ABSTRACT

The Wasatch Front was heavily used in prehistoric times, when vast wetlands along the eastern shores of Great Salt Lake were home to Native Americans for over 10,000 years. Flooding in the late 1980s exposed hundreds of villages, campsites, and 85 human skeletons, dating to the Fremont period about 900 years ago when native populations peaked. The Northwestern Band of the Shoshone Nation permitted analyses on the skeletons including radiocarbon dating, carbon isotopes, CAT scans, and DNA. Fremont lifestyles ranged from farming to foraging during the lives of individuals, plus there was movement of people around the landscape and among lifestyles. Activity patterns varied by gender. Farming and population declined after A.D. 1300, but foragers continued to frequent the Wasatch Front until A.D. 1600-1700 when population greatly declined and did not recover, possibly from European disease. Direct lineal descent from the Fremont to the Shoshone cannot be demonstrated at this time, but both ancients and moderns are Native Americans. The cultural resources of Great Salt Lake are rich, nonrenewable, subject to destruction, and hold ethical implications suggesting greater appreciation by managers and Great Salt Lake advocacy groups.

INTRODUCTION

Perhaps most famous for its images juxtaposing water and desert, the Great Salt Lake also supports vast tracts of ecologically varied wetland habitats along its eastern shores (figure 1). These wetlands were a focal point for American Indian life beginning over 10,000 years ago, and continuing to historical times. Flooding of Great Salt Lake in the late 1980s exposed new evidence for ancient human life in the area, including residences, work places, and human remains. The Wasatch Front was likely a populous part of the Utah region in ancient times, just as it is today, but the most intense occupation of the region by ancient people occurred within the last two millennia. It is this period that is best represented in the archaeology of the Great Salt Lake wetlands.

The population in the vicinity of Great Salt Lake markedly increased between A.D. 400 and 1300, peaking between A.D. 900 and 1200. This time is referred to as the Fremont period. “Fremont” is also the name of an archaeological culture named after the Fremont River in central Utah by Noel Morss who first documented the ancient culture during an expedition to that area in 1928-29 (Morss, 1931). This origin of the name is contrary to the popular belief that archaeologists named the culture after the Euro-American explorer, John C. Fremont. The Fremont is best thought of as a farming and foraging lifestyle, with cultural materials such as houses and ceramics being similar to those found across the Colorado Plateau and eastern Great Basin region. The Fremont culture is not presumed to represent a single ethnic group, nor even a single language, and stands in contrast to the millennia of foraging cultures that previously occupied the region. The farming of maize, beans, and squash by the Fremont fundamentally altered the character of life. Ironically, farming was abandoned during the 12th and 13th centuries, marking the onset of the Late Prehistoric period. A sizable foraging population however, remained tethered to the Great Salt Lake wetlands until A.D. 1500 or later. Sometime during the 17th century, the life way may have become more mobile, and the population around Great Salt Lake decreased. While there is evidence for a substantial lake transgression in the 17th century, an event that would have inundated wetlands, it is possible that the decrease in population was caused by some of the dozen or so diseases introduced to the Americas by European colonization. The diseases, first brought to the continent in the 16th century, moved rapidly among Indian populations, and may have spread into northern Utah with the introduction and use of the horse. Regardless of whatever caused the population decline, the American Indian presence along the Wasatch Front never returned to the population levels found during the Fremont and the early phases of the Late Prehistoric period.
Figure 1. Map of eastern Great Salt Lake wetlands showing surrounding sites (referenced in text) and area of burial recovery and test excavations.
On the eve of European contact with the area in the late 18th and early 19th centuries, the Indian acquisition of horses and firearms had completely altered their lifestyles. Images from this recent period yield a picture of American Indian life on the Wasatch Front that is as romanticized as it is different from the preceding millennia. The relationship between the historical Ute and Shoshone occupants of the Wasatch Front, and the ancient people, is well-established as “Native American.” However, the dynamics of interaction between the pre-Columbian and historical Native Americans remains the subject of exciting investigation.

The story of life on the Wasatch Front during the last two millennia is enhanced by new evidence from the Great Salt Lake wetlands. Flooding and subsequent regression of Great Salt Lake during the late 1980s revealed hundreds of archaeological sites (figure 2a-b) and exposed the bones from at least 85 ancient people (figure 3a-d) (Simms and others, 1991; Fawcett and Simms, 1993; Simms, 1999). Through the efforts of avocational and professional archaeologists, several state and federal government agencies, and the wisdom of local American Indian tribes, the skeletons were saved, studied in 1990–92 and eventually interred in a dedicated burial vault in 2001 (Simms, 1993; Simms and Raymond, 1999). This combined effort enabled a rare marriage of archaeological evidence with modern, high-tech analyses that gleaned extensive information from human remains, undreamed of only a few decades ago. The archaeology tells how people lived and how they used the landscape. It describes their culture, provides a chronology of events, and reveals the behavior of people living in farming villages, foraging hamlets, short-term campsites, and special task locations. It also yields some information about how people interacted with the supernatural. The studies conducted upon human bone reveal information difficult to obtain by recording or excavating archaeological sites. Studies directly upon the human skeletal remains indicate how much maize (and meat) people ate during their lives (Coltrain and Stafford, 1999), identify health and nutritional status (Bright and Loveland, 1999), characterize lifetime activity patterns (Ruff, 1999), and in a general way, identifies genetic characteristics and relationships (O’Rourke and others, 1999). Over 50 of the 85 Great Salt Lake individuals were dated using Accelerator Mass Spectroscopy radiocarbon dating (AMS C-14), a technique requiring only 0.1 gram of bone. By directly dating individual skeletons, and not just the archaeological sites, the age of the skeletons is more precise.

