Life at the Nexus of the Wetlands and Coastal Prairie, West Los Angeles

Jeffrey H. Altschul, John G. Douglass, Richard Ciolek-Torrello, Sarah Van Galder, Benjamin R. Vargas, Kathleen L. Hull, Donn R. Grenda, Jeffrey Homburg, Manuel Palacios-Fest, Steven Shelley, Angela Keller, and David Maxwell

For over 8,000 years, aboriginal peoples lived and adapted to the changing environments of the Ballona Lagoon, a drowned river valley located on Santa Monica Bay, near Los Angeles. During this time, the coastal environment, including the Ballona itself, altered significantly with resulting changes in human behavior. This, in addition to a melding of cultural traditions from both the coast and the desert, led to a complex social dynamic that flourished in the Los Angeles Basin. Research by Statistical Research, Inc. (SRI) and others at nearly 25 archaeological sites in the Ballona region offers a unique view into human adaptations to coastal wetlands.

One of the seminal processes in the prehistory of the Southern California Bight was the transformation of small, dispersed, and mobile residential groups into larger, more nucleated and stable settlements between 1,000 and 2,000 years ago. These changes were associated with increased population size and social complexity. Archaeologists have long debated whether these demographic and social changes represented the culmination of a long-term, gradual cultural evolution or were the result of punctuated culture change (Arnold 2001; Carniero 1998).

Figure 1: Map showing Santa Monica Bay and the location of areas and sites discussed in the text, including the Ballona Lagoon.

Most archaeologists have focused on proximate causes when discussing these changes. Some have argued that there was an environmental trigger, such as an increase in sea surface temperature or extended periods of drought, that led to social disruption and ultimately to social transformation (Arnold 2001; Raab and Larson 1997). Others have cited social causes, such as the immigration of Uto-Aztecan speakers from the Mojave Desert, as leading to these changes either through hostile interactions with indigenous people or through an integration of cultural patterns (Kroeber 1925).

In this paper, we eschew the search for single causes, and instead focus on documenting changes in environment, subsistence, and settlement over the past 8,000 years in one coastal area, the Ballona. Our ultimate purpose is to provide a detailed case history that can be compared with neighboring areas in the search for more universal causes of social change.

The Paleoenvironment of the Ballona

The Ballona is a drowned river valley at the edge of Santa Monica Bay near West Los Angeles, sandwiched between the Santa Monica Mountains and the Palos Verdes peninsula (Figure 1). Ballona and Centinela creeks, which feed the Ballona wetlands, drain an approximately 110-square-mile area, bounded on the south by the Westchester Bluffs and by the Baldwin and Beverly Hills to the east and north. During much of the Holocene, however, Ballona Creek captured the flow of the much larger Los Angeles River, as evidenced by a massive submarine fan-delta off the coast. This change in flow of the Los Angeles River has been documented multiple times during the historic period (Gumprecht 2001)

Since 1989, Statistical Research, Inc. (SRI) has been fortunate to work on the prehistory of the Ballona through survey and excavation of numerous prehistoric and historic-period archaeological sites in the area. Our overarching goal over the past seventeen years has been to study human adaptation to a dynamic environment. Three major research objectives have guided our work in the region: 1) to reconstruct the changing paleoenvironment of the wetlands and lagoon; 2) to document the dynamics of prehistoric settlement; and 3) to understand the evolving organization of human groups in response to changes in

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the natural and cultural landscapes through the examination of site structure (Altschul et al. 1991; Altschul et al. 2003; Douglass et al. 2005a).

An interdisciplinary team of geoscientists, led by Dr. Jeffrey Homburg, has spent more than a decade reconstructing the Holocene environment of the Ballona (Figure 2). From this research, we know that at the end of the Pleistocene, what later became the Ballona Lagoon was an open marine coast. By 7000 BP, sea levels were 10–15 m below current levels, and the shore line was at least 500 m farther off shore than today. Ballona Creek captured the flow of the Los Angeles River during much of the Holocene, as evidenced by a massive submarine fan-delta off the coast. One of Homburg's team, Dr. Peter Wigand, used pollen data to reconstruct the region's paleoclimate (Wigand 2005). Wigand argues that there was a dramatic increase in both annual temperature and precipitation between 8000 and 7000 BP, events that corresponded to the establishment of a rich marsh at the base of the bluffs. At times, this major river cut into the Westchester Bluffs, leaving marshy, vegetated areas along the eastern and southern portions of the bay. Drainage off the bluffs also cut side canyons, depositing sand and sediment in alluvial fans that created well-drained land surfaces at the edge of the marsh. One of the most pronounced of these side canyons, termed the Lincoln Gap, had begun to form by 7000 BP (see Figure 2).

