities and help to enhance archeological interpretation throughout the park, specifically at the reconstructed depot at Grand Portage. By regularly monitoring Fort Charlotte and protecting its archeological resources, Grand Portage National Monument staff can hope to bring Fort Charlotte more

into the mainstream of park interpretation and visitor interest without sacrificing archeological integrity or site significance.

Negative Impacts

In the realm of natural resources, short-sighted techniques to prevent natural disturbances can occasionally result in dire consequences. These kinds of concerns have counterparts in cultural resource management. A National Park unit, for example, can legitimately police sites within its boundaries (16 USC 470), but the protection of park resources can simultaneously increase the vulnerability of those resources located immediately outside the park, where the federal government has no legal control. Thus, heavy-handed protection of park resources may cause collateral damage to the larger archeological record as "demand" for artifact-collection among looters increases (analogous to allowing fuel load to increase prior to a catastrophic burn). Similarly, sites that are well protected may experience a decline in looting or other damages, but less protected sites could be at risk for displaced stressors—including vandalism, casual collection, or merely routine visitor-use—much in the same way that hardening a river bank increases erosional stress further downstream. Finally, protecting archeological sites too obviously, as at Fort Drum, New York, can be interpreted as "dig here for artifacts" (Rush et al. 2008:151, USACE 2005). Well-meaning park visitors and casual looters may be deterred by signage and the threat of legal action, but serious looters at Buffalo National River, for example, have been known to work at night with electric

generators and may even be armed (Caven Clark personal communication). In the face of such determination, protection and monitoring strategies must rely on law enforcement practices, and should acknowledge that safe confrontation of looters trumps archeological concerns.

A monitoring plan of the nature discussed here has other negative impacts with which archeologists are more familiar: that of introducing bias to the archeological record. At Fort Charlotte, thirteen features were deemed useful for monitoring purposes, based on the goals defined by the Midwest Archeological Center's 2009-2010 research project. As Chapter 3 illustrates however, there is a wide array of research agendas to be pursued at Fort Charlotte, ranging from extremely context-sensitive investigations to overarching regional trends. The park should be cognizant of a multifaceted interest in Fort Charlotte, and effectively monitor the entire site, as well as its environment, as suggested by Chapter 4. Perhaps this may be achieved in the future through random samples of site areas, or through more advanced electronic monitoring, but park resources are limited. Salient features will be selected and sample plots may be monitored according to an established routine, while less visible or significant features decay. Unfortunately, this bias favoring "salient features" is the reality of historic sites preservation, and archeologists should be aware of its effects (see Barthel 1989).

Positive Impacts

The benefits of an archeological monitoring plan far outweigh the costs. At Fort Charlotte, land managers can expect to gain a measure of protection for archeological resources through the consistent monitoring of archeological features and the local environment. While evidence of looting gained through electronic surveillance could be admissible in a court of law, and has led to arrests in the southwest (DesJean and Wilson 1990), capturing an identifiable individual on film is unlikely (Caven Clark personal communication). Rather, the park should expect to use electronic surveillance as a means of pattern recognition in visitor-use of the area, which will aid in planning and development rather than reactionary steps. Of course, hope also remains that devices like seismically triggered alarms and motion-sensitive cameras may be used to prosecute and ultimately end looting. Equipment that demonstrates a park presence, including simply flagged monitoring points, will also lend themselves to deterring casual looters—which is to say, visitors will "know we know they know" where obvious features are located. The effectiveness of a deterrence strategy will also be enhanced by educating visitors regarding the implications of the Archeological Resources Protection Act (available online) and the Antiquities Act (available online). This is accomplished on-site with signage, but could be emphasized at the park visitor center as well.

A monitoring plan will also expand archeologists' ideas regarding research and preservation. Monitoring data, which will include images of features from year-to-year, and potentially season-to-season, can be used in spatial analysis or in the study of

formation processes (e.g., Schiffer 1983). These data will also provide a wealth of background information that can direct mitigation or research plans by identifying those features least likely to survive, or those most likely to be undisturbed. A monitoring plan will further prepare archeologists at Grand Portage National Monument to deal responsibly and quickly with incidental finds, before they are disturbed or even noticed by visitors. Monitoring data may also bear on interpretation at the lakeside depot, where images or descriptions of Fort Charlotte could stand in for otherwise undirected and destructive visitation. Finally, the monitoring plan proposed here has itself been directed by archeological research questions—including questions related to the use of land surrounding Fort Charlotte, and the extent of the posts proper. Because the monitoring plan was tailored specifically to Fort Charlotte and to these explicit research questions, additional monitoring points may be established later to serve other purposes. Ultimately however, archeologists at Grand Portage will carefully observe and preserve archeological resources for future archeological research. This stands in contrast to mainstream historic preservation, which focuses on mitigation or on visible historic structures (Barrow 2009; Crosby 1978; Mills and Fore 2000; Thorne 1991, 1989, 1988; and others).

