THE UPLAND ARCHAEOLOGY OF WEST ROCK RIDGE IN SOUTH-CENTRAL CONNECTICUT: SMALL STEMMED POINT TRADITION LAND-USE INTENSIFICATION

by

COSIMO SGARLATA

A dissertation submitted to the Graduate Faculty in Anthropology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

2009

© 2009

COSIMO ANTHONY SGARLATA

All Rights Reserved

This manuscript has been read and accepted for the
Graduate Faculty in Anthropology in satisfaction of the
dissertation requirement for the degree of Doctor of Philosophy.

William J. Parry

Date — Chair of Examining Committee

Louise D. Lennihan

Date — Executive Officer

Thomas H. McGovern

Timothy W. Pugh

Kenneth L. Feder

Supervisory Committee

THE CITY UNIVERSITY OF NEW YORK

Abstract

THE UPLAND ARCHAEOLOGY OF WEST ROCK RIDGE IN SOUTH-CENTRAL CONNECTICUT: SMALL STEMMED POINT TRADITION LAND-USE INTENSIFICATION

by

Cosimo Sgarlata

Adviser: Professor William Parry

West Rock Ridge is an intrusive diabase sill that was injected between layers of brownstone bedrock, and subsequently exposed by erosion. Although its precipitous west facing cliff and more gently sloping but rocky and uneven eastern face, provide one of South-Central Connecticut's most rugged environments, the objective of this project was to see how this setting could contribute to understanding of Southern New England's prehistoric occupants.

Following Barber's (1981) advice concerning "new ways" to look at "new data" the project focused on changing land-use patterns on the part of South-Central Connecticut's prehistoric inhabitants. It was the conclusion of this investigation that Small Stemmed Point Tradition habitation of West Rock Ridge occurred under conditions of high hunter-gatherer population density and territorial packing. These conditions favored thorough coverage of available territorial ranges, and inclusion of otherwise marginal resource patches, such as West Rock, into annual subsistence rounds.

It can be further suggested that cultural adaptations which rely on decreased residential mobility and focal dependence on vegetative and/or aquatic resources adjacent to habitations would lead to decreased coverage of available territorial ranges. In fact, the continued reliance on high residential mobility, despite increasing numbers of hunter-gatherers during the Late Archaic Period, appears to have been a major factor pushing Small Stemmed Point Tradition populations to utilize resource patches that were apparently marginal at other times.

The long temporal duration of the Small Stemmed Point Tradition argues against models of cultural complexity that postulate increasing population density as a “prime mover” for the adaptation of hierarchical societies. As Woodburn suggests (1998) the differences between residentially mobile “immediate return” hunter-gatherers, as opposed to more sedentary “delayed return” economies have important implications in terms of socio-political organization and structure. Immediate return economies are more often egalitarian in comparison to delayed return economies in which some forms of permanent authority and hierarchical differentiation are found. The persistence of very stable cultural patterns, such as the Small Stemmed Point Tradition may therefore have its explanation in terms of individual choice and agency, favoring autonomous social relations.

Acknowledgements

I would like to thank my dissertation advisor Professor William Parry for his profound patience in teaching me, as well as his expert guidance in all of the phases of my research including methods, theory and writing. I would also like to thank my other committee members, including Thomas McGovern, Tim Pugh and Ken Feder for their advise and encouragement. Special thanks to Ernie Wiegand of Norwalk Community College, my first archaeology teacher, and Lori Weinstein, of Western Connecticut State University, for her help in getting my research started as an undergraduate student.

I would not have been able to perform this project without the assistance of Nicholas Bellantoni, Connecticut's State Archaeologist, David Poirier and the rest of the staff of the Connecticut State Historical Commission, as well as the Connecticut Department of Environmental Protection, who helped me to obtain the necessary permits.

Thanks also to Simon Donato who provided me invaluable information concerning matters of importance concerning the history and prehistory of the West Rock Ridge area, to Barbara Calogero, who gave of her time to analyze thin sections of geological samples, and to David Lentz who identified paleobotanical remains from the Wintergreen Notch site.

I also need to extend my thanks to Michael Rodgers and Nancy Parsons, of Southern Connecticut State University who contributed their report of the West Rock Nature Center 1 site, Jim Murray who provided information concerning the Rocky Top site, and Holly Cuzzone, from Yale University, for information she volunteered concerning the Cove River site. Finally, my sincere appreciation to all those who assisted in excavation of West Rock Ridge sites at some point during the archaeological investigations: Dawn Brown, Rob Wallace, Katherine Forgacs, Jane Gary, Anthony Dadio, Mariana Matotov, Scott Palumbo, Raymond Martina, Jeff Huzzi, Melissa Arsenault, Ryan Murray, Melissa Savilonis and Mia Lyren.

Table of Contents

Chapter 1 1

The Role of Upland Archaeology in Studying Prehistoric Hunter-Gatherers 1

What are the Uplands? 7

Research Objectives 11

The Project Area 15

West Rock Ridge 18

Selected Research in Upland Archaeology 19

Chapter 2 28

Research Design and Theoretical Perspectives 28

Variability of Hunter-Gatherer Land Use Patterns 29

Binford's (2001) Theory of Intensification 31

Theoretical Perspectives 36

Optimal Foraging Theory 36

Hunter-Gatherer Mobility 40

Expedient and Curated Technologies 44

Other Important Theoretical Concerns of the West Rock Ridge Project 49

Ambush Hunting 49

Artifact Breakage and Discard Patterns 53

Risk and the Use of Hunting Aids Such as Traps and Facilities 56

Non-Site or Distributional Archaeology 57

Chapter 3 60

Methodology 60

Site Survey 62

Excavation 65

Concepts and Terms Used in Lithic Analysis 66

Comparative Analysis of Site Assemblages 73

Measurement Tools for Predictions Made in Chapter Two 80

High Residential Mobility 81

Distinct Sense of Territoriality 84

Foraging Mobility Strategy 86

Organization of Technology 90

Significance of Hunted Resources 93

Organization of the Rest of this Volume 95

Chapter 4 97

Geology and Geological History of the Central Connecticut Lowlands and its Trap-Rock Ridges 97

Connecticut's Geological History 100

Connecticut's Central Lowlands 103

Lithic Raw Material Sources 106

The Geological Formation Processes of West Rock Ridge and its Archaeological Record 110

Ecology of Connecticut's Trap-Rock Ridges 111

Chapter 5 113

West Rock's Ecological Context: A Model for its Prehistoric Utilization 113

West Rock Ridge and its Ecological Diversity 115

Connecticut's South-Central Lowlands 126

Significant Environmental Zones of South-Central Connecticut 128

Summary and Discussion 133

Chapter 6 136

Ethnography of the Quinnipiac and other Native American Cultures of Southern New England 136

Native American Cultures of Southern New England 137

Ethnographic and Historical Documentation of the Quinnipiac 149

Quinnipiac Culture 152

Ethnohistory of the Paugussett 158

Chapter 7 160

Southern New England Prehistory and the Available Archaeological Record of South-Central Connecticut 160

Prehistory of Southern New England 161

The Paleo-Indian Period 161

The Early Archaic Period 166

The Middle Archaic Period 169

The Late Archaic Period 172

The Long Temporal Duration of the Small Point Tradition 182

The Terminal Archaic Period 185

The Early and Middle Woodland Periods 190

The Late Woodland Period 194

The Archaeological Record of South-Central Connecticut 196

Analysis of Site Files for South-Central Connecticut 211

Discussion 214

Chapter 8 216

Information Gathering or “Lookout Sites” 216

Environmental Context 217

Survey Methodology and Site Selection 221

The West Rock Ridge Site 224

Blakeslee Quarry site: Locus A and Locus B 229

Locus A 230

Locus B 234

The Kietan Lookout Site 238

The Kietan Lookout Site North 247

Discussion 247

Chapter 9 249

Quarry and Lithic Procurement Sites 249

Sources of Lithic Raw Materials in the West Rock Ridge Area 251

Environmental Context of West Rock Ridge's Quarry and Lithic Procurement Sites 255

Archaeological Investigation of Quarry and Lithic Procurement Sites 258

The Konolds Pond Site 260

Methodology 262

Stratigraphy 265

Analysis of Lithic Artifacts from the Konolds Pond Site 267

Analysis of Lithic Debitage 272

The West River Site 277

The Building Brook Site 281

Discussion 288

Chapter 10 292

Seasonal Campsites Along Upland Streams 292

The Fairhaven Reservoir Site 294

Methodology 300

Stratigraphy 301

Excavation and Site Boundaries 302

Lithic Analysis of Artifacts Recovered From the Fairhaven Reservoir Site 303

Debitage Analysis 309

The West Rock Nature Center 1 site 320

The Building Brook Farm Collection 324
Discussion 328
Chapter 11 329
Intercept Hunting Sites 329
Intercept Hunting 330
Wintergreen Notch 331
Disturbance 334
Methodology 340
Stratigraphy 341
Artifact Analysis 343
Debitage Analysis 353
Projectile Point Impact Damage and Artifact Discard Patterns 359
Ambush Hunting 361
Collectors and Task Specific Locations 364
The Rocky Top Site 368
The Whaley Site 374
Discussion 376
Chapter 12 379
Comparison of Lithic Assemblages from West Rock Ridge Sites 379
West Rock Ridge and Prehistoric Settlement Patterns in South-Central Connecticut 390
Chapter 13 396
Conclusions 396
Hypothesis Testing 399
High Residential Mobility 403

Discrete Sense of Territoriality 408
Foraging Mobility Strategy 412
Expedient Core Technology 420
Significant Reliance on Hunted Resources 423
Conclusions of Hypothesis Testing 426
Significance of these Findings for Archaeological Studies of Hunter-Gatherers ... 429
Future Directions of Research 432
Summary of Research Conclusions 447
Bibliography 449

List of Figures

Figure 1.1: Topographic Map of West Rock 2
Figure 1.2: Typical Profile of Connecticut Trap-Rock Ridge 4
Figure 1.3: View Looking Southeast at West Rock 5
Figure 1.4: View Looking East Showing Columnar Joints 6
Figure 1.5: The Judge's Cave 10
Figure 1.6: Archaeological Sites Discovered During West Rock Ridge Survey 16
Figure 3.1: Location of Survey Transects 64
Figure 4.1: Location of West Rock and Important Landmarks in Text 98
Figure 4.2: Connecticut Geologic and Ecologic Regions 101
Figure 6.1: Culture Regions for Native American Societies 138
Figure 7.1: Levanna Points from Donato Site 205
Figure 7.2: Quartz Stemmed and Triangular Points from Donato Site 206
Figure 7.3: Celts, Gouge and Hoes 207
Figure 7.4: Holed Slate Pendants 208
Figure 7.5: Bifurcate, Lanceolate, and Large Bifaces 209
Figure 7.6: Various Projectile Types 210
Figure 8.1: Collection from Summit 223
Figure 8.2: Wading River Point from West Rock Ridge 226
Figure 8.3: Wading River Point, and Possible Biface 237
Figure 8.4: Excavation Grid and Location of Kietan Lookout 240
Figure 8.5: Kietan Lookout Artifacts 242
Figure 8.6: Hornfels Wading River Point 243
Figure 9.1: Chert Nodules from Building Brook 256

Figure 9.2: Location and Grid for Konolds Pond 261

Figure 9.3: Artifacts from Konolds Pond 269

Figure 9.4: Artifacts from Building Brook 287

Figure 10.1: Location and Grid for Fairhaven Reservoir 304

Figure 10.2: Artifacts from Fairhaven Reservoir 305

Figure 10.3: Clustering of Chert Debitage 317

Figure 10.4: Clustering of Quartz Debitage 318

Figure 10.5: Clustering of Basalt Debitage 319

Figure 10.6: West Rock Nature Center 1 Artifacts 323

Figure 10.7: Building Brook Farm Collection 325

Figure 11.1: Wintergreen Notch before Parkway Tunnel 332

Figure 11.2: Location and Grid for Wintergreen Notch 345

Figure 11.3: Sylvan Side-Notched Points 346

Figure 11.4: Wading River Points 347

Figure 11.5: Assorted Artifacts 349

Figure 11.6: Point Tips 350

Figure 11.7: Snook Kill Point 370

Figure 12.1: Comparison of Assemblage Richness 382

List of Tables

Table 7.1: Cultural Periods 166

Table 8.1: Size and Weight for West Rock Ridge Site Debitage 229

Table 8.2: Size and Weight of Debitage from Locus A, Blakeslee Quarry 233

Table 8.3: Flake Attributes from Blakeslee Quarry, Locus A 234

Table 8.4: Size and Weight of Debitage from Locus B, Blakeslee Quarry 236

Table 8.5: Flake Characteristics from Locus B, Blakeslee Quarry 238

Table 8.6: Size and Weight of Kietan Lookout Debitage 246

Table 8.7: Flake Attributes for Kietan Lookout 246

Table 9.1: Size and Weight of Quartz Debitage for Konolds Pond 273

Table 9.2: Quartz Flake Attributes for Konolds Pond 273

Table 9.3: Size and Weight for Chert Debitage for Konolds Pond 276

Table 9.4: Chert Flake Attributes for Konolds Pond 277

Table 9.5: Size and Weight for Basalt Debitage from Konolds Pond 277

Table 9.6: Basalt Flake Attributes for Konolds Pond 277

Table 9.7: Size and Weight for West River Debitage 278

Table 9.8: Flake Attributes for West River 279

Table 9.9: Size and Weight for Debitage for Building Brook 285

Table 10.1: Size and Weight for Debitage for Fairhaven Reservoir 311

Table 10.2: Flake Attributes for Fairhaven Reservoir 312

Table 11.1: Size and Weight for Quartz Debitage for Wintergreen Notch 354

Table 11.2: Quartz Flake Attributes for Wintergreen Notch 356

Table 11.3: Size and Weight of Rocky Top Debitage 372

Table 11.4: Flake Attributes for Rocky Top 372

Table 11.5: Size and Weight for Whaley Site 375

Table 11.6: Flake Attributes for Whaley Site 375

Table 12.1: Comparison of Lithic Assemblages for West Rock 381

Table 13.1: Raw Material Usage at West Rock 410

Chapter 1

The Role of Upland Archaeology in Studying Prehistoric Hunter-Gatherers

The West Rock Ridge project was unique in that it had as its subject one of the most rugged and harshest environments in Connecticut's South-Central Lowlands. For this reason the project differed in important ways from more conventional research, especially where traditional wisdom has guided archaeologists in the past to concentrate survey efforts on large tracts of level and well drained ground adjacent to fresh water sources. But the reasons for choosing this strategy are complex, and the decision to survey West Rock Ridge (Figure 1.1) has to be considered within the modern socio-political context within which we do archaeology.

Although it may seem counterintuitive at first, the West Rock Ridge project actually afforded one of the few available chances to conduct archaeological survey in the present township of New Haven. This is because New Haven is one of Connecticut's oldest and largest cities. Blessed with a quaint harbor, the town has been a center of business and commerce from its early days as a Puritan Colony (Menta 2003:83). For the most part Cultural Resource Management laws that have been so influential in protecting sites all over the United States came too late to protect the rich archaeological record that once must have existed throughout New Haven's coastline, its inland plains, and

Figure 1.1: Topographic Map of West Rock

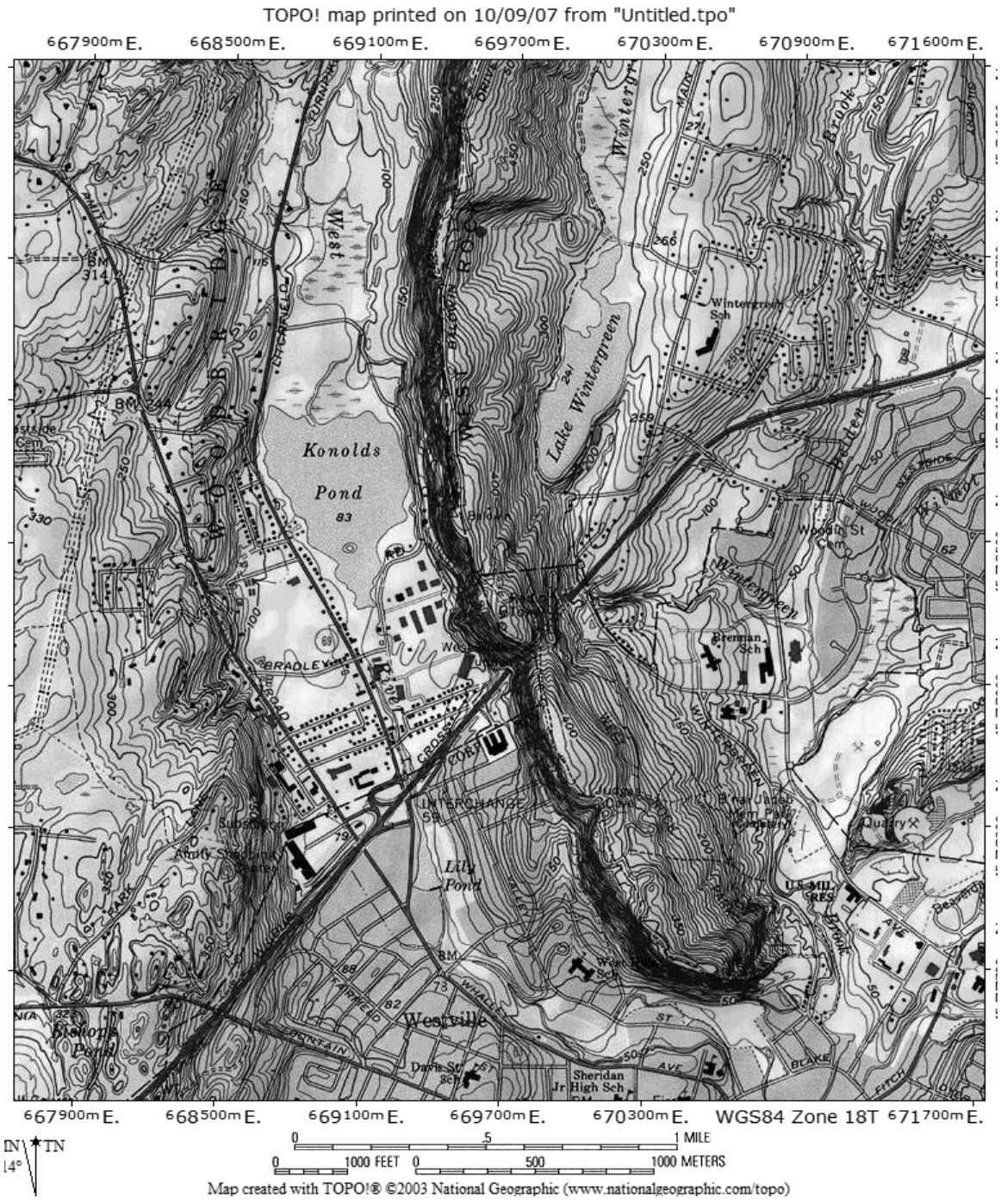


Figure 1.1 is a topographic map showing West Rock Ridge.

picturesque river valleys.

Urban development has in fact spread throughout much of the greater New Haven area but the trap-rock ridges, rugged as they are, have been spared from the urban sprawl. Rising with their orange glowing cliffs (Figures 1.2, 1.3 and 1.4) of columnar basalt and green forested tops they present a stark contrast to the busy city landscapes below, a landscape of high rises and business parks which at times encroaches up against the ridges as if to almost touch their placid rocky faces. In fact large tracts of the ridge have never suffered under the weight of the plow, despite the fact that almost all of the surrounding lowlands have been farmed at one time or another since early historical times.

It is hoped that this research will encourage other archaeologists to realize the potential of Connecticut's trap-rock ridges, especially since with some respect for the unique kinds of data available in these settings, a baseline of information about Connecticut's prehistoric past can be found along these lofty ridge tops even where urban encroachment has left little else for archaeologists to find.

But the most important inspiration for the project at West Rock Ridge was a concurrent development within archaeology which pays the same respect to the significance of researching those topographic high spots as has been traditionally accorded the topographic low spots. This inspiration has even led archaeologists of a similar bent to sometimes euphemistically refer to this endeavor as an "upland archaeology" (Gardner 1981:2).

Along with this growing interest in archaeological uplands has also arisen an awareness of the new kinds of information and insights that are available from these

Figure 1.2: Typical Profile of Connecticut Trap-Rock Ridge



Figure 1.2 is a photograph taken looking north from the parking lot of Southern Connecticut State University. One can see West Rock Ridge just as its tilted basalt plate first pokes out of the ground behind the vegetation in the foreground. Its columnar, steep west-facing cliff is also visible on the left. After rising to its maximal summit hundreds of feet above the lowlands below, the ridge continues to extend for about 7 miles further to the north, with the precipitous cliff face visible throughout this extent. Because West Rock represents a tilted basalt plate, the cliff edge, its western face, is an essentially vertical drop in some places, while on the east (right) it possesses a much gentler slope of about 25º. The plate disappears below the brownstone bedrock even further to the east and continues plunging downward below the ground surface.

Figure 1.3: View Looking Southeast at West Rock



Figure 1.3 is a photograph looking southeast along a portion of West Rock Ridge. Although vegetation covers the lower portion of the ridge some of its jagged cliff face is visible along the horizon. The ridge, having a steep west-facing cliff extending essentially in a north/south direction, provides an effective barrier to communication between present day Woodbridge, Connecticut and Hamden, Connecticut.

Figure 1.4: View Looking East Showing Columnar Joints

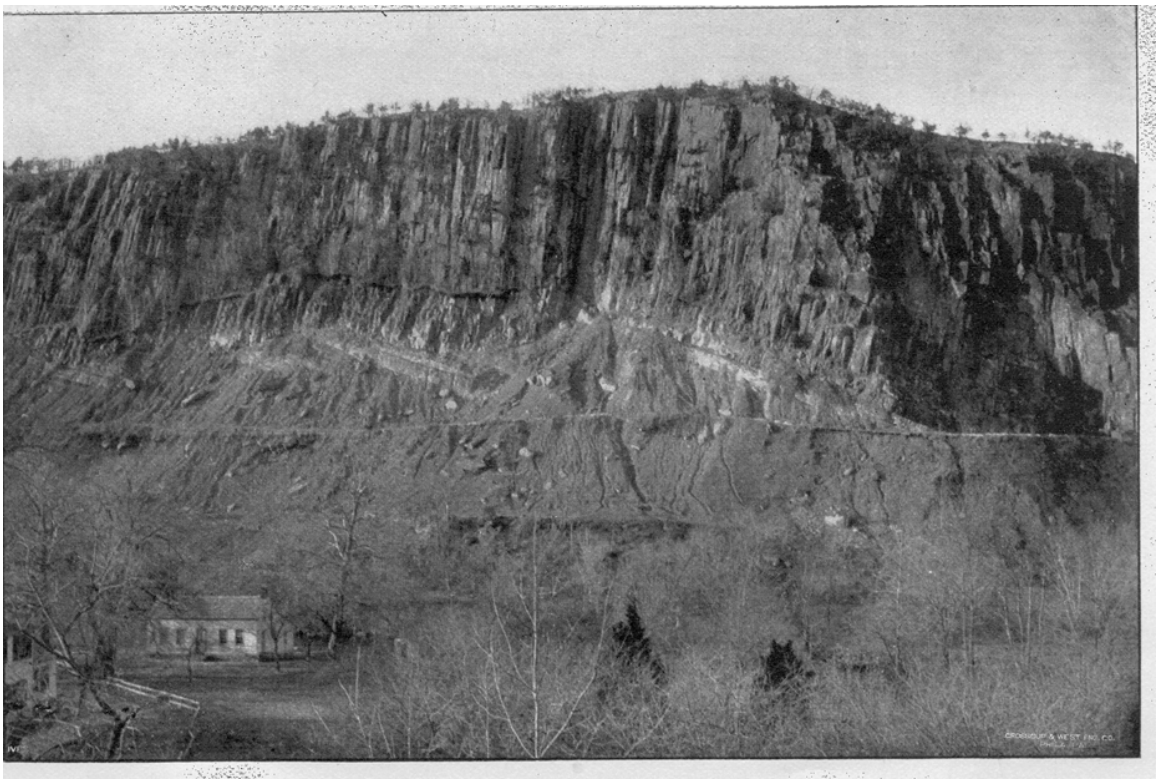


Figure 1.4 is a photograph taken from Dana (1891) looking east that gives a good view of West Rock's steep, columnar, jointed cliff face, which glows majestic orange in the summer sun.

settings. But this information often presents interpretive challenges. As Barber (1981:116) pointed out at the first symposium for Upland Archaeology in the East (1981) held by the Archaeological Society of Virginia, the data were new but for the most part the methods available to synthesize this data were old. This observation has served as a primary source of guidance for the West Rock Ridge project. Inevitably, to understand the role that West Rock played in hunter-gatherer adaptations of the past, it will be necessary to find new ways to look at the new data that this unique trap-rock ridge possesses.

What are the Uplands?

In considering the importance of uplands to archaeologists, a question worth asking is, "What exactly are the uplands?" This is a question, however, having numerous answers. Some researchers consider uplands as the mountains, others as the mountain foothills, while even others use a definition similar to that given by Gardner (1981:2), "Uplands, in the sense which I have been using the term for the past several years, essentially refers to those areas away from the floodplains and between the bluffs of rivers and the base or foothills of the mountains." It is important for this reason to carefully define how I intend to use the term "uplands" in the context of the present project.

Due to its unique geological past the lowlands of central Connecticut are surprisingly level, sometimes markedly so, considering the stereotypical image of New

England's rolling hills. These level and fertile plains are broken by sharp ridges, many of which rise precipitously from the contrasting flatlands below. These trap-rock ridges represent uplifted and exposed basalt plates (Figure 1.2) that were previously buried under layers of sandstone (Bell 1985:161–162). This orientation gives them characteristically steep cliff faces on their western margins and more gentle eastward sloping faces.

West Rock Ridge is fairly typical of other trap-rock ridges in Connecticut's Central Valley. Aside from cliff faces, the ground surface of the ridge is highly uneven, having a large percentage of exposed bedrock and generally rock covered slopes. Hiking over these ridges can be extremely challenging unless one can follow carefully prepared routes such as the Blue Trail that follows West Rock's summit. Although fresh water sources exist along West Rock, its challenging topography can make reaching these sources quite strenuous.

While these ridges may sound like uninviting places, a fairly brief study of the available literature points out both their ecological diversity (Rozsa and Dowhan 1977; Lee 1985; Hammerson 2004:101–102) as well as the important information they have provided to scientists unraveling the mysteries of Connecticut's deep geological past (Dana 1891; Bell 1985). Having an appreciation of the range of environmental contexts that were probably used by prehistoric inhabitants of South-Central Connecticut, the West Rock Ridge project promises to add to this body of data by providing archaeological insights into the significance of this truly remarkable geological wonder for New Haven County's original inhabitants.

It is in this sense that I have defined the term “uplands” as the trap-rock ridges intervening in the otherwise level and fertile Lowlands of Central Connecticut. In this sense “uplands” refers to that part of the environment that is not only lofty, but also rugged and difficult to traverse. The project aims to elicit information from this somewhat unlikely environment that will help archaeologists to understand changing land use patterns on the part of South-Central Connecticut’s prehistoric occupants, as well as helping to elucidate the processes of landscape learning and exploration for hunter-gatherers and how this relates to changing demographic parameters.

Finally, the West Rock Ridge project is not a rockshelter survey. Although one might expect that rugged trap-rock ridges would be ripe for this kind of investigation, trap-rock is actually very erosion-resistant and not conducive to cave-forming processes (Bell 1985:100). Additionally, columnar trap-rock joints typically break into cubical masses, or exfoliate as mounds of talus, leaving little in the way of sufficient overhangs. All of the sites discovered during the West Rock Ridge project represented open air sites. An exception to the observation that caves are absent from West Rock Ridge is the Judge’s Cave (Figure 1.5) to be described below, where Whaley and Goffe hid to escape their British pursuers (Atwater 1902:431–434). But even in this case the “cave” which is actually a narrow crevice formed by a split glacial erratic would only have served as a shelter in the most desperate of circumstances.

Figure 1.5: The Judge's Cave



Figure 1.5 is a photograph of the Judge's Cave, actually a split glacial erratic, located on West Rock's summit in its southern portion. The tiny crevices in this split erratic allowed Whaley and Goffe to hide from British soldiers and the wrath of Charles II after they had signed the death warrant of his father.

Research Objectives

Like most archaeological projects, the initial objectives of the West Rock Ridge project were simple. Survey transects had to be laid and sites had to be discovered. The most basic level of analysis for the project was the identification of settlement pattern data. Using Willey's (1951) definition below makes clear that information gleaned from settlement pattern analysis provides a deeper perspective than is possible with the investigation of any one site. The study of settlement patterns attempts to include all of the different types of sites produced by distinct peoples, as well as the environmental contexts of the various activities performed by whole human cultures. According to Willey (1951:1):

> The term "settlement patterns" is defined here as the way in which man disposed himself over the landscape on which he lived. It refers to dwellings, to their arrangement, and to the nature and disposition of other buildings pertaining to community life. These settlements reflect the natural environment, the level of technology on which the builders operated, and various institutions of social interaction and control which the culture maintained. Because settlement patterns are, to a large extent, directly shaped by widely held cultural needs, they offer a strategic starting point for the functional interpretation of archaeological cultures.

More pertinent in the context of the present project is Winters' (1969) settlement patterns analysis of the Late Archaic Riverton culture located in the central Wabash River Valley in Illinois. Winters (1969:108) bracketed the temporal frame of this cultural manifestation to between about 3,000 and 3,500 B.P. The major focus of his study was

three sites: 1) the Robeson Hills site, 2) the Riverton site, and 3) the Swan Island site. In his analysis Winters (1969:108) was able to demonstrate that all three of these sites occupied different seasons in the annual subsistence moves of the Riverton Culture, and more importantly that each performed a somewhat different functional role in the overall Riverton cultural system.

The Robeson Hills site was located adjacent to the channel of the Wabash River but on a bluff top rising one hundred feet above it. Robeson Hills represented the only one of the three sites investigated by Winters (1969:116–117) where substantial numbers of post molds and storage pits were found, indicating a large investment in the construction of dwellings. Robeson Hills was occupied during the winter time and according to Winters (1969:119) Riverton culture subsistence associated with this site can be characterized as a general hunting and gathering strategy.

The Riverton site is located on the lower terrace of the Wabash River. This site was occupied during the summer months and was associated with logistical hunting sites (Winters 1969:137). One of the major subsistence focuses of the Riverton culture at this time was organized communal hunting.

The Swan Island site was a spring/fall transient encampment (Winters 1969:131) located in a slough of the Wabash River where fish, turtle, raccoon and squirrels were taken in daily foraging activities.

Because the West Rock Ridge project represented the first systematic archaeological survey of any of Connecticut's trap-rock ridges, it was able to fill important gaps in information. However, the West Rock Ridge survey has to be considered within the context of the surrounding lowlands of South-Central Connecticut.

West Rock is a long and linear north/south trending ridge, and considering the importance of mobility for southern New England's prehistoric cultures alone, it was expected from the outset that data available from this project would only comprise a portion of the overall settlement pattern of any of the cultural groups implicated during the study. It will be important, therefore, to attempt to integrate data from the West Rock Ridge project with information from the surrounding lowlands.

However, the more important objective of the project was to understand the role that West Rock Ridge played for prehistoric adaptations in South-Central Connecticut. This role would have been intimately tied to changing land use patterns of the area's hunter-gatherer societies. In chapter two the relationship between mobility and increasing population density will be examined in order to model changing land use patterns in South-Central Connecticut. An initial hypothesis for this project was that because of West Rock's rugged topography, it was marginal to prehistoric subsistence pursuits. Only as a result of mobility stress caused by population packing, it was hypothesized, did local hunter-gatherer societies add West Rock Ridge as a resource patch to their annual movements.

The hypothesis stated above will only be considered a starting point and therefore revision of this hypothesis will be an important component of the research. The incorporation of new environments brought with it intimate exposure to new species of plants and animals, and inspired the development of new techniques to exploit these environments. This learning process, in turn, was an important component of the evolution of hunter-gatherer societies. More typically the words "cultural evolution" are associated with those punctuated events such as the first stone tools, the first clay pots, or

the origins of agriculture. But for hunter-gatherers, change and adaptation were a part of everyday life. This project therefore focuses on a more subtle form of cultural evolution: the adjustments on the part of mobile people in pursuit of wild resources to their own increasing numbers.

This later research objective will be the focus of chapters two and thirteen. Chapter two will present the theoretical underpinnings of the project. Chapter three will present basic methods of survey, excavation and analysis, as well as measurement tools for predictions provided in chapter two. Chapters four and five cover the environmental component of the research. Chapter four gives a good description of the geological history and formation processes of West Rock Ridge, while chapter five focuses on in its ecological context.

Chapters six and seven provide the cultural context of the research. Chapter six presents ethnographic data concerning southern New England's Native American inhabitants with a special emphasis on the Quinnipiac, New Haven's original occupants. Chapter seven provides a detailed summary of the prehistoric period in Southern New England, as well as the available archaeological record from South-Central Connecticut.

Chapters eight, nine, ten and eleven present the archaeological data contributed by the West Rock Ridge project (Figure 1.6). These sites are arranged by four basic site types: 1) information gathering, 2) quarry and lithic procurement, 3) seasonal campsites, and 4) intercept hunting sites. This preliminary site classification is followed, however, only for organizational purposes. Chapter twelve presents a comparative analysis of the lithic assemblages for all of the sites researched as part of this project.

Finally, chapter thirteen will reintroduce the measurement tools for those predictions made in chapter two, and the hypothesis that West Rock was only incorporated into annual subsistence as a result of population density and packing will be tested. Also revision of this hypothesis, as well as future directions of research will be suggested in the remainder of the concluding chapter.

The rest of the present chapter provides the basic background information of the project. First, the project area is described. Next, a brief description of West Rock Ridge is given. This environment will be discussed in much more detail in chapters four and five. Finally this chapter concludes with a summary of the archaeological literature, describing research which had a strong influence on the West Rock Ridge project.

The Project Area

Most of the project area is included in West Rock Ridge State Park, one of the largest state parks in Connecticut. Figure 1.6 shows the locations of sites excavated during the West Rock Ridge project. The park spans the towns of New Haven, Woodbridge, Hamden, Bethany and Cheshire. The story of West Rock Park's development is one of slow accretion that began with an early vision of preserving some of New Haven's scenic natural features for future generations. The first contributor was Elijah Thomas, who in 1826 donated a 50 acre tract on the border of New Haven and Woodbridge (Munich,1976).

Figure 1.6: Archaeological Sites Discovered During West Rock Ridge Survey

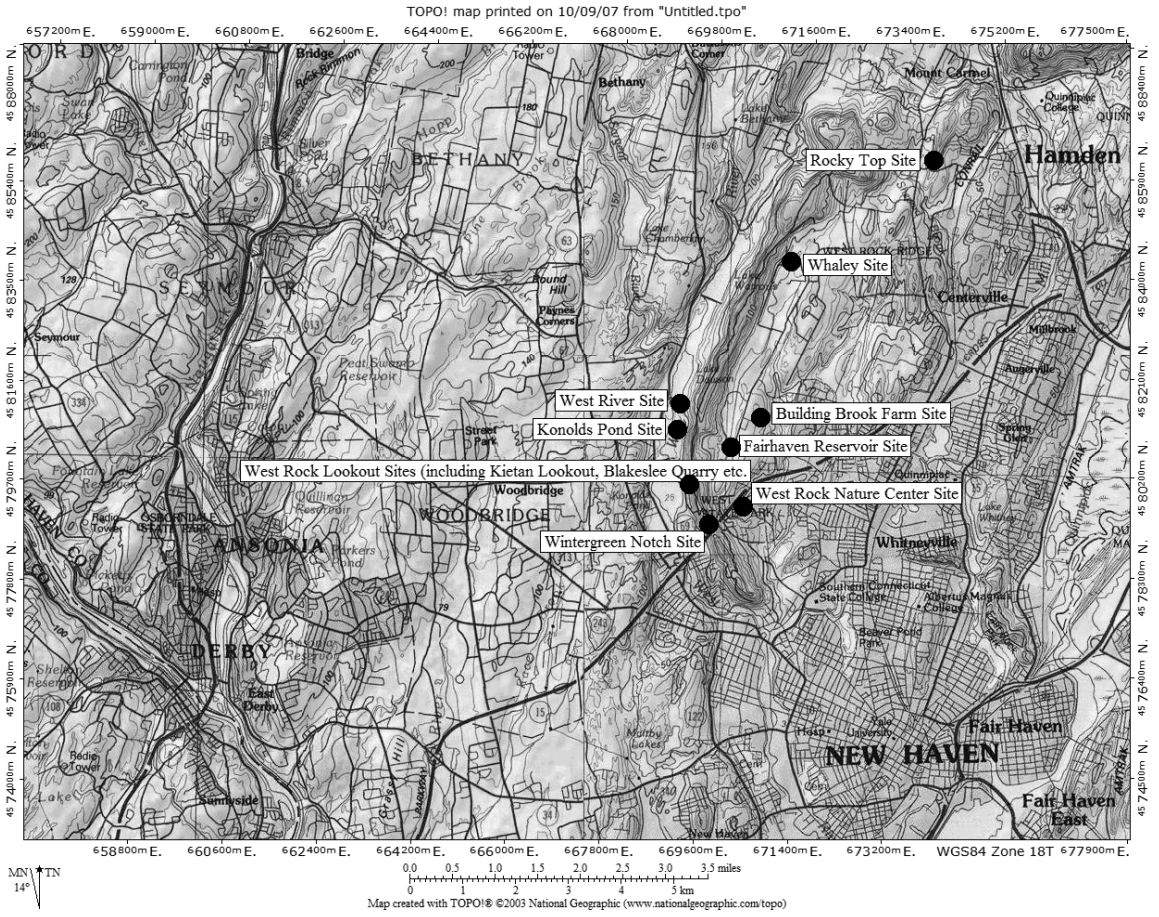


Figure 1.6 is a map showing the location of all of the sites that were researched as part of the West Rock Ridge project. West Rock can be seen in this topographic map just to the northwest of New Haven town center as an approximately north/south trending linear ridge, although it is actually somewhat curved, pointing to the northeast in its northern extreme. All of these sites were discovered by the author during survey stages of the project except for the West Rock Ridge site which was initially reported by Donato (personal communication 2002). The West Rock Ridge site is one of three lookout sites that collectively are identified on the map as "West Rock Lookout sites (including Kietan Lookout, Blakeslee Quarry etc.)".

By the late 1800's West Rock Park had grown to 600 acres due the efforts of Henry English, who patiently acquired and added small land holdings. A major addition to the park was made in 1927 when Simeon Baldwin donated a portion of his estate for the construction of Baldwin Road. This route follows the ridge top overlooking the towns of Woodbridge and Bethany until ending to the north at West Shepard Avenue in Hamden. The park continues to grow as members of the West Rock Ridge State Park Commission acquire small land holdings whenever possible. The most recent addition to West Rock Park is the Wintergreen Lake property consisting of 254 acres on the eastern side of the ridge (Ludwig 1981). In 1981 Mann prepared a park development plan for West Rock highlighting the unique geological and ecological aspects of the ridge as important considerations in future urban planning and land management. Mann's (1981) report covered 3,540 acres and since most of the land holdings implicated in Mann's development plan were subsequently purchased by the state, this area is a reasonable estimate of the park's current size.

One of New Haven's most important historical sites exists on top of West Rock. Judges' Cave (Figure 1.5) is formed by an enormous glacial erratic that had split into several sections. It had been one of the locations where Edward Whaley and William Goffe hid out to escape the wrath of Charles II. The judges had signed the death warrant of Charles I, only to be in the unfortunate position of witnessing the ascendance of the former King's son to England's throne (Atwater 1902:431–434).

The archaeological investigations to be discussed in this text occurred over a five year period, while I was a student at the Graduate Center of the City University of New York (CUNY), between June 2001 and August 2005. All of the sites included in this

report were discovered by the author except for the West Rock Ridge site, discovered by Simon Donato (personal communication 2003).

West Rock Ridge

West Rock is a long, linear ridge, running north to south, and having a steep west-facing cliff towering over the surrounding lowlands for most of its extent, which covers approximately 15 miles (Figures 1.2 and 1.3, and 1.4). This is the characteristic form of most of Connecticut's trap-rock ridges (Bell 1985:162), which share a similar developmental history, to be described in chapter four. The west cliff face is composed of columnar joints of basalt with tall mounds of talus built up against its base. Along its eastern face, West Rock is more gently sloped, approximately 25° (Figure 1.2), but contains a high proportion of exposed bedrock, or rocky and talus covered soil. Although soils can be deep on the more level and stable portions of the slope, erosion limits the degree of soil formation which can overlie bedrock over much of the ridge's surface.

West Rock adds to the archaeological study of upland settings because, beyond existing as an inland ridge between lowland river valleys, it also provides an extremely rugged environment. The large tracts of level and well-drained soils that are most typically the subject of archaeological investigation simply are not to be found at West Rock. Yet, ecologists working in the State of Connecticut have noted the importance of West Rock (Rozsa and Dowhan 1977), as well as Connecticut's other trap-rock ridges

(Dowhan and Craig 1976:18–19; Hammerson 2004:101–102; Lee 1985) as critical habitats for rare and endangered species. This occurs because of the tremendous variability in terms of topography, soils and hydrology that exists on the state's trap-rock ridges contributing to pronounced wildlife diversity. Despite its rugged and imposing topographic characteristics, West Rock would have been a very productive habitat for mobile hunter-gatherers.

Connecticut's trap-rock ridges stand in sharp contrast to the surrounding lowlands of Central Connecticut. These lowlands are broad and level, with rich soils that represent the best farmland in the state. The trap-rock ridges tower over the lowlands like the spines of enormous dinosaurs, with their jagged and weathered faces looking down from lofty heights. South-Central Connecticut would have represented a fertile environment, having rivers with wide floodplains, expansive valleys, wetlands and a coastline possessing a peaceful bay. The prehistoric occupation of West Rock has to be considered in relation to its surrounding lowlands because the lowlands provided many ideal locations for prehistoric inhabitation and subsistence. The ecology of West Rock and the rest of Connecticut's Central Lowlands will be the subject of chapter five.

Selected Research in Upland Archaeology

In the tradition of academic research the West Rock Ridge Project had its origins in the writings and ideas of those researchers who paved the way for the type of

investigation which I conducted. In order to give the reader a sense of the scope and contribution of "upland archaeology" a few selected survey reports will be summarized below.

A vital source of information was The Upland Archaeological Symposium (1981) compiled by the Archaeological Society of Virginia. In this volume, Foss (1981:101) discussed the importance of integrating knowledge gained from archaeological research in the Blue Ridge Mountains with data from surrounding lowlands:

> In the strict sense, there really is no "Blue Ridge Prehistory". Exploitation and settlement of the mountain region has always been interrelated with the activities of populations outside the mountains. If we are to fully understand the role of the Blue Ridge in the development of prehistoric culture, we must broaden our perspective and begin to pursue truly regional questions.

A similar concern is applicable for West Rock Ridge, where archaeological occupation of the ridge can only be interpreted in a context with settlement data from the surrounding lowlands.

Stewart (1981:43) used information concerning the frequency of artifacts composed of a good quality lithic raw material which was only available in Maryland's Blue Ridge province, a metamorphosed rhyolite or metarhyolite, to observe changes in the overall usage of the Blue Ridge province during prehistory. He noted these changes in frequency both within the Blue Ridge, as well as in the adjacent Piedmont Province to the east and Great Valley province to the west.

According to Stewart (1981:50-52) only isolated point finds occurred in Maryland's Blue Ridge during Paleo-Indian times. Occupation of the Blue Ridge

increased during the Early Archaic and then again during the Middle Archaic. During the Middle Archaic 70% of tools found in the Blue Ridge province were composed of metarhyolite and this lithic raw material also had become popular in the adjacent Piedmont and Great Valley provinces. However, Stewart (1981) noted that discarded tools at metarhyolite processing sites in the Blue Ridge were frequently composed of exotic raw materials.

Stewart (1981:59) described the settlement pattern of the Blue Ridge during Late Archaic times as representing an intensification of that pattern witnessed during the Middle Archaic, not necessarily involving the utilization of new environments. There was a significant increase in the total number of sites as well as an increase in the numbers of sites that had been revisited. A small number of Late Archaic hunting/extraction camps were large enough to have served as seasonal base camps, and the overall pattern was described in terms of more sites for all of the micro-environments that witnessed prehistoric usage (Stewart 1981:59).

Metarhyolite percentages were similar for the Late Archaic as for the Middle Archaic, but the overall increase of site frequency led Stewart (1981:59) to conclude that Late Archaic people visited the ridge more frequently and with more regularity. This later conclusion was supported by his observation that even discarded tools at metarhyolite processing sites were composed of metarhyolite and not exotic raw materials. The opposite observation had been made for the previous Middle Archaic Period, when discarded tools were typically composed of exotic cherts (1981:54-55).

Early Woodland patterns were similar to those of the Late Archaic, but by Middle Woodland times the frequency of visits to the Blue Ridge had diminished even though

metarhyolite continued to be an important lithic raw material. This trend continued into the Late Woodland Period, when it is believed that changing settlement patterns associated with increasing importance of horticulture had reduced occupation of the Blue Ridge to forays by small groups from farming base camps (Stewart 1981:60–66).

Stewart's (1981) research in Maryland's Blue Ridge province is an important influence for the West Rock Ridge Project because of his ability to understand trends in the overall usage of uplands, as well as to integrate settlement data from the uplands into a more regional perspective.

Lacy (2000) provided meaningful insights for any archaeological investigation of uplands. It has to be pointed out that Lacy's (2000) project area differed considerably from what is being investigated here. His interest was in documenting the prehistoric occupation of the Green Mountains in Vermont, despite the fact, that aside from the Otter Creek site previous research from any location within more than 350,000 acres of the Green Mountains National Forest was confined to three find spots and a single site report (2000:119). The Green Mountains however represent a quite extensive and ecologically diversified environment in comparison to West Rock Ridge, the latter of which is a 15 mile long north/south trending trap-rock ridge. However, Lacy's (2000) observations were still an invaluable inspiration in the context of the present research.

Lacy (2000:115) described how the particular economic, social and political frameworks within which we do archaeology had created a myth. The myth was that the Green Mountains, and therefore most of Vermont, were unoccupied during prehistory. But a better explanation for the lack of documented sites in this environment was a simple archaeological truism that archaeologists tend to look for sites where they have

been successful before. Lack of previous work in uplands therefore can translate to disinterest. According to Lacy (2000:118) many archaeologists still do not appreciate the fact that the distribution of known archaeological sites is probably more closely associated with the intensity of surveys conducted in different areas, than any other factor.

Describing the difficulties he faced in legitimizing his request for funding to the U.S. Forest Service, Lacy (2000:199–200) gave the following reasons for his proposed research:

> In brief: (1) prior to the advent of professional CRM, most sites were discovered through soil disturbance associated with farming at lower elevations in alluvial deposits; (2) our twentieth-century, Euro-American view of the landscape did not encourage a search since the mountains were not "civilized" places to live and farm; (3) archaeologists had rarely consulted with Native Americans about their understandings of past land use in the mountains, and so our lack of knowledge was based in part on culturally derived myopia; (4) the development of cultural histories and typologies favored the identification of large, dense, stratified deposits characteristic of seasonal riverine gathering spots, which in turn influenced field survey methodology; and (5) CRM followed in the geographic footsteps of earlier site discoveries and therefore reinforced predictive models that were based on already existing data, which takes us back to the beginning of this sequence (2000:119–120).

Lacy (2000) also made two points considering perceptions which can condition archaeologists to undervalue survey in upland settings, both of which are also undeniably untrue. The first is the assumption that rich lowland sites are simply bigger versions of the types of sites available in uplands. If this was the case then why waste the funding and time to locate and excavate the smaller upland sites? But this is exactly what can not be assumed, it has to be tested. According to Lacy (2000:117–118) if we had available

information to compare the range of functions and seasons or time frames of occupations for lowland and upland sites, we might find that the information does not overlap.

Finally, Lacy (2000:116–117) suggests that it might be better to presume that archaeological data is continuously but unevenly distributed across the landscape instead of as individual and discreet bundles of artifacts, or sites. This would be the case for instance if people had frequented a location for gathering vegetal foods. In this case artifacts would accumulate slowly over time, but not as discrete archaeological "sites". Using conventional wisdom it can be assumed that lowlands represent peaks in artifact distributions, where all of the rich and deep sites are located, while the uplands represent valleys where artifact densities are thinner.

But Lacy (2000:117) points out that even if lowlands have higher volumes of artifacts, the uplands still may have more sites. Hunter-gatherer populations living in small scattered family groups are likely to create many more small lithic scatters than rich deep sites. The danger of course is that by failing to survey the uplands archaeologists may actually miss the majority of sites, albeit most of these sites may represent nothing but small lithic scatters.

Thomas (1975:61–63) elaborated a similar perspective questioning the centrality of the "site concept" in the context of regional survey samples. He suggested that while archaeologists consistently regarded the "site" as the most basic element for analysis, that at least with respect to certain types of research questions they would be better served using the single artifact as the most basic analytical element. In this case the characteristics of the individual artifacts represent the central element of study.

This type of analysis would be appropriate in the context described above, when people had revisited an area, perhaps a favorite tree-nut harvesting location, over a very long period of time. Although accumulations of artifacts in these settings would eventually become dense enough to resemble true "sites", these types of archaeological contexts would require an entirely different analytical approach. By using the individual artifacts and their characteristics as the basic analytical unit, the archaeologists might note the association of certain types of plant processing equipment over a fairly large area for instance, and discover the true nature of the prehistoric activities.

Feder (2001) reported his investigations of the Firetown Meadow site located in the McLean Game Refuge, an upland environment overlooking the Farmington River Valley in north central Connecticut. This report has direct bearing on the West Rock Ridge Project because the eastern margin of the Farmington River Valley is demarcated by Talcott Mountain, which is itself a portion of the Metacomet Ridge, a large extrusive trap-rock ridge that extends from coastal Connecticut northward to Massachusetts.

According to Feder (2001:21) Talcott Mountain acted as a cultural barrier between people living in the Connecticut River Valley to the east and the Farmington River Valley to the west. This was apparent due to differential usage of basalt and hornfels lithic raw materials available to inhabitants west of Talcott Mountain, in the Farmington River Valley, but not to the east in the Connecticut River Valley. Abundant tools from these lithic raw materials were found at Farmington River Valley sites, but rarely were tools made from these raw materials found in Connecticut River Valley sites.

Interestingly, Menta (2003:15) suggested that West Rock Ridge may have served a similar role during late prehistory, acting as a cultural barrier between the Quinnipiac

living to the east in present day New Haven and Hamden, and the Paugussett to the west in Milford, Woodbury and Orange.

Also similar was the usage of hornfels (probably metamorphosed sandstone) and basalt, both of which were used extensively in the Farmington River Valley (Feder 2000:21–22), as they were by the prehistoric occupants of West Rock Ridge. The genesis of these lithic raw material types is related to the geological formation processes of Connecticut's trap-rock ridges, to be discussed in chapter four.

Finally, Wadleigh's (1981) observations from the Northeastern Highlands of Connecticut Survey (conducted by the Public Archaeology Survey Team, or PAST) were similar to findings from the West Rock Ridge project. Wadleigh (1981:82) concluded that the highlands were most intensively occupied during the Late Archaic Period:

> Based upon the size, age and locational data presented for the 1978 and 1979 field seasons, it can be inferred that the Northeastern Highlands were more broadly and more intensively exploited during the Late Archaic. This emerging pattern is further supported by preliminary data collected during the 1980 Woodstock survey (in press). Use-wear analysis of recovered lithic assemblages indicates that the range of functional tool categories in the highlands may be similar to that found in the Connecticut River Valley. Furthermore, if changes in site frequencies and artifact density reflect changes in population, it would appear that the highlands were more densely populated in the Late Archaic Period.

In this quote Wadleigh (1981:82) was comparing the frequency of Late Archaic components to Woodland components from his survey data. He utilized a generalized classification scheme including Laurentian, Small Point and Susquehanna Tradition components in his Late Archaic data and combined what is commonly divided into Early, Middle and Late Woodland Periods into a single Woodland data set. Wadleigh (1981:78)

stated that these generalized classifications were necessary due to the small sample size for both temporal periods. He reported a total of 32 Late Archaic components (Wadleigh 1981:78) and 18 for the Woodland Period (Wadleigh 1981:80). Only minimal evidence of Early Archaic occupation had been present while Paleo-Indian and Middle Archaic material was completely absent.

Chapter 2

Research Design and Theoretical Perspectives

The focus of this chapter is to formulate a research design that will help elucidate how South-Central Connecticut's prehistoric populations utilized West Rock Ridge. The following hypothesis will be tested here: due to its rugged topography West Rock Ridge was marginal to prehistoric subsistence pursuits, however because of its ecological diversity it was added to local subsistence rounds under conditions where very thorough coverage of available subsistence territories became an optimal strategy. In order to reasonably test this hypothesis it will be necessary to draw from Binford's (2001) theory of intensification, in order to model the kinds of factors that would influence hunter-gatherers to utilize strategies providing for maximal coverage of the territories available to them. The result of this modeling process is that five predictions will be given concerning those factors most likely responsible for the choice, on the part of hunter-gatherers, to add otherwise marginal resource patches as part of their annual movements.

Additionally, this chapter will provide the theoretical underpinnings of the research and in the meantime will cover a broad variety of issues taken from the available archaeological and anthropological literature. These issues will include topics related to hunter-gatherer mobility and land use patterns described above, as well as a number of

topics related to intercept hunting, artifact discard patterns, the use of hunting aids such as traps and facilities, and “nonsite” archaeology.

Variability of Hunter-Gatherer Land Use Patterns

I will argue that increasing population density acts as a constraint on hunter-gatherer mobility pursuits leading to: 1) increased residential mobility, and 2) regional packing of individual subsistence units; and that these two factors increase the effective coverage on the part of mobile peoples of their available territories. In other words, these factors would influence hunter-gatherers to more thoroughly cover the subsistence territory available to them. This is so because the size of local subsistence groups should have a direct relationship to the frequency with which they must change residences. The larger the size of local subsistence units, the more quickly resources adjacent to the habitation will be exploited, and the sooner a change of residence will occur (Binford 2001:234).

However, according to Binford (2001:219) these constraints must inevitably lead to changes in hunter-gatherer mobility and subsistence. These changes will allow for development of strategies allowing local subsistence groups to produce more and more resources from smaller and smaller territories. A simple form of cultural change leading to this later result would be increased reliance on storage.

But Binford (2001:257) sees intensification to be the driving mechanism of this later process. Intensification occurs because the combined effects of increased residential

mobility and fission and splitting of local groups, producing regional packing, will not provide ultimate solutions to subsistence needs as population density continues to increase. Ultimate changes in the subsistence base involving the development of strategies and techniques for maximally exploiting resources adjacent to habitation sites must also occur. Although the specific trajectory of intensification will vary relative to the types of resources available, hunting which generally requires great residential mobility should become eschewed, in favor of techniques allowing for intensive exploitation of vegetative and/or aquatic resources (Binford 2001:210).

Hunter-gatherer land use patterns therefore are modeled here as a tension between these two factors: 1) high residential mobility and territorial packing under the influence of increasing population density, and 2) cultural mechanisms allowing for reduced residential mobility and the production of more and more resources from smaller and smaller territories. I will argue in this text that first of these factors, increasing population density, influences hunter-gatherers to more thoroughly exploit their available subsistence ranges; while the later factors, cultural processes of intensification, act as a buffering mechanism allowing hunter-gatherers to make a living from smaller available territories. Furthermore, the degree to which cultures utilized marginal resource patches such as West Rock Ridge should vary positively with increasing hunter-gatherer population density, but negatively with cultural intensification of the subsistence base.

Binford's (2001) Theory of Intensification

In Constructing Frames of Reference, Binford (2001) continues his pursuit of developing middle range theory for bridging the inevitable gap that archaeologists must face between those patterns occurring in the static archaeological record of the present, and the past behavioral correlates which are assumed to be implicated by those patterns. Binford (1980:4–5) emphasizes that understanding of the static patterning of the archaeological record is only possible through study of the processes which brought this patterning into existence in the first place. According to Binford (1980:5) this can only be done through the ethnoarchaeological study of living hunter-gatherer societies. Ethnoarchaeology by definition, is the first hand study of living hunter-gatherers with the expressed purpose in mind of observing how behavior on the part of these living peoples, actually correlates with the kinds of patterning that archaeologists wish to interpret.

Constructing Frames of Reference (Binford:2001) involved the analysis of 340 known hunter-gatherer societies along with information concerning the world's global environmental systems. Binford (2001) was able to explain how a wide range of variation in terms of hunter-gatherer behavior could be determined by a few demographic and environmental parameters. One of the most central theoretical perspectives which Binford (2001) presented in Constructing Frames of Reference was his theory of intensification.

Observing the relation between the variables “population density” and the “area” occupied and controlled by distinct hunter-gatherer populations, Binford (2001:213) noted that a very strong negative correlation existed. Except for those peoples with known economic interaction with market economic systems, the numerically smallest ethnographically known hunter-gatherer societies exploited the largest territorial ranges, and the numerically largest distinct hunter-gatherer populations exploited the smallest territories.

Binford (2001:229) went on to explain that this somewhat counterintuitive observation, by implicating mobility stress placed on hunter-gatherer societies by increasing population density:

> Other things being equal, mobility costs act as the ultimate limiting factor on economically constituted hunter-gatherer societies.

In other words, large subsistence groups are not favorable for mobile hunter-gatherers. The more people living in the same subsistence unit, the more quickly available resources are exploited, and the sooner a residential move must occur. Kelly (1995:135) made a similar observation in terms of his “effective foraging radius”. According to Kelly (1995:132–141), the farther from a habitation a forager must travel to obtain food, the more time spent in transit and the lower the caloric returns. This means that given the known caloric requirements that a group must face, there is a maximal distance from the habitation where it is effectively possible to meet subsistence needs. Large subsistence groups will reach this effective foraging radius more quickly, both

because they have relatively higher caloric requirements and because they deplete nearby resources faster.

Given an upper limit for the optimal size of subsistence groups relative to available resources (Binford 2001:239), the only option is for groups to fission and splinter after this upper limit has been reached. Once hunter-gatherers can no longer expand into new unpopulated regions, fission and splintering leads to packing of regional territories by individual subsistence units. Although individual groups of hunter-gatherers will strive to maintain a territory large enough to fulfill annual subsistence needs, limitations of available space can only result in ever shrinking and circumscribed ranges.

In terms of hunter-gatherer subsistence and mobility strategies, an effective packing threshold will occur and reorganization must take place (Binford 2001:442-443). The trajectory of this reorganization will depend on numerous factors, including the available resource base. Generally, however, dependence on hunted resources requires a high degree of mobility and therefore hunted resources will become less important (Binford 2001:222). The optimal solutions will be development of techniques and strategies for maximizing productivity of vegetative and or/ aquatic resources adjacent to habitations. These strategies are aimed at learning to acquire more and more resources from smaller and small territories; a process that Binford (2001:210) labeled "intensification", which he defined in the following way, "by which I mean tactical or strategic practices that tend to increase the exploitation of resources in circumscribed or shrinking food patches."

What is of interest in the context of the West Rock Ridge project, however, is what Binford's (2001) theory of intensification implies concerning changing land use patterns on the part of hunter-gatherer societies. Kelly (1995:131) described a difference that exists between the size of the territory exploited and the degree to which that territory is covered thoroughly. For instance, hunters making long logistical forays may exploit their environments less thoroughly than plant-dependent people who make numerous short residential moves.

If the chance that hunter-gatherers utilized West Rock Ridge was directly associated with their need to maximally exploit all of the environmental zones available to them, then Binford's (2001) theory of intensification provides a model by which its utilization can be predicted. Territorial coverage should become greater under conditions of high residential mobility and territorial packing. Therefore, increased population density would be one factor contributing to its importance to South-Central Connecticut's prehistoric inhabitants.

However, as hunter-gatherers undergo intensification they develop means to offset this need to rely on mobility in their subsistence pursuits. For instance (Binford 2001:368-372), dependence on storage can negate the need for large residential groups to move frequently. Large subsistence groups can work cooperatively to take advantage of food resources when abundance is high. If these resources can be stored then the group can remain residentially stable even when resources are less available.

But Binford's (2001) theory is helpful in this context because he explains how intensification processes are actually a reaction on the part of hunter-gatherers to the mobility stress that increasing population density places on their cultural system. In other

words, changing land use patterns can actually be modeled in terms of this tension. Territorial coverage can be expected to be maximal under conditions of high residential mobility and population density, and to decrease in relation to cultural mechanisms alleviating the need on the part of hunter-gatherers to rely on mobility to fulfill their subsistence needs. In fact, Binford (2001:234) mirrors these sentiments exactly:

> At a given level of food availability in the habitat, the larger the group size, the greater the demand on the available food supply per unit of occupied area. Therefore, other things being equal, in the absence of intensification, the larger the group size, the greater the number of moves a group must make during a year in order to meet subsistence needs.

Given these observations of Binford's (2001) theory of intensification the following predictions can be made to test the hypothesis stated at the beginning of this chapter. If utilization of West Rock Ridge depended on the degree to which South-Central Connecticut's prehistoric populations needed to cover as much of their available territories as possible, then those cultural or temporal traditions most frequently present in West Rock's archaeological record should: 1) be highly residentially mobile, 2) live within fairly distinct territorial ranges, 3) organize their mobility in terms of a forging strategy, 4) utilize an expedient core technology, and 5) rely at least to a significant degree on hunted resources.

This hypothesis is only considered an initial way to gain insight into how South-Central Connecticut's prehistoric populations utilized West Rock Ridge. Revision of this hypothesis, therefore, is considered an ongoing pursuit of the research.

The theoretical underpinnings of the five predictions above will be the subject of the next section. Optimal foraging theory, variation in hunter-gatherer mobility strategies, and expedient as opposed to situational tool use will be covered below. Afterward, the available anthropological literature will be reviewed in terms of special issues related to West Rock's unique archaeological record. These issues include ambush hunting, artifact discard patterns, the use of traps and facilities, and "offsite archaeology".

Theoretical Perspectives

Optimal Foraging Theory

According to Smith (1995) optimal foraging theory, which is borrowed from evolutionary ecology, has been used successfully in anthropological applications. Popular forms of optimal foraging research applied to anthropological studies are the Diet Breadth and Prey Choice models. The question of interest to researchers using these models is, "Given an array of available prey types, which ones would be harvested by an efficient forager?" (Smith 1995:627).

As in the above example, all optimal foraging models require some basic assumptions concerning the behavior of hunter-gatherers, the most obvious of these is that they will behave in an optimizing manner (Smith 1995:626). In most cases this

means that researchers assume that hunter-gatherers will minimize costs in terms of time and effort, and maximize returns in terms of calories or nutritional yields.

One objection that some anthropologists have to the use of optimal foraging theory for hunter-gatherer studies is that it has its basis in modern assumptions concerning natural selection (Smith 1995:626–627). Optimal behavior is considered more beneficial to those individuals who utilize it, and this therefore gives them a competitive advantage. Some anthropologists disagree with the assumption that anthropologists can borrow a theory from ecology because the choices on the part of hunter-gatherers are cultural, and represent processes completely distinct from the evolution of adaptive phenotypes in non-human species. Smith (1995:627) explains, however, that anthropologists performing optimal foraging research do not typically view the type of evolution they are studying as Darwinian in the strictest sense. Instead they consider the choices on the part of hunter-gatherers to reflect a kind of economic behavior in terms of weighing costs and benefits, and this type of behavior is completely accessible in terms of human cultural studies.

As Kelly (1995:73) points out, one of the most intriguing aspects of the theory for anthropologists is the ability to use actual currencies such as time for costs, and calorie or energy returns for benefits. This allows for formal testing of the model's assumptions as long as the prey types available to hunter-gatherer groups are known.

An important advantage of optimal foraging studies pointed out by Smith (1995:625–626) is that they can be applied to specific cases, for instance, in the example of trying to understand why a particular group of hunter-gatherers makes the prey choices they do. But at the same time optimal foraging studies can be useful for production of

general theory that is applicable to a broad range of archaeological and ethnographic situations.

The predictions given in this chapter were based, at least to some degree, on assumptions concerning optimizing behaviors. For instance, that foragers will move to another site once resources within their efficient foraging radius have been depleted, is based on the assumption that they will weigh the benefits of living at a new location against the costs of moving. More importantly the research assumes that hunter-gatherers made choices about the environmental zones, or resource patches, they exploited. At some critical point it is assumed that prehistoric peoples living in South-Central Connecticut weighed the advantages of adding new environments to their subsistence, against the investment that would be made in terms of time and energy to explore these new environments and learn what kinds of resources or opportunities were available.

Other forms of optimal foraging theory deal with choices on the part of hunter-gatherers as they relate to the utilization of resource patches. These models rely on an assumption that resources are heterogeneously distributed across a landscape (Smith 1995:630–631). The assumption that resources are heterogeneously distributed is probably applicable to the temperate woodlands of South-Central Connecticut, where hunter-gatherer societies would have to rely on a variety of resources that would be abundant in specific locations on a seasonal basis.

The Patch Choice model (MacArthur and Pianka 1966) is similar to the Diet Breadth model in that it tries to predict, given an array of available patches, which ones would be utilized by efficient foragers? The choice would depend on the tradeoff between foraging in less productive patches and time spent traveling to new patches.

Smith (1995:631) points out that the Patch Choice model actually does not account for diminishing returns, but works best only with regard to resources which can be harvested at a constant rate until the last one is gone. This would account only for resources that are clumped in one place and require no further search times once they are located.

Unlike the Patch Choice model, Marginal Value Theorem (Charnov and Orians 1973) assumes that as resources are encountered in a particular patch, they become scarcer and more difficult to locate. The question that this model approaches is, "What is the optimal amount of time that efficient foragers should spend in any individual patch?" Marginal Value Theorem predicts that once the expected returns from the current resource patch, plus the costs of moving, are equal to the average expected returns of other available patches, then efficient foragers will change residence. This theorem is the opposite of the Patch Choice model in that it does not work well when resources are clumped in one place and will be depleted constantly until the last one is gone. Instead this model is based upon the concept of diminishing returns. It is presumed that the more resources are encountered, the longer time will be spent searching for new items (Smith 1995:631–634).

Marginal Value Theorem actually provides a simple way of stating the hypothesis of this research: marginal resource patches like West Rock Ridge will be added to subsistence pursuits once the returns from other available patches are equal to or below the average expected returns from environments like West Rock. In other words, it is presumed that once more optimal patches have already been exploited, that lower choices will be added.

Another important optimal foraging model is the Horn model (Horn 1968). This model predicts the optimal settlement pattern in cases where resources are clumped as opposed to being heterogeneously distributed over the landscape. According to the Horn model efficient foragers should utilize dispersed settlement when resources are evenly distributed, and centralized or aggregated settlement when resources are clumped or mobile (Smith 1995:634).

Hunter-Gatherer Mobility

Kelly (1995:111) noted that while mobility is an important characteristic of the hunter-gatherer way of life, that not all cultures move in the same way. Furthermore, Kelly (1995:120-121) understood that the term "mobility" can actually refer to a number of things, and that each of these is not equal to the other:

> Rather than rely on a typological scheme, I have used five separate variables to measure dimensions of mobility: 1) the number of residential moves made each year, 2) the average distance moved, 3) the total distance moved each year, 4) the total area used over the course of a year, and 5) the average length of a logistical foray.

Following Kelly's (1995) advice above, mobility will be defined in this project in relation to the thoroughness with which hunter-gatherers are expected to cover their territories. Thorough coverage should be a result of frequent short moves over a relatively circumscribed range. This means that residential moves should be frequent, average distance moved should be short to moderate, and the cumulative total distance of

moves per year should be relatively large. However, the total area covered may actually be small, and long logistical forays should be rare.

Binford (1980:4) described hunter-gatherer settlement systems as being composed of two different strategies as they relate to the way that people move, in relation to the distribution of key resources in their environments. These two components are "foraging" and "collecting" mobility strategies. Because Binford (1980:4) used a cultural systems approach, he defined variability in terms of these different strategies as it related to differences in the types of sites produced by either of these settlement components. These later observations make his settlement model useful for archaeological investigations.

Which of these strategies, foraging or collecting, will dominate the settlement system of a particular culture, is a factor of the distribution of critical resources in the local environment (Binford 1980:13–17). Foraging is most efficient when resources are evenly distributed throughout the environment. Foragers extract resources on daily excursions from their habitation sites. These sites are positioned to take advantage of which ever resources are seasonally abundant. Storage is not an important component of this settlement strategy. Foragers therefore "map onto resources" (Binford 1980:4) sustaining themselves by moving frequently to new resource patches.

Collecting is a mobility strategy which, on the other hand, is best suited to environments where resources are heterogeneously distributed across the landscape. This condition has been referred to before in this text as a "patchy" or "clumped" distribution. In these types of environments incongruence is likely to occur between the accessibility of two or more critical resources. When this is the case no amount of residential moves

can solve the problem. The solution is to send special task groups out to camp, sometimes at great distances from the habitation, in order to produce those resources in bulk that are not available back at home. According to Binford (1980:15) the greater amount of seasonal variability present in terms of temperature and/or patterns of rainfall, the more likely will collecting be employed as a mobility strategy. Storage is very important in this settlement strategy.

This in turn acts as a feedback mechanism. The more a group relies on storage the more they have to lose by moving from one location to another, and this is true whether or not this means leaving resources behind or energy spent moving the stored resources (Binford 1980:15). Storage therefore tends to pull the system further toward a collecting strategy, because the fact of storage alone creates a conflict in terms of the positioning of critical resources. Aside from environmental variables, any constraint which will restrict mobility will add to the likelihood that collecting will be an important component of the settlement system (Binford 1980:17).

Binford (2001:269) makes the point that as intensification of the subsistence base increases that a collecting mobility strategy will be favored. This leads to prediction number three in the model presented in this chapter. Because cultural mechanisms of intensification serve to offset the need to cover local territories thoroughly, it is predicted that a forging mobility strategy will be a characteristic of those cultures most likely to leave their archaeological remains at West Rock Ridge.

Binford (1980:7–9) was able to observe variability in the types of sites produced by these two mobility strategies. Forager settlement patterns should consist of two general site types. The first are seasonal campsites from which people move out on a

day-to-day basis to procure resources to meet daily subsistence needs. These residential sites are changed as soon as resources adjacent to the habitation are depleted. The second type of site produced by foragers are task-specific locations that are transient stops where resources are extracted in day-to-day foraging activities.

In addition to main habitations and task-specific locations, collectors produce a third type of site that acts to define this settlement strategy (Binford 1980:8–9) These are the field camps where groups of specialists maintain themselves, sometimes at great distances from the habitation, in their pursuit of an abundance of resources that will be transported to those waiting at home. These various site types will be discussed in much greater detail in chapter three, when archaeological measurements for the predictions given in this chapter will be presented.

Binford (1980:12) makes it clear that foraging and collecting mobility strategies are not polar opposites, and that hunter-gatherers will typically employ a little of each. However, because each represents a specific response keyed to a fairly distinct set of environmental parameters (congruence, or lack of it, in terms of all of the critical resources necessary to a particular society), individual hunter-gatherer societies can be analyzed in terms of the dominance of one strategy over another in relation to their unique cultural systems.

Expedient and Curated Technologies

In his ethnographic field work among the Nunamiut, Binford (1979) made another very important observation concerning variability of technological strategies employed by hunter-gatherers. According to Binford (1979:255) technological strategies were organized in relation to the specific situations or contexts within which they were used. Examples of this type of situational strategy would be the contrasts between three types of gear: active, passive and insurance gear. Active gear are all of those forms of equipment that are in use at any one time. An example of active gear among the Nunamiut would be kayaks during summer and sleds during winter. Of course, passive gear would represent just the opposite. Kayaks were stored during the winter and sleds were stored during the summer (Binford 1979:256–257).

Binford (1979:257) described insurance gear in the following way:

> Insurance gear is cached throughout the region, not in terms of specifically anticipated seasonal needs, but in terms of what might generally be needed at the location at some time in the future.

Nunamiut would always carry things in their packs in anticipation of situations where someone might be in trouble and need a specific item in the future, such as: emergency foods, tool stone, or a strike-a-light. These items would be cached in a

number of locations, including stream crossings, well-known caves or rock crevices, adjacent to known stops, and in deliberately constructed rock cairns (Binford 1979:257).

Another very important situational consideration, which will have direct bearing on the choices on the part of South-Central Connecticut's prehistoric inhabitants to exploit specific lithic raw material sources, is Binford's (1979:259–261) concept of embedded procurement strategies. According to Binford (1979:259) Nunamiut rarely considered procurement of raw materials an objective of and by itself. Instead, raw material procurement, including lithic raw material, was almost always an incidental component of other important activities. The terminology used by Binford (1979:259) is that lithic raw material acquisition was typically "embedded" in other basic subsistence tasks.

More important in relation to the five predictions made earlier in this chapter, is Binford's (1977:35–36) distinction between expedient and curated tool use. Bamforth (1986:39) considered Binford's definition of curated technology in terms of five aspects of tool manufacturing and use: 1) tools are manufactured in anticipation of future needs, 2) tools are designed to be multi-functional, 3) tools are carried from one site to another, 4) tools are maintained, and 5) recycled. This can be contrasted to expedient tools which are: 1) manufactured when the need arises, 2) manufactured only to be functional without any specific design characteristics, 3) used only once, for the task at hand, and 4) are typically discarded immediately after being used.

Parry and Kelly (1987) expounded on Binford's (1977) concepts above, describing differences in the organization of lithic technology on the part of hunter-gatherers in terms of those dominated by expedient or informal cores, and those

dominated by formalized cores (curated technology). Expedient core technologies include flake production using amorphous hand held flake cores, or bipolar technique. Parry and Kelly (1987:287) describe bipolar technique as the placing of the core on an anvil and its subsequent smashing using a large and heavy stone. The resultant flakes are produced: "with all of the finesse of a man cracking walnuts." Formalized cores on the other hand included bifacial and prismatic blade cores (Parry and Kelly 1987:285).

Similar to Binford's (1979:255) observations concerning situational variability in terms of technological strategies, Parry and Kelly (1987:300) describe how the selection of expedient or formalized core technologies is also a consideration of situational requirements of lithic raw material availability and stone tool needs:

> Much of the variability in tool-making methods and the resulting tool morphology can be understood as a function of the role of stone tools, which is to solve the problem of spatial and temporal differences between the location of stone tool use, while meeting the functional needs of the task(s) for which the tool is used.

This later observation can be explained by summarizing the different advantages and disadvantages of formalized versus expedient core technologies. According to Parry and Kelly (1987:300) mobility plays an important role in the selection of formalized core technologies. This is because highly mobile people can not easily carry a great amount of weight in tool stone.

Formalized tools such as bifaces can be described as multi-functional and multi-use (in other words, curated). They are multi-functional because with little modification

a bifacial edge can perform a wide variety of tasks. They are multi-use because bifacial edges can be easily re-sharpened when they are dull (Parry and Kelly 1987:298).

Bifacial cores also carry the advantage of providing for the maximal amount of useful cutting edge for the weight of the core to be carried. This is because bifaces can serve both as tools and as the source of sharp bifacial flakes, which in turn can be used as serviceable tools in a wide variety of tasks (Parry and Kelly 1987:298).

Bifacial and other formalized core technologies therefore solve the problem of access to lithic raw material for both anticipated and unanticipated tool stone needs, in the context of a very mobile way of life (Parry and Kelly 1987:300). The disadvantages of formalized core technologies include: 1) formalized cores can only be made by skilled flintknappers, 2) time and effort in making formalized tools and cores is greater in comparison to expedient tool production, and 3) only high quality lithic raw material can be used in formalized core technology, and this often requires trips to distant quarry sources (Parry and Kelly 1987:298–299).

Expedient core technologies, on the other hand, do not require formalized training. The simple use of a bipolar technique means that anyone can manufacture tools, and regardless of skill level these tools can be produced very quickly. For instance after a quantity of flakes have been produced by a bipolar technique, the tool user simply picks from the available fragments and uses that piece with an edge suitable for the task at hand (Parry and Kelly 1987:285–288).

Parry and Kelly (1987:300) described how sedentary societies do not require highly portable tool kits, and because they can stockpile raw materials even when sources are not locally abundant, the problem of incongruence in relation to accessibility of lithic

raw material at those locations where stone tool use is required, is obviated. In a sedentary context expedient tools offered many advantages, including: 1) even poor quality lithic raw material could be used, 2) experience was not necessary, 3) tools could be produced quickly, 4) unretouched tool edges are even sharper than bifacial edges, 5) a suitable edge for any task could usually be obtained.

But Parry and Kelly (1987:299–302) also noted that even mobile societies could use expedient core technologies as long as lithic raw material was widespread and abundant. This is exactly the case that is anticipated in South-Central Connecticut where good quality quartz sources are very abundant and widespread. Considering that territorially packed hunter-gatherers were not likely to have access to exotic sources of chert, it is anticipated under conditions of high residential mobility and territorial packing, that local populations would be almost completely dependent on quartz for the majority of their tool stone needs. Because quartz is not the kind of high quality lithic raw material necessary for formalized core technologies, local populations are expected to take advantage of its abundance throughout their territorial ranges by using an expedient core technology, probably a bipolar technique.

Parry and Kelly (1987:285) noted a gradual trend, which was fairly worldwide but perhaps most pronounced in North America, where formalized core techniques became replaced, almost exclusively at times, by expedient core technologies. They considered this trend to be most closely associated with the advent of somewhat sedentary villages (Parry and Kelly 1987:297).

Other Important Theoretical Concerns of the West Rock Ridge Project

West Rock's unique geological characteristics make it necessary to take a further excursion into archaeological and anthropological theory. The presence of restricted accessways from one side of the ridge to other, as well as very localized water sources, presented local prehistoric peoples with the opportunity to ambush game animals at locations where hunters could predictably await their arrival.

Large tracts along the ridge top also appeared to have been used as information gathering locations. But the archaeological record along these ridge tops does not appear to correspond to distinct "sites" in the way that archaeologists typically define them. Instead they appear to represent gradual accumulations of artifacts over a long period of time as people revisited the area amidst day-time excursions, leaving a tool here and a few waste flakes there as they did so. This section will review the available anthropological/archaeological literature in terms of the following topics: 1) ambush hunting, 2) artifact breakage and discard patterns, 3) use of hunting aids such as traps or facilities, 4) risk, and 5) and "non-site-oriented archaeology' (Thomas 1975:62).