Early Settlement

Based on radiocarbon dates, humans appeared on the landscape beginning around 8000 BP. This early occupation was Millingstone in character and reflected the estuary and bay-shore adaptation common to coastal California in the early Holocene (Breschini and Haversat 1991; Gallegos 1991; Macko 1998; Mason and Peterson 1994; Walker 1952). Midden deposits and features from this period, mostly rock clusters representing cooking hearths or clean-outs, are sparse and lack diversity (Hull et al. 2006). Lithic tools also lack diversity, whereas stone material use is much more diverse than in later times in the Ballona (Hull 2005). These data run counter to current notions of the early development of sedentary settlement (Colten and Erlandson 1991; Porcasi and Porcasi 2002) and suggest a small and highly mobile foraging population that occupied the Ballona on a short-term, seasonal basis.

Initially, the Millingstone-period occupation was restricted to the West Bluffs area, near the Lincoln Gap, although even older sites may be found in now-inundated areas offshore and deeply buried in stream alluvium (see Figure 2). These Millingstone-period sites reflect the diversity of subsistence strategies evident in other California coastal regions during this time. The earliest sites on the bluffs, LAN-64 and -206, evidence the specialized procurement strategy (Figure 3) found at the Malaga Cove and Shobhan Paul sites, where shellfish and fish were the primary protein sources (Porcasi and Porcasi 2002) (see Figure 1). The high frequencies of sharks and rays that distinguish the early Ballona sites from the Malaga Cove and Shobhan Paul sites is most likely the result of the lagoonal setting of the former. Late Millingstone settlement on the bluff top and at the edge of the lagoon indicates a more generalized foraging strategy similar to San Diegito (early Holocene) settlements documented by Gallegos (1991) and Warren (1967). At the lagoon edge, subsistence emphasized the exploitation of small terrestrial mammals, with a much lower use of fish and shellfish (see Figure 3). Contrary to what one might expect, bluff top sites that are more distant from the lagoon evidence a much greater emphasis on fish, especially sharks and rays from the lagoon. The abundance of scallops and oysters in these early collections is consistent with the relatively open lagoon conditions suggested by the environmental reconstruction for this time period (Van Galder and Ciolek-Torrello 2005) (Figure 4).

After 6500 BP, the alluvial fan at the base of the Lincoln Gap also was settled. Wigand (2005) used palynological data to reconstruct the region's paleoclimate. Wigand argues that during the period between 8000 and 7000 BP, there was a dramatic increase in both annual temperature and precipitation. Temperature and precipitation reached their Holocene maxima at this time, which also corresponds to the establishment of coastal and montane chaparral communities. During the period between 7700 and 7000 BP, Wigand concludes, a rich marsh was present immediately north of the earliest dated archaeological sites on the bluff tops. This marsh resource disappeared by 6900 BP, due to rapid in-filling of portions of the marsh through flooding of Ballona and Centinela creeks.

By 5000 BP, sea levels had stabilized, leading to the creation of a bay in the Ballona area (see Figure 2). Oysters found in cores suggest open estuarine conditions, which would have been conducive to human settlement. Yet, of the 102 radiocarbon samples taken from 15 sites in the Ballona, none date to the period between 6000 and 5000 BP (Figure 5). Currently, we have no good explanation for this hiatus. After 5000 BP, there was a dramatic decline in the effective precipitation in southern California. It may be that simultaneous drying of the climate along with a drop in temperature drove the human population in the Mojave Desert toward the coast. These events may have ushered in another of the seminal events of southern California prehistory—the migration of Uto-Aztecan speakers from the desert to the coast, which Kroeber (1925) termed the Shoshonean wedge.

Kroeber argued that the Shoshonean intrusion occurred late in prehistory, perhaps around AD 500, when the bow and arrow make their appearance in the archaeological record. Others have argued that the Shoshonean intrusion occurred along the Southern California Bight around 3000 BP, at the beginning of the Intermediate period. Altschul and his colleagues (Altschul and Grenda 2002, Altschul et al. 2005), for example, suggest that the intrusion may have been only the most recent in a long history of movement between the desert and the coast. Unusual aspects of material culture, such as desert-style Marymount points (Van Horn 1990), distinctive micro-drills, use of stone in place of shell for bead manufacture, and cremation burial, are hallmarks of this immigration into the Ballona. Most of these traits first appeared in the Ballona around 3000 BP, although some of them may have appeared as early as 5000 BP, during the Millingstone period.