Summary

The success of a monitoring plan at Fort Charlotte depends on establishing a baseline, measuring changes to the site, recording these changes, and acting on the data

that are generated. A baseline has been established by the field projects in 2009 and 2010, and this thesis has suggested ways to measure changes to the site, and ways to gather useful data for planning and development (Chapter 4). In the final chapter, I will briefly explore the topic of record-keeping and reporting, and discuss what the park can do with monitoring data, as well as what cannot be done.

Chapter 6: Data Management

Given the significance and research potential of Fort Charlotte, this thesis has proposed a generalized approach to historic sites monitoring, the implementation of which was described in the previous chapter during the 2009-2010 Midwest Archeological Center projects at Grand Portage. A monitoring plan does not end after establishing monitoring points, however, or even after routine data collection. Rather, a monitoring plan comes to fruition when these data are archived, compared, and used to preserve the site. This final chapter will therefore discuss ways that monitoring data can be gathered, stored, reported to park management, and ultimately applied to the benefit of the archeological site. I will also touch again on the limitations of monitoring data, and develop a focus on future archeological research.

Record-Keeping

Data-collection: Standardization and Forms

Chapter 4 suggests that monitoring data be collected on a routine basis, the frequency of which is determined by threat levels and park management/research goals. Once archeological planners establish monitoring points on-site, what should be done with them? Land managers have several options of differing cost and effort. At the lowest cost level, photographs and erosional observations can be taken at each monitoring point, and visitor-use can be assessed as a whole for the site (Santucci et al.

2009). With more cost and effort, digital mapping can be employed that makes use of photographs, feature measurements, visitor-use information, and other observations to develop comparable and useful maps, using monitoring points essentially as field-tested "datums" for the purpose. Educated and trained volunteers may also be used to monitor sites between scheduled visits by park personnel (LaBelle 2003, Kelly 2007, Hallowell-Zimmer 2003, Elmendorf 1990, Prokopetz personal communication). Finally, although the cost of implementation and training is high, electronic surveillance equipment provides the highest frequency of monitoring to nearly instantly detect changes in features (DesJean and Wilson 1990, Clark personal communication).

These recommendations tend to leave the methods of observation to the imagination. In fact, worthwhile observation takes careful thought and methodological consistency so that meaningful comparisons can be drawn between individual site condition assessments over the long term. To combat subjective measures of site condition, the Midwest Archeological Center of the National Park Service has developed, and routinely revises, the standard site condition assessment (SCA) form (NPS 2009a). This short, one page form is the methodological backbone of the Archeological Sites Information Management System (ASMIS) for the midwest region, and requires qualified archeologists to evaluate sites based on specific observations using defined responses. Site condition may range from "good" to "destroyed," and each of the six possible responses are carefully defined by the NPS. For example:

GOOD - The site, at the first condition assessment or during the time interval since its last condition assessment, shows no evidence of noticeable deterioration by natural forces and/or human activities. The site is considered currently stable and its present archeological values are not threatened. No adjustment to the currently prescribed site treatments are required in the near future to maintain the site's present condition.

...

POOR - The site, at the first condition assessment or during the time interval since its last condition assessment, shows evidence of severe deterioration by natural forces and/or human activities. If the identified impacts continue without the appropriate corrective treatment, the site is likely to undergo further degradation and the site's data potential for historical or scientific research will be lost. [NPS 2006]

In addition to an overall (and a somewhat perception-based) assignment of condition, NPS archeologists in the midwest region are also required to list "threats"—potential factors of deterioration—that are affecting the site, and to identify any "disturbances," or ongoing factors of deterioration. The archeologist must then simply check boxes that correspond to defined values of disturbance effects, threat timeframes,

proposed treatments, data potential, etc. Although these site condition assessments have proven effective in gathering the condition data necessary for ASMIS and Federal compliance (sites are treated as "assets," and are subject to audits), site conditions are often vague and subjective from an archeological researcher's point of view. Thus, the standardization of SCA forms throughout the midwest region is to be celebrated, but as a result of its implementation, is too generalized for use in a monitoring program that seeks to measure and prevent the degradation of key archeological features.