Ambush Hunting

Crowell and Hitchcock (1978) described ethnographic data, collected by direct observation and informant interviews, with Kalahari Basarwa (Bushmen) concerning the practice of ambush hunting from behind blinds in Botswana. According to Crowell and

Hitchock (1978:37) ethnographic information concerning other hunting strategies such as tracking and pursuit of large game, as well as capture of burrowing animals, have been well documented in this area. But ambush hunting from behind blinds is not well recorded, and so these authors performed their research while direct ethnographic observation and interview was still possible, and while extant hunting blinds could be still be visited.

Information had been collected from two different Basarwa groups living in different ecological settings: one was a group of !Kung living at Dobe, a settlement at a small permanent water hole in the western Kalahari desert, and the other was a group of /Kaičwa Basarwa living along the Nata River northeast of Nata Village. The authors (Crowell and Hitchcock 1978:37) described the construction and placement of blinds, the ambush strategies used in the two areas, and provided a comparison of the relative success of these two groups in terms of differences in their hunting techniques.

!Kung blinds consisted of: 1) circular courses of calcrete blocks about 1.5 meters of interior diameter, and 10 to 65 centimeters high, or 2) pits dug twenty to thirty centimeters deep using digging sticks with a low screen (50-60 cm high) of brush and grass around them. Blinds also took advantage of whatever bushes or tree trunks were available for additional concealment. Usually a fire was built inside the blind and then banked so that only its embers remained lit in order to provide warmth, or for lighting a pipe (Crowell and Hitchcock 1978:38).

The blinds were always placed so that the animals would approach from the upwind side relative to the location of the hunters. They could be placed either: 1) adjacent to the pans where the animals would congregate to drink, or 2) well hidden

along the trails leading to the open pans. In the Dobe area hunters utilized an ambush strategy only during the dry seasons, when water was available at a limited number of pans. Crowell and Hitchcock (1978:39–43) were not convinced that all of the animals hunted were attracted by the presence of water at the pans, but believed that salt licks present as the water holes dried up may have attracted some of the species hunted.

Dobe hunters had access to the following species: kudu, duiker, wildebeest and roan antelope. They utilized poison-tipped arrows shot from bows, and Dobe hunters typically attempted to shoot all of the animals who approached a water hole. After being hit it was necessary for the hunters to pursue the wounded animals the next day. All hunting took place on moonlit nights when visibility was appropriate (Crowell and Hitchcock 1978:37–43).

The other group of hunters, for whom Crowell and Hitchcock (1978:43–45) had information concerning ambush hunting techniques, lived along the Nata River. Important differences in the hunting techniques between these two groups were noted. Blinds were constructed along the Nata River, especially during the dry season when it contracted into a series of pools. They were placed either around the pools themselves, or along trails used by the animals to descend the banks adjacent to the river. Unlike the Dobe area, ambush hunting was practiced during the rainy season as well as the dry season. Because the number of trails descending from the river banks was limited, the prediction of which trails animals would use was easier for Nata hunters then had been the case in the Dobe area.

Crowell and Hitchcock (1978:44) were able to obtain abundant information concerning ambush hunting at pools along the Nata River. Large herds of buffalo or

wildebeest would descend from trails worn into the river banks, to drink water at the pools. After all of the animals had descended, the hunters would only choose the fattest ones. The hunters would hide in chest-deep log-roofed pits or behind reed screens. Although most hunters used rifles, the use of spears was also recorded. One informant recalled killing a wildebeest using a spear which he threw from a special type of brush blind that allowed him to stand and throw the spear, while still being concealed from the animals.

An interesting observation by Crowell and Hitchcock (1978:43–44) was that three spear kills were attempted in ambushes at Nata River pools. All three were successful, and tracking of game animals was not necessary because the animals were killed on the spot. The preferred technique was to throw from behind blinds which were positioned to allow for a level shot at close distance, ideally about ten meters away. Animals could also be pinned against the bank by hunters with spears.

Using a limited sample of data collected over a single dry season, Crowell and Hitchcock (1978:45–49) compared productivity from the two areas described above (Dobe and the Nata River). A number of factors contributed to a higher success rate for the Nata River hunters, who killed and recovered all 16 of the animals they targeted for a mean edible meat yield of 199 kg. per kill. Using poison arrows the !Kung hit only 16 of 24 animals while recovering 14 of those 16 hit, yielding only 53 kg. of meat per kill. Nata River hunters had the advantage of using rifles and did not have to track down wounded animals, all but one dying right on the spot, whereas !Kung hunters typically had to track game they had shot. The hunters from the Nata River area also had larger bodied game animals available to them.

Artifact Breakage and Discard Patterns

Flenniken's (1991) interpretation of the Diamond Lil site, located in Oregon's Cascade Range, has important implications for the Wintergreen Notch site, one of the most prolific sites discovered during the West Rock Ridge project. According to Flenniken (1991:185), traditional spatial analysis of bone and lithic clusters could not discern one of the most important activities which had transpired at the Diamond Lil site. From traditional analysis, Flenniken (1991:180) was able to discern that the site had been used intensively, and two distinct artifact clusters could be identified. One was bone which was unidentifiable to species, although it could be discerned to represent some kind of large bodied mammal. The other was a dense concentration of lithic debitage along the perimeter of the bone scatter. This evidence indicated that bone had been processed at the site, either in butchering or marrow extraction activities, and also that tools had been manufactured and rejuvenated.

But in order to understand the true nature of the activities occurring at the Diamond Lil site, Flenniken (1991:185) had to turn to information that was gleaned from projectile points and projectile point fragments. First, evidence of impact damage occurred on many of the projectile points. But perhaps the most interesting observation on Flenniken's (1991:185–190) part, was that the ratio of projectile point tips to points possessing a basal section, was key to interpreting the most important activity occurring at the site. By analyzing the point tip/midsection to complete point/basal fragment ratio for other sites in the Cascade Range, Flenniken (1991:185) found that kill/butchery sites

typically had a ratio of one to one, while campsites or special purpose sites focused on activities other than kill/butchery had a ratio of approximately one to four.

In the case of kill sites, the explanation was that point tips were not worth recovering because they could not be reworked into new tools and also because they would be difficult to locate. Point tips therefore were left in those locations where they had broken by impact resulting from a missed shot. Point bases on the other hand were more valuable because these could be reworked into new points, and also because the shafts they were attached to represented a large investment in labor and so hunters would be sure to retrieve them (Flenniken 1991:185).

Alternately, in locations where animals were primarily butchered, point tips embedded in the flesh of game animals would be removed (Flenniken 1991:185). Robertson (1980:53–54) made a similar observation concerning the discard of projectile point bases and tips within a social context at a Late Prehistoric Cherokee village. He concluded that households where point bases were found represented residences where individuals had shot game animals to return the meat to the campsite. However, households where only point tips were found represented a social context where meat had been shared, and the point tips had been removed during butchering activities.

At the Diamond Lil site Flenniken (1991:190) reported that 45 projectile point tips/midsections had been recovered along with 50 complete points/basal fragments, producing a ratio of nearly one to one. Also using ethnographic descriptions of Late Prehistoric hunters, and information concerning behavior of deer and elk; Flenniken (1991:190) was able to conclude that deer had been “gathered” from the Middle Fork of the Willamete River and driven uphill to the Diamond Lil site where they had been

ambushed by hunters waiting behind brush blinds. Flenniken's (1991) observation that kill/butchery sites typically possess a point tip/midsection to complete point/basal fragment ratio of one to one will become important later in this text, when the Wintergreen Notch site is discussed.

Bartram (1993) studied the discard patterns of bone refuse produced during his ethnoarchaeological work with the Kua San hunter-gatherers of Botswana. One of Bartram's (1993:66–67) most important observation was that after making a kill, hunters could make any one of a number of decisions concerning where to butcher game animals and how to transport them. These alternate strategies included:

1. carrying the entire carcass (not practiced for larger animals);
2. carrying the entire carcass in partially disarticulated units;
3. carrying selected carcass parts;
4. caching meat;
5. moving camp to the kill

Bartram (1993) concluded that evidence of butchery activities both at kill sites and habitations would be influenced by these decisions, and that in turn these decisions would be influenced by factors such as the number of people in the party, and the distance to the habitation site.

Risk and the Use of Hunting Aids Such as Traps and Facilities

Hitchcock (1983:254) compared hunting technology of mobile and sedentary populations in the eastern Kalahari Desert, Botswana. He concluded that the use of specialized technologies such as traps, ambushes and facilities in hunting was pursued to a much greater degree by sedentary people. This may have been the case because sedentary populations tended to have stored resources on hand and so were better able to deal with failure. Hitchcock (1983) reasoned that the time and effort spent manufacturing and organizing hunting activities utilizing ambushes or specialized facilities was prohibitive to populations living on day-to-day acquisition of resources, because in this case there would be no resources to fall back on in case the plan backfired. Hitchcock (1983) did however note that ambush hunting was not exclusively a pursuit of sedentary populations, and in fact both sedentary and mobile populations utilized this technique.

Kelly (1995:100) offered a somewhat different perspective concerning risk on the part of hunter-gatherer societies. On the one hand, individuals might be willing to broaden their diets to reduce the risk of returning home with no food at all, even while this represented decreasing yields. On the other hand, in cases where risk is unavoidable one way or another, individuals might choose to simply ignore the risk factors and take their chances in an attempt to maximize possible returns.

Non-Site or Distributional Archaeology

Previously it was described that foragers acquire resources on a day-to-day basis at sites that Binford (1980) defined as task-specific locations. Artifact discard patterns at these sites more often represent no more than a few artifacts at a time, leading to low archaeological visibility. However, favorite gathering locations can be visited over long periods of time resulting in impressive accumulations of artifacts. These accumulations may even be reminiscent of true "sites" from an archaeological perspective. However they require much different methods of interpretation.

Two methods for dealing with this type of data are Ebert's (1992) "distributional archaeology" and Thomas's (1975) "nonsite archaeology". Ebert (1992:245) raises the issue that considering the new found self-consciousness of archaeology today, that one point of interest is the potential lack of consistency between method and theory as it relates to the "site concept". Ebert (1992:245) is willing to admit that sites exist as places where people did things, and that these sites are components of human systems of organization, but he does not consider them to be central for understanding how human systems are organized across cultural landscapes.

Ebert (1992:245–246) compares the archaeological record to a time elapsed exposure, as opposed to likening it to a series of individual snapshots. If one can imagine setting up a time exposure film adjacent to a favorite berry gathering location, for

instance, the resultant composite image would actually be the amalgamation of numerous individual events:

> While thinking about how to compare ethnographic situations to the archaeological record in a distributional way, it occurred to me that perhaps one could place a camouflaged or at least armored camera in an occupied, ongoing hunter-gatherer camp to provide an analogue to the "time exposure" sample of behavior that results in artifact distributions. The shutter could be left open—but in a very short time, the emulsion would be filled, and the image would be hopelessly continuous. I recently saw a time exposure of thousands of automobiles crossing the Brooklyn Bridge. One could never separate one set of headlights from another, or tell whether one vehicle stopped and another accelerated.

Ebert (1992) generalizes the pursuit of archaeology as a study basically focused on the organization of human cultural systems. In this context the "site concept" can hopelessly become mired in the theoretical baggage associated with its usage as the central element of archaeological study.

Thomas (1975) pursued a survey of the Reese River Valley in central Nevada from a theoretical perspective. His ultimate goal was to test whether or not Julian Steward's (1938) model of Great Basin adaptive systems was actually applicable in terms of hunter-gatherers living in this area throughout the length of the prehistoric period, an assumption that some archaeologists apparently had made. In order to pursue testing this hypothesis, Thomas (1975:62–63) abandoned the centrality of the site in his analysis, but instead concentrated on individual artifacts and their attributes as the basic elements of analysis.

Archaeologists using these nonsite methods are interested in sampling continuous distributions of artifacts, without formal measurements or definitions of sites per se. In

this way the association, for instance, of simple forms of plant processing equipment distributed over a fairly continuous ecological area, might signal repeated visits by people gathering important vegetative resources over a long period of time. This conclusion, however, might not seem apparent from surveys that only consider "sites" to be the central element of study.

Dunnell (1992:21) argues that the word site, which is defined in the English language as a place where something is or has been located, was simply added to archaeological discourse incidentally, but has unfortunately come to imply that all artifact clusters can legitimately be interpreted in terms of ethnographically known types of of human activity. He argues further that because the site "notion" has never been defined systematically, and because its justification as an analytical unit is unwarranted, it should be abandoned completely. Dunnell (1992:36-37) finds the notion particularly alarming for its centrality in the organization of cultural resource management projects, fearing that other analytical tools should be developed before the presently dwindling archaoeloigcal record is non-existent.

Marquart and Crumley (1987:1) wrote about how human societies actively form, and are in turn formed, by their natural and social landscapes. They consider this an important argument for non-site survey methods, pointing out how archaeologists can miss important cultural information by focusing soley on large, dense campsites, instead of viewing the archaeological record as continuous (Marquart and Crumley 1987:2).

Chapter 3

Methodology

This chapter focuses on the methodological concerns of the West Rock Ridge Project. These methodological concerns will address the issue of how both data from West Rock Ridge, as well as regional survey and overall synthesis of Southern New England prehistory; will be utilized to address those questions that were raised in chapters one and two. To review briefly, the West Rock Ridge project has as its objective finding answers to the following questions:

1. What can data from West Rock add to knowledge concerning prehistoric settlement patterns of South-Central Connecticut?
2. How did West Rock Ridge fit into the prehistoric adaptations of South-Central Connecticut's prehistoric societies? What can be learned about the mobility and land use patterns of these hunter-gatherers from these data? Of what significance will information concerning changing land use patterns be to general theory concerning hunter-gatherer ways of life?

The chapter begins with a general review of survey and excavation techniques that were used throughout the research. Next, basic terms and concepts used in the analysis of lithic artifacts will be described. The chapter will end with a description of methods used for comparative analysis of lithic artifact assemblages from West Rock's sites, followed by a presentation of the methodological tools that will be used to test the five predictions made in chapter two.

These five predictions were made in order to test the initial hypothesis of this research. Due to West Rock's rugged topography it was suggested that prehistoric hunter-gatherers living in South-Central Connecticut only added it, as a resource patch, to their annual subsistence under conditions of increased population density and regional packing of individual subsistence units. These five predictions were that those cultural or temporal traditions most represented by survey data from West Rock Ridge should: 1) be highly residentially mobile, 2) should have at least some distinct sense of territoriality, 3) will utilize a foraging mobility strategy, 4) will use an expedient core technology, and 5) will rely at least to a significant degree on hunted resources.

Because this hypothesis is only considered an initial attempt to understand how West Rock fit into prehistoric adaptations in the state, ongoing revision of the hypothesis will be an important component of the project. In the concluding chapter an alternative hypothesis will also be evaluated. This alternative hypothesis will suggest that local prehistoric inhabitants found West Rock to be ideally suited to fulfill at least some of their basic needs. However the West Rock Ridge project is also concerned with changing land use patterns on the part of hunter-gatherer societies, and how these changing patterns of landscape utilization in turn can be implicated in how hunter-gatherer societies found

new ways to take advantage of those environments which were added as part of their seasonal movements.

Site Survey

The majority of West Rock Ridge consists of moderately to steeply sloped ground. Subsurface testing, as a survey strategy, was only possible over four fairly broad areas. Information gained from test pit survey, however, was supplemented by walking survey. Because the West Rock Ridge project focused on a unique and rugged environment in order to understand its importance to south-central Connecticut's prehistoric inhabitants, a premium was placed on finding sites in locations that did not fit the standard criteria of level and well drained locations near to water. Walking survey allowed for the inspection of a far greater area as well as enabling for inspection of some the ridge's rugged topography.

The project area was restricted to the ridge, the high terrace banked against its western cliff face and the Wintergreen Brook Basin, which ran between the ridge and a series of low hills about one hundred meters to the east. Although the ridge is actually 17 miles long, only the portion of the ridge that is elevated well above the ground level with its steep western face was included in the project. This consisted of the first 6 miles of West Rock Ridge north of the location where it first breaks ground about 3 miles to the northwest of New Haven Bay.

Figure 3.1 depicts the four areas of West Rock Ridge where excavation of test pits along approximately north/south orientated transects was possible. Survey test pits were placed at 15 meter intervals in most areas but a closer 10 meter interval was used to locate small lithic scatters positioned adjacent to the prominent view sheds, or observations points, along West Rock's summit. These four areas can be described in the following way: 1) a high glacial outwash terrace banked against West Rock's western cliff face and overlooking the floodplain of the West River, 2) the area immediately surrounding present day Wintergreen Lake, 3) an area extending from about a mile north of Wintergreen Lake and paralleling Mountain Road, 4) along West Rock's summit where the best observation points for viewing the West River Valley were located.

In two of the above mentioned areas, a more or less continuous distribution of artifacts was found to exist below the ground surface. These were: 1) the high glacial outwash terrace banked against West Rock's western cliff face, and 2) along West Rock's summit. In these areas a series of shovel test pits was excavated at five meter intervals around each of the positive units, and in all of the cardinal directions, to gain further information. A decision was made based upon the additional data, concerning which find spots were most likely to represent significant deposits of archaeological material. However in both cases the continuous distribution of artifacts was noted, and interpreted to represent revisiting of the area on the part of prehistoric inhabitants over a long period of time (Thomas 1975; Ebert 1992).

Due to the presence of former and present man-made reservoirs and flood control measures along much of Wintergreen Brook, including its canalization and dikes built to

Figure 3.1: Location of Survey Transects

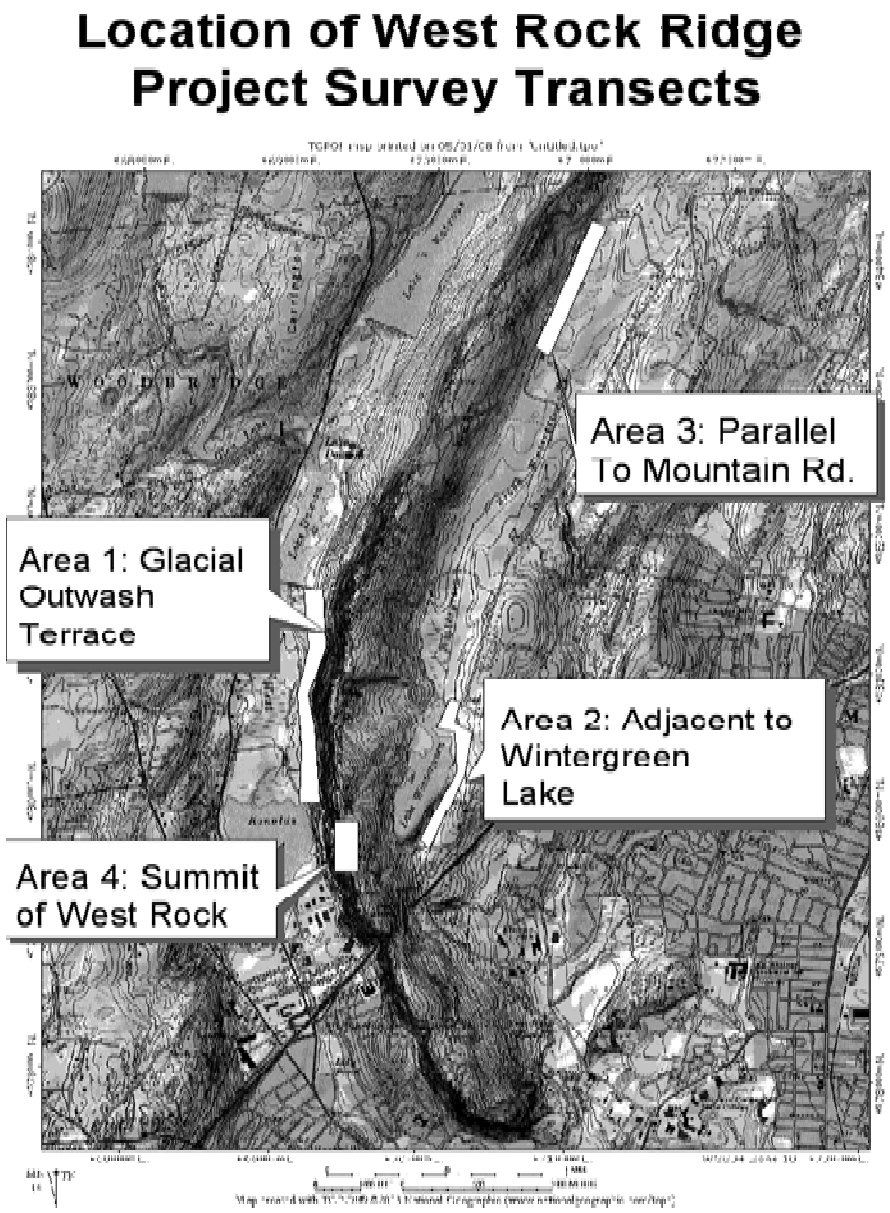


Figure 3.1 is a map showing the locations of the four areas at West Rock Ridge where test pit survey transects were excavated. These four areas included: 1) a high glacial outwash terrace banked against West Rock's western cliff face and overlooking the floodplain of the West River, 2) the area immediately surrounding present day Wintergreen Lake, 3) an area extending from about a mile north of Wintergreen Lake and paralleling Mountain Road, 4) along West Rock's summit where the best observation points for viewing the West River Valley were located.

contain its floodwaters, the areas mentioned above were the only locations suitable for formal test pit survey. However, walking surveys did replace formal test pitting surveys in those areas of the ridge that were too rocky and sloped for test pitting, and some important sites were discovered in this way.

Excavation

A grid of one meter squares was laid out from a datum point, which was always selected for both its permanence and its proximity to the site's artifact bearing deposits. Each excavation unit was labeled in terms of its distance along an east/west and north/south baseline from datum. Eighth or quarter inch screen was used depending on the potential to recover small finds. Excavation methods included shovel-shaving and troweling. An attempt was made to plot all formal artifacts in place with a depth measurement as well as a distance from the east and north wall of the unit in which it was found. Occasionally formal tools were found in the screen and of course these lacked similar documentation.

All artifacts including lithics, bone, shell and charred vegetal fragments were placed in bags along with tags giving the site, designation of the unit, depth below surface and stratigraphic level from which the artifact came. Field forms were recorded for all units which included stratigraphic information concerning natural layering of site soils, Munsell soil color, soil texture, wetness and inclusions of gravel, pebbles, boulders or roots. Flotation samples were taken whenever the presence of a potential feature was

ascertained. A single radiocarbon date from a potential feature was obtained, but subsequent flotation analysis and study of the potential feature's plan and profile was not able to verify its cultural origin.

Concepts and Terms Used in Lithic Analysis

Types of lithic raw material identified at West Rock included quartz, chert, basalt, hornfels, quartzite, argillite and jasper. After being subdivided into raw material types, all chipped stone artifacts were classified as cores, tools or debitage. Cores are considered objective pieces, which served as a source of flakes. These flakes in turn were used either as expedient tools or blanks for the production of formal tools. Two kinds of cores were found at West Rock Ridge, flake cores and bipolar cores. Flake cores were typically wedge shaped and had negatives from the removal of large flakes from at least one face. Bipolar cores were often rounded and crushed and were produced by placing the pebble on an anvil, or on the ground surface, and bringing a heavy hammer stone down on it in order to split the pebble or reduce it to many fragments. The fragments could then in turn be picked through in order to obtain a suitable flake that could be used without further modification as a tool.

Tools could be further subdivided into expedient tools, usually unmodified flakes, and formally retouched tools, such as bifaces and unifaces. Expedient tools consisted of debitage having a useful edge that was utilized to perform a task without any further modification, or secondary flaking, present. Formal tools possessed at least some

secondary flaking or retouch on one face. Unifaces were formal tools having flakes removed from only one face, while bifaces had flakes removed from two opposite faces. Unifaces included formal types such as scrapers and retouched flakes or blocks. Scrapers have steeply angled retouch on one or more edges.

Bifaces included formal types such as preforms, knives, drills and projectile points. For the purposes of this report bifacial preforms were simply referred to as bifaces. All biface preforms were roughly staged in terms of how far along the manufacturing process had proceeded before the biface was broken or rejected and discarded. These rough stages included: 1) early stage bifaces defined by a series of flakes around the biface perimeter that formed a rough and uneven edge, and the presence of at most a few broad thinning flakes, 2) middle stage bifaces had a fairly even edge and were well thinned, although sufficiently thick in cross-section to indicate that further work was necessary, and 3) late stage bifaces had even edges, were fairly symmetrical and well thinned. While Callahan (1979) has to be credited with the concept of lithic manufacturing stages in his analysis of eastern North American fluted points, the stages included in this text were based upon Boudreau's (1981) description of his replication experiments with quartz Squibnocket stemmed and triangular points typically found in New England. Some late stage bifaces demonstrated attempts at shaping that allowed the end product (typically a projectile point) to be identified.

Formal bifacial tools such as drills and knives were classified either according to their shape, or preferably by the presence of use-wear. All informal tools, or those not possessing secondary retouch, were classified as such based on the presence of use-wear alone. A binocular microscope with 300X magnification was employed for use-wear

identification after its presence was detected using a hand-held 10X magnification lens. All bifaces that were finished specimens having a hafting element, and a fairly symmetrical blade possessing a sharp tip, were classified as projectile points. Diagnostic projectile points were classified according to typologies developed for the Northeast such as those by Ritchie (1971) and Fogelman (1992).

Debitage is defined as the unused waste chips produced during processing of lithic raw material or during stone tool manufacturing. All debitage was further classified as flakes or shatter. Shatter is considered unplanned and uncontrolled removal of debitage producing blocky angular shapes. A large proportion of shatter in a debitage sample can provide evidence of early stages of lithic raw material processing when the flintknapper is more interested in crude shaping or simply the removal of flawed and otherwise less suitable tool stone (Kooyman 2000:52; Boudreau 1981:18). Flakes, on the other hand, are considered planned removal of detached pieces using a blow, or pressure, applied to an edge and typically with some attempt in mind to control the size or the shape of the removal (Kooyman 2000:151–155).

Flakes are recognized due to the particular characteristics of the types of stone that prehistoric flintknappers used in order to make tools. Suitable raw material usually is homogenous and fine textured. Knappable stone is often recognizable because the grains are hardly visible to the eye. Tool stone should also be brittle enough to break using a moderate amount of force and yet elastic enough so that it does not simply shatter into so many pieces when it is struck (Odell 2004:47). Elasticity refers to the degree to which something can return to its initial shape after being struck. Quartz, the raw material from which the vast majority of artifacts from West Rock Ridge are made tends

to be somewhat brittle, which gives it the disadvantage of being unforgiving. If a toolmaker misplaces or miscalculates a blow to the objective piece, it can shatter into so many pieces rendering it useless.

Flakes have characteristic features on their ventral faces. If one imagines an original core, the ventral surface of the flake is considered that side that was originally attached to the core. The ventral surface is therefore the side of the flake initiated when it detached from the core. The dorsal side of the flake, on other hand, is the original exterior of the core. If previous removals had occurred before the flake in question was struck off, the evidence of those removals will occur as negative surfaces, or flake scars on the dorsal face.

The characteristic features of flakes, which occur on their ventral surfaces, are in turn a product of the homogenous nature of raw materials used to make tools. These features will be discussed below.

If a BB strikes a plate of glass, the resultant hole created will be the size of the BB on the entrance side, but will expand creating a much larger hole on the exit side, so a cone shaped piece of glass has been removed. The cone is sometimes referred to as a Herzian cone (Odell 2004:50–53), which occurs because glass is so fine-grained and homogenous that the force imparted by impact spreads through the glass like waves in a pond expanding around a pebble dropped onto a surface of water. The crack, in other words, follows along lines of force instead of following natural fracture planes in the rock. This is the very characteristic that makes fine grained and homogenous rock suitable for tool making because the flintknapper can plan the size and shape of the removal due to the fact that it detaches along somewhat predictable lines of force.

In a flake, just below the point where the force was imparted to cause detachment and on the ventral surface, the lithic analyst can find half a remnant of the Hertzian cone. This cone in turn merges with a raised surface called the “bulb”, located just below it (Andrefsky 1998:17).

Other terms, which shall be used in this text, include the flake “striking platform”, which refers to that surface where force was imparted in order to detach the flake. In hard hammer percussion the striking platform would be a surface where a hammerstone had impacted the core and initiated the removal of a flake. In soft hammer percussion an antler billet is often used to strike off a flake. In pressure flaking an antler tine is typically used in order to create pressure that pushes a flake from the core. In all of these cases that surface where force was imparted either by percussion or pressure is considered the striking platform.

In order to shape formal tools, flintknappers often took extra steps in order to prepare the striking platform, either by removal of flakes to isolate it, or through grinding and abrasion in order to give it more bite or support (Whittaker 1994:140–147). Flake platforms can be subdivided into several types. Cortical platforms represent instances in which the flake was detached utilizing a blow along an original exterior surface, or cortex, of the rock from which it was detached. Single faceted, or flat, striking platforms are surfaces that were originally created by the removal of a single flake. Multifaceted striking platforms have at least two surfaces created by the removal of two or more flakes. Lipped striking platforms have a small projection or lip where the platform intersects the ventral flake surface (Andrefsky 1998:18). Although in the past some analysts have considered lipped platforms to be indicative of soft hammer percussion,

this platform type is more a function of a relatively low platform angle where the crack that subsequently detaches the flake is initiated by bending forces. Percussion flaking will also produce lipped platforms as long as the flake is detached in this way. Finally, platforms that were ground or rubbed in order to strengthen them or improve their bite were classified as "ground" or "abraded" platforms.

Although flakes may break during the tool manufacturing process, the identification of flake fragments having a remnant of their original striking platform, gives an indication of the number of flake detachments that occurred at the site. The presence of many large cortical or single faceted platforms might indicate early stages of core reduction, when the goal was to produce large flakes, possibly to be used as tool performs. Smaller multifaceted or lipped platforms, sometimes showing evidence of preparation in form of grinding or abrasion, are thought to represent later stages of tool manufacturing, especially bifaces, when flintknappers carefully removed smaller flakes of just the right size and shape to slowly shape a formal tool. Lipped platforms should occur when the edge angle is low enough to allow for initiation of a bending fracture, which would more typically indicate that the piece has already been thinned to some extent (Kooyman 2000:60).

When possible, individual flakes were classified according to certain flake types in terms of whether they were produced during the production of bifaces, as a result of bipolar reduction, or if they represented small pressure flakes. Bifacial thinning flakes are recognized because they have a remnant of the bifacial edge from which the flake was removed, usually having a multifaceted and/or lipped platform. Bipolar flakes are much more difficult to identify. Because a bipolar flake is produced when a core is rested on an

anvil, or other suitable surface, and then struck with a blow from a heavy hammerstone, bipolar flakes can show evidence of impact on two opposite faces, or alternately they can show evidence of crushing on the side that was in touch with the anvil (Andrefsky 1998:27). Small pressure platforms can be identified under 300X magnification using a binocular microscope. Flake classification leads to direct evidence, therefore, of lithic processing activities such as biface manufacturing, bipolar reduction or pressure flaking. However, good examples of any of these flake types are rare due to the vagaries of debitage production, and so flake classification is only possible on a very small proportion of the debitage which was under study.

All debitage, both flakes and shatter, was examined for the presence of cortex and subsequently measured and weighed. Cortex represents the weathered exterior of the original rock which was the raw material source of the artifact. After being divided into flakes and shatter all debitage was placed into size categories of one centimeter increments, and all of the flakes and shatter within each incremental size grade were weighed keeping individual unit, level and raw material type separated.

In addition to chipped stone tools, one ground stone tool was recovered during the research at West Rock Ridge. Ground stone tools are manufactured from heavier coarse grained rocks, compared to fine grained homogenous raw material used to make chipped stone tools. This is because ground stone tools usually include types such as axes or pestles that undergo heavy pounding and have to withstand this kind of usage for a prolonged time. Ground stone tools are usually pecked to remove small, often dust sized particles during the stages of initial shaping, and then they are ground in order to smooth their surfaces (Odell 2004:74–85). The only ground stone tool recovered during the

excavations at West Rock Ridge was a pestle, believed to have been used in the processing of nuts or other vegetal materials at the Fairhaven Reservoir site.

Neither pottery nor steatite bowl fragments were recovered during the project. Faunal and floral materials were also very rare. No bone was recovered. Shell fragments were found at the Fairhaven Reservoir site, but it was impossible to tell whether these belonged to the prehistoric occupation, or whether they were attributable to the historic period, because they were found in the plow zone. Carbonized seed and nut fragments did occur. The nut fragments were not identifiable according to species. Many of the seeds recovered from the Wintergreen Notch site were identified at the level of genus or species by David Lentz (personal communication 1999) of the New York Botanical Gardens.

No cultural features were positively identified during the project, although several potential features were examined. When possible features were encountered, soil was removed in bags to later undergo flotation analysis. Features were bisected so that both plan and profile drawings could be made. This was done in attempt to understand if the shape of the potential feature could be found to be consistent with either a fire pit, storage pit or a post mold.

Comparative Analysis of Site Assemblages

For organizational purposes all of the sites discovered during the West Rock Ridge project were divided into four categories, each of which will represent a separate

chapter in this text: 1) information gathering sites, 2) quarry or lithic procurement sites, 3) seasonal campsites, and 4) intercept hunting sites. However after these sites have been described individually, a formal comparison of the lithic assemblages will be given in chapter twelve.

This analysis will take into account the following variables: 1) the proportion of debitage having a cortical surface, 2) the ratio of flakes to shatter, 3) the ratio of cores to bifaces, 4) the total number of bipolar cores, 5) the total number of amorphous flake cores, 6) the percentage of bifacial thinning flakes, 7) the proportion of lithic debitage ≥ 3 cm in length, 8) the number of distinct tool types identified, and 9) the proportion of each assemblage represented by the most dominant of its tool types.

As Kooyman (2000:2) points out, lithic technology involves many stages, or steps, from the time tool stone is initially quarried at its source to the time it is reworked to a diminutive form and discarded into the archaeological record. Prehistoric artisans managed these various stages of the lithic cycle in a schedule with all of the other activities they performed. Different steps in the overall tool manufacturing process tend to occur at particular site types, for instance (Kooyman 2000:2):

> Early manufacturing stages, such as roughing out the initial tool form, were usually done in proximity to the quarry location. Tool resharpening usually occurred where the finished tool was used, and extensive repair and re-working often occurred in habitation sites where much time was available to complete such labor intensive tasks.

For these reasons identification of stages of the lithic manufacturing process was an important component of the comparative analysis of West Rock Ridge lithic

assemblages. Those indices which were considered most sensitive for identifying stages of lithic manufacturing were: 1) percentage of cortical debitage, 2) the flake/shatter ratio, 3) debitage size, 4) percentage of bifacial thinning flakes, and 5) presence and number of cores. An explanation for the importance of each of these indices is given below.

As defined before, cortex represents the outer surface of lithic material that has been naturally weathered either by physical or chemical processes (Kooyman 2000:170–171). Because the cortex is the outer unmodified exterior of the rock, early stages of lithic processing should include debitage with cortex on it (Kooyman 2000:52). Boudreau (1981:18) stated that for quartz pebble industries the relative proportion of cortex indicates whether or not pebble smashing occurred on-site or off-site. Andrefsky (1998:102) also recognizes that cortex has been useful to archaeologists for recognizing stages of tool manufacturing but adds that the amount of cortex will vary according to a number of factors including the amount of cortex on the objective piece, the kind of artifact being produced and the technique of manufacture.

When pebbles or nodules were the original lithic raw material source, the size of the pebble or nodule is a determinant of the amount of cortical debitage produced. More cortical debitage should occur in the reduction of small pebbles, having more surface area in relation to their mass, than large pebbles. This later point will be an important variable considering that most debitage from West Rock Ridge will represent lithic raw material obtained from pebble, cobble or nodular sources. Percentage of cortex should be useful as an aide in determining stages of lithic manufacturing for West Rock Ridge sites because vein sources were relatively unimportant in those assemblages studied.

Percentage of cortex would not be a good indicator of lithic reduction stages in association with vein sources, at least in theory, because cortex is only present on the exterior of the vein while most of the mass of lithic material lies in the interior of the vein itself. However, vein sources of quartz also have internal flaws that are penetrated by water, creating iron-stained pseudo-cortex.

Andrefsky (1998:96) points out that size has been considered an important factor in the analysis of lithic debitage for a long time. The general assumption is that the size of debitage is directly related to the size of the objective piece, and that therefore because lithic processing is a reductive process the overall trend should be for larger flakes to be less common in later stages. Small flakes tend to be in the majority during all stages of lithic tool manufacturing. Kooyman (2000:52) reflects this same sentiment indicating that large pieces of shatter as well as the presence of unmodified pieces of lithic raw material are good indicators of early stages of lithic processing. Boudreau (1981:18) suggests that low percentages of large shatter are indicative of off-site smashing of quartz pebbles.

A cutoff point of three centimeters in length was used for comparative analysis of debitage from West Rock Ridge. This was a cutoff point that demonstrated the most empirical ability to segregate sites having proportionally large debitage from those having smaller debitage. It also makes sense to use this debitage size because considering the dimensions of early and middle stage bifaces present at West Rock Ridge sites, debitage of about 3 centimeters should represent about the maximal size produced during middle and later stages of tool manufacturing.

The term “shatter” as it is used in this text follows the reasoning of Kuiji, Prentiss and Pokotylo (1995:120) in that the initial sort of debitage relied on the presence or absence of a single flake ventral (interior) surface, as defined by the presence of characteristics such as force lines or a bulb of percussion. All debitage having a single ventral face were classified as flakes, and all non-orientable fragments were shatter.

As stated before Kooyman (2000:52) suggests that large pieces of shatter should correlate with early stages of lithic processing. Describing quartz industries, Boudreau (1981:18) indicated that much shatter is produced during the early stages of lithic processing when the objective is the removal of course irregularities from the core material. The flake/shatter ratio was considered a fairly good indicator of stages of lithic reduction for quartz. Respecting the difficulties inherent in the lithic interpretation of quartz assemblages, the distinction between flakes and shatter was usually straightforward and this variable had the added benefit of being quantifiable.

Bifacial thinning flakes were recognized due to the presence of a remnant of the bifacial edge as a striking platform for the flake. Also, flakes having dorsal flakes scars and a lipped platform were included as bifacial thinning flakes. This is because the edge from which these flakes were removed had to have already been thinned to some extent in order to facilitate the type of bending fracture necessary for production of lipped platforms (Whittaker 1994:189).

The percentage of bifacial thinning flakes should indicate the relative importance of bifacial production in the comparative of analysis of West Rock sites. However, according to Boudreau (1981:20) only a small percentage of quartz flakes resulting from bifacial reduction survive intact for quartz assemblages, so the percentage of bifacial

thinning flakes will probably underestimate the importance of bifacial production for individual sites.

Kooyman (2001:52) notes that cores should be a good indicator of early stages of lithic reduction, as long as cores were used as an initial stage of lithic processing in the sequence being studied. In the case of West Rock Ridge sites, cores produced from pebbles and nodules were often found in association not only with numerous pebble and nodule fragments; but also numerous unaltered pebbles and nodules which obviously represented the parent source of lithic raw material. When all of these artifacts along with natural unaltered pebbles and nodules were found together in the same context, a fairly secure argument that initial stages of lithic processing had occurred at the site was possible.

Two of the variables chosen for comparative analysis of West Rock lithic assemblages are measurements of assemblage variability: 1) the distinct number of tool types in each assemblage, and 2) the proportion of an assemblage comprised by the dominant tool type. These measures are proxy indicators of the variables "assemblage richness" and "evenness" respectively. The usage of these measurement tools for identifying site types will not be described here, because this issue will be addressed in detail in the next section. However, the logic behind the proxy indicators for "richness" and "evenness" will be explained below.

Odell (2004:110) defines assemblage richness as, "the quantity of classes in an assemblage in proportion to the total quantity of objects." Of course the variable "total amount of distinct tool types" is not corrected for assemblage size. However, a graph indicating quantity of tools on the *x* axis and quantity of tool types on the *y* axis is the

best way to correct for assemblage size. This type of graph will be provided in chapter twelve. Numerical representations of richness which divides the number of distinct tool types by the number of tools in the assemblage can be deceptive, especially when comparing small collections.

For instance, a typical small lithic scatter from West Rock Ridge might contain one projectile point along with associated debitage. Dividing number of distinct tool types by the total number of tools gives one as a measure of assemblage richness (1/1=1). Of course "one" represents the greatest amount of assemblage richness possible using this kind of numerical representation. Yet for archaeological purposes an assemblage with a single projectile point could hardly be considered rich, and certainly would not be equivalent to an assemblage with 10 total artifacts and 10 distinct tool types (10/10=1).

Because of the relative small size of assemblages from most of West Rock Ridge's sites, assemblage richness is measured by simply using the proxy indicator "total number of distinct tool types in the assemblage". Since this number is not corrected for assemblage size it will be reported along with the total number of tools in the assemblage.

Assemblage evenness, which Odell (2004:110) defines as, "the equitableness of distribution of objects within each of the types," is even harder to measure. For all practical purposes evenness relates to whether or not the assemblage is dominated by one or a few specific tool types, which is best represented for all of West Rock Ridge's sites as the proportion of the total assemblage comprised by the most dominant tool type.

Finally the variable "ratio of bifaces to cores" is similar in this context to the ratio of "bifaces to flake cores", the later of which was used by Parry and Kelly (1987:290) to characterize assemblages in terms of the likelihood that they represent either expedient or

formalized core technologies. This variable will be discussed in detail later in this chapter.

Measurement Tools for Predictions Made in Chapter Two

In order to assess the major hypothesis of this research, measurement tools for testing those five predictions made in chapter two have to be formulated. The major hypothesis of this research is that West Rock Ridge was marginal to prehistoric adaptations in the South-Central Connecticut, but that under conditions of increasing population density and territorial circumscription of packed hunter-gatherer subsistence units it was added to annual subsistence rounds, as populations had to more thoroughly cover their available ranges. For convenience's sake these predictions will be repeated here. Those temporal or cultural traditions that are most frequently documented in West Rock's archaeological record should represent adaptations characterized by: 1) high residential mobility, 2) a distinct sense of territoriality, 3) a foraging mobility strategy, 4) utilization of an expedient core technology, and 5) should rely to at least a significant degree on hunted resources.

Cultural and temporal traditions identified in West Rock's archaeological data are the same as those reported throughout most of the Northeastern United States, and follow models which for the most part were derived from Ritchie's (1965) early work in New York State. Ritchie's work is supplemented by Dincauze's (1976) work at the Neville site, Snow's (1980) synthesis of New England archaeology and McBride's (1984) survey

of the Lower Connecticut River Valley. Due to lack of datable material, cultural affiliation from West Rock Ridge sites relied on projectile point typologies developed for the Northeast by Ritchie (1971) and Fogelman (1992).

High Residential Mobility

Before discussing the formulation of archaeological measurement tools for high residential mobility, it will be necessary to define exactly how the kind of mobility discussed here is to be characterized. High residential mobility in this context is considered to be an adjustment to increasing hunter-gather population density. Therefore it will be useful to formulate measurement tools for both hunter-gatherer population density and residential mobility.

On the one hand it is unfortunate that population density and residential mobility are difficult issues to address using archaeological data; on the other hand because these issues are fairly common topics for archaeologists who have performed regional synthesis in Southern New England and Connecticut, many well regarded opinions on these matters can be consulted. The major problem for estimating population using archaeological data is how to convert frequency of excavated components or radiocarbon dates into numbers of people. The question is, “Does frequency of excavated components associated with particular cultural groups, or frequency of reported radiocarbon dates over specified time spans, equate with total population in a direct way?

Reeves and Forgacs (1999:52) discuss why direct analogy between radiocarbon samples and population estimates is over simplistic. Cultural factors can influence site formation processes and these in turn can affect the number of datable features/components that are produced. Agricultural societies may for instance produce more in the way of deep, datable features, such as storage pits, post molds and middens, as a result of their somewhat more sedentary living. Charcoal and other organic matter will physically decay over time, leading to less available carbon for radiocarbon dating from Paleo-Indian and Archaic sites as opposed to Late Woodland sites. Post-depositional processes such as rising sea level and changing river courses can also destroy sites.

The same issues that can be cited for radiocarbon dates can essentially be used to argue that analogy between, for instance, the number of cultural components affiliated with a recognizable archaeological traditions and population estimates, would be just as over simplistic. With the added problem that cultural affiliation as defined by diagnostic projectile points or ceramic sherds does not control for time, except in the relative sense.

But these problems may not prevent the use of information concerning frequency of cultural components from available regional surveys, or the available radiocarbon database compiled by Reeves and Forgacs (1999) from being used in this analysis. What is of interest in the context of the present research is some estimate of *relative* population density. In other words, it might suffice simply to know that population density was, or was not, fairly pronounced during the temporal period in question. Also, if cultural components/radiocarbon dates are very frequent for those cultural/temporal traditions in question, one of the issues would be whether or not high residential mobility actually

inflated the reported numbers. Of course, because residential mobility is the variable that is of most interest it would be counterintuitive to reject the importance of the data on this basis. Therefore keeping those caveats in mind, which were stipulated by Reeves and Forgacs (1999:52), some reasonable inferences about population density and residential mobility can be made using data from regional site survey and radiocarbon dating.

In fact, frequency of cultural components from regional survey can be used to infer information concerning residential mobility if it is considered in a context with data about the average duration of time that sites were occupied. Fortunately, McBride and Dewar (1981) approach this issue directly, arguing that although component frequency was highest in the Late Archaic Period, that subsequent decreases in component frequency were associated with increasing site size. They use this observation to argue that population density may have remained fairly stable after the Late Archaic in the lower Connecticut River Valley, and that decreased component frequency indicates larger more sedentary villages.

Of course, information concerning season of occupation, especially when multiple seasons can be inferred, would be the most direct means of establishing length of occupation for specific sites. McBride (1984) does provide some information concerning seasonality for lower Connecticut River Valley sites, but unfortunately this type of data is only available for a small percentage of sites and so must be used in conjunction with other information.

McBride (1984) also addresses the issue of changing patterns of residential mobility in his dissertation focusing on the regional cultural prehistory of the Lower Connecticut River Valley. Additionally, data collected from West Rock sites can also be

used to infer information concerning residential mobility, if site size can be associated in a general way with duration of seasonal occupation. Finally, the issue of foraging/collecting mobility strategies discussed below is relevant to this issue, and will be useful for analyzing mobility patterns for occupants of West Rock Ridge.

Perhaps the greatest advantage for evaluating population density and mobility patterns throughout regional prehistory in Southern New England, is that these issues have been discussed in most of the major archaeological syntheses performed in the area. Consensus from regional survey and synthesis of archaeological data such as those provided by Snow (1980), Dincauze (1971; 1973; 1975), Wadleigh (1981), McBride (1984), McBride and Dewar (1981) and Cassedy (2007), should provide a fairly accurate means of evaluating the issues of population density and residential mobility throughout the prehistoric period.

Distinct Sense of Territoriality

Evaluation of the degree to which hunter-gatherer societies possessed a distinct sense of territoriality is even more difficult to address from an archaeological perspective. Wobst's (1977) approach in terms of the use of stylistic signaling in order to facilitate information exchange certainly merits consideration. According to Wobst (1977:328), those artifacts which are most visible to the greatest number of people would be those that would best be used in order to convey a person's group affiliation. However, projectile point (Ritchie 1971) and pottery styles (Smith 1980; Rouse 1980) in the

Northeast only show stylistic variation over very broad regions, and so these do not seem sensitive to the type of territorial marking that is of interest here.

In fact, Wobst (1977) anticipated this very problem, indicating that only the most visible artifacts should be used for stylistic signaling, and that this type of behavior should only predominate in societies in which stylistic signaling would target a very large number of individuals outside of one's own social group. As Wobst (1977:326) put it, "It is not surprising to find that certain aspects of band society material culture show so little evidence of 'stylistic' elaboration." Projectile points and pottery would not be the most visible items of material culture to invest with style conveying group affiliation. Body paint or dress would be more appropriate for this purpose, and little evidence of either of these classes of "artifacts" could be expected to be preserved archaeologically. Second, neighboring territorial groups would have known each other and some kin ties probably existed. Territoriality in the sense that it is used here is simply an economic behavior that avoids competition for critical resources at important seasonal sites. There may have been little value in large investments of stylistic signaling in this context.

However, lithic raw material use may represent a fairly useful proxy indicator for the type of territorial behavior that is of interest here. According to Renfrew and Bahn (1991:325), simple down-the-line exchange produces a characteristic pattern of exponential fall-off of goods as they move further from the source area. This happens, for instance, when the raw material passes from one hunter-gatherer band to another. Each band will retain a given proportion of the raw material and pass the remainder on to the next band down-the-line. Each time the raw material passes from one group to

another the amount available decreases, until those living at a great distance from the source can only be expected to have access to a small amount.

Because high quality lithic raw materials (such as Hudson Valley cherts) exist at great distances from South-Central Connecticut, under conditions of packed hunter-gatherers very little of this exotic chert should actually be available from simple down-the-line exchange. This is because so many distinct groups maintaining their own territorial ranges would intervene between these sources and local populations in South-Central Connecticut. Lithic raw material availability in South-Central Connecticut would be limited to local quartz, hornfels, basalt, and a limited amount of chert existing at a newly discovered source which was identified during the West Rock Ridge project. But only quartz was available in enough abundance to fulfill daily tool stone needs. For this reason it can be expected that exotic cherts would be of interest to these local groups, if they were available. The degree to which lithic artifact assemblages are dominated by locally available raw material types therefore could be considered a proxy indicator of territoriality, at least in the sense that it is used here; that is in terms of numerous individual groups maintaining their own distinct territorial ranges.

Foraging Mobility Strategy

Binford (1980:17-19) provides clear archaeological correlates for the types of assemblage variability which he predicts will correspond to his foraging or collecting strategies. The factor which conditions the choice on the part of hunter-gatherers to

utilize either of these strategies is the pattern of resource distribution in the local environment. For Binford (1980:15), the shorter the growing season, the more chance occurs that incongruities will exist in the distribution of critical resources. When this is the case no number of residential moves can solve the problem, the closer a group moves to one resource the further away it will be from another. It is in this type of environmental setting that a collecting strategy, where special task groups are sent to camp away from the habitation to acquire those resources not available at home, will be most advantageous.

Foragers on the other hand "map into" resources (Binford 1980:15). The seasonal base camp becomes the hub of activities, from which parties move out on a daily basis in order to encounter resources. Foragers do not invest to any great degree in storage, instead they acquire and process foods to meet daily subsistence needs. When resources in the present patch have been depleted they move to another patch where resource abundance can be expected. Variability among the seasonal camp sites of foragers can therefore be expected to correlate with the degree to which distinct resources are targeted during different seasons. A foraging strategy works best when critical resources are evenly distributed across the landscape (Binford 1980:5–10).

Binford (1980:17) explains differences in assemblage variability in terms of "coarse" and "fine-grained" assemblages. A coarse-grained assemblage would refer to a site that had been occupied over a long period of time, perhaps a year. In this case the distinction between individual events and their by-products would be difficult to distinguish. A fine-grained assemblage on the other hand represents a brief occupation. In the later case distinct activity areas may be fairly easy to distinguish archaeologically.

Recall that as seasonal distinctions in resource availability increases, interassemblage variability (among assemblages of different seasonal camp sites) will also increase among foraging seasonal camp sites. However, as the growing season decreases and seasonal variability in resource availability continues to increase, the logistical component of the mobility system should also become more important. Because collectors remain stationary, acquiring critical resources not available adjacent to the habitation by utilizing special task groups, the tendency will be for collecting base camps to represent much more course grained assemblages of artifacts. There will also be less interassemblage variability among collecting base camps due to their longer duration of occupation, allowing for a wider and more similar range of activities to take place (Binford 1980:18).

Assemblages for both seasonal campsites of foragers and base camps of collectors should be relatively rich (possessing a number of distinct tool types) and even (proportions of tools types should be relatively evenly distributed). But a distinction exists because due to longer duration of occupation, a greater range of activities and therefore tool types will be present at collecting base camps. Foraging camp sites, on the other hand, can be somewhat more specialized in terms of seasonal focus in resource procurement, and so the various seasonal campsites will represent "noisy" (Binford 1980:18) category with sometimes marked distinctions between them.

Task-specific locations of foragers should represent those activities performed in daily resource procurement/processing away from the habitation site. These sites typically do not represent large accumulations of artifacts. At times, favorite locations that were visited again and again over long periods of time can form significant

accumulations of artifacts, but these do not represent “sites” in the classical sense of the word and require different archaeological methods for their interpretation (Binford 1980:9). Artifact assemblages from task-specific locations should represent only those tools used in procurement/processing of specific resources. These assemblages therefore should be highly uneven and sparse in terms of diversity of tool types (lacking in assemblage richness).

Task-specific locations of collectors can represent dense accumulations of artifacts as collectors target specific resources in abundance to provide not only for themselves, but also for those waiting at the habitation. Examples of these types of sites would be kill-butchering locations or fish weirs. Artifact assemblages from collecting task-specific locations can be large, but they should also be highly uneven representing only those tools required for acquisition/processing of those specifically targeted resources (Binford 1980:10).

The last type of site to be discussed will be the field camps produced during logistical exploitation of resources in a collecting mobility system. These are camps where groups of specialists maintain themselves, sometimes at great distances from the base camp. Because domestic activities occur at these field camps artifact assemblages should be somewhat rich. However, because specialists at these camps focus on procurement in abundance of specifically targeted resources, activities will occur at field camps that do not normally occur at habitation sites (Binford 1980:7–9). Because of this focus on resource specialization, tool kits can be dominated by a narrow range of types important for acquiring/processing these resources.

Using these guidelines set forth by Binford (1980), it will be possible to utilize data collected from West Rock Ridge in order to interpret whether those cultural or temporal traditions present utilized a collecting or foraging mobility strategy. Also useful in this regard will be McBride's (1984) research from the Lower Connecticut River Valley in which he attempted to define variation in hunter-gatherer mobility patterns throughout the regional prehistory of this area, and Ritchie and Funk's (1973) study of prehistoric settlement patterns in the Northeast.

Organization of Technology

Parry and Kelly (1987:285) observed a general trend, with emphasis in North America but also occurring in Europe, where Archaic peoples tended to rely on bifacial core technologies while late prehistoric cultures had shifted emphasis markedly toward production and use of tools manufactured using expedient cores. They explained this trend in relation to the inherent advantages and disadvantages of formalized and expedient cores respectively.

For mobile peoples formalized cores offered the advantage of supplying tools that could be used again and again to perform a number of tasks, while at the same time producing the greatest amount of cutting edge for the weight of the core to be carried (Parry and Kelly 1987:298–299). For sedentary peoples expedient tools could be manufactured easily and quickly, using bipolar or amorphous flakes cores. Raw material distribution is an important factor conditioning the utilization of expedient core

technologies, because they are relatively less efficient and require more lithic raw material. The advantages of expedient core technologies is that they save time in tool production, the trade-off being that tools are less portable than those produced in formalized core technologies (Parry and Kelly 1987:300–302).

Parry and Kelly (1987:297) stated that the most coherent explanation for the observed shift from formalized to expedient core technologies was a change in settlement pattern to increasingly sedentary villages. The explanation of this shift is that mobile people needed to solve the problem of lithic raw material availability in the context of stone tool needs (Parry and Kelly 1987:299–300). Sedentary people, however, who could stockpile raw materials, and did not face the problem of carrying a mobile tool kit, selected for advantages of expedient core technology, in terms of labor investment in tool manufacture and maintenance.

However for this very reason even mobile societies can utilize expedient core technologies when lithic raw material is widespread and abundant, because in this case the problem of congruence between lithic raw material availability and the context of stone tool needs is obviated. Mobile societies can therefore utilize expedient core technologies even when only lower quality lithic raw material is available, as long as it is abundant and can be found over a widespread area (Parry and Kelly 1987:300–301).

It is in this later context that expedient core technologies are expected to dominate in the assemblages of packed hunter-gatherers living in South-Central Connecticut, because under these conditions little else would have been available to fulfill daily tool stone needs aside from local quartz. Because quartz is a relatively low quality lithic raw material it would have been less suitable for production of formalized cores. But mobile

prehistoric peoples would have had access to quartz as a lithic raw material wherever their stone tool needs arose, because of its abundance and widespread distribution throughout the area.

Parry and Kelly (1987:290–294) utilized a number of indices in order to document a trend from formalized to expedient cores in North America. These indices included; 1) the biface to flake core ratio, 2) the percentage of biface thinning flakes, and 3) the percentage of facially retouched tools in the stone tool assemblage. Although Parry and Kelly (1987) documented the usage of expedient technologies in a range of contexts from sedentary to decreased mobility, the amount of mobility predicted here for cultures who utilized West Rock Ridge would be relatively high in comparison to most of the examples given. For these reasons important differences in the organization of expedient core technology may exist in a context of relatively high residential mobility.

The most reliable indicator for organization of technology in this context is considered to be the cores themselves. Parry and Kelly (1987:286–287) reported the use of bipolar and amorphous flake cores in production of expedient tools, while bifacial and prismatic blade cores are mentioned in the context of formalized core technologies.

The flake core to biface ratio is considered suspect in relation to quartz industries because both Boudreau (1981:5) and Ritchie (1981:104) observed that Squibnocket projectile points were often manufactured using shatter produced by an expedient (bipolar) core technique, as tool blanks. Since the majority of cores recovered from West Rock Ridge were bipolar, a simple ratio of bifaces to the total number of cores recovered from each of the sites was recorded.

The percentage of bifacial thinning flakes from flake assemblages should provide a relative indicator of the importance of bifacial production and/or maintenance at West Rock sites. Despite Boudreau's (1981:20) warning that quartz bifacial thinning flakes are usually broken into random pieces, it was felt that by classifying only fragments that retained platforms (which should by definition include a remnant of the bifacial edge) a reliable estimate of the percentage of bifacial thinning flakes and an approximation of the importance of biface production/maintenance for individual assemblages was still possible. Flakes having a lipped platform and flake scars on their dorsal faces were also considered to be bifacial thinning flakes, because initiation of bending fracture necessary for lipped platform formation requires a low edge angle.

Significance of Hunted Resources

Binford (2001:222) predicted that the stress which increasing population density would place on mobile hunter-gatherers would eventually cause a reorganization of the subsistence base, with more focal dependence on local vegetative and/or aquatic resources and a decreased reliance on hunted resources because the later requires a high degree of mobility to pursue. Since this type of subsistence reorganization is predicted to decrease the utilization of marginal resource patches such as West Rock Ridge it is considered that cultural groups who favored this environment should not demonstrate this kind of focal subsistence on local vegetative and/or aquatic resources, and that concomitantly hunted resources should remain an important component of their overall

subsistence. This is predicted because this type of focal subsistence would lead to a more sedentary lifestyle and logistical exploitation of resources not available adjacent to habitation sites. It is felt that hunter-gatherers would be more selective of those resource patches they would exploit in this later context because they would be targeting bulk acquisition of specific resource not available adjacent to their main habitation sites.

Very acidic soils at West Rock Ridge and the potential for numerous small lithic scatter sites (which do not typically produce features where carbonized food items will be preserved), means that preservation of organic food remains should be rare in West Rock's archaeological record. For this reason it will be necessary to consult published reports and regional syntheses such as Ritchie (1965; 1969), Snow (1980) and McBride (1984) for subsistence information occurring at sites where preservation conditions were favorable.

Additionally however, the identification of site types can contribute information concerning subsistence activities for prehistoric cultures who occupied West Rock Ridge. For instance, the presence of sites with not much else present but numerous projectile points and point tips, showing evidence of damage due to breakage during impact (missed shot), would be strong evidence of a specialized site concentrating on hunted resources (Flenniken 1991).

Organization of the Rest of this Volume

The next six chapters will make a stark departure from the theoretical and methodological issues which have been discussed in detail thus far. These next chapters will report a wide variety of data collected in association with the West Rock Ridge project. Chapter four focuses on the geological context of West Rock's archaeological record, while chapter five focuses on its ecological context. Chapters six and seven have as their subject the cultural context of the project: chapter six emphasizing ethnographic information, and chapter seven discussing archaeological synthesis of regional prehistory and the local archaeological record of South-Central Connecticut. Chapters eight, nine, ten and eleven synthesize the archaeological data from West Rock Ridge in terms of four preliminary site types: 1) information gathering or lookout sites, 2) quarry or lithic procurement sites, 3) seasonal campsites, and 4) intercept hunting sites.

After these data have been presented, chapters twelve and thirteen will represent a return to the methodological and theoretical issues that have been presented in the first three chapters of the text. Chapter twelve will provide a summary of comparative analysis of lithic assemblages from West Rock's sites, while chapter thirteen evaluates the predictions given in chapter two using the archaeological measures presented in this chapter. This concluding chapter evaluates the hypothesis that South-Central Connecticut's prehistoric inhabitants did not find West Rock Ridge important in their annual subsistence rounds, until increased population density and regional packing of hunter-gatherer subsistence units caused them to add otherwise marginal resource patches

as they were forced to cover their available ranges as thoroughly as possible. Because this was only considered an initial hypothesis, chapter thirteen will also focus on revision of this hypothesis as well as suggestions for future directions of research.

Chapter 4

Geology and Geological History of the Central Connecticut Lowlands and its Trap-Rock Ridges

What makes the West Rock Ridge project unique in terms of upland archaeology is its focus on a very prominent and rugged geological formation, amidst otherwise broad, level and fertile lowlands (Figure 4.1). An understanding of the geological history of West Rock and Connecticut's South-Central Lowlands brings the reader to truly understand how unique and rugged Connecticut's trap-rock ridges are. But a geological baseline serves an even more fundamental role in association with West Rock's archaeological record. The unique geological history of the ridge is also responsible for the presence of important sources of lithic raw material, prominent view sheds, and even well known and used ambush hunting locations. To understand the archaeology of West Rock Ridge one truly has to have a sense of its unique geology.

As Coleman (2005:1) points out, although the bedrock which forms the foundation of Connecticut's landscape today appears static, placid and unmoving; the record that can be read from its rocky substrate tells of a turbulent history in which vastly different environments once existed. Geologists have learned to unravel this history in terms of the movements of the continental plates. Coleman (2005:28) defined plate

Figure 4.1: Location of West Rock and Important Landmarks in Text

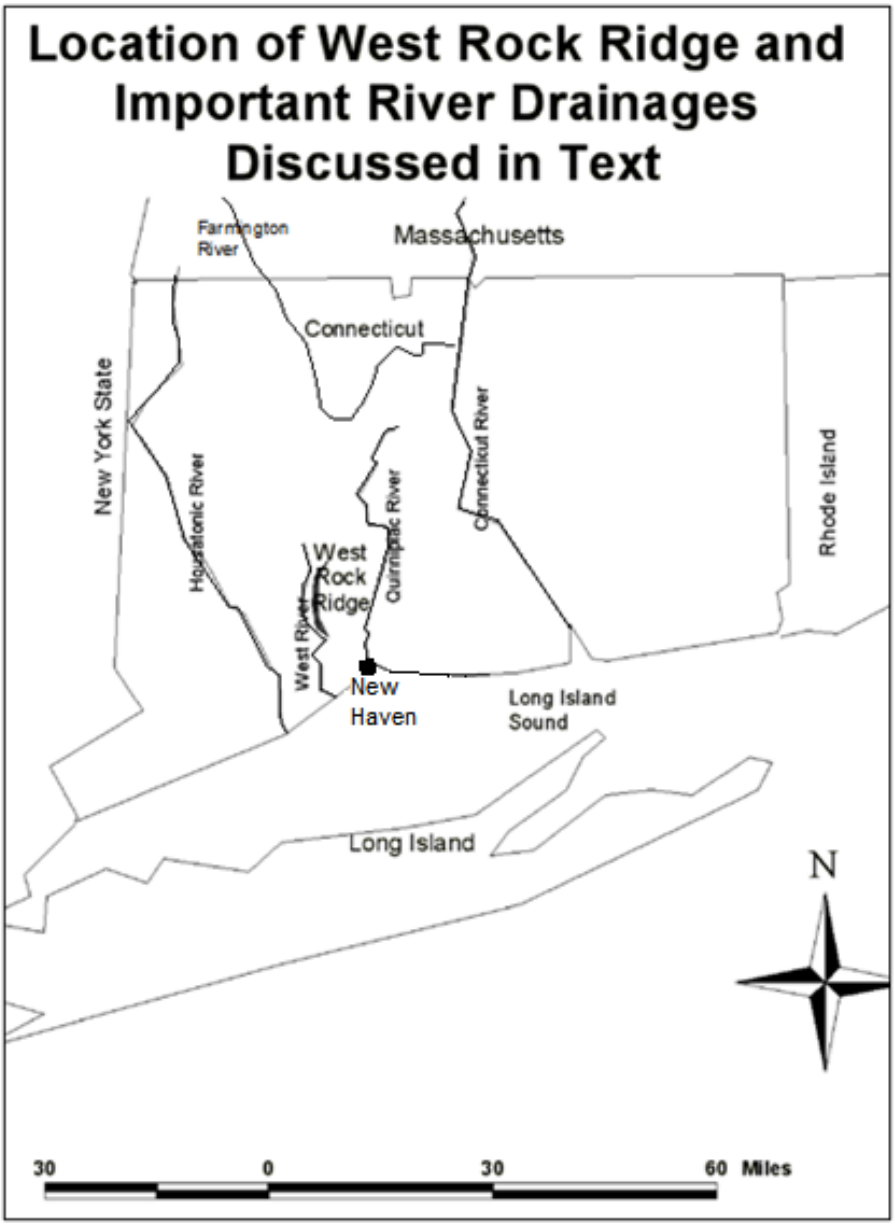


Figure 4.1 is a map showing location of West Rock Ridge and other important landmarks.

tectonic theory in the following way:

> The theory and study of the earth's rigid outer plates and their formation, movement, interactions and destruction; the attempt to explain seismicity, volcanism, mountain building, and evidence of paleomagnetism in terms of plate motions.

The major story of Connecticut's present topography begins about 300 million years ago with the great continental collision which produced the super continent Pangaea. However portions of bedrock in present day northwestern Connecticut are continuous with a Precambrian massif called Grenville, which extends from Labrador to Mexico; and formed as a mountain range that acted like a giant suture, welding North America to a number of other continents. From one billion to 500 million years ago all of these land masses were part of a super continent named Rodinia (Coleman 2005:2–4).

When fragments of this continent drifted away from each other, western Connecticut comprised a coastal environment, lying on the very edge of the widening Iapetos Ocean. This peaceful scene was interrupted by the Taconic Orogeny about 450 million years ago. This orogeny was caused by the collision of the Taconic Island chain with Laurentia (North America). An orogeny is a tectonic event in which large portions of crust are folded, thrust-faulted, metamorphosed and subject to magma intruding from below the earth's crust (Coleman 2005:29).

For another 40 million years, Southeastern Laurentia (North America) was once again a passive continental margin where sediments accumulated along an ocean shelf. Then about 400 million years ago a thin fragment of crust called Avelonia, which had drifted away from the Continent of Gondwana (Africa), collided with Laurentia; an event

called the Acadian Orogeny. At this time Gondwana was also pushing toward Laurentia, forcing the vast Rheic ocean which separated them under a subduction zone (Colemen 2005:19–21).

Connecticut's Geological History

Two specific events in deep geological time form an explanatory framework for much of the physical topography existing in Connecticut today. These events are: 1) a continental collision responsible for the formation of a super-continent, which geologists refer to as Pangaea, 250 million years ago, and 2) the subsequent break-up of the super-continent, which caused the formation of numerous rift valleys between the diverging continental plates. In turn these events are directly implicated in the geological division of present day Connecticut into three major physiographic regions (Figure 4.2): 1) the Eastern Highlands, 2) the Central Lowlands, and 3) the Western Highlands (Bell 1985:10).

Bell (1985:146) simplified much of Connecticut's geological past by summarizing it in one informative word, "crunch!" The bedrock geology of the state may represent the compression of as much as 3,000 miles of earth's crust into an area that is presently 100 miles across. The force created when the proto-African continental plate rammed the proto-North American continental plate, compressed, folded and deformed the previous bedrock along the continental margins. The intensive metamorphic

Figure 4.2: Connecticut Geologic and Ecologic Regions

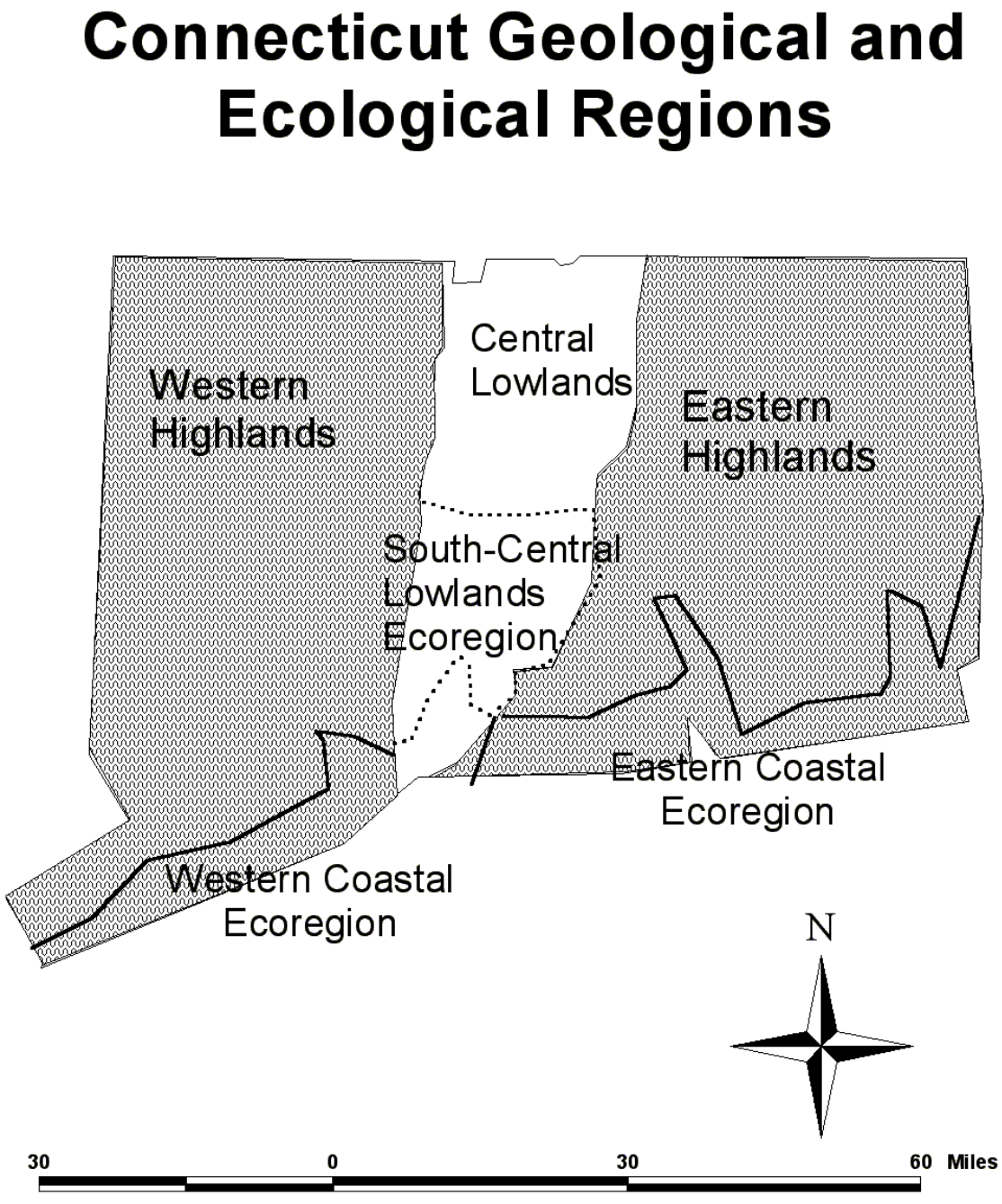


Figure 4.2 is a map showing Connecticut major physiographic and ecological regions.

processes which ensued, produced the erosion resistant-bedrock that today underlies most of the eastern and western portions of the state (Bell 1985:146–157).

The rolling and hilly topography present in eastern and western Connecticut today is also a direct result of this metamorphism. Hills exist where extremely-erosion resistant bedrock is present and valleys occur where streams have down-cut into softer rock. Although glacial scouring smoothed many of the bedrock features of Connecticut's Eastern and Western Highlands, the basic contours of its rolling and hilly landscape withstood the major ice advances of the Pleistocene Epoch. Additionally, the numerous stone walls that line and crisscross the landscape in eastern and western Connecticut today are also a direct result of the erosion-resistant nature of underlying bedrock. Although the last advance of the Laurentide[1] ice sheet was able to pry pebbles and boulders from the bedrock, these boulders resisted transformation into rock dust and survived to become the nemesis of farmers, who diligently cleared their fields and created the abundant stone walls that have come to represent one of Connecticut's most endearing features.

---

[1] The Laurentian ice sheet refers to the easternmost and largest of two glaciers that advanced over much of northern North America during the last major glacial event, an event that geologists refer to as the Wisconsin Glaciation.

Connecticut's Central Lowlands

Two hundred million years ago the continental plates reversed direction and began to pull away from each other. When this occurred, the tremendous pressure that existed while the plates were touching released, and what is presently Connecticut's central valley plunged downward. The valley opened up in a manner similar to a huge trap-door, with a hinge along the western portion of the lowlands (Bell 1985:158–159). On the eastern side the land dropped downward as much as two miles along the eastern border fault. The rift valley that had formed Connecticut's Central Lowlands was only one of many that occurred in the space between the diverging continental plates.

Two processes subsequently acted to fill the depression, which had been created during the break-up of Pangaea. First, sediments from the Eastern and Western Highlands were transported in by water. Coarser sediments formed deltas along the valley walls, but finer sediments were carried into the center of the depression. After thousands of years these sediments lithified, becoming the brownstone bedrock that underlies most of the central part of the state today (Bell 1985:157–164).

Central Connecticut's brownstone bedrock provides clues for geologists and paleontologists, in the form of numerous dinosaur footprints and evidence that a lush tropical forest and a monsoon climate had once existed in the valley. But this placid scene was interrupted at least three times as magma from deep within the earth found its way to the surface. The magma did not erupt explosively as volcanoes. Instead it simply flowed over the surface covering the entire central valley in blankets of thick, hot molten

lava. These molten rock layers formed as much as 300 feet deep. The magma, which later cooled into basalt and formed the state's trap-rock ridges, was the second geological force acting to fill the deep trough in the middle of the state (Bell 1985:159–161).

Eventually, these processes would repeat themselves. Sediments washed in once again to cover the basalt plates, and after thousands of years another layer of brownstone was added. Then another flow of magma covered the valley, and so on and so forth, until alternating layers of brownstone and basalt formed like a huge stack of pancakes across Connecticut's valley. One more fact must be added to this scenario in order to understand the characteristic form of the ridges today. The land continued to sink downward along the eastern border fault, tilting the entire stack of alternating brownstone and basalt layers 25°, so that it became inclined upward and to the west.

When the soft brownstone bedrock on top of the basalt plates eroded, the western margins of the up-tilted basalt plates became exposed. The characteristic form of Connecticut's trap-rock ridges (Figure 1.2), with their lofty and nearly vertical western cliff faces and their gently sloping face along the eastern side (25°), actually coincides with the up-tilted western margins of thick basalt plates, which continue to extend underground toward the east (Bell 1985:161).

Unlike the central Metacomet Ridge, the basalt that formed West Rock did not flow over the ground surface. Instead it forced its way between horizontal layers of brownstone. It therefore represents an intrusive igneous formation as opposed to the Metacomet Ridge, which is an extrusive igneous rock. Once West Rock became exposed, however, it possessed the same characteristic form and inclination of the Metacomet Ridge (Bell 1985:163–164).

Today, Connecticut's central valley stands in sharp contrast to the rolling and hilly highlands of the eastern and western portions of the state. The valley has broad expanses of very level land, and much of the best farmland in Connecticut occurs in the central part of the state. The broad and level expanses of the lowlands are explained by the soft brownstone bedrock, which was planed smooth by the glacial advances of the Pleistocene ice age. Additionally, central Connecticut's trap-rock ridges provide sharp contrast for the surrounding lowlands, rising as they do from the gentle plains with steep and precipitous cliff faces having angular trap-rock that breaks along its summit into geometric forms and gives the ridges a jagged, saw-toothed appearance.

Connecticut's trap-rock ridges occur in two major belts within the Central Lowlands. The central Metacomet Ridge is the major belt, representing a nearly continuous ridge that arises along the coast in Branford, Connecticut and continues for more than 100 miles northward into Massachusetts, where it ends as the Holyoke Range. West Rock is part of the western belt of ridges, which is actually discontinuous and consists of West Rock, East Rock, the Sleeping Giant and the Barndoor Hills. These ridges are intrusive igneous rocks, meaning they were part of the magma plumbing that didn't reach the surface. Because of the tilting of the bedrock layers, however, they became exposed as the overlying brownstone eroded away (Bell 1985:163).

Lithic Raw Material Sources

Prehistoric populations relied on fine-grained and homogenous rock types in order to manufacture stone tools. Four distinct lithic raw material types could be acquired at West Rock Ridge or in the adjacent lowlands: 1) quartz, 2) chert, 3) hornfels, and 4) basalt. It is necessary only to review Connecticut's geological history in order to explain the origins of these raw material types. However, in order to understand their accessibility to prehistoric populations an additional comprehension of the local glacial geology of South-Central Connecticut is required. The importance of acquiring knowledge not only about the genesis of rocks, but also how they came to exist where they are located is emphasized by Odell (2004:21):

> Knowing the genesis of rock types is important, but it is not all we need to know about the raw material. Additionally, it is necessary to have a working knowledge of the process by which stones reached their current location on the landscape, because these parameters often dictated how the lithic source was acquired.

In the case of quartz, it was not only necessary to understand the genesis of quartz in the escarpment between Connecticut's Central Lowlands and its Western Highlands, but also how glacial processes had transported quartz from its original source area and incorporated it into an outwash terrace resting against the base of West Rock. The geological processes responsible for the formation of this glacial outwash terrace will be discussed in detail in chapter nine.