Warren (1967) and Gallegos (1991) suggest that desert groups would have accessed coastal wetlands, such as the Ballona, similar to the wetlands of the Great Basin. Estuaries and vernal pools of the coast

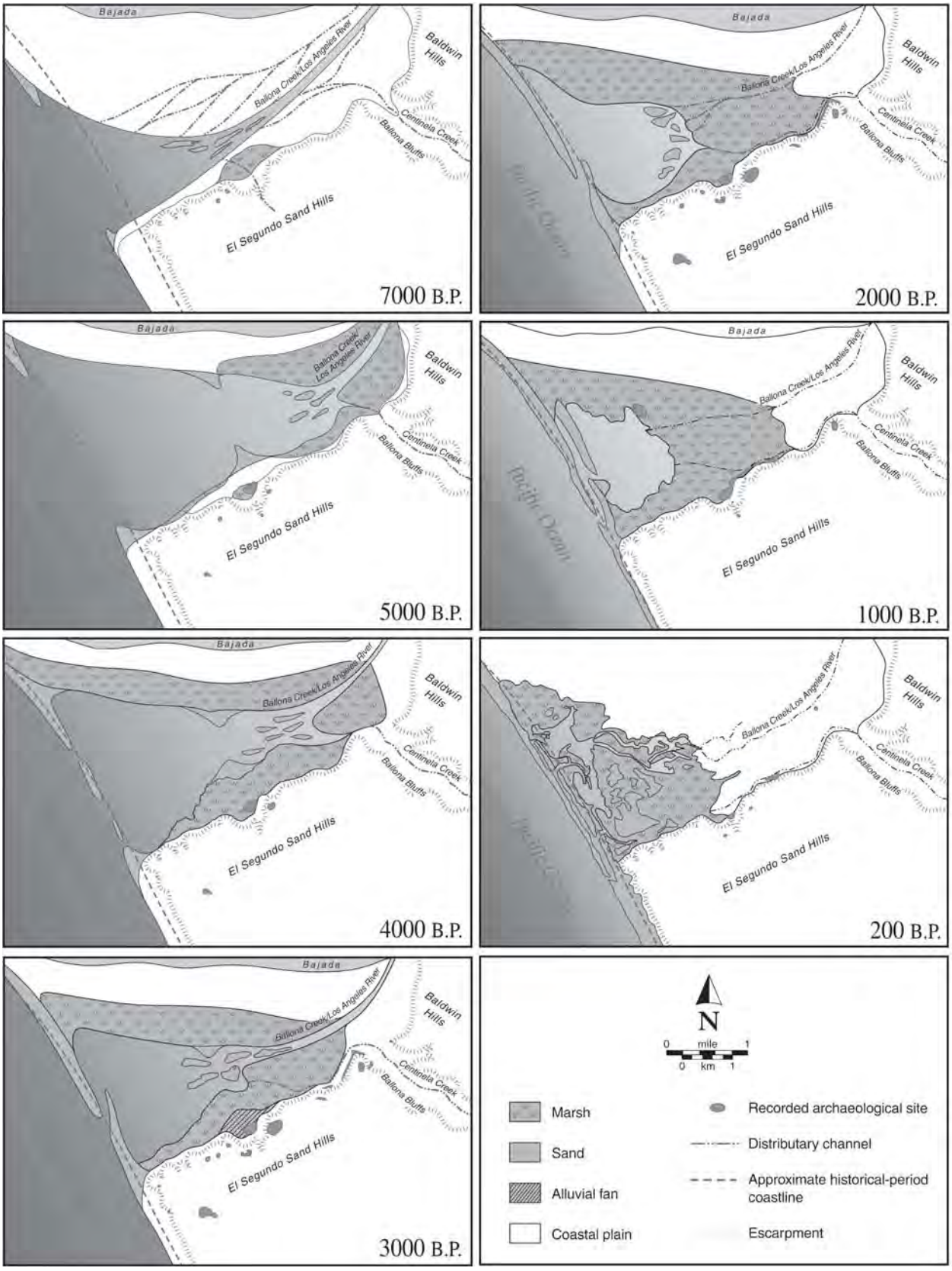


Figure 2: Reconstruction of the Holocene environment in the Ballona area.