In the same vein, NPS "ranger monitoring" forms seek to regularly record archeological site conditions for updating ASMIS (NPS 2009b). The difference between ranger monitoring and official site condition assessment is that "monitoring" does not imply any trained archeologist has recently visited the site. Rather "monitoring," as defined in ASMIS, is conducted by people familiar with the site's location, but not necessarily trained in the investigation of cultural historical resources. The form itself is simple, consisting primarily of basic site and personal information that can be entered into ASMIS to demonstrate the site was visited in a given year (e.g., name of monitor, date of inspection, reason for visit, site number, etc.). Additionally, the form requires the monitor to evaluate to two questions: 1.) is there any visible ground disturbance, and 2.) is there anything that might damage the site in the future? The answers are taken to reflect "disturbances" and "threats," respectively, which are noted and taken into account by archeologists during a formal site condition assessment. If severe damage is noted during a monitoring inspection, it can thus be brought to an archeologist's attention, and

damage can hopefully be mitigated. More to the point, site conditions can be tracked and recorded annually in ASMIS without sending an archeologist to evaluate every site in the National Park Service. Making use of untrained observers to monitor archeological sites is not a new idea (Elmendorf 1990, Hallowell-Zimmer 2003, Kelly 2007, LaBelle 2003), and has obvious benefits where archeologists cannot always be present. At Fort Charlotte, where the archeological site is far from rangers' regular duty-stations, it may be worth considering using interested volunteers to monitor the site in between officially scheduled assessments. In such a situation, guiding the assessment activity with a standardized form is a good way to ensure that comparable data is gathered each time a feature is monitored.

In her monitoring plan proposal for Dinosaur National Monument in Colorado, Smith (1985) considers law enforcement a "strong deterrent" (1985:4), and argues that site inventory and subsequent monitoring is critical in order to provide evidence in court. According to her strategy, site monitoring occurs after inventory and evaluation, and is conducted according to the results of evaluation of a site's inventory (Smith 1985:38). As the monitoring process continues, "inventory information is used as a resource base for comparative work" (Smith 1985:38). The proposed monitoring plan, which may result in stabilization actions by the park, consists of four components: site photography (both general and detailed), quantitative measurements of an affected area, mapping, and a brief form specific to rock art condition evaluation, similar in style to the now-standard NPS site condition assessment (Smith 1985:47). The combination of these four types of data

is meant to show change over time, and to provide evidence of deteriorating conditions under suspicious circumstances. Although the plan was never adopted at DINO, Smith's monitoring strategy demonstrates the importance of systematic observation, evaluation, and comparison. According to Smith, "usual inventory or monitoring methods are inadequate to record it [rock art] properly" (1985:55). As such, her 'prototype' monitoring form is designed to supplement existing monitoring/condition assessment forms, and adds fields such as design elements of the rock art, colors, superimposition, patination, lichen, weather, and tracings (Smith 1985:55-56). These "special considerations" add to the resolution of the monitoring data, and allow for in-depth comparisons by people who are not necessarily trained in studying rock art.

Similarly, when Dial (1996) surveyed the Sny Magill mound group at Effigy Mounds National Monument, Iowa, she developed supplemental fields to more carefully record threats and disturbances unique to the site. This form specifically tracked tree growth on the Sny Magill earthworks, emphasizing (1) vegetation, including number, trunk diameter, and health of trees, (2) evidence for active mound erosion, and (3) other forms of ground disturbance, such as tree falls, pot holes, or animal burrows. In developing this system to monitor unique threats, Dial was able to record and monitor a variety of threats that standard condition assessments would otherwise miss.

Given the preceding examples, I recommend continued use of the forms in place within the National Park Service at Fort Charlotte: SCAs should be completed on schedule by qualified archeologists, and avocational monitors should carefully record

their observations using the appropriate monitoring form. In addition, the examples set forth by Smith (1985) and Dial (1996) demonstrate that monitoring data can be enhanced with supplemental observations specific to the site or features being monitored. I recommend, therefore, that a form similar to Appendix B be introduced at Fort Charlotte in addition to the regular assessment forms. This form emphasizes site-specific observations that (1) can be entered into MWAC's GIS database, (2) can be tied to previous mapping efforts (e.g., site feature numbers and monitoring points), and (3) address the threats specific to a shallow historic site like Fort Charlotte (e.g., visitor use and tree falls).

Photography

Photography is an important part of monitoring and documentation, and it is well worth a few words to discuss procedure. High Dynamic Range (HDR) photography was used during the 2009-2010 MWAC projects in hopes of developing a clearer image of specific features. This technique is a recently popular method of combining the data from three bracketed photographs (meaning three identical photographs taken at various exposures), and is meant to enhance the fidelity of the image during processing (Long 2007). In short, an HDR photograph contains the color information of three photographs, and while not all of it can be displayed in any given picture at once, the extra data allows for more manipulation and the ability to highlight salient portions of the photograph. HDR photographs were taken of several features in 2010 using a tripod at marked

monitoring points, but these photographs have not been expertly processed.