Quartz veins usually occur in bedrock as a result of groundwater or hydrothermal solutions (literally hot-water solutions), which are saturated with silica (quartz is composed almost completely of silica). As these solutions cool they deposit silica along natural joints (fractures occurring in rock due to expansion, contraction or tectonic forces, which usually form a definite pattern and are important structures allowing water to penetrate at depth) (Tarbuck and Lutgens 1992:117) and fissures in bedrock, eventually forming quartz veins. Recall that metamorphism had folded and twisted the bedrock of the Western Highlands. Because West Rock exists along the margin of the Central Lowlands it is adjacent to slate and schist bedrock, which forms an escarpment where the Western Highlands meet the lowlands of the Connecticut Valley. Quartz veins are numerous in these bedrock types underlying the escarpment, both due to their highly jointed and fractured natures as a result of metamorphism, and also due to the hot water vapors produced by magma flows when the magma, which had blanketed the central valley, came into contact with them.

However, these numerous veins are only accessible where they intersect with the ground surface, and inspection of the exposed slate and schist bedrock of this escarpment reveals that many of these veins are quite small. Ironically, secondary deposition of quartz, which had been glacially scoured from its bedrock source, made it abundant along the top of an outwash terrace resting against the base of West Rock Ridge. Here a nearly unlimited supply of quartz, ranging from pebbles to large boulders, was accessible requiring no further effort to procure than by walking on the terrace and picking up the most desirable pieces. Consequently, two major quartz procurement sites were located

along the high terrace overlooking the West River and at the foot of West Rock Ridge. These sites were named the Konolds Pond site and the West River site, respectively.

The second most abundant lithic raw material type found at West Rock Ridge sites was a local form of chert, which apparently is part chalcedony (Calogero personal communication 2006). According to a geoarchaeologist working in Southern New England, Barbara Calogero, this chert formed as nodules in the cooling magma, which became the state's trap-rock ridges. A large number of nodules, many boulder-sized, existed in the glacial till deposits on the gently sloping eastern flank of West Rock Ridge.

A local resident, who shall remain anonymous due to the sensitive nature of the information gleaned from his generosity, allowed me to excavate in his abandoned garden plot, where abundant evidence of prehistoric processing of these nodules had taken place. The nodules possessed exteriors that had not been weathered smooth, and in many cases retained numerous ripples and indentations, which apparently represent their original faces that were created in their genesis. It would not appear, therefore, that glacial activity had transported them far from their original source, and their size would make human transport for significant distances improbable. So it may well be that the nodules had eroded from the trap-rock of West Rock's eastern face.

The discovery of a local source of chert was an unexpected benefit of the research at West Rock Ridge. Debitage from this raw material type was found at many of the sites excavated during the project. At the Fairhaven Reservoir site, the local chert represented a significant proportion of lithic artifacts recovered. The chert is mottled, and was composed of many colors, the most dominant being red and dark brown, but also ranging from white to gray and even blue. It also varied greatly in texture from course to very

fine. The best examples were waxy in luster, brittle, with sharp conchoidal[2] fracture and thin flakes possessed translucent edges. Sources of chert are fairly rare in Connecticut, and so this beautifully colored local raw material is a source of great interest. The chert available at West Rock did, however, represent a fairly limited source and due to the variability present within this raw material type it will prove difficult to identify from sites beyond the West Rock Ridge area. My personal experience is that the chert is so variable that visual identification based on a single artifact can not be done confidently.

The other raw material types utilized by prehistoric occupants of West Rock Ridge were a local hornfels, and basalt. The hornfels was formed as brownstone bedrock metamorphosed upon contact with the flowing hot magma that formed the ridges. The basalt probably is not local to West Rock Ridge itself, but would have originated with one of the extrusive trap-rock ridges such as the Saltonstall Ridge located about 5 miles to the east. Because West Rock is an intrusive igneous rock, it crystallized slowly producing a course grained trap-rock called diabase. Extrusive igneous rock, on the other hand, which is abundant all along the Metacomet Ridge, extending through the entire Connecticut Valley, cooled quickly and so has a fine grained texture making it more suitable for making stone tools.

---

[2] This is a type of rock fracture that occurs in homogenous rocks having microscopic grain sizes, in which breakage does not occur along planes or crystal faces, but instead spreads out evenly in all directions following the lines of force. The classical example of conchoidal fracture is to drop a BB on a pane of window glass, which creates a small hole on one side but a wide circular expanding hole on the other.

The Geological Formation Processes of West Rock Ridge and its Archaeological Record

Some specific characteristics of West Rock made it ideally suited for the performance of certain activities, which were vital to prehistoric peoples. For instance, the height of its summit and the enormous distance over which its western cliff face towers over the West River Valley made it attractive for information gathering, as is well represented by the numerous "lookout sites" along its summit height. Of course, suitable sources of lithic raw material also made the ridge essential to local populations in terms of fulfilling their need for tool stone. However, West Rock's unique geology also helped fill the needs of local prehistoric populations in other ways, which would have been less predictable without systematic archaeological survey.

As described earlier West Rock formed as a sill, and so it never broke the surface of the ground. Instead, it pushed its way between brownstone bedrock layers, spreading them apart by a height of 300 feet and running horizontal or parallel to the ground surface. Because the brownstone is crumbly and soft in sections, parts of the overlying brownstone layer plunged downward, and partially blocked the flow of magma. Apparently, one such obstruction created a prominent gap in West Rock, which Dana (1891:34–36) named "Wintergreen Notch." Although other slight gaps exist over West Rock's extent, only Wintergreen Notch provided enough of a decrease in summit height to allow for communication over the top of the ridge. Wintergreen Notch, therefore acted as a communication corridor between the eastern side of West Rock and the western side.

This gap was also the only communication corridor for a distance of ¾ miles to the south and approximately 6 miles to the north.

For South-Central Connecticut's Late Archaic populations, Wintergreen Notch served another function entirely. The notch also provided a natural game trail, and hunters would wait on the south facing slope of Wintergreen Notch to ambush game animals that passed on a narrow path just below their blinds.

But this was not the only location of intercept hunting sites at West Rock Ridge. Intercept hunting sites can be thought of as locations where hunters could wait because they could predict the appearance of game animals. The ridge's trap-rock contains many fissures and cracks, which act to store and discharge water all along its perimeter. Many springs form in this way. Because springs are relatively small bodies of water, and because other water sources are not plentiful along West Rock's rugged margins, the tiny water holes provided ideal locations for hunters to wait for unsuspecting game animals. At least two more sites, the Rocky Type site, and the Whaley site, appear to have functioned in this way.

Ecology of Connecticut's Trap-Rock Ridges

Far from being barren wastelands, the wide variety of environmental settings available at Connecticut's trap-rock ridges provides a habitat to numerous species, some of which only thrive along these ridges. This diversity of habitats is in turn a product of variation in soil types, moisture, slope, aspect, temperature and numerous other factors;

which in combination produce drastically different environments, at times in the space of a few feet, resulting in a mosaic of vegetative patches throughout West Rock's landscape. The ecological context of archaeological information recovered during the project will be the subject of the next chapter.

Chapter 5

West Rock's Ecological Context: A Model for its Prehistoric Utilization

Despite its formidable topography, West Rock Ridge boasts a level of environmental diversity which is almost unparalleled throughout the state. According to Rozsa and Dowhan (1977:27), West Rock is believed to contain the second highest concentration of rare and endangered species in Connecticut. These ecological characteristics may have been an important factor in the minds of those peoples who left their archaeological remains there.

In the context of the central hypothesis of this research, that West Rock was only added to annual subsistence under conditions where hunter-gatherers had to maximally exploit their available territories, these ecological factors take on added importance. During times of the year when seasonally abundant resources were insufficient to sustain everyone living in a local territory, dispersal of small family groups was a common strategy for hunter-gatherers (Binford 2001:213). At these times ecological diversity may have been an important factor in resource patch selection. It makes sense that under conditions of population packing, when seasonally abundant resources were less likely to sustain local populations throughout the year, that ecologically diverse settings such as

swamps, marshes, or trap-rock ridges in South-Central Connecticut may have taken on added importance.

As will become abundantly clear throughout the rest of this chapter, the variety of wildlife species at West Rock is ultimately a result of the diversity present in soils, hydrology, temperature, slope and aspect throughout the ridge. As Ludwig (1981:43) explains:

> The variety of wildlife in any location is intimately related to the heterogeneity of the physical environment. Different animals require different types of food, cover and nesting sites, all related in some way to the type of vegetation. Animal habitats are, therefore, generally closely related with plant communities.

In other words, the diversity of animals that can survive in an environment is a factor of the diversity of plant species present, and variety in plant species relies, in turn, on diversity of the physical environmental setting. Rosza and Dowhan (1977:6) explain the relation between different plant communities and the physical environments which support them:

> The summit of a mountain and its lower slope exemplify this. Shallow, droughty soils derived from bedrock are typical conditions near or on mountain summits. At the base of a slope, both the texture of glacial till materials and the prevalence of seepage water may serve to improve moisture conditions. In each case, a different plant community is correlated with different edaphic, or soil factors, particularly soil moisture, as a result of changing topography.

Variety in terms of physical environment is a characteristic which almost defines West Rock Ridge and Connecticut's other trap-rock ridges. From its exposed and dry

summits, steep and fissured cliff faces, rocky talus slopes, gentle forested dip slope, and wet spring-fed bases where wetland swamps and marshes predominate; ecological diversity, sometimes contained within very short stretches of the ridge, represents the only constant in an otherwise unpredictable world.

But West Rock represents only a small portion of South-Central Connecticut's otherwise broad and fertile lowlands. Prehistoric utilization of West Rock must be considered in context with the Lowlands that surrounded it. Therefore the ecology of Connecticut's South-Central Lowlands (Figure 4.2) will also be explored in this chapter. Additionally, the importance of species listed will be considered in relation to their potential uses by ancestral Native American populations.

West Rock Ridge and its Ecological Diversity

Connecticut's trap-rock ridges are unique in that they possess both northerly species existing at the southern extreme of their natural ranges, as well as southerly species existing at the northern extreme of their ranges. Lee (1985) explains why this is so. First, the cliffs of the state's trap-rock ridges, including West Rock, typically face toward the west and so the summits receive warmth during sunny afternoons. Additionally the trap-rock is able to absorb and hold heat. This combination of factors produces micro-climates along the ridges that are warmer than those for the region in general. For these reasons, species typically found in more southerly environs can be found on Connecticut's trap-rock ridges. Species at West Rock Ridge which fall into this

category include yellow corydalis (*Corydalis flavula*), prickly pear cactus (*Opuntia humifosa*), Torrey's Mountain-mint (*Pycnanthemum torrei*) and the Falcate Orange-tip butterfly (*Anthocharis midea*). Lee (1985:21) hypothesizes that there may have been an overall cooling trend throughout the past few thousand years and that these species represent remnants of populations that have since moved their ranges to the south.

Second, the piles of talus banked against the cliffs at the bottoms of the trap-rock ridges insulate underlying pockets of air, as well as rocks and soil. The heavier cool air is transported by convection currents downslope, while hot air rises up toward the tops of the cliffs. Lee (1985:24) notes that, "A large talus slope is like a giant, silent air-conditioner, constantly feeding a flow of cool air from its base." For this reason the forests adjacent to the talus deposits along the bottoms of Connecticut's trap-rock ridges possess species typical of the northern forests in New Hampshire and Vermont such as striped maple (*Acer pensylvanicum*), American yew (*Taxus Canadensis*), and round-leafed dogwood (*Cornus rugosa*) (Lee 1985:24).

Another factor adding to wildlife diversity at Connecticut's trap-rock ridges is fact that basalt is rich in calcium minerals and forms soils having a fine texture upon weathering. These soils allow for the appearance of plants which thrive in limestone soils such as rock cress (*Arabis lyrata*) and purple cliffbrake (*Pellaea atropurpurea*) (Lee 1985:22).

Additional species found at the limits of their natural ranges include post oak (*Quercus stellata*) and drop-seed (*Sporobolus heterolepsis*). Post oaks are typical species of America's southeastern coastal plain, and are rarely found at any distance from the coastline as they are at West Rock. Drop-seed is a Midwestern prairie grass, which is

found at the southeastern extent of its geographic range on the ridge top (Rosza and Craig 1977:1).

Finally, the great diversity in terms of soil, moisture, slope and temperature, which can be found on trap-rock ridges, facilitated the formation of numerous distinctive biotic communities, many of which can occur in close proximity over very short distances. Lee (1985:22–29) described the changes in vegetation that can be observed in a hypothetical journey from one side of the ridge to the other, from the forests occurring adjacent to talus at the bottoms of the cliffs, up the cliff faces, past the summits and down the gentle eastern dip-slope. Lee's (1985) analysis of typical vegetation zones for Connecticut's trap-rock ridges is informative not only for its explanation of bio-diversity, but also because it describes patterns of vegetation occurring on trap-rock ridges in a fairly understandable way. For these reasons Lee's observations will be summarized below.

According to Lee (1985), the western footslopes of Connecticut's trap-rock ridges are typically inhabited by a mixed hardwood/hemlock forest of ash, oak and hemlock forming a canopy over ground covered by a variety of ferns. Wildflowers such as bloodroot (*Sanquinaria Canadensis*), jack-in-the-pulpit (*Arisaema triphyllum*) and jewelweed (*Impatiens capensis*) abound in these rich, moist forests. The cool shade transitions to intense heat as one moves over the talus slope at the bottom of the cliff face, but tenacious vines such as Virginia creeper (*Parthenocissus quinquefolia*) and poison ivy (*Toxicondendron radicans*) are often earlier colonizers here, which helps to stabilize the slope. Eventually, organic litter trapped between the talus allows elderberry (*Sambucus pubens*) and hophornbeam (*Ostrya virginiana*) to seed and tap into.water and

soil resources under the talus. Pink herb robert flowers (*Geranium robertianum*) also grow in this environment (Lee 1985:22–24).

The talus boulders and the sheer cliff above are covered by lichens. Fissures within the upper cliff edges are a habitat for drought resistant herbaceous[3] plants such as columbine (*Aquilegia canadensis*), saxifrage (*Saxifraga virginiensis*) and corydalis (*Corydalis sempervirens* and *C. flavula*). The ridge tops are exposed to wind and weather and water run-off is rapid, so trees are short in stature and only competitively able species can survive. Red cedar (*Juniperus virginiana*) is at home clinging to the fringes along the upper cliff edge and chestnut oak (*Quercus prinus*) is adapted to drought stress. Other species of oak and hickory, which are usually slender and wizened in this setting, also occur along the edge of the summit (Lee 1985:27–28).

On flat summits, meadows of bluestem (*Andropogon scoparius*) and poverty grass (*Danthonia spicata*) are predominant. Sedges and herbaceous plants such as sunflower (*Helianthus divaricatus*), bastard toad flux (*Comandra umbellata*) and harebell (*Comandra rotundifolia*) catch the sun that comes through the short-statured and patchy canopy. Increased protection from wind, moisture and deeper soils descending on the eastern slope of the ridge brings about a transition from oak/hickory at the top to a denser forest with a variety of trees similar to the mixed hardwood forest of the western footslope. Additionally, small wetland areas at the bottom of the eastern footslope are inhabited by numerous wetland species (Lee 1985:25–29).

---

[3] Herbaceous plants do not have woody stems and so their fleshy parts wither away after each growing season.

Ludwig (1981) researched the Lake Wintergreen property in a report designed to aid in land management decisions after Lake Wintergreen was taken out of service as a reservoir for drinking water in 1978. Ludwig described the forest along West Rock's gentle eastern slope and the Wintergreen Brook valley in terms of four biotic community types: 1) an upslope community, 2) a middle slope community, 3) a low slope community and 4) wetlands. According to Ludwig (1981), the upslope community is dominated by chestnut oak with occasional white, black and scarlet oaks. The only shrubs occurring in the upper slope are huckleberry and lowbush blueberry. Species diversity increases in the middle slope where black, white and scarlet oaks now outnumber chestnut oaks and hickory, while at the same time species such as red maple, black birch and white ash also make their appearance. Mountain laurel, maple-leaved viburnum, dogwood, huckleberry and blueberry make up the understory. Also present in the upper and middle slopes are island communities of grasses, mosses and lichens surrounding bedrock exposures. The lower slope includes species from the other vegetation zones both above and below. Tulip, white ash and red oak trees, which grow to great heights in this zone, shade a well-developed understory of witch hazel, arrow-wood and highbush blueberry, along with other shrubs that also occur in the middle slope. At the bottom of the eastern footslope, wetland swamp forest is predominant, with mostly red maple but also having associated birch, tupelo, elm and black ash present. The understory is dominated by spicebush and sweet pepperbush and the herbaceous layer includes skunk cabbage and cinnamon fern (Ludwig 1981:36–40).

The most important study of the vegetation inhabiting Connecticut's trap-rock ridges, for the purposes of this paper, is Rozsa and Dowhan's (1977) report concerning

the biotic communities of West Rock Ridge. Rozsa and Dowhan (1977:5) mapped the distribution of various plant communities that they were able to identify at West Rock, defining plant communities in the following way:

> The recognition of plant communities, or abstract subdivisions of the vegetation, is an attempt to simplify the complex vegetation by understanding the juxtaposition and associations of individual plant species, each with a different ecological amplitude, under a unique set of environmental factors.

Rozsa and Dowhan's (1977) research clearly foregrounds the profound diversity of plant species and communities present at West Rock. A total of 11 natural vegetation communities were identified and several of these also were further subdivided. The information is too detailed to review in this text, but the reader should refer to A Summary and Map of the Biotic Communities of West Rock Ridge by Rosza and Dowhan (1977) for full details. However, two of Rosza and Dowhan's (1977) vegetation communities for West Rock are included below so that the reader can get a sense of the relationship between biotic communities and their physical settings, as well as the distinctiveness of various vegetation communities which exist in relatively close proximity in this environment.

The Juniperus Community was located on the rocky ledges just above West Rock's precipitous cliff face. Dominant trees included white ash (*Fraxinus Americana*), red cedar (*Juniperus virginiana*), chestnut oak (*Quercus prinus*), black oak (*Quercus velutina*), post oak (*Quercus stellata*) and bear oak (*Quercus ilicifolia*). The shrub layer

consists of downy arrow-wood (*Viburnum rafinesquianum*), lowbush blueberry (*Vaccinium vacillans*), black huckleberry (*Gaylussacia baccata*) and choke cherry (*Prunus virginiana*) and the herb layer includes little bluestem (*Andropogon scoparius*), wild oat grass (*Danthonia spicata*) and panic grass (*Pancium linearifolium*) (Rosza and Dowhan 1977:11–12).

The Osmunda Claytoniana Community exists along West Rock's eastern slope in areas where ground water seepage occurs through bedrock features or where temporary rivulets can be found, making the soils relatively moist compared to other areas on the ridge. The tree and shrub layer consists of red oak (*Quercus rubra*), white oak (*Quercus alba*), black birch (*Betula lenta*), red maple (*Acer rubrum*), witch hazel (*Hamamelis virginiana*) and maple-leaved viburnum (*Viburnum acerifolium*). The most distinctive characteristic of this community is the herb layer, which is mostly dominated by ferns such as interrupted fern (*Osmunda claytoniana*) and New York fern (*Dryopteris novaboracensis*), although locally horse-balm (*Collinsonia Canadensis*) may dominate (Rozsa and Dowhan 1977:17–18).

The above plant communities of West Rock Ridge make up only two of the eleven natural[4] communities reported by Rozsa and Dowhan (1977). However, these examples are enough to demonstrate to the reader how Rosza and Dowhan (1977) were able to identify communities representing unique combinations of species that were associated with specific regimes of soil, moisture, slope and temperature on the ridge.

---

[4] The twelfth community was the evergreen plantations, which were deliberately placed around the local reservoirs to minimize the amount of leaf litter entering the water.

Their research is important for archaeologists because it clearly demonstrates the profound diversity of species present at West Rock. The role that this diversity may have played for attracting prehistoric activities at West Rock is a central issue of this ecological analysis.

West Rock and Connecticut's other trap-rock ridges are also considered critical habitats for rare and endangered species in the state (Dowhan and Craig 1976:18–19). Dowhan and Craig (1976:15) identified critical habitats in the following way:

> The distribution of species are determined by a number of environmental and historical factors, although, in general, they are primarily a function of climatic tolerances and availability of suitable habitats. The effects of climatic and edaphic (soil) factors on the physiology of individuals is beyond the scope of this report; however, these tolerances are often clearly reflected in the distribution of species in relation to major climatic regions and habitat types.

Crevices at the tops of the sheer cliff faces harbor many rare and endangered plant species in the state including several ferns and grasses. Cliff-nesting peregrine falcons were once numerous in these ridges, they now occur only as rare visitors. Snakes such as northern copperheads (*Ancistrodon contortrix mokasen*) and timber rattlesnakes (*Crotalus h. horridus*), which have also become rare in the state can still be found with some frequency on the trap-rock ridges. Additionally, many of the ridges are known for their concentrations of butterflies, many of which are rare (Dowhan and Craig 1976:18–19).

With specific reference to West Rock Ridge, Rosza and Dowhan (1977:1) stated the following:

> West Rock is a superlative example of a trap-rock ridge, even though its vegetation and several of its physical features have been modified to a greater or lesser degree by various human activities. The ridge is of unparalleled biological significance in Connecticut, noteworthy not only in terms of its high concentration of state rare plants and insects, but in the occurrence of several rare and very uncommon vegetation types as well. A number of rare plants and insects reach their geographic range limits in the state on West Rock, and additionally, there is often an especially remarkable juxtaposition of both northern and southern species in the same general area or habitat on the ridge.

Rosza and Dowhan (1977:2) reported that 8 state rare plant species occur at West Rock Ridge, additionally several varieties of butterflies were originally discovered at West Rock as well as several insects including an unnamed Dobsonfly.

By comparing plant species identified by Rosza and Dowhan (1977) from West Rock Ridge with information concerning edible and useful plants in Connecticut and New England (Kavasch 1994; Seymore 2002), it becomes clear just how productive the ridge's biodiversity would have been to local prehistoric populations. The following summary of West Rock's useful plants only takes into consideration the ridge summit, its talus deposits and its gently sloping eastern face. This does not include abundant vegetative resources that would have been present in the many wetland environments that surround the ridge.

Many nut producing trees are abundant at West Rock Ridge, including the oak species: chestnut oak (*Quercus prinus*), black oak (*Quercus velutina*), post oak (*Quercus stellata*), bear oak (*Quercus ilicifolia*), white oak (*Quercus alba*), red oak (*Quercus rubra*) and scarlet oak (*Quercus coccinea*). A total of 27 oak species exist in New England, all of which produce acorns, which are the most abundant natural occurring nut in the region. Although acorns must be leached to reduce tannin, they were ground into

acorn meal, an important food for prehistoric Native American populations (Kavasch 1994:32). Other important nut producing trees include: sweet pignut hickory (*Carya ovalis*), pignut hickory (*Carya glarba*), shagbark hickory (*Carya ovata*), mockernut (*Carya tomentosa*) and beech (*Fagus grandifolia*). Hickory nuts fall and ripen in October. Hickory bark can also be used for smoking and drying certain foods or meats, and additionally nuts can be boiled to make green and brown dyes (Kavasch 1994:30). Beech nuts were also important in October. The nuts could be used to make coffee and additionally the inner bark of beech trees can be used to produce flour for making bread (Kavash 1994:27).

Aside from nut producing trees, red cedar (*Juniperus virginiana*) bark could be used to make baskets, blankets and mats, and added to tobacco. These trees, which grew abundantly on West Rock's summit, also produce bluish fruits that can be used to make beverages or as seasoning (Kavasch 1994:31). According to Seymour (2002:94–95), needles from eastern hemlock (*Tsuga canadensis*) trees are used to make tea.

Many berry producing plants also occur at West Rock and these include: dogwood (*Cornus florida*), staghorn sumac (*Rhus typhina*), low-bush blueberry (*Vaccinium vacillans*), black huckleberry (*gaylussacia baccata*), choke cherry (*prunus virginiana*), spicebush (*Lindera benzoin*), downy arrow-wood (*Viburnum rafinesquianum*), maple leaved viburnum (*Vibernum acerifolium*) and elderberry (*Sambucus canadensis*).

Other important food plants available at West Rock were wintergreen (*Gaultheria procumbens*), cinnamon fern (*Osmunda cinnamomea*) Torrey's mountain-mint (*Pycnanthemum torrei*) and prickly-pear (*Opuntia humifusa*).

The above list does not include wetland species that would have been abundant along the bottom of the ridge and surrounding it. However, it is obvious that many important plants were available at West Rock. Additionally, these plants would have attracted game animals such as white tailed deer and turkey, along with a host of small mammals that existed in Connecticut's forests. In prehistoric times, lynx probably lived along the trap-rock ridges as well as bears and wolves.

For prehistoric hunter-gatherer societies living in Connecticut's woodlands, a vital part of survival was positioning people at those locations where the most abundant foods would be located according to the changing seasons. During the course of the year, movement of people would therefore be patterned, and despite annual variations a fairly stable seasonal round would be followed.

Despite the variety of foods available at West Rock, most of its resources could be acquired at other locations, and it probably did not represent a location where any important seasonal resources were targeted on an annual basis. As we will see later in the text, however, lithic raw material and important hunting spots potentially could have been utilized regularly in this way.

But seasonally abundant resources were not always available to local prehistoric populations. During the course of the year certain harsh times, when foods were neither abundant nor easy to locate, would occur. It was at these times that biologically diverse environments such as West Rock, as well as South-Central Connecticut's numerous wetlands, streams and lakes, would have been vital to local populations. It is in this context that prehistoric utilization of West Rock is modeled. For several reasons, hunter-gatherers living in southern Connecticut would have to break up into small family or

extended bands and disperse into environments where a wide variety of resources could be foraged. These reasons would include the following possibilities, but would not exclude others: 1) harsh times during the year when particularly abundant seasonal resources were not available, 2) unpredictable shortages caused by environmental perturbations and 3) increased hunter-gatherer populations.

Because West Rock Ridge was only a small part of the local environment that prehistoric populations would have depended on, it is necessary to put information concerning its ecology into a broader context that will include Connecticut's South-Central Lowlands (Figure 4.2).

Connecticut's South-Central Lowlands

Dowhan and Craig (1976) noted that great diversity exists in Connecticut, considering the relatively small size of the state, in terms of both the physical landscape and the biological communities which occupy these various habitats. Because the use of political boundaries for dividing the state into various regions was useless for their own ecological considerations they came up with a classification scheme dividing the state into 11 "ecoregions" (1976:25). As defined by Dowhan and Craig (1976:27) an ecoregion can be thought of in the following way:

> As used in this publication, an ecoregion is an area characterized by a distinctive pattern of landscape and regional climate as expressed by the vegetation composition and pattern and the presence or absence of certain indicator species and species groups. Each ecoregion has a similar interrelationship between

> landforms, local climate, soil profiles, and plant and animal communities. Furthermore, the pattern and development of plant communities (chronosequences and toposequences) and of soil profile is similar on similar physiographic sites.

Because Dowhan and Craig (1976) emphasized the association of biotic communities and their relationship to those physical environments, which they occupy, their classification system is considered useful for archaeological purposes. Overall 11 ecoregions were defined for Connecticut and these included: 1) the Northwest Highlands, 2) the Northwest Uplands, 3) the Northeast Uplands, 4) the Northwest Hills, 5) the North-Central Lowlands, 6) the Northeast Hills, 7) the Southwest Hills, 8) the South-Central Lowlands, 9) the Southeast Hills, 10) the Western Coastal and 11) Eastern Coastal ecoregions (Dowhan and Craig 1976: 26). The most important of these Connecticut ecoregions for the purposes of this thesis is the South-Central Lowlands, although West Rock Ridge is also in close proximity to the Southwest Hills, and Western Coastal ecoregions as well (Figure 4.2).

According to Dowhan and Craig (1976:36–37), the South-Central Lowlands ecoregion (Figure 4.2) is a near-coastal lowland, having low average elevation of less than 200 feet, which is cut by a series of north trending linear trap-rock ridges, which reach maximal elevations of 1,000 feet. The area has a frost-free season of 165 days, which begins as early, or earlier, than any other part of the state. Average annual precipitation in the South-Central Lowlands is 45 inches, average winter temperature is 29.5°F and average summer temperature is 70°F. The forest is basically of the oak-hickory or oak-yellow poplar type, with various oak and hickory species dominant along with yellow poplar, black birch, white ash and hemlock. The sand plains and trap-rock

ridges are major habitat types within this ecoregion. Soils are developed on glacial tills in the uplands and stratified drift in the intervening valleys. The rivers have broad well-developed floodplains with the ground gradually rising toward the trap-rock ridges (Dowhan and Craig 1976:36–37).

West Rock Ridge also exists adjacent to: 1) the Eastern and Western Coastal ecoregions (Figure 4.2), consisting of seaboard extending to about 5 miles inland with numerous tidal marshes, river estuaries and sand beaches (Dowhan and Craig 1976:39–41) and, 2) the Southwest Hills ecoregion, which has higher average elevation than the South-Central Lowlands, of between 250 and 750 feet, and with significantly more rolling and uneven topography, and rivers which have less developed floodplains (Dowhan and Craig 1976:35–36).

Significant Environmental Zones of South-Central Connecticut

According to Hammerson (2004:11), "A 'sound' is a long, wide ocean inlet." Connecticut's shore rests on Long Island Sound (Figure 4.1), which is about 110 miles long and has a maximal width of about 21 miles. The sound is home to a large community of coastal and near coastal fishes, the exact composition of which varies according to the seasons. Trawl samples reveal that winter flounder, windowpane flounder, little skate, red hake, scup, fourspot flounder and Atlantic herring are the most dominant fishes in spring. Scup, winter flounder, windowpane flounder and butterfish are dominant summer species with bluefish and weakfish also moving into the sound.

The most abundant fish in the fall season are butterfish, windowpane flounder, winter flounder, Atlantic herring, scup and little skate (Hammerson 2004:14).

Rocky, muddy and sandy shorelines are home to numerous species that would have been vital to Connecticut's ancestral Native American populations. These include: mussels, lobsters, crabs, periwinkles, clams, oysters, quahog and shrimp. Other important coastal wildlife would have included sea birds, such as ducks, geese, gulls and mallards, and marine vegetation such as seaweeds, lichens and mosses.

South-Central Connecticut also possesses abundant wetlands, which would include salt water marshes, brackish water marshes, fresh water marshes, swamps and bogs. Connecticut's wetlands are a source of great bio-diversity in the state. Saltwater marshes provided numerous grasses such as cordgrass and spikegrass useful for making baskets and weaving. Shrimp, mussels, snails, turtles, muskrats, raccoons, meadow voles and shrews inhabit saltwater marshes, as do food plants such as bayberry and goldenrods. Salt water marshes, however, are a relatively recent development of coastal stability and began forming along the Connecticut coastline between 2,000 and 4,000 years ago (Hammerson 2004: 25–30).

The New Haven area is home to several important brackish water marshes including those along the lower reaches of the Quinnipiac, West, East and Branford Rivers. Cattails, which represented an important food source for prehistoric populations, occur in brackish and freshwater wetlands. These food plants possess not only edible shoots and roots, but also yield pollen, which after drying is a source of very fine flour (Kavasch 1994: 60). Wild rice and hemp, the latter of which is used for making rope, can

also be obtained in South-Central Connecticut's brackish water marshes (Hammerson 2004:31–32).

Freshwater marshes are numerous in South-Central Connecticut. Cattails, wild rice, frogs, turtles, numerous birds such as ducks, geese and mallards can be found in Connecticut's freshwater marshes. Also attracted to these locations were important game animals such as white-tailed deer, beaver and raccoons (Hammerson 2004:47–51). Inland freshwater marshes and swamps are abundant adjacent to West Rock and many of the state's other trap-rock ridges. Berry producing plants such as highbush blackberry, winterberry, highbush blueberry, maleberry, chokeberries and nannyberry are abundant along inland marshes and swamps. Other important food plants were cattails and cinnamon fern. Abundant wildlife including mammals, birds, reptiles and amphibians are also attracted to inland wetlands (Hammerson 2004:71–75).

Connecticut's forests provided essential resources to its prehistoric inhabitants. Of course, the trap-rock ridges represent part of this overall forested landscape, but particularly important in terms of available land for hunter-gatherers living in the South-Central Lowlands would have been the rich forests that occupied its broad, and extremely level and fertile plains, especially in the New Haven area.

Although the resources available in these temperate forests are too great to enumerate on an individual basis, perhaps the most important of these would have been the forest nuts, or mast, produced in Southern New England's oak-hickory forest zone. Mast was important to local populations not only directly as a source of nut meat, but also because of the crucial role it plays in oak forest ecology. Mast is the favorite food source of many game animals important to prehistoric hunter-gatherers such as white-

tailed deer and turkey, but a more complete list of species for which mast represents a critical dietary component includes: ruffed grouse, wild turkey, blue jay, woodpeckers, eastern chipmunk, flying squirrel, gray squirrel, white-footed mouse, deer mouse, black bear, white-tailed deer, weevils, sap beetles, and the larvae of acorn moths and filbert worms (Hammerson 2004:107).

Oaks do not abundantly produce acorns annually. Instead they tend to produce bumper crops in some years followed by less than abundant nuts in following years. This is a problem if all of the oak species are synchronous in terms of their bumper crop years. This problem is alleviated in some degree in southern Connecticut due to the fact that black/red oaks take two years for acorn development while white oaks only take one, meaning that the timing of their good and bad years is not synchronous, ensuring a more predictable diet of forest nuts each fall. This does not alleviate the fact, however, that occasionally years with very few acorns will occur (Hammerson 2004:107). Fortunately, Connecticut's oak-hickory forests contain several other species, which are mast producers and these include mockernut hickory, bitternut hickory, shagbark hickory, pignut hickory, American hazelnut, beaked hazelnut, eastern hop-hornbeam, American hornbeam, American beech and American chestnut.

Additionally, many types of vegetation in southern Connecticut's forests produce berries, fruits and seeds. Forest animals are abundant in Connecticut's woodlands and include shrews, bats, eastern chipmunks, gray squirrels, flying squirrels, white-footed mice, red-backed voles, woodland voles, weasels, gray foxes, otter, beaver, mink, raccoon, muskrat, white-tailed deer, wild turkey, rabbits, and woodchucks. In prehistoric times, bear, wolves, lynx and bobcat would also have been present. Also, various species

of fowl including now extinct passenger pigeons, which were once exceptionally numerous, were important to prehistoric Native American societies (Wood 1977:50) as were various mushroom species available in Connecticut's woodlands (Kavasch 1994:23–26).

Major rivers in the New Haven area include the Quinnipiac and Housatonic (Figure 4.1), the latter of which is about 20 miles to the west in the Southwest Hills ecoregion. But numerous small rivers and tributary streams also exist. These would have provided fish resources as well as a means to travel by dugout canoe. Small Connecticut streams can include species such as brook trout, chain pickerel, golden shiner, common shiner, blacknose dace, longnose dace, creek chub, fallfish, white sucker, creek chubsucker, slimy sculpin, pumpkinseed, tesselated darter, American eel and others. Large rivers support many of the same fish as smaller streams and also contain species such as sea lamprey, shortnose sturgeon, Atlantic sturgeon, Atlantic salmon, American shad, alewife, blueback herring, Atlantic menhaden, white perch, spottail shiner and brown bullhead, and other infrequent associations (Hammerson 2004:45–46).

Many of these fish species are anadromous, meaning that they spend most of their adult life in the open sea, but return to inland freshwater streams to reproduce. The migrations of these fish can be timed with great regularity in the spring and fall, and at these times very large quantities of fish can be obtained. Obviously, anadromous fish runs represent an important seasonally abundant resource.

Although very large natural lakes do not occur in South-Central Connecticut, numerous ponds and small lakes can be found. Lakes were a source of many plant species including cattails, and they also provided fish resources such as largemouth bass,

smallmouth bass, bluegill, black crappie, white catfish, northern pike, common carp, rainbow trout, brown trout and kokanee (Hammerson 2004:68).

According to Snow (1980), people of the Mast Forest Archaic in southern New England utilized the following important seasonally abundant resources: 1) forest nuts, 2) shellfish, 3) anadromous fish and 4) white-tailed deer. Although white-tailed deer would have been available all year long, they were especially important during the fall, when deer populations were fattest in preparation for the lean winter ahead. A quick glance of the ecology of the South-Central Lowlands demonstrates that all of these resources were not only available, but they probably were abundant on a seasonal basis. From this observation it can be predicted that prehistoric hunter-gatherer societies occupying South-Central Connecticut during the Late Archaic had available to them the means to time their seasonal moves to resource-rich locations in a fairly regular manner. The archaeological correlate of this prediction would be that large, multi-component sites, representing reoccupation on a seasonal basis, should exist adjacent to sources of seasonally abundant resources. This hypothesis can be tested with information concerning the archaeological record of South-Central Connecticut, which will be the subject of the next chapter.

Summary and Discussion

Hunter-gatherers living in South-Central Connecticut were blessed with a wonderful environment. Seasonally abundant resources were available and would have

provided an opportunity for stable and predictable seasonal rounds. The archaeological correlate for this later observation would be the expectation that seasonal campsites would be reused again and again, building up large amounts of cultural material as a result of some degree of redundancy in terms of site locations.

Trap-rock ridges, however, were another sort of environment that could have been very important to the area's local prehistoric populations. During times of resource scarcity it was not uncommon for larger hunter-gatherer groups to break up into small individual family units and live in dispersed settlement pattern throughout the landscape. At these times ecologically diverse environments may have been very important, because they would have provided a degree of security with numerous resources to fall back on such as berries, fruits, nuts and mushrooms.

For these reasons the research at West Rock Ridge is important both due to: 1) the fact that it attempts to demonstrate how hunter-gatherers included more and more otherwise marginal resource patches into their subsistence under conditions of increasing population density and regional packing, and 2) because it promises to at least suggest some criteria that would have been important in the choices of hunter-gatherers expanding their land use patterns in this way.

This suggestion would be that environments such as wetlands, swamps and Connecticut's trap-rock ridges, may have been selected as resource patches during times of environmental scarcity due to their rich ecological diversity. This would indicate a somewhat different subsistence strategy than might occur at certain times of year when seasonally abundant resources, such as migratory fish, would have represented a focal subsistence target.

In turn, hunter-gatherers would have learned about new landscape types during this kind of niche expansion. An important component of the West Rock Ridge project therefore will be to attempt to understand how new techniques and strategies may have been developed in order to maximize productivity of West Rock Ridge. The type of learning that hunter-gatherers undertook as a result of their adaptations to increasing population packing were probably as much a part of the overall process of cultural evolution for hunter-gatherer societies, as are those events that receive the majority of attention in the archaeological literature: such as the origins of agriculture, the development of fired clay technology, or even the first stone tools. The West Rock Ridge project therefore, at least in a sense, focuses on cultural evolution of hunter-gatherer societies as a part of the everyday decisions they made, instead of focusing on those punctuated events which are considered to have represented profound technological innovations.

Into this geological and ecological context now must come the human actors who will carry out that drama which we seek to investigate in the archaeological theater. The following two chapters will: 1) provide information concerning the ethnography of Southern New England with special focus on the Quinnipiac of the New Haven area, and 2) summarize the regional cultural prehistory of Southern New England as well as the local archaeological record available in South-Central Connecticut.

Chapter 6

Ethnography of the Quinnipiac and other Native American Cultures of Southern New England

In 1638 Theophilus Eaton and John Davenport, accompanied by 500 Puritan settlers, signed a treaty with Momauguin, the Quinnipiac sachem, ceding present day New Haven, Connecticut to the British colonists (Menta 2003:85–89). The Contact Period brought devastation to Native American communities all over Southern New England with epidemics, loss of ancestral lands and eventually the near destruction of their culture. Ethnographic accounts provide a glimpse at something that the archaeological record can never recreate: the living, vibrant Native American cultures that once inhabited these lands. This chapter provides a summary of ethnographic information for the Quinnipiac, New Haven's original inhabitants, and other Native American cultures of Southern New England.

This information must be considered with a degree of caution, however, because most of it comes from historical documentation of peoples living at the time of European Contact. Not only was the Contact Period a time of major reorganization and change for Native American cultures living in Southern New England, but considering the time depth of the prehistoric period (which is in excess of 10,000 years), those facts that were

observed about these people can not be assumed to be representative of much of the prehistoric archaeological record that is the subject of this text.

Native American Cultures of Southern New England

According to Salwen (1978:160), Native American populations stretching from the Atlantic Coastal shore in Saco Bay, Maine, to the Housatonic River which empties into Long Island Sound, and inland into Massachusetts, southeastern New Hampshire and the southwestern tip of Maine, were practicing a fairly similar cultural pattern at the time of European contact (Figure 6.1). This cultural area was bounded on the north where Western Abenaki languages predominated, and where horticulture played a significantly decreased role in subsistence. The border on the southwest was less pronounced in terms of specific cultural patterns, but a clear linguistic break occurred somewhere between the present day Housatonic River and the Connecticut/New York State boundary where Munsee Delaware speakers lived. This cultural area includes Southern New England and Long Island, and the original inhabitants of present day New Haven, the Quinnipiac, lived in the southwestern part of this region.

In addition to the Native American cultural groups of Southern New England, the Mahican and the Delaware (neighbors to the west and southwest respectively), as well as the Iroquois from central New York State, will be described in this chapter. These indigenous cultures had important influences on peoples living along the southern Atlantic Coastal area of New England where the Quinnipiac dwelt.

Figure 6.1: Culture Regions for Native American Societies

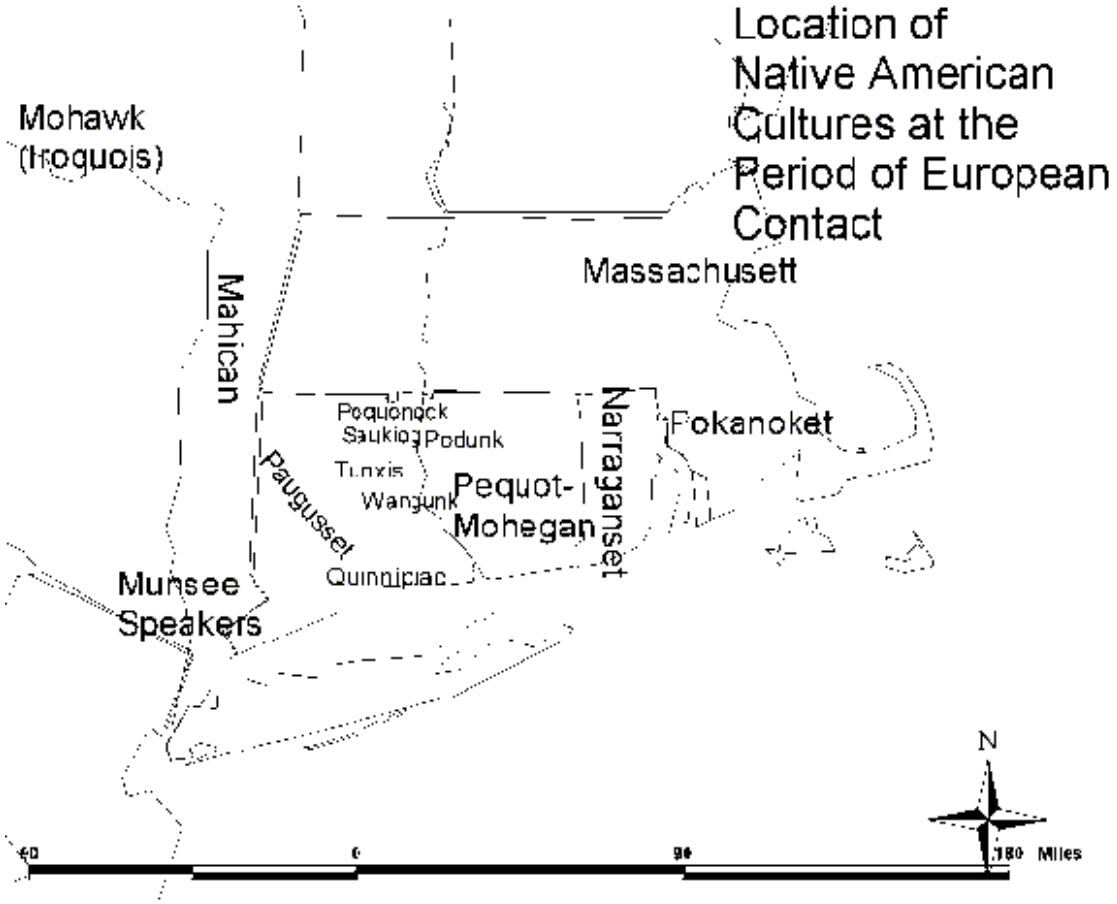


Figure 6.1 is a map showing the location of Native American cultures discussed in this text at the time of European Contact.

Five closely related Eastern Algonquian languages were spoken in the Southern New England cultural area: Loup, Massachusett, Narragansett, Mohegan-Pequot-Montauk and Quiripi-Unquachog. Actually Eastern Algonquian languages were spoken in a very broad area along the Northeastern Atlantic Seaboard and inland from the Maritime Provinces of Canada to North Carolina. But within this larger area Goddard (1978:74) suggests that three major language blocks could be distinguished: 1) the Western and Eastern Abenaki, Micmac and Maliseot-Passamaquoddy in northern New England and the Canadian Maritimes, 2) the languages of Southern New England and Long Island listed above, and 3) the Munsee and Unami speakers of the Delaware subgroup extending from present day southwestern Connecticut to North Carolina. The Mahican, living to the west of the Southern New England cultural area and along the Hudson River Valley drainage, spoke a language representing a mixture of Southern New England and Munsee dialects (Brasser 1978:198).

The languages of Southern New England were apparently all similar enough so that speakers could understand each other. But the similarities were probably most common for groups living adjacent to one another. So, that language formed a kind of continuum, and peoples living at distant ends of this cultural area may have had difficulty communicating (Goddard 1978:70).

Subsistence in Southern New England depended on seasonal movements that were keyed to cycles of resource productivity in the various environments exploited by local populations: sea shores, rivers, lakes and forests. At the time of European contact horticulture was important to all of the cultural groups inhabiting this area (Salwen 1978:160).

The most common house structure was built by driving long flexible saplings around an oval perimeter, which were bent over until each met its opposite member, creating a domed roof. Longhouses were also built, which were larger structures where several nuclear families might dwell. Some longhouses could be as much as 100 feet long (Salwen 1978:164).

Settlement patterns varied according to the distinct environmental types which local cultures inhabited, but Salwen (1978:165–166) described a general seasonal settlement pattern marked by: 1) dispersed habitation during summer where individual houses were spread out widely and surrounded by horticultural fields, 2) a major move inland to sheltered locations in deep forests where firewood, was plentiful during wintertime, 3) spring fish runs at favorite spots along rivers where migratory fish could be caught in abundance and where multivillage gatherings might take place. Additionally, crops would have been harvested in the fall, and inland moves for collecting nuts could also have occurred in the late fall.

The basic sociopolitical unit for Southern New England's Native American cultures (Salwen 1978:166–167) was the village, and this was headed by a sachem who seems to have inherited his/her authority from a recognized "chiefly" lineage. Native American women leaders, referred to by the somewhat unflattering term "squaw sachems", were recorded in Southern New England. Sachems apparently did not have absolute authority and depended on consensus from their councils in making decisions (Salwen 1978:166–167).

The Quinnipiac who inhabited New Haven Bay at the time of European contact will be discussed in detail later in this chapter. A brief summary of information

concerning other of Southern New England's Native American cultures will be given below.

According to Salwen (1978:172), in the 1630s Sassacus, who was the chief sachem of the Pequot, held dominion over the Mohegan, the Quinnipiac and all of the other Native American groups living along the Connecticut River. The Pequot lived to the east of the Quinnipiac along the Thames River drainage in eastern Connecticut. The Dutch had forged trading relations with the Pequot early on, and this inspired an expansionist campaign by the Pequot in which they moved to gain control of the Connecticut River's access to inland furs, as well as exacting tribute from coastal producers of wampum in order to facilitate inland trade.

The success and power the Pequot gained in this endeavor was to be their undoing, as the English greatly feared the Pequot and waited for their chance to get them out of the way. When the Dutch purchased land from the Pequot in the Connecticut River Valley, the English retaliated by signing a treaty with the local Indians who were at the time subjugated by the Pequot, but whom of course the English claimed to be the rightful landowners. Seeing an opportunity to escape subordination, the Mohegan and the Narragansett (siding with the English), burned a major Pequot Village in Mystic, Connecticut in 1637, killing over 300 men, women and children in the process (Salwen 1978:173). This led to the end of the power vacuum held by the Pequot, and as shall be described later, indirectly led to the establishment of a Puritan settlement in New Haven.

The Narragansett were the enemies of the Pequot, and lived further to the east owning most of what is present day Rhode Island. According to Simmons (1978:191), until their destruction in 1675-1676 the Narragansett were the most powerful and

populous people in New England. Simmons (1978:190) described "Narragansett" as an ethnic label that could be defined narrowly as a sachemdom, which was the hereditary bounded territory ruled by the dominant patrilineage and subdivided into lesser sachemdoms; or as the extended sachemdom which included all other sachemdoms where the Narragansett held sway.

When Roger Williams and other Englishmen had been banished from Massachusetts Bay Colony, they entered into Narragansett territory where they were greeted as friends and given lands allowing them to establish Providence. Williams (1643) wrote A Key to the Language of America which contained many words in the Narragansett language, as well as valuable insights into their cultural ways of life.

The principle religious figure of the Narragansett was the shaman, who presided over calendrical rituals, such as a harvest ritual which involved singing, dancing, and giving away of wealth that had been accumulated for this very purpose (Simmons 1978:192). Two sachems presided over the Narragansett, an older sachem who governed at home and a younger one that dealt with subjects and enemies. For the Contact period Narragansett, Canonicus was the elder sachem who marked his name on early deeds with a bow, and Miantonomi was the younger sachem who signed with an arrow (Simmons 1978:193). According to Simmons (1978:191), European writers distinguished the Narragansett among others for their industry in trade and for their courteousness in dealing with the English.

Roger Williams was largely responsible for the Narragansett entering on the side of the English and the Mohegan in their war on the Pequot. Afterward, the Mohegan and the Narragansett agreed to forget their former hostilities, but in 1643 Uncas, the Mohegan

sachem, captured Miantonomi during an abortive attack, and the English commissioners of the United Colonies allowed Uncas to execute the Narragansett younger sachem. When Pokanoket refugees entered Narragansett territory in the midst of King Phillip's War, Canonchet, the son of Miantonomi, refused to surrender them over to the Colonial authorities. In 1675 the United Colonies declared war on the Narragansett, destroying their refuge in the Great Swamp in South Kingstown, inflicting great casualties and driving the rest into guerilla exile (Simmons 1978:193–196).

In 1620 the Pokanoket (or Wampanoag) lived in a series of allied villages along the eastern border of Rhode Island and in southeastern Massachusetts. The Pokanoket were on friendly terms with the Massachusett living to their north, and were enemies with the Narragansett living to their west. Following the epidemics of 1617-1619, the Pokanoket were weakened considerably. Epidemics hit all of Southern New England's Native American peoples with great fury. After this time Massasoit, the Pokanoket sachem, welcomed the Plymouth Colony settlers in 1621 (Salwen 1978:171).

Massasoit entered into friendly relations with the colonists, partly at least due to the fact that the weakened Pokanoket had been driven from island to island in Narragansett Bay by their enemies, the Narragansett. These friendly relations would last until Massasoit's death in 1662, at which time the second of his sons, Metacomet (who is better known in Colonial history as King Phillip), led an uprising that has gone down in history as King Phillip's War. This war which lasted from 1675-1676, represented the united efforts on the part of many Native American groups from Rhode Island to Vermont and New Hampshire, in a last ditch attempt to thwart the growing power of the

English. The war ended with King Phillip's death, as well as the extinction of most of the Pokanoket (Salwen 1978:171–172).

To the north of the Pokanoket dwelt the Massachusett and the Pawtucket. These were closely related groups, both of which had been struck extremely hard by the 1617-1619 epidemics. The Pawtucket lived in the northern end of this range, extending approximately from the Charles River estuary in present day central Massachusetts to approximately Saco Bay in southwestern Maine. The Pawtucket were in conflict with Native American peoples living to the north of them in Maine and Nova Scotia. The combined effects of war and disease had left this cultural area nearly void of inhabitants, and probably for these reasons the Pawtucket saw the English as protectors and transferred great tracts of land to them (Salwen 1978:169–170).

Living to the south of the Pawtucket were the Massachusett who in turn lived along the southern Massachusetts coastline and inland, in an area lying to north of the Pokanoket homeland. Their fate was similar to their Pawtucket allies to the north. Both suffered immensely from epidemics and warfare from Native American groups from Maine and Nova Scotia. The English found whole villages abandoned in 1620, and after the colonists had settled at Plymouth the Massachusset sachem, Obbatinewat, had pledged his loyalty to King James. In 1622 when the English started a colony in Wessagusset, a local sachem of the Massachusset, Obtakiest, was alleged to have organized a plot to drive away the English, which was revealed to the colonists who sent a party to Wessagusset and killed some of the leaders, wounding Obtakiest. This later incident had represented the only clash between the English and the Massachusett (Salwen 1978:170–171).

Other smaller Native American groups lived in Southern New England. The Quinnipiac and the Paugussett lived along the Connecticut coast between the Connecticut and Housatonic River Valleys. Also, according to Menta (2003:31), in 1791 Thomas Jefferson compiled a list of 162 words from an elderly woman living across the sound in Long Island, which Tooker (1911) observed was related to Quiripi spoken in New Haven. The Quinnipiac, Paugussett and other Native Americans living in central Long Island, across the sound from New Haven, all spoke somewhat different dialects of the same Quiripi-Unquachog language.

Living to the north of the Quinnipiac and to the west of the Connecticut River in present day central Connecticut were the Wangunk, Tunxis, Poquonock and Saukiog. Little is known about these later groups because they were severely struck by epidemics. They have collectively become referred to as the Connecticut "River Indians". Menta (2003:32) stated that the Quinnipiac maintained close relationships with the Wangunk and Tunxis. In fact, the Quinnipiac were struck as severely as the "River Indians" by epidemics occurring in 1633-1634 (Menta 2003:69–71). According to Goddard (1978:72) it is generally presumed that the Connecticut River was the western boundary between the Quiripi and Mohegan-Pequot languages; and Wojciechowski (1985:5–6) wrote that he considered the linguistic boundary between the Quiripi-speaking Paugussett and the Munsee speakers of Norwalk to coincide with the present day Saugatuck River between Westport and Norwalk. Potentially then, Quiripi may have been spoken over a fairly widespread area throughout most of that portion of the State of Connecticut which lies west of the Connecticut River.

Living outside of the Southern New England cultural area were the Mahican and the Delaware. Because these groups had important influences on those Native American cultures living in South-Central and southwestern Connecticut they will be discussed here in some detail.

The Mahican occupied the drainage of the Hudson River Valley, from Lake Champlain in Vermont on the north, to present day Dutchess County, New York and the middle Housatonic drainage on the south. They spoke a language that was probably closely related to the Algonquian languages of Southern New England, as well as the Munsee spoken by those peoples living to the south of their homeland (Brasser 1978:198). The similarities between the words Mahican and Mohegan has led some to conclude that the later, which is a Native American culture of eastern Connecticut, represented movement of people into this region from New York State. Archaeological and linguistic evidence, however, points to an in situ development of the Mohegan culture in Connecticut (Salwen 1978:172).

Brasser (1978:198) states that the Mahican cultural pattern was probably most similar in its general outline, to the Iroquoian Mohawk living to their west and the Munsee people to their south. Typically, hilltop sites were selected for their palisaded villages, which contained from 3 to 16 bark-covered longhouses. Horticulture was of paramount importance to the Mahican, and these villages would be moved about every 8 to 12 years.

In the spring the Mahican were busy fishing along the Hudson and its tributaries, as immense schools of migratory herring and shad were available. During the summer the men plied the waters of the larger rivers with dugout or birch bark canoes, while they

built fishweirs along smaller streams, for catching fish and collecting freshwater mussels. After the fall harvest collective hunting activities were planned, and during the winter people scattered throughout the hunting territories (Brasser 1978:199).

Brasser (1978:200) stated that both the Mahican and the Munsee were organized according to a system of three matriclans. Although this clan system can not be documented for the prehistoric period, literary evidence indicates that it was quite developed during historical times and so this probably was an original feature of the prehistoric Mahican society. It is assumed that these clans lived as fairly independent units occupying separate villages.

During the 16th century intense frictions developed between the Mohawk and the Mahican. At this time Mahican would not hunt or settle west of the Hudson River, while Mohawk suffered a similar prohibition to the east (Brasser 1978:198).

The Munsee and Unami dialects spoken by Delaware (Lenape) societies living along the Atlantic coastline and inland, from the lower Hudson River Valley to North Carolina, represented a distinct break from the Mahican and Southern New England Algonquian languages spoken to the north and east. Munsee and Unami were both Eastern Algonquian languages, as were those of the Mahican and Southern New England Native American societies. But Munsee and Unami represented a distinct subgroup of Eastern Algonquian differing in important ways from the Southern New England subgroup (Goddard 1978:75–76).

The cultural pattern of the Munsee was similar to that of the Mahican described above and will not be repeated here. According to Snow (1980:307), Munsee speakers were slowly pushing north and northeastward, displacing Mahicans in the lower Hudson

River Valley and Southern New England Native American peoples in southwestern Connecticut. Snow (1980:325-330) suggests that this displacement must have resulted from some advantage, which he further ventured were related to more sedentary village living and greater dependence on horticulture.

The Mohawk, occupying the Mohawk River in Valley in central New York, represented something different from those cultures described to this point. First, the Iroquoian languages represent an entirely different language family from Eastern Algonquian languages described thus far, as different as Chinese is to English (Menta 2003:31). The Mohawk actually represented the easternmost Nation of the Iroquois Confederacy. The Iroquois lived in palisaded villages and relied heavily on horticulture for their livelihood. They are probably best known for their fierce, warlike reputation which they earned through their ability to successfully broker their position of power by controlling the European fur trade with interior cultures. The reputation of the Iroquois has no doubt been exaggerated to some degree in historical accounts. For instance, although Townshend (1900:10) remarked that the Quinnipiac of New Haven payed tribute to both the Mohawk as well as their Pequot neighbors, Menta (2003:60) did not believe that the distant Mohawk of central New York State did in fact extend such control: stating that he found it hard to believe the Quinnipiac could be subject to two patrons at the same time, and indicating no primay documentary sources exist verifying this relationship.

Ethnographic and Historical Documentation of the Quinnipiac

The ethnographic record of the Quinnipiac can only have limited value for aiding in the interpretation of the archaeology of West Rock Ridge. Most of the data recovered from this important trap-rock ridge appears to be associated with the Late Archaic Period (6,000 to 3,700 years ago), and thousands of years had intervened between the time when the bulk of this archaeological record was created, and 1638 when Eaton and Davenport entered negotiations with the Quinnipiac in order to establish their Puritan Colony in New Haven. Additionally, important changes in Quinnipiac culture had already occurred as a result of European contact well before the Quinnipiac began their fateful relationship with their English neighbors (Cece 1977).

However, as long as the limitations of Quinnipiac ethnography concerning the archaeological record at West Rock can be fully appreciated, this ethnographic record stands to add something that the static archaeological record can not. Ethnography provides an opportunity to view New Haven's ancestral Native American society as a living whole. Although the available historical documentation of the Quinnipiac and subsequent ethnographic research must be viewed from the cultural perspective from which is was taken, still the combination of ethnography and archaeology promises to provide a richer vantage point from which to view South-Central Connecticut's ancestral Native American societies than the archaeology record alone can offer.

In 1614 when Adrian Block explored the Connecticut coastline, one of the cultures whom he established contact with, in order to develop a trade in local furs, was

the Quinnipiac. Menta (2003:65) cited documentary evidence from a Dutch lawyer in the 1620s that the Quinnipiac had contributed many beavers to the Dutch fur trade. The fur trade influenced Quinnipiac culture in profound ways. Settlement had to remain close to the coastline during the fall and early spring in order to make contact with the traders when the accumulation of furs was at its greatest. The Dutch soon learned of the importance of wampum[5] to Native American cultures. Because wampum could be traded for furs and pelts to inland cultures, where beaver were more numerous, Dutch traders encouraged populations to produce this commodity for them (Menta 2003:66). William Bradford (1856:139), the Governor of Plymouth Colony, noted that in 1628 much wampum was made and kept by the Pequot and Narragansett who become very powerful with this commodity. Connecticut's coastal populations often spent much time living in coastal settlements producing wampum, which they exchanged for Dutch trade goods. For these reasons the increased time spent trapping beaver and other fur animals altered Native American subsistence patterns as well as their patterns of seasonal movements that had been practiced before the popular fur trade caught hold (Bragdon 1996:34–38). Subsistence patterns were also altered by European technology obtained in trade, such as firearms, spring traps, drills for tapping Maple trees, and other items.

The fur trade influenced Quinnipiac culture in another important way. Townshend (1900: 10) reported that the Quinnipiac had been anxious to enter an

---

[5] Wampum refers to strings of alternating, white and/or purple shells woven into long belts that had ceremonial importance to Native American societies. Dutch traders , realizing the possibility of trading this commodity to local indigenous cultures in exchange for furs and skins, utilized wampum in their transactions.

agreement with Davenport and Eaton in order to gain the protection of the English, because they were suffering depredations from both the Pequot living to the east and the Mohawk to the northwest. The Pequot had taken advantage of European interest in the fur trade and embarked on an expansionist campaign in order to exact tribute and monopolize relations with the foreign traders. The Quinnipiac were only one of a number of cultures in southern New England who had been subjugated and were forced to pay tribute to the Pequot.

Even before the momentous changes effected by the fur trade, one of the events that had permanently altered almost all of America's indigenous cultures had taken place. Without immunity for diseases carried by European explorers and traders, New England's Native American cultures suffered from widespread and devastating outbreaks of plagues and epidemics. Although the Quinnipiac had escaped the wrath of the plague of 1616 because it had not spread beyond Cape Cod, they were not so fortunate when the epidemic of 1633 struck (Menta 2003:69–71). Despite the fact that no record exists to document the impact of this outbreak on the Quinnipiac, Menta presumed that they had been similarly affected as the River Indians, living in interior Connecticut, to whom they were closely associated. This would mean that small-pox had reduced their population by 95% during the 1633 outbreak.

Obviously, cultural change had accompanied the relation of South-Central Connecticut's Native American populations to the foreign traders and explorers that would soon confine them to reservations on their former lands. However, cultural contact is often the scene of negotiation between cultures, and forms of resistance represented by preservation of indigenous cultural practices are well known despite the

seemingly one-sided nature of early contact between Native Americans and Europeans. Similar evidence exists for the Quinnipiac, and the following account reported by Menta demonstrates how the Quinnipiac had retained one important aspect of their culture, despite having been confined to a reservation on the eastern side of Quinnipiac Bay.

In his account Menta, told about how Momauguin, the Quinnipiac sachem, was forced to defer to traditional interpretation concerning the limited power of the sachem, and the importance of consensus for indigenous cultures. Momauguin had been confronted colonial officials concerning the deaths of several English hogs, owing to attacks from dogs owned by the Quinnipiac Indians. When the infuriated colonists demanded compensation, the Quinnipiac promised to kill their dogs. But when only evidence of the death of a few of the Quinnipiac dogs had been provided, the Town Marshall went to Momauguin to inquire who among the Quinnipiac had not complied. To this Momauguin replied that he could not tell the names of his fellow men who had not killed their dogs, because he feared some might retaliate. In other words, Momauguin, despite his invaluable role as negotiator between the colonists and his fellow Quinnipiac, did not dare to overstep his traditional authority in the face of pressure from the colonial officials to betray his guilty compatriots (Menta 2003:55–56).

Quinnipiac Culture

One of the most important issues for archaeologists concerning the ethnography of the Quinnipiac are references to their agricultural fields, indicating that domesticated

corn and probably beans and squash had become an important part of their subsistence by the time Davenport and Eaton (1638) first mentioned them in New Haven's early colonial records. But archaeological evidence indicates that agriculture had only recently become important to Connecticut's coastal societies, and in fact Cece (1977) argues that lack of archaeological evidence of intensive agriculture along the coastline indicates that the importance of domesticated crops coincided with the fur trade and a need to remain along the coastline to interact with traders and produce wampum.

Indeed, the earliest published evidence of domesticated corn in Connecticut comes from the Morgan site in Rocky Hill Connecticut. Two separate assays on charred maize from this site returned dates of approximately 1320 A.D. and 1360 A. D. (not calibrated) respectively (Lavin 1988:17). Considering these are the earliest well-known dates for corn from an archaeological context in Connecticut, it would appear that maize agriculture came fairly late to the area. Perhaps more importantly, the Morgan site is located in the northern portion of the state along the Connecticut River. Similar evidence for intensive dependence on maize agriculture does not exist for the coastline, and so it is very possible that abundance of shellfish and other coastal resources mitigated the need to intensify agricultural practices along New England's shore. If this is the case than South-Central Connecticut's prehistoric populations may have been practicing a more traditional subsistence based upon seasonally abundant wild resources prior to contact with European traders and explorers. It is difficult for these reasons to utilize observations concerning Quinnipiac subsistence practices to aid in the interpretation of local pre-Contact Period sites.

Most of the information in the following discussion of Quinnipiac culture comes from two sources. The first is Charles Townshend's (1900) The Quinnipiac Indians and Their Reservation. Townshend grew up on an estate existing on the land of the former Quinnipiac Reservation, which is located on the eastern side of New Haven Bay. Because of his avid interest in the culture of New Haven's original indigenous inhabitants, Townshend compiled important information, which included firsthand accounts from actual Quinnipiac informants. The second source was John Menta's Masters thesis at Southern Connecticut State University, The Quinnipiac: Cultural Conflict in Southern New England (2003). Menta was a gifted student of Native American cultural history, who died at a very young age, but his work is invaluable as a source of information about the Quinnipiac. More general information concerning the Quiripi language was available form Goddard (1978:72).

The language spoken by the Quinnipiac was Quiripi, one of 5 distinctive Native American dialects used in Connecticut. Quiripi, in turn, is a dialect of the Eastern Algonquian language bloc. Most of New England's Native American populations spoke a dialect of Eastern Algonquian. These languages were mutually intelligible and so speakers, especially those living adjacent to one another, could understand one another. The only speakers whom the Quinnipiac encountered within their sphere of contact, who they would not have been able to communicate with, were the Mohawk who spoke a dialect of the Iroquoian language group. According to Menta, Iroquoian would have been about as compatible to Algonquian as English is to Chinese (2003:30–32). Quiripi is considered a sub-branch of Proto-Algonquian, an ancestral language that is approximately 4,000 years old in North America.

According to Townshend (1900:65) the dwelling of the Quinnipiac was the wigwam, which was similar to examples from Niantic Connecticut that were drawn and described by former Yale president Ezra Stiles. These were circular structures built upon a ring of saplings that were inserted into the ground, bent together at the top and tied, in order to produce a low domed structure of about 8 to 10 feet in height and 10 to 16 feet in diameter. These were covered with woven mats or hides and also could have a layer of cedar shingles placed all around for insulation and waterproofing. A hole was left in the roof for fire to escape and houses were spacious enough to contain a single nuclear family as well as some extended family members.

The Quinnipiac River (Figure 4.1) provided a major communication route. The Quinnipiac built and utilized dug-out canoes that were produced by building a fire under a tree, felling it, and then hollowing out the charred side using stone axes. Dug-out canoes are different from birch bark canoes used in northern New England. Lighter birch-bark canoes can be easily carried, or portaged, between streams. Dug-out canoes, being heavy, have to be parked in favorable locations. The advantage of dug-out canoes is that they are less likely to capsize and could be taken out on open sea. Beside the Quinnipiac River, New Haven's other smaller waterways such as the West (Figure 4.1) and Mill Rivers were also important communication routes. In fact, the area is so well endowed with minor rivers and streams that almost any part of Quinnipiac territory was easily accessible by canoe (Menta 2003:27).

Although travel by canoes would have been important, Menta (2003:28) concluded that Southern New England's Algonquians were probably much more reliant on travel by footpaths. In fact, New Haven is known to have represented an intersection

of four major Indian paths in Connecticut, including the Great Shore path, which followed the same route as the present Boston Post Road connecting New York to Rhode Island and Boston. Menta (2003:28) also mentioned an additional trail, which connected the Quinnipiac homeland to that of their neighbors, the Paugussett living along the Housatonic River to the west in present day Milford. This trail, the Paugussett Old Path, passed just below West Rock Ridge.

Not much is written about Quinnipiac religion, but this is not surprising. The Puritans looked with disdain upon the religions of New Haven's indigenous populations believing them to be nothing other than idolatry and devil-worship. Like other Algonquian societies, however, the Quinnipiac religious leaders were probably shamans. Native American religions associated the existence of spirits and supernatural beings with many natural elements of the world such as trees, rock formations and animals. A shaman was considered to be a mediator between the living world and the world of the spirits. Shaman were curers, fortune tellers and rain-makers, who were thought to have the power to travel to spirit worlds in dreams in order to communicate with important beings and enlist them as allies. Colonial Records of New Haven do indicate that a swamp to the east of their Reservation in East Haven, the Great Swamp, was a place where the Quinnipiac "powwows" congregated and enacted elaborate rituals (Menta 2003:36).

The Quinnipiac hunted many different kinds of mammals, although the most important was probably white tailed deer. They utilized a variety of techniques such as

hook and line, nets, spears and weirs[6] in order to obtain both fresh and salt water fish. Shellfish were an important component of their diet and colonial records indicate massive shell heaps along the New Haven coastline. Foraging for tree nuts, berries, fruits, seeds, tubers and other plant parts was also significant (Menta 2003:42–52).

As mentioned previously, information concerning Quinnipiac seasonal rounds and subsistence strategies needs to be considered in the context of cultural changes, which had occurred as a result of European contact including the fur trade and their relations with New Haven's Puritan colonists. According to Menta (2003:40–42), the Quinnipiac still practiced a pattern of annual seasonal moves, which was somewhat anchored around tending and supervision of their corn fields during the summer and harvesting during the fall. In the spring they camped at fishing stations where they could take advantage of anadromous fish runs. They also traveled to their favorite locations for gathering shellfish, fruits, seeds and berries during the summer. Fall nut harvests were often an important cooperative activity and in the winter they resided in sheltered ravines where plenty of firewood was available so they could hunt and catch fish through the ice.

In order to try to understand the political organization of the Quinnipiac, Menta (2003:52–56) relied on information contained in their land transactions with the Puritan colonists of Quinnipiac Bay. He interpreted that the Quinnipiac represented a loose association of four bands, each having its own sachem. However, Momauguin seems to have acted as the head sachem, or overall leader, for all the Quinnipiac bands. For

---

[6] Weirs were constructed either from poles upon which nets were strung, or from piles of stone. They were placed in rivers and streams in the form of a funnel through which fish were filtered into small enclosures where they could be speared or netted.

decision making he relied on a council, which included the individual heads of the other Quinnipiac bands, and his leadership depended on his experience and decision making skills.

Ethnohistory of the Paugussett

Wojciechowski (1985) provides an ethnohistorical account of the Paugussett people of the lower Housatonic River in western Connecticut. The Paugussett apparently spoke a dialect of Quiripi that was similar to that spoken by the Quinnipiac and these groups were probably loosely associated. Other "River Indians" living mostly on the western side of the Connecticut River were the Tunxis, Poquonock, Saukiog, Podunk and Wangunk. Little is known of these interior peoples, but Menta (2003:7–10) suggests all of these groups were probably on friendly terms and were at least loosely associated, and so perhaps it can be speculated that a fairly similar adaptation prevailed among the Native American peoples of central and western Connecticut.

Wojfiejowski's (1985) research affirmed that the Paugussett were an extensive cultural entity consisting of at least four major subgroups including the "Paugussett proper" to be distinguished from the larger Paugussett Nation that encompassed all of the Housatonic River in present day Connecticut. This organization is similar to that which Menta (2003:10-21) proposed for the Quinnipiac which he believed were actually a conglomeration of four smaller subgroups, but for whom Momauguin appears to have acted as the head sachem. These other local Quinnipiac groups included Momauguin's

band centered in East Haven, the Totoket in modern day Branford, a band headed by Montowese, Momauguin's son, in present day Wallingford, and a band headed by Momauguin's sister the "squaw sachem" Shaumpshuh in Guilford, Connecticut.

Chapter 7

Southern New England Prehistory and the Available Archaeological Record of South-Central Connecticut

In the Northeast, archaeologists have modeled regional prehistory in terms of cultural and temporal "Traditions", which are based for the most part on distinct types of artifact assemblages, particularly diagnostic projectile points. Ritchie (1971:5) pioneered this work for New York State, and subsequent research (including supporting radiocarbon dates) has not only supported his proposed chronology, but has also added absolute dates to it. According to Ritchie (1971:6), testing of the validity of these formal types has shown them to exist as entities having cultural, spatial and/or temporal associations. Archaeologists working in Connecticut have adopted these models of cultural traditions largely from researchers working outside of the State, such as Ritchie (1965) and Dincauze (1973), but they have been found to be generally useful.

This chapter presents an overview of the cultural prehistory of Southern New England. Because the cultural/temporal associations identified for West Rock Ridge were the same as those recognized broadly throughout Southern New England, a fairly detailed description of these regional traditions will be given below.

Following this overview of regional prehistory, the available archaeological record of South-Central Connecticut will be described. Data from this summary

includes: 1) published reports, 2) information gleaned from the historical resources inventory available from the files of the Office of the State Archaeologist (OSA) for Connecticut, Nick Bellantoni, and 3) information gained from local researchers and collectors. The West Rock Ridge project can not be considered a regional survey. The objective of this research is to investigate land use patterns for a particular environment type, a trap-rock ridge in South-Central Connecticut. Because this is the case, information from the available archaeological record for this local area will be crucial for understanding how West Rock fit into wider patterns of settlement and subsistence.

Prehistory of Southern New England

The Paleo-Indian Period

According to Funk (1978:16), Paleo-Indian (12,000 B.P. to 10,000 B.P.) cultures of the Northeast represented an adaptation to rapidly changing late glacial conditions. Their assemblages have been compared to Clovis and Folsom hunters of large Pleistocene mega-fauna, but certain dissimilarities exist. In the Southwest, Clovis and Folsom projectile points are the most diagnostic artifacts of the Paleo-Indian Period. These are fluted projectile points, which are expertly chipped bifaces characterized by a medial thinning flake, or flute, originating from a concave base and extending sometimes as much as two thirds of the way up one, or both faces.

Fluted points are also found in the Northeast but their variety is noteworthy. Sometimes numerous types such as pentagonal, triangular, wasted or stubby varieties are found at the same site, such as the Reagan site in Vermont. More often individual sites have a narrow range of types present but these are not comparable to other sites. What's more, chronological relationships among these various fluted point types within the Paleo-Indian Period have not been worked out for the Northeast (Snow 1980:122).

Added to this dilemma is the fact that excavated Paleo-Indian components are not numerous, and the majority of fluted points which have been discovered represent isolated surface finds. Well-dated Paleo-Indian components for the Northeast have become the exception instead of the rule. While Funk (1978:16) admits to the inevitable loss of data that occurs when dealing with very ancient archaeological remains, he further states that the paucity of Paleo-Indian components must also result from their relatively small numbers in the Northeast at this time.

The environment in the Northeast at the time of Paleo-Indian occupation was much different than it is today. While the Wisconsin ice front was at its maximal southward position its terminal moraines created what is present day Long Island and Cape Cod. About 15,000 years ago the ice began to retreat. By 13,500 years ago the glacier had disappeared from Connecticut, the ice-line existing approximately at the Connecticut/Massachusetts border. Initially, only tundra vegetation inhabited the land south of the receding glacial front. But according to Snow (1980:115), this post-glacial mid-latitude tundra would have been a more productive environment than its present day northern counterparts. One important reason why this would be the case is that more

direct radiation strikes the earth at mid-latitudes than at upper latitudes, although the effects of these conditions for tundra vegetation are unknown.

Because so much of the earth's water had been incorporated into polar glaciers the world's oceans had been depressed 130 meters below their present levels (Snow 1980:105). This left vast expanses of the ocean shelf exposed along the Atlantic coastline.

Southern New England's vegetation continued to change because as the ice-front pushed further northward, floral species migrated in from the south as global climatic conditions ameliorated. According to Snow (1980:115) a spruce forest replaced the tundra of Southern New England about 12,000 years ago, lasting until about 9,500 years ago. This was not a closed forest but was instead characterized by wide expanses of open grassland, or what is referred to as a parkland habitat. This type of open parkland was an ideal setting for large bodied herbivores, which in turn would have made it a productive environment for Paleo-Indian hunters.

Aside from the variety of fluted point styles present in the Northeast, Funk (1978:16) describes the overall toolkit as similar to its western counterparts. Important components of this tool kit include bifacial knives, retouched flake knives, and a variety of unifaces that include end and side scrapers which often possessed characteristic graving spurs. The uniformity and conservatism of this Paleo-Indian toolkit is further interpreted by Funk (1978:18) to represent their rapid migration into the area, and subsequent high degree of mobility necessary to pursue herds of migratory caribou, which may have been their most important target species in the Northeast.

However, although stereotypical models of Paleo-Indian hunters often portray them as exclusive predators of large bodied ice age mammals, both Funk (1978:18) and Snow (1980:150) agree that Paleo-Indians in the Northeast relied also on small game, plants and fish for a significant component of their diets. This suggestion is borne out by the presence of fish bones and hawthorn plum remains at the Shawnee-Minisink site along the upper Delaware River Valley, which was dated by McNett (1977) to 10,590 ± 300 B.P.

Only two dated Paleo-Indian components have been reported from Connecticut. The first is the Templeton site in Washington, Connecticut which was reported by Moeller (1980), and was radiocarbon dated at 10,191 ± 300 B.P. Templeton was interpreted as a single component temporary camp occupied by a small but complete family group. Jones (1997) reported a date of 10,260 ± 170 B.P. obtained from a hazelnut shell fragment from the Hidden Creek site in Ledyard, Connecticut. This later site was interpreted as a briefly occupied Late Paleo-Indian camp.