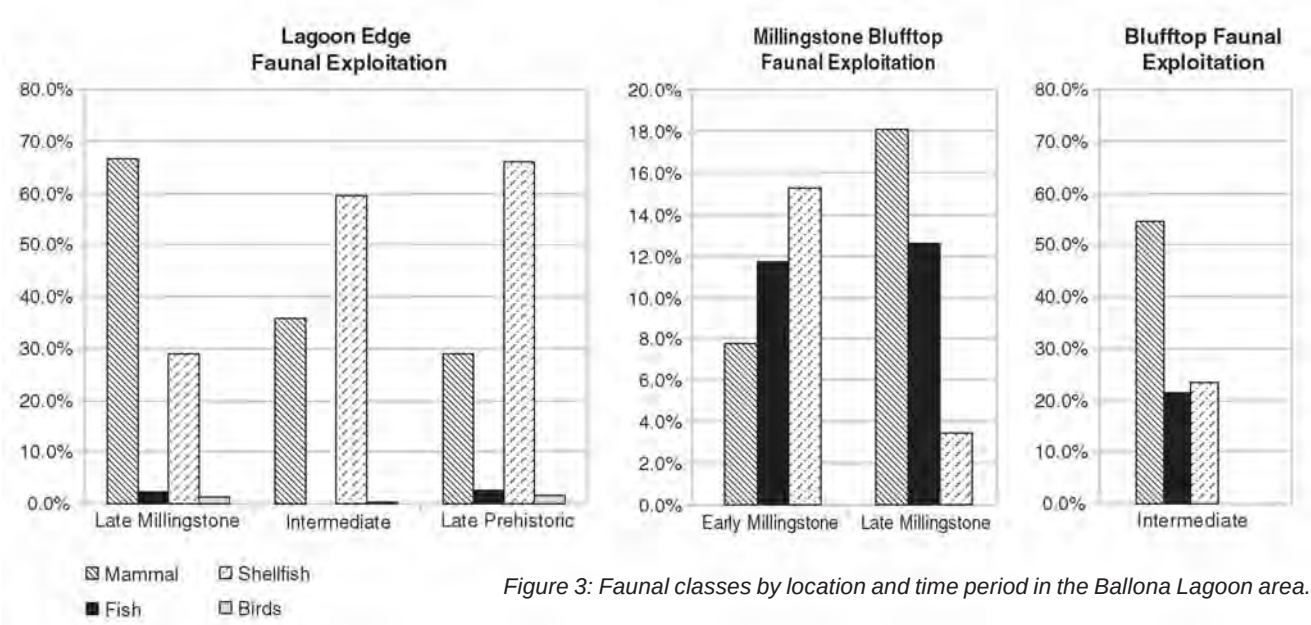
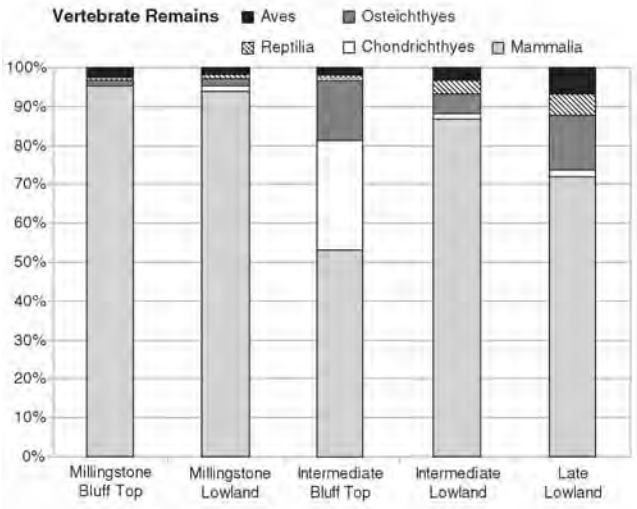


Figure 3: Faunal classes by location and time period in the Ballona Lagoon area.