Nevertheless, minimal processing has shown that HDR photography can help in some cases to expose parts of the feature we wish to monitor. It is therefore recommended that site monitors experiment with whatever photographic technique provides the most archeological data, balanced with image processing time and expertise, given the lighting and vegetation at Fort Charlotte. Note that while aerial photography has been shown to be an unreliable way to measure erosion over a wide area (SAA 2000, Creamer et al. 1997), photography itself has great potential on a smaller scale to detect human and animal disturbances to features at Fort Charlotte. In addition, these photographs comprise an historic record that archeologists can use in planning future excavations.

Possibly more important than the method of photography is the archival procedure for storing photographs. Digital images should be kept indefinitely on archival quality magnetic media, and prints should be stored in an acid-free environment. It is important to maintain ready access to prior photographs, particularly for this monitoring plan, because monitoring points have been established specifically in order to compare pictures over the long-term. In many cases, repeat photography will be the only method in place to detect subtle changes to a variety of features. The U.S. Army Corps of Engineers requires photographs to be entered, along with GPS data, into the Omaha District's GIS database (USACE 2005:9). MWAC has developed a similar process during their 2009-2010 projects, in which a GIS database was compiled of all GPS points (for

both artifacts and features), with an interactive database of photographs and documentary information associated with each point.

The Archeological Sites Management Information System

This monitoring plan relies on comparing information from year to year in order to detect and react to subtle changes in archeological features. As such, it will be necessary to maintain a database of comparative information and condition assessments, either within the park or at an information center such as MWAC. While a GIS database is an excellent tool for visually representing the location and condition of features, as well as displaying the associated images and documentation, it does not function particularly well as a record of sequential monitoring activities and their results. By examining patterns, rather than merely the most recent condition of the site, responsible long-term data storage articulates with changing research goals and objectives. Crosby (1978:75) observes that "the computerization of the data will not only make it more available and, consequently, more usable, but it will probably also lead to the development of other computer programs designed to extract types of information and to make comparisons *which are not even being considered at this time*" (emphasis added). This is no less true today, as both research questions and technology continue to advance. Generally speaking, the National Park Service is attuned to the need for long term, reliable site stewardship information (Henry 1993). The NPS Intermountain Region's Vanishing Treasures program, for example, recognizes the need for comparative,

accessible information, and uses the "Facility Management Software System" (Barrow 2009). Rather than complicate the issue with new software, however, this monitoring plan would be best served to interface with the well-established Archeological Sites Management Information System (ASMIS).

ASMIS is the repository of site condition information for the National Park Service, and is the primary reporting mechanism by which agencies demonstrate the condition of their archeological "assets" for federal review. With the advent of the newest version of ASMIS, the system is fully online and is accessible (in read-only format) by authorized park personnel service-wide. Only authorized individuals are allowed to modify records, and as such, the database is carefully controlled and attempts to provide only the most accurate condition, location, and documentation for any given archeological site. ASMIS contains a wide variety of fields organized under tabs for each site documented by the National Park Service. Tabs include location, condition, cultural affiliation, images, and site management, and these tabs contain sub-fields such as UTM coordinates, date of last condition assessment, threats and disturbances, etc. Given the extensive ongoing development and availability of ASMIS, it is recommended that a site monitoring plan enter as much information as possible into the database. Specific fields that this plan addresses are (1) "Management Action" (e.g., monitor, assess condition), (2) "Treatment Proposed" (e.g., mitigate disturbances, schedule monitor/assessment visits), (3) "Threats and Disturbances" (e.g., visitor use, timeframe, severity of effect), and (4) "Images." Each of these four specific fields can be updated after each condition

assessment, thereby producing an accessible and reliable record of monitoring for the site. Additionally, because Grand Portage is a small park with only two archeological sites, it may be prudent to develop sub-sites (another feature of ASMIS) to record information specific to individual features at Fort Charlotte.

I would also propose a new field in ASMIS, following Caven Clark's concerns regarding the use of monitoring equipment. At Buffalo National River, electronic surveillance of archeological sites has been attempted, but the operative status (i.e. whether or not the equipment works, or has even been deployed) and the location of the instruments is often not known (Clark personal communication). I therefore recommend adding a field to ASMIS entries that allows land managers to track the use of electronic surveillance equipment on archeological sites. From something as simple as a checkbox (e.g., "electronic surveillance is in use at this site") to a menu of equipment currently used at the site (e.g., seismic monitor, still camera, motion detector, etc.), recording this information in ASMIS would not only increase the effectiveness of the equipment by tracking its status, it would encourage other parks to consider the possibility of using the equipment as well.