Most of the other Paleo-Indian sites identified in Connecticut represent isolated fluted point find spots, which occasionally are associated with other artifacts such as gravers and scrapers. For instance, McBride (1984:237–238) reported five fluted point finds in the Lower Connecticut River Valley. Interestingly, all of these were located in close proximity to the Connecticut River (Figure 4.1).

Funk (1978:18) considers settlement data for the Paleo-Indian Period in the Northeast to be scant, and concludes that only two fairly distinct site types can be recognized. These include: 1) larger sites such as Shoop, Bull Brook and West Athens Hill, all of which were apparently reoccupied by one or more bands over a period of

several seasons, while 2) smaller sites such as Potts and Kings Road probably represented special purpose sites where a small group of people performed a limited range of tasks. Funk (1978:18) further observed that most Paleo-Indian sites in the Northeast occur on well drained low rises or hills. Although the functionality of these locations may seem elusive today, in an open-parkland environment these sites would have provided an opportunity to observe the movements of game animals. Another important criterion for site location utilized by Paleo-Indians in the Northeast, was proximity to the kinds of high-quality lithic raw material sources necessary for the production and maintenance of their distinctive tool kits (Gardner 1974).

Snow (1980:153) interpreted available Paleo-Indian settlement data to indicate a three-tiered structure, basically adding a third site type which he called "multi-band conglomerations" to the two site types above, observed by Funk (1978:18). Multi-band conglomerations would represent occasions where several bands camped together, probably at times when abundant resources were available, in order to conduct important rituals and to exchange gifts and marriage partners. Since these were maximal aggregation sites, they represented a larger group of people than would normally reside together. According to Snow (1980:145–147) an example of one of these maximal aggregation sites was the Bull Brook site in Massachusetts. Other important Paleo-Indian sites in the Northeast are the Dutchess Quarry Cave (Funk 1978:18) and Vail sites (Gramly 1982). Both of which suggest intimate relations between Paleo-Indian settlement and movement of game animals. A fluted point occurred in a context with a probable caribou bone fragment at Dutchess Quarry Cave, and the Vail site has been interpreted as a Paleo-Indian kill site taking advantage of migrating caribou.

Table 7.1: Cultural Periods

Cultural Period	Approximate Time Span (given in years before present)
Paleo-Indian	12,000 to 10,000 B.P.
Early Archaic	10,000 to 8,000 B.P.
Middle Archaic	8,000 to 6,000 B.P.
Late Archaic	6,000 to 3,700 B.P.
Terminal Archaic	3,700 to 3,000 B.P.
Early Woodland	3,000 to 2,000 B.P.
Middle Woodland	2,000 to 1,000 B.P.
Late Woodland	1,000 to 350 B.P.
Contact	350 B.P.

The Early Archaic Period

Following Snow (1980) the Archaic is divided into four Periods: 1) the Early Archaic lasting from 10,000 to 8,000 B.P., 2) the Middle Archaic from 8,000 to 6,000 B.P., the Late Archaic from 6,000 to 3,700 B.P. and Terminal Archaic from 3,700 to 3,000 B.P. The earliest of these periods is perhaps less well understood than the Paleo-Indian Period.

Snow (1980:157) characterized the Early Archaic as representing a time of cultural readjustment in the Northeast, when Holocene forests replaced the open parkland habitats of the Paleo-Indian Period. Gone were the large Pleistocene mammals, so subsistence depended on hunting and gathering of a wide variety of forest products. In the Northeast the Early Archaic is signaled by the presence of projectile point types initially identified in the Southeast, such as Hardaway, Kirk, Palmer, and bifurcated-based types such as Kanawha, St. Albans and LeCroy. Unfluted lanceolate points of the Plano Tradition, considered as intermediate between the fluted points of the Paleo-Indian Period and Early Archaic styles in parts of the Midwestern and Western United States, are rare in the Northeast (Funk 1978:16).

Ritchie (1965) has argued that this lack of Plano styles, as well as overall scarcity of Middle and Early Archaic sites in the Northeast, is the result of unfavorable ecological conditions. According to this hypothesis, the pine forests which replaced the open spruce parkland about 9,500 years ago in Southern New England, represented a closed boreal forest, which was too unproductive for hunter-gatherers causing them to move elsewhere where vegetative cover was more suitable. Snow (1980:166–169) objected to Ritchie's hypothesis on two fronts: 1) much more information concerning the Early Archaic has been found since the time when Ritchie posited his argument, 2) information cited from Davis (1967:35–36) indicates that the pine forests of the Early Holocene were not like modern boreal forests, but have no modern analogue and appear in fact to represent forest types which would have been at least moderately productive for hunter-gatherers.

Funk (1978:20), however, acknowledges that Early Archaic sites are much more widely distributed along the southern margins of the Northeast in general, coinciding

with the northern extension of the Middle Atlantic deciduous forest. The implication here is that this southern fringe of deciduous forests was a better habitat for hunter-gatherers, and that at least a moderate population did exist at the time along the New York and New England coastline as well as inland along river valleys such as that of the Hudson, Housatonic and Connecticut (Figure 4.1). Important Early Archaic sites identified in the Northeast include Sheep Rock Rockshelter in Pennsylvania, and a series of Staten Island sites reported by Ritchie and Funk (1971).

Significant differences exist, however, between Early Archaic sites of the Northeast and those of the Southeast despite the similar projectile point types found in both areas. First, while the Early Archaic point styles mentioned previously have been claimed to occur in discrete levels at sites in the Southeast where changes in point typology have often been interpreted to represent discrete temporal horizons, all of these styles are found mixed in the same levels in the Northeast. Funk (1978:21) interprets that this represents mixing of horizons at sites so far excavated in the Northeast. Snow (1980:162) offers a different interpretation, disavowing the concept that discrete projectile point types can be equated temporal horizons in the same manner that geologists use marker fossils. Instead, Snow argued that all of these point types were parts of composite tools, and it should be no surprise that the same individuals would use different projectile point types in the contexts of different activities.

The second major difference is that radiocarbon dates associated with Early Archaic types in the Southeast tend to return later radiocarbon dates when associated with the same point styles in the Northeast. Snow (1980) argues that although these dates are different, they should not be disregarded simply because evidence from the two areas

does not coincide. According to Snow (1980:162–163) the dates are perfectly good and require no better explanation than that these point styles were used later in the Northeast. Indeed, many radiocarbon dates associated with bifurcated point styles that have been dated to the Early Archaic when found in the Southeast, are found to be Middle Archaic (8,000 to 6,000 B.P.) in age in the Northeast (the same is probably true in the Southwest and Great Basin where similar style Pinto points may represent a widespread early Middle Archaic horizon).

The Middle Archaic Period

The Middle Archaic as defined here lasted from 8,000 B.P. to 6,000 B.P. By 8,000 years ago New England's deciduous forests were already well developed, although they would not reach their essentially modern characteristics till about 6,000 years ago (Snow 1980:173).

Much more is known about the Middle Archaic than the previous Early Archaic Period. A great deal of knowledge comes from the Neville site (Dincauze 1976). The Neville site is located on the east side of the Merrimack River in Manchester, New Hampshire, just to the north of the Amoskeag falls. The name Amoskeag is derived from the Indian word for "fishing place", and the falls represented a famous spring fishery until it had been dammed in the middle 1800s. At the time the site was occupied the falls had developed into its predominantly modern conditions, and abundant fish runs would have been available (Dincauze 1976:1).

A hearth feature from the Neville site returned a radiocarbon date of 7,740±280 B.P. associated with Neville points, which were the dominant projectile point type in the deepest layers of the site. Stratigraphic contexts were also well preserved at the Neville site, and instead of demonstrating the existence of distinctive horizons dominated by specific projectile point types, point styles at the Neville site were found to gradually replace one another in frequency without any distinctive breaks between them. The three artifact horizons identified by Dincauze (1976) at the Neville site were the Neville, Stark and Merrimack horizons, respectively, from oldest to youngest. Neville points are morphologically similar to Stanley Stemmed points reported by Coe (1964:35) in the American Southeast, and they are of similar age. The same can be said concerning the similarities of Stark and Morrow Mountain points (Dincauze 1976).

Associated with the Neville points were scrapers, including quartz crystal scrapers, perforators including some with Neville bases, flake knives, hammerstones, choppers, a spokeshave and polyhedral nuclei of quartz crystal (Dincauze 1976:105). Added to this assemblage in the Stark horizon were winged atlatl weight fragments and a ground stone, full-grooved diorite axe (Dincauze 1976:107). Also known from Neville and Stark sites in the lower Merrimack drainage are plummets, which are probably net-sinkers, as well as semi-lunar knives and gouges. The former of these tools indicates preoccupation with fishing activities, and according to Snow (1980:176) the later is possibly associated with construction of dugout canoes. Dincauze (1976:97) supported her conclusion that the site served as both a base camp and a fishing station, occupied during the spring/early summer, with an observation that unusually high mercury levels were found in the site's cultural layers.

Furthermore, Dincauze (1976:139) interpreted that the cultural sequence at the Neville site, spanning the Middle and Late Archaic Periods, coincided with an increasingly specialized use of the site, and that this in turn was associated with an increasingly more complex subsistence pattern, where special purpose sites not only became more numerous but also more varied. Snow (1980:183) adds that subsistence activities were also more carefully planned and scheduled than had previously been the case.

According to Funk (1978:25), the latter part of the Middle Archaic is typified by the presence of broad side notched points which are almost identical to Otter Creek points. Ritchie (1969) defined Otter Creek points as part of his Late Archaic (Laurentian) Vergennes phase. However, Otter Creek-like points often appear in contexts that are earlier than any dated Vergennes phase components, without however any of the other associated artifacts which Ritchie used to define this phase. Funk (1978:25) suggested that very similar points from the Midwest may have represented the origin for Otter Creek points found in the Northeast.

Shortly after the appearance of Otter Creek-like points at the Sylvan Lake Rockshelter, in a horizon that yielded a radiocarbon date indicating occupation near the very end of the Middle Archaic, artifact frequencies proliferated in the overlying Late Archaic horizons. This pattern is repeated in many other locations throughout the Northeast (Funk 1978:25).

The Late Archaic Period

According to Tuck (1978:28), the variety of cultural expressions for the Late Archaic in the Northeast is best understood in terms of broad cultural traditions. The "whole cultural tradition" concept that he employs requires archaeologists to look beyond single artifact classes, or even technological assemblages, but instead to combine technological information with what else can be inferred concerning other aspects of overall cultural systems, such as subsistence, settlement pattern, mortuary information and aesthetics.

Using this concept, Tuck (1978) identified four broad cultural traditions for the Northeast. Each of these traditions, in turn, coincided with fairly well defined ecological regions within which they occurred. These four distinctive regions were: 1) the mixed prairie-hardwoods region of the Midwest, 2) the Great Lakes-lake forest region, 3) the Maritime provinces of Canada and the northern New England coastline, and 4) the oak-hickory mixed deciduous forests extending from along the Atlantic coastline and inland, from southern New England to the Mid-Atlantic States. Each of these regions displayed a fairly continuous cultural pattern that Tuck attributed to both environmental homogeneity and communication networks (1978:28).

The first of these cultural traditions belongs to the mixed prairie-hardwood region of the Midwest (Tuck 1978:28–30). This zone extends from western Indiana, through Illinois and over a fairly broad area extending to the south and west of these states. The

environment here is characterized by large tracts of open grassland interspersed with stands of oak and hickory trees. This is the ecological area that was home to the Helton culture, identified by Struever (1979) at the Koster site in Illinois. The Helton culture represents a Middle Archaic manifestation whose projectile points match the Otter Creek type. Tuck (1978:28) states that deer, elk, beaver, bear, fox, squirrels, and other small mammals, as well as fish, shellfish and birds were abundant in this region. The Helton toolkit included specialized tools for hunting, fishing and gathering of plants and shellfish, and also a distinctive bone industry including pins, pendants, beads, antler flakers, bone awls and turtle shell cups or bowls. Burials were flexed interments associated with grave goods that occurred in small cemeteries at the edge of the villages (Tuck 1978:30). The Black Earth site however had several hundred burials.

The Maritime Archaic cultural pattern had its home along the northern New England coastline, as well as Canada's Maritime provinces, Newfoundland and Labrador (Tuck 1978:32). Two factors distinguish this cultural pattern: 1) an economy with a distinctive orientation for resources acquired from the sea, and 2) a mortuary complex including elaborate burials covered with red ocher, and often including an assortment of specially manufactured grave goods (Snow 1980:190–216). Tuck (1978:34) suggested that this burial cult may have been a precursor to later developments throughout the Northeast.

Snow (1980:211) interpreted that Maritime Archaic cultures spent their summers fishing and hunting sea mammals along the ocean shore, while spring and fall sites were inland along rivers taking advantage of migratory fish runs, and winters were spent at inland camps from which cooperative caribou hunting probably took place.

According to Tuck (1978:30), the Lake Forest Tradition was found mostly in the drainages of the Great Lakes, although it was also present along the St. Lawrence River drainage and the northern portion of the Champlain Valley. The characteristic forest type of this region was "beech-maple-hemlock and maple-basswood forests, often with a fair amount of oak, walnut, butternut and pine" (Tuck 1978:30). Lake Forest Archaic components occur in Southern New England, and so this cultural pattern will be described in some detail.

This forest region can be distinguished both from the boreal forests to the north as well as the oak-hickory mixed deciduous forests to the south. Ecologically the Lake Forest region contained more raccoon, cottontail rabbit, gray squirrel and Virginia deer, whereas the boreal forests to the north had more caribou and moose which would have accounted for different adaptive patterns between these two areas (Tuck 1978:30).

Differences in faunal species were less pronounced between the Lake Forest Region and the oak-hickory-chestnut-deer-turkey biome to the south. However, important differences in fishing technology can be observed for these latter two areas. Typical fishing equipment for the Lake Forest Tradition includes leisters, harpoons and the gaff, which can be used without hook and line, as well as hauled seine lines and gill nets. To the south in the oak-hickory and mixed hardwood zone, the hook and line, simple spears, and utilization of fish weirs dominates. Tuck (1978:30) suggested that these technological differences might be related to different fish species obtained; which for the Lake Forest area included species such as northern pike, a species which is more easily taken by spearing than by hook and line.

As described earlier, the appearance of large, broad, parallel sided projectile points with prominent side-notches, square tangs and concave bases, seemingly indistinguishable from Ritchie's (1965) Otter Creek style, heralds the beginning of the Lake Forest Archaic over a very broad area of the Northeast. This point style is diagnostic of Ritchie's Vergennes phase, but early assemblages lack the rest of those components necessary for this phase designation. These point styles occur outside the Lake Forest Region during the Middle Archaic as part of the Helton culture tool kit.

Tuck (1978:31) sees the widespread distribution of this point style, as well as the far greater number of associated sites as compared to the Middle and Early Archaic Periods, as representing migration into the area by people from parts further south and west. Snow (1980:220) disagrees with this later hypothesis, using a date of 6300 B.P. associated with Otter Creek points for the Mohawk Valley in central New York, to argue that immigration can not be assumed and that all that is known is that this cultural manifestation arose from Middle Archaic roots and was widely distributed over the Northeast.

Regardless of which of the above hypotheses is correct, the Lake Forest Archaic represented a quantitative break from the Middle Archaic in terms of significantly more sites, many of which are much larger and contain more cultural refuse than anything identified beforehand (Funk 1978:27).

Archaeological research in this area was pioneered by Ritchie (1965), who identified three separate Late Archaic phases for what he labeled as the Laurentian Tradition. Ritchie's (1965) Laurentian can be considered synonymous with the Lake Forest Archaic as defined here, although the later term encompasses a larger area than

Ritchie originally included in his own definition. These three phases included: 1) the Vergennes phase, 2) the Vosburgh phase, and 3) the Brewerton phase. Ritchie's (1965)Vergennes phase was identified by a stone tool assemblage including Otter Creek points, end scrapers with similar bases as Otter Creek points, expanded base drills, bifacial knives, as well as a ground stone industry, including axes, adzes, gouges, ulus, and ground slate knives or spear points. Replacing the Vergennes phase in the eastern portion of the Lake Forest region about 2,500 B.C. was the Vosburgh phase, characterized by distinctive corner-notched Vosburgh points as well as a continuation of the chipped stone tool industry of the Vergennes phase, but with a much decreased role for the ground stone tool industry. In central New York State, the Vergennes phase gave way to the Brewerton phase identifiable by characteristic side-notched, corner-notched and eared triangular points, lesser numbers of ground slate tools, and persistence of earlier forms of chipped stone scrapers and knives (Tuck 1978:32).

Snow (1980:222) interpreted that in the Champlain and upper Hudson River drainages, Lake Forest Archaic seasonal rounds consisted of caribou hunting from back country camps during the winter, perhaps larger aggregations at spring and fall fish runs, and a diffuse pattern of hunting, fishing and gathering of plant foods during the summer. The proportion of projectile points at Lake Forest Archaic sites is interpreted to indicate significant reliance on hunted resources while plant processing equipment is rare.

A point of some archaeological debate has been the coexistence of the Lake Forest Tradition with the next of the archaeological cultures to be discussed here, the Mast Forest Archaic. Tuck (1978:36) interpreted the evidence to indicate an intrusion of Lake Forest Archaic people into southern New England after about 2,000 B.C. Snow

(1980:226–228) prefers to consider the Lake Forest Archaic and the Mast Forest Archaic as representing two distinct adaptations; one having its center in the forests extending southward from the Great Lakes, and the other occurring in the oak-hickory biome extending from the Southern New England coastline and inland. According to Snow (1980), a zone of tension occurred between these two areas, and it should not be surprising if some traits typical of the Lake Forest Archaic core area were found in this marginal zone of tension between it and the core area of the Mast Forest Archaic and vice versa. In other words, in this latter scenario it is the cultural traits which were doing the moving (diffusion) not people.

McBride (1984:248) disagreed with Snow's (1980) interpretation, stating that the distribution of Laurentian (Lake Forest Archaic) cultural materials along the coastline of Southern New England and as far south as Martha's Vineyard indicates more than simply a marginal zone of tension. According to McBride (1984:247), the Lake Forest Archaic is well represented in the Lower Connecticut River Valley, but at most sites where Lake Forest Archaic materials occur they are only represented by a few artifacts and rarely do these components dominate at any particular site. Larger base camps are not present for the Lake Forest Archaic as they are for the Mast Forest Archaic to be described below. For the most part, the settlement pattern appears to indicate small mobile bands, exploiting a variety of environmental zones.

In Southern New England and inland along the river valleys is an environmental zone described by Tuck (1978:34) as "the oak-hickory-chestnut-deer-turkey Biome." Tuck considered this to be one of the most productive environments for human habitation in the Northeast. Snow (1980:223) coined the term "Mast Forest Archaic" to describe a

cultural tradition which flourished in association with the mast, or nut bearing, trees of Southern New England's oak-hickory forests. The importance of acorns for Southern New England ecology was discussed in chapter five. Not only were acorns and other tree nuts consumed by Native American populations, but mast also supported game animals that were important to their survival such as deer and turkey.

As with most archaeological traditions of the Northeast, identification of Mast Forest Archaic sites most typically relies on the presence of diagnostic projectile points. These points, which shall be referred to in this text as the Small Stemmed Point Tradition, includes a series of narrow bladed, thick, stemmed or side-notched projectile points, often having rough bases characterized by a section of the unmodified cortical surface of the pebble from which the point was manufactured, and chipped for the most part from local materials. These point styles (including Lamoka, Wading River, Sylvan, Squibnocket and others) have a wide dispersion coinciding fairly closely with the oak-hickory forests of the Northeast. Tuck (1978:34–37) describes this region as extending along the coast from southern Maine to northern North Carolina and westward through Ohio and Michigan and as far as Illinois. Kinsey (1972 342–343) who made one of the earliest descriptions, used the term "Piedmont Tradition" to encompass a variety of projectile point complexes found in the Northeast including Sylvan Lake, Wading River, Squibnocket, Bare Island, Poplar Island and Accokeek Creek. Brennan (1967) referred to this as the "Taconic Tradition".

I have chosen to retain the term Small Stemmed Point Tradition in this text, despite Snow's (1980:223) warning that archaeological traditions should not be equated with projectile point types. The reasons I have done so are partly symbolic. During my

archaeological work in Connecticut and western New York, I share the experience, with many other archaeologists, of having encountered numerous sites from this ubiquitous tradition. Although I can only speak from my own perception of how others view this tradition, it does seem to me that the term "Small Stemmed Point Tradition" often raises visions of complete confusion as these sites seem at times to be distributed throughout the landscape in an almost incomprehensible fashion. However, I will argue that the project at West Rock Ridge has afforded a perspective of the Small Stemmed Point Tradition that offers new insights into the demographic and cultural processes existing behind the spatial and temporal distribution of these sites.

Tuck (1978:35) describes the nonperishable component of the Late Archaic assemblages in Southern New England and the Middle Atlantic states as unimpressive. The stemmed and side-notched projectile points have already been described. Add to this the triangular projectile points, knives, choppers, hammerstones, polished adzes, plummets, net-sinkers, as well as equipment for processing vegetal foods such as pestles. Bone artifacts are rare, even in contexts where preservation should be good, such as in Ritchie's (1969) excavations of shell midden sites in Martha's Vineyard. Despite the good preservation characteristics of soils containing abundant shell, only splinter and deer ulna awls were found in Martha Vineyard sites. Art and ornamentation also appear to be scant aside perhaps from that which appeared in perishable forms such as basketry and woodwork. Neither does much evidence exist concerning magical or religious beliefs, except for a mortuary complex reported by Robbins (1960) at the Wapanucket site in eastern Massachusetts.

Subsistence depended on a number of resources in Southern New England and the Middle Atlantic States including mammals such as Virginia deer, black bear, raccoon, opossum, woodchuck, eastern and New England cottontail rabbits, otter, gray squirrel, red and gray foxes and also possibly wolves. A number of migratory birds, as well as turkey, grouse, passenger pigeon and waterfowl were also taken. The sea provided fish and mammals such as seals. Shellfish were also a very important dietary component, as were migratory fish species during the spring and fall (Tuck 1978:34–35).

Snow (1980:228) noted important differences between Mast Forest and Lake Forest subsistence. Pestles, manos and shallow mortars are much more typical for Mast Forest Archaic sites than for the Lake Forest Archaic. This indicates the processing of vegetal foods such as seeds, nuts, berries and roots; but Ritchie (1969:62) considered the most important of these would be acorn meal. Also as mentioned previously, while fishing technology is primarily represented by the harpoon, leister points and the gaff in the Lake Forest Archaic cultural area, the hook and line, as well as weirs and traps, are the dominate among fishing equipment used in the Mast Forest Archaic area (Snow 1980:229).

Snow (1980:230) also interpreted Mast Forest Archaic seasonal movements in the following way. Large coastal shell midden sites are fairly common and these probably represent summer habitations. Spring and fall fishing sites have also been recorded. Finally, back country hunting camps such as Sylvan Lake Rockshelter were inhabited during the winter.

Several Connecticut surveys have noted higher proportion of Mast Forest Archaic components compared to other time periods (McBride and Dewar 1981; Wadleigh 1978;

Swigart 1977). Cassedy (1999:131) reported on findings from Cultural Resource Management research on the Iroquois Pipeline project in the early 1990's; where 62% of all diagnostic projectile types from the Housatonic River drainage were recorded as Mast Forest Archaic types. Reeves and Forgacs (1999:56) noted a spike in the frequency of radiocarbon dates during the time period between 4,600 to 3,600 B.P., which includes the later portion of the Late Archaic and the first century of the Terminal Archaic as defined here, in Connecticut, Massachusetts and New Hampshire.

As was discussed in chapter three, caution has to be exercised in equating frequency of radiocarbon dates with population density, because cultural factors can be responsible for the production of relatively more dated features without any real correlation with population density. However, in the case of the Small Stemmed Point Tradition, several researchers providing regional synthesis have interpreted the high frequency of radiocarbon dates and cultural components to indicate a relatively high population density (Snow 1980:230; Dincauze 1975:25; McBride 1984:260).

In general Small Stemmed Point Tradition sites are frequent and occur in a wide variety of environmental zones. Dincauze (1973; 1974) concluded that parochial use of local lithic raw materials indicates that groups lived in fairly well defined territories. Operating from seasonal base camps located along major rivers, the settlement system included a complex pattern of seasonal moves and a diffuse subsistence strategy (McBride 1984:258). McBride (1984:262), who performed survey of the Lower Connecticut River Valley, gave the following description of Small Stemmed Point Tradition settlement and mobility patterns, "The available evidence on site distribution,

size, and type point to highly mobile groups seasonally exploiting a variety of ecozones and microenvironments."

McBride (1984:260) also pointed out that, "The size and nature of 'base camps' such as Woodchuck Knoll have been used to suggest larger population aggregations at certain times of the year." Alternately these sites may represent seasonal re-use over long periods of time. Information concerning seasonality and subsistence was available from the Woodchuck Knoll site in Connecticut, which McBride (1984:263) interpreted as a summer-fall occupation. Food resources identified from the Woodchuck Knoll site included goosefoot, walnut and hickory. McBride (1984:263) also reported on the Archaic Midden site, located in an intertidal zone in Haddam, Connecticut, where fresh water clam, small amounts of quahog and oyster, as well as white-tailed deer and unidentified mammal bone were recovered.

The Long Temporal Duration of the Small Point Tradition

An important issue that does arise in the context of the Small Stemmed Point Tradition in Southern New England is the long span of time during which these points were manufactured and used. Although this is not considered to be an issue which will interfere with the interpretation of West Rock Ridge data, it will be important to discuss this problem in some detail here.

Lavin and Russell (1985:54–56) observed that Small Stemmed points were found in the same stratigraphic levels as Middle Archaic and Middle Woodland types at the

Burwell-Karako site in East Haven, Connecticut. Their association with steatite and ceramics at this same site, verifies their presence in Early Woodland contexts. While Lavin and Russell's (1985) observations are very informative, questions still exist as to how to interpret their stratigraphic data.

I would argue that given the potential for artifact mixing due to frost-heave in Southern New England, some caution should be exercised interpreting stratigraphic data from the Burwell-Karako site. Small Stemmed points constitute of 1376, or 89%, of the total projectile points from the Burwell-Karako site. Random geological processes such as frost-heave certainly would have affected a far greater number of Small Stemmed points than other traditions simply because of their relative proportions. Diffusion in this case could result in artifacts from the densest layers becoming thoroughly mixed with those in layers above and below, especially when only a few artifacts could be found in these layers.

Waters (1992:92-93) defined cryoturbation, or frost heave, as "the disturbance of archaeological remains in a matrix that undergoes freezing and thawing." Waters (1992:294;Figure 7.2) gives the maximum depth of freezing in southern Connecticut as well over a meter, which is greater than the deepest levels at the Burwell-Karako site.

It is interesting that at the Burwell-Karako site only 14 Middle Archaic Neville and Stark points were found. Aside from the stratigraphic anomalies reported above for the Small Stemmed Point Tradition, 3 of the Neville and Stark points came from disturbed contexts, and 8 came from levels also containing Terminal Archaic types such as Snook Kill, Susquehanna Broad and Mansion Inn. Also, Lavin and Russell (1985:48–49) interpreted that 2 bifurcated based points, usually considered Early Archaic types,

were heirlooms in order to explain their provenience in layers that also contained Terminal/Late Archaic artifacts.

For these reasons, I would argue that the available radiocarbon database for Connecticut is a much more reliable means of determining the temporal span of Small Stemmed Points in Southern New England. According to Reeves and Forgacs (1999), the earliest radiocarbon date associated with the Small Stemmed Point Tradition in Connecticut is from the Firetown Meadow site (Feder and Banks 1996) which returned a date of 4610±80 years BP. The most recent date recorded was from the South Kent Rockshelter (Swigart 1976) which returned a date of 2350 ±125 years BP. The time span between these dates is about 2,300 years. A total of 36 dates associated with diagnostic projectile points of the Small Stemmed Point Tradition were reported from Connecticut's data base. Twenty-two fall into the Late Archaic (6,000 years B.P. to 3,700 years B.P.), 6 fall into the Terminal Archaic (3,700 years B.P. to 3,000 years B.P.) and 6 fall into the Early Woodland Period (3,000 years B.P. to 2,000 years B.P.).

My point in this research, however, is not to argue against the fact of the long temporal duration of the Small Stemmed Point Tradition. Nor am I trying to deny that long temporal duration affects the number of sites associated with this tradition, and therefore impacts interpretations of population density and mobility. I would argue, however, that the long duration of this tradition does not of itself explain the ubiquity of Small Stemmed Point Tradition sites in Southern New England. While chronological data are the basis upon which archaeologists make their conclusions, in this case it also can not be overlooked that the sheer numbers of Small Stemmed Point Tradition sites in

Southern New England warrant some consideration in terms of cultural and behavioral factors which can be responsible for this pattern.

I would agree with researchers such as Dincauze (1975) and Snow (1980) who interpret that the available evidence for frequency of Small Stemmed Point Tradition sites (as well as the number of radiocarbon dates associated with this tradition during the Late Archaic in Connecticut) leads to a conclusion that these hunter-gatherers lived at relatively high population densities. The issue which can not be overlooked here is the extent to which sites related to this tradition represents a fairly consistent cultural pattern throughout this duration. If the latter case is true, then the more important issue in terms of archaeological comprehension of hunter-gatherer adaptations would be to understand why this cultural pattern lasted as long as it did?

The Terminal Archaic Period

The Terminal Archaic in Southern New England is signaled by the appearance of the Susquehanna Tradition, the hallmark of which is the appearance of a series of broad bladed projectile points and associated drills, marking a distinct technological break from the Small Stemmed Point Tradition. Susquehanna points were not only larger, broader and heavier than Small Stemmed points, they were also typically manufactured from non-local chert, argillite, slate, or fine grained igneous rocks (Dincauze 1975:27). The early portion of the Terminal Archaic is also marked by the introduction of soapstone bowls,

while the later portion saw Southern New England's first clay pottery. Using Snow's (1980:235) period boundaries, it extended between 3700 BP and 3000 BP.

According to Tuck (1978:38), the introduction of soapstone bowls must have simplified the task of preparing vegetal foods. Snow (1980:240) noted that the preponderance of steatite bowl fragments occur in base camp sites along major streams, and adds that transportation of these heavy bowls from one site to another was probably facilitated by the use of dugout canoes (1980:250).

Both Tuck (1978:38) and Snow (1980:236) trace the origins of the Susquehanna Broad Point Tradition to projectile point types found outside of New England and New York State, such as the Lehigh Broad type from Pennsylvania, the Savannah River type from the Carolina Piedmont, and the Koens-Crispin type from the Delaware drainage. Tuck (1978:37) concluded that the Susquehanna Tradition had diffused into New England from a center along the coastline of the Middle Atlantic States. Snow (1980:247–248) does not consider this diffusion to represent a migration of people into Southern New England, but does regard migration as an appropriate explanation for the diffusion of Susquehanna Tradition traits into northern New England.

Snow (1980:236) considers Genesee points to be a part of the Susquehanna Tradition due to their generic resemblance to Snook Kill points, despite the fact that Genesee points have not been found in association with steatite bowls while other Susquehanna types have. In the Susquehanna River drainage a sequence of broad bladed points essentially spans the first half of the Terminal Archaic, including: Lehigh, Perkiomen, Susquehanna Broad and Dry Brook. These points have their analogues in New York and Southern New England, where the Snook Kill point is analogous to the

Lehigh Broad type. Also, in eastern New England Wayland Notched points are analogous to the Susquehanna Broad style, and Coburn points are analogous to Dry Brook points.

Ritchie (1969:157) noted a particularly riverine orientation for the Susquehanna Tradition, observing that all along the Susquehanna River drainage and throughout the Finger Lakes in New York, these sites were typically located on the first terrace above the main stream. Tuck (1978:37) also described an orientation of Susquehanna Tradition sites to major rivers and their tributaries. Turnbaugh (1975) went even further, suggesting that the location of these sites indicated a subsistence focus on migratory fish such as shad, and that this focal economy was a major reason for the rapid diffusion of this tradition. Snow (1980:252-253) offers a somewhat different interpretation, citing evidence (McBride,1978) for the usage of semi-domesticates such as the *Chenopodium* species, goosefoot and pigweed, and implying that a focus on gathering and storage of plant foods provided adaptive advantages in terms of a more stable and sedentary way of life.

Interestingly Parry (1989), offered a seemingly conflicting argument, pointing out that Susquehanna Tradition technology was organized using formalized cores with a major emphasis on bifaces, and indicating that this signaled a highly mobile way of life. However these apparently disparate points of view are actually compatible, considering Binford's (1980:17) observation that any factor leading to decreased residential mobility will add to the importance of logistical production.

Long term logistical forays on the part of Susquehanna Tradition cultures would require great mobility. In fact, the usage of long distance logistical journeys could

explain the availability of high quality lithic raw material from outside of the local area. Additionally, if Snow (1980:250) is correct concerning the reliance on dugout canoes for water transport, the distances available for these logistical forays could put them in reasonably close proximity to peoples with whom they could trade with to acquire these raw materials.

This conclusion is supported by McBride's (1984:282–283) examination of settlement pattern data from the Salmon Cove phase, a local manifestation of the Susquehanna Tradition in the lower Connecticut River Valley:

> This model suggests that the subsistence system would be characterized by a focal adaptation, perhaps associated with riverine resources. In such a system, large residence camps would be located adjacent to riverine areas, perhaps with smaller temporary camps and task-specific locations located in the floodplains and uplands. The existing settlement data do not suggest permanent residence in the riverine zones, and as a result we would expect a series of residential moves occurring within the riverine zone or dispersement into smaller groups at certain times of the year, perhaps to all three ecotones. The pattern described above suggests aspects of a collecting system as defined by Binford (1980).

In the above quote, McBride (1984:370) was contrasting Susquehanna Tradition settlement patterns with those of the Small Stemmed Point Tradition in the Lower Connecticut River Valley, the latter of which he classified as foragers. The relationship between the Small Stemmed Point Tradition and the Susquehanna Tradition in Southern New England has been a point of controversy. It appears that both of these traditions co-existed in this area during the Terminal Archaic. Tuck (1978:36) interpreted the available evidence to indicate an intrusion into the area by Broad Spear cultures coming from the southeast. He cited Ritchie's (1969) work from Martha's Vineyard in which

Susquehanna Tradition point styles were found in layers devoid of shellfish, and that these layers intervened between Small Stemmed Point Tradition layers, both above and below, associated with abundant shellfish.

Snow (1980:247) does not agree with this opinion. Instead, he considers that only Susquehanna Tradition projectile points were grafted on to a basically Mast Forest Archaic way of life in Southern New England. According to this scenario the dominance of Susquehanna Tradition point styles temporarily swamped out those of the Mast Forest Archaic, the latter of which resurface again during the Early and Middle Woodland Periods in the form of Greene and Rossville points; which like Small Stemmed points were typically chipped from local quartz and that also bear some morphological similarities.

Evidence of a mortuary ritual is well documented for Susquehanna Tradition cultures of the Terminal Archaic in Massachusetts (Dincauze 1968).

According to Tuck (1978:38), the later portion of the Terminal Archaic was characterized by the appearance of the first ceramic vessels in Southern New England, a style referred to as Vinette I, and also by relatively narrow bladed projectile points often made of local quartz having characteristic fishtail shaped bases, diagnostic of Ritchie's (1965) Orient phase and referred to as Orient Fishtail points. However, in other parts of New York, New Jersey and Pennsylvania Orient Fishtails are often manufactured of the same lithic raw material types as Susquehanna points, in fact intergrading and appearing to represent narrow versions of this later type. Orient culture sites in Long Island also document extensive exploitation of shellfish during the later portion of the Terminal Archaic (Tuck 1978:38).

The Terminal Archaic, as defined by Snow (1980:235) coincides with what was once referred to as the Transitional Period (Witthoft 1949). This later term was used to describe a stage of cultural development when preceramic peoples utilized soapstone bowls, and this was thought to inspire the later independent invention of pottery in the Northeast. According to Snow (1980:240) this designation is no longer appropriate, because archaeologists now know that pottery was being made in the Southeast prior to 4,000 B.P., and independent invention is not necessary to explain its appearance in the Northeast during the Terminal Archaic Period. While Snow's (1980) observation is correct, alternate interpretations are possible. The earliest pottery style in the Northeast (Marcy Creek Plain) is suggestive of independent invention not only because this early ware was tempered with steatite, but also because they were shaped essentially to mimic those soapstone bowls which were their predecessors.

The Early and Middle Woodland Periods

The Early (3000 B.P. to 2000 B.P.) and Middle Woodland (2000 B.P. to 1000 A.D.) Periods are no less confusing in their definitions than was the Terminal Archaic. This is also the case for similar reasons. Many archaeologists have used these terms to describe a cultural developmental stage: one marked by the technology to make fired clay pots along with the introduction of horticulture. Neither of these criteria defines the Early and Middle Woodland Periods temporally. As described in the previous section, Orient cultures of the Terminal Archaic Period already possessed Vinette I clay pots.

Although many of the cultures of the Northeast did adopt horticulture based upon domesticated maize at this time, it appears that cultures in Southern New England lagged behind to some degree, and regardless horticulture was not universally practiced throughout New England at the time of European contact (Snow 1980:261–262).

Cultural developments at this time in Southern New England diverged in other important ways from what was occurring elsewhere in Eastern North America. The Adena culture asserted its presence in its Ohio heartland, with its elaborate mortuary cult and spectacular burial mounds, while along coastal New York and Southern New England a basic "Archaic" way of life persisted. According to Cantwell and Wall (2001:92), the lack of similar developments along coastal New York may not have represented any backwardness on the part of these peoples, as much as it was a factor of a productive environment which made cultural complexity unattractive to them. They also warned that impressions of these Early and Middle Woodland societies should not be tempered by Anglo-European notions concerning the value of dominance and competition.

Smith (1950) provided the earliest chronology for the Woodland Period in Southern New England. Using nothing but pottery and basing his chronology on the McKern system, Smith (1950:146) interpreted that all of coastal Southern New England and Long Island represented a single ceramic tradition early on which he defined as the Windsor Tradition. During the Early Woodland Period the East River Tradition, representing cultural elements entering from the south and west, replaced the Windsor Tradition in the eastern portion of this region. According to Rouse (1980:67), developments in central and eastern Connecticut (including South-Central Connecticut)

sprang from the earlier of these traditions which using the McKern system, is referred to as the Windsor aspect.

In turn the Windsor aspect was divided into the following foci, which are listed here from the earliest to the most recent: Orient, North Beach, Clearview, Sebonac and Niantic (Smith 1950:129). Using the terminology of this text, Smith's North Beach focus is approximately contemporaneous with the Early Woodland Period, and the Clearview focus approximates the Middle Woodland Period.

Ritchie (1069) identified the Lagoon complex of the Early Woodland Period at Martha's Vineyard in Southern New England. Diagnostic artifacts of Ritchie's (1969) Early Woodland Lagoon complex included Vinette I pottery associated with Lagoon and Rossville projectile points. Vinette I pottery was also found at earlier Terminal Archaic sites associated with the Orient phase.

According to Snow (1980:279) only a tentative interpretation of Early Woodland subsistence and settlement is possible in southern New England, because the vast majority of identified sites are small coastal campsites and these do not represent the entire seasonal rounds. Smith (1950:135) noted the importance of shellfish and deer to the diet. McBride (1984:296–297) reports a variety of shellfish from the Waldo Hennessy site in Branford where abundant remains were identified, but stresses that other faunal species such as porcupine, mallard, egret and deer were present, and that meat from these game animals represented a much larger dietary component than shellfish.

Snow (1980:278) suggests that Early Woodland cultural patterns in Southern New England were essentially a continuation of a basic pattern established during the Mast Forest Archaic. McBride (1980:298) concluded that mobility patterns for Early

Woodland peoples of the Lower Connecticut River Valley represented a return to a foraging strategy; which is similar to his interpretation of the Late Archaic Small Stemmed Point Tradition and in contrast to the use of a collecting strategy on the part of the Susquehanna Tradition during the Terminal Archaic.

Juli (1999:144) reported a strong argument for cultural continuity between the Late Archaic and Early Woodland Periods in Connecticut with Small Stemmed Points made from local quartz in association with Vinette 1 ceramics.

The Middle Woodland Period coincides with Smith's (1950) Clearview focus. McBride (1984:309–310) described a shift in mobility strategy once again for the Middle Woodland Period. Similar to the trend noted for the Terminal Archaic, there is once again a tendency for logistical exploitation of lowlands, indicating that a collecting strategy was utilized. Storage pits are found more frequently at habitation sites, which are once again focused along riverine zones in the Lower Connecticut River Valley. Sites are more numerous and larger and appear to represent increasing sedentism relative to the previous Early Woodland Period (McBride 1984:309). McBride (1984:306) also notes that despite an expectation that introduction of cultigens would greatly impact settlement and subsistence during the Woodland Period, no evidence of domesticated cultigens predates 1000 A.D. in Southern New England.

Funk (1968) identified the Fox Creek Phase corresponding to the Middle Woodland Period in eastern New York. This manifestation was centered on the New York coastal region and along the Susquehanna, Schoharie and Hudson River Valleys (Ritchie and Funk 1973:356). In addition to Middle Woodland pottery types the diagnostic artifacts of this phase were Fox Creek ("Cony" points), Greene, Jack's Reef

Corner-Notched and Jack's Reef Pentagonal points, as well as Petalas blades, the latter of which Funk believed were associated with processing of sea sturgeon (Ritchie and Funk 1973). Ritchie (1969:226) identified similar projectile point associations for the Middle Woodland Period of Southern New England from his work on Martha's Vineyard.

The Late Woodland Period

Distinctive developments occurred in central New York's Mohawk Valley during the Late Woodland Period (1000 A.D. to 1600 A.D.) that would distinguish this area from Southern New England. Ritchie (1965) identified the Owasco and Iroquois Traditions, the later of which he divided into three phases: 1) Oak Hill, 2) Chance, and 3) Garoga. With almost complete certainty the origins of the Historical Period Iroquois culture can be traced as far back as the Owasco Tradition (Snow 1980:308–309). This area of the northeast saw a strong trend throughout the Late Woodland leading to: 1) large, nucleated, semipermanent settlements, often located on hilltops and having palisades built around for defensive purposes, 2) strong reliance on horticulture, 3) and an evolving political organization based on clearly defined lineages.

Southern New England also witnessed important cultural changes throughout the Late Woodland: but nowhere was dependence on horticulture as pronounced or settlements as large or nucleated as they were for the Iroquois. Nor does it seem likely that the complex political organization of the Iroquois with its three dominant clans, was exactly duplicated anywhere else in the Northeast.

Using Smith's (1950) chronology the Late Woodland begins with the Sebonic phase, followed by the Niantic phase somewhere after 1500 A.D. Diagnostic ceramics of the Sebonic phase were Windsor Brushed, Windsor Fabric-marked, and Windsor Cord-marked. Levanna Triangular projectile points dominate throughout the Late Woodland, but gradual replacement by smaller Madison Triangles begins to occur towards the end. Sebonic sites are typically located on well-drained ground along bays and estuaries and near to shellfish beds. People lived in circular wigwams and utilized a diffuse pattern of subsistence. By the time of European contact this economy consisted of shellfish, deer and smaller mammals, migratory fish, wild vegetal foods and maize throughout Southern New England. Storage pits were common and people fished using dugout canoes that were manufactured with woodworking tools such as ground stone axes, celts and adzes. Mortuary practices included flexed primary interments with few burial goods, mirroring events of the Iroquois culture and an overall trend that would persist into the Contact Period, of unelaborated burials (Snow 1980:324–325).

Smith's (1950) Niantic phase, which marks the end of the Late Woodland Period, can only truly be distinguished from the preceding Sebonic phase due to the incorporation of a set of Iroquoian pottery types into the overall ceramic technology (Snow 1980:325).

In the Lower Connecticut River Valley, McBride (1984:322) notes a continuation of cultural developments already identified for the Middle Woodland. He described Late Woodland settlement patterns in the following way (McBride 1984:326):

> Settlement patterns for the period A.D. 800-1500 in southern New England are thus characterized by: 1) aggregation in coastal/riverine areas; 2) increasing sedentism, and 3) use of upland areas by small groups of individuals organized for specific tasks.

McBride (1984:328) further stated that a collecting mobility strategy continued to dominate at this time. Concerning the issue of horticulture, McBride (1984:323) stated that only a single kernel of maize had been recovered during his work in the Lower Connecticut River Valley, which had been dated to 1500 A.D. Although he admitted that it is unlikely that this evidence represents the earliest cultigens, he went on to state that if archaeologists are to infer that the tendency toward population aggregation and sedentism was associated with the introduction of horticulture, that earlier evidence of domesticates should be present (McBride 1984:323).

The Archaeological Record of South-Central Connecticut

The archaeological record of the Greater New Haven area is examined in terms of three sources: 1) three published reports, 2) information gleaned from the site files for Connecticut, housed at the Office of the State Archaeologist (OSA), and 3) information provided by local researchers and informants. The availability of information from South-Central Connecticut illuminates the potential importance of the West Rock Ridge survey for providing an archaeological baseline of information for the Greater New Haven area. The information is surprisingly scanty and consists mostly of uninvestigated sites and surface collections made by local amateur collectors.

West Rock Ridge is not the only prominent trap-rock formation in New Haven, Connecticut. In fact, Dana (1891) described four rocks: West Rock, East Rock, Mill Rock and Pine Rock. Additionally a fifth rugged trap-rock formation, Mt Carmel, whose silhouette when viewed from the horizon resembles a recumbent giant, and therefore has earned the name "the Sleeping Giant"; looms further to the north in Hamden. Although none of these trap-rock formations is as large as West Rock, another of these rocks, Pine Rock, is the location for what MacCurdy (1914:9) described at the time when he investigated the site, as the most important of Connecticut's rockshelters.

Pine Rock cave formed because of the dissolution of the sandstone layer that underlies a tilted basalt dike. Like West Rock, the trap-rock forming Pine Rock had been injected between softer brownstone layers. But Pine Rock represents a dike, meaning that the magma which formed it originally forced its way through fissures perpendicular (flowing upward) to the ground surface. Later this trap-rock mass tilted, giving the erosion resistant basalt roof an inclination of 35º to 40º. Trap-rock is highly erosion resistant, one of the reasons why no rockshelter sites were encountered during the West Rock Ridge survey. But sandstone erodes very easily and as a result the underlying sandstone eroded away leaving the trap-rock to form the roof of a large cave. MacCurdy (1914:11–12) describes the maximum overhang as about fifteen to twenty feet, extending for 100 feet in width over the habitable portion of the site.

A number of artifacts were collected at the Pine Rock Rockshelter site, including an atlatl weight, a semi-lunar knife, gouges, axes, adzes, drills, knives, pottery sherds, steatite bowl fragments, bone points and a variety of stone projectile points. Unfortunately, all of the artifacts came from the hands of local collectors and none are

associated with any data concerning their stratigraphic provenience. The cave was destroyed, not shortly after MacCurdy (1914:14) had been informed of its archaeological value, by an extra charge of dynamite from nearby trap-rock quarrying activities.

MacCurdy (1914:12-14) believed that the cave's prehistoric occupants had arrived shortly after the recession of the late Wisconsin ice sheet. He based this opinion on three observations: 1) a thick layer of black ash and artifacts resting right on top of the sand floor that had since been covered by a thick talus deposit, 2) the presence of bones from Wapiti (*Cervus Canadensis),* and 3) the presence of a type of snail (*Littorina irrorata),* which is no longer found north of the Florida coast. This later of these observations may be explainable by Braun's (1974) research concerning changes in sea level and temperature and their affect on available shellfish species. Indeed the presence of *Littorina irrorata* was noted by Sargeant (1952:14) at the Grannis Island site located along the Quinnipiac River in New Haven. The earliest known component at Grannis Island, as will be discussed below, was from the Middle Archaic Period (8,000 to 6,000 B.P.)

Despite MacCurdy's (1914) observations above, examination of the figures provided in his report suggests an initial occupation no earlier than the Late Archaic. Identifiable projectile point types included Brewerton Side-Notched, Brewerton Eared-Triangle, Wading River, Sylvan Side-Notched, Snook Kill, Rossville, Greene and Madison; spanning the Late Archaic, Terminal Archaic, Early Woodland, Middle Woodland and Late Woodland Periods. Therefore the cave had been occupied over a very long period of time. Considering the enormous amounts of artifacts that had come from the cave's spoils, that were not available to MacCurdy (1914:11–12) because they

were in the hands of unidentified collectors, the possibility is that earlier artifacts had once been present.

A wealth of faunal remains were identified from the Cave's deposits, these included: bear, raccoon, dog, lynx, gray fox, beaver, squirrel, field mouse, turkey, white-tailed deer, white-footed mouse, snapping turtle and blackfish. Identified shellfish species included *Ostrea virginiana, Venus mercenaria, Peten irradians, Mya obsolete, Tritia trivitatta, Balanus eburneus, Crepidula convexa, Crepidula fornicate, Littorina irrorata* along with common land shells (MacCurdy 1914:14).

Grannis Island is a low mound of glacial debris that becomes an island at high tide, and is located about one and a half miles from the mouth of Quinnipiac Bay. The Quinnipiac River (Figure 4.1) at this juncture experiences significant tidal influences, and the difference from low to high tide is about 5 feet. The island is composed of clear sand overlying a layer of sand and pebbles. This later layer was apparently spread uniformly throughout Connecticut's Central Lowlands by late glacial meltwaters. Sargent (1952:35) was able to recognize two cultural layers, although the division between these two was admittedly arbitrary. The lower layer which he referred to as Zone 1, occurred in the clear and compact sand lying just above the sand and pebbles. Sargent (1952:46–47) interpreted this lower level as the pre-ceramic layer, as it lacked pottery sherds as well as steatite bowl fragments. The upper cultural layer was described by Sargent (1952:35) as a shell deposit, which he labeled Zone 2. This zone was the ceramic layer and it belonged to the Terminal Archaic/Woodland Periods.

Sargent (1952:48–49) compares some of the materials found from the site to weathered argillite points found in the Susquehanna drainage, these presumably were

broad points of the Susquehanna Tradition, one example of which is given as figure 6b (Sargent 1952:39) which resembles a Snook Kill point but is stratigraphically from the lower level. This evidence and the presence of steatite bowl fragments located intermediately between the pre-ceramic and ceramic levels, is suggestive that the site was occupied during the Terminal Archaic. Sargent (1952:46) also identified Vinette I pottery, as well as what he believed was Niantic ware and a possible intermediate type. Niantic ware would date the site to the later portion of the Late Woodland Period, while Vinette I and an intermediate type are at least suggestive that the site may also have been occupied throughout Early and Middle Woodland times.

Although Sargent (1952) described the site's lithic artifacts before the advent of formal typologies for the Northeast, from his drawings several diagnostic Late Archaic projectile point types can be identified for the pre-ceramic level. These included Wading River, Sylvan Side-Notched, Brewerton Eared-Triangle and Brewerton Corner-Notched. Finally, Sargent (1952:46) considered at least some of the European artifacts to coincide with the Native American occupation, indicating the site was also utilized during the Contact Period (sometime after about 1600 A.D.).

A secondary locus was also discovered below the marshland that had formed along the outskirts of the island. Sargent (1952: 48–49) speculated that this workshop was occupied before the sea level had risen significantly, as the locus is presently four to five feet underwater during high tide. Information from the site files for the State of Connecticut indicates that this component is of Middle Archaic age.

Sargent (1952:46–48) interpreted the site as a seasonally occupied camp that would have been utilized in the processing of shellfish. Several hearth features

containing a lower layer of pebbles forming a flat surface, fire reddened soil and rocks, along with shell and/or ash, were interpreted as clam baking pits. Sargent (1952:34) did not consider the site suitable for winter habitation, exposed as it was on all sides to cold winds and inclement weather. The site's occupants also conducted a variety of hunting activities. Faunal remains pertaining to the Native American habitation included rabbit, squirrel, meadow mouse, muskrat, mink, raccoon, dog, bearded seal, seal, white-tailed deer, cormorant, bald eagle, blue winged teal, duck (possibly a mallard), oyster, scallop, mussel, channeled whelk, soft-shelled clam, and snail (Sargent 1952:38).

The Grannis Island site, therefore, probably represents a seasonal habitation that may have been utilized from Middle Archaic times to the Contact Period (8,000 years ago till sometime after 1600 A.D.); although the Middle Archaic workshop may well represent a functionally different type of site than was the case for the shell midden occupations which were described above.

The final published report for New Haven, Connecticut is the Burwell-Karako site (Lavin and Russel 1985). The Burwell-Karako site is located in East Haven, about 300 meters southeast of where the Quinnipiac River empties into New Haven Harbor. The site is located just to the east of the location of the former Historical Period Quinnipiac Reservation. Between the site and the former reservation there also once ran a brook that was fed by two springs. Lavin and Russell (1985:45) interpreted the site as a multi-component camp and cobble reduction workshop. Diagnostic artifacts from the Burwell-Karako site span from the Early Archaic to the Historical Contact Periods (10,000 years ago till some time after about 350 years ago). Once again, here is an example of a site that was reoccupied over a very long period of time.

The oldest artifacts from Burwell-Karako were two bifurcated base points that Lavin and Russell (1985:48–49) did not conclude represented a distinct occupational component. Instead they were interpreted as representing heirlooms that were found and saved by later peoples. This interpretation, in part, was based on the stratigraphic provenience of the bifurcates, which were located at the junction of the humus and lower yellow sand layer. This junction was associated with artifacts from the Terminal/Late Archaic Periods.

The Middle Archaic occupation was much more substantial representing a total of 12 Neville and 2 Stark points. Lake Forest Archaic types such as Brewerton Side-Notched, Brewerton Eared-Notched, Brewerton Corner-Notched, Brewerton Eared-Triangle and Vosburg were also well represented including 32 total specimens. Lavin and Russell (1985:51) concluded that the Lake Forest component represented a distinct occupational episode, which is at odds with Snow's (1980:227) interpretation of a marginal zone of tension where cultural traits but not people diffused across the boundary between Mast Forest and Lake Forest Archaic adaptations.

The Small Point Tradition from the Burwell-Karako site, however, was extensive including 1376, or 89%, of the total excavated projectile points. Lavin and Russell (1985:52) referred to the Small Stemmed Point Tradition component as the Narrow Point Tradition of the Burwell-Karako site, and noted that while these points clustered in Late/Terminal Archaic levels that they were also found in the deepest layers, at times stratigraphically below Neville points as well as in layers associated with Terminal Archaic and Early Woodland points. My own critical interpretation of this stratigraphic

data was provided in an earlier section of this chapter named, “The Long Temporal Duration of the Small Stemmed Point Tradition”.

Fragments of steatite bowls; pottery types such as North Beach netmarked, Clearview stamped, Shantock Cove incised, Windsor fabric-marked, East River cordmarked, Sebonic stamped, Niantic stamped, Niantic stamp and drag, Niantic punctuate, and Niantic linear dentate; and projectile points such as Snook Kill, Perkiomen, Susquehanna broad, Wayland notched, Mansion Inn, Boats, Orient, Meadowood, possible Greene and Rossville, Fox Creek stemmed, Levanna and Madison document the occupation of the Burwell-Karako site throughout the Terminal Archaic, Early, Middle and Late Woodland Periods (Lavin and Russell 1985).

Holly Cuzzone (personal communication 2006) volunteered information concerning the Cove River site, located on the floodplain of the Cove River about a mile from the coastline on Long Island Sound. Holly is a graduate student at Yale University in New Haven, Connecticut, and she reported that the site is a multi-component camp site occupied from Early Archaic through Late Woodland times.

Another informant who provided vital information was Simon Donato (personal communication 2002). Simon grew up in the local area and one of his favorite pursuits as a youth was finding prehistoric artifacts. One spot where this pursuit was well rewarded was a place labeled the “flats” by local inhabitants. This was the name given to an extremely level section of West River Valley. West Rock’s precipitous cliff face rises above this valley, and views of its tall columnar basalt joints glowing red in the late summer sun are visible along most of its length, especially so at the section where Donato made his collection. The flats are partly a result of the glacial scouring of the soft

sandstone (brownstone) bedrock, and partially the result of the massive outpouring of glacial floodwaters that left thick layers of stratified drift to cover the valley. The Donato site represents artifacts collected in the plowed fields of a local farm located in the "flats".

The Donato collection included 78 complete or nearly complete Levanna points, many of which were manufactured from sandstone that metamorphosed in contact with cooling magma that formed the trap-rock ridges. Technically this material is referred to as a maroon hornfels. These points are depicted in Figure 7.1. Of particular note is a specimen that can be found in Figure 7.1 on the second row from the bottom and all the way to the right. This is an example chipped from the locally available metamorphosed sandstone. It is a complete specimen and appears to have been chipped into the shape of a bear. This possible bear effigy may represent a rare example of the symbolism and beliefs of South-Central Connecticut's prehistoric inhabitants.

Figure 7.4 depicts holed slate pendants, collected from the same site. The slate from which these pendants were made is found naturally in abundance in the same field where the site was located. These artifacts add to knowledge concerning the art and ornamentation of South-Central Connecticut's ancestral Native American inhabitants. Other diagnostic projectile point types include a white quartz bifurcate (Figure 7.5), a red jasper Stark point (Figure 7.6), an extensive Mast Forest Archaic assemblage of small-stemmed points, Brewerton Side-Notched (Figure 7.6), Vosburg (Figure 7.6), Mansion Inn and Boats blades (Figure 7.5), Rossville and Meadowood points. This range of point types indicates the site was occupied from the Early Archaic through the Late Woodland Period. White quartz stemmed points of the Mast Forest Archaic, or what is referred to in

Figure 7.1: Levanna Points from Donato Site

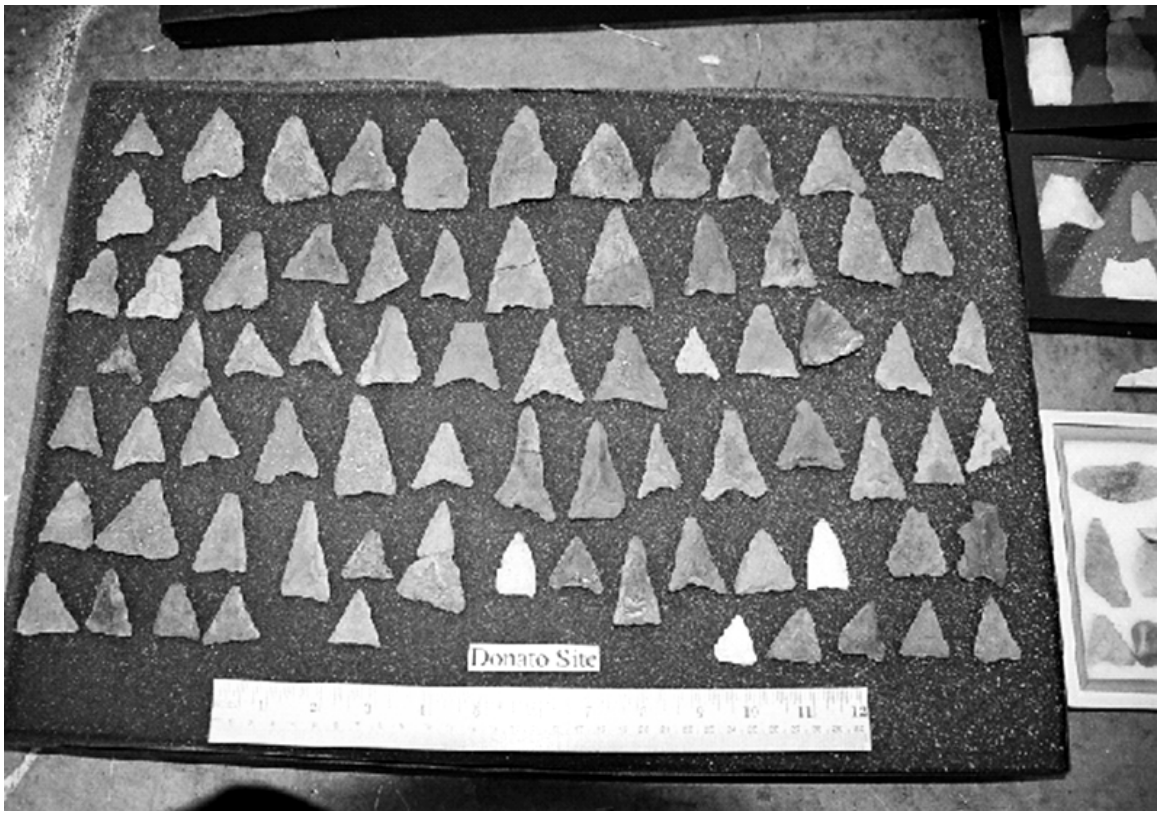


Figure 7.1 is a photograph of complete or nearly complete maroon hornfels Levanna points from the Donato site in Woodbridge, Connecticut. All the way on the right, on the second row from the bottom is an apparent "bear effigy" chipped from hornfels and appearing similar to the Levanna points in every way except for its distinctive form.

Figure 7.2: Quartz Stemmed and Triangular Points from Donato Site

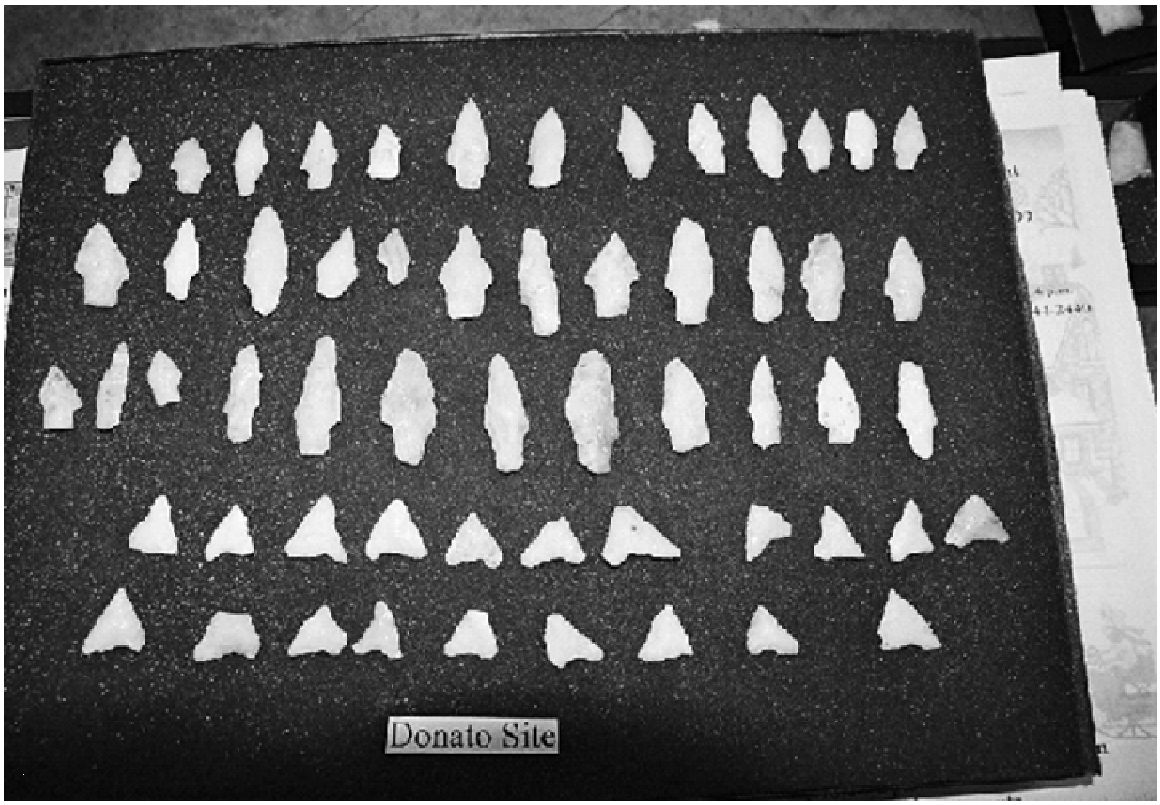


Figure 7.2 is a photograph of quartz Small Stemmed Points from the Donato site. The bottom two rows are quartz triangular points several of which are similar in shape to Levanna points depicted in Figure 7.1, and therefore should be grouped with these.

Figure 7.3: Celts, Gouge and Hoes

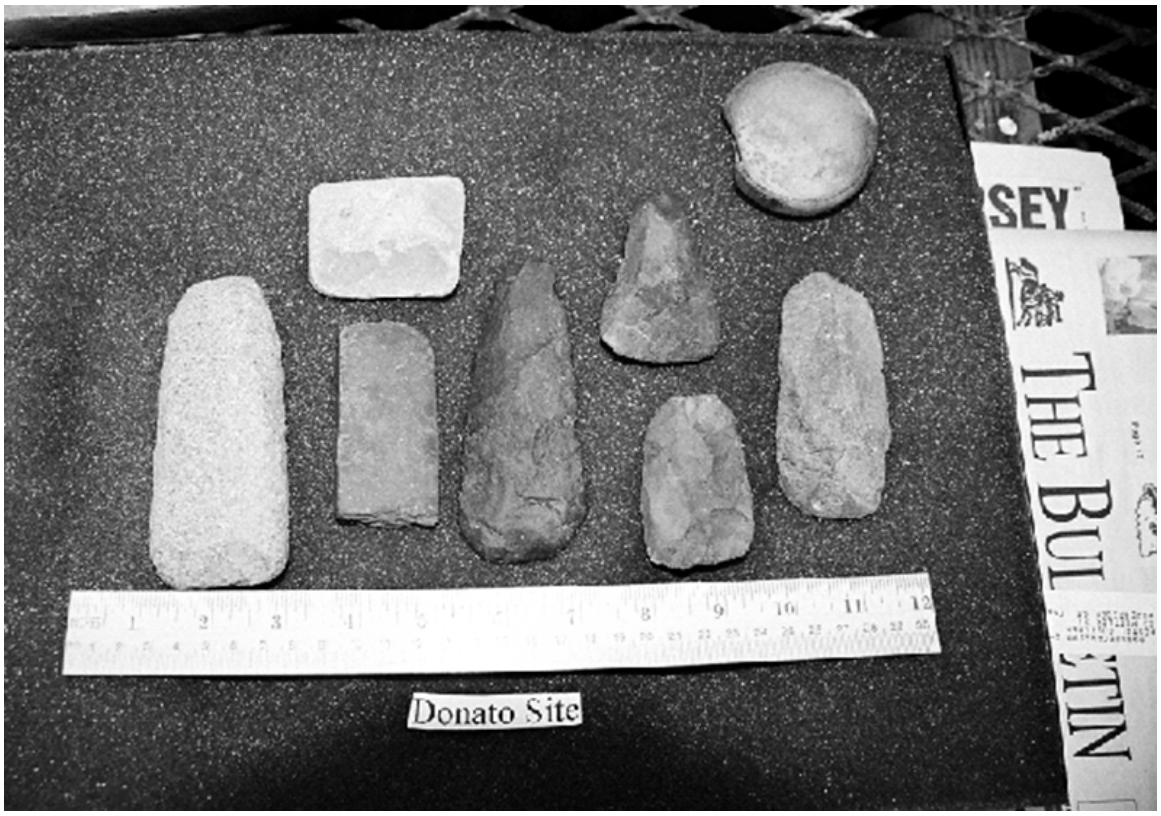


Figure 7.3 is a photograph of various chipped and ground stone tools from the Donato site. Of particular importance are those artifacts on the bottom row all the way to the right, and in the middle (third from right). These may be hoes, the one on the right manufactured from sandstone and the one in the middle chipped from chert. The artifact on the bottom row left is interpreted as a celt, the second from the left as a gouge, the second from the right on the bottom row was interpreted as an adze, as was the artifact above it, the other two are somewhat anomalous pieces, the round object in the upper right hand of the photograph may be a sharpening stone and the flattish pieces in the second row on the left may be a whetstone.

Figure 7.4: Holed Slate Pendants

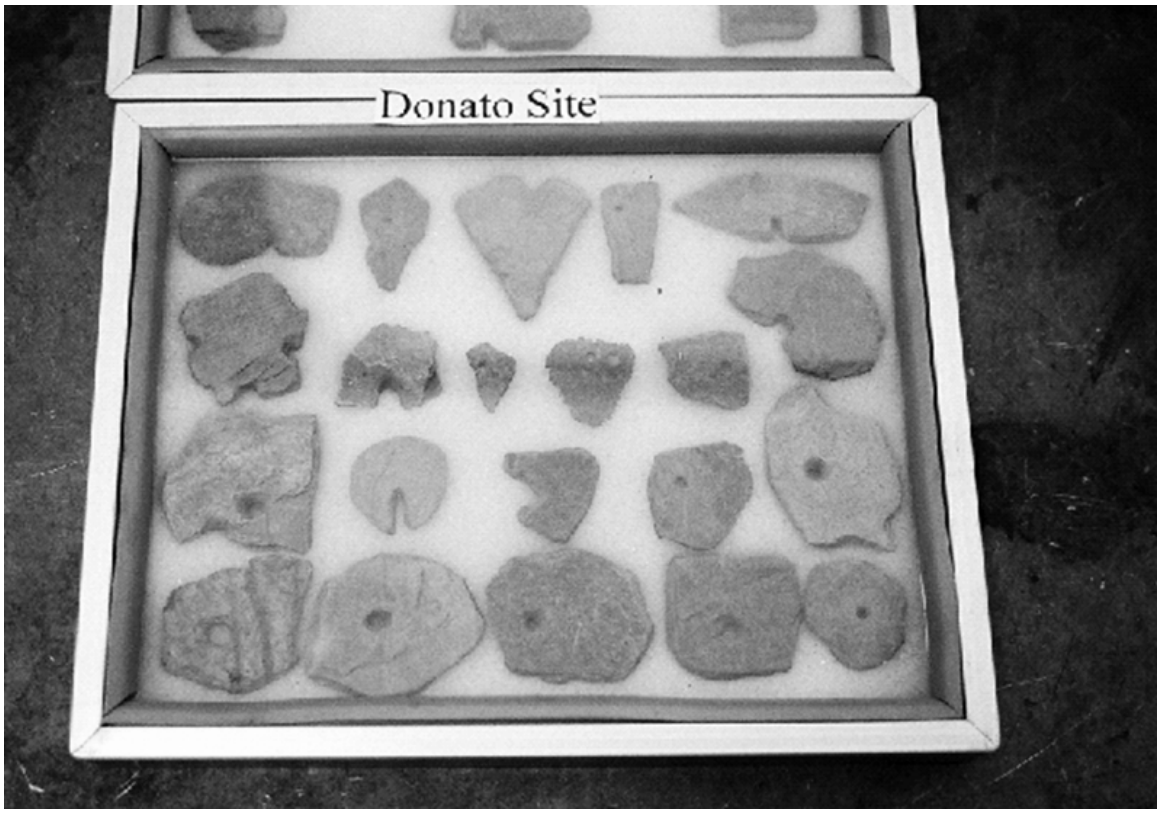


Figure 7.5: Bifurcate, Lanceolate, and Large Bifaces

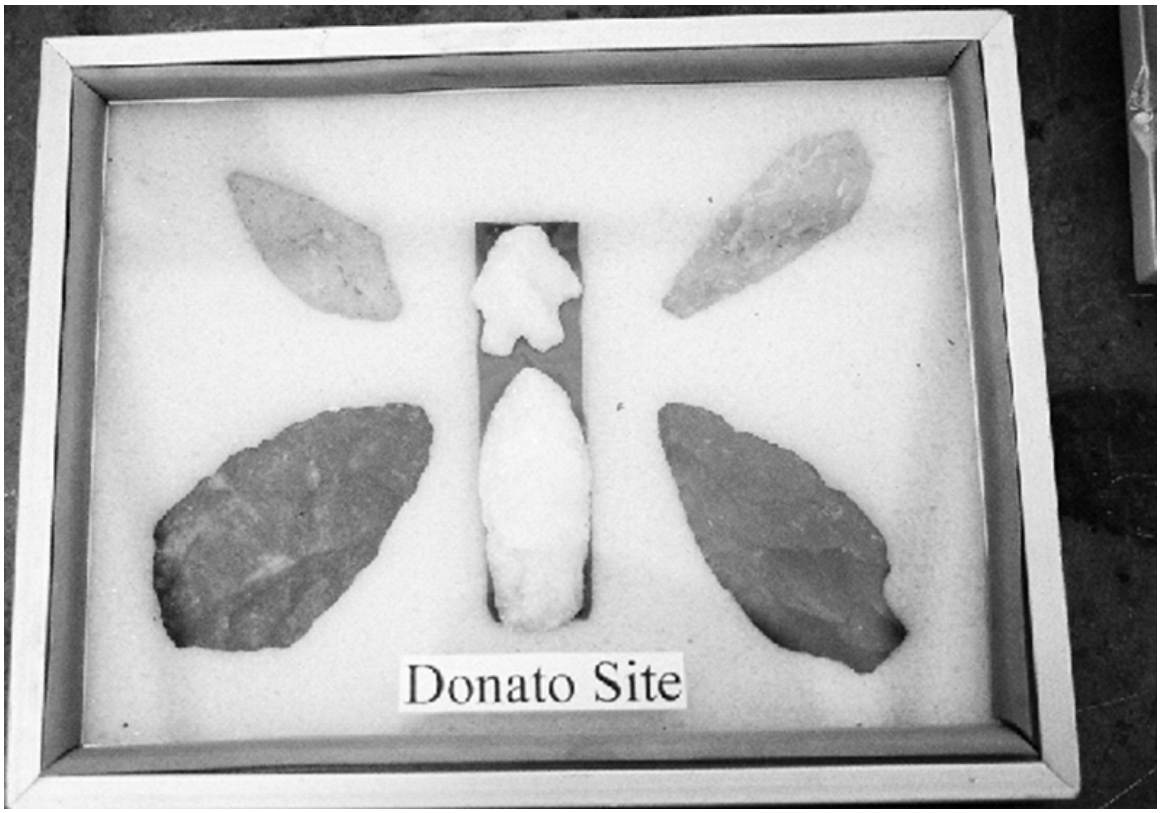


Figure 7.5 is a photograph of a quartz bifurcated based point from the Donato site, which is the point located in the top of the middle row, below it is a quartz lanceolate point and on either side of the bottom row are large blades which probably represent Mansion Inn or Boats blades.

Figure 7.6: Various Projectile Types

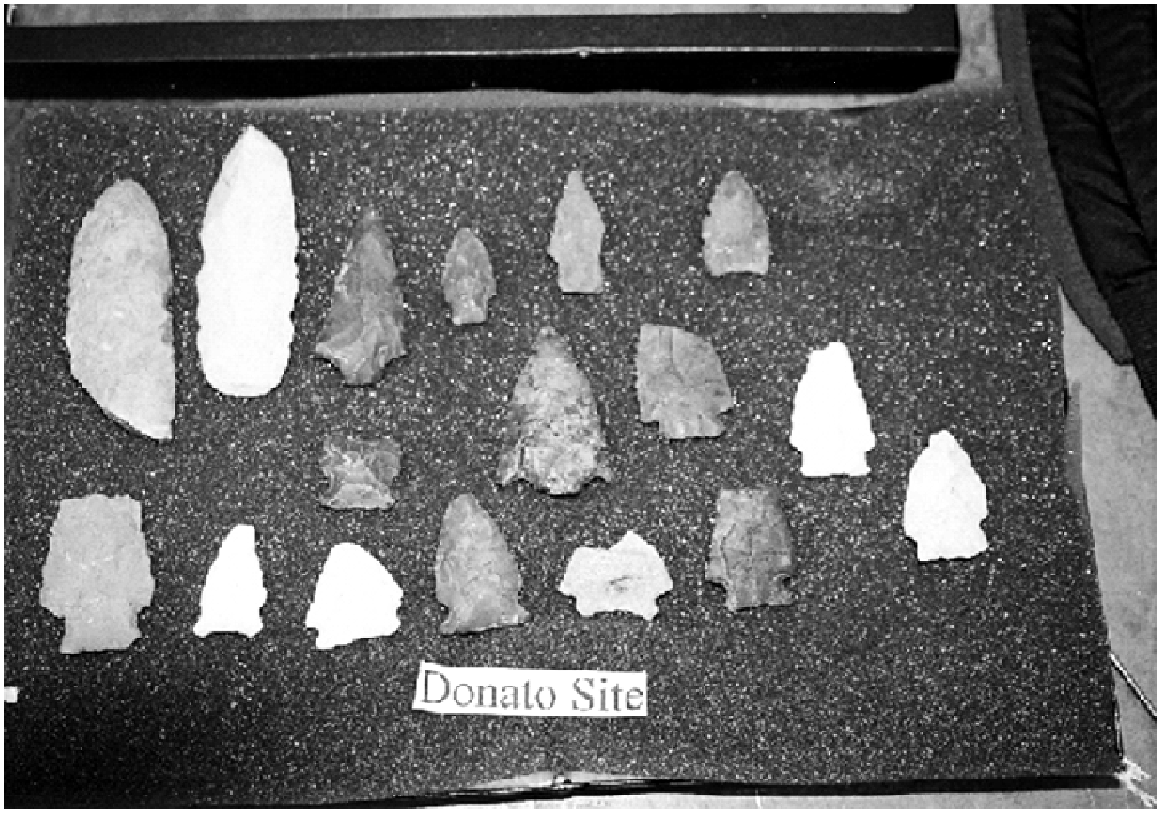


Figure 7.6 is a photograph of various projectile point types from the Donato site. On the bottom row from the left are a Brewerton Side-Notched, Brewerton Eared Notched, Brewerton Corner Notched, Brewerton Side-Notched, possible Brewerton Eared Notched, and two Brewerton Side-Notched points. Second row from left is a basal section of a Meadowood point, an untyped notched based variety, a Vosburg, and a Brewerton Side-Notched point. Top row from the left are two bifaces, while the third point from left top row is a red jasper Neville point, the next two types are Small Stemmed Points while the final appears to represent a Port Maitland Triangle.

this report as the Small Stemmed Point Tradition are depicted in Figure 7.2 (top three rows). The bottom two rows are quartz triangular points that bear similarity to the Late Woodland Levenna triangles depicted in Figure 7.1 and probably should also be included in this category.

Also of interest is a collection of large ground and chipped stone artifacts depicted in Figure 7.3. These include a celt, (on the bottom row left), a gouge, (bottom row, second from the left) and two artifacts, which bear resemblance to hoes. The first is a possible chipped stone hoe manufactured from chert (bottom row middle) and the other is a cruder sandstone specimen (bottom row, right).