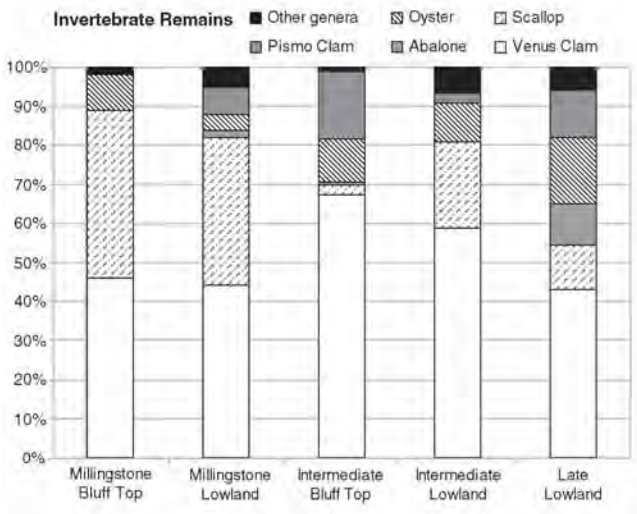


Figure 4 (Left): Bluff-top and lagoon-edge vertebrate and invertebrate remains in the Ballona Lagoon area.

would have presented familiar resources and adaptive opportunities where traditional technologies and subsistence practices could be employed with little modification. The data from the Ballona support this view (Ciolek-Torrello and Douglass 2002).

After sea level had stabilized, subsequent changes to the Ballona were largely driven by sedimentation that continued to decrease the amount of open water and to re-establish marshy areas in the wetlands. Between 5000 and 3000 BP, occupation seems to have focused primarily on the alluvial fan and associated sand spits near the Lincoln Gap. These areas would have provided the best locations for exploiting the marsh and the lagoon. By 3000 BP, settlement had increased in upstream locations of Centinela and Ballona creeks and on the bluff tops. Five midden deposits, all of which are relatively sparse, date to this period. These middens are not significantly different from those of the Millingstone period, suggesting a continued pattern of small, mobile foraging groups.

INTERMEDIATE PERIOD

The majority of sites studied in the Ballona were occupied between approximately 3000 and 1500 BP. All well drained landforms in the wetlands and the knolls on the surrounding bluffs hosted residential sites at this time. Unlike Millingstone and early Intermediate-period sites, later sites were relatively large and contained hundreds of features, including hearths, mortuary features, and houses. The faunal collections from these sites are diverse, reflecting a much broader-spectrum collecting strategy that targeted terrestrial mammals and birds from the freshwater marsh and coastal prairies, as well as fish and shellfish (see Figure 3). Differences between bluff top and lagoon edge sites persisted, with sharks and rays (Chondrichthyes) from the

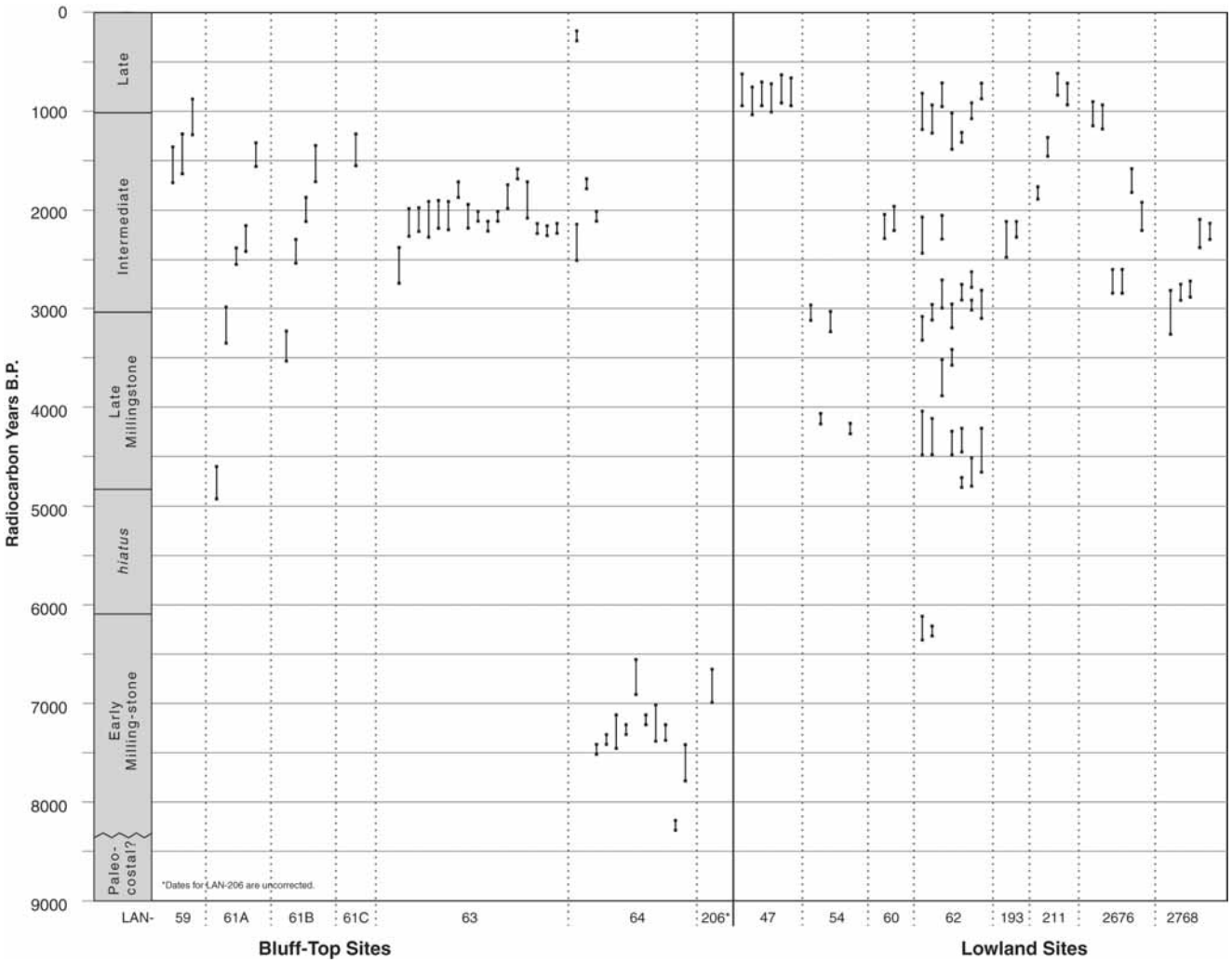
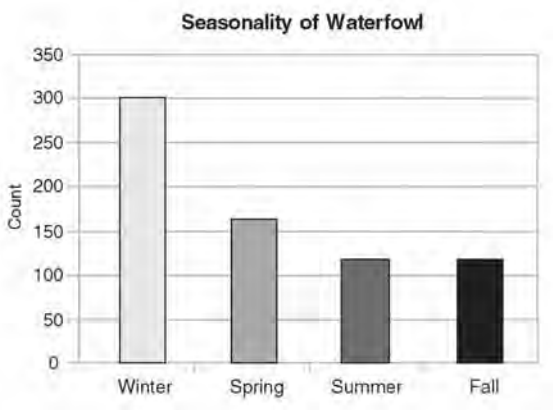