Reporting

Data-collection and data-storage is a critical component of monitoring archeological sites, because it generates a "paper trail" that archeologists can use to assess trends in a site's condition, as well as identify and mitigate immediate threats. But how

and when should the larger trends be evaluated, and, ultimately, be presented to the authorities who will undertake management actions?¹ The U.S. Army Corps of Engineers (2005) has developed guidelines that briefly address these issues:

A report will be prepared on an annual basis by the Cultural Resources Program Manager, summarizing activities that have occurred during the previous year and any recommended changes to the monitoring and enforcement program. [...] The information in this report will be used to reorder the priority list for site protection, refine the monitoring and enforcement plan as needed and assist enforcement personnel in their efforts. [USACE 2005:9]

The U.S. Army Corps of Engineers also requires monitoring information to be entered into the Omaha District's GIS database, "the official location for all GPS and pictorial data that will be gathered" (USACE 2005:9). Thus, cultural resource managers are required to evaluate monitoring data collected each year and make recommendations, but little systematic attention is given to multi-year trends in site condition or use. Because the Fort Charlotte monitoring plan is designed to be a long-term activity—potentially spanning the careers of multiple resource managers—it is necessary to

¹ The process by which any management action is taken—and by whom—is another (extremely variable) matter, and requires consultation with interested parties. That process is beyond the scope of this thesis, and should adhere to appropriate federal laws and regulations (e.g., NEPA, NHPA).

develop a more rigorous method of detecting subtle, cumulative changes to archeological resources.

For the tools to recognize long-term changes in archeological resources, we turn again to the management of natural resources. Niemi et al. (2004) and Noss (1990) discuss "ecological indicators" with respect to monitoring environmental changes. Indicators "isolate key aspects of the environmental conditions, document large-scale patterns, and help determine appropriate actions" (Niemeijer 2002 in Niemi et al. 2004), as discussed in chapter 4 of this thesis. Indicators must be sensitive, easy to measure, relevant to significant phenomena, etc. (Noss 1990), but they do not necessarily identify the agent of disturbance (Niemi et al. 2004), which means that stresses reflected by "ecological indicators" are not always clear or easily resolved. In a paper entitled "Linking Monitoring to Management and Planning," Bennetts et al. (2007) introduce "assessment points" as a mechanism to cause land managers to stop and systematically assess all the subtle, cumulative evidence they have collected. Assessment points are preselected conditions (or 'red flags') along a continuum of conditions where managers wish, a priori, to evaluate the status and trends of the resource, relative to their goals. Like "ecological indicators," assessment points are meant to simplify the data accumulated by a monitoring plan. In this case, Bennetts et al. (2007:61) explain that defining assessment points ahead of time means that "gradual change, occurring before a threshold is reached, can be overlooked." By the same token, when conditions reach a predefined state—for example, when there are two trees on feature X, putting it at risk for

excessive heat buildup during a fire—evaluation can occur and decisive action may or may not be taken. Assessment points provide the "envelope in which ecosystem changes are considered desirable" (Bennetts et al. 2007:63), and they prevent management action from stalling due to a lack of information, while simultaneously allowing for flexibility. "Assessment points provide an opportunity, but not an obligation, for managers to take action prior to reaching a value where a stronger response may be warranted" (Bennetts 2007:65). Thus, by implementing a system of assessment points for archeological sites, land managers can develop a planning 'road map' that accommodate virtually any response to stress—including very gradual damage to a site.

Assessment points may be assigned to certain "indicator" values (or, as defined in chapter 4, "vital signs"), or to certain predefined times. As an example of the former, imagine that an assessment point is defined as when a certain feature is visible from the visitor trail. (This may be due to climate changes, fire, altered visitor-use of the area, or any number of other reasons.) Land managers will have recognized, a priori, the possibility that these conditions will lead to necessary actions. The situation can be assessed at that time, and management options—including no action—can be entertained. Just as importantly, naturally and gradually fluctuating tree growth can be more or less ignored (for the purposes of this example), so long as the feature remains out of sight. Perhaps another assessment point is defined when the feature exhibits signs of visitor use, short of looting. Again, when and if visitor use is observed on the feature, a predefined condition has been reached at which action may or may not be necessary, but a flag has

been raised that suggests an assessment of patterns is warranted. Assessment points may also be defined according to time intervals. In this sense, the NPS and the U.S. Army Corps of Engineers already use assessment points in the form of site condition assessments and monitoring inspections. These assessments, entered into a GIS database and ASMIS as discussed above, provide the basic data by which patterns can be observed. The disadvantage in routine monitoring, however, is that it becomes too routine, and does not necessarily trigger an assessment of larger patterns if site stresses are very gradual. Thus, assessment points of both the conditional and routine types are necessary in a monitoring plan geared toward effective preservation of an archeological site.