The marriage of archaeological and biological evidence enables our story of the ancient Great Salt Lake wetlands to look beyond the familiar labels that often force our understanding of the past into neatly bound stereotypes of immutable peoples, cultures, or ancient races. We now can describe life where individuals were active agents of dynamism in cultures that exhibited permeability and plasticity as much as they surely exhibited elements of ethnic identity and resistance to change. There were connections among people, there was residential fluidity across space, and there were changes of lifestyle during the lifetimes of individual people. As might be expected, there was genetic exchange across landscapes as well. This creates a complex and woefully incomplete understanding of the connections between ancient and modern American Indians in our region.

Archaeology is the only way to know what the ancient human wilderness of the Wasatch Front was like, and the Great Salt Lake wetlands contain a rich archaeological record. The richness of this resource is not evident to the casual visitor, and is often undervalued in the planning, management, political, and even educational processes. For that reason, we include a statement on the management and polit-
The archaeological record of Great Salt Lake is a nonrenewable, priceless information resource about our human past.

GEOGRAPHY AND HUMAN USE

The Great Salt Lake wetlands are best developed near the debouchments of the Bear, Ogden, Weber, and Jordan Rivers, and a host of associated streams and springs along the nearby Wasatch Range. The influx of fresh water variously reduces the salinity of the lake depending on seasonal flow levels, wind patterns, lake elevation, and the arrangements among numerous stream channels guiding water into the lake. Small fluctuations in water level cause rapid lateral shoreline shifts due to the shallowness of the lake basin. In fact, wind from individual storms can raise lake levels along the eastern shores as much as two meters (Atwood, 1994). These factors combine to form a dynamic mosaic of brackish-to-fresh-water marshes and wetlands, with ponds and slow-moving streams bounded by walls of bulrush and cat-tails. On slightly higher ground, and along the natural levees flanking every stream channel, salt grass meadows and greasewood plains predominate. These habitats support an abundance of wildlife including fish (suckers and chub), and small mammals (muskrats, rabbits, and beaver). Less evident today are the bison, antelope, mule deer, and bighorn sheep (not restricted to high altitudes in prehistoric times) the ancient landscape supported. Great Salt Lake waterfowl, ducks, geese, and grebes to name only a few, occurred in legendary proportions (Fremont, 1988 [1845]). Hundreds of plants were used as food, including an array of greens, shoots, and especially roots, tubers, and seeds because they are storable. Various plant foods were available from springtime to well into the winter. The plants were eaten fresh, or stored for the hardest and coldest part of winter.

Although plant foods were abundant in the Great Salt Lake wetlands, one should not conjure an image of an ancient "Garden of Eden." For human foragers, or farmer-for-
agers, the availability of food within the wetlands varied greatly by season, and winter was a time requiring food storage. Wetlands are dynamic, and the subtle topographic relief and high annual variability of effective moisture (temperature, precipitation, and evaporation) require an ever-changing set of foraging strategies.

Foraging strategies shaped the behavior of the Fremont along Great Salt Lake. People had to decide where to locate villages and camps. This required decisions about which resources to exploit, while foregoing other resources. People had to decide which resources to transport and how far. Transport costs shaped behavior then, just as they do today. People had to consider that changing circumstances sometimes made it better to live in central places, deep in the wetlands, or to live on the margins of the wetlands. At other times, it may have been best to live outside the wetlands all together, and use them only as needed. Decisions about these ever-changing situations conditioned the development of social networks that variously brought people together or cast them into relative isolation. These social relationships, in turn, shaped the character of people's ideological beliefs and their perceptions about what was valuable in life.

Wetlands provided ancient foragers with concentrated patches of useable biomass, but the bounty was not uniform across space, nor spans of time as short as a single year. This human habitat was more of a dynamic theater of trade-offs than it was an idyllic and static Garden of Eden.

The advent of farming only added to the behavioral options. While farming could produce a large surplus of food, enabling short-term population increases, the juxtaposition of surplus against inevitable crop shortfalls guaranteed tension between population growth and resource scarcity. Rather than bringing stability, farming brought greater dynamism to the region. People dealt with the tensions of growth by adjusting their group size, and by putting greater labor into farming while also exploiting wild foods.

Decisions about daily life were not limited to food. People had to decide whether to make ceramics, and what kind, depending on their mobility. Ceramics do not transport well, but are useful if one is settled, or has an intention of returning to a place. The debris from manufacturing stone tools also reflects the different approaches taken by the ancient people to managing precious toolstone that had to be transported from outside of the wetlands.

**PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS**

The Great Salt Lake wetlands have been known to be archaeologically rich since the 19th century (Maguire, 1892), and several generations of professionals and avocationists have produced a wealth of published and unpublished information. In this section, we provide references to basic information sources, but focus on the aspects of the archaeology that indicate what people did. Our goal is not to summarize the archaeology, but to provide some examples of what it tells us about the past, and to explain why systematic study and astute management of archaeological resources is important.