Figure 5: Radiocarbon dates collected from sites in the Ballona Lagoon area.

lagoon emphasized in bluff top sites and shellfish from the mudflats targeted at lagoon edge sites. The emergence of Venus clam as the predominant shellfish in almost all collections is consistent with the expansion of mudflats at this time (see Figure 4). Seasonality data are limited, but the dominance of migratory waterfowl in the avian faunal collections suggests a predominantly late fall to early spring occupation (Figure 6). The lithic collections are indicative of a logistically organized settlement (Hull 2005). Together, these data suggest residential mobility in the Ballona was significantly reduced in the Intermediate period, but a fully sedentary occupation is still not indicated.

Three archaeological sites, LAN-63 and -64, and –206A, in the West Bluffs area, provide our best data on Intermediate period settlement (Figure 7). Due to residential development, most of the three defined archaeological sites comprising this settlement were subject to data recovery that entailed large-scale excavation, followed by mechanical stripping and complete mapping and recovery of all exposed features (Douglass et al. 2005b). Analysis of the midden materials supports a highly diverse set of activities, strongly suggestive of a more permanent

Figure 6: Seasonality indicators in the Ballona Lagoon area based upon waterfowl remains.



occupation. As important as the number and variety of features are their distribution (Douglass and Ciolek-Torrello 2005). These sites overlook two large, natural depressions. The eastern depression was used as a community trash dump and was surrounded by hundreds of thermal features, some of which were associated with artifact concentrations reminiscent of toss zones (Binford 1983:317; Gargett and Hayden 1991). On the western flank of this depression were three features consisting of large numbers of milling implements, many of which had been intentionally broken and smeared with ochre. Interspersed among the milling stones was cremated human bone. Inhumations also were found in several locations throughout the community. Often, these burials were found in small clusters, suggesting the presence of burial grounds for specific social groups. The western depression, which held water for various lengths of time, was used primarily as a plant-resource procurement area, with processing taking place on the higher ground where hearths abound.