Assessment points are one way to trigger the assessment and subsequent reporting of monitoring information to land managers. However monitoring data are recorded, evaluated, and ultimately used, preservation actions will rely on reliable, long-term information to assess patterns in resource condition. Lewis (2007:39) cautions that "scientists tend to know (and communicate) too much"—simplifying the collection of data by supplementing existing forms (e.g., Appendix B), interfacing with existing databases (e.g., ASMIS), and suggesting a series of 'red flags' to assess a site's condition has therefore been the goal of this discussion. According to Lewis (2007), 'science' here is not equated with decision-making, but rather provides the data that helps land managers focus their efforts. An archeological monitoring plan must play by these rules,

and provide the best possible picture of the condition and trends of the resource in order to best preserve it.

Potentials and Limitations of Monitoring Data

As discussed briefly in the previous chapter, monitoring data have a variety of uses. Specifically, monitoring archeological features allows for efficient response by park personnel to immediate threats, such as looting or catastrophic erosion. A monitoring plan also incorporates the scientific method into land management, allowing for long-term observation and informed planning (cf. Lewis 2007, Soukup 2007). From a purely archeological standpoint, a monitoring plan offers to expand archeologists' ideas regarding preservation. Monitoring is not undertaken to block research. Rather than delaying or denying archeological research in favor of preservation, a monitoring plan can help to guide excavation to where they will best mitigate data loss. A monitoring plan also serves to more fully protect already well-preserved archeological features, and ensures their continuation for future research. Moreover, monitoring data provide a record of deterioration that is otherwise absent from the historical record—a body of data particularly useful for relocation features or for determining the effects of taphonomic processes on the archeological record. Finally, research questions can be asked of the monitoring data themselves, including those dealing with formation processes (e.g., Schiffer 1983) and questions regarding the natural environment with which traders had to contend.

From a management perspective, monitoring data are most useful when combined with analytical tools, such as GIS, or documentation software like ASMIS. Using GIS, visitor-use maps can be built that incorporate monitoring data to identify areas of potential impact, guiding development, mitigation, or further research, as the case may be. ASMIS and other forms of documentation (such as forms and photographic prints) will provide the dataset that, as Crosby predicted in 1978, can be used to make comparisons and develop questions not yet considered. Further, the organization brought to the data by these tools will facilitate long-term observation of the site, and allow land managers—and Grand Portage National Monument in particular—to steward archeological sites over multiple land managers' careers. As monitoring data are gathered and visitor-use becomes apparent, it may also be possible to expand the program to address local interest in the site, leading to education potentials and visitor involvement in the preservation of the site (Brodie and Gill 2003, Elmendorf 1990, Hollowell-Zimmer 2003). In short, the potentials inherent in 'merely' monitoring an archeological site are more numerous than one might expect.

At the same time, monitoring an archeological site is not like monitoring a storefront. Archeological monitoring must rely on planning and forward-looking documentation, and cannot consist only of reactionary efforts. Certainly, electronic surveillance shows promise, but its utility for identifying and prosecuting looters has been demonstrated only very rarely (DesJean and Wilson 1990, Clark personal communication). Rather, this thesis suggests that the answer to protecting archeological

sites through monitoring lies in long-term pattern recognition and park planning. Careful mapping and routine documentation, combined with planned assessment points, offers the most efficient way for national park units to use the systems already in place to better evaluate the condition of their cultural resources. Implementing a hierarchical sub-site condition assessment, such as that proposed in chapter 4, is a scalable and long-term solution that lends itself to such documentation.

Conclusions

This thesis has proposed a monitoring plan for Fort Charlotte at Grand Portage National Monument, Minnesota. This monitoring plan is an extension of the preservation ideals outlined in chapter 2, which began by protecting archeological resources through permitting and fines, and emphasized scholarly research. As archeology becomes more sensitive to context—and more directly driven by federal regulations and undertakings—preservation moved to an emphasis on *in situ* archeological remains, and ways to mitigate necessary damages. This monitoring plan goes a step farther, and helps to ensure not only that context remains undisturbed, but that when it is disturbed, archeologists can identify the pertinent causes and effects. Moreover, land managers can develop predictions and models for threatened areas before damage occurs, thus preventing damage. This is only possible through pattern recognition developed through monitoring data.