Past excavations provide information on eleven sites, all of Fremont and Late Prehistoric age (A.D. 400 to historic period). These sites are: (1) Willard (Judd, 1926; Kennedy, 1930; Maguire, 1892; Steward, 1933), (2) Warren (Enger and Blair, 1947; Hassell, 1961; Manful, 1938), (3) and (4) Knoll and Levee (Fry and Dalley, 1979), (5, 6 and 7) Bear River numbers 1 (Pendergast, 1961), 2 (Aikens, 1967), and 3 (Shields and Dalley, 1978), (8) Injun Creek (Aikens, 1966), (9) Orbit Inn (Simms and Heath, 1990), (10) site 42SL197 (Schmitt and others, 1994), and (11) site 42WB32 (Fawcett and Simms, 1993). Their general locations are shown on figure 1. Other sites referred here, and by their Smithsonian numbers (such as 42WB48) are reported in the more recent studies associated with the recovery of human remains (Fawcett and Simms, 1993; Simms and others, 1991; Simms, 1999).

Sites that include substantial Fremont residential farming bases, such as Willard, are located on flood plains, near the toes of alluvial fans, in the manner so typical of Fremont agricultural sites along the eastern Great Basin rim. Such sites are located under virtually every modern Utah city and town along Interstate Highway 15 from Brigham City to Cedar City (for overviews of the Fremont Culture, see Jennings, 1978; Madsen, 1989; Marwitt, 1970; Madsen and Simms, 1998). The Willard site, destroyed by ground leveling and dike construction, is largely underneath the picnic and camping areas of Willard Bay State Park. Over 50 house mounds contained superimposed pit structures and/or adobe-surface structures (Judd, 1926; Steward, 1933). Superposition suggests pit houses evolved from circular to square shapes between A.D. 1125 to 1200 (see Talbot, 1997 for a thorough review of Fremont architecture). The move from circular to square housing, in conjunction with other mobility evidence, is a significant transition worldwide because it correlates with increased tethering to places (Flannery, 1972; Gilman, 1987; Hunter-Anderson, 1977; Whiting and Ayres, 1968). Artifacts from the Willard site, in museum and private collections, contain small side-notched and corner-notched arrow points, grinding stones, slate knives, burials, maize, beans, squash, textiles, ornaments, and figurines.

The Warren site near Plain City had 16 mounds (Manful, 1938) containing houses of the Willard type (Enger and Blair, 1947). Artifactual characteristics at the Warren site are similarly broad, with bone and shell, bushels of fish bone (Manful, 1938), figurine fragments, large, Utah-type metates, a lignite-bead necklace, and other trappings of residentially stable occupation. The Warren site, along with countless others, has been destroyed by field leveling for modern agriculture, and by urbanization.

The Knoll site, and the late component of the Levee site located on the lower Bear River, yielded round and square pit houses which are shallower than those at Willard. Radiocarbon dates indicate a transition from round to square pit houses after A.D. 1100, with human use possibly extending through A.D. 1200 (Fry and Dalley, 1979:5). Pit houses are also present at Bear River number 3, and at several sites in the area of human skeleton recovery (42W48, 42W185a-c, and 42WB324). These pit houses were found at lower elevations than ever before (1,282 m, 4,205-6 feet). In contrast to Willard and Warren, where storage was in surface structures of adobe, storage at these other sites was limited to small, bowl-shaped, subsurface pits indicative of short-term storage and food hiding (Zeanah, 1988). Although the Knoll assemblage of associated artifacts is not as substantial as at...
the Willard and Warren sites, all of the pit house sites indicate considerable residential stability. This stability may, or may not, have been associated with farming (Madsen, 1982).

The Great Salt Lake Fremont have long been portrayed as a foraging economy, but the presence of farming is supported by the site locations and maize remains at Willard, Warren, Bear River number 3, 42WB32, and Injun Creek. The best places to locate large farming villages was just outside of the wetlands and along streams, precisely where the greatest amount of modern urbanization has occurred. Substantial Fremont sites are known along the Weber River, Ogden River, Layton Creek, the Jordan River, and City Creek, which once flowed through downtown Salt Lake City.

Other sites yield circular mud and pole structures, indicative of less investment than pit houses. These sites include the early component of the Levee site, Bear River numbers 2 and 3, Injun Creek, 42WB185c, and 42WB32 sites. At 42WB32, three such structures are superimposed, and three radiocarbon samples date them from A.D. 1035 to 1155, the heart of the Fremont period (Fawcett and Simms, 1993). Storage at these sites is also in small subsurface pits, again contrasting with deeper storage pits that represent larger scale storage goals (Talbot and Richens, 1996). An exception is Injun Creek near Plain City, where a larger, above-ground, adobe storage structure was found. However, Injun Creek is the only non-pit house site in the area yielding maize remains. The diversity of the artifact assemblage at most of these sites is high, as would be expected at residential bases where the full human technological inventory would be represented.

Higher mobility is indicated at Bear River number 1, a temporary camp with no structures and a less diverse artifact assemblage. It was likely a stopover at the location of a bison kill (Lupo and Schmitt, 1997). The Orbit Inn site, near the Brigham City airport, is a Late Prehistoric residential camp that was intermittently occupied from spring through fall for several weeks each visit over a 50-year span. Here, only light structures were found, either wickiups or brush windbreaks, but there were distinct activity areas: 18 subsurface pits, sizable refuse deposits, and a broad assemblage composition that accumulated through repeated use of the site. Light structures, reflecting brief use, are also found at other sites, (such as 42WB40, 42WB144, 42WB184 and 42BO73) some of which may be Fremont in age. Subsurface pits used for roofing, storage, and ultimately refuse, abound across the study area; one site (42WB317) southwest of Willard Bay contained more than 150 subsurface pits.