This occupation corresponds with a brief period of unusually high precipitation after a long period of decline documented by Wigand (2005). Sites located on the bluff top immediately south of the Ballona Lagoon were ideally situated to procure resources from two distinct environments: the Ballona wetlands to the north, and the extensive Los Angeles Coastal Prairie, which contained numerous vernal pools, to the south. Macrobotanical evidence from West Bluffs suggests that its inhabitants took advantage of this ecotone, collecting seeds from plants growing around vernal pools to the south and marsh plants from the Ballona Lagoon to the north. Because of the dramatic increase in rainfall during this brief period, resources in both the Ballona wetlands and the Coastal Prairie would have been at their peak, making the area especially attractive to settlement.

Late Period

By 1000 BP, settlement changed fundamentally. As the Ballona Lagoon became a sediment-choked estuary, most areas were abandoned except the lagoon edge. By this time, most of the local population was concentrated in one very large settlement, nested for 1.5 km along the base of the bluff, near the mouth of Centinela Creek. At 2000 BP, nearly every habitable location on the bluff tops and along Centinela Creek had hosted human activity. Less than a thousand years later, nearly all occupation was concentrated along lower Centinela Creek.

Community Structure

Why did the settlement pattern change so dramatically between 2000 and 1000 BP? To examine this question, we need to establish baseline information on site structure and demography. By 2000 BP, there were sites located both along the top of the bluffs and at the base of the bluffs. As we have expanded our analysis of sites in both locations, we have been surprised that the data suggest that there may have been subsistence differences between these groups of sites, as mentioned above. These data suggest that each site represents a residential base camp or small village.

Although sites occupied during the Intermediate period appear to have been functionally different from one another in terms of subsistence, we have not determined whether these different sites were independent, contemporaneous settlements or independent but sequentially occupied settlements. For example, only the slope of the Bluffs separated the three Lincoln Gap settlements (LAN-61, -62, and -63). It is possible that either the entire community moved periodically en masse from the top to the bottom of the Bluffs and back again, or that the three settlements were occupied simultaneously.

The West Bluffs community is currently the best-studied (Douglass et al. 2005b). As discussed above, space at the West Bluffs sites was highly structured and segregated into communal refuse areas, resource procurement and processing areas, ritual space, and burial areas, indicating a relatively substantial and permanent occupation (see Figure 7).

Van Horn and his colleagues (Van Horn 1987) argued that the sites comprising the West Bluffs community were created by repeated, periodic, short-term visits by one or two domestic units. For the occupation prior to 2000 BP, we concur with Van Horn's inference. After this date, however, the community underwent a fundamental change. Multiple social groups lived here on an extended basis. We find little evidence to support intermittent occupation. More than 20 radiocarbon dates, primarily from features at LAN-63 and -64, cluster in a 300-year period around 2000 BP (see Figure 5). This sustained 300-year occupation corresponds well with Wigand's brief period of maximum precipitation. Together, these data suggest that all three Lincoln Gap settlements were probably occupied during this brief period of optimal climatic conditions. While short-term, intermittent settlement both preceded and followed this climatic optimum in the Intermediate period, large and relatively stable communities probably formed along the entire length of the Westchester Bluffs during this brief period to take advantage of peak resource availability at the nexus between the wetlands and the coastal prairie.

By 1000 BP, the entire population in the Ballona had congregated along the lagoon edge, with most people located at the base of the bluff. As with the earlier communities, this community exhibits a significant degree of site structure. At the lagoon edge, there is evidence of processing of estuarine resources. Domestic use areas are found farther up the alluvial fan.

Summary And Conclusions

In conclusion, small, highly mobile foragers first settled the Ballona during the early Holocene, between ca. 7000 and 8000 years BP. The limited archaeological evidence suggests that during this period, as the lagoon was still forming, these early residents first settled on the top of the Bluffs, with a focus, at least initially, on fish and shellfish from the lagoon and grasses from the Coastal Prairie. Occupation during the middle Holocene intensified and resource use diversified, as evidenced by a greater number of sites in different areas of the Ballona and the increased exploitation of small terrestrial mammals. During a brief

period of greatly increased precipitation around 2000 BP, settlement expanded dramatically along the Westchester Bluffs to take advantage of a short-term increase in lagoon and prairie resources. Numerous small settlements, reflecting a pattern of much-reduced residential mobility and broad-spectrum resource procurement, were established on top of the bluffs, along Centinela Creek, and at the lagoon edge. Environmental conditions deteriorated by 1000 BP, with a combination of decreased precipitation and cyclical episodes of extreme drought. Rather than abandon the area or return to the pattern of small mobile groups, the relatively large and stable population of the Ballona aggregated in a few large settlements along lower Centinela Creek and at the edge of the lagoon, where they could exploit the most reliable resources.