Protecting archeological resources facilitates context-sensitive research, such as that presented in chapter 3. The "big" questions in archeology can be answered best by examining undisturbed sites and landscapes in their entirety—not merely salient or visible features. As such, this monitoring plan is concerned with the entirety of the archeological record, including sites and the surrounding environment. Preserving and understanding the whole of Fort Charlotte enhances research in gender, niche construction, power relationships, spatial analysis, and a host of other agendas.

Thus, the monitoring plan proposed in chapter 4 emphasizes a wide array of monitoring potentials over the whole of Fort Charlotte and the surrounding area. From measuring general stream bank erosion to precisely pinpointing post holes, the ultimate goal is to better understand everything that is happening to the archeological resources in our care. The projects undertaken by the Midwest Archeological Center alone (chapter 5) have documented a significant and well-preserved site in Fort Charlotte, and one that promises to advance our knowledge of the fur trade considerably if it remains intact. Careful documentation and continued observation of the site will ensure that this is the case until it is sensitively excavated in the best traditions of modern archeology.

This leads to one final point that must be emphasized. The value of archeological resources is their “potential to contribute new information about the past when subjected to archaeological study” (Lipe 2000:113). This has been demonstrated to be the case at Fort Charlotte, where potential for new information is quite high. Thus, the monitoring plan proposed here is meant to aid, not to block, archeological research. This monitoring

plan is tailored to detect disturbances and visitor use relevant to archeological study, and is uniquely suited among the myriad of preservation alternatives to maintain current information about—and ready access to—a resource that will, ultimately, be consumed for the public good. It should not be the case that archeologists merely watch Fort Charlotte decay. On the contrary, monitoring the site allows for more directed preservation, mitigation, and excavation that will support archeological research in the future.

As archeological research and land management continue side-by-side at Fort Charlotte, a monitoring plan will inform future work and prevent degradation of the site in the interim. In the same way, some degree of site-specific archeological monitoring at other historic sites can provide a better archeological record for future archeologists, at minimal cost. It is hoped that this monitoring plan will spur archeological attention to site preservation beyond the 'fire and forget' sorts of preservation, such as site burial or restricted visitor use. On the contrary, archeology can benefit from investing in historical sites, to better understand the subtle processes of change that occur daily within the archeological record and within public interest.

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Appendix A: Grand Portage Timeline

c. 1300-1680	Ojibwe trend west according to seasonal round	Clark 1999
Mid-1600s	Portage likely known to <i>coureurs de bois</i>	Birk 2005
1615	French present	Thompson 1969
1659	Founders of HBC in Canada	Thompson 1969
1680s	Ojibwe trend west in order to improve their position in trade	Clark 1999
Early 1700s	French present	Birk 2005, Woolworth 1993
1730s	Ojibwe present	Birk 2005
1731	Vérendrye scouts the portage	Birk 1975, Birk 2005, Thompson 1969, Woolworth 1993
1732	Vérendrye sets out, and improves the portage	Thompson 1969
1760	New France ceded to the British	Birk 1975, Woolworth 1993
1767	British traders receive permission to winter with the Indians in the NW	Woolworth 1993
1768	FIC established?, independent traders form NWC nucleus	Birk 2005
1772	Pork eaters required to carry goods over the portage (six packs)	Woolworth 1993
1775	Common-stock trade alliance / Alexander Henry arrives / large-scale trade starts	Birk 2005, Thompson 1969, Gilman 1992 / Thompson 1969, Woolworth 1993 / Woolworth 1993
1776	American Revolution spurs consolidation	Thompson 1969
1778	500 men employed / British troops present / Frobisher brothers & McTavish ally	Birk 1975 / Birk 2005, Birk 2006, Thompson 1969 / Thompson 1969, Woolworth 1993
1779	"Logic suggests" storage facilities at FIC Consolidation of NWC , 16 shares, 1-year commitment	Woolworth 1993 Thompson 1969
c. 1780	Rendezvous begin / NWC 16 shares, 3-year commitment	Birk 2005 / Thompson 1969, Woolworth 1993
1781-82	Smallpox epidemic	Birk 2005
1783	Consolidation of NWC / Frobisher brothers and McTavish, owners in Montreal	Birk 2005, Birk 2006 / Thompson 1969
1784	Consolidation of NWC / concern over "now-successful" Am. Revolution	Cooper 2004, Woolworth 1993, Gilman 1992 / Thompson 1969
1785	FIC considered an "old fort"	Woolworth 1993
1787	NWC builds or extends palisade around FIC (McKay's tomahawk) / 20 shares	Birk 2006, White 2005 / Thompson 1969
1790s	Tanner passes through FIC	Birk 2006, White 2005
1793	Macdonnell visits FIC, man "so long in charge" known as Governor	Thompson 1969, White 2005, White 2004, Woolworth 1993
1794	Macdonald relieves Mr. Lemoine, notes extensive storehouses & pickets incident	Thompson 1969, Woolworth 1993
1797	Opposition establishes a more substantial post near FIC / XYC formation	Thompson 1969 / Woolworth 1993, Gilman 1992
1798	XYC formation	Birk 2006
1799	XYC formation	Birk 1975
c. 1800	Fences repaired, agriculture undertaken at FIC to thwart XYC post	Thompson 1969
1800	Headquarters of NWC and XYC; large commercial est.	Birk 2005
1801-07	Construction begins at Ft. William	Woolworth 1993, Gilman 1992
1802	Rendezvous end / XYC traders drink outside "our Stores" at FIC	Birk 2005, Cooper 2004 / Woolworth 1993
1803	NWC moves to Ft. William	Birk 1975
1804	NWC merges with XYC / end of British occupation	Birk 1975, Birk 2005, Birk 2008, Gilman 1992 / Birk 2005, Thompson 1969, Woolworth 1993
c. 1805	Buildings, stores, stockades mentioned at FIC	Woolworth 1993
1816	Selkirk possibly using FIC area	Woolworth 1993
1821	NWC merges with HBC	Gilman 1992
1822	Thompson (surveyor) mentions FIC	Woolworth 1993
1823	Major Delafield notes @ FIC: clear field, wild roses, sweet pea, dock intact	Woolworth 1993