Analysis of Site Files for South-Central Connecticut

Finally, information concerning prehistoric sites in South-Central Connecticut was gleaned from the site files housed in the Office of the State Archaeologist (OSA). This exercise was productive for understanding local prehistory, but information obtained in this way was usually limited to surface finds and often reported by non-professionals. However, interaction with professionals was provided when sites were reported and so all available information was recorded in a consistent and professional manner. Most typically, chronological information was restricted to identification of diagnostic artifact types, and site locations were reported accurately enough so that general information about the environmental context could be ascertained.

The site files were checked for the following towns: Branford, North Branford, Wallingford, Hamden, East Haven, North Haven, West Haven and Woodbridge. A total of 71 prehistoric sites were recorded for these towns and 84 cultural components were identifiable from these sites. These could be broken down into identifiable cultural components in the following way: 5 Early Archaic (6.0%), 2 Middle Archaic (2.4%), 26 Small Stemmed Point Tradition (31.0%), 11 Lake Forest (13.1%), 16 Terminal Archaic (19.0%), 9 early Woodland (10.7%) and 5 Middle Woodland (6.0%) and 10 Late Woodland (11.9%). However, it must be reiterated that because these sites for the most part represent surface collections, the identification of a single diagnostic projectile point was considered a component in the context of this analysis.

A total of 29 sites were multi-component, and at least four of these were noteworthy. Three were located at Quinnipiac Bay and another was positioned adjacent to the Quinnipiac River and about three miles north of the bay. The Waterfront site was located about 250 meters from New Haven Bay and represented an important site that unfortunately was well known to collectors all over the Northeast. The site is known to have been occupied at least from the Early Archaic through the Late/Terminal Archaic. Two other sites adjacent to New Haven Bay were occupied from the Late Archaic to the Late Woodland and from the Late Archaic to the Middle Woodland Period respectively. One inland site was located along the Muddy River and within a few hundred meters of the Quinnipiac River, which was occupied from the Late Archaic through the Early Woodland.

Distributional patterns are difficult to identify from the information available from the state files, but at least a few observations are worth mentioning. Late Woodland sites

are definitely clustered along the coastline, both adjacent to Quinnipiac Bay and all along the coast to the east in Branford.

A surprising number of Early Archaic components were identified, although most of these represent isolated surface finds, so it is difficult to interpret their meaning. Four of the five Early Archaic components were located in the Valley of the West River (Figure 4.1), and one was adjacent to Quinnipiac Bay. However, caution should be exercised in interpreting this distribution, because the large number found in the West River Valley may be due to the fact that a fairly large amount of farmland is present there. Recently plowed farm fields were a favorite spot for local collectors to find relics.

The South-Central Connecticut Lowlands (Figure 4.2) is part of what Funk (1978:20) considered to be the northern extension of the Middle Atlantic deciduous forests, which in Early Archaic times represented the most populous area of the Northeast. Additionally, the South-Central Lowlands represent a very level, ecologically rich area with good quality soils. The abundance of bifurcated surface finds may well be an indication that the West River, and others of New Haven's important river valleys, represent an important opportunity for future archaeologists to study Early Archaic settlement patterns in Connecticut.

More information exists for Terminal Archaic sites which tend to cluster in major river valleys such as the Quinnipiac (Figure 4.1) and Mill Rivers. But at least one upland Terminal Archaic site occurs along a small tributary brook. Certainly Mast Forest Archaic components, or what shall be referred to in this report as the Small Stemmed Point Tradition, are the most numerous. One could also suggest that in comparison to Terminal Archaic components, the Small Stemmed Point Tradition appears to occur

slightly more in the uplands away from the major river valleys, and along smaller tributary streams.

However, I would argue that the most important observation I was able to make using data gleaned from the State files was the fact the beyond noticing more Small Stemmed Tradition sites, and a tendency for these to occur in a wider variety of environmental zones, there is little to distinguish their pattern of distribution from other periods. This observation will stand in stark contrast to findings from the West Rock Ridge project, in which differential distribution of Small Stemmed Point Tradition sites is quite pronounced. This suggests that research of environments that may have been marginal to most of prehistoric peoples, except during those times where incorporation of formerly unused resource patches was necessary, may be an important avenue of research for comprehending differences in the adaptations of Small Stemmed Point Tradition societies relative to other cultural manifestations in South-Central Connecticut.

Discussion

Information gleaned from the available archaeological record of South-Central Connecticut was able to provide some basic information concerning the prehistory of this local area. Occupation of South-Central Connecticut's broad, fertile lowlands may well have been significant at least since Early Archaic times. Additionally, redundancy of site location was quite pronounced for many of the available recorded sites. This indicates a stable pattern of seasonal rounds that in some cases appears to have been followed for

thousands of years. This is exactly the expectation that was formulated from a study of the ecological characteristics of Connecticut's South-Central Lowlands. Finally, the combination of stable sources of seasonally abundant resources, and ecologically diverse environments such as swamps, wetlands, and trap-rock ridges, may have combined to offer hunter-gatherers a very rich environment that could have sustained a large number of people.

The discussion of geological, ecological and cultural context has come to a close. Next, the data accumulated during the West Rock Ridge project will be presented. This will be done in four chapters, which have been organized according to basic sites types for the convenience of the reader. Following these chapters a comparative analysis of lithic assemblages from these sites will be presented. Finally, in the concluding chapter the archaeological record of West Rock Ridge sites will be analyzed in light of the theoretical perspectives that were presented in the first few chapters of this text.

Chapter 8

Information Gathering or "Lookout Sites"

In chapter four it was described how West Rock's unique geological characteristics did at times make it suitable to local prehistoric populations for a number of tasks. One of the important functions that the ridge served to some of South-Central Connecticut's prehistoric inhabitants, was as an observation or "lookout" point, probably for spotting game animals in the West River Valley below.

West Rock Ridge truly offered ideal vantage points for observation of the West River Valley, which is a north/south trending valley and therefore basically parallels the course of the ridge. As described in chapter four the ridge represents a basalt plate that had been tilted up and to the west, and so its east facing slope drops at about a 25º degree angle down and to the east (Figure 1.2). The summit of the ridge towers over the surrounding lowlands by about 300 feet (Figure 1.4), and its west facing cliff represents a fairly precipitous drop. This allows for numerous unobstructed views of the West River Valley, especially at locations where exposed bedrock intersects the top of the cliff face and so vision in not interrupted by trees. The total view shed available takes in about a half a mile to the west, where the Western Highlands form a scarp of low hills; and to the

north and south the view seems almost unlimited, probably taking in over a mile in total length.

The following information is presented in terms of four sites located along the ridge top. But information from survey indicated that a fairly continuous distribution of artifacts existed from one end of the survey transect to the other, covering a distance of about 200 meters parallel to the ridge top and the cliff face, from which vantage points were available. The survey, in essence, represented a 200 meter sample of West Rock's summit, but similar view sheds were probably available for miles in either direction.

Following Ebert (1992) and Thomas (1975), this continuous distribution of artifacts is considered to provide information that the excavation of no single site can. Although four "hot spots" were chosen for excavation purposes, the more realistic interpretation of the overall data generated from the ridge top survey is that prehistoric people had revisited the location over a very long period of time, pursuing daytime activities while away from their habitation sites. In this case however, at least three of the "sites" appear to demonstrate fairly distinct associations among artifacts and as such are considered to be representative of the type of activities performed by people visiting this area.

Environmental Context

The information gathering sites along West Rock's summit are perched over three hundred feet above the West River Valley (Figure 4.1) below. All are associated with

exposed bedrock along the cliff edge, and so a clear and unobstructed view of the valley was possible. Below these observation points lies the West River Valley. The valley is about half a mile wide and is an inland finger-like extension of the New Haven plain. The valley is extremely level and fertile and notable for hundreds of artifacts that have been collected from the many farms located along it. Local collectors call the section of the West River Valley immediately below the lookout sites discussed in this chapter "the flats" because of its unusually level landscape. At one time all of this was farmland. Today several of these farms are still functioning.

The West River (Figure 4.1) once meandered at a distance of about one eighth of mile below the lookout sites and to the west. Presently, Konolds Pond exists just below these sites, but the pond is artificial and was created by obstruction to the outflow of the West River. An 1868 Beer's map of Woodbridge, Connecticut shows the West River meandering in its former course below the ridge top. This is probably the condition that existed in prehistoric times.

The number of surface finds collected from the plowed fields stretching out below West Rock's lookout sites attest to prehistoric interest in the West River Valley. It makes sense then that prehistoric populations would have likewise had an interest in utilizing observation points of this same valley. In order to make good judgments concerning the availability of game, lookout sites such as those discussed below may have been essential because they would have allowed hunters to assess the number of game animals present before engaging in hunting activities. Among those important archaeological sites located in the West River Valley were four find spots of Early Archaic points and the extensive Donato (personal communication 2002) collection (see Figures 7.1-7.6) that

included a substantial Late Woodland assemblage and also a large collection of quartz small-stemmed and side notched points from the Late Archaic Small Stemmed Point Tradition.

The *Soil Survey of New Haven County, Connecticut* (1979) identified the soils along the top of West Rock Ridge as Holyoke-Rock outcrop complex. These soils are excessively drained, rocky and interspersed with bedrock outcrops. Tree wind-throw is common due to shallow rooting where bedrock is close to the surface. The survey test pit records also indicated that the soils at the summit of West Rock had developed from glacial till deposits that apparently were left capping the ridge after the glacier had departed. The *Soil Survey* (1979) described typical Holyoke soils as having a surface layer (A horizon) of very dark gray brown silt loam extending down to a depth of two inches and a subsoil layer (B horizon) of dark reddish brown and reddish brown silt loam extending to a depth of 11 inches. The soils encountered during the ridge-top excavations were often much deeper, although soil depth tended to vary substantially on West Rock's summit.

Lee (1985:27) describes the vegetation along the tops of Connecticut's trap-rock ridges as, "…not tall or vigorous, but tough and competitively able." Exposure to factors such as sun, wind and inclement weather as well as rapid run-off selects for drought resistant species. Trees are typically short in stature and slim, providing little in the way of shade. Red cedars are in their native habitat fringing along the rocky ledges. Diminutive forms of oak, hickories and ashes can also be found, with chestnut oaks and other oak species often dominating due their ability to tolerate droughty environments.

During their fall migration, West Rock is an important spot for birdwatchers to observe the southerly migration of a variety of hawk species. Cold winds pushing down from the northwest are warmed by the western cliff faces of the state's trap-rock ridges and the subsequent updraft pushing southward provides a flyway for migrating hawks (Lee 1985:33). Peregrine falcons were also once numerous nesting birds in the crevices along these ridge-tops, but Lee attributes their decline to two causes: 1) trapping on the part of falconry buffs, and 2) increased use of pesticides which apparently affects eggshell thickness.

Meadows of little bluestem (*Andropogon scoparius*) and poverty grass (*Danthonia spicata*) can be found along the flat ridge top summits, where drought tolerant wildflowers and shrubs are also found (Lee 1985: 27). Of importance for prehistoric Native American populations would have been blueberry and huckleberry patches that can be found fully ripened in the open sun by late July, and along the ledges (Lee 1985: 27).

Menta (2003: 44) related a quote from Ezra Stiles indicating that the local Native American inhabitants were in the habit of burning tracts of forest along the summit of West Rock in order to improve hunting opportunities for white-tailed deer (*Odocoileus virginianus*). More importantly in the context of the present discussion of "lookout sites", white-tailed deer would have been abundant in the edge forest existing along the base of West Rock's cliff face. Munich (1976: 10) described a variety of small mammals that can typically be spotted at West Rock including: red fox, gray fox, raccoon, opossum, chipmunk, short and long-tailed weasel and a host of small rodents. Added to this list New England cottontail (*Sylvilagus transitionalis*), gray wolf (*Canis lupis*), black

bear (*Ursus americanus*), bobcat (*Lynx rufus*) and wild turkey (*Meleagris gallopavo*) were all species that may have inhabited West Rock during prehistoric times.

Survey Methodology and Site Selection

A review of the site files for the state of Connecticut, located at the Office of the State Archaeologist (OSA), indicated that two find spots had occurred along West Rock's ridge-top. Both were isolated surface finds. About half a mile north of the survey area an atlatl weight had been discovered along a bridal path on West Rock's summit. Atlatl weights are thought to be weights that were attached to a spear thrower, or atlatl, used by Archaic hunters to create more leverage which helped propel spears more forcefully.

The other find spot was made by a local collector named Simon Donato (personal communication 2002) whose name appears frequently throughout this dissertation. Donato owns extensive artifact collections that he amassed as a youth, growing up in the greater New Haven area. Today, Simon is an archaeology enthusiast and has contributed much important information to the current project at West Rock. Donato found a quartz triangular point on rocky, sloped ground overlooking West Rock's cliff face. The surface find appeared to represent slope wash from a level area just above where the point was discovered. A judgmental pit placed in this level area produced a cluster of flakes, but the site was still considered part of the West Rock Ridge site that Donato had documented in the state files.

The ridge-top extending to the north of Donato's site was fairly open and level simplifying the task of performing test pit survey along a 200 meter section of it. A ten meter test pit interval was used in order to increase the chances of encountering small lithic scatters. However, while I have catalogued four distinct artifact clusters on West Rock's summit as sites, I do not deny the continuous distribution of the artifact record. Not only were numerous positive test pits located in the 200 meter transect, but careful inspection along the cliff edge, where erosion was pronounced, revealed widely spaced surface artifacts covering almost the entire area where the survey was conducted. Additionally, Donato possessed a collection of artifacts from West Rock's summit. This collection is depicted in Figure 8.1. When asked if he could recall the exact provenience of these artifacts Donato (personal communication 2003) was only able to reply that he had picked them up here and there over a very wide area adjacent to West Rock's cliff face.

For these reasons the best approach to the archaeological record along West Rock's summit would be to utilize a non-site method such as that proposed by Thomas (1975), or Ebert's (1992) distributional method. Although I will argue that at least three of the four sites identified seem to represent distinct activity areas, even these can only be considered snapshots of a longer time-elapsed photograph. This continuous distribution of artifacts tells us something that no individual site can. The ridge-top appears to have been visited by individuals and groups who may have each only left behind a few artifacts during any particular visit, but the overall continuous distribution tells us that people had been visiting the area over a very long period of time.

Figure 8.1: Collection from Summit

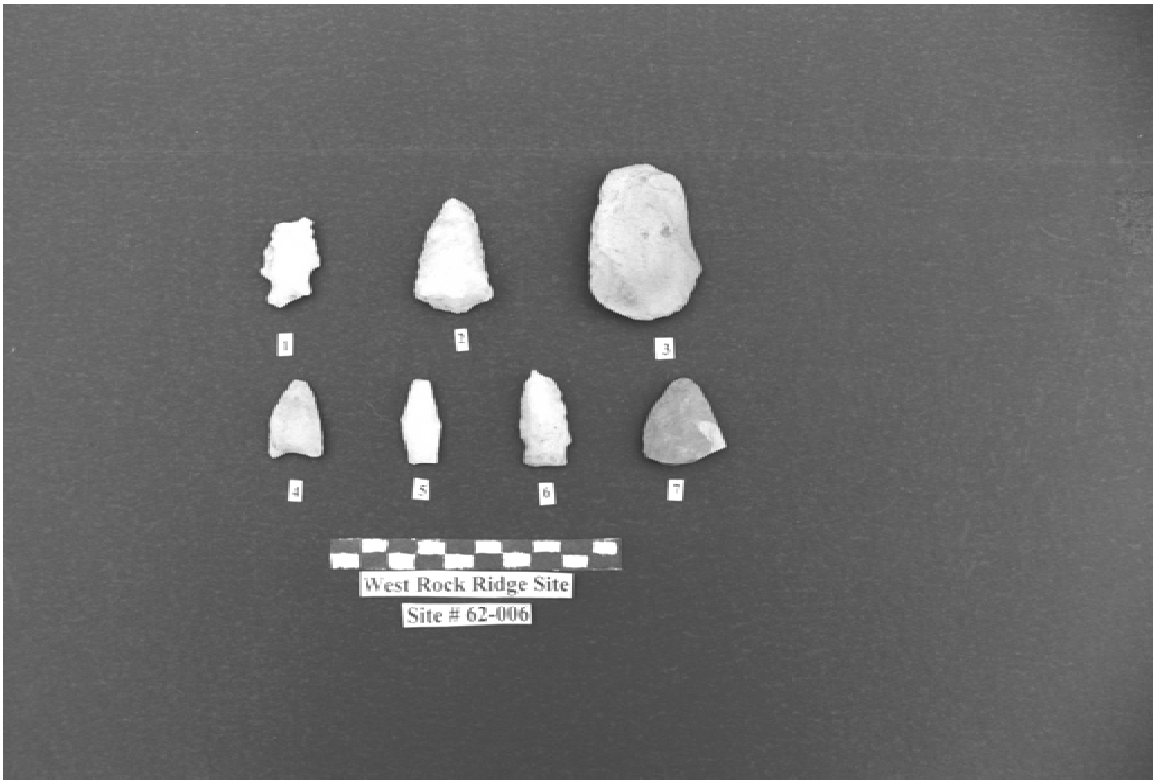


Figure 8.1 Collection by Donato from along West Rock Ridge's Summit.

Unfortunately, West Rock's summit did suffer from two major causes of disturbance and at least one of these was responsible for destruction of a significant portion of one of the sites. The major cause of disturbance was the quarrying of trap-rock by the Blakeslee Company, who terminated their operations at West Rock in the 1960s. Large amounts of trap-rock have been used in Connecticut's roadbeds and for a time West Rock was a source of this material. An extensive quarry scar, about 100 meters across and 25 meters deep destroyed the greater portion of one of the sites investigated in the ridge-top survey. This site was named the Blakeslee Quarry site.

Trap-rock quarrying of West Rock was also indirectly responsible for another cause of disturbance. With a major portion of the cliff edge removed, soils that had once been protected from erosion were exposed along the quarry scar hastening erosion of large amounts of soil that was not directly removed along with the trap-rock.

Additionally, Baldwin Road was constructed parallel to West Rock's cliff edge. The road is currently closed to the public. All of the archaeological data obtained from West Rock's summit was discovered between Baldwin Road and the cliff edge. It is suspected that further sites may have been destroyed by blasting associated with road building or may lay undetected beneath the road bed.

The West Rock Ridge Site

The West Rock Ridge site was initially identified and named by Simon Donato (personal communication 2002), who had recovered a single triangular point on sloped

and rocky ground overlooking West Rock's cliff face as a youth. Donato's find indicated that cultural material had eroded from a small level and well-drained location immediately upslope from the spot where the point had been recovered. I excavated a judgmental test pit in the level ground above the find spot which revealed the presence of lithic debitage allowing for the identification of a small lithic scatter that was completely excavated. A total of 5.25 one meter squares were excavated, and artifacts recovered included 18 pieces of lithic debitage and a single white quartz Wading River point, which was missing its tip section.

Three stratigraphic layers were identified at the West Rock Ridge site. The surface layer, or A-horizon, extended to a depth of between 7 and 10 centimeters and consisted of a very dark brown silty loam. The subsurface layer, or B-horizon, was as much as 33 centimeters thick and extended to a depth of about 40 centimeters. The B-horizon consisted of dark yellowish brown silty sand. The substratum was a gravelly, glacial till resting on basalt bedrock. Most of the artifacts were recovered from the junction of the A and B horizons.

The single projectile point recovered from the West Rock Ridge site was a white quartz point (Figure 8.2) having a straight or very weakly side-notched stem that apparently was manufactured using a combination of percussion and pressure flaking. Pressure flaking was confined to the finishing stages and was apparent on the base and blade edges. The artifact was typologically identified as a Wading River point, which Ritchie (1971) described as a Late Archaic type, radiocarbon dated at 2190 B.C. ± 100 years at the Hornblower II site in Martha's Vineyard. Ritchie also described this point

Figure 8.2: Wading River Point from West Rock Ridge



Figure 8.2 Wading River Point from the West Rock Ridge Site

type as widely distributed throughout southern New England, as well as eastern and southern New York, and is apparently contemporaneous with the Sylvan Lake complex in eastern New York and the Squibnocket complex of Martha's Vineyard (Ritchie 1971:131). Wading River points are one of a number of small stemmed and side-notched points, usually chipped from local quartz, that are collectively referred to in this text as the Small Stemmed Point Tradition.

The Wading River point was broken during usage as a dart or spear point, apparently by impact, and then discarded at the site. Slight grinding or rubbing along the base and under each of the tangs indicated that the point was a finished specimen that had probably been secured in a haft before undergoing breakage. The impact which broke the point removed the tip and left a large hinge-fracture on one side of its midsection. The point is depicted in Figure 8.2.

A total of 18 pieces of debitage were recovered from the site. Information concerning the relative size, in one centimeter increments, and weight of debitage is given below in Table 8.1. As is apparent from Table 8.1, 14 of the total debitage were flakes and 4 were shatter giving a ratio of flakes to shatter of 3.5 to 1. Four of the flakes possessed a cortical surface that could be identified as belonging to a pebble source. The percentage of debitage having a cortical surface therefore was 22.2%, however none of these represented primary flakes and two of the cortical surfaces represented only a small portion of the flake's dorsal surface. No cores were found and the only biface recovered was the broken and discarded projectile base.

As revealed in Table 8.1 all of the debitage was small, being under 2 centimeters in length. Analysis of flake debitage indicated that two of the 14 flakes were biface

thinning flakes (14.3%), 8 possessed flake scars on their dorsal surfaces (57.1%), 9 had remnant striking platforms (64.3%); of 9 remnant striking platforms, 7 represented lipped platforms (77.7%), and one flake striking platform was identified as multifaceted (7.1%). As stated in chapter three, pressure flakes which typically shatter on detachment were not quantified, but a qualitative assessment was made in terms of whether there were some, a moderate amount, or numerous pressure flakes present. In this case it appeared that numerous of the flakes recovered were small pressure flakes.

All of the debitage recovered from the West Rock Ridge site was white quartz that appears to have derived from the same raw material source. It is possible therefore that all resulted from the same knapping episode. However, an attempt at refitting the pieces was unsuccessful, so this could not be verified.

As stated previously, although 22.2% of debitage was cortical, none of these pieces possessed a large amount of cortex on their dorsal faces. This fact, combined with the small size of the debitage present at the site, argues that lithic raw material which was worked at the site was carried in after having undergone some preliminary processing elsewhere. The question remaining to be asked is, "In what form was lithic raw material incorporated into the site?"

The projectile point had represented a finished specimen that had been discarded due to damage, so the debitage was not likely produced during the manufacturing of this point. The presence of two bifacial thinning flakes indicates that at least some late stage biface manufacturing was occurring, although this obviously did not represent the complete manufacturing of a point from scratch. The interpretation of this data is that a utilized and broken point had been discarded at the site, and a new replacement projectile

had been chipped using a bifacial preform which was carried as personal gear for this very purpose.

Table 8.1: Size and Weight for West Rock Ridge Site Debitage

Flakes

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	> 10
Count	4	10	-	-	-	-	-	-	-	-	-
Weight (g)	0.3	4.1	-	-	-	-	-	-	-	-	-

Shatter

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	> 10
Count	3	1	-	-	-	-	-	-	-	-	-
Weight (g)	0.5	0.6	-	-	-	-	-	-	-	-	-

Blakeslee Quarry site: Locus A and Locus B

The Blakeslee Quarry site was located in two separate loci. The Western Locus, or Locus A, was contained within a thin remnant layer of soil clinging to the top of West Rock's cliff face. The soil had apparently been much further from the cliff face, but the site was unfortunately located in the middle of a trap-rock quarry scar created by the

Blakeslee Company. Not only had much of the site been destroyed as a result of the trap-rock quarrying activity, but the remnant soils adjacent to the cliff edge were slowly being eroded, so that with the passage of enough time none of the site's western locus would have remained. The Eastern Locus, or Locus B, represented a similarly disturbed deposit. Artifacts were clustered around the rim of a low-lying bedrock exposure. It is interpreted that the artifacts were originally deposited on this low-lying bedrock exposure and subsequently washed down onto soils that surrounded the outcrop.

Locus A

The Blakeslee Quarry site was located about 50 meters to the north of the West Rock Ridge site. A total of four half-meter squares (totaling one square meter) were excavated as a transect into a remnant soil deposit clinging to the top of West Rock Ridge. The soil deposit was surrounded by exposed bedrock on all sides except for the cliff face. The soil had apparently been 25 meters from the cliff edge, but subsequent quarrying of trap-rock by the Blakeslee Company had left it exposed on the cliff edge. In this position erosion will eventually cause all of the residual soil to wash over the edge. No doubt numerous artifacts were lost, not only during the quarrying of trap-rock, but also subsequently as remnant soil clinging to the cliff edge continued to erode away and join the rest of the rocks and dust at the bottom of the cliff 340 feet below.

Site soils from Locus A were highly mottled, without a humus layer and ended in basalt bedrock at depths of between 6 and 18 centimeters. The soils were excessively dry

and are thought to have lost their original soil profiles. No stratigraphic layers could be discerned and the entire cultural deposit either lacked stratification, or site stratigraphy could not be discerned.

A sample of 166 pieces of debitage was recovered for analytical purposes. Additionally, two formal artifacts were discovered on the surface. One was a complete quartz Burwell point, a type initially identified by Lavin and Russell (1985) at the Burwell-Karako site and considered to be associated with the Late Archaic occupation (6,000 to 3,700 years ago). The other was a small quartz projectile point tip fragment.

Tables 8.2 and 8.3, below, present the results from debitage analysis. A total of 166 pieces of debitage were recovered. Seventy-eight, or 47%, were classified as flakes and 88, or 53%, were classified as shatter. This produces a flake to shatter ratio of about 1 to 1.1. Only 5 cortical debitage, or 3%, were recovered from locus A. Two of the cortical debitage were primary flakes and three were secondary. No cores were recovered. The size distribution for debitage recovered from the Blakeslee Quarry site was different from that previously described for the West Rock Ridge site. More large debitage was present in the former, with 20 pieces, or 12%, greater than 2 centimeters in length.

Interpretation of Locus A of the Blakeslee Quarry site has to be undertaken with caution because of the tremendous amount of disturbance. Because it is impossible to tell which artifacts were lost and which were not, it can not be determined if the sample taken is a representative one. For now, the artifacts recovered were treated as a tentative sample, partly because they are all that is left of the site, but also because there did not

seem any obvious reason to believe that the artifacts recovered had not been protected together, because the test pits were taken as far away from the cliff edge as possible.

Forty-two, or 54%, of 78 flakes recovered possessed a remnant of the original striking platform, 19 of these platform bearing flakes (45.2%) possessed a lipped platform. Twenty-three, or 29%, possessed flakes scars on their dorsal surfaces. Four of the 78 flakes recovered (5.1%) were bifacial thinning flakes, and it was considered that some pressure flakes were present.

Some obvious differences exist between the West Rock Ridge site, and Locus A of the Blakeslee Quarry site. First of all, the mere density of artifacts, with 19 artifacts occurring in 5.25 meters^2 or 3.6 artifact per meter^2 for the West Rock Ridge site, and 166 per meter^2 for Locus A. Also from Table 8.2 it is obvious that at least some of the debitage was larger for Locus A of the Blakeslee Quarry site, having 20 pieces of over 2 cm in length, or 12.5%, as compared to none for the West Rock Ridge site. The flake to shatter ratio from both sites is also quite different, which had been 3.5 to 1 for the West Rock Ridge site and only 1 to 1.1 Locus A.

Only 5 total debitage, or 3% were cortical, and though some larger debitage is present, it is not frequent, and 5 pieces of debitage, or 3%, were larger than 3 cm in length. Unfortunately, the sample of debitage from the site is not complete so only tentative conclusions can be drawn. It can be said with some confidence, however, that more early or middle stages of tool manufacturing occurred at Locus A of the Blakeslee Quarry site relative to the West Rock Ridge site.

Some bifacial manufacturing is indicated by the presence of four bifacial thinning flakes, and perhaps by the presence of some pressure flakes. But once again, it does not

appear that lithic raw material was acquired or initially processed at the site, and it is more likely that it was carried in while in a somewhat less modified form than was the case for the West Rock Ridge site. In this case, perhaps lithic raw material was transported to the site as flake blanks or appropriate pieces of shatter, requiring more early and middle stage processing, or alternately cores may have been introduced to the site, although no cores were found in the small sample taken.

Table 8.2: Size and Weight of Debitage from Locus A, Blakeslee Quarry

Flakes

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	> 10
Count	25	39	12	2	-	-	-	-	-	-	-
Weight (g)	1.7	17.5	30.9	14.4	-	-	-	-	-	-	-

Shatter

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	> 10
Count	44	38	3	2	1	-	-	-	-	-	-
Weight (g)	3.7	19.6	14	12.1	11.3	-	-	-	-	-	-

Table 8.3: Flake Attributes from Blakeslee Quarry, Locus A

	Count	Percentage
Single Faceted Platforms	**21**	27%
Double Faceted Platforms	**2**	3%
Having Dorsal Flake Scars	**23**	29%
Having a Lipped Platform	19	24%

Locus B

Locus B of the Blakeslee Quarry site is located 22 meters to the east of Locus A, and along the outer rim of a low-lying bedrock exposure. The concentration of artifacts along this rim is interpreted to mean that the artifacts had originally been deposited on the bedrock exposure, but then subsequently were washed down into the soil around its perimeter. The result obviously is that the site represents a secondary deposit. Once again caution has to be exercised in interpreting the sample of artifacts recovered because one does not know how the processes which secondarily transported the artifacts created bias in terms of the kinds of artifacts that were present. However artifacts from Locus B will be treated as a tentative sample partly because they are the only artifacts recovered from the eastern locus, but also because it makes sense that since the artifacts had not moved far, a fairly representative sample may be present.

Because Locus B of the Blakeslee Quarry site represented a secondary deposit, site stratigraphy will not be described, and of course no attempt was made to perform stratigraphic or spatial analysis of artifacts.

One 1-meter square excavation unit and 3 half meter test pits were placed along the perimeter of the low-lying bedrock outcrop in the artifact bearing deposits. Tables 8.4 and 8.5 below give information from debitage analysis pertaining to debitage sizes and flake characteristics respectively. The assemblage from Locus B was very similar to that recovered from Locus A in its general pattern. A total of 272 debitage was recovered, 115 or 42.3% were flakes, and 157 or 57.7% were shatter. This gives a ratio of flakes to shatter of about 1 to 1.4. Only 6, or 2.2%, of this debitage was cortical. Size ranges were somewhat smaller than had been the case for Locus A, but still larger than for the West Rock Ridge site, with 23 or 8.5% over 2 cm in length, and only 5 or 1.8% over 3 cm in length. In contrast to both of the sites discussed so far Locus B of the Blakeslee Quarry site had 14 total brown chert debitage, which accounted for 5.1% of the total assemblage.

Ninety-five of 115 flakes, or 82.6%, possessed a remnant of the original striking platform. Four, or 3.5%, of these remnant platform bearing flakes possessed a multifaceted platform, and 56, or 48.7%, had lipped platforms. Twenty-seven, or 23.5% of total flakes had flake scars on their dorsal surfaces. Eleven of the recovered flakes, or 9.6%, were bifacial thinning flakes and a moderate amount of pressure flakes was recorded for the sample.

One formal tool was recovered from Locus B of the Blakeslee Quarry site. This was a projectile point base that had apparently been broken during the process of

manufacturing (Figure 8.3). The base showed no evidence of grinding or abrasion and did not appear to represent a finished specimen, so it is concluded that breakage occurred very late in the manufacturing process.

The presence of the projectile point broken during the manufacturing process, and the eleven bifacial thinning flakes provides conclusive proof that projectile point manufacture was occurring at the site. Similar to Locus A of the Blakeslee Quarry site, the percentage of cortical debitage was low, and flake debitage sizes were larger relative to the West Rock Ridge site. The flake to shatter ratio was even lower for Locus B, with 1 to 1.4 compared to 1 to 1.1 for Locus A. Although this conclusion is somewhat tentative, once again a reasonable guess is that lithic raw material for projectile point manufacturing was carried into the site in the form of flake blanks or suitably large pieces of shatter, or alternately as cores. Once again evidence for the later of these alternatives was not found.

Table 8.4: Size and Weight of Debitage from Locus B, Blakeslee Quarry

Flakes

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10
Count	54	50	8	3	-	-	-	-	-	-	-
Weight (g)	3.7	20.2	16.4	17.9	-	-	-	-	-	-	-

Figure 8.3: Wading River Point, and Possible Biface



Figure 8.3. 1: quartz Wading River Point broken during manufacturing process, 2: possible quartz biface.

Shatter

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	> 10
Count	76	69	10	2	-	-	-	-	-	-	-
Weight (g)	6.3	34.4	31.9	7.7	-	-	-	-	-	-	-

Table 8.5: Flake Characteristics from Locus B, Blakeslee Quarry

	Count	Percentage
Single Faceted Platforms	**35**	30%
Multi-faceted Platforms	**4**	4%
Having Dorsal Flake Scars	**27**	23%
Having a Lipped Platform	56	49%

The Kietan Lookout Site

The Kietan Lookout site (Figure 8.4) was located about thirty meters to the north of the Blakeslee Quarry site, and similarly to the rest of the information gathering sites included in this chapter, was positioned very close to the cliff's edge. Although all of the cultural artifacts were recovered from soil in stratigraphic context, a low lying rock outcrop was adjacent to the site and so an unobstructed view of the West River Valley below was possible. The Kietan Lookout was the largest of the ridge-top sites and

probably the most important in terms of cultural material recovered. Excavation approached one hundred percent of the total site area, which was included in a block about 3 x 3 meters in size.

Stratigraphic layering of the Kietan Lookout site consisted of a surface layer, or A-horizon, consisting of a very dark brown silty loam extending to a depth of between 10 and 12 centimeters. The subsurface, or B-horizon, consisted of a dark yellowish brown fine sandy loam extending to a depth of between 35 and 40 centimeters. Below the subsurface soil was a layer of glacial till, including sand, gravel and pebbles similar to that encountered at all of the sites excavated along the ridge-top.

Although cultural artifacts were contained in both layers, a Late Woodland (Ritchie 1971: 31) Levanna point (Figure 8.5, No. 4) was stratigraphically positioned above the rest of the artifacts and located in the A horizon at a depth of about 7 centimeters. The rest of the cultural materials are considered to be associated with a Late Archaic component, all of which was stratigraphically below the Levanna point and found either within the A/B interface or the B horizon located at depths of between 10 and 40 centimeters below the surface. It was not possible to discern any further stratigraphic separation of artifacts. Lithic tools from the Kietan Lookout site are depicted in Figures 8.5 and 8.6.

Artifacts recovered from the Kietan Lookout site included 5 projectile points, two bifaces and 92 pieces of lithic debitage. This indicates a density of about 10 pieces of debitage per square meter which is higher than the West Rock Ridge site (18 debitage

Figure 8.4: Excavation Grid and Location of Kietan Lookout

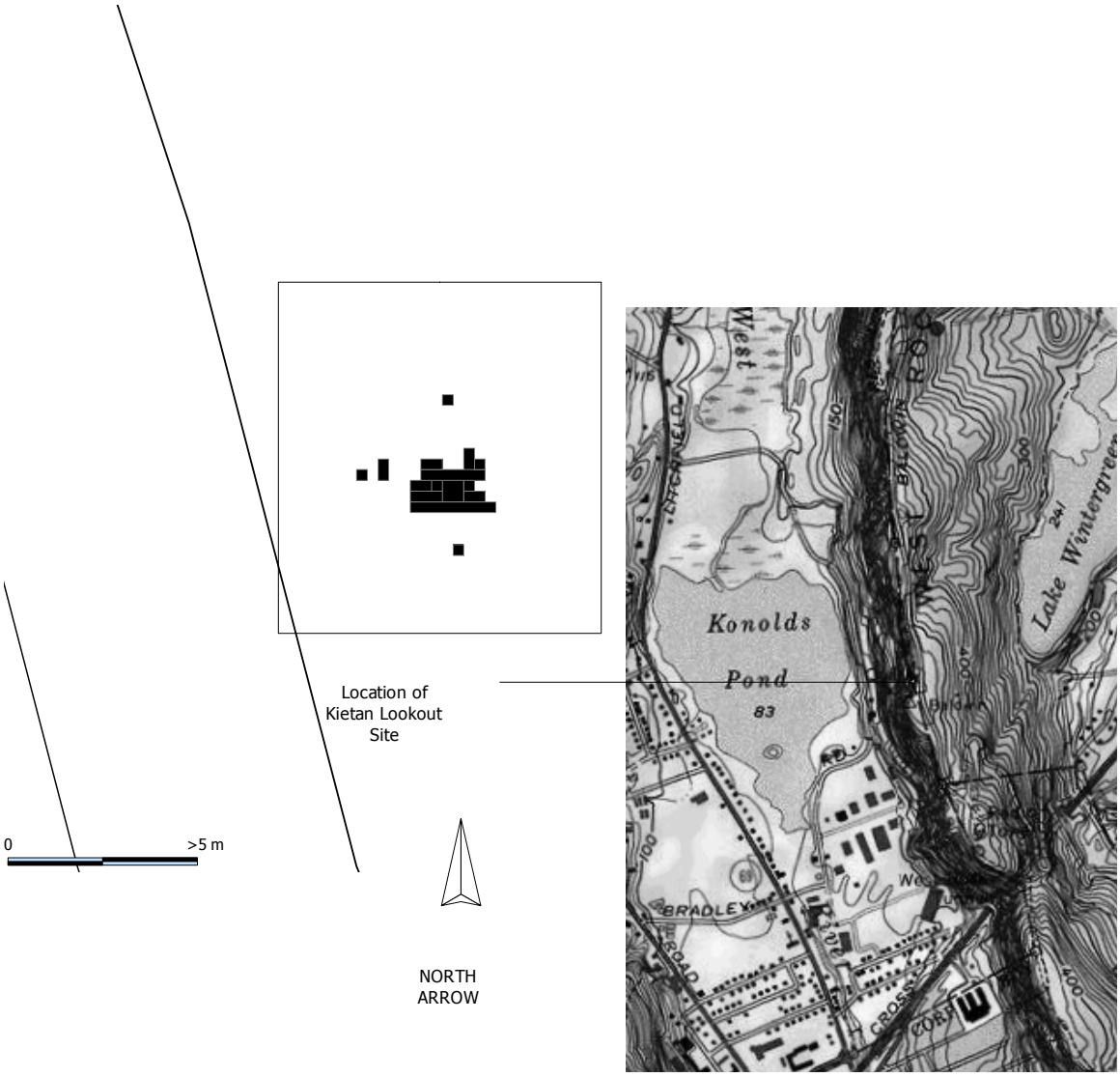


Figure 8.4 is a map showing the location of the Kietan Lookout site along West Rock's summit, as well as the excavation grid which in this case represented nearly one hundred percent of the site.

recovered from about 5 square meters of excavation) but lower than Locus A of the Blakeslee Quarry site, the latter of which produced about 166 pieces of debitage from one square meter.

Projectile points were further classified as a Levanna Triangle and 4 Wading River points. The Levanna Triangle was a moderately large specimen made from white milky quartz. It was nearly complete only lacking one of its basal shoulders. Pressure flaking along its base and blade edges indicated the point was finished, and it is interpreted that the point had been removed from its haft and discarded at the site due to breakage suffered from utilization. The point was biconvex in cross-section, having the general shape of an equilateral triangle with straight edges and a concave base. Its shoulders were asymmetrical with one being markedly larger than the other. This is similar to the shape of Levanna points recovered from the Donato site which was described in chapter seven.

The only other finished point discovered at the site was a complete maroon hornfels projectile classified as a Wading River point (Figure 8.6). The point had very shallow side-notches, and was plano-convex in cross section. It had apparently been chipped from a large flake preform because aside from a series of small pressure flake scars along its blade margins the ventral surface of the flake from which the point had been manufactured was essentially unmodified. The point is thought to have been lost at the site, possibly while attached to its haft. This is interpreted because, although the point is obviously a finished specimen it had suffered no apparent damage, at least not severe enough to warrant removing it from the haft and intentionally discarding it.

Figure 8.5: Kietan Lookout Artifacts

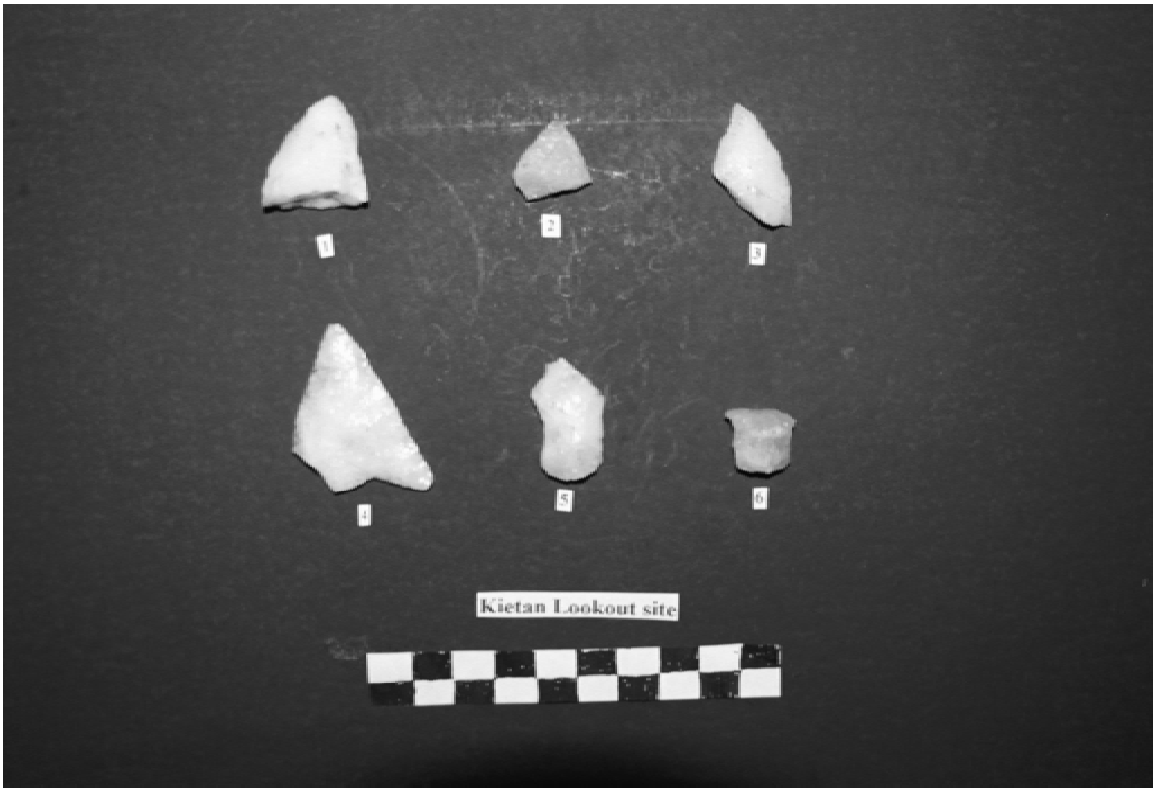


Figure 8.5 Nos. 1 and 3, quartz bifaces, No. 2 unfinished quartz point tip; No. 4 quartz Levanna Triangle Point, Nos. 5 and 6 basal sections of Wading River Points.

Figure 8.6: Hornfels Wading River Point



Figure 8.6 Maroon Hornfels Wading River Point.

The other three projectile points found at the Kietan Lookout site were unfinished points that appear to have been broken and discarded during the manufacturing process. Two were basal sections of Wading River points chipped from quartz that were crudely shaped by percussion flaking and lacked any rubbing or basal grinding (Figure 8.5, Nos. 5 and 6). The third was a point fragment, a tip section, chipped from quartz and although well formed had not undergone final shaping and lacked a crisp sharp point (Figure 8.5, No. 2). The broken points were direct evidence that projectiles were being manufactured at the site.

Two bifaces (Figure 8.5, Nos. 1 and 3), also chipped from milky white quartz, were discovered. The bifaces were well formed, although they were somewhat asymmetrical. Both were broken along their midsections and are considered to represent manufacturing breakage.

A total of 92 pieces of lithic debitage were recovered from the site. Sixty-nine were classified as flakes (75%) and another 23 were shatter (25%) giving a ratio of 3 flakes to one piece of lithic shatter. Only one piece of lithic debitage, or 1.1% was cortical and apparently had originated from a quartz cobble or nodule. Information concerning the size and weight of debitage for either flakes or shatter is given in Table 8.6. The large majority of debitage is 2 centimeters or less in size, with only four or 4.3% being larger, and all of these being less than 3 centimeters long. No cores were recovered from the site and all of the debitage was of quartz.

Analysis of flake characteristics is presented in Table 8.7. Twenty-three or 33% of flakes were classified as possessing a single faceted platform, 5 or 7% had multi-faceted platforms and 34, or 49%, had lipped platforms. Additionally, 21 or 30%, had

flake scares on their dorsal surfaces and 18, or 26.1% were classified as bifacial thinning flakes, while pressure flakes were classified as numerous in the collection. None of the bifacial thinning flakes could be refitted to the broken bifaces.

Because nearly 100% of the Kietan Lookout site was excavated, fairly confident conclusions can be drawn concerning this site. In terms of several characteristics the Keitan Lookout site is most like the West Rock Ridge site. Artifact density is somewhat higher, representing 99 artifacts in about 12 square meters or 8 artifacts per meter^2, which is higher than for the West Rock Ridge site which had only 3.6 artifacts per square meter. But both of these sites are more similar to each other, in being much less than the 166 artifacts per one square from Locus A of the Blakeslee Quarry site. The flake to shatter ratio also corresponds, with 3 to 1 for the Kietan Lookout site, and 3.5 to 1 for the West Rock Ridge site, as does the fairly uniformly small debitage and the recorded numerous amounts of small pressure flakes.

The projectile points and bifaces broken during the manufacturing process and the high percentage of bifacial thinning flakes (18 or 26.1%), leaves no doubt that biface manufacturing was an important activity. However, at least one observation is similar to findings from the West Rock Ridge site. It is telling that only small debitage, apparently indicating late stages of manufacturing is present at both of these sites, and in this case two broken late stage bifaces are present. The most likely interpretation would be that bifaces had been transported to the site, probably as personal gear for those people who visited it. In turn, this form of personal gear was probably carried in anticipation of the need to repair damaged hunting equipment. The importance of this observation will be returned to later in this chapter.

Table 8.6: Size and Weight of Kietan Lookout Debitage

Flakes

Length (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	> 10
Count	25	40	4	-	-	-	-	-	-	-	-
Weight (g)	3.5	11.3	10.1	-	-	-	-	-	-	-	-

Shatter

Length (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	> 10
Count	9	14	-	-	-	-	-	-	-	-	-
Weight (g)	1.6	7.4	-	-	-	-	-	-	-	-	-

Table 8.7: Flake Attributes for Kietan Lookout

	Count	Percentage
Single Faceted Platforms	**23**	33%
Multi-faceted Platforms	**5**	7%
Having Dorsal Flake Scars	**21**	30%
Having a Lipped Platform	34	49%

The Kietan Lookout Site North

Located about 50 meters to the north of the Kietan Lookout site was a very small lithic scatter. The scatter included an unidentifiable quartz point fragment as well as seven pieces of quartz lithic debitage including three flakes and four shatter. The sample is too small to warrant further interpretation. Only four half meter test pits were excavated into the site's artifact bearing deposits. The site was delimited by a series of pits in all of the cardinal directions and apparently only covered a small spatial area. It was not reported on the Connecticut State files as a separate site, but for the purpose of this dissertation will be treated as such due to the fact that it was quite distant from the Kietan Lookout site located fifty meters to the south and therefore can not be considered a separate locus of it.

Discussion

In chapter two the concept of non-site (Thomas 1975) archaeology was introduced. Binford (1980:9) also described how foragers travel to resource procurement locations on a day to day basis, leaving an artifact here and there as they only acquire enough resources for daily subsistence, and then return home again at the end of the day. After a long time, areas reused again and again in this way, can actually represent large accumulations of artifacts. It would appear that artifact deposits along the top of West

Rock built up in this manner. Although at least three fairly distinct sites were described in this chapter, a continuous distribution of artifacts all over West Rock's summit was apparent both from positive survey test pits, as well as surface finds which were most abundant adjacent to the cliff's edge where erosion was pronounced.

The proximity of all these artifact bearing deposits to the cliff edge at West Rock's summit, and their pronounced drop off moving any substantial distance from this edge, argues strongly that the sites were associated with the available observation points of the West River Valley below. The significant amount of non-site archaeological remains also strongly argues that the area had been utilized in this way, and revisited again and again, over a very long period of time.

One last observation can be made from the analysis of lithic artifacts from these sites. An activity that appears to have been consistently practiced at all of the sites was the manufacturing of tools, probably projectile points. Also, evidence at two of the sites indicates that hunters had carried preforms as part of their personal gear, in order to replace damaged equipment. It can be suggested that as hunters waited at the top of West Rock's summit for game animals to appear, that this represented a convenient time to repair hunting equipment. This may have occurred in a context where successful or unsuccessful hunts had resulted in damage to hunting equipment, but the hunters in need of obtaining more meat, climbed to the top of the ridge once again in order to spot another opportunity. The most likely location where they could have easily ascended and descended West Rock's precipitous cliff face would have been through Wintergreen Notch less than a quarter mile to the south (see chapter 11), but accessible climbs were also probably available at intermediate locations between the steeper portions of the cliff.

Chapter 9

Quarry and Lithic Procurement Sites

As had been the case with the first site type discussed in chapter eight, West Rock's unique geological history is largely responsible for the second site type which was fairly prominent at West Rock Ridge: quarry and lithic procurement sites. In this chapter, local sources for two lithic raw materials that were important to South-Central Connecticut's prehistoric inhabitants will be discussed: quartz and chert. Both were available as secondarily deposited pebbles and nodules. Quartz was available as pebbles and also very large nodules, that had been transported by glacial ice and melt water and had been incorporated into a terrace banked against West Rock's western cliff face. Chert formed as nodules in the flowing magma that formed Connecticut's trap-rock ridges (Calogero personal communicatrion 2006), and may have subsequently eroded from decomposing basalt to be deposited along West Rock's gentle eastern sloping face.

This chapter will review some of the information presented in chapter four in order to discuss both the genesis of these raw material types, as well as those processes of secondary deposition that made them available to prehistoric tool makers. Analysis of lithic procurement sites from West Rock Ridge will focus on the means that prehistoric inhabitants used to acquire and process lithic raw material, as well as the organization of

lithic procurement activities. Ericson (1984:3–5) makes the point that different societies organized their "lithic production systems" differently. For instance, lithic acquisition and production may be the domain of specialists in some cultures, while others might simply acquire lithic raw material by "direct access"; where individuals or small groups simply travel to quarries on an "as needed" basis, satisfying their own tool stone needs and then moving on (Ericson 1984:6).

Prehistoric stone tool using cultures probably did not usually conduct special journeys to quarries. Instead, when stone was widespread and abundant they simply may have acquired it in the context of other activities, such as subsistence. This is what Binford (1979:259–262) refers to as an "embedded procurement strategy." For this reason the environmental contexts of the lithic quarry sites described below will also be discussed. Some general methodological issues related to archaeological investigations of quarries will also be presented (LaPorta 2000).

The three sites from West Rock Ridge where prehistoric cultures of South-Central Connecticut obtained lithic raw material were: 1) the Konolds Pond site, 2) the West River site, and 3) the Building Brook Farm site. The former of these two were quartz quarries, and the last was related to chert procurement. After information recovered from these sites is presented, there will be a discussion of how these data fit into the overall research objectives of the West Rock Ridge project.

Sources of Lithic Raw Materials in the West Rock Ridge Area

The origins of quartz acquired by prehistoric populations from the Konolds Pond and West River sites, located on the high terrace overlooking the West River, can be traced to bedrock sources from the West River Valley. These bedrock sources in turn can be associated with intense metamorphism that resulted from the continental collision responsible for the formation of the super-continent Pangaea 250 million years ago (Bell 1985:152–157). Rodgers, Gates and Rosenfield (1956:36) identified these bedrock types as the Orange Phyllite and Prospect Gneiss formations. Both of these formations contain abundant quartz veins.

The presence of these quartz veins can be explained by the fact that both of these bedrock types possess many joints and natural fissures, and by the fact that when hot magma from the Central Lowlands came into contact with these metamorphic rocks it brought with it hot water solutions and gases. Quartz veins typically form in natural fissures in rock as a result of hydrothermal solutions that lose their ability to carry silica as they cool down. This causes the silica to settle out and accumulate within joints and fissures of the surrounding bedrock, eventually forming quartz veins (Dake, Fleener and Wilson 1938:5054). Wheeler (1937:15) also reported that large quartz boulders, up to a foot in diameter, exist in the coarse arkose adjacent to West Rock, which underlies the Konolds Pond and West River sites, discussed below.

The quartz acquired from the Konolds Pond and West River sites was not, however, quarried from a vein source. Instead, prehistoric flintknappers took advantage of the pebbles, nodules and boulders that were part of a secondary deposit. The high terrace, overlooking the West River, is banked against the base of West Rock's cliff face (Figure 3.1). According to Flint (1930:176), the terrace had formed under melt-water that had been impounded between West Rock's western cliff face, and a tongue of stagnant ice remaining in the middle of the of the West River Valley, in the closing stages of the Pleistocene. The terrace upon which the sites are located is fairly broad, extending about 50 meters from the talus deposits along the base of West Rock, and then dropping suddenly to the level of the lower terrace, which overlooks the West River. This sudden drop-off represents an ice-contact face, mirroring the former position of the central valley ice lobe that was a fading remnant of the last ice age.

The formation of the terrace upon which the Konolds Pond and West River sites were located can be explained by Flint's (1930:56-70) theory of glacial stagnation along the Connecticut coastline. Although Flint's hypothesis has been refuted for the Connecticut River Valley, his hypothesis still appears to hold for the state's small river valleys (Little 1984:58). Flint (1930:56–58) explained that glacial recession is more typically modeled as gradual retreat of a unified ice front. This normally occurs because the retreating ice front is actually maintained due to a balance struck between the accelerated melting of ice along the margin, and the continued flow of ice emanating from the source area. However, according to Flint (1930:65–67), evidence from most of the state's river valleys indicates that the ice became stagnant because it was cut off from

its source area further to the north. In this case the ice had no recourse left but to melt from the top down.

A continuous sheet of ice will actually melt slowly because of albedo effect. The ice will act as a mirror reflecting sunlight and heat into space. However, as soon as the first bit of rock should poke through this veneer of ice this effect would be reversed, as the rock absorbs light and heat, facilitating accelerated melting all around its exposed surface (Flint 1930:59). The ridges on the margins of river valleys, therefore, became exposed long before ice in the center of the valley melted. Eventually, as this progressed melt-water became impounded between the valley margins and the ice lobe in the center of its valley. Wherever the impounded lakes and melt-water channels once existed, banked terraces had formed against the valley margins, having their origins in the accumulation of sediments deposited by the melt-water.

Glacial ice, scouring the Orange Phyllite and Prospect Gneiss formations to the north and northwest, picked up large volumes of quartz in the process. This quartz had been added to the terrace upon which the sites were located in two ways: 1) directly by ice that sloped downward from the center of the valley and toward West Rock Ridge, the valley's margin, and 2) by torrential melt-water.

A walking survey of the West River Gorge, to the northwest of West Rock, where many exposed quartz veins exist, did not produce obvious evidence that prehistoric populations had quarried these sources. For this reason it should be questioned why had so much interest been invested in the terrace where quartz raw materials were available as secondary deposits?

The answer to this question might be that this raw material source was easier to exploit. Glacial activity left abundant quartz pebbles, nodules and even boulders (glacial erratic) on the terrace and these could be had simply by walking the terrace over and picking up the most suitable pieces. The lithic raw material available along the top of the terrace was of relatively uniform and good quality because the glacier (stream) acted to differentially "select" those homogenous pieces. Poorer quality lithic raw material that was full of flaws and inclusions apparently did not survive the inevitable smashing and pounding they received during glacial (stream) transport.

Additionally, as will be discussed below, the terrace was conveniently located in close proximity to a number of environmental zones, including forest, wetland and riverine settings that would have meant that a wide variety of food resources would have been locally available. Binford (1979:259–261) described how he observed in his ethnographic field work with the Nunamiut Eskimos that lithic procurement rarely occurred as a goal of and by itself, but more often acquisition of tool stone was "embedded" in other activities such as hunting forays.

The second raw material source that was exploited prehistorically at West Rock was a local chert, that was also part chalcedony, and formed as nodules within the flowing, cooling magma that was the precursor of Connecticut's trap-rock ridges (Calogero personal communication 2006). The chert was available along West Rock's gentle eastern slope and on a terrace overlooking Building Brook, which has its headwaters at West Rock Ridge. Abundant nodules were available in this location ranging from grapefruit-sized to moderately large boulders. The exteriors of the nodules showed little evidence of weathering, and in fact retained the dimpled and uneven

surfaces, which apparently resulted from their genesis encased within cooling basalt (Figure 9.1). Since no other sites have been identified in South-Central Connecticut where exploitation of this local chert source was reported, this was considered a major discovery from the research at West Rock Ridge. In fact, it should be added that local chert sources are not well known for Connecticut in general, and when chert is located at local sites within the state it is more often interpreted as either representing importation of exotic material from outside the state, or alternately as glacially transported cobbles scavenged from river beds.

Environmental Context of West Rock Ridge's Quarry and Lithic Procurement Sites

Obviously the most important factor determining the location of lithic procurement sites is the availability of raw material. But for the three sites presented in this chapter, environmental context merits discussion. It will be assumed that in cases where raw material was available from a number of sources, as is often the case with quartz, that other factors may have influenced the decision to exploit any one raw material source, or the intensity to which a specific resource was utilized.

The terrace upon which the Konolds Pond and West River sites was located demonstrated evidence of generalized procurement of quartz nodules and pebbles over much of its overall extent, which includes an area about one mile long. This poses the question of whether or not, in this case, exploitation of the available quartz was embedded (Binford 1979:259–261) in foraging activities taking advantage of a variety of

Figure 9.1: Chert Nodules from Building Brook

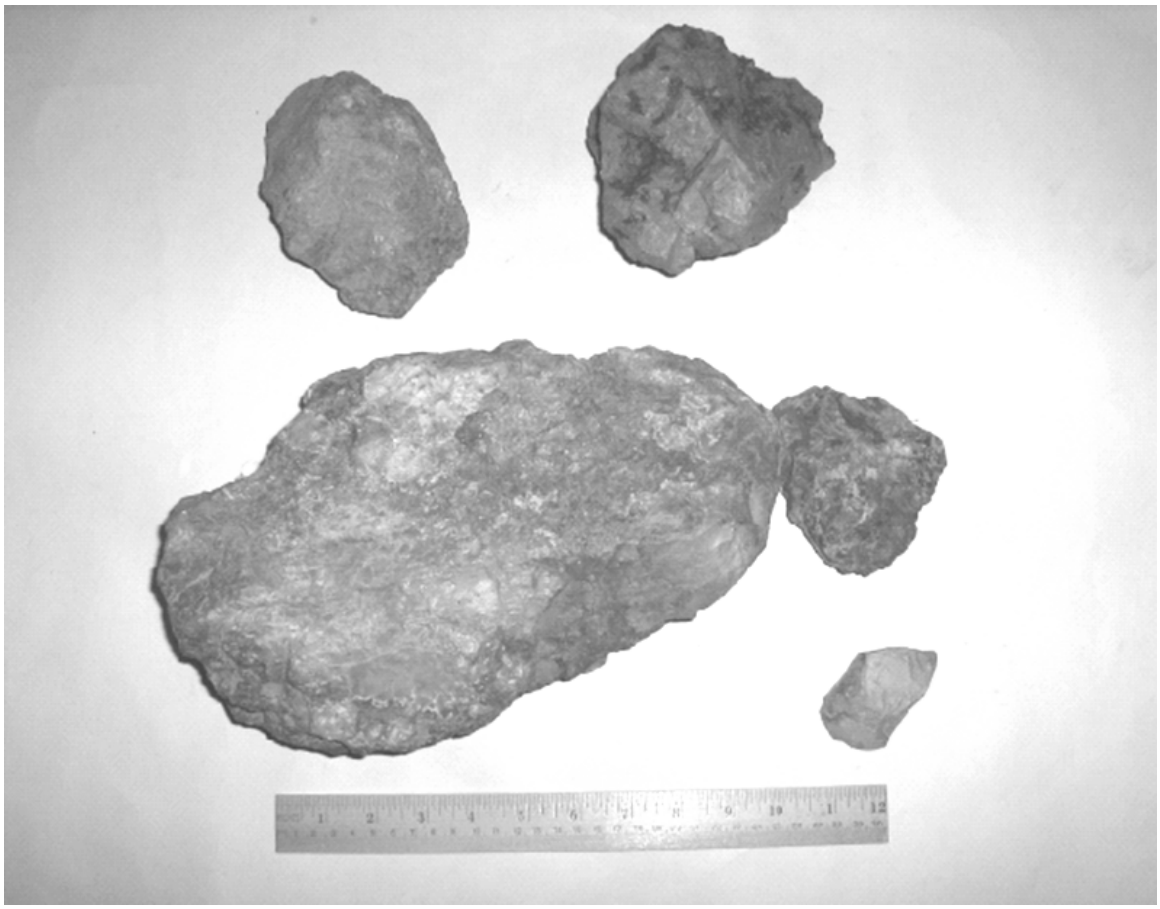


Figure 9.1 is a photograph of various sized chert nodules which apparently originated in formation processes of Connecticut's trap-rock ridges

environmental zones which could be accessed from campsites along the terrace or alternately along the banks of the West River below? Both the Konolds Pond and West River sites were located within 200 meters of four distinct environmental zones: 1) oak-hickory forest, 2) wetlands, 3) riverine, and 4) edge habitat occurring between the talus deposits at the base of West Rock and the forests of the West River Valley. Edge environments such as these represented a vital habitat for an important food source of ancestral Native American populations, white-tailed deer.

Also located in a very advantageous environmental setting was the Building Brook Farm sire where prehistoric flintknappers had acquired chert from a local source. The site existed adjacent to a well sheltered gorge created by down cutting on the part of Building Brook into soft brownstone bedrock. The gorge would have provided a suitable location for winter habitation. In fact, a local farmer had amassed a collection of artifacts from the farm he grew up on as a boy that bears this observation out completely. The collection was made from a former farm that had encompassed much of the terrace upon which the chert quarry was located and it included many large, beautifully chipped bifaces and knives, as well as projectile points spanning a large portion of Connecticut's prehistory including a Middle Archaic (8,000 to 6,000 years ago) Stark point manufactured from non-local grey chert (see Figure 10.7).

Unfortunately, none of the artifacts in the farmer's collection were manufactured from the local chert available at the quarry source, nor were any artifacts diagnostic of relative time or cultural affiliation available from the quarry. The farm has long since been sold and subdivided into numerous house plots, and most of the new land owners were not willing to let me investigate on their property. For this reason I owe all the

more thanks to the individual, who chose to remain anonymous, that allowed me to perform test excavations. However, it is still worth asking how much the combination of factors, a well-sheltered gorge and a nearby source of local chert nodules, had contributed to the extensive prehistoric activities that had occurred at this location?

Archaeological Investigation of Quarry and Lithic Procurement Sites

Quarry and lithic procurement sites can represent important opportunities for investigating prehistoric cultural systems (Ericson 1984:1–9). For this reason specific techniques useful for investigating activities related to the acquisition and initial processing of lithic raw material must be adopted to take advantage of the unique kinds of information available. One important aspect which has already been addressed in this chapter includes local geology, especially in relation to the lithic resource base as well as processes of erosion and secondary deposition that can affect the accessibility of raw material. But additionally, methodological and analytical techniques appropriate for interpreting the prehistoric activities conducted at quarry sites must be followed. A suitable model for analysis of these site types is provided by La Porta and Associates (2000), a cultural resource management (CRM) firm specializing in geoarchaeological studies.

According to La Porta (2000:11–13) quarry sites typically demonstrate spatial segregation of activity areas, and additionally these activity areas can often be identified by the specific types of debitage, hammerstones and tools associated with them. These

activity areas include: 1) the zone of extraction, 2) initial processing or "benefaction" stations, and 3) tool production stations.

Not all quarry sites are equally well-developed. "Expressions" represent sites where evidence of quarrying activities is scant, either because the raw material source was abandoned or because the site represented a failed attempt to develop the quarrying activities further. "Movements" are better developed quarries, where spatial separation of activity areas is more obvious. "Motions" are fully developed quarries whose site architecture is often visible from simple surface inspection (La Porta 2003:9).

Additionally, La Porta (2000:15) suggests that terms applicable to mining activities replace the typically used archaeological nomenclature for debitage analysis which includes terms such as "flakes" and "shatter". According to La Porta (2000:11–13) processing of quarried rock follows a regular sequence and each of the component stages produces a distinctive debitage type. Directly at the zone of raw material extraction, initial processing involves the removal of country rock, or adhering rock that is part of the bedrock which housed the vein source exploited at the quarry. This initial processing produces massive amounts of tailings, which can easily be identified by the presence of adhering country rock. Next the raw material undergoes benefaction, meaning that the more homogenous raw material is differentially selected by the removal of portions of rock that contain faults and inclusions. Finally the homogenous units of raw material, separated from less desirable material during the process of benefaction, is used to make bifaces at separate tool making stations, which most often occur on level and well drained ground above or below the zone of extraction.

The lithic procurement sites that I investigated at West Rock did not represent quarrying from a massive source, such as a quartz or chert vein, and so the model proposed by La Porta (2000; 2003) was not strictly followed. Instead I have chosen to retain usage of terms such as flakes and shatter because they are suitable for the testing and early processing of cobbles and nodules that were exploited from the Konolds Pond and West River sites. But La Porta's (2000) general directive for using both methodology and analytical techniques appropriate for investigation of activities performed at lithic procurement sites was acknowledged.

The Konolds Pond Site

The Konolds Pond site (Figure 9.2) is a prehistoric quartz lithic procurement site, that is located 41°21.672' north latitude and 72°58.644' west longitude on the upper eastern terrace of the West River Valley. The West River flows past the site about 200 meters to the west and continues on its course another 5 miles before emptying into Long Island Sound. As mentioned previously West Rock's steep cliff face rises up behind the site providing some protection from cold winds and stormy weather. Between the terrace upon which the site is located and the West River exists extensive wetlands. Artifacts were concentrated along the edge of the terrace, at the juncture where it began to slope downward and toward the wetlands below. Dry sandy soil inhibited forest growth on the top of the terrace giving it a fairly open quality. The terrace is level and very well drained and would have been a suitable location for habitation. Extending to the west,

Figure 9.2: Location and Grid for Konolds Pond

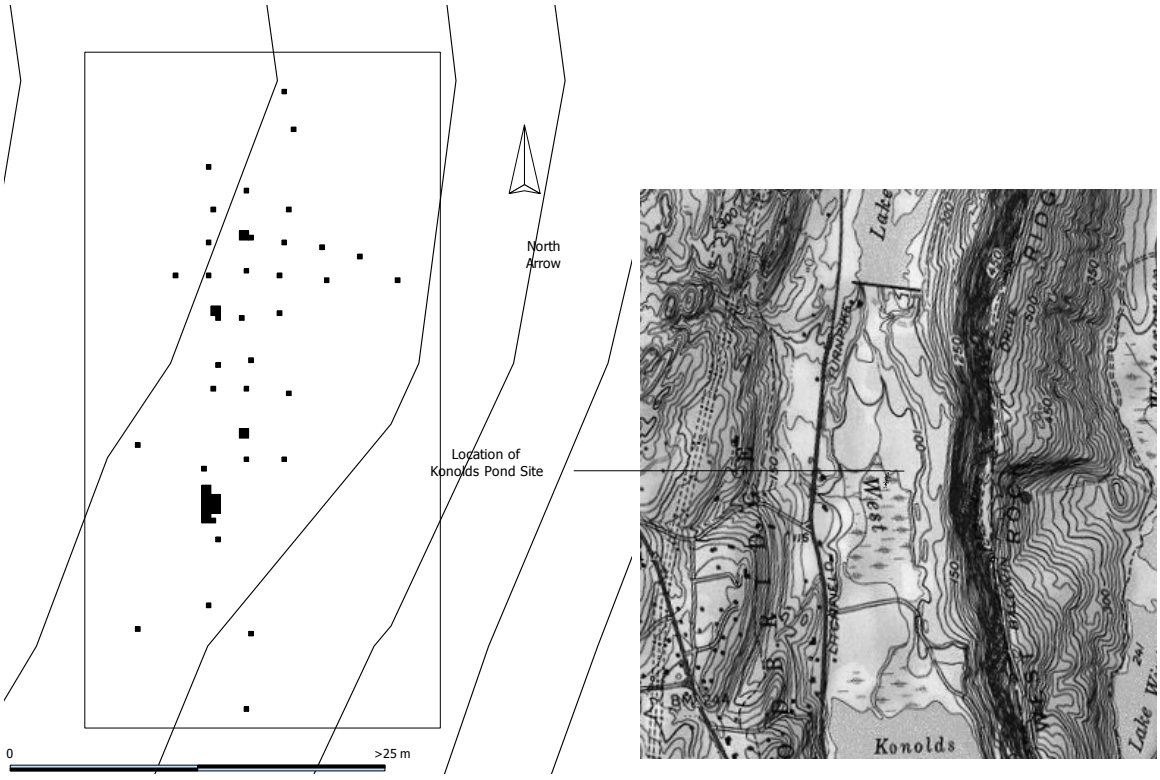


Figure 9.2 is a map of the location of the Konolds Pond site along a glacial outwash terrace which was banked against West Rock's cliff face, as well as the excavation grid used in data recovery from the site.

just beyond the West River, the valley is extremely level and fertile and would have supported a luxuriant mixed hardwood forest at the time of the site's occupation.

The discovery of the Konolds Pond site was facilitated by a series of survey transects that were placed parallel to the terrace, which generally trends in a north to south direction. These test pits were placed every fifteen meters and numerous positive test pits along the terrace revealed that general lithic procurement activities were fairly extensive. In fact evidence of this type of activity could be found intermittently along the terrace for over a distance of about a mile. The Konolds Pond and West River sites were selected for further investigation because of the intensity of prehistoric activities present in these locations. Thorough investigation of all of the sites present along the high terrace overlooking the West River was impossible due to time constraints. However, if evidence recovered from the Konolds Pond and West River sites is any indication, the area was a significant source of lithic raw material for South-Central Connecticut's prehistoric populations.

Methodology

A convenient opening in a stone wall that flanked the northern portion of the site was used as datum. Most of the artifacts recovered from the Konolds Pond site were found to the south of this stone wall. A grid of one meter squares was laid out extending from the datum point. These one meter units were labeled according to their distance both to the south and east or west of the datum point. For instance, a one meter square

whose northwestern corner was located ten meters to the south and ten meters to the west of datum was designated as grid unit S10W10. Excavation proceeded in two phases. The initial phase saw the excavation of half meter test pits at a regular ten meter interval throughout the site area. At least two sterile test pits were excavated in each of the four cardinal directions in order to determine the site's boundaries. The Konolds Pond site was found to be quite extensive, covering an area of approximately 2,000 m^2. The second phase of excavation involved placing one meter units in those locations where artifacts were particularly dense.

Each unit was shovel shaved and midden was removed by natural stratigraphic layering. Additionally natural layers were broken into arbitrary 10 centimeter levels in order to increase the chances of distinguishing stratigraphic associations or relations among artifacts. All soil was sifted through ¼ inch mesh screen. One potential feature was discovered. The feature represented a circular concentration of charcoal located at a depth of 22 centimeters below the surface. The potential feature, however, contained only wood charcoal and had no identifiable shape in cross section.

Enough charcoal was removed from the potential feature in order to obtain a radiocarbon date, which was returned from Beta Analytic Laboratories at Cal AD 1410 to 1530 (Cal 540 to 420 BP) and Cal AD 1550 to 1630 (Cal BP 400 to 320) at 2 sigma calibration (Beta-17826). Two date ranges were returned because the date in radiocarbon years intersected the calibration curve, in absolute years, in two locations. The returned date falls into the prehistoric period, but the potential features did not possess recognizable shape nor were any seed or nut fragments recovered from flotation of its

internal contents. Because only wood charcoal was present the potential feature was rejected and considered to represent the remains of a burned root.

Excavation included 34 half meter squares and 9 one meter excavation units within the artifact bearing deposits of the site. This indicates that only 17.5 m^2 of the site's total area of approximately 2,000 square meters was excavated. This represents less than a one percent sample. Spatially, one distinct locus was identified in the southwestern portion of the site that was considered to represent a distinct tool making station. The presence of four projectile points, a scraper and two utilized flakes further indicates that this locus may represent a small seasonal campsite, distinct from the rest of the general lithic processing activities occurring over the rest of the terrace.

Aside from the locus mentioned above, however, the only activity which dominated the entire extent of the Konolds Pond site was selection, testing and processing of quartz pebbles and nodules that had been obtained along the terrace's surface. For this reason the debitage, bifaces and cores recovered are considered to constitute a representative sample for the site. The entire list of artifacts recovered includes: 5 Small Stemmed Projectile Points, 2 late stage bifaces, 1 middle stage biface, 2 early stage bifaces, 3 biface fragments, 1 scraper, 2 retouched, utilized flakes, 2 flake cores, 1 anvil, 1 anvil fragment, 2 possible hammer stones and 6,404 pieces of lithic debitage.

Vertical stratification of the Konolds Pond site is discussed below.

Stratigraphy

According to the Soil Survey of New Haven County (SSNHC) (USGS: 1979) the soil type present at the Konolds Pond site was a Manchester gravelly sandy loam. Manchester series soils in turn are part of the Manchester-Deerfield unit, which collectively represent excessively to moderately well-drained soils occurring on broad outwash plains on nearly level to sloping ground. The SSNHC described Manchester gravelly sandy loams as having an upper soil layer, or A horizon, consisting of a reddish brown gravelly sandy loam extending to a depth of about 6 inches (14.5 cm). The B horizon, or subsoil, is most often composed of yellowish brown sandy loam having a thickness of about 10 inches (25 cm). The substratum consists of stratified sand and gravel extending to a depth of 60 inches (152 cm). Manchester gravelly sandy loams are known to have low available water capacity and to warm up rapidly in the spring. Unless irrigated these soils have poor potential for growing crops, and although it supports trees fairly well, seedling mortality is high due to lack of sufficient moisture (1979). This fact was borne out by field observation, because a fairly open forest existed on top of the terrace.

Stratigraphic information gleaned from field notes at the Konolds Pond site differed only slightly from the description of Manchester gravelly sandy loam provided by the SSNHC. The upper soil layer, or A horizon, for the Konolds Pond site was recorded as a very dark brown, loose, sandy loam extending to a depth of between 16 and 26 cm (6.5 to 10 inches). The B horizon, or subsoil, was alternately recorded as

yellowish brown, dark brown or dark reddish brown, friable sandy loam, having a moderate amount of gravel as well as some pebbles. The B horizon extended from a top depth of 16 to 26 cm to a bottom depth of between 39 and 48 cm (15.5 to 19 inches). The subsoil was recorded as stratified sand and gravel, which was sterile of cultural materials.

The stone walls lining the field where the Konolds Ponds site is located indicates that the area had been used historically as pasture land. Additionally, it may have undergone some plowing or cultivation, although evidence of this was scant. Some historical artifacts were recovered from the upper soil horizon, but the overall dry and sandy nature of the site soils probably prohibited the usage of the terrace for extensive agricultural activities. Forest succession indicated that the field had remained untouched for quite a long time, probably at least two hundred years.

The effort to distinguish stratigraphically separate cultural layers was not successful, as is often the case with lithic procurement sites. The overall homogeneity of cultural deposits is interpreted to indicate that acquisition of raw material from the Konolds Pond site was by direct access over a fairly long period of time. This would mean that prehistoric individuals or small groups had visited the site intermittently acquiring what was required for their own immediate purposes. Despite individual variation in lithic procurement activities the overall trend was for small mobile societies to select, test and process quartz with the objective of removing from the site suitable pieces for making stone tools at other locations. For mobile societies this preferably would have meant the production of highly portable performs. With these general objectives in mind the site's deposits accumulated as roughly homogenous layers over the time period when the site was utilized.

Analysis of Lithic Artifacts from the Konolds Pond Site

The sample of artifacts recovered from the Konolds Pond site included 5 projectile points, 5 bifaces in various stages of manufacturing, 3 biface fragments, a scraper, 2 retouched and utilized flakes, 2 cores, 18 bipolar cores, an anvil and 6,404 pieces of lithic debitage (Figure 9.3). While this represents a large volume of artifacts, less than one percent of the total site was excavated and so of course this represents only a small portion of the total artifacts. First the tools, cores, hammerstones and anvils will be described, next lithic debitage analysis will be presented, and then all of the data from artifact and spatial analysis will be combined to provide an interpretation of the site.

The five projectile points (Figure 9.3, Nos. 5-9) form a fairly homogenous group, all of which were white quartz Small Stemmed points, identified as Wading River points, which Ritchie (1971:131) reported as a Late Archaic (6,000 to 3,700 years ago) type. The points are all also similar because they are small and apparently represent specimens that had been re-chipped and were at the end of their use-lives.

The first point had a blade in the shape of a narrow isosceles triangle with a well formed tip. The point had only one prominent shoulder on one side, and a base that was somewhat rounded and asymmetrical. The point apparently had been broken but re-chipped with a few well placed pressure flakes in order to render it serviceable. The base did not appear to be ground or abraded.

The second point had a blade in the shape of an isosceles triangle with a sharp and well formed tip. Like the previous point it had only one prominent shoulder, the other

side had obviously suffered damage during usage, missing the shoulder and part of the midsection. The stem was straight sided with a straight or slightly concave base with no grinding or abrasion present. Once again, the point appears to have incurred impact damage, but was subsequently repaired with a few well placed pressure flakes in order to render the point serviceable.

The third point had a blade shaped like a narrow isosceles triangle with a sharp needle-like tip. The shoulders were only very weakly discernable. The stem was generally straight and the base appeared to have gentle rubbing or abrasion on one side. The point appeared to have previously undergone damage during usage and had been re-chipped into a serviceable condition.