For 7,000 years, subsistence in the Ballona had focused on the lagoon, its associated wetlands, and the surrounding Coastal Prairie. By the late period, however, attention began to shift to offshore and other more distant environments as the lagoon and its associated wetlands silted in and died up.

Overall, archaeological and paleoenvironmental evidence suggests that demographic and social changes in the Ballona were related to the gradual evolution of the lagoon from an open embayment to a sediment-laden estuary, to short-term climatic fluctuations, and to the movement of people between the desert and the coast. The emergence of stable, nucleated settlement in the Ballona can be seen best as a response by a population that had grown during a brief period of exceptionally good climatic conditions to an evolving wetland and an extended period of unpredictable resource availability.

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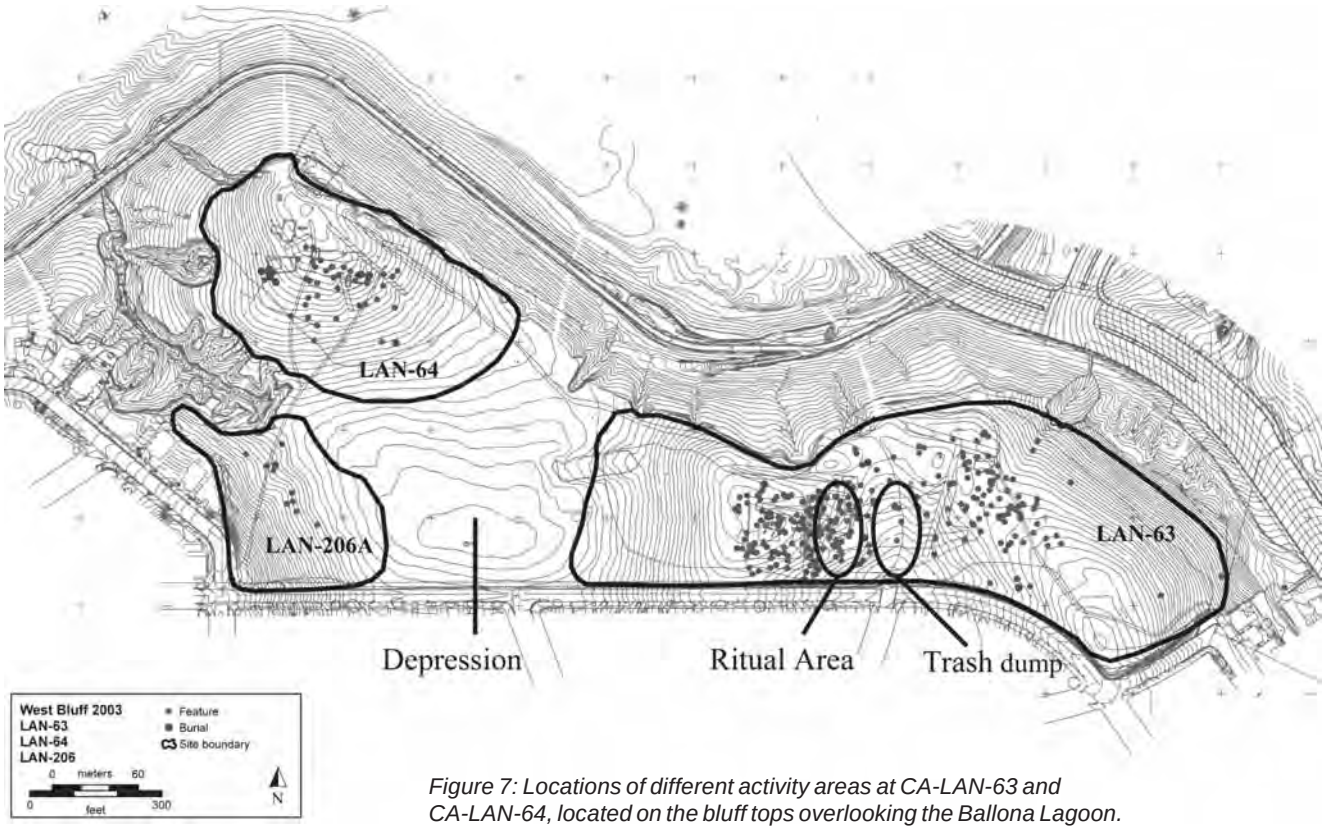

Figure 7: Locations of different activity areas at CA-LAN-63 and CA-LAN-64, located on the bluff tops overlooking the Ballona Lagoon.

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