Chipped-stone artefacts and ceramics also help reveal the behavior of ancient inhabitants. The remains from manufacturing chipped-stone tools feature a high degree of tool stone conservation, and reflect the absence of naturally occurring tool stone in the wetlands. There was caching of primary and secondary flakes (Cornell and others, 1992), low flake weight, and frequent resharpening of projectile points. The intensive use of tool stone appears to result not only from limited supply, but also from low residential mobility within the food-rich wetlands. The approach to tool manufacture, called bi-polar reduction, also suggests low mobility and tool stone conservation. On the other hand, a technique called bifacial reduction is evident at a minority of sites, indicating that logistic use of sites by people from larger residential bases did occur (Elston, 1988; Kelly, 1988, 1995; Simms and Whitesides, 1993).

There is high variation among the side-notched arrow points, with many falling at the boundaries of archaeologists’ point categories. Projectile points are useful as time markers when sample sizes are adequate, and when other site-dating evidence exists. It remains dangerous, however, to date sites and ascribe them to cultures on the basis of only a single line of evidence, such as a projectile point or two. It is also risky to categorically define ancient peoples’ ethnic, linguistic, or tribal affiliations only on the kind of arrow points found (for example, the assumption that if it is a Desert side-notched point, this person must be Shoshone). It is precisely these kinds of unresolved issues that require careful recording of archaeological sites in the Great Salt Lake wetlands because the current sample sizes in publicly available collections are small.

Broken ceramics are ubiquitous at Great Salt Lake wetlands, and ceramics were adopted not only by farmers during the Fremont period, but by foragers with residential patterns stable enough to make ceramic use worthwhile. Dean (1992) finds significant overlap among northern Utah ceramic types in their attributes of temper, color, and wall thickness, suggesting subtle gradation in forms. Janetski (1994) counters with evidence from Utah Valley that shows there is indeed a chronological sequence of ceramic types from Fremont to Late Prehistoric times. Simms and others (1997) show that the existence of a chronological sequence of ceramic types is not at odds with findings of significant variability in ceramics.

Simms and others (1997) found a relationship between the degree of labor investment in undecorated Great Salt Lake ceramics (by far the most common ceramics found), and independent archaeological measures of residential mobility. Labor investment varies, within culturally defined limits, according to the intended use life of the vessel. Essentially, greater functional diversity and higher quality of vessel manufacture are associated with the large residential farming bases (for example, Willard). Pottery of lesser investment occurs at residential bases where evidence indicates shorter-term stays, reliance on foraged foods, or a mixed farmer-forager diet (for example, the Levee site and 42WB32). High ceramic variability occurs at residential camps (for example, the Orbit Inn) because ceramics at such sites were discarded under various mobility regimes, and thus came from a variety of local sources. We find high-quality pottery at a few small sites, like that found at farming bases, suggesting a logistic connection to such bases. X-ray diffraction was employed to test hypotheses about raw-material sources for ceramic manufacture; analytical results on the types of source materials were consistent with predictions based on the degree of residential mobility. Variability in ceramic quality can be found even at the height of Fremont farming times showing that even then, not all people made the same decisions about how to approach life.

Archaeology yields a picture of the Great Salt Lake Fremont people who farmed and lived in large villages near the toes of the alluvial fans adjacent to the Wasatch Range. These people supplemented their diet with foraged foods and exploited the wetlands, leaving the cultural material they brought from their villages at temporary camps and work stations in the wetlands. People also ventured into the surrounding mountains and, while the archaeology of the Wa-
ARCHAEOLOGICAL STUDIES AFTER GSL FLOODING

In 1983, the Great Salt Lake water level began rising and peaked in the spring of 1987, at an elevation of 1,283.8 m (4,211.8 ft), perhaps exceeding the historically recorded maximum reached in the 1870s (the exact year and level is not known, see Mabey, 1986). The lake soon began receding, and by the fall of 1987 large areas of lake bed were freshly exposed. Lake levels continued to decline for the next six years to approximately 1,280.2 m (4,200 ft). During the lake-elevation rise, the submerged land northwest of Ogden was scoured by waves powered by prevailing northwesterly winds along a shoreline unprotected by the dikes that shielded other areas (figure 1). After the lake receded, the scoured landscape was a flat, nearly featureless plain stripped of vegetation. Surface deflation ensued, as wind removed the thin crust of alkali that covered the land surface, revealing hundreds of archaeological sites (figure 2a-b), and thousands of human bones (figure 3a-d). Other stretches of the eastern shores of the lake did not experience the same degree of erosion. The mouth of the Bear River, the lower Jordan River, and the stretch between Farmington Bay and Ogden Bay could also contain archaeological sites and burials under a shallow layer of sediment (Allison, 1997).

Prior to the removal of the human remains exhumed by the lake by Utah State University, state and federal agencies consulted with several American Indian tribes. In November 1989, representatives of the Northwestern Band of the Shoshone Nation decided that remains jeopardized by erosion and vandalism should be removed. Further consultation regarding disposition and analysis of the human remains continued for several years after 1989. The State of Utah funded construction of a burial chamber at Pioneer State Park in Salt Lake City where the remains were interred by the Shoshone in 2001 (Simms, 1993; Simms and Raymond, 1999).

Characteristics of the Burials

The age of the exposed skeletons ranges from A.D. 400 to 1450, but the overwhelming majority lived during the peak of the Fremont period between A.D. 700 to 1300, when the Indian population peaked. The bones of 85 individuals were recovered. The minimum number of 85 individuals is determined by counting specific bones such as the left clavicle (there can only be one per person). However, of the 85 individuals, 45 percent are represented by fewer than five bone elements, and only 20 percent consist of more than half of the skeleton (Simms and others, 1991).