The fourth point had a blade shaped like an isosceles triangle and a well formed tip. The shoulders were not pronounced but were obvious on either side. The stem was straight on both sides and the bottom, and some abrasion or rubbing appeared under both of the shoulders. The blade was apparently reworked with small pressure flakes on either side.

The fifth point had a blade in the shape of an isosceles triangle with a well formed but somewhat rounded tip. Slight shoulders occurred on either side and the stem was straight both on the sides and the base, with rubbing or abrasion on either side of the stem. Once again reworking of the point was obvious due to the discontinuous nature of the flaking on the stem as opposed to the point's blade.

The most abundant artifact type recovered from the Konolds Pond site was bifaces, which included 5 broken specimens and 3 fragments. All of the bifaces where

Figure 9.3: Artifacts from Konolds Pond

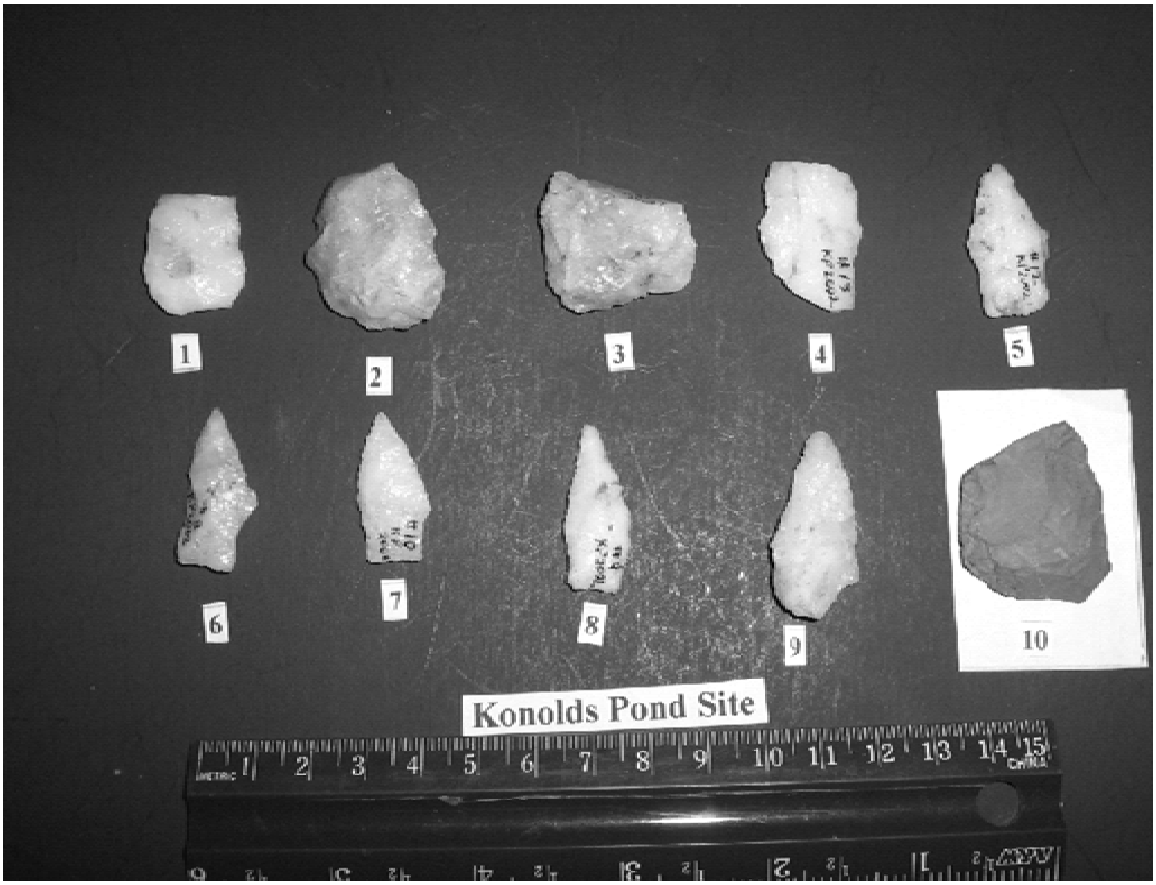


Figure 9.3: No. 1 and 3 late stage bifaces; No. 2 middle stage biface; No. 4 utilized flake; Nos. 5-9 Wading River Points; No. 10 basalt scraper.

chipped from either white or partially translucent quartz, which was consistent with raw material that was available from the terrace upon which Konolds Pond site was located.

Bifaces were staged roughly because of the difficulty in identifying precise manufacturing stages when quartz is used as the raw material. The stages were defined in the following way: 1) early stage bifaces had only evidence of flakes removed along the edges in order to roughly shape the piece, 2) middle stage bifaces had symmetrical edges and had undergone some thinning, and 3) late stage bifaces were well thinned and had very symmetrical edges.

The first two bifaces were broken during the early manufacturing stages. Both had steep flakes removed along their edges, which remained rough and uneven. Both bifaces did possess at least one large thinning flake on one face indicating that thinning occurred early in the manufacturing process.

A single middle stage biface (Figure 9.3, No. 2) had been broken by a transverse fracture after being edged all around. The biface was somewhat thinned but required further shaping.

Two bifaces broken during the later stage of manufacturing (Figure 9.3, Nos. 1 and 3) were recovered from the site. The first was well thinned having symmetrical edges that were formed by a series of small pressure flakes along the perimeter. The biface was broken by a transverse fracture before it was finished. The second of the late stage bifaces had symmetrical edges but was in need of further thinning when it apparently also had suffered a transverse fracture and was discarded.

The other three formal stone chipped tools consisted of two retouched and utilized quartz flakes (Figure 9.3, No. 4) and a gray basalt scraper (Figure 9.3, No. 10). Use-wear

on the utilized flakes consisted of microflaking which occurred on either side of the retouched edges. The scraper had been chipped from a flake, with steep retouch along the working edge that also possessed evidence of use-wear in the form of microflaking.

A small pebble had been used as an anvil and was evidence that a bipolar core technique had been utilized at the site. The artifact was a small circular pebble with flattish sides, 76 centimeters long, possessing use-wear in the form of pock marks that converged as an indentation on one of the pebble's flat surfaces. The anvil is thought to have been used to support a core that was then shattered into several pieces as a heavy hammerstone was brought down on it. Additionally, 18 very large quartz fragments were interpreted as bipolar cores.

Only two flake cores were identified from the site. The first of the flake cores was wedge shaped with striking platforms on the wider or upper part of the wedge and large flake scares extending down along both faces. This was a large core of whitish, semi-translucent quartz that was 146 mm, 119 mm wide and weighed 990 grams. The smaller core was also wedge-shaped and had evidence of the removal of at least one large flake. This core was 117 mm long, 75.5 mm wide and weighed 375 grams.

The two probable hammerstones were both quartzite pebbles, the larger of the two was 89 cm in length and was roughly oval in shape with two flat sides and use-wear consisting of pock marks converging together on one end. The other was 69 cm long, oval in shape, with flattish sides and having evidence of use-wear on both ends which was more pronounced on one side where pock marks converged into an indentation.

Analysis of Lithic Debitage

A total of 6,404 pieces of lithic debitage were recovered from excavated units at the Konolds Pond site. The vast majority of this debitage was quartz, including 6,353 of the total or 99.2%. In addition to quartz, chert accounted for 31 or 0.5% and basalt made up 20 or 0.3% of the total debitage recovered. Analysis of debitage from the Konolds Pond site included: 1) identification of cortex, 2) classification of debitage as flakes or shatter, 3) quantification of debitage size and weight according to one centimeter increments and 4) examination of flakes in terms of possessing a remnant of the original striking platform, 5) classification of remnant striking platforms as being, single faceted, multi-faceted or lipped, 6) presence of evidence of previous removals on the dorsal surface of all flakes, 7) examination of flake platforms for evidence of use-wear or alternately for signs of platform preparation in terms of grinding or abrasion, and 8) quantification of bifacial thinning flakes and obvious bipolar debitage, as well as a relative assessment of the number of pressure flakes in terms of whether they were present, absent, moderately abundant, or numerous.

Table 9.1 below gives information concerning size and weight of flakes and shatter divided into incremental size grades using a one centimeter interval. Next Table 9.2 gives the results of analysis of flakes from the Konolds Pond site in terms of platform characteristics and possession of dorsal flake scars. These tables include only quartz debitage. Chert and basalt debitage will be discussed separately.

Table 9.1: Size and Weight of Quartz Debitage for Konolds Pond

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11
Flake Count	352	1,670	431	132	19	4	-	-	-	-	-
Weight (g)	45.3	743.4	928.2	818.8	272.6	117.1	-	-	-	-	-
Shatter Count	384	2,219	694	231	68	18	13	8	8	1	1
Weight (g)	72.8	1331.7	1928	1943.5	1392.2	727.4	1000.2	669.7	913.5	134.7	490

Table 9.2: Quartz Flake Attributes for Konolds Pond

Attribute	+ for RPBF	Lipped	Flake scars
Count	904	323	1194
Percentage	33.4	11.9	44.1

In order to keep data presented in Table 9.1 simple, information concerning cortical debitage was not included but will be given in the following section of text. A total of 1001 of quartz debitage possessed at least a portion of cortex on one surface, representing 15.8% of all debitage. Shatter was more numerous than flakes with 3,645 debitage catalogued as shatter and 2,708 as flakes. This produces a flake to shatter ratio of 1:1.3, with 57.4% of the total as shatter and 42.6% as flakes.

Of 2,708 total flakes, 904, or 33.4%, possessed a remnant of the striking platform; of these 323, or 11.9% of the overall total, possessed a lipped striking platform; and 1194

flakes, or 44.1%, had flake scars from previous removals on their dorsal surfaces; 573 flakes, or 21.2% were classified as bifacial thinning flakes, 39 pieces of debitage were classified as bipolar flakes and numerous pressure flakes were noted. Percentages are not given for bipolar debitage because it was too difficult to identify with confidence and so reporting this figure as a proportion would be misleading.

Several lines of evidence strongly support the argument that lithic raw material was both obtained and initially processed at the Konolds Pond site. Large debitage was very numerous with 503 of 6,353 quartz debitage, or 7.9%, being over 3 centimeters and many even bigger pieces present. A large portion of debitage was cortical with 1001, or 15.8% of the assemblage. Also shatter was very numerous making up 3,645, or 57.4% of all debitage. The most conclusive evidence, however, comes from the 18 bipolar and 2 flake cores, all of which were derived from quartz pebbles and nodules that were abundantly accessible all over the terrace where the site was located. These cores and other large cobble fragments would have been difficult to transport far from their source, and so there is little doubt that this evidence points to the initial processing of quartz lithic raw material obtained in the vicinity of the site. Additionally, the 39 pieces of bipolar debitage documents the act of splitting pebbles open as an initial step in lithic processing at the site, as does the pebble anvil.

The manufacturing of bifaces can be directly inferred from two lines of evidence: 1) the presence of five broken bifaces, and 2) 573 bifacial thinning flakes. Five worn out and damaged projectile points had been left at the site, apparently in a context where replacement tools had been manufactured.

The site possessed deep artifact bearing layers, sometimes extending from near the surface to depths of below 60 cm. This indicates that cultural materials had accumulated over a very long period of time. Horizontal and vertical variability in site deposits was not discernable aside from a single locus to be described below that may have represented a short-term seasonal campsite. The occurrence of similar activities over a very broad portion of the terrace, approximately a mile in length, indicates that people visited the area over a very long period of time, fulfilling their individual lithic raw material requirements and contributing to the general build-up of archaeological deposits in the process. The choice to acquire quartz as cobbles and nodules scattered widely along the top of the terrace, may have been influenced by the ability to acquire lithic material in the midst of general hunting or foraging activities in the rich environment surrounding the Konolds Pond site.

Finally, a small relatively dense cluster of artifacts in the southwestern portion of the site where several tools occurred, including 4 of the 5 projectile points recovered as well as a scraper and two utilized flakes, probably indicates that at least one small group of people made a small seasonal camp at the Konolds Pond site. The presence of camps along the West River, and in association with the terrace where the quartz quarry sites discussed here were located, was revealed due to the presence of several surface scatters on the low terrace and floodplain of this river. These scatters were not investigated as part of the West Rock Ridge project because they were not located on the ridge itself. However, one scatter on the western side of Konolds Pond, investigated by the author between the months of June and July of 2007, proved to be an extensive site, possibly a

village, covering more than 4,000 m². Abundant quartz debitage and diagnostic projectile points of the Small Stemmed Point Tradition were recovered in initial test excavations.

Chert and basalt debitage is discussed last because: 1) it was not numerous and 2) its usage seems to represent something apart from the activities identified during the analysis of quartz artifacts. Information about relative size and weight of chert and basalt debitage from the Konolds Pond site is given in Tables 9.3 and 9.5 respectively flake attributes are in Tables 9.4 and 9.6. Neither chert nor basalt appears to have been procured or initially processed at the Konolds Pond site. So, it must be presumed that artifacts of chert and basalt were transported into the site. In terms of basalt, only flakes were present and it can at least be speculated that these are indicative of tool maintenance activities, because at least one basalt scraper was discarded at the Konolds Pond site.

Table 9.3: Size and Weight for Chert Debitage for Konolds Pond

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Flakes	1	15	3	3	1	-	-
Weight (g)	0.1	6.0	3.7	10.6	12.3	-	-
Shatter	-	5	2	-	1	-	-
Weight (g)	-	4.3	3.1	-	20.4	-	-

Table 9.4: Chert Flake Attributes for Konolds Pond

Attribute	+ for RPBF	Lipped	Flake scars
Count	11	5	10
Percentage	47.8	21.7	43.5

Table 9.5: Size and Weight for Basalt Debitage from Konolds Pond

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Flakes	-	9	8	1	-	1	1
Weight (g)	-	6.6	11	3.9	-	25.8	31.3

Table 9.6: Basalt Flake Attributes for Konolds Pond

Attribute	+ RPBF	Lipped	Flake scars
Count	15	8	14
Percentage	75.0	40.0	70.0

The West River Site

Located about 500 meters to the north of the Konolds Pond site was the West River site. The West River site was not as thoroughly researched as the Konolds Pond

site, but still it provided valuable information concerning prehistoric lithic procurement activities along the high terrace banked against the base of West Rock's cliff face.

An attempt was made to delimit the West River site in all of the cardinal directions, but a continuous thin deposit of artifacts both to the north and the south made this impossible. A conservative estimate is that prehistoric lithic procurement activities concentrated in an area of approximately 3,000 m^2. Site stratigraphy and soils were similar to the Konolds Pond site and will not be repeated here. Aside from those test pits used in an attempt to delimit the site's boundaries the vast majority of artifacts recovered came from only two half-meter test pits located in the midst of the site's deepest artifact bearing deposits. Table 9.7 below provides information concerning relative size and weight for flakes and shatter recovered from the site. Table 9.8 provides information concerning analysis of flake attributes.

Table 9.7: Size and Weight for West River Debitage

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Flakes	50	128	29	1	2	-	-
Weight (g)	5.3	44.8	50.6	3.7	32.7	-	-
Shatter	35	174	45	14	6	1	2
Weight (g)	7.2	88.1	138.4	113.9	117.6	53.4	32.7

Table 9.8: Flake Attributes for West River

Attribute	+ RPBF	Lipped	Flake scars
Count	48	31	81
Percentage	22.9%	14.8%	38.6%

The analysis of artifacts from the West River site represents a very small sample and so only generalizations can be made concerning the types of activities that prehistoric inhabitants performed. The bulk of artifacts came from two test pits separated by 15 meters in what appeared to be the densest artifact bearing deposits from the site. Although the test pits were small half meter pits, they both produced impressive amounts of quartz debitage, 187 and 251 were the totals respectively. In all 487 pieces of quartz debitage were found at the site. No lithic tools were recovered but one quartz bipolar core was found.

Of 487 quartz debitage 210, or 43.1%, were flakes and 277, or 56.9%, were shatter, yielding a ratio of about 1 flake for every 1.3 shatter. Cortical debitage was represented by 106 pieces, or 21.8% of the total. One hundred, or 20.5%, pieces of debitage were over 2 centimeters in length, and similarly to the Konolds Pond site larger debitage pieces made up a much greater proportion of the total debitage by weight. A total of 62 flakes were classified as bifacial thinning flakes, pressure flakes were numerous, and 5 bipolar debitage were also identified.

Although the sample was small, these numbers are similar to observations from the Konolds Pond site, and suggest that quartz nodules and pebbles were selected, tested

and initially processed at the West River site. This conclusion is supported by the presence of one bipolar core and at least 5 bipolar debitage which indicates that cobbles and pebbles, readily available along the terrace, where tested and split open.

Similarly, flake attributes including 48, or 22.9%, flakes possessing a remnant of their original striking platform, 31 or 14.8% having lipped platforms, 81 or 38.6% having flake scars on their dorsal surfaces, numerous pressure flakes, and most importantly the identification of 62 bifacial thinning flakes (31.0% of flakes recovered from the site) indicates that manufacture of bifaces was an important activity.

Cultural deposits at the West River Site were also very deep, just as they had been at the Konolds Pond site, indicating once again that this quarry had been visited over a very long period of time.

But as described previously, these two sites only represent a portion of the archaeological record present on the high terrace of the West River. Numerous positive test pits were recorded all along this terrace encompassing a distance of approximately one mile. These two sites were selected because they showed promise of yielding a large amount of cultural material. The West River site was not well researched, and so it remains a very important site for investigation of quartz procurement and lithic processing activities for future archaeologists working in the New Haven area. But the larger picture is that small groups of hunter-gatherers had visited a very wide expanse of this terrace, leaving numerous artifacts as evidence of the general importance of this area in their lithic procurement activities.

The Building Brook Site

The discovery of the Building Brook Farm site was completely accidental. The site is important because it represents a rarity in the state of Connecticut, the acquisition on the part of prehistoric populations, of chert from a source that had originated in the local bedrock. The chert source exploited at the Building Brook Farm represented a secondary deposit and therefore can not technically be considered a bedrock source; but the nodules processed by the site's prehistoric inhabitants had originally formed within the cooling basalt of Connecticut's trap-rock ridges (Calogero personal communication 2006). These nodules apparently had eroded from trap-rock along West Rock's gentle eastern slope.

The discovery of the site would not have occurred without the generous help of a local Hamden resident who gave me permission to perform test excavations on his property in an abandoned garden plot. I originally had asked permission to perform excavations at what would become the Building Brook Farm site because I hoped to gather information related to an extensive surface collection that another local resident had kindly allowed me to examine (see Figure 10.7). The collection, which has come to be labeled the Building Brook Farm collection (the owner chose to remain anonymous), was significant for possessing many beautifully chipped artifacts including large bifaces and knives as well as a Stark projectile point, a type that is diagnostic of the Middle Archaic Period (8,000 to 6,000 years ago). What I did not expect to find was a fairly

intensive lithic processing site where prehistoric inhabitants had selected, tested and processed nodules of local chert, as well as producing bifaces from this raw material.

Both color and texture vary widely for the locally acquired chert, as can be expected from a source that actually consists of individual nodules (Figure 9.1), each with its own somewhat unique formation history. The nodules are thought to form in flowing magma as silica accumulated in pockets that occurred while the basalt was still hardening (Calogero personal communication 2006). Nodules formed in this way were apparently abundant along a gently sloping terrace overlooking Building Brook and at the bottom of West Rock Ridge. The chert was part chalcedony (Calogero personal communication 2006) and any one fragment inevitably possessed numerous colors. The most typical colors were browns ranging from chocolate brown to light olive brown, and reds ranging from deep red to maroon; but other colors including white, grey and blue were also present. The knapping quality was also extremely variable, sometimes being full of faults and impurities. However, industrious effort and careful selection was apparently able to separate fairly large homogenous pieces of chert, having a typical waxy luster and capable of producing very sharp and hard flakes having translucent edges.

According to the Soil Survey of New Haven County (SSNHC) (1979) the Building Brook Farm site occurred in a soil type that was identified as a Watchaug fine sandy loam. The SSNHC reported that these soils typically occur on 3 to 8 percent slopes, and have moderate permeability to water with a seasonally high water table occurring just twenty inches below the surface from late fall to early spring. This observation was born out by the property owner, who complained that the soil was often

very wet. The seasonally wet soils apparently represent a perched water table, caused by the discontinuous layers of hardpan in the soil substratum that prevents downward infiltration over much of the terrace.

According to the SSNHC a typical soil profile for Watchaug fine sandy loams includes a surface layer, or A horizon, extending to a depth of 8 inches consisting of a dark reddish brown fine sandy loam, and a subsoil, or B horizon, extending to a depth of 24 inches and consisting of reddish brown or yellowish red sandy loam that is mottled in its lower six inches. The substratum, or C horizon, consists of a reddish brown, mottled, friable gravelly, sandy loam that extends to a depth of about 60 inches and as reported earlier possesses discontinuous layers of hardpan soils.

Field notes taken during test excavations at the Building Brook Farm site agree in a general way with the description provided by the SSNHC. The top 16 to 20 centimeters, however, consisted of a plow zone that could be described as a dark brown silty loam. Artifacts were infrequent in the plow zone. Below the plow zone the A horizon was recorded to a depth of between 28 to 33 centimeters and consisted of a dark reddish brown silt loam. The subsurface, or B horizon, extended to a depth of between 52 and 62 centimeters and consisted of a firm, dark reddish brown sandy loam. The C horizon was brown hardpan that was impermeable beyond the first few centimeters. Artifacts concentrated below the plow zone and extended all the way down to where the impermeable hard pan layer was found. Once again, no stratigraphic separation of artifacts could be discerned.

Units were carefully shovel shaved, following the natural stratigraphic layering, but these natural layers were so thick that it was also necessary to further subdivide them

according to 10 centimeter arbitrary levels in an attempt to discern vertical separation of cultural components. All soil was screened through ¼ inch hard mesh cloth.

Twelve half meter shovel test pits and four one-meter excavation units were excavated in the garden plot, totaling an area equivalent to 7 one meter squares. With the permission of the property owner I was also able to dig several pits outside of the garden plot and these revealed that testing and processing of chert nodules may well have been a widespread activity all over the terrace, although none revealed the kinds of artifact densities that were apparent at the Building Brook Farm site. There is no way of telling what proportion of the site was excavated because test pits within the garden itself were not able to delimit the site completely. It can be reported, however, that high artifact densities were only present in a very small portion of the garden plot, in its southeastern corner.

A total of 1,472 artifacts were recovered from the Building Brook Farm site. All of them represented the locally acquired chert, except for one single quartz flake that was identified among the site's deposits. Two of these artifacts were bifaces, 12 were bipolar cores, one was a flake core, and one possible hammerstone was also found. The rest of the artifacts represented 1,458 pieces of lithic debitage. No diagnostic artifacts revealing temporal or cultural affiliation were located at the site.

Table 9.9, below provides information concerning relative size and weight as well as proportion of flakes and shatter. Only one quarter of the lithic debitage is represented in Table 9.9 because site deposits were so obviously continuous that it was not considered necessary to examine the entire assemblage. This sample came from two of the one meter square units.

Table 9.9: Size and Weight for Debitage for Building Brook

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	15-6
Flakes	5	49	16	6	3	-	-	-	-	-	1	-	-
Weight (g)	0.5	20.7	29.1	45.9	58.7	-	-	-	-	-	155.0		
Shatter	15	156	53	38	3	11	7	4	2	1	1	1	1
Weight (g)	3.0	91.5	200.4	368.0	248.0	580.9	395.6	408.8	284.5	315.0	435.0	240.0	134.5

From Table 9.9 it is obvious that a significant proportion of debitage was large in size, including 79 of the 373 pieces analyzed which were larger than 3 cm, or 21.2%. Also shatter was much more frequent than flakes, the latter of which made up only 80 of 371 debitage, or 21.4%, yielding a flake to shatter ratio of 1 to 3.7. Including the entire assemblage of 1,458 debitage pieces, 57 were classified as bifacial thinning flakes, some pressure flakes were present, and 151 debitage fragments were classified as bipolar debitage.

Two chert bifaces were recovered from the site (Figure 9.4, Nos. 2 and 3). Both these bifaces where broken by transverse fractures that appear to have split them approximately in half. The bifaces were well shaped, although apparently chipped using a minimal number of flake removals. But the most unique characteristic of the bifaces is that they were large, and also fairly thick. The first of the two bifaces was 59 mm long, 38 mm wide and 24 mm thick, the later of the two was 48 mm long, 43 mm wide and 16

mm thick; but since both bifaces had been broken approximately in half it is assumed that they were originally about twice the size reported above. It is truly unfortunate that no complete bifaces were found because this could have represented very important information.

Twelve bipolar cores, as well as 151 pieces of bipolar debitage, indicates that initial splitting and testing of cobbles using a bipolar technique was the major activity performed at the site. Apparently, the large volumes of shatter and many split cobble fragments, documents the care taken by the site's prehistoric occupants in order to find large pieces of homogenous lithic raw material. The larger portions of these nodules had been full of flaws and inclusions, but splitting of larger pieces facilitated discovery of portions of the rock that were suitable for the manufacture of large bifaces. This process of freeing large homogenous pieces of lithic raw material is consistent with the benefaction stage of LaPorta's (2000) model of quarry related lithic processing. Once again the presence of many split cobble fragments, as well as fairly abundant natural chert nodules both co-occurring in the same location on the terrace, indicates that the site was utilized as a quarry.

Large pieces of suitable lithic raw material were probably used in one of two ways: 1) directly in order to manufacture bifaces, or 2) at least one very large piece had been used as a flake core. Additionally many large flakes were found that would have been suitable as tool preforms. One of the important goals of the prehistoric flintknappers had obviously been the manufacture of large bifaces, two broken examples of which were found at the site. Further evidence of biface manufacturing were the 57

Figure 9.4: Artifacts from Building Brook

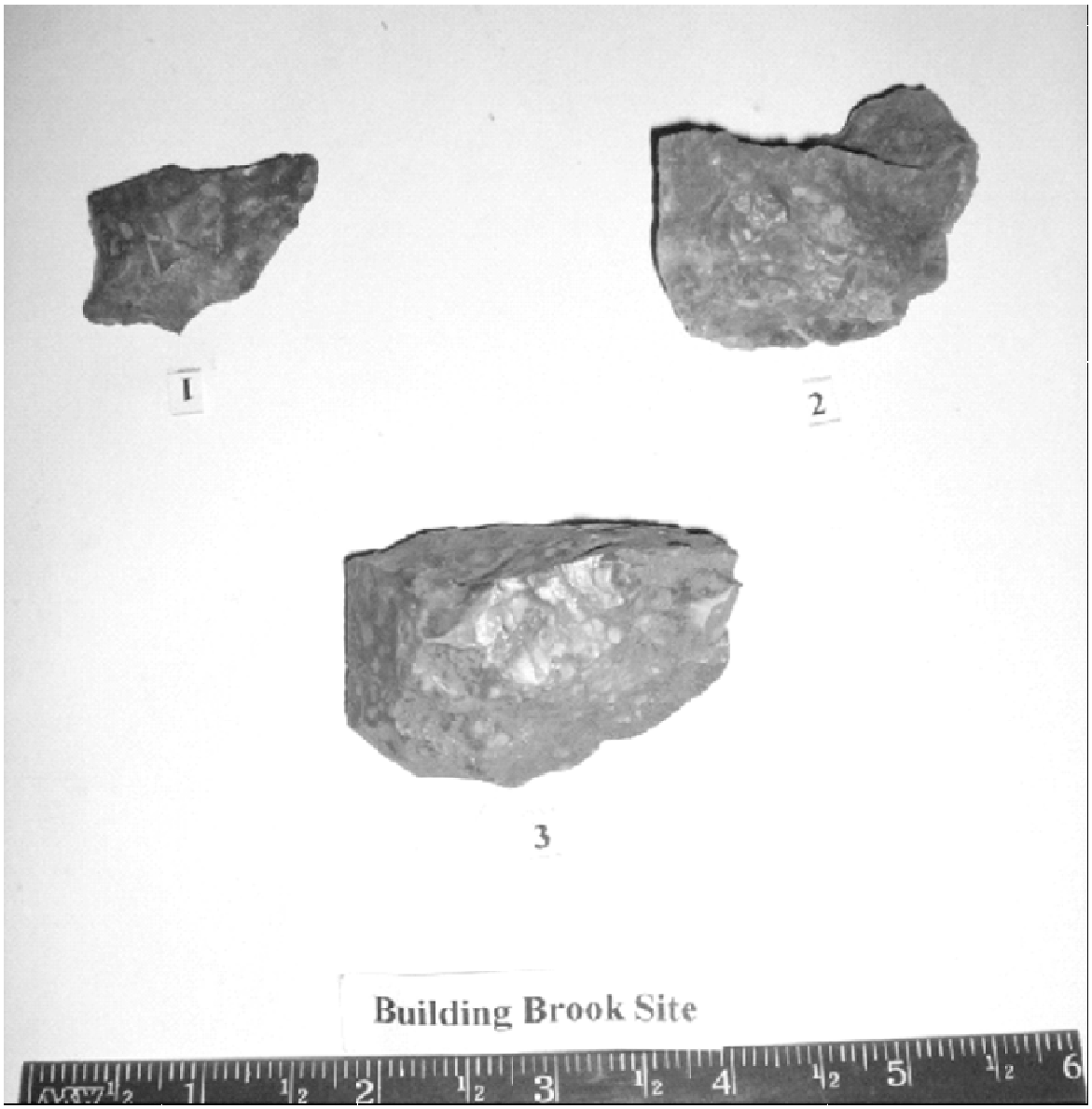


Figure 9.4 Nos. 2 and 3 are chert bifaces, No. 1 is a possible chert graver.

bifacial thinning flakes. Late stages of tool manufacturing probably did occur at the site, because some small pressure flakes were found. But these were not numerous.

It can be suggested that if these bifaces were the intended end product of the lithic processing activities at the Building Brook Farm site, that the prehistoric occupants utilized them as flake cores at other locations. This observation stems not only from the size and thickness of the broken bifaces recovered, but also from the observation that at sites where the local chert was utilized at West Rock Ridge (for example, the Blakeslee Quarry site), the only artifacts recovered made from this raw material type are numerous large and small flakes. Only very rarely have formal tools made from this raw material type been identified.

Discussion

Two lithic raw materials that were very important for the prehistoric inhabitants of South-Central Connecticut were available from West Rock Ridge: chert and quartz. The archaeological investigation of the identified quarry sites was successful in revealing more than simply the extent of the deposits, and by inference, the general importance of these lithic raw material sources to the area's inhabitants. It was also possible to make at least some conclusions concerning how the prehistoric peoples who utilized these sites organized their lithic procurement activities.

In the case of the Konolds Pond and West River sites, acquisition had been by direct access. Apparently small groups of people had visited the terrace upon which

these sites were located over a long period of time, in the fulfillment of their immediate tool stone needs. These activities had led to the gradual build up of deposits over a very broad portion of the terrace. Furthermore acquisition of lithic raw material may have been embedded in other subsistence related activities conducted in the West River Valley.

This type of lithic procurement, which had been practiced by the Small Stemmed Point Tradition cultures who left their diagnostic artifacts at the Konolds Pond site, is consistent with the predictions (given in chapter two) concerning organization of technology for those cultures who should have been most likely to incorporate West Rock into their annual subsistence. Heavy reliance on local quartz lithic raw material sources may have been influenced by the degree of territorially expressed by individual subsistence groups, and may have resulted from packing of local groups within the regional territory. Additionally, acquisition of lithic raw material by direct access is consistent with the usage of the source by mobile groups who could visit the area at times of the year when supplies of lithic raw material ran short.

The Building Brook Farm site, however, gives an impression of something different from those activities described above. The large bifaces present are suggestive of their usage as cores, or what would be a formalized core technology (Parry and Kelly 1987). Also, the organization of activities was somewhat more complex. Great effort had been expended in trying to find suitable raw material, and much waste was produced in this process. However, once large pieces of homogenous raw material were acquired, equally great effort was exercised in maximizing its usefulness. Large bifaces were carefully chipped with a minimal number of well-planned removals, and at least one flake

core demonstrated evidence of numerous removals which would have produced large flakes that could have functioned as suitable tool preforms.

No diagnostic artifacts occurred at the Building Brook Farm site, but the presence of large and small flakes from this same raw material source at West Rock Ridge sites indicates that people of the Small Stemmed Point Tradition had access to it. Additionally the raw material, when found at Small Stemmed Point Traditions sites, is inevitably confined to large and small flakes. Only rarely have formal tools, manufactured from this local chert, been found at these sites. This would support the suggestion made above, that lithic raw material had been introduced into the sites as bifacial cores. These cores could have in turn served as a source of flake tools.

These observations lead to speculation that the chert source from the Building Brook Farm site may have been processed by a specialized sub-group of the local community. Given Ericson's (1984:6) comment that the color of local lithic raw material can be a source of pride for people who associate it with their homeland, one can even wonder if the beautiful brown, red, pink and maroon hues found in these chalcedony-like cherts gave this source a special meaning. Of course this all has entered the world of speculation and is beyond the scope of the present research, but does lead to a discussion of the importance of sourcing this raw material type. To this end, however, only a few general comments can be suggested.

The chert available from the Building Brook Farm site is highly variable in terms of its color and texture, making it very difficult to identify from individual samples. Additionally, the most typical brown and reddish hues look very similar to high quality lithic sources from outside of the area (such as Pennsylvania Jasper) when observed as

individual specimens. Identification of the raw material in archaeological assemblages is only possible, with any degree of confidence, when numerous flakes are present which collectively demonstrate the variability in terms of colors that are present in the local parent material source. For this reason tracing this raw material type to sites removed from West Rock Ridge, or South-Central Connecticut, will probably have to rely on chemical characterization and not simple visual identification.

Chapter 10

Seasonal Campsites Along Upland Streams

Small upland streams having their headwaters at West Rock Ridge, or alternately receiving a large contribution of run-off from its slopes, were apparently suitable locations for short term encampments which have been interpreted as seasonal campsites. Several campsites along the West River Valley have already been mentioned in relation to lithic procurement sites existing on a high terrace banked against the west facing cliff face of the ridge. The encampments discussed in this chapter, however, existed on the opposite side of the ridge, and at the bottom of its gentle east facing slope. These three sites are: 1) the Fairhaven Reservoir site, 2) the West Rock Nature Center site, and 3) a suspected encampment related to the Building Brook Farm collection.

Of all of these sites, the Fairhaven Reservoir site was the most thoroughly researched, and is considered to be only one example of a number of potential camps that have subsequently been inundated by the creation of Wintergreen Lake. Wintergreen Lake is a man-made reservoir that formerly provided drinking water to local residents of the city of New Haven. In terms of the second site reported in this chapter, it was my great fortune to be able to enlist the help of Michael Rodgers from Southern Connecticut State University and one of his enterprising students, Nancy Parsons, in their excavation

of the West Rock Nature Center 1 site. I had discovered the site while walking the nature center's park trails in 2000. One day, discussing Michael's plans to conduct a field school on the West Rock Nature Center property, I suggested that Michael use the site for his field school. This represented a tremendous contribution to the present research project because the West Rock Nature Center site was very similar to the Fairhaven Reservoir site, and together with it, these sites appear to represent a fairly consistent theme; a point that will be returned to later in this chapter.

The final site to be discussed in this chapter occurred in relation to an artifact collection that a local resident made as a youth on his former grandfather's farm. The collection possessed several expertly crafted large bifaces and knives, and would appear to have represented an important habitation along Building Brook, which forms a very well sheltered gorge where it descends West Rock's gentle eastern slope and down cuts into softer brownstone bedrock. Although no formal investigation of the area where the collection occurred was possible, it is still included in this chapter.

The Fairhaven Reservoir site will be discussed in the greatest detail, beginning with information concerning the general history and ecology of the Wintergreen Lake area. Next, artifacts recovered from the site will be described, and along with some spatial and contextual analysis, a general interpretation of important activities which occurred at the site will be provided. Afterward, the West Rock Nature site and the Building Brook Farm collection will also be discussed, with an emphasis on how data from both of these sources contributes to an overall understanding of prehistoric habitation sites from West Rock Ridge.

The Fairhaven Reservoir Site

The Fairhaven Reservoir site is located on a low rise on the eastern side of Lake Wintergreen. However, this had not been the context of the site in the past. Lake Wintergreen was originally created by the Fairhaven Water Company, who in 1863 dammed Wintergreen Falls, taking advantage of a large bedrock basin to create the artificial lake. The Fairhaven Water Company originally had grand plans to create three more reservoirs to the north of Lake Wintergreen, but this was not to be the case. In 1876, the lake and all of the other assets of the Fairhaven Water Company were taken over by the New Haven Water Company (Ludwig 1981:7).

The lake did provide drinking water for a fairly small customer base in New Haven and Hamden for 115 years. In 1975 the Safe Water Drinking Act established standards, which Lake Wintergreen would not have been able to fulfill without additional water filtration. The small size of the reservoir made this prohibitive and the lake was taken out of commission in 1978 (Ludwig 1981:8). Once the Wintergreen Lake landholdings were put up for sale the state had priority in terms of the opportunity to purchase the property. The state exercised this priority and the property was made an addition to West Rock Ridge State Park.

An addendum to this story occurred in 1978 and 1979, when the Army Corps of Engineers, concerned that the dam might fail and cause catastrophic flooding temporarily drained the lake in order to inspect the dam (Ludwig 1981:9). The State Archaeologist for Connecticut (OSA), Nicholas Bellantoni (personal communication 2002), told me that a

local resident had taken him to Wintergreen Lake and shown him widespread deposits of chipping waste and artifacts on the lake bottom. Apparently other sites, which presently lie underneath Lake Wintergreen, existed in this area. This adds all the more importance to the Fairhaven Reservoir site because of the information that the site can offer concerning prehistoric usage of the area. The Fairhaven Reservoir site was spared because it existed on a low rise that was not inundated by the man-made reservoir.

More information was available concerning the environment of Wintergreen Lake than for any of the other West Rock Ridge sites. This was due to an extensive report prepared by Ludwig (1981), an ecologist, who provided advice concerning future land management decisions for the property. Because environmental context is so important for understanding the nature of the archaeological record, all of the pertinent information from Ludwig's report will be summarized here.

Ludwig described the property surrounding the present Lake Wintergreen as the Wintergreen Brook Valley. At the time of the prehistoric occupation of the site, Wintergreen Brook flowed through the center of this valley (Ludwig 1981:7). The Fairhaven Reservoir site had been situated on a low, but level and well drained rise above the brook, which had flowed about fifty meters to the west. Extending between Wintergreen Brook and the low rise that the Fairhaven Reservoir site rested upon, was a swampy wetland.

According to Ludwig (1981:7), the ecology of the Wintergreen Brook Valley depends to a great extent on the types of glacially deposited sediments existing at different locations in the valley. Two general types of glacially deposited sediments are glacial till and stratified drift. These types of deposits differ in terms of the way they

were originally laid down. Glacial till deposits result from glacial transport, meaning they are deposited directly by ice. As the glacier pushed forward, it scraped sediments and rock debris from the ground in its wake, and these various deposits later became laid down directly by the ice, either simply deflating to the ground where the glacier melted beneath them, or more typically they were spread out on the ground beneath the weight of the flowing ice. The vast weight of the overlying ice sheet often compressed these deposits creating a soil type that is impervious to infiltration from groundwater called hardpan.

Stratified drift deposits are much more permeable to water. In fact, where they exist, they often act as a conduit for groundwater as is the case for Wintergreen Brook, which follows the course of the stratified drift deposits in the center of its valley. Stratified drift deposits, by definition, were laid down by water. Flowing water holds particles in suspension relative to its velocity, or rate of flow. Fast moving water can hold even large rocks in suspension. But as water slows down heavier objects fall out of suspension and are deposited on the stream bed. This factor produces stratification, because water acts as mechanism that is capable of sorting various sized sediments. Very fine silts and clays aren't usually released from suspension unless the water ceases flowing, as in lakes, ponds or puddles. During the waning stages of the last Ice Age, glacial melting sent vast torrents of water issuing forth that flowed down river valleys toward Long Island Sound. At first, these fast moving waters only deposited large sediments, but as they slowed down smaller and smaller particle sizes settled out. A typical profile therefore for stratified drift deposits created by post glacial melting would have course sediments on the bottom, such as course sand and gravel, and then moving

up the profile will be found finer and finer sediments. The finest sediments, silts and clays, would be found at the top.

The presence of these deposits explains the hydrology and, by analogy, the vegetation types found within the Wintergreen Brook Valley. The brook flows down the center of the valley where permeable stratified drift deposits exist (Ludwig 1981:21). On either side of Wintergreen Brook exist glacial till soils that are underlain by layers of hardpan. These hardpan layers make the soil impermeable to downward infiltration by groundwater. Wherever these impermeable soils exist in the lower reaches of the valley, extensive wetlands have formed (Ludwig 1981:30).

However, according to Ludwig (1981:30), glacial till soils of the Wintergreen Brook Valley can be subdivided further into two more types: 1) consolidated glacial till deposits, such as the hardpan soils that underlie the wetlands bordering Wintergreen Brook, and 2) unconsolidated glacial till deposits that do permit downward infiltration of groundwater. Because these unconsolidated glacial till soils exist on the higher elevations overlooking the lowland wetlands, and because they are permeable to groundwater, they are typically very well drained. The Fairhaven Reservoir site was located to take advantage of this fact. It is positioned on a low rise overlooking the wetlands and on soils developed from unconsolidated glacial drift deposits. These soils provide a level and well drained location suitable for a campsite.

Wintergreen Lake, and the Fairhaven Reservoir site, both exist at the bottom of West Rock's gentle eastern slope. Ludwig (1981:35–36) described the various vegetation zones that occur throughout the Wintergreen Valley, including West Rock's gentle

eastern slope, the brook and its surrounding wetlands, and also the low hills bordering these wetlands.

At the top of West Rock's gentle eastern slope, Ludwig (1981:36) identified the upslope community. Here chestnut oaks dominate because they are able to tolerate the harsh dry and exposed conditions at the top of the ridge. The shrub layer in the upslope community primarily consists of huckleberry and lowbush blueberry.

Species diversity increases moving down from the ridge top. The middle slope community still includes chestnut hickory, but white, black and scarlet oaks are more numerous. Also present are hickory, red maple, black birch, white ash and occasional stands of hemlock. The understory is often dominated by impenetrable thickets of mountain laurel, but patches of maple-leaved viburnum, dogwood, huckleberry and blueberry also occur (Ludwig 1981:36–37).

The low slope community has the greatest species diversity. Here species occurring in both the upslope and middle slope communities coexist with species occurring in the low lying wetlands. The understory is very well developed, consisting of shrubs similar to those found on the middle slope but also including arrow-wood, witches hazel and highbush blueberry (Ludwig 1981:40).

The low lying wetlands on either side of Wintergreen Brook possess a kind of vegetation that Ludwig (1981:40) described as the swamp forest type. The dominant trees are red maple, with birch, tupelo, elm and black ash as frequent associates. The understory is primarily spicebush and pepperbush, and the herbaceous layer typically includes skunk cabbage and cinnamon fern.

Ludwig (1981:45) stated that an area must have heterogeneity in its physical environment to support a wide range of wildlife species. This is so because various wildlife species differ in their requirements for food, cover and reproduction. The heterogeneous physical environment of the Wintergreen Brook Valley supports a wide variety of plant communities, which in turn support a wide range of wildlife species including: white tailed deer, rabbit, squirrel, fox, raccoon, opossum, otter, woodchuck, heron, osprey, loon, sparrow, kingbird, frogs, turtles and snakes. In addition to these wildlife species, Ludwig's (1981:35–45) description of vegetation zones also included many plant species important to Native Americans. Finally, Wintergreen Brook probably supported at least some fish species such as brook trout, golden shiner, common shiner, blacknose dace, longnose dace, creek chub, fallfish, white sucker and tessellated darter (Hammerson 1984:45). Wintergreen Falls, the water fall that was dammed to create Wintergreen Lake, is also not far from the Fairhaven Reservoir site. The falls were located about an eighth of a mile to the south and may have represented an important fishing location in prehistoric times.

From the above description, it is obvious that the inhabitants of the Fairhaven Reservoir site had located themselves in a very rich environment in terms of numerous plant and wildlife species that they could have subsisted from. But the site was also positioned adjacent to important sources of lithic raw material and as will be suggested below, it is the combination of these factors that appears to have attracted the site's prehistoric occupants to the area.

Methodology

The excavation of the Fairhaven Reservoir site was conducted by a small crew, including myself and two volunteers, Jane Gary and Anthony Dadio, as well as a Hunter College (CUNY) graduate student named Mariana Matotov. The excavations were conducted between the months of June and August during the summer of 2004. The summer was not particularly wet and soil conditions remained very dry throughout much of the field season.

A large immovable boulder existing between the site and Wintergreen Lake was chosen as the datum point. Datum was located to the north and west of the site, and individual grid units were labeled such that the unit designation consisted of the distance along both a north/south and east/west transect in relation to the datum point, such that a unit whose northwest corner was 10 meters to the east and 10 meters to the south of datum was designated as S10E10.

Excavation was performed by shovel shaving techniques unless potential features were uncovered, at which time trowels or appropriate small tools were used. All site midden was screened using ¼ inch hardware mesh cloth. Units were dug according to natural stratigraphic layers, but because of the depth of these natural layers they were further subdivided into arbitrary 10 centimeter levels.

Stratigraphy

According to the Soil Survey of New Haven County (SSNHC) (1979) the soil at the Fairhaven Reservoir site was a Cheshire fine sandy loam. These soils are typically found on gentle 3 to 8 percent slopes and along broad hills and ridge-tops. The soils are well drained although substratum layers could be quite compact at times. The SSNHC described Cheshire fine sandy loams as having a surface layer, or A horizon, extending to a depth of about 20 centimeters and consisting of dark brown fine sandy loam. The subsoil, or B horizon, typically extending to a depth of 66 centimeters, consists of reddish brown, friable, sandy loam. The substratum, or C horizon, extends to a depth of up to a meter and a half, and consists of reddish brown, friable, gravelly sandy loam.

Information gleaned from the excavation unit field forms agreed in general with the description of Cheshire fine sandy loams given above. Site soils were found to have an upper humus layer of very dark brown fine sandy loam extending to a depth of between 6 and 11 centimeters. The rest of the A horizon was a dark yellowish brown fine sandy loam with some gravel and occasional pebbles extending to depths of between 16 and 24 centimeters. The B horizon was a strong brown to dark reddish brown sandy loam with moderate amounts of both gravel and pebbles, extending to a maximal depth of between 50 and 55 centimeters. The substratum, or C horizon, was more often very firm, reddish brown, gravelly, sandy loam. The substratum was sterile of culture materials.

The field where the site was discovered had been plowed during historical times as was evident because of the occasional historic artifacts recovered from the upper soil layers. The field, however, had not been cultivated recently, and judging from the maturity of trees had been left idle for about 100 years. The mixing of historic and prehistoric artifacts in the upper soil layers indicated that the upper portion of the site was disturbed by these plowing activities, but below a depth of about 20 centimeters it is believed that the site was relatively undisturbed. Furthermore, as will be discussed later, the horizontal extent of artifacts is believed to have been artificially increased due to these plowing activities. However, below the plow zone, several discreet artifact clusters, probably representing activity areas were identifiable.

Excavation and Site Boundaries

Excavation was conducted in two stages. The site was discovered by a positive test pit, in a survey transect that had been oriented in a north/south direction, so that it ran approximately parallel to the eastern side of Wintergreen Lake. Initially half meter test pits were used to recover a sample of the site's deposits and to define its boundaries, which were located using two sterile test pits in each of the four cardinal directions. The artifact bearing deposits of the site were found to extend approximately 20 meters in a north/south direction and 50 meters in an east/west direction, giving the site a total area of about 1,000 m^2. A large sample of the site was excavated including 42.25 square meters of its total area. Of this total, 37 one-meter units represented a contiguous

excavation block that covered the area of the site found to have the densest artifact concentrations. See Figure 10.1.

Lithic Analysis of Artifacts Recovered From the Fairhaven Reservoir Site

A total of 1,581 lithic artifacts were recovered from the Fairhaven Reservoir site. Nineteen of these were lithic tools, including projectile points, knives, bifaces, a scraper and retouched or utilized flakes. One large chert core was cached at the site. Only one ground stone tool was found, a pestle, which had been utilized for processing vegetal foods. The rest of the 1,560 artifacts were lithic debitage. The stone tools will be described first, followed by the debitage, and then these data will be synthesized along with spatial analysis to present an interpretation of the site.

The stone tool assemblage included 2 complete projectile points and 4 tip fragments. All of the projectile points and tips were made from quartz. The two diagnostic projectile points were a Squibnocket Triangle (Figure 10.2, No. 2) and a Wading River point (Figure 10.2, No. 1). Ritchie (1971: 127) identified Squibnocket Triangles at the Hornblower II site in Martha's Vineyard where they were associated with a radiocarbon date of 2190 B.C. ± 100 years. Wading River points have already been described in this report and Ritchie (1971:131) believes them to also be a Late Archaic type. The Squibnocket Triangle was 29 mm long and 17 mm wide, with a blade in the shape of a broad isosceles triangle, with slightly excurvate edges. The base is slightly

Figure 10.1: Location and Grid for Fairhaven Reservoir

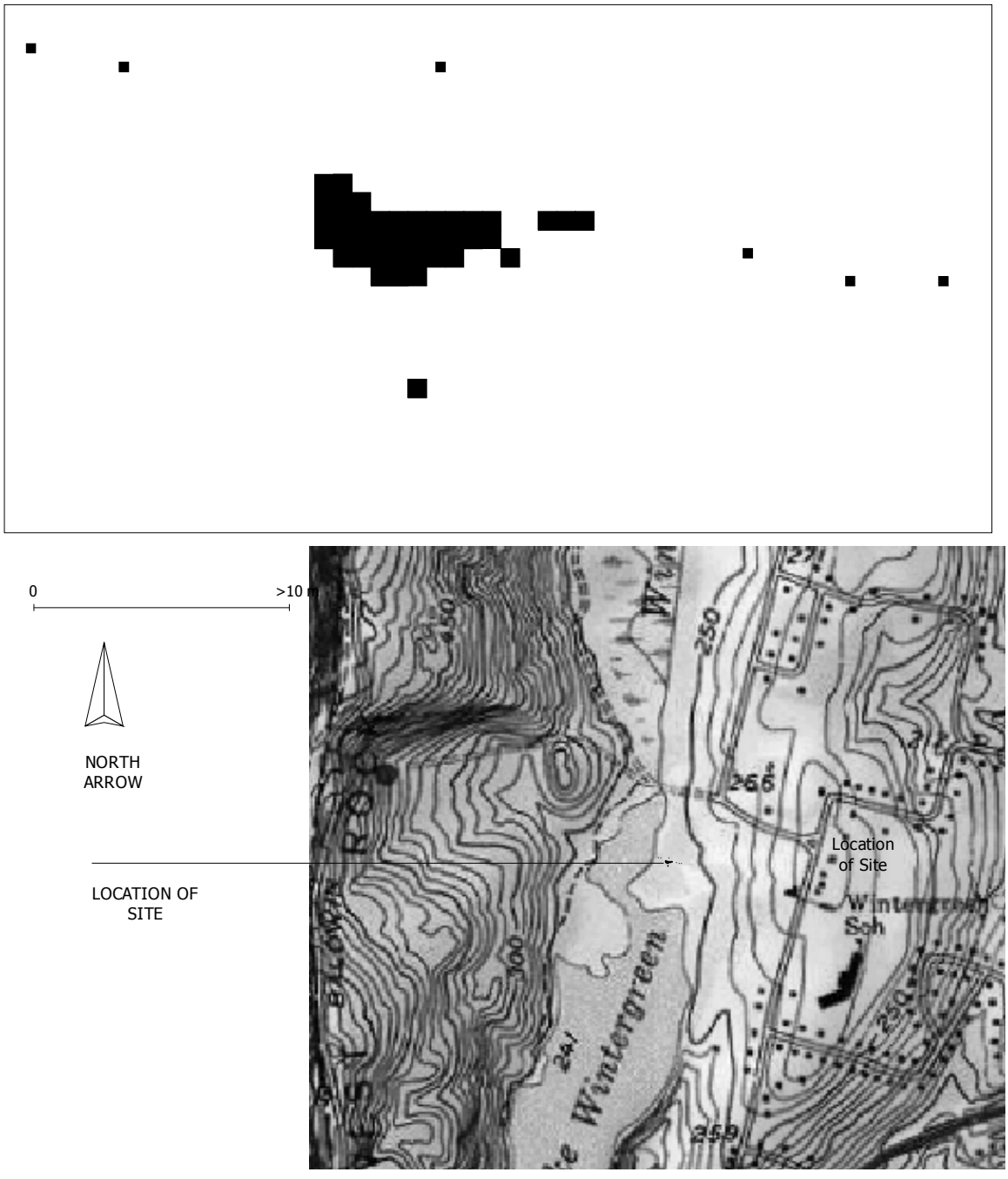


Figure 10.1 is a map showing the location of the Fairhaven Reservoir site and the excavation grid used in data recovery.

Figure 10.2: Artifacts from Fairhaven Reservoir

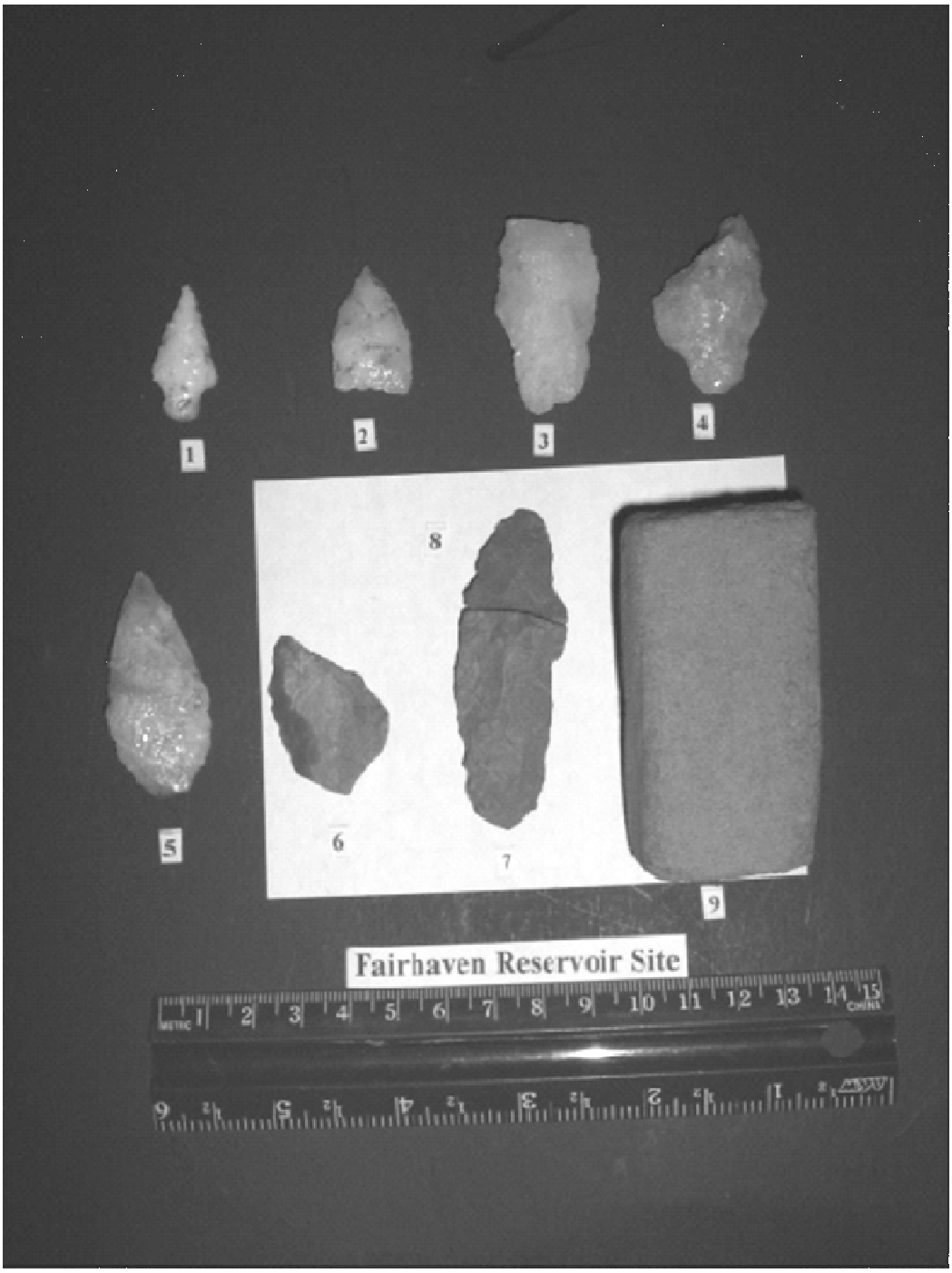


Figure 10.2 No. 1 Wading River Point; No. 2 Squibnocket Triangle; No. 3 middle stage biface; No. 4 late stage biface; Nos. 5 and 6 bifacial knives; No. 7 basalt middle stage biface; No. 9 ground stone pestle.

convex, no grinding or rubbing was noted. The point was complete and is believed to have been formerly attached to a haft before it was discarded.

The Wading River point was 31 mm long and 14 mm wide. It had a blade in the shape of a narrow isosceles triangle, with pronounced but slightly rounded shoulders. The stem was straight sided and the base was slightly convex, with rubbing or grinding noted under one of the shoulders and on one side of the stem. This was a complete point, and like the Squibnocket triangle is believed to have been attached to a shaft before being discarded at the site.

The rest of the projectile points recovered from the site were four quartz tip sections. At least one of these clearly represents breakage due to impact.

The most numerous artifact class recovered was bifaces. A total of 6 bifaces were found. These included early, middle and late stages. One of the bifaces was found in two sections located less than 2 meters apart (Figure 10.2, Nos. 7 and 8). This was a large middle stage biface made from grey basalt. After conjoining the ends of the biface together, it was 46 mm long and 22 mm wide. The biface is considered to represent breakage during the middle stages of tool manufacture, because it was still being thinned when it broke. In fact, it appears that the knapper had been in the process of trying to remove a high spot (produced by a hinge fracture) when the biface snapped. Otherwise it was very long and narrow, with well formed edges, but was not symmetrical and required further thinning. The edges possessed broad shallow flake scars that traveled to the middle of the piece leaving a central ridge on both sides. The artifact leaves no doubt that at an attempt had been made to manufacture at least one biface at the Fairhaven

Reservoir. After it had broken the flintknapper did not appear to have tried to salvage the separate pieces, even though one end was still quite large.

One late stage biface appears to have been undergoing final shaping when it broke with a diagonal fracture in the upper portion of the blade (Figure 10.2, No. 4). The point was obviously intended to be a stemmed point because the stem was already formed at least in outline. The biface was well thinned with fairly symmetrical sides. Although it still required further shaping it is considered to be a late stage biface because at least some initial shaping had already been accomplished.

Another middle stage biface was made from quartz (Figure 10.2, No. 3). It was 42 mm long and 23 mm wide and had originally been somewhat longer because part of the tip and midsection was missing. The rough outline of the biface suggested that it was intended to be a stemmed point, but this is not considered to represent final shaping, instead it appears that the knapper simply had left the base slightly more constricted than the waist in anticipation of performing more definable shaping in a later stage. The biface represents a middle stage manufacturing break because it required much further thinning. It had fairly even edges and it was moderately symmetrical.

A yellow iron stained quartz biface had been broken during the early stages of tool manufacturing. It was broken with a diagonal fracture that would appear to have taken a substantial portion of the biface with it. It was thick, with uneven edges, but had undergone some initial thinning with a few broad flakes extending past the center of the piece on either side.

The other two bifaces are considered as only fragments. One made from smoky quartz appears to posses a stacked step fracture that the flintknapper had attempted to

remove when the biface was broken. The other made from brown chert, which is visually identifiable with raw material from the Building Brook Farm site, had only evidence of at least one broad flake removal on either side before it was broken and discarded.

Two of the artifacts recovered from the Fairhaven Reservoir site were knives. One was a beautifully chipped leaf shaped specimen made from white quartz that was 48 mm long and 22 mm wide (Figure 10.2, No. 5). The tool was symmetrical and biconvex in cross section, with a distinct point, excurvate sides and a straight base. The knife had careful pressure flaking along its perimeter and was well thinned with broad flakes extending beyond the center of the piece. The second knife was made from a flake and it was retouched on both sides with a series of small pressure flakes creating a sharp and wide edge (Figure 10.2, No. 6). The knife was chipped from chert that is visually similar to material recovered from the Building Brook Farm site and has use-wear in the form of microflaking on both sides of the retouched edge. The flake-knife was 36 mm long and 23.5 mm wide.

Of the four remaining chipped stone tools, one was a quartz uniface that may have been used as a scraper, two were retouched and utilized flakes and one was a utilized flake that apparently had been used without further modification.

One ground stone tool was recovered (Figure 10.2, No. 9). It was almost perfectly square in cross section and was ground and abraded to form a large and heavy basalt pestle. Use wear in the form of pock marks on one of the distal ends indicates that the tool was used to process vegetal foods, probably acorns.

A very large nodule of chert that is identical to specimens recovered from the Building Brook Farm site was found. The nodule is 29 cm long, 19 cm wide and 11 cm,

weighing 6.2 kilograms. It is thought to represent a core that was stored or cached at the site. The nodule does have evidence of removals along one of its faces, and some debitage identical to the nodule was recovered from the site. The nodule was not good quality chert because it contained extensive faults and inclusions. It is thought to have been used in the production of expedient tools. Only a small portion of the total mass of the nodule, however, had ever been utilized and the site's occupants obviously had little inclination to carry the core with them when they left.

Debitage Analysis

A total of 1,560 pieces of lithic debitage were recovered from the Fairhaven Reservoir site. This debitage included 6 different raw material types: 993 were quartz (63.7%), 455 were chert (29.2%), 106 were basalt (6.8%), 2 were quartzite (0.1%), 2 were maroon hornfels (0.1%) and 2 were yellow jasper (0.1%). Of all of the raw material types represented in the sample of debitage, only 2 yellow jasper flakes were not locally acquired. All of the rest of the lithic raw material, 99.9%, was obtained at or in the vicinity of West Rock Ridge.

Sources of quartz and chert were discussed in the previous chapter. All of the chert recovered from the Fairhaven Reservoir site was visibly similar to raw material obtained from the Building Brook Farm site. Although West Rock is a trap-rock ridge, it is composed of a coarser grained type of basalt, diabase, which is not suitable for making stone tools. But basalt was available in the stream bed of the West River as glacially

transported cobbles. Also, all of Connecticut's extrusive igneous trap-rock ridges are composed of fine-grained basalt, and one of these ridges, the Saltonstall Ridge is located adjacent to New Haven in Branford, Connecticut. Hornfels is abundant at West Rock Ridge. Local hornfels can be grey, pink, red or maroon, and is formed due to the metamorphism of arkose or brownstone bedrock in contact with the molten magma that formed Connecticut's trap-rock ridges. Quartzite is abundant in Connecticut, and although no bedrock sources exist locally, quartzite pebbles can be found with little effort in most of south-central Connecticut's stream beds. Only the yellow jasper, which is thought to have come from Pennsylvania, is likely to have traveled any great distance before being incorporated into the site.

A consistent method of debitage analysis was used for all of the sites described in this text so these procedures will only be reviewed briefly below. Quantitative data such as debitage size and weight, as well as presence or absence of cortex was recorded. Flake characteristics recorded were: 1) presence or absence of a striking platform, 2) whether platforms were single faceted, multi-faceted or lipped, 3) presence or absence of dorsal flake scars. Additionally, bifacial thinning flakes were quantified in terms of each of the lithic raw material types present, and also an assessment of the relative abundance of small pressure flakes was made in terms of whether some were present, or if they were moderately abundant or numerous. Bipolar debitage and flakes having use-wear present on their striking platforms, as determined under magnification using a 300X binocular microscope, were also counted. However, due to the inherent difficulty in identifying both bipolar debitage and use-wear on quartz flakes consistently, these later data are not

considered to provide reliable quantitative information concerning the proportion of bipolar reduction or tool resharpening, respectively, which occurred at the site.

Tables 10.1 and 10.2 below give information concerning debitage size and weight in one centimeter increments, and attributes of flakes, respectively.

Table 10.1: Size and Weight for Debitage for Fairhaven Reservoir

Size (cm)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
Quartz Flakes	147	438	77	10	2	1	1	-	1
Weight (g)	16.0	168.4	143.0	73.2	38.8	66.9	65.4	-	52.9
Quartz Shatter	51	210	44	6	2	2	1	-	-
Weight (g)	10.2	110.2	98.1	54.6	33.9	108.7	51.3	-	-
Chert Flakes	35	252	53	16	2	1	1	-	-
Weight (g)	4.3	94.1	88.4	107.9	39.8	16.9	29.5	-	-
Chert Shatter	8	47	28	9	2	-	-	-	-
Weight (g)	2.0	30.7	89.3	83.0	41.4	-	-	-	-
Basalt Flakes	14	62	19	6	-	1	-	-	-
Weight (g)	2.3	27.4	42.0	38.2	-	15.5	-	-	-
Basalt Shatter	-	-	2	-	2	-	-	-	-
Weight (g)	-	-	3.9	-	21.7	-	-	-	-
Jasper Flakes	-	-	2	-	-	-	-	-	-
Weight (g)	-	-	3.5	-	-	-	-	-	-
Hornfels Flakes	-	1	-	-	-	-	-	1	-
Weight (g)	-	0.4	-	-	-	-	-	55.8	-
Quartzite	-	1	-	1	-	-	-	-	-
Weight (g)	-	0.2	-	6.1	-	-	-	-	-

Table 10.2: Flake Attributes for Fairhaven Reservoir

Raw Material	Single Faceted Platform	Lipped	Multi-faceted Platform	Ground Platform	Flake-scars	Use-wear
Quartz	212	244	14	3	298	19
Chert	88	146	40	32	240	0
Basalt	34	45	8	3	81	0
Quartzite	0	1	0	0	2	0
Hornfels	1	1	0	0	1	0
Jasper	2	0	0	0	2	0

Information from debitage analysis will be given separately, below, for each of the three major lithic raw material types utilized at the site: quartz, chert and basalt. However, all of this information will be combined in the following discussion and interpretation.

For quartz debitage, 80 or 8.1% were cortical, and 677 or 68.2% was classified as flakes, while 316 or 31.8% were shatter; giving a flake to shatter ratio of about 2.1 to 1. Platform types for quartz flakes were as follows: 212 or 31.3%, of all flakes had single faceted platforms, 244 or 36.0% had lipped platforms, 14 or 2.1% had multifaceted platforms, and 3 or 0.4% had ground platforms. In addition 298, or 44.0% of all quartz flakes had flake scars on their dorsal faces, 182 or 26.9% were classified as bifacial thinning flakes, and numerous small quartz pressure flakes were noted. Additionally, 14

quartz flakes had use-wear present on their striking platforms and 12 pieces of bipolar debitage were recorded for the collection.

For chert debitage, 8 or 1.8% were cortical, and 360 or 79.3% were classified as flakes, while 94 or 20.7% were shatter; giving a flake to shatter ratio of 3.8 to 1. Platform types for chert flakes were as follows: 88 or 24.4% had single faceted platforms, 146 or 40.6% had lipped platforms, 40 or 11.1% had multifaceted platforms, and 32 or 8.9% had ground platforms. In addition, 240, or 66.7% of all chert flakes had flake scars on their dorsal faces, 126 or 35% were classified as bifacial thinning flakes, and numerous small chert pressure flakes were noted. Distinguishing ground from utilized platforms was impossible for chert flakes, so no assessment is made in terms of the presence of use-wear. Four bipolar chert debitage were identified in the collection.

For basalt debitage, 102 or 96.2% were classified as flakes, and 4 or 0.4% were shatter; giving a flake to shatter ratio of 25.5 to 1. No basalt debitage was classified as cortical, but this may have occurred due to difficulties in identifying basalt cortex due to natural weathering of surfaces on basalt artifacts. Platform types for basalt flakes were as follows: 34 or 33.3% had single faceted platforms, 45 or 44.1% had lipped platforms, 8 or 7.8% had multi-faceted platforms, and 3 or 2.9% had ground platforms. In addition 81 or 79.4% of all chert flakes had flake scares on their dorsal faces, 39 or 38.2% were classified as bifacial thinning flakes, and numerous small basalt pressure flakes were noted. As noted before, natural weathering of surfaces for basalt artifacts was problematic and for this reason it was impossible to distinguish traces of use-wear on flake striking platforms. No basalt bipolar debitage was recorded for the collection.

Collectively, all of the debitage recovered from the Fairhaven Reservoir site demonstrated a tendency toward later stages of tool manufacturing/maintenance. First this is indicated by the universally small debitage sizes: only 26 pieces of quartz debitage or 2.6% was greater than 3 cm in length, the same was true for 31 or 6.8% of all chert, and 9 or 8.5% of basalt. Flakes were dominant for all three lithic raw material types, and remnant platform bearing flakes were also frequent; including those with lipped, multifaceted and ground/abraded platforms. Additionally, a high proportion of flakes for all three raw material types had flake scars present on their dorsal faces. Cortical debitage was not highly abundant for any of the lithic raw material types.

The manufacture of bifaces is verified both by the presence of broken bifaces and the numerous bifacial thinning flakes found at the site. Tool use and maintenance is also indicated by the presence of flakes having use-wear on their striking platforms.

The above information is most useful when considered in relation to information concerning stone tool variability. In chapter three, measurements for assemblage variability were presented: richness and evenness. Richness was defined as the number of distinct tool types in a collection relative to the total number of tools present. In the case of the Fairhaven Reservoir site a total of 20 stone tools were identified, including 19 chipped stone tools and one ground stone tool. Seven distinct tool types were present: 1) projectile points, 2) bifaces, 3) a bifacial knife, 4) a flake knife, 5) a scraper, 6) three utilized flakes (two having retouch), and 7) a pestle. In addition a total of 16 bipolar debitage and one bipolar core was recovered, probably indicating the manufacture of expedient tools.

Assemblage richness for West Rock Ridge sites is best represented using a graph that compares all of the sites present in terms of a measure of total tools recovered on the *x*-axis, and the number of distinct tool types identified on the *y*-axis. This graph is presented in chapter twelve (Figure 12.1). The Fairhaven Reservoir site demonstrates very high assemblage richness compared to other sites studied during the West Rock Ridge project. Considering that the most dominant tool type, bifaces, represents only 6 or 30% of the combined chipped and ground stone tool assemblages, stone tool variability at the site is also considered to be relatively even.

This type of assemblage variability is considered to indicate that the Fairhaven Reservoir site was a camp where a wide variety of domestic tasks were performed on a daily basis. The site appears to have been occupied at least during the fall season due to the presence of charred (but unidentifiable) nut fragments. The inhabitants of the Fairhaven Reservoir site may in fact have chosen the campsite at least in part to take advantage of proximity to nut sources, which were harvested in the fall, although they also could have been stored throughout the winter. Also, Binford's (1980:17) observations concerning coarse and fine grained assemblages sheds some light on the duration of the site's occupation.

Below the plow zone three separate activity areas are identifiable in terms of distinct scatters composed of different lithic raw material types: quartz, chert and basalt (Figures 10.3, 10.4 and 10.5). Above the plow zone artifacts were considerably mixed, and the former boundaries of the site are considered to have been extended by these plowing activities. But the distinctiveness of these three activity areas indicates that the site's deposits can be characterized as fine-grained, and this in turn means that it was

probably not occupied for a very long period of time. Binford (1980:17) proposed that whether assemblages are fine or coarse grained is a factor of the length of occupation. With longer occupations, activity areas tend to overlap and blur, making distinction of activity areas difficult.

It can be concluded therefore, that a small but complete family group (venturing the guess that the pestle was a woman's tool) camped at the site for a fairly brief period of time during the fall. Considering relative artifact densities a reasonable approximation would probably be that the site was occupied for a length of time somewhere between a few weeks or several months. These people camped on a well drained location, adjacent to resources that could be acquired from the surrounding forests, wetlands and stream.

Alternately the site may have been revisited on several occasions, but it is considered a single component occupation based on the fact that the only diagnostic artifacts recovered are associated with the Small Stemmed Point Tradition occupation. It is also possible that what is presently the Wintergreen Lake area, had been revisited seasonally by local prehistoric populations but that small seasonal campsites were not redundant in terms of their exact locations. This is suggested due the observation earlier in this chapter, that while the lake had been temporarily drained to inspect the reservoir's dam, artifacts were visible over a widespread area of the lake's bottom.

At least one further interpretation can be suggested considering the importance of tool manufacturing at the site. It is significant that the only core identified for the Fairhaven Reservoir site was an expedient chert core. This core was actually a nodule of highly flawed chert and it is not considered to have been useful in the production of tool

Figure 10.3: Clustering of Chert Debitage

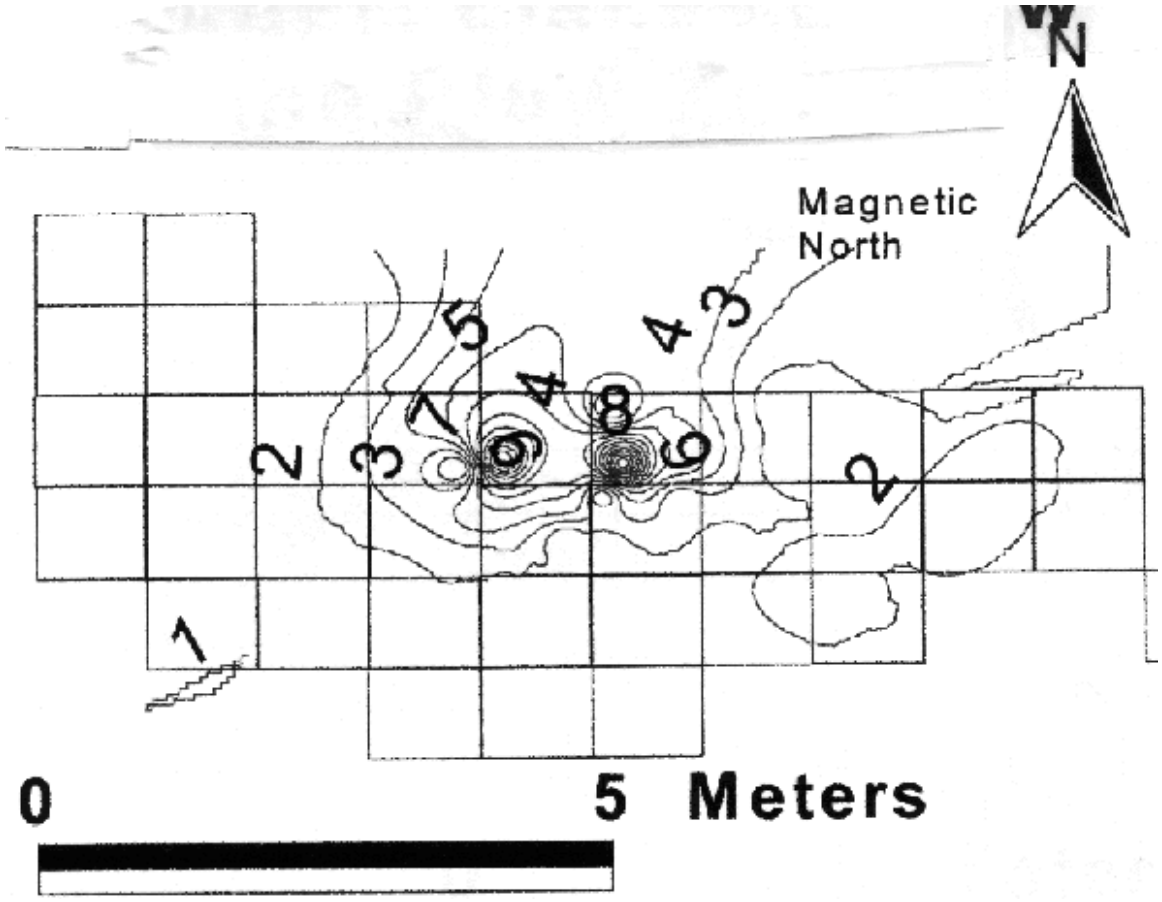


Figure 10.3 is an artifact distribution map showing clustering of chert debitage below the plow zone of the Fairhaven Reservoir site. Comparison of the maps for quartz, chert and basalt debitage shows that concentrations of debitage appear to exist in discrete portions of the site, and this latter observation is interpreted to represent discrete activity areas.

Figure 10.4: Clustering of Quartz Debitage

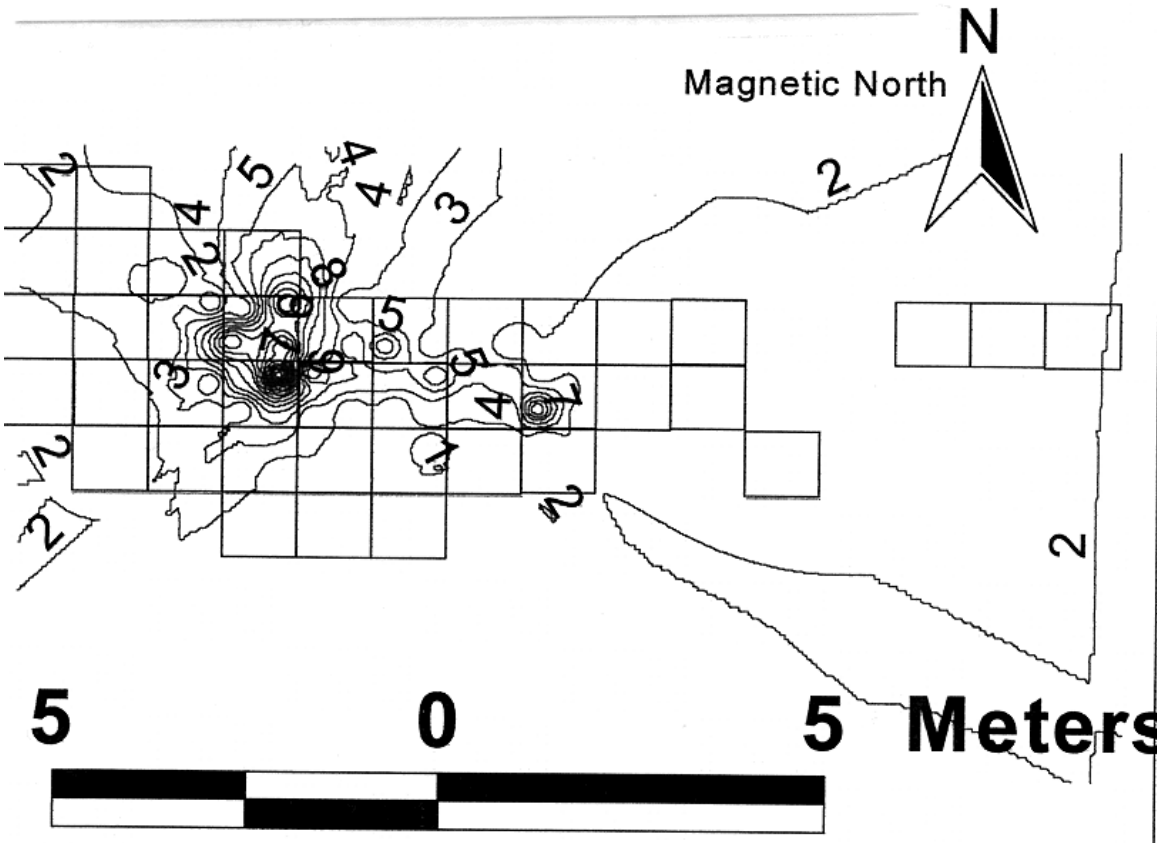


Figure 10.4 is a density distribution map of quartz debitage for the Fairhaven Reservoir site below the plow zone. When compared to the distribution maps of chert and basalt debitage, apparent clustering of artifacts in distinct portions of the site was interpreted as evidence of distinct activity areas.