c. 1860	Use of the portage ends	Birk 1975
1899	State geologist notes @ FIC: foundations, evidence of dock	Woolworth 1993
1922	MHS survey of FIC, Abinson's map / a hunter notes palisade outlines, cellar, 2 wells	Birk 2005, Woolworth 1993 / Woolworth 1993
1932	FIC lightly collected, artifacts on display	Birk 2005
1936-37	CCC excavations under MHS supervision @ depot	Birk 2005, Hamilton et al. 2005
1960	GRPO established	Birk 1975
1961	Excavations aiding reconstruction / east of creek, north of highway / FIC underwater	Birk 2005 / Hamilton et al. 2005 / Woolworth 1993
1962	Excavations east of creek, south of highway	Hamilton et al. 2005
1963	MHS 2-day underwater survey / excavation of palisades	Birk 2005, Woolworth 1993 / Hamilton et al. 2005
1964	Road to FIC installed / excavation of canoe warehouse	Birk 2005 / Hamilton et al. 2005
1969	Great hall fire / sewage line & backhoe monitoring	Birk 2005 / Hamilton et al. 2005
1970	Excavations aiding reconstruction / kitchen found	Birk 2005 / Hamilton et al. 2005
1971	Excavations aiding reconstruction, 1-day underwater survey / kitchen investigation	Birk 2005, Woolworth 1993 / Hamilton et al. 2005
1972	Mitigation for kitchen sewer, water trenches	Hamilton et al. 2005
1972-76	Birk's underwater work	Birk 1975, Birk 2005, Woolworth 1993
1974	More authentic great hall established	Birk 2005
1975	Excavations for monitoring	Birk 2005
1977	Initial listing on the NRHP	Birk 2005
1978-80	Geophysical survey @ depot by MWAC	Birk 2005
1979	Neg. MWAC shovel tests in peripheral areas @ FIC	Birk 2005
1980	Geophysics (MWAC, Weymouth) and mapping (MWAC, Jones) at FIC	Woolworth 1993
1980s	Restrooms/campsites added at FIC	Birk 2005
1984	MWAC takes responsibility for GRPO	Birk 2005
1989	Mitigation explorations for drains to reconstructions (MWAC, Noble)	Hamilton et al. 2005
2001	Geophysical investigation within stockade (MWAC, Volf) & mapping (Lakehead U.)	Hamilton et al. 2005

Supplemental Monitoring Observations: Fort Charlotte (21CK7)

Grand Portage National Monument, MN

Name: _____ Date: _____

Cultural feature # (CF): _____ Nearest monitoring point (MP): _____

Evidence of visitor use? Y / N

Describe (*Is the **visibility** or **integrity** of the feature affected?*)

Trees on feature? Y / N

Number of trees: _____

Species, if known: _____
(for fire damage assessment)

Trunk diameter(s): _____

Select all that apply: sapling / mature / dead / fallen

Evidence of natural disturbances? Y / N

Describe (*Monitoring points 2 and 4 only: measure distance to stream bank.*)