The bones were affected by natural processes as well as ancient cultural practices. Erosion often scattered the skeletons. In several cases, sediments showed that previous lake-level fluctuations had exposed skeletons, only to rebury them. In some instances, transport of bones by natural lake processes from closely spaced burials often created a single locus of commingled human remains. In other instances, commingling resulted from human practices. In one case, 11 individuals were found clustered in a 4-meter (13-foot) wide area of burned bulrush plants (the human remains were not burned). Several of the 11 individuals appear to have been buried in a single event, but it is also clear that others were buried later. In another case, an infant was secondarily interred upon the lap of a partial, adult female skeleton that exhibited evidence of burning (the infant was unburned). A few cases of commingling appear to result from intentional commingling of one or two elements from several individuals. A burial practice that may produce commingling, but for which we have only sketchy documentation in the Great Basin, is token burial. Token burial is the practice of retrieving a bone(s) of a deceased relative who initially had to be buried away from home (Brooks and Brooks, 1990), and burying the bone(s) at another location.

Cut-marks and drilling are evident on some individuals, indicating postmortem alteration of the bone by humans using sharp tools (Simms and others, 1991: 36, 38, 39, 42, 56, table 7). This practice is highly variable in expression, but occurs widely across cultures around the world over time periods spanning tens of thousands of years. It usually indicates some sort of ritual modification of the bone. While this sort of finding is often uncritically attributed to cannibalism, there is no evidence for this in the sample of Great Salt Lake human remains described here. Further, since ritual postmortem bone modification is far more frequent than cannibalism, it is the most parsimonious interpretation with the evidence at hand.

The clearest case of bone modification is a hole drilled through the ulna (lower arm) of an adult female, whose remains were interred in a ritual burial including red ochre (an iron oxide clay used in the burials of many cultures of the world for thousands of years). An infant was later interred upon the lap of this woman, but whether the wrist bone was drilled at that time or some other time cannot be determined.
Cutmarks were found on two other adult females, around the ankle in one case. However, not all the evidence of cutmarks is conclusive and in one or two cases, the marks appear to be from shovel damage by a known, twentieth century relic hunter who dug up skeletons and sometimes even left tell-tale broken wine bottles at his "digs."

Gnawing by carnivores and rodents is evident on some bones. Stratigraphic evidence showed that burials had often been exposed to carnivores by erosion associated with post-interment fluctuations of the Great Salt Lake (Simms and others, 1991).

Very few grave goods were found with the Great Salt Lake skeletons, but a low frequency of non-perishable grave goods is consistent with patterns of burial from foraging societies in general. Even in the case of Fremont farmers, grave goods are infrequent (Gunnerson, 1969; Madsen and Lindsay, 1977; Dodd, 1982; Janetski and Talbot, 1997). A few of the Great Salt Lake burials do contain grave goods such as a fragment of deer antler, a tubular bone bead and tiny shell pendant, a large Utah-type metate, a quartzite mortar, and a burial with a mano and fresh-water clam shells. A few burials yield red ochre-staining of human skeletal elements showing that bones had been exhumed by Native Americans after the flesh was gone and rubbed with red ochre. Red ochre is associated with the burial ritual in many societies around the world and throughout ancient and modern history. The above-mentioned interment of 11 individuals yielded numerous grave goods including fan-shaped arrangements of bone awls, an arrangement of 13 bone counters or gaming pieces, a carved bison horn, a Utah-type metate (found almost exclusively at Fremont residential bases), and a carved-bone duck-head effigy (Simms and others, 1991). Most of these grave goods are smeared or stained with red ochre.

Burial position and orientation is variable among the 27 individuals for which this could be determined (Simms and others, 1991). Positions include flexed (reclining, resting on left or right), extended, and unusual postures. Burials face in all directions, but north was the most common (n = 10) followed by east (n = 8), south (n = 3) and west (n = 1). Intermediate orientations included northwest and northeast (n = 2), southeast (n = 1) and southwest (n = 1). The variation suggests there were a variety of interpretations as to the correct placement of the dead during the three centuries of religion represented by the Great Salt Lake sample.

Burial pits were detected in only a few instances. This can be attributed to previous erosion and reburial of remains. However, even the complete or nearly complete skeletons are rarely associated with pits. In some cases, burial was made in aeolian (wind) sediments. Fowler (1992) reports that Northern Paiute from the Stillwater area of western Nevada often buried the deceased in sand hills flanking the wetlands. Burial pits can easily become obscured if the sands are mobile. In other instances, water burial seems plausible and is known to the area, such as the case of the Shoshone chief, Pocatello (Madsen, 1986). If a deceased person were lowered into one of the slow-moving water channels, they would become covered with silts, a situation common among the Great Salt Lake burials; water burial may account for the position and sedimentary context of some skeletal remains (figure 3d).

The Great Salt Lake skeletal sample is extremely valuable in another way. Most human skeletal collections are either found within archaeological sites or are isolated finds, such as those found in rock crevices or caves. The Great Salt Lake sample is not only the second largest skeletal collection ever found in the Great Basin, but it is a sample of all human remains interred over a 30-square-mile (78-square-km) area, and exposed en masse by natural processes. It thus lacks the bias so characteristic of archaeological skeletal samples.