Figure 10.5: Clustering of Basalt Debitage

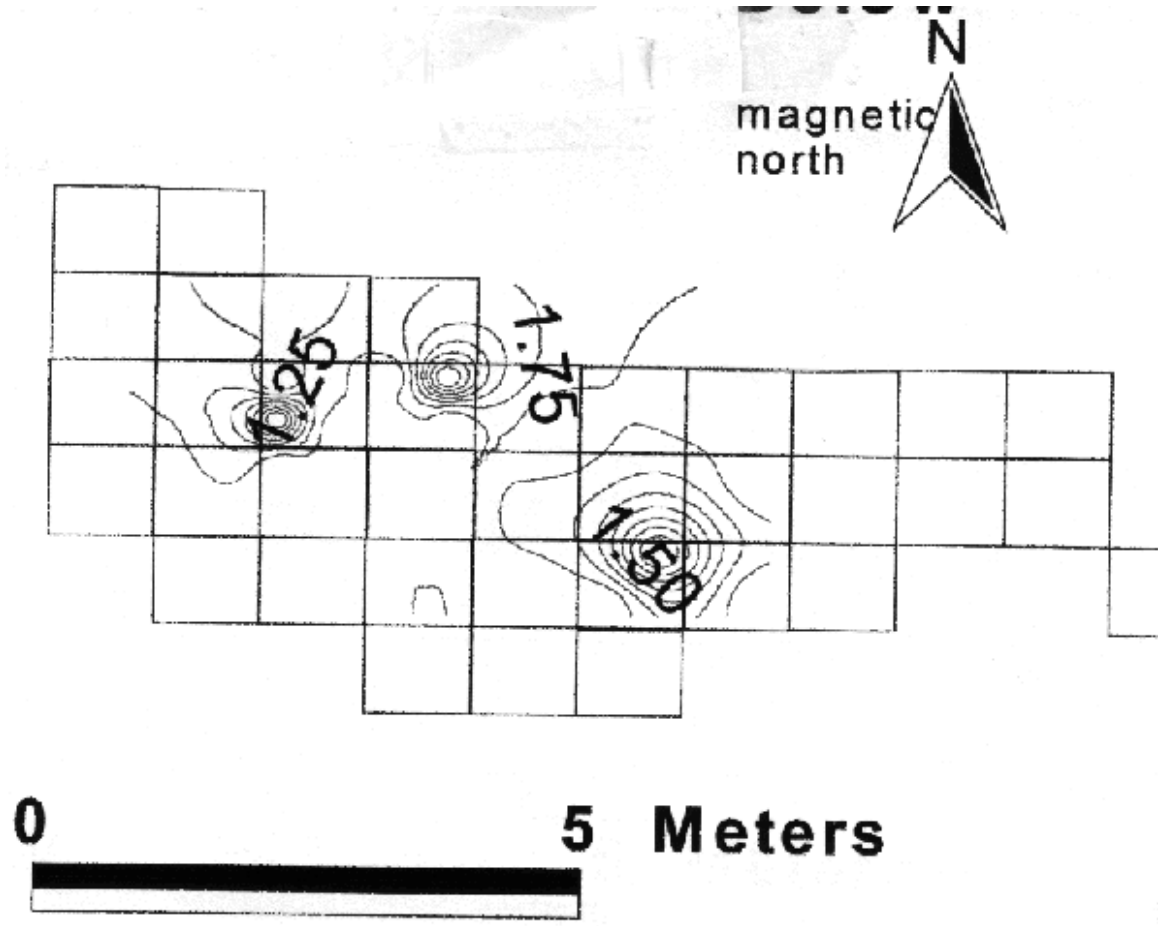


Figure 10.5 is a distribution map for basalt debitage from beneath the plow zone of the Fairhaven Reservoir site. When compared to similar maps for chert and quartz, it appears that debitage from these raw material types clustered in different portions of the site and this in turn was interpreted to signify distinct activity areas.

blanks for formalized tools. Instead, along with the presence of 16 bipolar flakes, it indicates production of expedient tools that were probably used in a domestic context.

An interesting characteristic of the lithic debitage assemblage was the presence of numerous large flakes representing a variety of different raw material types. Furthermore, all of these lithic raw material types (quartz, chert, basalt and hornfels) could be acquired in close proximity to the site and along West Rock Ridge. Because these flakes appeared at the site in the absence of the cores from which they were struck, and because similar large flakes were probably used as preforms for the manufacture of stone tools at the site, it is suggested that the site's location was chosen with the proximity of these sources of lithic raw materials in mind. Perhaps it can even be further suggested that the a small family group camped in this ecologically rich setting during the fall months, in order to replenish their lithic raw material supplies in anticipation of the rugged winter months ahead.

The West Rock Nature Center 1 site

The West Rock Nature Center 1 site was excavated by Nancy Parsons of Southern Connecticut State University under the direction of Michael Rodgers. This was the only site reported in this text that was not excavated by the author personally, although I discovered the site while hiking along the West Rock Nature Center trails. The West Rock Nature Center is located on the opposite side of the main entrance for West Rock Ridge State Park, and on the opposite side of Wintergreen Avenue.

During a conversation with Michael Rodgers, who discussed plans with me to use the Nature Center in his archaeological methods class, I suggested to him that excavation of the site would be beneficial to me. This was a fortuitous for both of us, and since the site turned out to be a small seasonal campsite very similar to the Fairhaven Reservoir site, the research was a significant contribution to this project.

The West Rock Nature Center 1 site was located on a low bench overlooking Wintergreen Brook. The course of the brook has obviously diverged at least twice before modern times because two abandoned stream channels intervene between the site and the brook. The site was also located on fairly level and well drained ground a few meters above the course of the brook. A series of low hills rise to the east forming a scarp behind it, and to the west, West Rock Ridge rises gradually to its summit. So the site was fairly well protected from wind gusts on both sides. A few hundred meters to the north Wintergreen Brook forms a falls as it cuts into the softer brownstone bedrock. The West Rock Nature Center Site 1 was positioned in a rich ecological setting adjacent to resources available from woodland, wetlands and the stream.

Information from the West Rock Nature Center 1 site is not as complete as had been the case from the Fairhaven Reservoir site, but enough data are available to form some fairly safe conclusions. The total area of the site was about 616 m^2, and excavation included 14.25 one meter square units (Parsons 2006).

Artifacts recovered from the site included 27 lithic tools (Figure 10.6) and 4,695 pieces of debitage. Because eighth inch screen had been used to recover the sample, only 961 of this debitage was larger than 1 cm. Of this later total 25, or 2.6% were longer than 3 cm in length. Lithic raw material types found at the site included 4,667 quartz, or

98.7%, 39 quartzite or 0.8%, 14 chert or 0.3%, 8 basalt or 0.2% and 2 of arkose (brownstone) which made up less than 0.1% (Parsons 2006).

A complete and finished Wading River point was found at the site. Projectile points were the dominant artifact class, making up 12, or 44.4%, of the stone tool assemblage. Most of the projectile points represented manufacturing breaks and along with the one complete Wading River point, indicated that the site was a Small Stemmed Point Tradition occupation. Also present were 9 bifaces, a scraper, a punch, a chopper and three pieces of utilized debitage, yielding a total of 6 distinct tool types. From Figure 12.2 it is obvious that this site is most like the Fairhaven Reservoir site, (compared to other West Rock Ridge sites), in terms of the stone tool assemblage richness.

Sharing a very similar environmental context, and appearing to be a location where a small group camped over a fairly brief period of time, the site also is similar to the Fairhaven Reservoir site in terms of the manufacture of projectile points. I interpret the West Rock Nature Center 1 site as a small, short term seasonal encampment in a well sheltered location, where a small family group subsisted from a diverse ecological setting while obtaining tool stone from the West Rock Ridge area and repairing damaged tool kits.

Figure 10.6: West Rock Nature Center 1 Artifacts

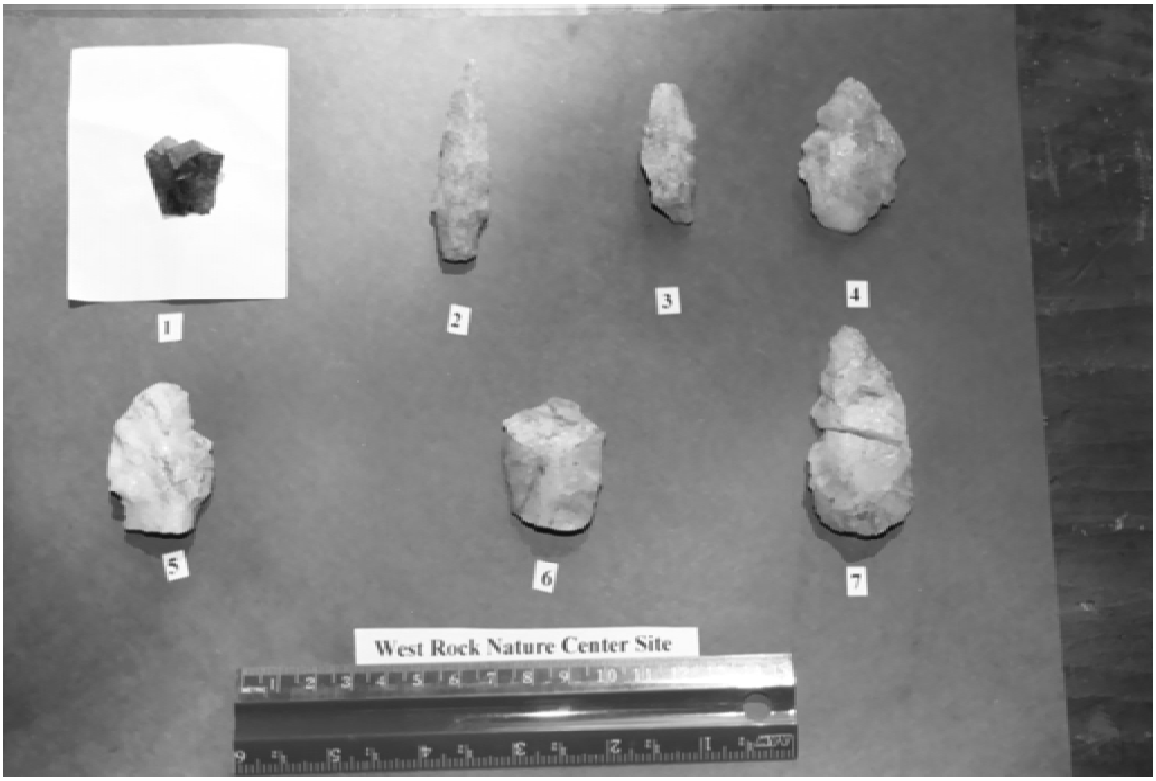


Figure 10.6 Artifacts from the West Rock Nature Center Site.

The Building Brook Farm Collection

The Building Brook Farm collection had been gathered by a local Hamden resident, who picked up the artifacts on a farm that had been owned by his grandfather. Since that time, the land had been sold and subdivided into numerous lots. The greatest proportion of artifacts appear to have come from a location adjacent to the Building Brook. This upland stream has its headwaters at West Rock Ridge, and cuts a deep gorge as it flows over the brownstone bedrock, or arkose, at the bottom of West Rock Ridge's gentle eastern slope.

Unfortunately little else in terms of information is available in association with the collection. However examination of it reveals that it includes several large and beautifully chipped bifaces, knives and projectile points. Two knives about 9 centimeters in length were chipped from local quartz. One is an expertly crafted tear-drop shaped knife with very symmetrical and sharp retouched edges (Figure 10.7, on the right end of top row). The other is similar to a small knife occurring at the Wintergreen Notch site. It possesses one very prominent shoulder on one side, and so the specimen was obviously hafted. The alternate side forms a long and sharp edge with a very broad blade (Figure 10.7, end of left top row).

Additionally a large biface, possibly made from green Onondaga chert, was about 10 cm long (Figure 10.7, second from left, top row). The biface was expertly chipped with broad thinning flakes, and it could easily have served as both a tool and a core for

Figure 10.7: Building Brook Farm Collection



Figure 10.7 Building Brook Farm Collection. Poor photograph due to very spontaneous moment which represented the only opportunity to photograph the artifacts.

the production of large flakes. A single grey chert Stark point (Figure 10.7, top row, second from right), missing only a section of its tip, is a Middle Archaic type (8,000 to 6,000 B.P.) and represents the earliest known occupation of West Rock Ridge recorded during the project.

Other projectile points included Otter Creek (Figure 10.7, left end of middle row), a Brewerton Side-Notched point (Figure 10.7, second from left end of middle row), a Meadowood point (Figure 10.7, third from right end of middle row) a Jack's Reef Pentagonal point (Figure 10.7, second from right end of middle row), a Brewerton Eared-Notched triangle (Figure 10.7, end of middle row), a Snook Kill point (Figure 10.7, left end of bottom row), and a very long Narrow Stemmed point, which is classified as a quartz Lackawaxan (Figure 10.7, third from left on bottom row) type; although Fogelman (1992:81) does not indicate quartz as a typical raw material for this point style. It may simply represent a larger version of a Small Stemmed Point, several of which were present in the collection (Figure 10.7, second from left and third from right on bottom row).

All of these projectile point types indicate occupation of the area where the Building Brook Farm collection was made from Middle Archaic (8,000 to 6,000 B.P.) to Middle Woodland (0 A.D. to 1,000 A.D.) times. It is impossible to speculate further concerning the prehistoric occupation responsible for the presence of these artifacts. However, it appears that the collection only included the largest and most prominent specimens, and therefore it has to be suggested that small pieces of debitage, pottery and tool fragments were not recognized by the individual (who chose to remain anonymous) who made the collection.

I must also apologize for the poor quality of the photograph. The collection's owner was not anxious to have me view the artifacts, and only after significant prodding was I able cajole his brother to bring the artifacts with him to the site where we were excavating. Upon being told that I had fifteen minutes to look at them before they had to go back I quickly improvised the photo, but not being familiar with the equipment failed to realize that while using the macro setting the camera would cut off the top of the picture.

The Building Brook Farm collection probably represents long term habitation of a well sheltered gorge occurring at the base of West Rock's gentle eastern slope. It would therefore represent one of three campsites reported in this chapter located along upland streams which have their headwaters at West Rock Ridge. The collection also led to the discovery of the Building Brook Farm site, a chert quarry discussed in chapter nine. Surprisingly, no connection could be made between the quarry and the collection, because no diagnostic artifacts were recovered from the quarry and none of the artifacts in the collection was made from the local chert. The inability to further research this tremendously important site was one of the great disappointments of the project. But the land had been subdivided into numerous plots and attempts to convince local residents living along Building Brook to allow me to investigate further were refused.

Discussion

In chapter nine it was suggested that seasonal campsites existed along the West River and Konolds Pond in association with both an ecologically diverse environment and access to lithic raw material, in this case quartz. The sites discussed in chapter ten occur on the other side of West Rock Ridge, at the bottom of its gentle eastern slope. However, all of these campsites, both known and suspected, would appear to share a common theme: seasonal occupation by small groups, utilizing a diverse ecological setting and taking advantage of local lithic raw material availability in order to replenish dwindling supplies of tool stone.

Chapter 11

Intercept Hunting Sites

West Rock's intercept hunting sites represented the most significant interpretive problems encountered during the project. For this reason a number of theoretical perspectives will be covered in this chapter. Most of the key issues related to the identification of ambush hunting sites were presented in chapter two, and so for the most part only the most relevant factors related to interpretation of these sites are reiterated here. Other methodological issues related to physical and environmental context, as well as site formation processes, will also need to be incorporated into the analysis.

The most prominent of these sites, located in the Wintergreen Notch, will be discussed first. This site was one of the most interesting discoveries of the project, and it may one day receive National Registry recognition. For this reason, the Wintergreen Notch site will be presented first, followed by the Whaley and Rocky Top sites (Sgarlata 2000; Sgarlata 2006). The West Rock Ridge project offered an opportunity for fairly detailed investigation of intercept and ambush hunting sites. For this reason it will be especially important to conclude the chapter with a discussion of the cultural contexts in which hunter-gatherers choose to use intercept hunting methods, as well as the importance of these sites in terms of the overall objectives of the project.

Intercept Hunting

The term "intercept hunting" here is used to describe a method by which hunters wait, concealed at a location where they can predict that game animals will appear. It can be contrasted to methods of hunting that require mobility in order to find, track, stalk or otherwise pursue game animals. Hitchcock (1983:231) labeled this second method "encounter" hunting:

> There were a number of different methods of hunting used in the Western Sandveld and Nata River regions. The most common method in the two areas was encounter or pursuit hunting, in which an individual hunter, pair of hunters, or small group would range over the landscape looking for prey. When a potential prey item was spotted, a decision was made as to whether or not it should be pursued.

The usage of an "intercept" as opposed to "encounter" hunting strategies may not simply have been a matter of preference on the part of individual hunters. For instance Hitchcock, (1983:270) goes on to explain how the use of ambush hunting, as well as other aids such as traps and facilities, were used more frequently by sedentary populations than by mobile populations in Botswana's Eastern Kalahari Desert:

> Technological changes accompany the shifts in subsistence strategies. There is an increase in the use of facilities for hunting such as hunting blinds and game fences. There is also an increase in the use of hunting aids under sedentary conditions; domestic animals like dogs and horses become a more important part of the procurement system. Facilities which can be used in the absence of a person who constructed them, such as traps, also becomes increasingly significant.

However, ambush hunting sites could be used by mobile as well as sedentary populations and the differences noted above were only in terms of relative frequency. These issues will be returned to later in this chapter.

Wintergreen Notch

According to Dana (1891:26), a continuous magma flow created West Rock Ridge, and so its trap-rock can not be divided into a series of distinct outlets. This is despite the fact that West Rock represents one of the longest ridges in the Connecticut Valley region. The magma flow occurred beneath the surface as it pushed its way horizontally between brownstone bedrock layers, forcing the topmost brownstone layer upward. Because of the weakness of the overlying brownstone bedrock, part of it collapsed blocking a portion of the outflow of magma. The result of this type of process, which Dana (1891:34) referred to as the "effects of obstruction to the outflow" was the creation of at least one very prominent gap in West Rock Ridge. Dana (1891:34–35) referred to this prominent gap as the Wintergreen Notch (Figure 11.1), which he described in the following way:

> Half a mile further north is the third, called the "Wintergreen Notch." It is one of the larger gaps in the ridge. Along the summit, both from the north and the south, there is a descent of100 feet, from a height of 440 feet to 340. The decline is gradual on the south side, but very rapid northward; in the later direction the level of 460 feet is reached at the same distance from the center of the gap as 440 on the south. The third gap is caused by obstructions to the outflow, whatever the fact with the others.

Figure 11.1: Wintergreen Notch before Parkway Tunnel



Figure 11.1 is a photograph archived by Simon Donato showing Wintergreen Notch as it looked prior to the building of the West Rock Tunnel. The Notch which is obvious in the background represented a narrow funnel which would have been an ideal location for hunters to ambush game passing through.

From the point where West Rock Ridge first breaks ground about 4 miles to the northwest of New Haven Bay, it forms a continuous cliff face that towers over the surrounding lowlands, running in a roughly north-south direction for about 7 miles before its massive summit height gradually decreases. The ridge therefore serves as an effective communication barrier from east to west over a tremendous distance in the South-Central Connecticut Lowlands (between present the present day Connecticut towns of Hamden and Woodbridge). Even today the only available transportation route is under the ridge, through the West Rock Tunnel which was completed in 1943. The tunnel was a true engineering feat at the time of its construction, requiring extensive blasting and even costing human life to successfully complete (Larneo 1983).

But during prehistoric times Wintergreen Notch provided the sole access route from east to west across the top of the ridge, for distances of about one mile to the south and another 6 miles to the north. This factor, as well as the overall contour of the notch (which is v-shaped gap in the ridge) allowing for east/west travel over a narrow and restricted pathway, may have contributed to its usage by some of South-Central Connecticut's prehistoric inhabitants as a place to intercept deer that were passing through.

Sources of fresh water are not far from the Wintergreen Notch. Wintergreen Brook flows down a spectacular waterfall less than 150 meters to the east. Additionally, a local informant, Simon Donato (personal communication 2002) recalls that as a youth growing up in the area, and prior to the construction of the West Rock Tunnel, a fresh water spring erupted from fissures in West Rock's trap-rock not 100 meters to the northwest of the location of the Wintergreen Notch site. Donato recalls that the spring

had been a favorite local picnic spot that was named Miller's Grove. As will be described later, freshwater springs adjacent to Wintergreen Notch may have served as a lure to the favorite prey animal of South-Central Connecticut's Native American inhabitants, white-tailed deer.

Disturbance

The Wintergreen Notch site is located on the south-facing slope of the prominent gap in West Rock which was described above. The ground in this location has a moderate 25% slope. Percent slope is measured by dividing horizontal distance by vertical height, and so this indicates that for every 4 meters of horizontal distance the slope rises one meter. The ground is also rocky, being covered by talus and having exposed bedrock adjacent to the trail at the bottom of the notch.

Disturbance to the site's cultural deposits both human and natural were a very important component of the analysis of the site. Causes of disturbance that will be considered in this chapter will be cryoturbation[7], floralturbation[8] and faunalturbation[9]

---

[7] Waters (1992) defines cryoturbation as, "…the disturbance of archaeological remains in a matrix that undergoes periodic freezing and thawing (292)."

[8] Waters (1992) defines floralturbation as, "… the partial or complete disturbance of the archaeological site matrix and its contents by trees, shrubs, or other types of plants (306)."

[9] Waters (1992) defines faunalturbation as, "…the mixing of the site matrix and its archaeological contents by burrowing vertebrates and invertebrates (308)."

(Waters 1992:291–316), down slope erosion and a drainage pipeline that intersected the eastern portion of the site. By far the most important of these factors was down slope erosion of artifacts.

Rock, sediments and soil move down slope in a variety of ways. Fortunately the most potentially devastating of these ways in terms of destruction of the site's contexts do not appear to have affected it. Waters (1992:230–232) listed at least three mechanisms by which rock detritus and sediments move down slope under gravity's influence: 1) soil flow, 2) creep and 3) slumping.

Waters (1992:230) defines slumping in the following way: "Slumps are generated when a block of sediment breaks loose from its bed and slides downward and outward as a coherent unit along a curved failure plane." Slumping can be ruled out in terms of site disturbance because this process would have left concave scars or scarps, which were not present. Waters (1992:231–232) defined flows as down slope movement of soil that is saturated by water, and creep as slow, imperceptible movement of the upper soil layer. Stratigraphic analysis of site soils indicates that neither of these processes was important because soil moving down slope would become superimposed on the natural stratigraphic layers, and this was not the case.

The most important post-depositional factor which did affect the archaeological context of the Wintergreen Notch site was down slope erosion of artifacts. Fortunately a very informative research by Rick (1976) provided useful guidelines for understanding the effects of this form of disturbance on the site's artifact bearing deposits. Rick (1976:134) performed his investigation at the Ccurimachay rockshelter site, located in the highlands of Perú. His main objective was to demonstrate how down slope erosion of

artifacts creates artificial patterning of artifacts that archaeologists can mistakenly interpret as evidence of spatial segregation of activity areas at prehistoric sites. Ccurimachay was a rockshelter having a slight floor that overlooked a long and continuous slope, and artifacts were found down slope from the rockshelter at distances of between 20 and 300 meters (Rick 1976:134).

According to Rick (1976:139), artifacts will move down slope under the influence of gravity only as long as their kinetic energy is enough to overcome forces of friction, or alternately if they hit an obstruction. The patterning that he observed at the Ccurimachay rockshelter was that relatively heavier and denser artifacts came to rest on lower slope angles, while lighter artifacts came to rest on higher slope angles. Lighter artifacts, obviously having less kinetic energy once set in motion, are less able to overcome friction and therefore very light artifacts can come to rest on fairly steep slopes. Rick (1976:134) also concluded that vegetative covering has an important effect on down slope erosion, inhibiting it. In fact with the presence of a vegetative covering down slope erosion of artifacts can not be assumed for slopes less than 25%. Finally, and most importantly in terms of the Wintergreen Notch site, Rick (1976:144) stated that when down slope movement of artifacts is considered, the lightest and least dense artifacts are those that will most likely reflect the original distribution of cultural materials. This is because the lightest and least dense artifacts have the least amount of kinetic energy and so they come to rest even on relatively steep slope angles, as opposed to heavier artifacts which will not; and so heavy dense artifacts are more likely to continue moving even further down slope until reaching more level ground.

Given these general considerations, interpretation of the spatial patterning of artifacts on the south-facing slope of Wintergreen Notch is fairly straightforward. The site represents a dense cluster of especially numerous small flakes and micro-flakes, located between 10 and 15 meters above the bottom of the slope. The slope continues to rise about another 75 meters further above the site. Artifacts densities drop off sharply up the slope from this dense concentration of artifacts, and no artifacts were located either at the top of the slope or anywhere else above the level of the site. The surface of the site has vegetative covering including grasses and weedy plants, trees of relatively small stature and some low lying brush.

The highest concentration of artifacts includes densities of flakes of over 2,000 per m^2, and using eighth inch screen this included mostly small flakes and micro-flakes. Since these are the artifacts that would be least likely to travel down the slope under the influence of gravity, it is considered that this would be the most likely location for the original position of the site's deposits. There is little chance that cultural materials had moved down slope from above the level of the site, because had this been the case artifacts should have dispersed the further down slope from the original location that they traveled. The obvious dense cluster of small flakes in the furthest up slope portion of the site would appear to define the site's original context fairly confidently. Additionally, considering that vegetative covering should also have existed on the site in prehistoric times, as it does today, down slope erosion of artifacts can not be presumed since slope present at the site is only 25%.

While horizontal disturbance of the site's deposits was not pronounced enough to destroy its primary context, there is no doubt that some artifacts did move down the

slope. Surprisingly, however, very few artifacts occurred at the bottom of the notch, and the great majority were found either among the dense concentration of small debitage or just below it.

Vertical mixing of artifacts is another matter. All of the factors listed above, cryoturbation, floralturbation and faunalturbation (Waters 1992: 292–316) probably did play a role in mixing any possible stratigraphic layering that had ever been present at the site. Abundant earthworms (faunalturbation) were found in the soils where the Wintergreen Notch site was located. Surprisingly, these seemingly harmless creatures can have significant effects on vertical stratigraphy as they constantly ingest and pass mineral and organic material, forming worm casts as they do so (1992:314–316). When water in soils freezes it creates lenses (cryoturbation), and as these lenses form they push artifacts up toward the ground surface (Waters 1992:292–299). Cryoturbation also can be a significant factor in New England's temperate forests. Shallow soils present on many parts of the slope where the Wintergreen Notch site was located would promote tree throws (floralturbation) occurring when high gusts of wind knocked less firmly rooted or older trees over. Tree throws move artifacts both up and down from their original position in cultural stratigraphy. First, artifacts affected by down slope erosion can fall into the hollow left behind by the up-rooted tree. Second, artifacts caught in soil clinging to the tree's roots would be brought up to the surface as the tree falls over (Waters 1992:306–309).

The final process of post-depositional disturbance to be described here is the only assured human disturbance to the site that was recorded. The discovery of the Wintergreen Notch site coincided with the observation of projectile points and bifaces

occurring in a fairly straight line walking up the south-facing slope of notch. This fairly curious scenario actually had a very mundane explanation. At the top of the slope above the Wintergreen Notch there was a small structure that was identified as an air vent. This was a vent for the West Rock Ridge tunnel, which was located just to the north of the Wintergreen Notch site. Apparently workers had laid down a narrow water drainage pipe which intersected the eastern portion of the site. A shallow ditch had been dug to lay the pipe, and the workers must have filled the hole covering the pipe with the dirt they had originally removed, and so a straight line of artifacts coinciding with the location of the drainage pipe could be followed up the slope.

While any form of human disturbance to an archaeological site must be considered unfortunate, in this case not only was very little of the site affected but the artifacts which had been brought to the surface in the process of the excavation of the trench (dug to install the water pipe) represented the only tip-off to the site's location. Without this disturbance the site would never have been discovered, because situated as it was on rocky and moderately sloped ground the location would have been unsuitable for survey transects. This should serve as a fairly clear example of how surface survey in these types of topographically rugged settings can be crucial for identification of important sites; as well as the potential to miss archaeological sites using survey strategies that ignore rocky and fairly well sloped ground.

It should also be noted that due to the sloped and rocky terrain upon which the site was located, the area of the site had never fallen beneath the weight of the plow. This factor was indeed fortunate, and for this reason the Wintergreen Notch site may actually have undergone less overall disturbance than most other open-air sites in Connecticut.

Methodology

The methodology used for excavating the Wintergreen Notch site was similar to other sites discussed so far, except that several measures were taken to maximize the recovery of artifacts due to the abundance of cultural information present. Datum was a distinctive fissure in the low lying bedrock outcrop located to the east of the site. A grid of one meter squares was extended from datum such that the distance along both a north/south and east/west baseline from datum to the northeastern corner of a one meter square was the unit's grid designation. For instance a unit having its northeastern corner located at 10 meters to the south and 10 meters to the west of datum would be labeled S10W10. Units were excavated according to natural soil horizons, but these stratigraphic layers were further broken down into arbitrary 10 cm levels whenever the natural horizons were more than 10 centimeters thick.

More importantly, special steps were taken during the excavation of the Wintergreen Notch site in order to ensure maximal recovery of information. These steps included: 1) 10 one meter square units were excavated using trowel, instead of shovel shaving so that careful attention could be paid to changes in soil color as excavation proceeded, 2) 1/8 inch screen was used for all the troweled units in order to maximize the recovery of small flakes, 3) one meter units (one square meter) were further divided into half meter quadrants so that better horizontal provenience could be maintained, 4) when lithic tools were encountered an exact measurement for depth as well as distance from each of the north and east excavation unit walls was recorded, 5) soil samples were taken

and analyzed in order to determine soil texture in terms of the percentage of sand, silt and clay sized particles present, 6) flotation samples were taken wherever it was apparent that charcoal was present in the site matrix, 7) seeds recovered from the flotation were taken to Dr. David Lentz at the New York Botanical Gardens for identification and, 8) pH was measured from the site's soils.

Stratigraphy

According to the Soil Survey of New Haven County (SSNHC) (United States Department of Agriculture, 1979), the Wintergreen Notch site occurs in a soil type known as the Holyoke-Rock outcrop complex. This soil type occurs on 15 to 35 % slopes with interspersed bedrock outcrops and 15 percent of the ground surface covered by stones and boulders. These soils exhibit rapid runoff with low water capacity. They are often very shallow and have moderate water permeability.

The SSNHC (United States Department of Agriculture, 1979) describes Holyoke-Rock outcrop complex soils as having a surface layer, or A horizon, consisting of a very dark grayish brown silt loam that extends to a depth of about 2 inches. The subsoil, or B horizon, is either a dark reddish brown or reddish brown silt loam that extends to a depth below surface of about 10 inches. The substratum is basalt bedrock.

Stratigraphy recorded from field notes agreed generally, with the description of Holyoke-Rock outcrop complex soils provided by the SSNHC (United States Department of Agriculture, 1979) except for the fact that site soils at the Wintergreen Notch site did

appear to be somewhat more developed. From the field notes, the upper portion of the surface layer, or A horizon, consisted of a humus layer composed of organic matter such as decayed leaves extending to a depth of 5cm (2.5) inches. The rest of the A horizon was between 10 to 15 cm (3-5 inches) thick and was composed of a very dark brown, or dark grayish brown fine silty loam. The subsurface, or B horizon, began at a depth of about 15 to 20 cm below the surface and extended down to 40 to 50 cm below the surface, consisting of a yellowish brown, reddish brown, or reddish fine silty loam. Depth to bedrock varied considerably over the extent of the site, however, and when extremely shallow soils occurred, only the A horizon with a very slight B horizon was present. At times when deeper soils were encountered, a substratum, or C horizon, consisting of glacial till occurred above the basalt bedrock.

A soil sample from the B horizon indicated that the site soils at the Wintergreen Notch site were composed of 46.6% silt, 33.3% sand and 20% clay. A soil pH of 4.0 or less was recorded for several locations at the site. The acidity of the soil probably accounted for the absence of bone preservation at the site.

Artifacts at the Wintergreen Notch site were recorded between depths of about 5 cm below the surface, or just below the humus layer, and to a maximal depth of 50 cm. However, the vast majority of artifacts clustered in the lower portion of the A horizon and the top 10 cm of the B horizon. Vertical stratigraphy is not considered to be present at the Wintergreen Notch site. Several factors contributed to mixing of the site's deposits making recognition of discrete cultural layers impossible. These factors included: 1) erosion due to the slope present at the site, 2) earth worm activity, 3) freeze thaw cycles, and 4) tree-throws. The lack of vertical stratification in this instance does not

compromise the importance of the site. The vast majority of artifacts from the Wintergreen Notch site could positively be associated with the Small Stemmed Point Tradition component, and perhaps more importantly the site's deposits may have accumulated over a very brief period of time.

Artifact Analysis

A total of 125 lithic tools and cores, one possible hammerstone, and 17,277 pieces of debitage have been recovered from the Wintergreen Notch site, including surface finds and 17.25 m^2 of excavation (10 one-by-ones and 29 half meter test pits). Quantities of lithic tools and cores are as follows: 4 early stage bifaces, 4 middle stage bifaces, 6 late stage bifaces, 6 bifacial knives, 1 hafted knife, 1 flake knife, 2 drills, 1 notched flake, 1 triangular point, 2 point fragments, 15 side-notched points, 26 stemmed points, 1 quartz broad point, 51 projectile point tips and midsections, 1 possible hammerstone and 4 cores. The densest concentration of artifacts occurred in a contiguous block of 10 one-meter excavation units (Figure 11.2).

The majority of these artifacts would appear to have been associated with a single Small Stemmed Point Tradition component. This conclusion is based upon a fairly common characteristic among many of the artifacts from the collection: the presence of a highly polished cortical surface that apparently represents a quartz pebble source from a beach environment. Quartz pebbles and cobbles were available from Wintergreen Brook and in the till deposits where the site was located, but whenever cortex was observed on

artifacts from the Wintergreen Notch site only a highly polished and rounded surface was present. None of the cobbles and pebbles found in the brook or in local till deposits around the site had similar surfaces as those found on these artifacts. Beach pebble cortex was also very common at the site including about 20% of all of the debitage, almost half the Small Stemmed Tradition projectile points which possessed a portion of their intact bases, one of the flake cores, and several of the bifaces and knives.

The 15 quartz side-notched points were classified as Sylvan-Side Notched points, a type originally identified by Funk (1976) from the Sylvan Lake Rockshelter in New York State's Dutchess County (Figure 11.3). Funk (1976:159) described Sylvan Side-Notched points in the following way: "These points can be described as small to medium-sized, thick, broad, usually sloppily manufactured side-notched points." Ritchie (1971:129) gives an age range for this type of between about 4,200 B.P. and 3,500 B.P.

The quartz small stemmed points were similar to a type identified by Funk (1976:158) as Sylvan Stemmed points at the Sylvan Lake Rockshelter site, where quartz stemmed and side-notched points were found in association in the same stratigraphic levels. Actually quartz stemmed and side-notched points are fairly commonly found together in cultural contexts in New England, and these types probably represent the most numerous forms of projectile points that collectively are referred to in this text as the Small Stemmed Point Tradition. The narrow bladed stemmed points from the Wintergreen Notch site were similar to other Wading River points found at West Rock Ridge and therefore have been classified as Wading River points in this context (Figure 11.4). This is a point style that has been referred to numerous times in this text, and is a

Figure 11.2: Location and Grid for Wintergreen Notch

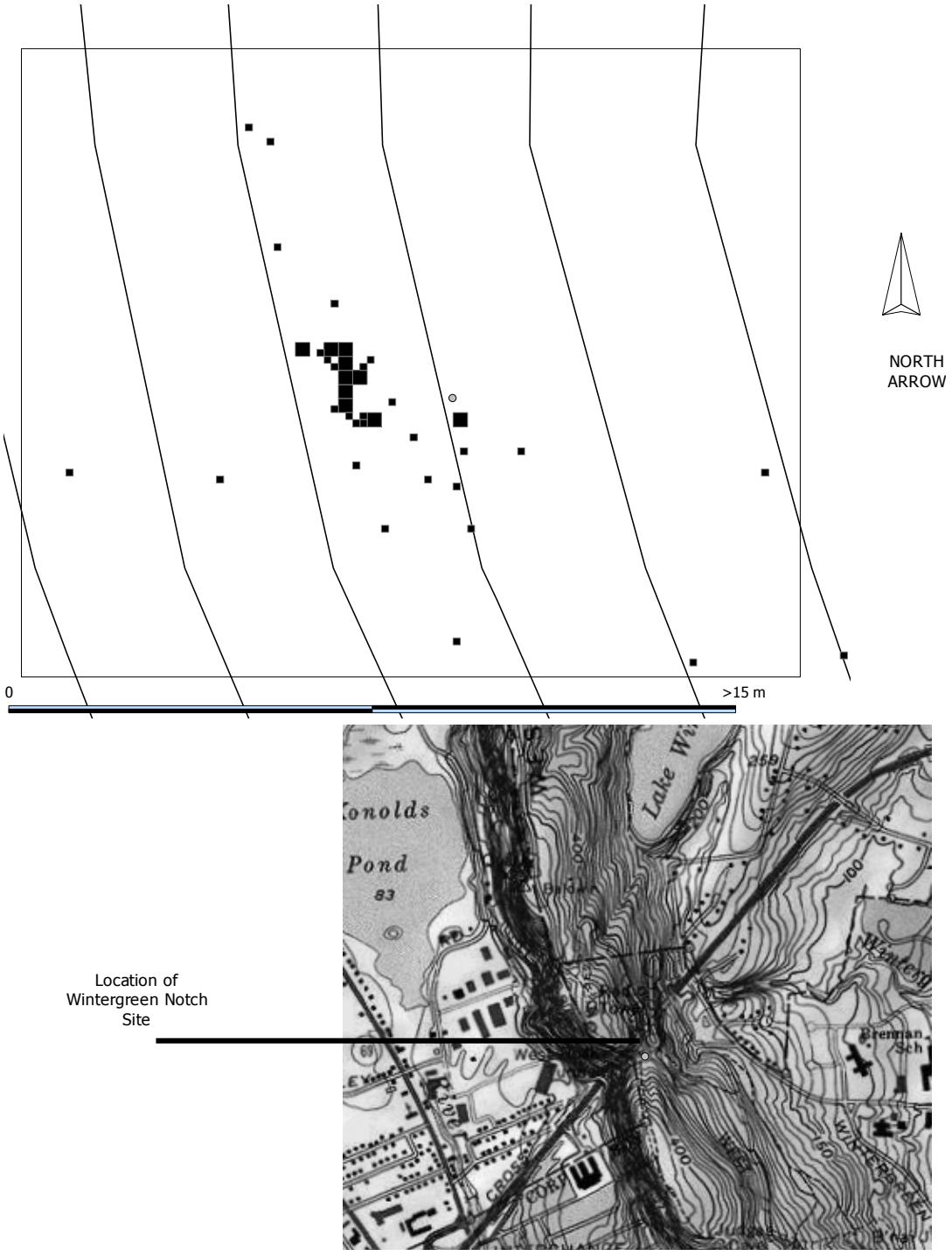


Figure 11.2 is a map showing the location and excavation grid used for data recovery of the Wintergreen Notch site.

Figure 11.3: Sylvan Side-Notched Points



Figure 11.3 Sylvan Side-Notched Points from the Wintergreen Notch Site.

Figure 11.4: Wading River Points

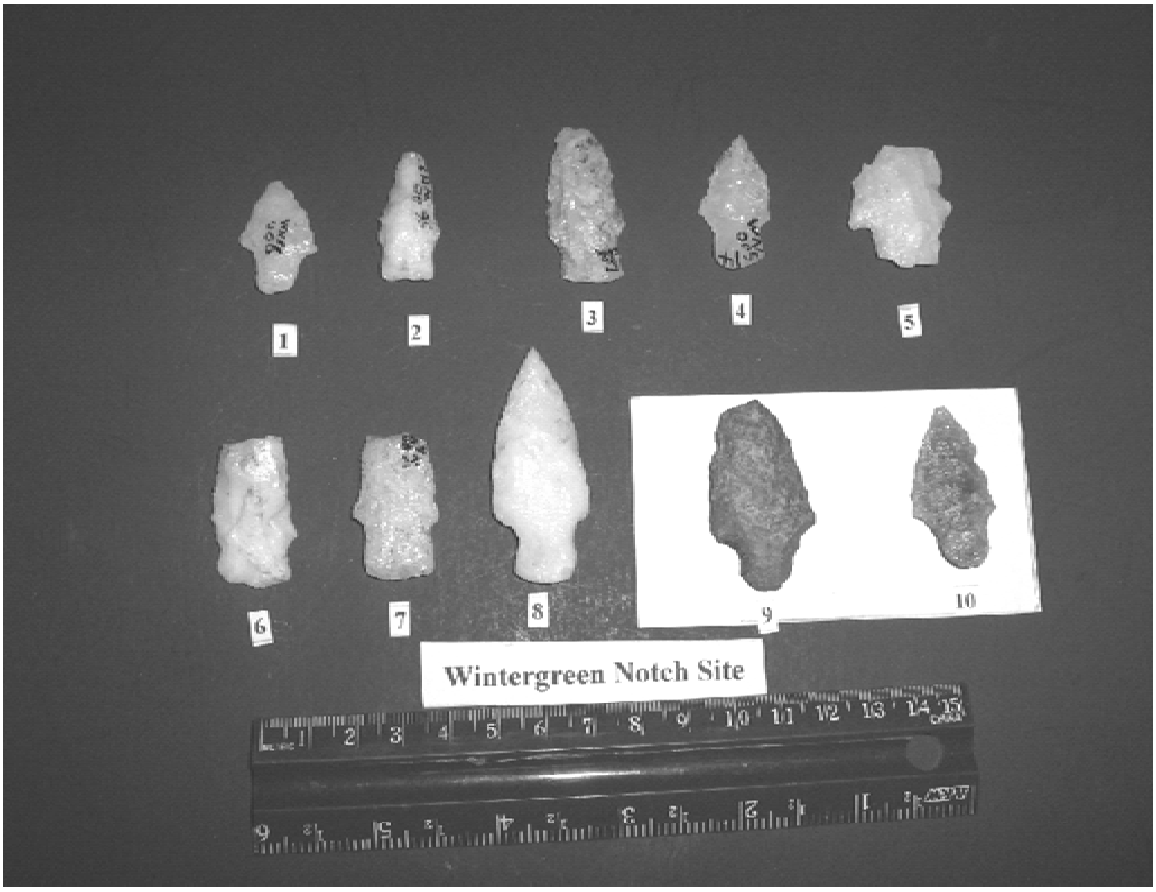


Figure 11.4 Wading River (Small Stemmed) Points from the Wintergreen Notch Site.

type that Ritchie (1971:131) associates with the Late Archaic of Southern New England and eastern and southern New York, extending as far west as eastern Pennsylvania and south to the Middle Atlantic region (Also probably related to the Lamoka culture, in fact the adzes depicted in Figure 7.3 are “Lamoka-like”).

The quartz triangular point found at the site was also a Late Archaic type, classified as a Squibnocket Triangle (Figure 11.5, No. 7) that Ritchie (1971:127) reports is found along Long Island in association with Wading River points. The final diagnostic projectile point recovered from the Wintergreen Notch site was a white quartz broad bladed variety that is considered a probable Wayland Notched point (Figure 11.5, No. 8) that Fogelman (1992:143) suggests should be dated about 3,700 B.P., and is associated with the Terminal Archaic of Connecticut and Southern New England. As mentioned in chapter seven, Wayland Notched points are considered analogous to Terminal Archaic Susquehanna Broad points in Connecticut (Snow 1980:236).

The most numerous artifact type recovered from the Wintergreen Notch site was projectile point tip sections (Figure 11.6). A total of 51 tip sections were recovered. Quartz was the dominant raw material for point tips, but as least three were made from chert and one was made from maroon hornfels. Only one of the point tips was considered to have been the result of a manufacturing break, and the rest appear to have been finished specimens that had been broken during usage as hunting implements. Broken, finished point tips are thought to occur in one of two contexts: 1) where projectile point breakage had occurred due to impact, or 2) embedded within the flesh of game animals where they were subsequently removed during butchering activities. The

Figure 11.5: Assorted Artifacts

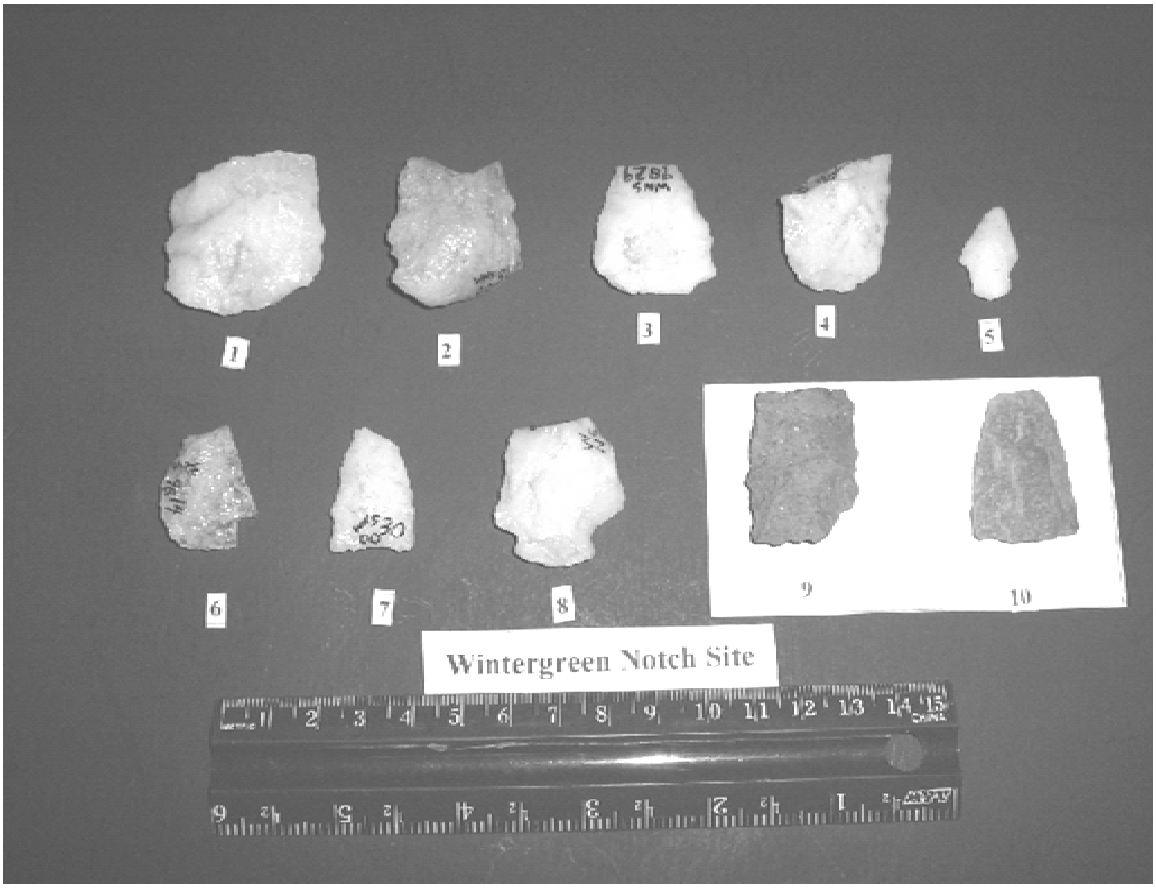


Figure 11.5 Nos. 1, 2 and 4 are Bifaces; Nos. 3, 6, 9 and 10 are knives; No. 5 is a drill, No. 7 is a Squibnocket Triangle Point and No. 8 is a Wayland Notched Point.

Figure 11.6: Point Tips

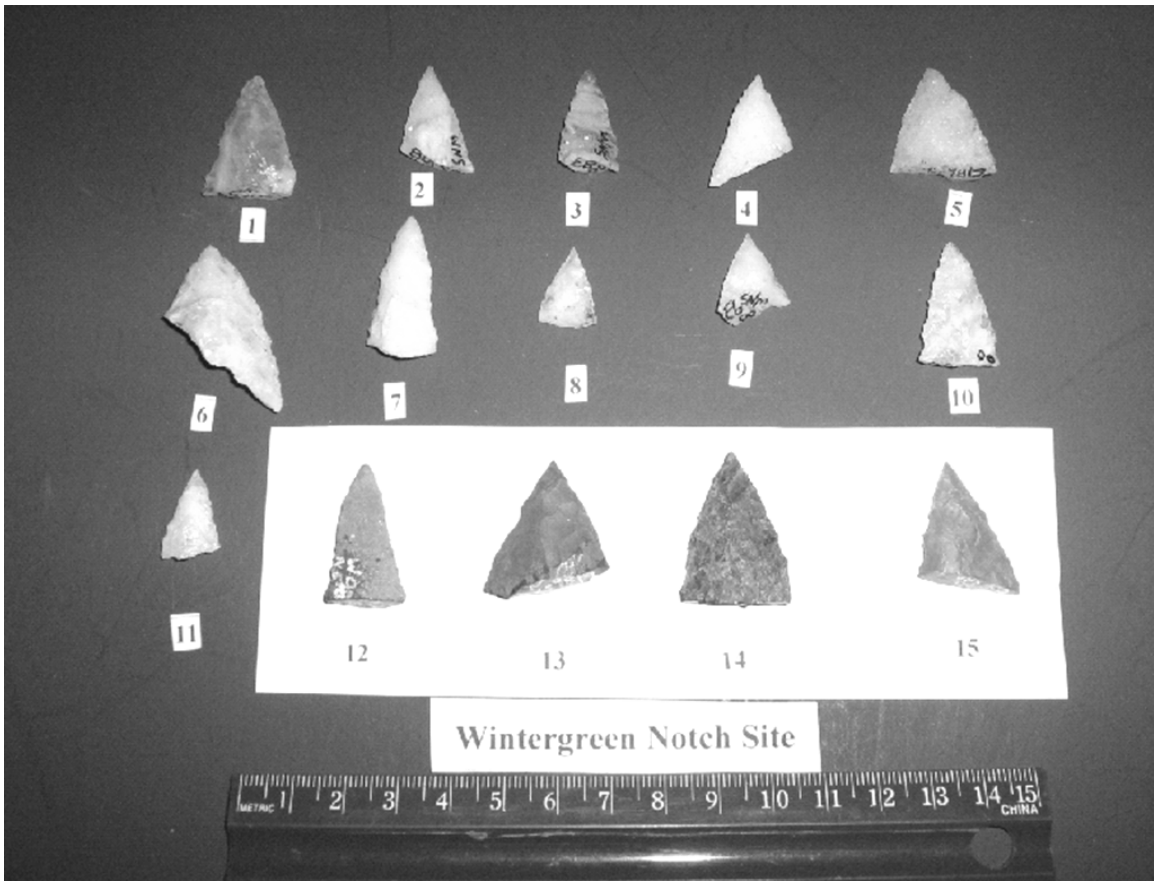


Figure 11.6: Nos. 1-11 Quartz point tips; Figure 12, Hornfels Point tip, Figures 13-15 Chert point tips.

importance of the great number of projectile point tips recovered from the site will be discussed later in this chapter.

Aside from projectile points, which have already been described, the second most numerous artifact type recovered was bifaces (Figure 11.5, Nos. 1, 2 and 4) A total of 14 bifaces were recovered from the site, all made from quartz. The bifaces are considered to represent manufacturing breakage and three of the late stage bifaces leave no doubt that the objective was production of projectile points. Two of the late stage bifaces represented failed attempts to manufacture quartz side-notched points and one was a failed attempt to manufacture a quartz stemmed point. The bifaces were further classified according to general manufacturing stages. Four of the bifaces represented early stage breakage having rough, irregular edges and requiring much thinning. Four middle stage bifaces had fairly even edges all around their perimeters and were thinner than the early stage bifaces, and six late stage bifaces were fairly symmetrical and well thinned, at least three of which were intended to become projectile points.

Next, in terms of numerical significance were knives (Figure 11.5, Nos. 3, 6, and 9-10). A total of eight knives were recovered from the site, 5 of these were quartz, one was quartzite and one was gray rhyolite. Two of the knives were straight sided or lanceolate (Figure 11.5, No. 9) in outline, 2 were triangular (Figure 11.5, No. 10), and 2 were ovate (Figure 11.5, No. 3). One of the knives apparently was hafted (Figure 11.5, No. 6). This knife, which possessed a sharp barb and straight stem on one side, but had a broad and excurvate blade on the other side, had originally been interpreted as a projectile point. But the discovery of a very similarly shaped, although much larger specimen from the Building Brook Farm revealed the artifact probably was a knife. A

large flake also had been utilized as a knife. Use-wear in the form of micro-flaking, scratching, crushing or removal of small, semi-lunar and scalar flakes occurred on all of the knives. Use-wear was identified using a binocular microscope with 300x magnification.

Two quartz drills were recovered. One was actually a miniature stemmed point (Figure 11.5, No. 5). The other was also stemmed but appears to have had the working end broken off. The final flake tool to be described here was a chert flake having a prominent notch chipped along one margin.

Only one possible hammerstone was recovered from the site, an oval quartzite pebble with battering along one end. Considering the amount of stone tool manufacturing that apparently occurred, the presence of only one hammerstone is considered surprising. But this may be explainable because of the fact most of the pebbles and nodules observed at the site were badly weathered and worn, apparently from glacial transport. It seems likely that hammerstones simply were not recognized for what they were.

Four cores were identified in the site's deposits. Two quartz bipolar cores were found at a separate locus on the opposite side of the notch as the Wintergreen Notch site, and may represent either a separate activity area or alternately a completely distinct component. One beautiful wedge-shaped chert core having large flakes removed from both sides was recovered from the surface. The chert was visually similar to chert obtained from the Building Brook Farm site, where the raw material had been procured and initially processed. Finally one large quartz flake core that was 17.5 cm long and shaped like an enormous orange wedge, with the smooth rind of a beach pebble located

where the orange rind would occur, was found among the deposits of the Wintergreen Notch site.

Debitage Analysis

A total of 17,277 pieces of lithic debitage was recovered from the Wintergreen Notch site. From a sample of 14,003 debitage recovered during the 2000 field season, 13,588, or 97%, was quartz. Brown chert similar to raw material obtained during the Building Brook Farm site made up 282, or 2%, of the total. Next in significance were other forms of chert, believed to be exotic, which made up 90, or 0.6%, and then quartzite accounting for 37 pieces or 0.3% of the total. Finally, insignificant amounts of basalt and hornfels debitage were found.

A sample of the debitage recovered from the Wintergreen Notch site was used for the purpose of debitage analysis. This sample consisted of 1,070 total lithic debitage recovered during initial test pitting of the site conducted between the months of June and August in the summer of 1998. This sample was chosen because it was recovered using quarter inch screen, so results from the analysis will be comparable to other sites studied from West Rock Ridge. Before analysis of this sample was conducted, however, an attempt was made to understand how samples recovered using the eighth inch screen differed from those obtained using quarter inch screen. In order to do this, a sample of 3 quadrants, which had been collected in the eighth inch screen were selected using a random number generator (Minitab).

This debitage sample was passed through the quarter inch screen in order to estimate how much, and what sorts of debitage fell through. From the three selected quadrants 68.2%, 68.3% and 66.9% respectively went through the screen. While the majority of these would appear to have been micro-flakes, in reality most of it was too small in order to analyze confidently. So the sample is considered suitable for analysis purposes, although it probably will underestimate the true numbers of flakes from the Wintergreen Notch site.

Because all of the debitage from the Wintergreen Notch site was not analyzed, a 95% confidence level was used and error ranges were attached to each of the results for the analysis. Table 11.1, below, gives information concerning the size of quartz debitage recovered from the Wintergreen Notch site. Quartz was the most dominant lithic raw material at the site representing 97% of all of the debitage recovered.

Table 11.1: Size and Weight for Quartz Debitage for Wintergreen Notch

Flakes

Size (cm)	0-1	1-2	2-3	3-4
Quantity	n=193 29.3% ± 2.9%	n=388 55.8% ± 3.2%	n=65 9.9% ± 1.8%	n=13 3.6% ± 1.2%
Weight (g)	21.9g	143.4g	142.0g	83.9g

Shatter

Size (cm)	0-1	1-2	2-3	3-4	4-5
Quantity	n=83 23.0% ± 4.0%	n=225 62.3% ± 4.5%,	N=44 12.7% ± 3.2%	n=6 2.8% ± 1.6%	N=3 0.8% ± 0.8%
±Weight (g)	13.7g	138.6g	119.0g	50.3g	52.3g

Only 22 pieces of debitage from the quartz sample were over 3 cm in length yielding an estimate for the Wintergreen Notch site at a 95% confidence level that 2.2%±0.8% was larger than 3 cm. Obviously small debitage sizes dominate at the site. This is also the case for all of the lithic raw material types. A total of 659 of quartz debitage from the sample were flakes and 361 was shatter. This means that at a 95% confidence level it can be expected that 64.6%± 2.7% of quartz debitage from the Wintergreen Notch site was flakes and 35.4%±2.7% was shatter. This would yield flake to shatter ratio of about 1.8 to 1. So far a high ratio of flakes to shatter and dominance of small debitage sizes has indicated that later stages of tool manufacturing and/or maintenance were dominant activities at West Rock Ridge sites. However, in this case cortical debitage was also numerous. A total of 204 of the debitage from the sample was recorded as having a cortical surface, yielding an estimate at a 95% confidence level that 20.0%±2.2% of all debitage recovered from the Wintergreen Notch site possessed at least some cortex on its dorsal face.

Table 11.2 below gives information concerning attributes of flake debitage recovered from the Wintergreen Notch site.

Table 11.2: Quartz Flake Attributes for Wintergreen Notch

Attribute	Single Faceted Platform	Lipped Platform	Multi-Faceted Platform	Flake Scars	Thinning Flakes
Quantity	n=151 22.9% ± 2.8%	n=110 16.7% ± 2.4%	N=3 0.5% ± 0.4%	n=350 53.1% ± 1.1%	n=95 14.4% ± 2.2%

It is predicted at a 95% confidence level that a significant number of flakes from the Wintergreen Notch site have either single faceted (22.9%±2.8%) or lipped platforms (16.7%±2.4%), and that a good proportion possess flake scars on their dorsal faces (53.1%±1.1%). Additionally, bifacial thinning flakes make up a fairly large proportion of flake debitage from the site (14.4%±2.2%), and small pressure flakes were recorded as being numerous. When considered in context with the 14 broken bifaces which were recovered from the site, it is obvious that manufacturing of lithic tools was a prominent activity. Evidence of use-wear on the striking platforms of seven quartz flakes from the sample indicates that dull tool edges were re-sharpened.

From lithic analysis of the Wintergreen Notch site, some general conclusions are possible. Obviously the large number of projectile points indicates an emphasis on hunting activities. In this context one would suspect that the presence of 8 stone knives represents the butchering of meat in association with acquisition of hunted game animals. Also tool maintenance activities would mean that tools were being used and re-sharpened, suggesting perhaps that large quantities of meat were butchered. Finally, the manufacture of projectile points, as well as the discard of slightly broken specimens and basal fragments, is interpreted as the discarding of points at the end of their use lives and the manufacture of replacement armatures to repair hunting equipment.

This general interpretation is supported by evidence from analysis of chert debitage from the site. The second most dominant lithic raw material type recovered from the Wintergreen Notch site was brown chert similar to lithic raw material found at the Building Brook Farm site. Because this raw material type was less abundant than quartz, analysis of chert debitage included all of the material recovered during the 2000 field season when most of the site was excavated.

A total of 282 brown chert debitage was recovered representing only 2% of the total in comparison to quartz which represented 97%. Flake sizes for brown chert debitage were as follows: 99 or 35.1% of brown chert debitage was under 1 cm in length, 137 or 48.6% was between 1 and 2 cm in length, 30 or 10.6% was between 2 and 3 cm in length, 15 or 5.3% was between 3 and 4 cm in length, and 1 or 0.4% was between 4 and 5 cm in length. Sixteen pieces of chert or 5.7 % was over 3 cm in length. Debitage under 1 cm in length was not analyzed further; of the remaining 183 debitage 111, or 60.7% were flakes and 72, or 39.3% were shatter. A total of 57 brown chert flakes were classified as

bifacial thinning flakes representing 51.4% of the collection and numerous small brown chert pressure flakes were noted.

As described in chapter nine, the production of large brown chert bifaces was observed at the Building Brook Farm site. The usage of this brown chert was similar for the Wintergreen Notch site as it was at other West Rock Ridge sites where this local lithic raw material was present. No formal tools were found, but large bifacial thinning flakes and small pressure flakes were numerous. This indicates that the lithic raw material was conserved. It also may support a suggestion made in chapter nine that prehistoric flintknappers made large bifacial cores with this lithic raw material type, in turn using these cores as a source of bifacial thinning flakes that served as tools. In this case brown chert bifacial thinning flakes, with their razor sharp and sturdy edges, would have served as useful butchering implements.

Additionally as described above, the only two bipolar cores recovered from the Wintergreen Notch site did not occur on the south-facing slope where the vast majority of artifacts were located. Instead they were found in a separate locus in the southern portion of the site, or on the north-facing slope. Also, the only three bipolar debitage recovered from the site also occurred in this locus. Whether or not this represents a separate component of the site, or a distinct activity area associated with the large Small Stemmed Point Tradition component can not be ascertained (no diagnostic projectile points were found on the north-facing slope). However, it can be suggested that additional butchering tools may have been expedient flakes manufactured in the bipolar reduction of quartz pebbles.

Using conventional lithic analysis, therefore, a fairly coherent interpretation of activities occurring at the Wintergreen Notch site is possible, which was given above. However in order to understand the context within which activities performed at the site took place, a similar approach to the analysis of projectile point impact damage and artifact discard patterns as Flenniken (1991) preformed at Diamond Lil site, in Oregon's Cascade Range, is necessary.

Projectile Point Impact Damage and Artifact Discard Patterns

In chapter two, Flenniken's (1991) interpretation of the Diamond Lil site located in Oregon's Cascade Range was presented. In this research Flenniken argued that evidence concerning projectile point impact damage and artifact discard patterns was necessary in order to understand the most important activity which occurred at this site. According to Flenniken (1991:185), the ratio of broken projectile point tips and midsections to whole points and basal fragments for the Diamond Lil site approached 1 to 1. He further argued that at other sites from the Cascade Range interpreted as either kill or butchery locations that a similar ratio was also found. In contrast, at sites interpreted as base camps or task specific locations other than kill or butchery sites, whole points/basal sections outnumbered tips/midsections by at least 4 to 1.

Flenniken (1991:185) went on to explain that projectile point tips, which tend to be small and unusable, were not retrieved and therefore were left where they had broken

upon impact (incurred either during a missed shot, or in striking the targeted animal). Alternately, projectile point tips may have been introduced into the site during primary butchering activities when they were removed from the meat of game animals. In contrast, whole points that had only been slightly broken were discarded because they were at the end of their use-lives; while broken basal fragments adhering to the foreshaft of the hunting weapon were removed either to repair the shaft, or because the basal sections were potentially in a condition where they could be reworked and used again. Because much more labor was invested in shafts than in points; broken point bases were usually brought back to camp attached to salvaged shafts, then discarded when the broken points were replaced on the shafts.

The high proportion of projectile point tips from the Wintergreen Notch site can be interpreted in a similar way. A total of 51 broken projectile point tip sections were recovered from the site compared to a 43 whole points/basal sections. This indicates a point tip/midsection to whole point/basal section ratio of 1.2 to 1, which is even higher than Flenniken (1991:185) recorded for the Diamond Lil site.

Although comparative experimental research for quartz projectile point impact damage is not available, examination of point fragments recovered from the Wintergreen Notch site is consistent with an interpretation that most of the point tips found resulted from damage during usage (a missed shot, or broken upon impact with the target). This type of damage is strongly suggested due to frequent observation of bending and shearing fractures, as well as crushing on a majority of the point tips (Sgarlata 2002:100).

Ambush Hunting

Crowell and Hitchock (1978:10) reported that !Kung (Bushmen) hunters from Botswana placed blinds along game trails leading to water pools where they waited for animals to pass by. Wintergreen Notch represents a very limited access way across West Rock Ridge, and represents a natural game trail for animals passing from one side of the ridge to the other. The notch also possesses the advantage of restricting the movements of game animals. Once inside the narrow v-shaped notch, game animals would simply have had no place to run except into the hands of the waiting hunters.

Water sources are located on either side of the notch. Wintergreen Brook is located to the east of the site and at the bottom of West Rock's gentle eastern slope, about 150 meters away. Also Donato (personal communication 2002) recalled that a prominent freshwater spring occurred not more than a hundred meters to the northeast of the site in a favorite picnic location that locals referred to as "Miller's Grove".

Several sources have noted the usage of communal drives for hunting white-tailed deer by Native American inhabitants of New England. Williams (1936:171), writing in 1643, observed this practice on the part of the Narragansett Indians of Rhode Island:

> The Natives hunt in two wayes:
> First, when they pursue their game (especially Deere, which is the generall and wonderfull plenteous hunting in the Countrey:) I say, they pursue in twentie, fortie, fiftie, yea, two or three hundred in company, (as I have seene) when they drive the woods before them.
> Secondly, They hunt by Traps….

William Wood (1977), writing in1634, described the hunting techniques of New England's Native American inhabitants in the following way:

> Besides their artillery, they have other devices to kill their game, as sometimes hedges a mile or two miles long, being a mile wide at one end and made narrower by degrees, leaving only a gap of six foot long over against which come through the narrow gut. So many as come within the circumference of that hedge seldom return back to leap over, unless they be forced by the chasing of some ravenous wolf or sight of some accidental passenger.

The Wintergreen Notch would have served perfectly as a natural chute through which deer could have been pushed, and then ambushed by hunters waiting on its south-facing slope. Figure 11.1 is a photograph obtained from a local resident, Simon Donato, showing Wintergreen Notch as it appeared from a vantage point on the western side of the ridge, just before the construction of the parkway tunnel in the 1940's. The photograph shows fairly clearly that access to the notch was not restricted, at least from the western approach, and that once inside it game animals would have been confined to a narrow passageway.

According to Crowell and Hitchcock (1978:38), Basarwa (Bushmen) of Botswana located their hunting blinds along game trails leading to freshwater pools. They noted that blinds could be easily constructed in several ways: 1) using blocky rocks built up in a circular ring, 2) digging shallow pits, or 3) simply using a screen of reeds and brush. Hunters often built small fires within these structures. These fires were often banked to eliminate smoke so that hot embers could provide warmth or light a pipe (Crowell and Hitchock 1978:38). The presence of such a fire may be indicated by the presence of carbonized seeds, and unidentifiable nut fragments, recovered during flotation analysis of

the Wintergreen Notch site soils. Although no distinct hearth or features were present, increased densities of charcoal in screened dirt led to the collection of flotation samples. Subsequently carbonized seeds were identified by David Lentz (1999) of the New York Botanical Gardens.

Two carbonized seeds recovered from the Wintergreen Notch site were identified to the level of genus and species: *Carex intumescens* (common name "sedge") and *Phytolacca americana* (common name "pokeberry"). Five other seeds that were identifiable only to the genus level included: cf. *Scleria* sp. (common name "scleria"), cf. *Pontederra* sp. (common name "pickerelweed"), cf. *Desmodium* sp. (common name "ticklover"), cf. *Acalypha* sp. (common name "copperleaf") and cf. *Hedeoma* sp. (common name "pennyroyal") (Lentz personal communication 1999).

Crowell and Hitchcock (1978:44) also noted that blinds were placed as close to game trails as possible, preferably within about 10 meters and in a position allowing for a flat shot. The Wintergreen Notch site was located between 10 and 15 meters above the narrow passageway through the bottom of the notch. This type of placement is consistent with Crowell and Hitchcock's (1978:49) observations concerning blind placement and target accuracy for Basarwa hunters of the Kalahari Desert.

A conspicuous difficulty with an interpretation of the Wintergreen Notch site as a kill site where game animals (probably white-tailed deer) were ambushed, is the absence of bone. However, this difficulty is easily explained by the low pH of site soils. As noted during the discussion of site stratigraphy, several measurements of pH were made throughout the site. All of these measurements yielded a pH value of less than 4.0. These are extremely acidic soils and bone preservation would not be expected, especially

in a context where the site was used by prehistoric hunters living during the Late Archaic Period, between 6,000 and 3,700 years ago.

The only context within which bone preservation would be expected to occur would have been in the case where meat or bones had been cooked for consumption at the site. But because the Wintergreen Notch site may have represented a kill/butchering location, game animals could easily have been first primarily butchered and then carried back to the original habitation (Bartram 1993:67). This description would in fact be similar to Binford's (1980:10) observations concerning the kinds of task-specific locations that are typical of collecting mobility strategies.

Collectors and Task Specific Locations

In chapter two, Binford's (1980) observations concerning alternate strategies of organizing group mobility, collecting and foraging, were presented. Despite other differences in their mobility patterns, both foragers and collectors produce task-specific locations, which are sites where individuals range out from their habitations in order to acquire and/or process resources. The major difference in terms of task-specific locations for collectors as opposed to foragers is the extent to which cultural debris is likely to accumulate in either of these types of mobility contexts.

Describing foraging task-specific locations, Binford (1980:9) stated that since foragers do not rely on storage and most often acquire resources only for the purpose of satisfying their immediate subsistence needs, that these sites produce scant numbers of

artifacts. Only in contexts when an area represented a favorite location for gathering particular resources would site debris accumulate in this way over very long periods of time, producing buildups that become archaeologically "visible." Several examples of these kinds of artifact accumulations have already been discussed in this text, such as information gathering or lithic procurement sites discussed in chapters eight and nine respectively.

Collectors, on the other hand, solve the problem of lack of spatial congruency for critical resources by sending special task groups to camp, sometimes at great distances from habitation sites, in order to acquire an abundance of resources not only for their own consumption but also for those waiting at the habitation. Collectors also rely to a much greater extent on storage than foragers. For these reasons task-specific locations utilized by collectors can represent very dense build-ups of cultural materials. Binford (1980:10) gave examples of bison kill sites on the Plains and intercept caribou kill-butchering locations among the Nunamiut.

Returning to assemblage variability, the concept of evenness is very important for understanding the stone tool assemblage of the Wintergreen Notch site. While a wide variety of tool types were present, projectile points are very dominant making up 86 of 121 total formal tools, or 71.8% of the collection. Because collecting task-specific locations represent sites where only specific resources were targeted, artifact assemblages from these sites can be expected to be highly skewed (or uneven) in terms of those tool types used in the acquisition and/or processing of these resources.

The Wintergreen Notch site assemblage is a perfect example of such a highly "uneven" assemblage. Not only do projectile points dominate at the site, but it can be

suggested that all the artifact types present were utilized in the acquisition and/or processing of white-tailed deer. Obviously projectile points were used in hunting, but knives as well as bipolar or brown chert bifacial flakes may also have been used in butchering. Broken bifaces probably represented projectile points in various stages of manufacturing. Replacement of hunting equipment would be expected after a major hunting event, because many hunting implements would be damaged or broken during the process. Even the drills could have functioned either to repair hunting equipment, or alternately to penetrate hides so that they could be tied to facilitate transport of butchered game parts.

Some further speculation can also be made concerning the organization of technology used at the Wintergreen Notch site. An interesting observation made during the analysis of lithic artifacts was the high percentage of tools (about one third) and debitage (about 20%) having a distinctive cortical surface adhering that could only have represented pebbles from a beach environment that had been polished and rounded by wave action. Not only does this observation lead to speculation that the Wintergreen Notch site represents a logistically organized task specific location utilized by a specialized group of hunters living at a habitation along the coastline; but observations made by Ritchie (1981:98) concerning quartz cobble industries from Late Archaic sites in Massachusetts and Connecticut provide some insight into how quartz cobble cores could have been prepared before being transported to the site.

Ritchie (1981) describes distinct trajectories for manufacture of tool preforms from quartz cobbles. One such trajectory utilized at the Bear Swamp II site in southeastern Massachusetts was as follows (Ritchie 1981:97–98):

> In an alternative sequence where flakes struck from a cobble core were the objective, an initial decortication flake taken off the end of a cobble created a striking platform for subsequent flake removals. Flakes were struck off as "slices" through the cobble such that they had cortex on their lateral edges but not on the striking platform. These "slices" were further reduced to points by chipping the edges so that cortex was sometimes left at the tip and basal ends of a bifacial preform. Finished points made by this process also occasionally had patches of cortex remaining on the basal portion of the stem.

Ritchie (1981:98) also cited a report from Bourn (1966:14) where he described reduction sequences from coastal Connecticut where large flakes struck from cobble cores, including primary decortication flakes, were used as blanks for stemmed points that frequently retained patches of cortex on their bases.

Many quartz decortication flakes similar to those described by Ritchie (1981:97–98) from the Bear Swamp II site, were found at Wintergreen Notch. These flakes appeared to represent the removal of the top of a pebble. After this step the flat surface would be used as a platform to remove flakes having cortex along one of their lateral margins. Used as preforms, the manufacture of points from these flakes characteristically leaves cortex adhering to the basal sections. About half of the points from the Wintergreen Notch site, with enough of an intact base to make a determination, had cortex attached in this way.

Additionally, one large quartz flake core from the Wintergreen Notch site appeared to be a very large "slice" from a pebble, similar to those described above, but much larger (17.5 cm long, and 6 cm wide). This core appeared like a large orange slice, only that beach cobble cortex existed where the orange rind should have been. But unlike cores described by Ritchie (1981:98), in this case the cortex served as a striking platform

for flakes that presumably were used as tool preforms. This trajectory could equally as well have resulted in points with cortex adhering to their bases.

The larger issue in the present discussion is that prehistoric flintknappers appear to have utilized trajectories in quartz cobble reduction industries that were much more complicated than simple pebble smashing using a bipolar technique. I would argue that the types of quartz cobble reduction sequences described above by Ritchie (1981:97–98) may have provided efficient means of acquiring a maximal number of preforms from individual cores. This in turn would maximize the number of projectile points that could be manufactured given the weight of lithic raw material carried to the Wintergreen Notch site.

This type of efficiency would have been important for hunter-gatherers utilizing an ambush hunting technique. Intercept hunting requires time and effort in its organization, planning and implementation, and carries risks if the expected game animals never arrive. But these risks can be offset by potentially high returns. In this case hunters would not want to miss the opportunity to exploit as many game animals as possible, once the opportunity presented itself, because they lacked efficient means to produce enough replacement projectile points.

The Rocky Top Site

A local resident of Hamden, Jim Murray (personal communication 2002), who had observed me excavating at the Konolds Pond site, approached me with information

about a large projectile point that he had found stuck in the roots of an upturned tree, and in a location that he described as a few miles to the north. He retrieved the point from his home and showed it to me, which was a large gray argillite Snook Kill point (Figure 11.7) found at a location called Rocky Top. Snook Kill points are a Terminal Archaic type that Fogelman (1992:149) bracketed in age between 1850 B.P. and 1470 B.P. The uprooted tree in which Murray had found the point was located in a low lying wetland at the bottom of West Rock's gentle eastern slope.

The point was 78 cm in total length despite missing a portion of its tip. The argillite had weathered gray and the broad flake scars were no longer discernable except in their general outlines. The point was well made and plano-convex in cross-section, so that one side was the flat surface of either a large flake or perhaps a blade that had formed the blank from which the point was manufactured. It had some grinding on the base, and is interpreted as a complete and finished specimen that had formerly been attached to a haft.

Subsequent testing around the fallen tree, in the roots of which the Snook Kill point was found, produced nothing in the way of cultural artifacts. However about 20 meters up a moderate 25% slope, a small lithic scatter was located. The slope overlooked the wetlands where the point was found, and at the bottom of the slope just below these wetlands was a small spring-fed pond. The pond is an example of many freshwater sources located along West Rock's gentle eastern slope. These occur because fissures in the diabase of West Rock Ridge accumulate water and discharge it into springs over much of the year. These freshwater sources were important intercept hunting locations

Figure 11.7: Snook Kill Point



Figure 11.7 Argillite Snook Kill Point from Rocky Top Site.

because: 1) aside from these springs fresh water sources were not frequent along West Rock's gentle eastern slope, at least to the north of the headwaters of Wintergreen Brook, and 2) the springs represented very spatially limited water sources where hunters could wait for game to come and drink.

The Snook Kill point which led to the discovery of the Rocky Top site could not be positively associated with it. The Snook Kill Point was made of gray non-local argillite, while all of the debitage from the Rocky Top site, except for a single chert flake, was quartz. Additionally, no diagnostic artifacts were recovered from the site. The only stone tool was a small fragment of a projectile point base, but the base was too small to classify in terms of its cultural or temporal associations.