**Studies on The Human Remains**

With permission from the Northwestern Band of the Shoshone Nation, small amounts of bone, typically fragments or small bones, were analyzed using carbon isotopes, visual examination, CAT scans, and DNA extraction. Stable carbon-isotope analysis identifies the major classes of plants consumed over the life of an individual. Since maize is in one of these groups, an estimate can be made of the amount of maize consumed. This analysis was conducted by Coltrain and Stafford (1999). Bones also reveal information about adequacy of diet, especially in the critical early years of life. They also indicate health factors such as general skeletal fitness, arthritis, and other specific syndromes. Teeth are another indicator of diet and health. Analyses of the health and nutritional aspects of the human remains were conducted by Bright and Loveland (1999). Using CAT scans on femora (hips) and humeri (upper arms), an engineering analysis of the internal bone structure can be made. Bone structure is acquired over an individual's lifetime, and is determined largely by activity patterns. Structural differences in bone can be detected between the weaker lower limbs from decreased lower-body activity that is often associated with farming, and strong lower limbs from a more active life associated with walking steep mountains. These analyses were conducted by Ruff (1999). Finally, one of the most intriguing but most preliminary analyses is the ancient population genetics using DNA extraction and amplification. These analyses were done by Dennis O'Rourke, Ryan Parr, and Shawn Carlyle (O'Rourke and others, 1999; Parr, 1998; Parr and others, 1996). The results of these studies are given in the next section.

**LIFESTYLES INFERRED FROM THE ARCHAEOLOGICAL AND BIOLOGICAL EVIDENCE**

**The Fremont**

Native American farming began in Utah about 2,000 years ago and as a consequence population grew. People congregated in larger groups because farming produced a stored supply of food. The production of a surplus provided a hedge against risk, while the reduced mobility of the farming lifestyle and the episodic surpluses from harvests fostered increased population. Crop shortfalls are also a part of farming, and these added a measure of risk, especially in the face of increasing population size. Farming also created new obligations and expectations that accompany a more complex social network. Along the Wasatch Front, full-time farming was a way of life for some, while other people...
switched back and forth from farming to foraging during their lifetimes. Still others remained foragers in the outlying areas, much like the situation in the 20th century where the last remaining foragers in the world were found only in the most remote and marginal places. Thus, foraging continued in areas not suitable for farming, producing a situation where foragers could either attach themselves to farming centers, or became marginalized in the outback. These circumstances made the Fremont period a time of increased demographic fluidity; movement of individuals, families and bands among lifestyles, and across landscapes. One of the impacts of farming was the intensification of human networks that likely ensnared Native peoples with different cultural backgrounds to a greater extent than in earlier periods.

Carbon isotope data support a demographic mix of farming and foraging. There is increasing dependence on maize from A.D. 400 to A.D. 850 (Coltrain, 1997). From A.D. 850 to A.D. 1250, there is high variation in the stable carbon isotope values indicating that some people obtained perhaps 50 to 60 percent of their lifetime calories from maize (Coltrain, 1997; Coltrain and Stafford, 1999). The same studies show that other people ate very little maize over the course of their lives, regardless of whether there were phases of their lives during which they ate more maize. Variation is even apparent in skeletons from the farming bases at Willard, Warren, and 42SL197 on the Jordan River delta, where people who ate a great deal of maize are found within the same sites as those who ate very little maize. The most common results however, are carbon isotope values in the middle range. These people either spent their lives eating a mixed diet, or experienced fluctuations in the mix of farmed or foraged foods during their lives.

The biomechanical analysis of limb bones (Ruff, 1999) indicates that men moved greater distances, and over difficult terrain, while women moved intermittently. This is consistent with an archaeological record of residential stability in the wetlands, moving among a series of base camps. Men were the primary harvesters of resources outside of the wetlands, while women were more tethered to the wetlands. A similar pattern is reported for the Carson-Stillwater area of western Nevada (Larsen and others, 1995; Larsen and Kelly, 1995). The behavioral inferences from the biomechanical analysis are consistent across the Great Salt Lake skeletal sample. This suggests that the dietary diversity shown by the stable isotope data occurred within a single overall pattern of life, and that the variations in diet are not expressions of two separate cultures of farmers and foragers.

The molecular genetic analysis (O’Rourke and others, 1999; Parr, 1998; Parr and others, 1996) indicates homogeneity across the Great Salt Lake sample. This too, suggests there was a single system with people cycling between farming and foraging lifestyles, producing genetic linkages. Whether people living any particular lifestyle saw themselves as belonging to a distinct culture cannot be known, but regardless of cultural identity, there was a crossing of boundaries in lifestyle and in reproductive relationships. These results are as preliminary as they are seductive, but are buttressed by a strong record of human behavior in the world showing that aboriginal peoples can marry widely and repeatedly, practice multilingualism, modify ethnic and religious identities, move in and out of farming, and move among different lifestyles and places during their lives.

Fremont to Late Prehistoric Transition

By the 12th and 13th centuries, farming was in decline. This was a time of climate change in western North America and for the Fremont, a reduction in summer monsoon rainfall that negatively affected maize farming. While droughts had occurred previously, those of the 12th and 13th centuries occurred in the context of the largest aboriginal population the region had ever supported. Under these circumstances, people were left with fewer options; the landscape could not support more foragers without overexploitation, and most of the locations for rainfall/runoff farming were occupied. Thus, people could not respond to crises by moving and colonizing new land without invoking contention from others. By the end of the Fremont period the Wasatch Front was fully utilized.

Interment of burials in the area essentially terminates after A.D. 1300, about the end of the Fremont period (Simms 1999: 34, 44, Table 3.2). Given that more recent burials would be expected to occur if they were present, the abrupt decline in the size of the sample is consistent with a population decline at the end of or the Fremont period.

A.D. 1300 is the accepted date for the end of the Fremont period (Janetski, 1994), but in terms of human behavior, the transition was likely underway before this time (Coltrain, 1997; Simms, 1990). The stable carbon isotope analysis yields some evidence for a decline in farming in the Great Salt Lake wetlands beginning around A.D. 1150 (Coltrain, 1997; Coltrain and Stafford, 1999). Forager diets predominate after this time, yet molecular genetic analysis indicates genetic continuity between the pre- and post-A.D. 1150 populations (O’Rourke and others, 1999; Parr and others, 1996). This suggests that the decline in farming happened to indigenous people who persisted through a transition lasting over a century. If migrants entered the region to fill the gap, the Great Salt Lake sample indicates that they did so only after the decline in farming after A.D. 1300.

The archaeological record of Great Salt Lake, as well as Utah Valley (Janetski, 1994), also shows clearly that a substantial number of people continued a foraging lifestyle in the wetlands up to A.D. 1500 or later. Thus, there was no mystical disappearance of a farming people, and no vanishing of "the Fremont" (again merely an archaeological term for a period when farming was practiced). A foraging economy however, could not support as many people, and overall population in the region declined.

The Final Decline - The Late Prehistoric to Historic Periods

By the end of the 16th century, the archaeological record in the Great Salt Lake wetlands is sparse. Only three radiocarbon dates later than A.D. 1600 are available. These include dates from the Fire Guard site in Ogden (Stuart, 1993), Injun Creek (Aikens, 1966) near Plain City, and the Fox site on the Jordan River near the north end of Utah Valley (Janetski, 1990). This circumstance invites speculation of depopulation due to European diseases because this has been a successful explanation for similar population anomalies around the continent (for example, Campbell, 1990; Ramenofsky, 1987; Verano and Ubelaker, 1992), and has been proposed for the Great Basin (Beck and Jones, 1992;
Simms, 1990). Diseases such as smallpox, measles, and influenza, to name only a few, were introduced to the Americas via Florida, Mexico, and possibly the west coast during the A.D. 1500s. American Indians had no resistance to these Old World diseases because the two hemispheres had been isolated for so long. Diseases were rapidly transmitted among Indian population centers in the Mississippi Valley (Ramensky, 1987), and slightly later to the Southwest (Reff, 1991), California (Preston, 1996), and the Columbia Plateau (Campbell, 1990). It is not known whether these diseases penetrated the Intermountain region with its low population densities. On the other hand, the high concentration of people along the ancient Wasatch Front could have resulted in severe epidemics if diseases were introduced.

The Great Salt Lake wetlands’ archaeological record supports a strong demographic anomaly in the A.D. 1600s. This unfortunately occurred when one or more rises of Great Salt Lake level inundated the wetlands between A.D. 1550 and 1700 (Currey, 1990; Currey and James, 1982; Currey and others, 1984; Murchison, 1989) destroying human habitation. Correlations to dendroclimatological evidence suggests the most likely window for one of these transgressions was A.D. 1610 to 1620 (Fritts and Shao, 1992). By the early 1700s, the lake had regressed, once again opening a large wetland for exploitation.

Another significant change is the introduction of the domesticated horse beginning by the middle A.D. 1600s, when the Comanche and Ute raided New Mexico for horses and metal goods. The Pueblo revolt in New Mexico in A.D. 1680 caused even more horses to be obtained by Indian groups. The introduction of the horse, and the increased mobility it brought, possibly contributed to the spread of disease.

After the flooding of the wetlands had receded in the early 1700s, people did not seem to return in any significant numbers. While it is possible that the change in lifestyle, brought about by the horse, lightened the archaeological imprint, foragers of previous centuries certainly left archaeological remains, and horse-mounted tipi dwellers of the plains left obvious archaeological sites. Our impression is that far fewer people lived in the region during A.D. 1600 to 1700 and thereafter. The mystery is heightened by the fact that lake fluctuations had occurred before without depopulating the region. The explanation for these changes remains unclear, but lake levels and climate may be less important factors behind the precipitous population decline in the 17th century than the introduction of European disease to a densely populated strip along the Wasatch Front, and the introduction of the horse that hastened the spread of disease.

By the time Euro-Americans arrived in the late 18th and early 19th centuries, the Ute of Utah Valley possessed horses (Warner, 1976), and early fur trappers and explorers commented on how few Indians occupied the Great Salt Lake wetlands, given the apparent richness of the area (Dewey, 1966). One group of Eastern Ute claimed to have lived near the mouth of the Weber River, but left the area when bison herds declined (Trenholm and Carley, 1964). Other inhabitants included Shoshone groups from Wyoming who annually frequented the Great Salt Lake wetlands for the fall bison hunt (Murphy and Murphy, 1960; Madsen, 1985; Wilson, 1991). The explorer John C. Fremont observed Shoshone fishing at the mouth of the Bear River, and later that summer found Shoshone in the marshes trapping fish and living in groups of two to 10 families (Fremont, 1888).

MANAGING ARCHAEOLOGICAL REMAINS

The Great Salt Lake wetlands, from Brigham City to Salt Lake City, are rich in cultural resources. These resources are protected by federal and state laws dating as early as 1906 that make it illegal to remove ancient objects from the surface or from excavations of any kind. Since the Fremont period population density was so high near Great Salt Lake, relative to much of ancient Utah, human skeletal remains from that period will continue to appear and be susceptible to vandalism and erosion. State law makes it a crime to disturb any suspected human remains prior to contacting local law enforcement. Pressures for development along the eastern edge of Great Salt Lake will surely continue, for example, the proposed Legacy Highway. Anywhere there are ancient stream channels meandering toward the lake, archaeological sites and human remains will be encountered whether they are readily apparent on the surface or not.

Perhaps more important than the law is the respect due the deceased, and the invaluable knowledge contained in the archaeological sites and in the human skeletal remains. In this paper, we have tried to show the value of the knowledge that can be gleaned from archaeological sites, from human skeletal remains, and how technical advances are increasing the amount of knowledge that can be gleaned. The foundation for the preservation is thus not preservation per se, but the respect due to living Native Americans descended from the ancients, and the educational value that comes from preservation, judicious study, and management of archaeological sites and human remains.

Ancient Native American skeletal remains must be protected. Destruction has occurred for decades and is caused by the hunters, ATV enthusiasts, fishermen, hikers, and collectors who use the Great Salt Lake wetlands. Destruction from natural erosion is also persistent, especially in areas more exposed to wind and wave action. Where the impacts of continued urban growth are inevitable, cultural resources should be recorded and in the case of human remains, moved and respectfully re-interred. Utah has made progress toward including Native American views and desires in the process of managing the state’s heritage resources. No living person however, can own the dead, and the remains from ancient times are a storehouse of knowledge about America’s collective past. Even if we decide not to study human remains now, it may be shortsighted for the living to categorically prevent future generations from making a decision to study. We really cannot speak for future generations of Utahs, Indian or non-Indian. A far-sighted solution was implemented in the case of the Great Salt Lake remains. They are interred in a burial vault with careful record keeping and managed by the tribes under the auspices of the Utah Division of Indian Affairs (Simms and Raymond 1999).

Despite progress in federal and state land managing agencies, the management of cultural resources along Great Salt Lake has primarily been reactive in the face of developments such as highways, parking lots, buildings, dikes and canals, sewers, park development, and vandals. If we could move beyond the view that cultural resources are either a...
nuisance to development, or are only the object of preservation for preservation’s sake, both the educational value of the past and the management task of selective preservation could be approached in a more proactive way. The Great Salt Lake area has a long history of professional and avocational archaeology, and given its proximity to urban areas, land managers should consider the current and potential uses of the archaeological resources by the public. Possibilities include programs of field recording and excavation, laboratory analysis, liaison with local Native American tribes, interpretive displays, and educational programs involving schools and public-service groups. Efforts along these lines are evident at Antelope Island State Park, and in some Wasatch Front towns such as Marriott. The potential for this form of inclusive management is great at the Bear River Migratory Bird Refuge (U.S. Fish and Wildlife Service), the Willard Bay area (Utah State Parks and U.S. Bureau of Reclamation), and in communities such as Layton, Syracuse, and Plain City to name a few.

The cultural resources of Great Salt Lake are a fragile and nonrenewable window to our past that helps us understand the present. The high frequency of ancient human skeletal remains add moral and political ingredients to the challenge of management. Cultural resources deserve a rightful place in the suite of management responsibilities accorded local, state and federal governments, and in the agenda of preservationist groups such as the Friends of Great Salt Lake and the Sierra Club who serve as advocates for the rich natural and heritage resources of the Great Salt Lake wetlands.

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REFERENCES

Aikens, C.M., 1966, Fremont-Promontory-Plains relationships, including a report of excavations at the Injun Creek and Bear River no. 1 sites, northern Utah: Salt Lake City, University of Utah Press, Anthropological Papers 82, 102 p.


Currey, D.R., Genevieve Atwood, and D.R. Mabey, 1984, Major levels of Great Salt Lake and Lake Bonneville: Utah Geological and Mineralogical Survey, Map 73, scale 1:750,000.


Dodd, W.A., 1982, Final year excavations at the Evans mound site: Salt Lake City, University of Utah Press, Anthropological Papers 106.


Enger, W.D. and Blair, W., 1947, Crania from the Warren
Mounds and their possible significance to northern periphery archaeology: American Antiquity, v. 13, p.142-146.

Fawcett, W.B. and Simms, S.R., 1993, Archaeological test excavations in the Great Salt Lake wetlands and associated analyses: Logan, Utah State University Contributions to Anthropology 14, various pagings.


Kennedy, O.A., 1930, Old Indian relics of Willard puzzle, Salt Lake Tribune newspaper article. Filed in box 8, file 7, Charles Kelly collection, scrapbook on archaeology: Salt Lake City, Utah State Historical Society.


—1986, Chief Pocatello, the white plume: Salt Lake City, University of Utah Press, 142 p.


Madsen, D.B., and Lindsay, L.W., 1977, Backhoe village: Salt Lake City, Antiquities Section Selected Papers 4, 119 p.


Manful, Elvira, 1938, George East - pioneer personal history: Salt Lake City, Utah State Historical Society.


Murchison, S.B., 1989, Fluctuation history of Great Salt Lake, Utah, during the last 13,000 years: Limnoeotectonics Laboratory Technical Report 89-2: Salt Lake City, Department of Geography, University of Utah, 137 p.

Murphy, R.F., and Murphy, Yolanda, 1960, Shoshone-Bannock subsistence and society: Berkeley, University of California
Anthropological Records v. 16, no. 7, p. 293-338.
Pendergast, David, 1961, Excavations at the Bear River site, Box Elder County, Utah: Salt Lake City, Utah Archeology, v. 7, no. 2.

Simms, S.R., Ugan A., and Bright, J., 1997, Plain-ware ceram-