Aside from the small white quartz point base the only other artifact of note was a quartzite core. It was a large quartzite flake core that was 18 cm long, 15 cm wide and 9 cm thick. It weighed 2,235 grams. The core was wedge shaped and showed evidence of removals on two sides. The core may have been stockpiled at the site. Because the core was quartzite and the flakes from the site were all quartz, the only exception being a single chert flake, association between the debitage and the core could not be verified. The core was located on the perimeter of the flake scatter defining the Rocky Top site, but because of its different weight and mass from the debitage it may have been affected differentially from down slope erosion. However, no evidence could be found of a site up the slope and above the small lithic scatter which is under discussion here.

A total of 176 debitage was recovered from the Rocky Top site. All of the debitage, except for one chert flake, was white semi-translucent quartz. Additionally all of the artifacts recovered from the site were found within a small grid of 5 one-meter

square excavation units. Information about the relative size and weight of flakes and shatter is given in Table 11.3 below. In Table 11.4 the results of analysis of flake characteristics is presented.

Table 11.3: Size and Weight of Rocky Top Debitage

A. Flakes

Size (cm)	0-1	1-2	2-3	3-4
Number	42	66	20	3
Weight (g(	4.2	23.2	33.3	12.9

B. Shatter

Size (cm)	0-1	1-2	2-3	3-4
Number	9	26	7	3
Weight (g)	1.5	12.0	11.2	20.8

Table 11.4: Flake Attributes for Rocky Top

	Single Faceted Platform	Lipped Platform	Multi-faceted Platform	Flake Scars	Bifacial Thinning Flakes
Number	23	18	2	81	5
Percentage of Flakes	17.6%	13.7%	1.5%	61.8%	3.8%

Small debitage sizes dominate the assemblage from the Rocky Top site. No debitage was larger than 4 cm, and only 6 of a total of 176, or 3.4%, was larger than 3 cm. The size distribution is similar to results from the West Rock Ridge site and the Kietan Lookout sites. At both these sites it had been interpreted that tools had been manufactured utilizing carefully prepared preforms. The skewed distribution of debitage sizes at the Rocky Top site might, therefore, be interpreted to represent a similar conclusion.

Flakes outnumbered shatter 131 to 45 for a ratio of 2.9 to 1. A total of 18 debitage had a cortical surface, which appeared to be from a pebble. The percentage of cortical debitage was therefore 10.2%. However, it must be noted that similar to the West Rock Ridge site, the cortical surfaces on these debitage pieces was consistent with a small pebble, and only a few small pieces of shatter could actually be classified as primary debitage.

Analysis of flake characteristics revealed that 81, or 61.8%, possessed flake scars on their dorsal faces, 23 or 17.6% had single faceted platforms, 18 or 13.7% had lipped platforms, and 2 or 1.5% had multi-faceted platforms. Additionally 5 of the flakes, or 3.8%, were classified as bifacial thinning flakes, and numerous small pressure flakes were noted.

Little can actually be said concerning this small lithic scatter. The broken projectile point base does seem to support a conclusion that the site represented a small task-specific location related to hunting activities, and at least some biface manufacturing did occur. The most important conclusion to be drawn from the site relates to its environmental context. Similar to the Wintergreen Notch, it was located on a 25% slope

and on rocky, talus covered ground. However in this case the existence of a small spring fed pond at the bottom of the slope, leads to an interpretation of the site as a small task-specific location related to hunting activities which likely targeted game animals, probably white-tailed deer, as they approached the water to drink.

The Whaley Site

About a mile and a half north of the Fairhaven Reservoir site, located at the bottom of West Rock's gentle eastern slope, numerous springs and spring fed ponds exist. The Whaley site is a small lithic scatter containing one nearly complete point, one point tip, and 30 lithic debitage. The site is located one hundred meters from a deep spring, but encroaching residential development probably destroyed other springs that were even closer.

The projectile point was a white quartz Sylvan Side-Notched point, which as mentioned previously, is one of several small stemmed and side-notched point types that collectively make up the Late Archaic (6,000 to 3,700 years ago) Small Stemmed Point Tradition in southern New England. The point was almost complete with rubbing present on its base, missing only one of its tangs, and is considered to have been removed from the haft at the end of its use-life. The point tip was a small quartz tip that apparently was damaged during impact.

Of thirty pieces of lithic debitage recovered from the Whaley site 27, or 90%, was quartz, 2 or 7.0% were red jasper, and 1 or 3.0% was a gray hornfels flake. Information

concerning size and weight of lithic debitage is presented in Table 11.5. Analysis of flake attributes is presented in Table 11.6. The majority of debitage was small. None was more than 3 cm long. Flakes outnumbered shatter by a ratio of 4 to 1 (24 flakes and 6 shatter).

Table 11.5: Size and Weight for Whaley Site

Flakes

Size (cm)	0-1	1-2	2-3
Number	7	13	4
Weight (g)	0.8	5.4	8.0

Shatter

Size (cm)	0-1	1-2
Number	1	5
Weight (g)	0.2	2.1

Table 11.6: Flake Attributes for Whaley Site

	Single Faceted Platform	Lipped Platform	Flake Scars on Dorsal Face
Number	8	4	16
Percentage	26.7%	13.3%	53.3%

Once again little can be said concerning an interpretation of the Whaley site. The presence of a projectile point would however support a conclusion that it was a task-specific location related to hunting activities. No obvious bifacial thinning flakes were found and only some small pressure flakes were noted. The environmental context would appear to be the only clue informative of how the site was utilized. Located at the bottom of West Rock's gentle eastern slope, it exists among the densest accumulation of small spring fed ponds that occur anywhere in the project area. The association of both the Whaley and Rocky Top sites with prominent spring fed ponds suggests that both of these sites were positioned in locations where hunters could intercept approaching game animals, probably white-tailed deer.

Discussion

Intercept hunting sites at West Rock Ridge were intimately tied to the unique geological formation history of this prominent feature of South-Central Connecticut's landscape. Rugged ridges with steep cliff faces extending for miles, such as West Rock, can effectively block travel for long distances. However one prominent gap in the ridge, Wintergreen Notch, provided a narrow passage way from one side of the ridge to the other. The gap also represented a narrow opening with trap-rock rising up on either side of it, such that within about 100 feet on either side of the notch the vertical height has risen 100 feet (Dana 1891:34–35). The other two sites, the Rocky Top and Whaley sites,

both appear to be associated with the capability of the trap-rock which composes the ridge to store water and discharge it into springs, some of which appear to flow perennially.

Small Stemmed Point Tradition sites in Southern New England appear for the most part to represent small seasonal campsites and task-specific locations, but occasionally large settlements occur (McBride 1984:260). At least one of these would appear to have existed at the Burwell-Karako site where thousands of Small Stemmed Points were found. Binford (1980:17) concluded that any factors which increase sedentism for hunter-gatherer societies will also increase the degree to which collecting is used as a mobility strategy. In this context logistical sites become a necessary component of the mobility strategy, because sooner or later some critical resource will become depleted adjacent to the habitation relative to the length of time a groups of people remains put. The Wintergreen Notch site may then well represent the type of collecting site used by Small Stemmed Point Tradition cultures in South-Central Connecticut to support those occasional large habitation sites which they occupied.

In terms of intercept hunting sites, all of the data collected during the West Rock Ridge project has now been summarized. The time has come to return to those theoretical perspectives presented in the opening three chapters of this text. The next chapter will look at the issue of settlement pattern by giving a comparative analysis of lithic artifact assemblages recovered during the West Rock Ridge project. This text will conclude with an analysis of the hypotheses presented in chapter two. This hypothesis stated that West Rock Ridge was added to annual subsistence moves by prehistoric populations in South-Central Connecticut only when increasing hunter-gatherer

population density caused an expansion into previously marginal resource patches. This type of alteration in land use patterns is believed to have occurred because more thorough coverage of available territorial ranges became necessary.

Chapter 12

Comparison of Lithic Assemblages from West Rock Ridge Sites

Considering the rather small sample size, the West Rock Ridge sites described in the last four chapters actually exhibit tremendous diversity in terms of a number of factors. In this chapter, variability among West Rock assemblages will be compared/contrasted in order to form an interpretive analysis of the archaeological record present there. In this way a coherent explanation for the site classification which organized the previous four chapters can be given.

The West Rock Ridge project has aimed to do much more than simply identify the archaeological record that was present in one of South-Central Connecticut's most rugged environments. Ultimately, land use patterns of South-Central Connecticut's prehistoric populations must be identified. But first, the role that prehistoric utilization of this ridge played in the larger patterns of settlement and culture for the area's ancestral Native American populations has to be understood.

Table 12.1 and Figure 12.1 present the data which will be discussed in this chapter. Table 12.1 summarizes variability observed among West Rock Ridge sites in terms of 9 distinct measures: 1) percentage of cortical debitage, 2) flake to shatter ratio, 3) cores to biface ratio, 4) number of bipolar cores, 5) number of amorphous flake cores,

6) percentage of flakes which were classified as bifacial thinning flakes, 7) percentage of debitage larger than 3 cm in length, 8) number of distinct tool types/total number of tools (a measure of assemblage richness), and 9) the proportion of the lithic assemblage that was dominated by the most abundant single tool type (a measure of assemblage evenness).

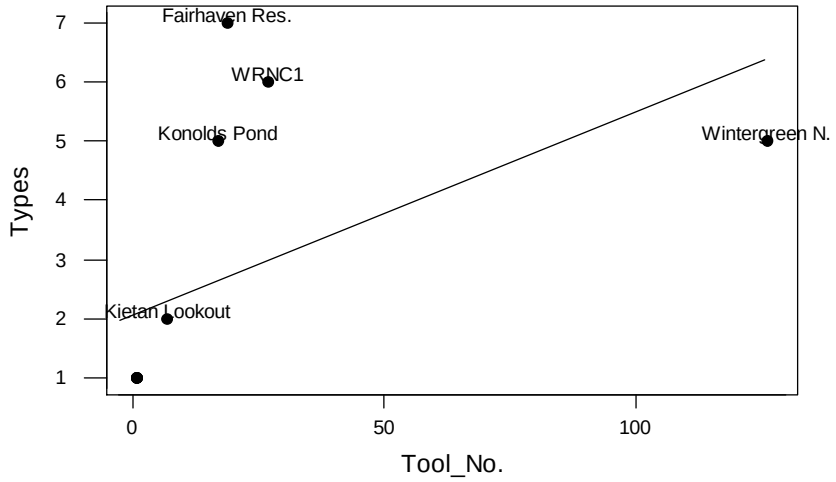
Figure 12.1 is a graphical presentation of relative tool richness for those sites that were excavated during the project. The *x*-axis of the graph gives the total number of tools for each of the sites, and the *y*-axis indicates the total number of distinct tool types. The line which is presented in the graph is completely subjective and should not be taken to represent a strict line of separation between any of the coordinates given. It has only been included in the graph in order to give the reader a visual cue to the reasoning used to interpret assemblage variability in this chapter. Information concerning assemblage richness will be used in conjunction with a measure of assemblage evenness: the proportion of the total stone tool assemblage comprised by the single most dominant tool type. Both of these variables are also presented in quantitative form in Table 12.1. Additionally, Binford's (1980:17–18) concepts of "fine-grained" and "coarse grained" assemblages, as well as his observations concerning the different types of sites he associated with foraging and collecting settlement systems will be useful for interpretation of West Rock's sites.

The first variable used for comparison of West Rock Ridge lithic assemblages was percentage of cortical debitage. Five sites had relatively high indices for this measurement. They were the West Rock Ridge site (22.5%), the West River site

Table 12.1: Comparison of Lithic Assemblages for West Rock

	% of Cortical Debitage	Flake/Shatter Ratio	Ratio of Cores to Bifaces	Bipolar Cores	Amorphous Flake Cores	% of Bifacial Thinning Flakes	> 3 cm Length	Distinct Types/ Total Tools	% of Dom. Type
West Rock Ridge Site	22.5%	3.5:1	-	0	-	14.3%	0	1/1	100%
Blakeslee Quarry Site (Locus A)	2.5%	1:2.7	-	0	-	5.1%	2.3%	1/1	100%
Kietan Lookout Site	1.1%	3:1	0:2	-	-	26.1%	0	2/7	71.4%
Konolds Pond Site	15.8%	1:1.3	4:1	18	2	21.2%	8.0%	5/17	50%
West River Site	21.8%	1:1.3	1:0	1	0	12.7%	5.3%	0	-
Building Brook Site	22.3%	1:5.5	6.5:1	12	1	18.3%	17.4 %	1/1	100%
Fairhaven Reservoir Site	5.6%	2.8:1	1:6	1	0	22.2%	4.4%	7/19	31.6%
West Rock Nature Center Site	-		-			-	2.6%	6/27	44.4%
Wintergreen Notch Site	20.0% ±2.2%	1.9:1	1:3.5	2	2	15.1% ±1.1%	2.0%	5/126	71.8%
Whaley Site	0	4:1	-	0	-	0	0	1/1	100%
Rocky Top Site	10.2%	2.9:1	1:0	0	1	3.8%	3.4%	1/1	100%

Figure 12.1: Comparison of Assemblage Richness



(21.8%), the Building Brook Farm site (22.3%), the Wintergreen Notch site (20.0%±2.2%), and the Konolds Pond site (15.8%). High percentages of cortical debitage should indicate early stages of lithic reduction because the cortex covers a pebble's exterior and therefore needs to be removed before further processing can take place. However, other factors such as the size of the pebble being processed can also influence the percentage of cortical debitage (see chapter three). More importantly, at lithic procurement sites from West Rock, early stages of lithic reduction occurred in association with middle and later stages, because bifaces were manufactured right at quarry sites. This later factor tends to produce a mixed signal making measurements such as percentage of cortex, flake to shatter ratio, or debitage size more difficult to interpret.

The high percentage of cortical debitage at the West Rock Ridge site can be explained by the introduction into the site of a tool preform manufactured from a small pebble. Despite the fact that an attempt was made to excavate the entire site only 18 pieces of lithic debitage were recovered, and cortical surfaces represented only a small portion on the ventral faces of those flakes upon which it was found.

As described in chapter eleven, the high percentage of cortical debitage present at the Wintergreen Notch site, is considered to be a factor of the kinds of cores and tool preforms used to manufacture tools at the site. Highly polished and rounded cortical surfaces on 20% of the debitage, and on one third of the tools, indicated that beach pebbles had served exclusively as the raw material source for lithic production at the site. Ritchie (1981:97–100) described lithic reduction trajectories for quartz pebbles in which tools are produced with cortex retained on their bases. Similar reduction strategies may have produced cores and tool preforms at the Wintergreen Notch site having a significant amount of cortex. The remaining sites listed above: the Building Brook Farm site, the West River site and the Konolds Pond site, all were interpreted as quarry or lithic procurement sites.

The flake to shatter ratio was also considered to be a useful indicator for early stages of lithic processing because, due to the unpredictable fracture characteristics of quartz, numerous large pieces of shatter should occur in early stages of cobble reduction (Boudreau 1981:18). This means that a low ratio of flakes to shatter will be associated with early processing stages for quartz cobbles. In fact, a low flake to shatter ratio was present at all of the quarry and lithic procurement sites identified during the West Rock Ridge project: 1:1.3 for both the Konolds Pond and West River sites, and 1:5.5 for the

Building Brook Farm site. Only one other site had a comparably low ratio of flakes to shatter, and that was the West Rock Ridge site with 1 flake to every 2.7 pieces of shatter. However the sample from this latter site was somewhat difficult to interpret because it had been collected from a remnant of soil clinging to the summit of West Rock's cliff face.

Another important indicator of early stages of lithic reduction for West Rock Ridge sites was the core to biface ratio. All of those sites interpreted as quarry and lithic procurement sites had a large number of cores relative to bifaces: 6.5:1 for the Building Brook Farm site, 4:1 for the Konolds Pond site, and 1:0 for the West River site.

Parry and Kelly (1987:290) used the ratio of flake cores to bifaces as a measure of the importance of bifacial production in the organization of prehistoric lithic technology. However, since Boudreau (1981:26) and Ritchie (1981:108–110) both state that suitable pieces of shatter produced by bipolar smashing of quartz cobbles were used in the manufacture of bifacial projectile points, a simple core to biface ratio was used in this analysis. This core to biface ratio includes both bipolar and amorphous flake cores, which were the only definitive types of cores recovered during the project.

Bipolar cores outnumbered amorphous flake cores by a frequency of 34 to 6. At quarry and lithic procurement sites, pebbles and nodules would appear to have been initially split open using a bipolar technique. Large quartz cobble fragments produced in this way were found at the Konolds Pond site, and similar fragments of chert nodules came from the Building Brook Farm site. These large fragments, in association with abundant unaltered quartz cobbles and chert nodules respectively, represented fairly

conclusive evidence that testing and initial processing of lithic raw material had targeted cobbles and nodules found directly on the surface of the ground at these two sites.

The core to biface ratio also gives some indication of the form in which lithic raw material was introduced into sites. Low core to biface ratios appear to be associated with sites where lithic raw material was brought in as tool preforms or flake blanks. An example would be the Kietan Lookout site where an attempt was made to excavate the site completely. In this case 2 bifaces were found at the site as well as numerous bifacial thinning flakes, but no cores and very little in the way of medium or large debitage occurred. I would argue that lithic raw material had to have been introduced into the site as bifacial preforms in order to produce this kind of artifact assemblage.

The Fairhaven Reservoir site with a core to biface ratio of 1:6 is an example of a site where bifaces and bifacial thinning flakes were numerous, but the only core found was obviously used only for the production of expedient tools. In this case flake blanks from several different local lithic raw material sources, including quartz, basalt and chert, probably were transported into the site where they could be manufactured into tools. The Wintergreen Notch site may serve as another example with a core to biface ratio of 1:3.5. At this site, one of the cores found was brown chert, but none of the tools were, and two of the cores may have been used in the production of expedient tools for butchering purposes. Yet, tool production was fairly extensive at the site, and this factor may indicate that some of the lithic raw material used at the site was brought to it in the form of flake blanks or tool preforms.

Interestingly, bifacial thinning flakes were found in good proportions at all of the West Rock Ridge sites with only a few exceptions. The exceptions were the Rocky Top,

Blakeslee Quarry and Whaley sites with 3.8%, 5.1% and 0 respectively. All of these sites represented small lithic scatters, and may be indicative of the fact that basic tool maintenance was at least as important an activity at these sites as was manufacturing bifaces.

The high percentage of bifacial thinning flakes also demonstrates that bifacial manufacturing was a very important activity to the Small Stemmed Point Tradition societies that produced these sites, and despite a dominance of bipolar and amorphous flake cores, these mobile societies appear to have organized their technology around the staged manufacture of bifaces. For instance, quarry and lithic procurement sites appear to be locations where lithic raw material was initially processed but, also where bifaces were manufactured. Cores do not appear to be abundant at camp sites. Instead, tool manufacturing proceeded using either preforms or flake blanks. Additionally, carefully prepared bifacial preforms seem to have been carried as personal gear in order to manufacture replacement projectile points at task-specific locations.

Another indicator of the importance of bifaces to Small Stemmed Point Tradition societies may possibly be the utilization of local brown chert using a bifacial core technology. Although this can not be verified, those bifaces found at the Building Brook Farm site may well have represented failed attempts to manufacture bifacial cores that would have been used as a source of flakes at other sites. The presence of many bifacial thinning flakes of local brown chert at Small Stemmed Point Tradition sites, both large and small, but the dearth of formal tools, may indicate this type of utilization.

Figure 12.1 above is a graphical presentation of assemblage richness for West Rock Ridge sites. Assemblage richness can be defined as the number of tool types in a

lithic assemblage relative to the total number of tools. The type of graphical presentation given below is the best way to visualize this data. The information used in the following discussion is also found in the last two columns of Table 12.1. The *x*-axis on the graph below defines the total number of lithic tools found at these sites, while the *y*-axis defines the total number of distinct tool types identified. The sites are labeled except for those in the far lower left hand corner of the graph, all of which have one tool and of course one distinct tool type. These later sites included the Whaley, Rocky Top, West Rock Ridge, Blakeslee Quarry and Building Brook Farm sites.

The line drawn in Figure 12.1 is simply included for explanatory purposes and should not be considered to represent a formal line of division among these sites. The concept of assemblage richness tries to capture how diversified any particular assemblage of stone tools is (Odell 2004:111–112). In the graph those sites in the upper left hand portion of the graph have a large number of distinct tool types relative to the total number of tools found in their assemblages. The two uppermost sites, the Fairhaven Reservoir and West Rock Ridge Nature Center 1 sites, were both interpreted as seasonal camps. Those sites below the line drawn from lower left to upper right on the graph were all interpreted as task-specific locations, except for the Building Brook Farm site which is considered to be a quarry or lithic procurement site.

The one anomaly appears to the Konolds Pond site, which is a quarry or lithic procurement site but which is above the line. However, the five distinct tool types displayed in the graph also came from a separate locus in the southeastern portion of the Konolds Pond site that appears to represent a small seasonal camp, distinct from other

widespread lithic procurement activities. The information presented on the graph would appear to support this conclusion.

The logic behind these interpretations is that habitation sites are locations where a number of distinct tool types should be present, because a fairly wide variety of tasks will be performed in these domestic settings. Task-specific locations, on the other hand, represent locations where resources were acquired and/or processed, while individuals were away from the campsite during daily foraging activities. Only those specific tools used in acquisition and/or processing of those specifically targeted resources will be found at task-specific locations. This means that a wide variety of tool types relative to overall tool frequencies would not be expected.

One more very important distinction is evident in Figure 12.1. The Wintergreen Notch site in the right hand portion of the graph displays a coordinate signaling a large total number of tools, but considering the number of tools recovered assemblage richness is actually fairly low. The other factor aiding in the interpretation of the Wintergreen Notch site is a measure of assemblage evenness, which is an indicator of how evenly dispersed artifact types are within an assemblage (Odell 2004:112–113).

From Table 12.1 the Wintergreen Notch site had the largest proportion of its assemblage composed of the most dominant tool type, in this case projectile points, making up 71.8% of all the tools recovered. According to Binford (1980:10), collectors utilize logistical sites where specialized groups target those specific resources not adjacent to habitation sites in order to provide not only for themselves, but also those waiting back at the camp. These sites can produce large accumulations of artifacts, but with highly uneven assemblages where only those tool types involved in

acquisition/processing of those specific targeted resources are found. A very large assemblage of projectile points, including numerous tip fragments displaying evidence of impact damage, would strongly suggest that the Wintergreen Notch site is a logistically organized task-specific location targeting hunted resources, most likely white-tailed deer.

One more factor has to be considered in the interpretation of seasonal campsites from West Rock Ridge. This would be Binford's (1980:17-18) concepts of "coarse" or "fine-grained" assemblages. According to Binford (1980:17), the factor at play here is the length of time that a site was occupied. The longer a habitation is occupied the more blurring will exist among distinct activity areas (coarse grained), while short term occupations will more likely possess distinct activity areas. The later of these possibilities indicating a fine grained assemblage would be the best description of the Fairhaven Reservoir site where three distinct activity areas were evidenced beneath the plow zone. The same is probably true for the West Rock Nature Center 1 site in which Parsons (2004:55–56) reported at least one distinct activity area was discernable.

Using Binford's (1980:18) logic that collecting base camps should be occupied for relatively longer periods of time than foraging seasonal campsites (due to the use of logistical exploitation of resources not available adjacent to habitations in the former case) one would suspect that both of the habitations at West Rock Ridge, the Fairhaven Reservoir and West Rock Nature Center 1 site, were seasonal campsites produced by foragers due to the fact that they seem to represent fairly short term occupations.

West Rock Ridge and Prehistoric Settlement Patterns in South-Central Connecticut

In chapter seven, available information concerning South-Central Connecticut's archaeological record was presented. Data collected from the West Rock Ridge project adds to this knowledge, especially where the Small Stemmed Point Tradition is concerned. As described in chapter seven, a total of 26 Small Stemmed Point Tradition components were identified in the State files for South-Central Connecticut, representing 31.0% of all components in this region. Yet despite this abundance of components, little else could be said concerning Small Stemmed Point Tradition settlement patterns, relative to other cultural and temporal affiliations, aside from two observations: 1) occupation was less focused on the coast than was the case for Woodland Period sites, and 2) there seemed to be somewhat better representation in upland environments than for other cultural or temporal affiliations.

Data recovered from West Rock Ridge adds a perspective concerning Small Stemmed Point Tradition settlement patterns in Southern New England that was not visible from study of site locations reported in the State files for Connecticut. When it comes to environmental types like West Rock, Small Stemmed Point Tradition components dominate almost to the exclusion of other temporal or cultural affiliations.

McBride (1984:265) observed that Small Stemmed Point Tradition settlement patterns in the lower Connecticut River Valley included numerous seasonal encampments in a variety of environmental settings, including uplands, although the majority of these

camps occurred in the river valleys. Additionally, McBride (1984:266–267) reported numerous task-specific locations exploited from these campsites. Supplementing this information for South-Central Connecticut, an observation can be made that several large habitation sites existed along the New Haven coastline, including the Waterfront, Cove River and Burwell-Karako sites.

The West Rock Ridge project was able to expand the knowledge base concerning Small Stemmed Point Tradition settlement patterns in South-Central Connecticut. Evidence of lithic procurement sites along a broad and extensive terrace banked against West Rock's cliff face was found for Small Stemmed Point Tradition cultures. Judging from the extent of the area that was quarried for quartz nodules and pebbles, and the depth of those deposits uncovered at two of these sites (the Konolds Pond and West River sites), it would appear that this terrace represented a significant source of quartz raw material during the Late Archaic Period (6,000 to 3,700 B.P.). Exploitation of these quartz deposits occurred by direct access and probably was embedded in other resource extraction activities along the environmentally diverse and rich West River Valley.

In addition a third lithic procurement site, this one concentrating on locally acquired chert and named the Building Brook Farm site, was discovered during the project. Chert sources originating in Connecticut bedrock are not well known for the State and so this discovery was of great significance during the project. Although no diagnostic artifacts revealing temporal or cultural affiliation were found at the Building Brook Farm site, two broken bifaces that had apparently been quite large were found. This evidence and the finding of numerous large and small bifacial thinning flakes from this raw material source at Small Stemmed Point Tradition sites from West Rock Ridge,

suggests that large bifaces were used as cores by these peoples for the production of sharp flake tools.

The discovery of small seasonal campsites along upland streams having their headwaters at West Rock Ridge would support McBride's (1984:262) observation that Small Stemmed Point Tradition seasonal camps occurred in a variety of environmental zones, including uplands. At least two of these camp sites, the Fairhaven Reservoir and West Rock Nature Center 1 site, appear to have represented a similar theme. These camps were located in rich environmental zones adjacent to riverine, wetland and forest resources; and one of the major activities at both of these sites appears to have been repairing of tool kits using lithic raw materials from sources exploited at West Rock Ridge. These sites may have represented seasonally planned stops in an ecologically diverse setting that coincided with a need to acquire tool stone and replenish tool kits. This type of site could have been utilized in anticipation of the need to make forays into environments where lithic raw material would be less abundant, or alternately, just before winter snows fell and lithic resources might be more difficult to locate.

Another interesting utilization of West Rock Ridge by Small Stemmed Point Tradition cultures was for observation points, or lookout sites, located all along the summit of West Rock and adjacent to its western cliff face. The Kietan Lookout, West Rock Ridge, and Blakeslee Quarry sites all represented task-specific locations where prehistoric hunters appear to have repaired broken tool kits, at times using carefully prepared tool preforms, while scanning the West River Valley below for game animals. Although three fairly distinct sites were located in this environment, a continuous distribution of artifacts was evident all along West Rock's summit. This observation

indicates that the archaeological record present adjacent to this cliff edge is the result of people revisiting the general location on day to day excursions, over a very long period of time.

The Wintergreen Notch site represents perhaps the most distinctive of West Rock's sites. It appears to have been a task-specific location produced by a specialized group of hunters who apparently waited in ambush for white-tailed deer either passing through, or alternately driven by means of some type of coaxing. The site fits perfectly the definition provided by Binford (1980:10) for task-specific locations produced by peoples using a collecting mobility strategy in order to procure an abundance of resources not only for themselves but also for others waiting at the main habitation site, and also for storage and later consumption. Considering that the site is associated with a very large Small Stemmed Point Tradition component of the Late Archaic, and that it may well represent a game drive, it represents a unique discovery in the State of Connecticut.

I would side with Snow's (1980:132) argument however, that archaeologists more often discover the result of long term processes than unique events, or "firsts" in the archaeological record. If the Wintergreen Notch site represents a logistical hunting location for provisioning a larger population waiting at a habitation site, then lithic raw material at the site would indicate that this would represent a habitation along the coastline because beach pebbles appear to have represented the lithic raw material source utilized at the site. As mentioned in chapter seven, several large Small Stemmed Point Tradition sites have been reported along New Haven's coastline. These sites include the Watertown, Burwell-Karako and Cove River sites. These sites would appear to have

been seasonal habitations, but they probably were somewhat more sedentary than many Small Stemmed Point Tradition encampments in South-Central Connecticut.

According to Binford (1980:17) any factor increasing the degree of sedentism for prehistoric hunter-gatherers would also have increased the logistical, or collecting, component of its mobility strategy. Occasional large habitation sites are well known for the Small Stemmed Point Tradition (Ritchie 1968:36–79; McBride 1984:260; Snow 1980:230). It makes sense that when seasonally abundant resources were available at certain locations, such as would be the case for coastal shell middens or migratory fishing sites, that habitations would be occupied over longer periods of time, and incongruence would become more likely in terms of at least some critical resources. At these times it should be no surprise that Small Stemmed Point Tradition peoples used a logistical component in their mobility strategies. Sites such as fish weirs (Snow 1980:229), which appear to be associated with the Small Stemmed Point Tradition, may be another form of these types of logistical sites.

Because no formal archaeological survey focusing on Connecticut's trap-rock ridges has been reported until this time, the information from the West Rock Ridge project adds to knowledge concerning overall prehistoric settlement patterns in the State. The next, and concluding, chapter of this text will take up those issues presented in chapter two. A hypothesis was stated at the outset of this project that West Rock was added to prehistoric subsistence in South-Central Connecticut only due to mobility constraints imposed by increasing hunter-gatherer population density. Using measuring tools identified in chapter three this hypothesis will be tested in a very general way. Because this hypothesis was only considered a starting point for understanding utilization

of West Rock Ridge on the part of local prehistoric societies, revision of this hypothesis will also be a topic discussed in the next chapter. Finally new directions for future research will be presented.

Chapter 13

Conclusions

The major hypothesis of this research is that because of increasing population density and territorial packing of local subsistence units, the Late Archaic Small Stemmed Point Tradition in Southern New England represented an adaptation stressing intensive utilization of all the various parts of their local landscapes. This adaptation included not only the usage of the different environmental zones which were available to them, but also gaining knowledge of these various landscape types in order to utilize them most efficiently.

It is within this context that data collected from West Rock Ridge are considered most useful for explaining processes of cultural adaptation and change in South-Central Connecticut. Diagnostic artifacts and components of the Small Stemmed Point Tradition completely dominated the archaeological record of West Rock Ridge. Of a total 69 diagnostic projectile points recovered during excavation at West Rock Ridge sites, 67 of these, or 97.1% were diagnostic projectile points of the Small Stemmed Point Tradition. These included types identified as Wading River (Ritchie 1971:131), Sylvan Side-Notched (Funk 1976), Squibnocket Triangles (Ritchie 1971:127) and Beekman Triangles (Ritchie 1971:121). The only other two point types identified were a Late Woodland

Levanna Triangle (Ritchie 1971:31–32) and a probable Terminal Archaic Wayland Notched point (Fogelman 1992:143).

A total of eight cultural components were identified from West Rock Ridge excavations. All of these components were identified as belonging to the Small Stemmed Point Tradition. At the Kietan Lookout site a single Levanna point had been found in a context where it was clearly positioned stratigraphically above a Small Stemmed Point Tradition component. The point is considered an isolated find and is not therefore interpreted to represent a complete Late Woodland component at the site.

Another apparently isolated point find occurred at the Wintergreen Notch site, in this case a single Wayland Notched point. However as discussed in chapter eleven, the vast majority of artifacts found at this site were clearly associated with a quartz beach cobble reduction industry that apparently belonged to the Small Stemmed Point Tradition, as evidenced by a significant proportion of both lithic tools and debitage possessing a remnant of cortex from a wave smoothed beach pebble. The discovery of a single Wayland Notched point at the Wintergreen Notch site in this context is not therefore considered to be sufficient evidence to suggest that a complete Terminal Archaic component was present.

The research at West Rock Ridge is especially informative because it establishes a fairly clear pattern of landscape utilization which is unique for the Small Stemmed Point Tradition in South-Central Connecticut. This observation is perhaps best expressed when comparing data from the West Rock Ridge survey with information contained within the site files for the State of Connecticut.

Analysis of information concerning the frequency of cultural components in South-Central Connecticut indicated that of 84 cultural components present, 26 or 31.0% belonged to the Late Archaic Small Stemmed Point Tradition. However, when comparing the distribution of Small Stemmed Point Tradition components with other cultural/temporal traditions, very little else can be said aside from perhaps the observation that these components were somewhat more frequent in upland environments. In other words, information concerning the distribution of Small Stemmed Point Tradition components across the landscape in South-Central Connecticut and the comparison of these site locations with other cultural/temporal affiliations does not appear to represent an overly productive exercise for understanding unique aspects of landscape utilization on the part of this tradition.

The research at West Rock Ridge is at least potentially important for understanding unique aspects of landscape utilization on the part of the Small Stemmed Point Tradition because the dominance of artifacts and components of this tradition is quite pronounced in this setting. As stated above 97.1% of all diagnostic projectile points as well as all eight of the verifiable cultural components present would indicate a significant bias in terms of the Small Stemmed Point Tradition in data recovered from survey at West Rock Ridge.

The steep slopes, rocky, uneven topography, and unique floral and faunal communities which characterize West Rock Ridge set it apart in terms of representing a truly unique environmental habitat within South-Central Connecticut. For these reasons it is considered important to understand how this bias, in terms of utilization of the trap-

rock ridges, can be explained by processes of cultural change and adaptation on the part of the Small Stemmed Point Tradition.

The rest of this chapter will therefore focus on the following question, "How were data from West Rock Ridge utilized to test a hypothesis that the Small Stemmed Point Tradition occupation of this area occurred in a context of increased population density and territorial packing?" Additionally, different adaptations to increasing population density and territorial packing on the part of hunter-gatherers will be discussed, as well as the landscape signatures which these different adaptations would create. Finally, directions for future research will be explored, including a discussion of how the West Rock Ridge project can contribute to an understanding of the utilization of patch selection models in the archaeological investigation of prehistoric hunter-gatherer societies.

Hypothesis Testing

In chapter one, the concept of "upland archaeology" was introduced. Much of the inspiration for performing the West Rock Ridge project came from comments on the part of Barber (1981:116), who describing his own archaeological experiences in Virginia's Blue Ridge Province, asserted that one of the inevitable problems faced in this type of research is that data are new but the available methods of data recovery and analysis are old. An attempt was made during the West Rock Ridge project to incorporate a somewhat novel perspective, by looking at how changing patterns of land-use on the part

of local prehistoric populations were implicated in variability with respect to the archaeological record present.

West Rock Ridge is one of Connecticut's largest trap-rock ridges. In general these ridges owe their presence to the unique geological formation processes responsible for the evolution of Connecticut's Central Valley. As such they have been the focus of geological and ecological study for generations. However, until now no formal archaeological survey focusing completely on this unique setting had been conducted.

In order to understand the kinds of changing land-use patterns which would have made West Rock attractive at some times in Connecticut prehistory (but perhaps less so in others) a general model of hunter gather land-use patterns was formulated using Binford's (2001) theoretical perspectives. In this model it is considered that thorough coverage of available subsistence ranges would be most likely to occur under conditions of increased hunter-gatherer population density. The effect of high population density on mobile hunter-gatherer societies can be two-fold: 1) larger subsistence units will more quickly exhaust resources adjacent to their habitation sites, and therefore will require more residential moves per year relative to small group sizes, and 2) due to an upper limit for effective group size, increasing levels of population density will lead to splintering of larger groups who will eventually pack regional territories and cause circumscription of available territorial ranges.

Under these conditions, hunter-gatherers can be expected to incorporate previously unused parts of their environments into their subsistence pursuits. Given an initial hypothesis that West Rock was marginal to prehistoric inhabitants of South-

Central Connecticut, it was anticipated that the factors described above would best predict its inclusion in hunter-gatherer movements.

However, according to Binford (2001), the stress which increasing population density places on mobility pursuits must eventually lead to a reorganization of the hunter-gatherer subsistence base in a direction whereby more and more people can subsist even while depending on smaller and smaller available territorial ranges. This reorganization essentially represents Binford's (2001:210) definition of intensification. Although the particular mix of resources available in any local environment will influence the trajectory taken, it can generally be stated that because mobility is important for pursuing and capturing game, that interest in large game animals will decrease as populations become more sedentary. At the same time, the development of new techniques and strategies allowing for maximal production of aquatic and/or vegetative resources adjacent to habitations, accompanied by a decrease in residential mobility, will become advantageous. Also, any factor which promotes reduced residential mobility should increase the need for storage, as well as promoting logistical exploitation of resources not available adjacent to habitations, or what Binford (1980:17) refers to as a collecting mobility strategy.

In terms of hunter-gatherer land-use patterns, it is expected that this later type of subsistence reorganization (Binford:2001) will lead to less thorough coverage of available territorial ranges. Less thorough coverage of available territories in turn is considered to be a product of logistical resource procurement by specially organized task groups, who camp sometimes at great distances from habitations and target those specific resources not available adjacent to habitations. This strategy solves the problem of

incongruent distribution of critical resources, where no amount of moves can locate the habitation in close proximity to all of those resources required by the residential group.

Because collectors rely on storage, and because these special task groups are attempting to acquire resources in enough bulk to feed not only themselves but also those waiting at the habitation, they are expected to be highly selective in terms of the resource patches which they target. In other words, in logistically organized settlement strategies, specialists are probably more likely to range over a fairly wide area and only target those localities which represent optimal patches for bulk accumulation of essential resources.

The degree to which hunter-gatherers maximally cover their available territorial ranges is therefore predicted to be positively correlated with increasing population density and high residential mobility, and negatively correlated with cultural processes of intensification which allow for more sedentary living and logistical resource exploitation. Given these observations concerning hunter-gatherer land-use patterns and some general knowledge of geological and ecological characteristics of Connecticut's South-Central Lowlands, such as the availability of widespread and abundant quartz, five predictions were made concerning reasons why West Rock Ridge should be of most interest to local prehistoric populations: 1) high residential mobility, 2) distinct sense of territoriality, 3) utilization of a foraging mobility strategy, 4) utilization of an expedient core technology, and 5) dependence to at least a significant degree on hunted resources.

Using data collected from survey these five predictions will be tested below in terms of how characteristic they are of the Small Stemmed Point Tradition, whose diagnostic artifacts and cultural components dominated the archaeological record from West Rock Ridge.

High Residential Mobility

In a context where thorough landscape coverage is predicted, high residential mobility should be associated with increased hunter-gatherer population density. It will be necessary to discuss the issues of population density and mobility together, because the archaeological interpretation of both these variables relies to some extent on frequency of cultural components and/or availability of radiocarbon dates within specifically defined time spans. It is also important to note at the outset of this discussion that there are at least two important aspects to mobility: the frequency of moves, and the average distance of moves. As modeled here, Small Stemmed Point Tradition mobility is predicted to represent frequent seasonal moves, but due to territorial packing these moves are not considered to have involved great distances.

Reeves and Forgacs (1999:32) reviewed some of the problems inherent in making direct analogies between radiocarbon date frequency and population density. The major problem is that cultural factors can cause the creation of relatively more datable features, without necessarily implying that more people were present. These factors can represent issues such as sedentary living in which numerous storage facilities, cooking hearths, or trash disposal pits can be found at semi-permanent horticultural villages. Other factors which can influence the component frequency of different temporal or cultural affiliations would include: 1) differential destruction of sites by geological processes such as aggrading river channels, or rising sea levels, and 2) the destruction of datable charcoal with age such that very old sites may be somewhat under represented.

The high frequency of both cultural components and dated radiocarbon features for the Small Stemmed Point Tradition, relative to other temporal or cultural affiliations, is well documented for Connecticut. Cassedy (2007:29) reported results from the Iroquois Gas Pipeline Cultural Resource Management (CRM) project, that 60% of all projectile points found in the Housatonic River drainage of western Connecticut were diagnostic projectile points of the Small Stemmed Point Tradition. McBride and Dewar (1981:46) also noted that site frequencies were higher for the Small Stemmed Point Tradition than any other cultural or temporal affiliation from their survey of the Lower Connecticut River Valley; and Wadleigh (1981:81-82) reported 32 Late Archaic components in his survey of Connecticut's Northeastern Highlands, while only 18 Woodland components were identified. Wadleigh (1981) combined Small Stemmed Point, Laurentian, and Susquehanna Tradition components into a generalized Late Archaic category, due to small sample size. However, he did report that 22 of these 32 Late Archaic components did indeed belong to the Small Stemmed Point Tradition.

Reeves and Forgacs (1999:19) observed that a spike in the frequency of Connecticut radiocarbon dates occurred during a time span measuring from the latter portion of the Late Archaic to the first one hundred years of the Terminal Archaic. This included those years between 4,800 B.P. and 3,600 B.P. More recently, Cassedy (2007:21,Figure 3) added a series of assays from the Iroquois Gas Pipeline CRM project from which more radiocarbon dates fell between 4,000 to 3,500 B.P. than any other 500 year span. This interval covers the end of the Late Archaic and the beginning of the Terminal Archaic.

Some disagreement exists concerning the temporal bracketing of the Small Stemmed Point Tradition. According to Lavin (1984), the Small Stemmed Point Tradition begins about 4,500 B.P. and continues to the Terminal Archaic and beyond. McBride (1984:56) brackets the Small Stemmed Point Tradition between 4,200 B.P. and 2,900 B.P. in the lower Connecticut River Valley. Pfeiffer (1984:85) places the beginning and ending dates for the Small Stemmed Point Tradition between 4,250 and 3,300 B.P. As mentioned in chapter seven, the radiocarbon data base for Connecticut (Reeves and Forgacs 1999) indicates that the earliest date associated with a Small Stemmed Point Tradition component was 4610±80 B.P., and the most recent available date is 2350±125 B.P. Although Small Stemmed Point Tradition sites are known to extend beyond the Late Archaic as it is defined here (6,000 to 3,700 B.P.) for the most part this cultural tradition is considered a Late Archaic manifestation.

Data from archaeological survey, as well as the available radiocarbon database for Connecticut therefore indicate that Small Stemmed Point Tradition components of the Late Archaic are relatively more frequent than other cultural/temporal traditions in Connecticut. Because no obvious sources of bias can be identified, these data can reasonably be interpreted to mean that population density was at least relatively high for this cultural tradition during the Late Archaic Period.

The question remains, however, of how to interpret this data in terms of hunter-gatherer mobility patterns. Fortunately, McBride and Dewar (1981:47) approach this question directly by observing the relation between component frequency and site size. They note that while component frequency peaks during the Late Archaic and subsequently decreases thereafter, site size reveals a reverse pattern increasing from the

Late Archaic to the Late Woodland. Their conclusion is that population may actually have remained stable, despite the decreasing numbers of reported sites; and what actually might be changing is that peoples were becoming more sedentary and more aggregated through time. One can infer by analogy that the highest residential mobility occurred during the Late Archaic, at which time the Small Stemmed Point Tradition dominated. In other words, McBride and Dewar (1981) observed, in the Lower Connecticut River Valley the majority of Small Stemmed Point Tradition components represent fairly small and temporary seasonal encampments, indicating relatively high residential mobility compared to subsequent cultural developments.

McBride (1984) also performed research that is pertinent to the question of Small Stemmed Point Tradition mobility patterns in the Lower Connecticut River Valley. He interpreted the Small Stemmed Point Tradition sites in this area as representing a foraging mobility system, indicating that seasonal campsites were moved frequently and that the only other site types that were part of their settlement system were task-specific locations, where resources had been acquired on daily forays from the campsite (1984:370).

What settlement data are available from West Rock Ridge would agree generally with McBride's (1984) conclusions, except for the Wintergreen Notch site, the interpretation of which indicates that Small Stemmed Point Tradition cultures in South-Central Connecticut at least occasionally used logistical hunting sites. Detailed descriptions of West Rock Ridge site types will be given below in the section covering foraging and collecting mobility strategies.

Ritchie and Funk (1973:338–339) report that although two large Lamoka Phase sites are noted in upstate New York, that most sites of this cultural manifestation are small temporary camps associated with both small and large streams, as well as lakes and marshes. Ritchie and Funk (1971:341–342) also indicated that temporary seasonal campsites dominated in Sylvan Lake Complex settlement patterns, which in this case included Wading River and Squibnocket components. All of these would be considered part of the Small Stemmed Point Tradition as defined here.

Archaeological researchers who have performed synthesis of available data from Connecticut and Southern New England all agree with an interpretation that Small Stemmed Point Tradition cultures were highly residentially mobile. For instance according to Dincauze (1975:25), this tradition represented a relatively dense population who practiced a complex pattern of seasonal moves in Southern New England. According to Snow (1980:230), the frequency and distribution of Small Stemmed Point Tradition sites in this same area indicates that a number of seasonal moves were performed. McBride (1984:262) described Small Stemmed Point Tradition mobility patterns for the lower Connecticut River Valley in the following way:

> The available evidence on site distribution, size, and type point to highly mobile groups seasonally exploiting a variety of ecozones and microenvironments.

The only seasonal data reported by McBride (1984:263) was from the Woodchuck Knoll site, which appears to represent an example of the kind of multi-seasonal occupation occasionally associated with the Small Stemmed Point Tradition,

and which was inhabited during the summer and fall. It was the only site of this kind reported from the lower Connecticut River Valley, from a sample that included 45 other smaller seasonal campsites and task-specific locations attributable to this same tradition.

From the available evidence which can be used to assess the degree of residential mobility characteristic of the Small Stemmed Point Tradition in South-Central Connecticut, it generally can be assumed therefore that they fit the first prediction of the hypothesis which is being considered here: that is they would appear to have represented highly residentially mobile people.

Discrete Sense of Territoriality

Because of the constraints that large group size places on hunter-gatherer subsistence units, larger groups should demonstrate a tendency to fissure and splinter off as hunter-gatherer population density increases. An inference that can be made concerning this generalization is that packing of these subsistence units within a regional territory would lead to exploitation of somewhat circumscribed ranges, and so I would argue that this later condition would be an important predictor concerning the degree to which local populations thoroughly cover their available landscapes during subsistence pursuits.

In chapter three (methodology) it was suggested that a reasonable approach to identifying territoriality, in the sense that it is used here, would be to analyze the types of lithic raw materials utilized by those prehistoric cultures who left archaeological material

at West Rock Ridge. The logic for using this type of analysis is that hunter-gatherers who receive the majority of their exotic lithic raw material from simple down-the-line exchange (that is to say that one local group exchanges goods with its immediate neighbors) should receive very little from distant sources under conditions of regional packing, because the majority of goods will already be absorbed as they pass through numerous intervening populations. This situation would seem to be applicable to South-Central Connecticut where high quality lithic sources exist at some distance, mostly in New York's Hudson River Valley, and where the only lithic resources present in enough abundance to fulfill every day tool stone needs would be locally available and abundant quartz.

Table 13.1 lists the frequency for different types of lithic raw materials utilized by Small Stemmed Point Tradition peoples at West Rock Ridge. The lithic raw material types identified in this table are: 1) quartz, 2) chert, 3) basalt, 4) hornfels, 5) quartzite, and 6) jasper. Only some of the chert and all of the jasper, among these sources, represents material that is exotic to West Rock Ridge and its surroundings.

Table 13.1 includes percentages of lithic raw material for all of the debitage collections from West Rock Ridge sites. Tools recovered from these sites closely reflect those trends observable for debitage. It is obvious from this analysis that local quartz dominates at all of the sites where Small Stemmed Point Tradition components were found. However, it is noted that quartz from the Wintergreen Notch site apparently came from a beach, which indicates that it was transported at least three miles.

The only site where quartz was less than 90% of the assemblage was the

Table 13.1: Raw Material Usage at West Rock

Site	Quartz	Chert	Basalt	Hornfels	Quartzite	Jasper
Wintergreen Notch	13,588 97%	372 2.6%	-	-	37 0.3%	-
Blakeslee Quarry East	257 94.5%	14 5.1%	-	-	-	-
Blakeslee Quarry West	165 99.4%	1 0.6%	-	-	-	-
Kietan Lookout	92 100%	-	-	-	-	-
Konolds Pond	6,353 99.2%	31 0.5%	20 0.3%	-	-	-
Fairhaven Reservoir	993 63.7%	455 29.2%	106 6.8%	2 0.1%	2 0.1%	2 0.1%
West Rock* Nature Cent.	98.7%	0.3%	0.2%	-	0.8%	-
West Rock Ridge Site	18 100%	-	-	-	-	-
Whalley Site	27 90%	-	-	1 3.0%	-	2 7.0%

* Only percentages available from West Rock Nature Center.

Fairhaven Reservoir site. Chert actually represented a fairly significant amount of debitage from the Fairhaven Reservoir site, accounting for 455 pieces, or 29.2%, as compared to quartz which made up 993 pieces, or 63.7%. However all of the chert from this site was similar to a lithic raw material source identified at the Building Brook Farm site, and was local in origin. Even when considering the most significant appearance of exotic chert at any of the West Rock Ridge sites, which is represented by 90 lithic debitage pieces at the Wintergreen Notch site, this still only accounts for 0.6% of the site's total assemblage. Again, these differences between the Wintergreen Notch site and others from West Rock Ridge, although subtle, indicate this site is different in important ways.

In summary, a total of 4 jasper flakes and the 90 debitage pieces of exotic chert from the Wintergreen Notch site represented the only lithic raw materials found during the project which definitely can be considered to have originated outside of South-Central Connecticut.

The conclusion from analysis of lithic raw material types utilized at West Rock Ridge sites is that people of the Small Stemmed Point Tradition were highly dependent on local lithic raw material sources. In fact this reliance resulted in the near absence of lithics from outside the local area. This observation would support an argument that regional packing of local subsistence groups created a degree of territoriality among separated Small Stemmed Point Tradition populations.

In fact Dincauze (1975:25) makes a very similar statement concerning lithic raw material usage by the Small Stemmed Point Tradition in Southern New England: asserting that these sites are completely dominated by local lithic raw materials and that

exchange networks capable of incorporating raw material from exotic sources are almost non-existent. Dincauze (1975) interpreted this same evidence as indicating a sense of isolation and discrete territoriality among these groups.

Foraging Mobility Strategy

As described earlier in this chapter, increasing population density and territorial packing should lead to more thorough coverage of local landscapes. But other factors have to be considered, such as the organization of mobility and subsistence pursuits. To summarize here foragers, who will move frequently as soon as resources have been depleted adjacent to their habitation sites, are expected to cover their landscapes in a somewhat more thorough fashion than collectors. In the latter case collectors, who utilize logistical exploitation of resources not found adjacent to their habitations, are predicted to be relatively less thorough in terms of the degree to which they cover their available territorial ranges. This is because collectors should move their residential base camps less often and also due to the fact that they are expected to be more selective in terms of choosing only those resource patches from which they can produce resources in bulk. For all of the above reasons, another important predictor for inclusion of marginal resource patches into prehistoric subsistence ranges was the utilization of a foraging mobility strategy.

Fortunately Binford (1980) was interested in how archaeologists can identify the various types of sites which he associates with his foraging and collecting settlement

models, and so he provided guidelines for recognizing these site types in an archaeological context. Much of what Binford (1980:17–19) had to say concerning the archaeological correlates of these sites types was reviewed in chapter three. In the following discussion, therefore, only those points will be repeated which pertain directly to interpretation of West Rock Ridge sites. The majority of sites from West Rock Ridge can be interpreted as seasonal campsites and task-specific locations produced by foragers.

A number of the sites discovered during this project were small lithic scatters represented by one or two tool types utilized in the acquisition and/or processing of a specific resource. These sites, which were considered to most closely resemble the kinds of task-specific locations which foragers produce in their daily subsistence pursuits (Binford 1980:9–10) included: 1) the Kietan Lookout, 2) the Blakeslee Quarry, 3) the West Rock Ridge site, 4) the Whaley site and 5) the Rocky Top site.

According to Binford (1980:5), foragers move out of their campsites on daily forays in order to acquire and/or process those resources necessary for their daily survival. Those places in the local landscape where foragers perform activities related to daily resource acquisition and/or processing are what Binford (1980:9) refers to as "task-specific locations." Because foragers are not typically interested in producing a surplus of resources, these task-specific locations should represent small lithic scatters where only a few tools can be found, and because the only activities performed at these sites would represent those tasks necessary in the acquisition and/or processing of the targeted resources only a fairly narrow range of tool types will be found.

Those sites listed above met all of these criteria, apparently representing transient activity areas created by one or a small group of individuals who had acquired resources

that would be transported back to their campsite. Not only were very few tools present, but the types of tools found were extremely limited. In fact only one of these sites, the Kietan Lookout, had even two distinct tool types present: projectile points and bifaces. Projectile points represented the only tool type found at the rest of these sites, and aside from these few tools the only other artifacts present were associated pieces of debitage, forming very small lithic scatters.

Both foragers and collectors produce task-specific locations, because people must range out from camps in daily forays in order to acquire resources. However, one important distinction is the fact that collectors often target resources in bulk. For this reason, task-specific locations produced as part of a collecting mobility strategy can actually represent dense accumulations of cultural materials. While potentially very large, these assemblages should possess only a fairly narrow range of tool types used in acquisition and/or processing of specific resources. None of the sites mentioned above appeared to represent this kind of intensive exploitation of specific resources. However one site identified during the West Rock Ridge project, the Wintergreen Notch site, which will be described later in this section, appears to represent a fairly classical example of either a field camp or a task-specific location attributable to logistically organized collectors.

One more observation is important for the interpretation of the Kietan Lookout, Blakeslee Quarry and West Rock Ridge sites as foraging task specific locations. Along the ridge top where all of these sites were found, artifacts were observed to be thinly but continuously scattered all along the area immediately adjacent to West Rock's summit over the entire survey transect. This thin but continuous distribution of artifacts was

interpreted to mean that individuals or small groups of people had visited the ridge top and utilized its observation points over a very long period of time, most often leaving only one or two artifacts as evidence of their activities.

Binford (1980:9) identifies these types of accumulations as typical of foraging task-specific locations that were used in a somewhat redundant fashion because resources, or in this case vantage points, were restricted to fairly defined environmental zones. Binford (1980:9) recommended that interpretive frameworks suitable for studying these types of deposits would be non-site methods such as those advocated by Thomas (1975) and Ebert (1992). While the "off-site" nature of the deposits along West Rock's summit was recognized, the three sites documented from the test pit survey did appear to represent discrete activity areas and were recorded in the State of Connecticut prehistoric site inventory as distinct sites.

The Fairhaven Reservoir and West Rock Nature Center 1 sites were interpreted as seasonal campsites utilized as part of a foraging mobility strategy. Both of these sites possessed significant amounts of artifacts, although neither could be described as particularly large in terms of depth and spatial extent of cultural deposits. Both sites also possessed a variety of tool types which appear to have been used in a domestic context, and site deposits from both sites could be characterized as relatively "fine grained"; meaning discrete activity areas could be recognized.

Binford (1980:17) used the terms "fine grained" versus "coarse grained" assemblages in order to contrast these habitation types. Unlike collectors who logistically exploit resources not available adjacent to habitations, foragers move to new resource patches when critical resources are not accessible within a single day's foraging

radius of the camp. Therefore, site deposits of seasonal campsites should not be as complex as those present at base camps of collectors because: 1) relative to the quantity of resources available adjacent to habitations, seasonal campsites by definition should not be occupied as long as collector base camps, 2) according to Binford (1980:17) the longer a habitation is occupied the wider variety of tools will be used and the more numerous will be various activity types, and 3) a variety of logistical resources can be introduced into collector base camps in bulk quantities, at least some of which should be processed there.

For these reasons site deposits at forager seasonal campsites should be relatively fine grained compared to collecting base camps. This means that distinct activity areas should be recognizable, and tool kits should represent only those types used in domestic activities as well as processing of resources acquired from daily foraging. Collector base camps on the other hand should be relatively more course grained with: 1) more activity areas relative to the longer duration of habitation, 2) storage facilities, and 3) evidence for processing of bulk resources which were logistically introduced to the site. These factors mean that site deposits will represent complex amalgamations of overlapping activity areas and a very wide assortment of tool types.

Distinct activity areas could be ascertained at both the Fairhaven Reservoir and West Rock Nature Center 1 sites, indicating that site deposits could be defined as "fine grained." However, in contrast to the West Rock Ridge, Blakeslee Quarry and Kietan Lookout site, where distinct activity areas could also be recognized, deposits at these later sites were much more extensive and dense. Also, a wide range of tools used in domestic activities were recovered from both these sites indicating they were habitations.

The existence of discernable activity areas, however, indicates that neither of these sites was occupied over extensive periods of time, nor was their evidence that bulk resources procured during logistical forays had been processed. It appears, therefore, that both of these sites represent seasonal campsites typical of a foraging mobility strategy, and that both were probably occupied by one or a few small family groups over a relatively brief time, perhaps over a period of several months. This is in contrast to expectations given above for assemblages typical of collecting base camps.

The Fairhaven Reservoir and West Rock Nature Center 1 also do not appear to represent the other type of residential sites which are produced as a part of a collecting mobility strategy: field camps. These latter site types represent temporary habitations where specialized task groups maintained themselves. Although domestic tools occur at field camps because they are habitation sites, the types of focal subsistence organized from these field camps can create assemblages highly skewed in terms of those artifact types used and maintained in acquisition or processing of those resources which were specifically targeted (Binford 1980:10). As described in chapter twelve, tool assemblages from the Fairhaven Reservoir and West Rock Nature Center 1 sites are fairly even, having a wide range of tool types present and without dominance of one or a few artifact types. Neither of these sites would appear to represent habitations from which logistical exploitation of specifically targeted resources had been organized.

McBride (1984) analyzed Small Stemmed Point Tradition settlement and mobility patterns in the lower Connecticut River Valley. His conclusion was that campsites were moved frequently, while field camps were not numerous. In fact of 45 Small Stemmed Point Tradition components studied, only one was identified as a field camp. The vast

majority of Small Stemmed Point Tradition sites in the lower Connecticut River Valley, therefore, were either seasonal campsites or task-specific locations; leading McBride (1984:370) to conclude that the type of mobility strategy being used was consistent with Binford's (1980:9) foraging definition.

As stated at the outset, however, revision of some of the predictions of the research's major hypothesis was considered an ongoing pursuit of the project. The major distinction for collecting mobility strategies is the logistical exploitation of resources, often acquired in bulk for storage purposes, by specialized task groups camping sometimes at great distances from the major habitation. The Wintergreen Notch site would appear to represent a classical example of this kind of site, although it is difficult to determine whether or not it represents a field camp or simply an intensively exploited task-specific location.

The thing that distinguishes the Wintergreen Notch site is an emphasis on the exploitation of game animals. The site possessed a large inventory of lithic tools, but 70% of these were projectile points. Additionally, of those remaining tool types which made up the rest of the inventory, bifaces, knives, utilized flakes, scrapers and drills probably also played a role in the processing of game meat and hides. The site was ideally situated on the south- facing slope of a narrow gap in West Rock's precipitous cliff face which represented the only east to west communication for over a mile to the south and about six miles to the north. The presence of numerous projectile point tips indicated that game animals were actually killed, or initially butchered, in the immediate area of the Wintergreen Notch site.

The distinction between the Wintergreen Notch site as a field camp or a task-specific location is somewhat more difficult, but this is not a point which requires great attention. Binford (1980:12) clearly described how distinct site types could blend from one to another in a collecting settlement system, and in fact the Wintergreen Notch site may well represent a combination of these site types: 1) a field camp where a group of specialists maintained themselves, and 2) a task-specific location where a large quantity of game animals, most likely white-tailed deer, were acquired and/or initially processed.

The presence of the Wintergreen Notch site at West Rock Ridge indicates that the settlement strategy of Small Stemmed Point Tradition peoples was somewhat more complex than a simple definition of "foragers" would suggest. This type of contradiction was anticipated by Binford (1980:19) who remarked that foraging and collecting settlement strategies should not be envisioned as polar opposites. In fact the vast majority of hunter-gatherer societies should utilize a little bit of both strategies in their annual seasonal movements.

Nor does it come as a surprise that a logistically organized site would be found as part of the Small Stemmed Point Tradition settlement pattern. Although the vast majority of habitation sites associated with this tradition appears to be small, temporary campsites; occasionally larger and somewhat more permanent settlements can be found. Perhaps the most distinguished of these would be the Lamoka Lake site in central New York State (Ritchie 1965). However, the large Small Stemmed Point Tradition occupations present in South-Central Connecticut such as the Burwell-Karako (Lavin and Russell 1984), Cove River (Cuzzone personal communication 2006) and the Woodchuck Knoll sites (McBride 1984:260) also attest to the fact that at times, perhaps when especially

abundant seasonal resources were available, larger and more permanent habitations were also a part of the settlement system in this area.

In this case, the Wintergreen Notch site probably represents a logistically organized hunting expedition staged from a large and relatively sedentary habitation along the coastline. The later inference is drawn from the fact that smooth, wave-rolled, quartz beach cobbles provided the main lithic raw material for the site's tool manufacturing activities.

I would argue further that the Wintergreen Notch site probably does not represent an isolated instance in terms of this general cultural pattern. For instance, fish weir sites that are thought to relate to the Late Archaic in Southern New England (Snow 1980:229) may also represent a variation on this same theme.

McBride's (1984) analysis of mobility strategies in the Lower Connecticut River Valley, and what evidence was available from West Rock Ridge would support, a conclusion, however, that foraging was the dominant mobility strategy characteristics of the Small Stemmed Point Tradition. The third prediction of the model presented in chapter two is therefore considered to be supported.

Expedient Core Technology

Parry and Kelly (1987) observed a shift in the usage of formalized core technologies to usage of informal cores in North America, and perhaps globally, in association with adoption of more sedentary lifestyles. However it is not this shift which

is the emphasis of the present discussion. Parry and Kelly (1987:300–302) also observed that expedient core technologies were important to some ethnographically known hunter-gatherers who were relatively mobile. They went on to explain that expedient core technology, in this context, occurred due to the presence of widespread and abundant sources of lithic raw material.

This utilization makes sense because a major concern for mobile stone tool using cultures is the need to use tools at locations where lithic raw material is not available. In this case formalized cores, which represent a lightweight and portable tool kit, solve the positioning problem of raw material demands and tool stone needs (Parry and Kelly 1987:300). However, when lithic raw material is widespread and abundant, the problem of congruence between lithic raw material needs and availability is eliminated. Also under these circumstances, low quality lithic raw material can be utilized because in contrast to formalized cores, expedient core technologies can incorporate imperfect or flawed lithic raw materials.

Due to cultural isolation imposed by regional packing, and the somewhat circumscribed territories that are expected to occur as hunter-gatherer population densities grow, it was concluded that the only lithic raw material available to populations living under these conditions in South-Central Connecticut would be widespread and abundant quartz. Quartz is too full of flaws and inclusions to be useful for production of formalized cores. However quartz is widespread in its distribution in South-Central Connecticut, and represents the only lithic raw material type which is abundant enough to fulfill every day tool stone needs for local prehistoric populations.

This prediction is not supported, however, from data accumulated during the West Rock Ridge project. Although bipolar core reduction appears to dominate in early lithic processing activities, and despite the fact that expedient tool production did occur at many of the West Rock Ridge sites analyzed during the project, bifacial tool manufacturing is more dominant at most sites. Bifaces are by definition formalized tools, and so a description of Small Stemmed Point Tradition technology as expedient would be deceptive.

All of the cores that were identified during the project were bipolar or amorphous flake cores, and these are expedient core types. However, during manufacturing, bifaces can also serve as cores (formalized) for flake tools. Additionally, preforms carried as part of personal gear can also have served as portable cores, so it is not possible to categorize the Small Stemmed Point Tradition as expedient based upon the observations made during this project.

Actually, data collected from the West Rock Ridge project may be insufficient for understanding the degree to which formalized or expedient core technologies dominated for the Small Stemmed Point Tradition. Because lithic raw material can be stockpiled at habitation sites, it is possible that expedient tool use would have been far greater at larger and longer duration habitation sites. However, the only habitation sites analyzed during the project appeared to have been fairly short term occupations: the Fairhaven Reservoir and West Rock Nature Center 1 sites.

I would argue, however, that these observations do not conflict with the predictions given in chapter two concerning the utilization of marginal resource patches. While these findings argue for revision of the initial hypothesis, what is indicated here is

that Small Stemmed Point Tradition peoples were highly dependent on utilization of local quartz, and that bipolar core reduction dominated during the early stages of lithic processing activities. The importance of bifaces in Small Stemmed Point Tradition technology is considered a factor of high residential mobility, which is a characteristic of this cultural pattern. These latter observations actually make intuitive sense considering that expedient core technology was predicted to have occurred under highly mobile as opposed to sedentary conditions, in this context. Small Stemmed Points found in the Farmington River Valley are also made almost exclusively from local raw materials, mostly hornfels and basalt (Feder personal communication 2009).

Significant Reliance on Hunted Resources

The final prediction to be tested here is that hunted resources should have represented at least a significant component of Small Stemmed Point Tradition subsistence patterns. This prediction anticipates the fact that reorganization of the subsistence base, in a direction where hunted resources become less important and focal dependence on vegetative and/or aquatic resources adjacent to habitations is advantageous, leads to changes not only in the organization of mobility but also landscape utilization. Because this type of subsistence reorganization is expected to lead to dominance of a collecting mobility strategy and more selective utilization of available resource patches, the last prediction is that hunted resources should comprise at least a

significant subsistence component for those peoples who most often utilized West Rock Ridge.

Unfortunately subsistence information from stratified Small Stemmed Point Tradition components is not abundant for Connecticut and southern New England. However, Ritchie's (1969) work on Martha's Vineyard and McBride's (1984) report on the Woodchuck Knoll site of the lower Connecticut River Valley provide exceptions. Ritchie gave subsistence information from his Squibnocket complex at the Hornblower II and Vincent sites on Martha's Vineyard.

At Hornblower II in stratum 3, which Ritchie (1969:34–38) ascribed to his Squibnocket complex (Small Stemmed Point Tradition), white tailed deer dominated the faunal assemblage with a minimal number of 10 individuals. Other important fish and mammal species were scup represented by 8 individuals, gray seal accounting for 5 individuals, Atlantic sturgeon representing 2 individuals, and finally raccoon, red fox, gray squirrel, dog, common loon, brant, red-throated loon, red-bellied turtle and tautog all represented by one individual each (Ritchie 1969:43–44).

At the Vincent site, where Ritchie (1969:154–155) ascribed Stratum 3B to his Squibnocket complex, those reported fish and mammal remains included 15 white tailed deer individuals, four gray seals, and one each of harbor seal, otter and raccoon. Shellfish were present at both Hornblower II and the Vincent site on Martha's Vineyard including Quahog, Virginia Oyster, Bay Scallop and Long Clam (Ritchie 1969:48,158).

McBride (1984:262–262) reports information concerning plant species that were important to Small Stemmed Point Tradition cultures of the Lower Connecticut River Valley, including American lotus, goosefoot, walnut and hickory from the Woodchuck

Knoll site. Also, fresh water clam, oyster, white tailed deer and unidentified mammal bones were recovered from the Archaic Midden site, while the Cedar Lake site yielded unidentified mammal and fish bones as well as fresh water clam (McBride 1984:263).

What information is available, therefore, would at least support a conclusion that white-tailed deer was an important source of meat for the Small Stemmed Point Tradition. However this information is hard to interpret because white-tailed deer appear to have been an important source of meat throughout the prehistoric period in Southern New England (except perhaps for the Paleo-Indian Period). For instance, looking at Ritchie's (1969:43–44,154–155) data from Martha's Vineyard, white-tailed deer dominated all of the prehistoric levels at both the Vincent and Hornblower II sites. Both of these sites represented fairly continuous occupation from the Late Archaic to the Late Woodland Periods.

Evidence from West Rock Ridge also supports a conclusion that hunted resources were important for the Small Stemmed Point Tradition, although in this case evidence did not represent actual faunal remains. However, the Wintergreen Notch and Whaley sites both appear to represent intercept hunting locations. At least one of these, the Wintergreen Notch site, was probably an ambush location where a large amount of white-tailed deer were procured. Additionally, information gathering, or lookout sites, such as West Rock Ridge, the Blakeslee Quarry and Kietan Lookout, supply additional evidence for the importance of hunting to Small Stemmed Point Tradition cultures. These sites appear to have represented vantage points from which game animals could be observed in the West River Valley below.

Conclusions of Hypothesis Testing

Not only were artifacts and components of the Small Stemmed Point Tradition dominant by far in West Rock's archaeological record, but the utilization of the ridge by these prehistoric people is consistent with the predictions of the model which was formulated to test the general hypothesis of this project. It makes sense that Small Stemmed Point Tradition people sought to maximize their utilization of all of the environmental zones available to them in their local territorial ranges due to increased population density and territorial packing of regional subsistence groups. It is under these conditions that thorough coverage of local available territorial ranges would be most likely to occur. Although one can not argue from negative evidence, it can at least be hypothesized that other cultural/temporal traditions occupying South-Central Connecticut during the prehistoric period did not experience this need to exploit their available subsistence ranges with the same thoroughness as people of the Late Archaic Small Stemmed Point Tradition.

Most of the predictions of the model which was developed in chapter two were met for the Small Stemmed Point Tradition. Furthermore, I would argue that these traits were part of an adaptation by which hunter-gatherers adjusted to increasing population density and regional packing during the Late Archaic. In general the Small Stemmed Point Tradition of the Late Archaic can be described as an adaptation characterized by: 1) high residential mobility, 2) a discrete sense of territoriality, 3) a foraging mobility strategy, and 4) dependence to at least a significant extent on hunted resources. Although

it was not concluded that an expedient core technology dominated for the Small Stemmed Point Tradition, the data was considered to support the model given in chapter two, which predicted that this tradition would be characterized by dependence on local quartz and their technology would be adapted to their need for frequent residential mobility.

While most of these predictions proved to be true, in a general sense, concerning the Late Archaic Small Stemmed Point Tradition in South-Central Connecticut, at least some revision of the initial hypothesis was considered necessary. First, while the most dominant form of mobility strategy represented by Small Stemmed Point Tradition settlement patterns would appear to be foraging, it does appear that at least at times logistical exploitation of resources did occur. This probably coincided with occasionally large aggregation sites in which people depleted resources adjacent to their habitations quickly.

The second important cause for revision of the initial hypothesis was the observed importance of bifaces in overall Small Stemmed Point Tradition lithic technology.

Neither of the above conditions however negates the model of Small Stemmed Point Tradition landscape utilization developed as a part of this project. One of the assumptions of that model which was tested here is that thorough exploitation of local available territorial ranges occurred under conditions of increased population density and territorial packing. Under these conditions it would make sense that larger aggregation sites would occur at times when seasonally available resources were particularly abundant. In these instances larger groups maintaining habitation near these resources, which may for instance have represented shellfish or migratory fish runs, would have exploited other critical resources around their habitations quickly making logistically

organized production necessary. Binford (1980:19) recognized that foraging and collecting were not polar opposites, but instead most foragers would utilize at least a little bit of both strategies. Under circumstances of increasing population density it is no surprise that hunter-gatherers would at least at times incorporate logistical mobility into their settlement strategies.

The second observation made during analysis of Small Stemmed Point Tradition lithic technology is that while bipolar (expedient) cores were present, bifaces and bifacial tools were the dominant component of their overall organization of technology. Again this is not surprising because the utilization of an expedient core technology is predicted to have occurred in a context of high residential mobility where widespread and abundant quartz was the only option for fulfilling every day tool stone needs. I would argue that the importance of bifaces for Small Stemmed Point Tradition peoples was a factor of the degree to which residential mobility was an important component of their overall adaptive strategy.

From the analysis of data collected from the West Rock Ridge project, therefore, it can be assumed that hunter-gatherer landscape utilization is influenced by factors such as population density and territorial packing. However, cultural factors such as the organization of mobility and the production of surplus resources including vegetative and/or aquatic resources adjacent to habitations will also influence the way that hunter-gatherers exploit their local landscapes, regardless of these demographic factors. In the case of hunter-gatherers who remain highly mobile and practice a foraging mobility settlement strategy, such as the Late Archaic Small Stemmed Point Tradition in South-Central Connecticut, thorough coverage of available environmental zones and resource

patches can be expected to occur. When subsistence pursuits turn to bulk production of vegetative and/or aquatic resources adjacent to habitations, utilization of a collecting mobility strategy and more selective utilization of available resource patches are predicted.

Another assumption that can be made from this model therefore, is that hunter-gatherer patch selection is dependent on both demographic and cultural factors, and that the utilization of marginal resource patches can be diagnostic of adaptations that rely on high residential mobility in contexts characterized by relatively high population density and territorial packing.

Significance of these Findings for Archaeological Studies of Hunter-Gatherers

The question remains, "What is the significance of these findings in terms of how archaeological data recovered during the West Rock Ridge survey can be used in the development of anthropological theory as it relates to hunter-gatherers?" One productive line of reasoning which can be developed is the relationship of this data with Woodburn's (1998:87–110) distinction between immediate return and delayed return hunter-gatherers.

Woodburn (1998:88) defines immediate return hunter-gatherer economies as those in which production is only aimed at meeting daily resource requirements. There is little or no accumulation of resources in this type of economic system. On the other hand, delayed return economies are geared toward production of surplus resources.

Perhaps Woodburn's (1998:89) most important conclusion concerning the differences between these economic types is that accumulation of surplus goods is most often associated with changes in overall political and social organization. The logic behind this assumption is generally related to the importance of leadership roles in terms of organizing the production and distribution of surplus resources, as well as the opportunity for entrepreneurs to own or at least control this surplus in order to advance their social status. For these reasons the development of relations of unequal status is a potential outcome for hunter-gatherers who become highly dependent on delayed returns economically.

It is tempting to try to understand the long temporal duration of the Small Stemmed Point Tradition in Southern New England in this context. At least some Anthropologists consider small scale hunter-gatherer societies to represent proto-typical egalitarian societies (Woodburn 1998; Leacock 1998). Contained within the Small Stemmed Point Tradition cultural system, as defined in this text, is an important component of egalitarian social relations: the ability to vote with one's feet. By remaining highly mobile in the context of increasing population density, Small Stemmed Point Tradition peoples may have clung to an opportunity to avoid relations of unequal status; and if Woodburn (1998) is correct, the potential for non-egalitarian relations increases in more sedentary contexts where production of surplus resources becomes the economic focus.

This point is especially attractive to pursue in terms of the side-by-side coexistence of the Small Stemmed Point Tradition and the Susquehanna Tradition in Southern New England (Chapter 7). Because this argument impinges on suggestions for

future directions of research it will be pursued further in the next section, when the settlement organization of the Small Stemmed Point and Susquehanna Traditions will be compared.

Another very important contribution of the West Rock Ridge project is that it demonstrates the potential for incorporating patch-selection models in archaeological research of hunter-gatherer economies. As discussed in chapter two, patch-selection models, such as marginal value theorem, are borrowed from behavioral ecology. In general, ethnographic applications of optimal foraging theory have been much more successful than similar attempts on the part of archaeologists, although this is probably due more to lack of sufficient data in archaeological contexts concerning available resources and past environments than due to theoretical shortcomings of these models (Sheehan 2004:163).

Even when considering archaeological applications of optimal foraging theory, archaeologists have been more successful using diet breadth models than for patch selection choice models. According to Sheehan (2004:170) this is because the amounts of data concerning past environments necessary to test models based upon patch-selection theory is particularly problematic for archaeologists.

However, the West Rock Ridge project offers a potential means of incorporating patch-selection choice models into archaeological research. Jochim (1998:13–29) stated that archaeologists should keep optimal foraging models simple and use generalized currencies, such as rankings of prey species instead of specific caloric and nutritional measurements, in order to avoid erroneous assumptions due to incomplete data. I would argue that patch selection models based upon general landscape characteristics, such

West Rock's rugged and uneven topography, can be used to understand decisions on the part of prehistoric hunter-gatherers in terms of landscape utilization. In this case the general hypothesis tested was that hunter-gatherers would be most willing to expend extra time and energy to exploit West Rock Ridge under conditions of increased population density and territorial packing, when thorough exploitation of available territorial ranges was most advantageous. With this in mind can similar research into other potentially marginal environments such as wetlands, other types of rugged uplands, or (for instance) New Haven's sand plains, contribute to an understanding of past hunter-gatherer adaptations?

Future Directions of Research

A debate that has pervaded the archaeological Northeast has been the relationship between the Small Stemmed Point and Susquehanna Traditions. The Susquehanna Tradition is recognized by the presence of broad bladed projectile points and soapstone bowls, among other cultural traits, and is a Terminal Archaic manifestation (approximately 3,700 to 3,000 B.P.). Various hypotheses have been forwarded in attempts to explain the contemporaneous distribution of sites from both of these cultural traditions in Southern New England. Among these explanations has been migration of Susquehanna Tradition peoples from a source area in the Middle Atlantic States (Tuck 1978:37–38) and peaceful coexistence with an already resident Small Stemmed Point Tradition population (Ritchie 1969:219).

Other hypothesis have considered the adaptive advantages of the Susquehanna cultural pattern that allowed them to replace formerly indigenous inhabitants (Turnbaugh 1975; Snow 1980:252–253). Without intending to complicate the debate further by forwarding a new explanatory hypothesis, the discussion below will focus on the potential for utilizing Binford's (2001) theory of intensification in order to better define the relationship between these cultural groups.

Some characteristics of the Susquehanna Tradition cultural pattern which have been used to contrast it with the Small Stemmed Point Tradition have been: 1) a much more pronounced settlement focus on major rivers and their tributaries (Tuck 1978:37–38; McBride 1984:279–280; Snow 1980:252), 2) intensification of subsistence focused on aquatic and/or vegetative resources (Turnbaugh 1975), and 3) utilization of collecting mobility strategy (McBride 1984:283). Also of interest here is the much more formalized lithic technology of the Susquehanna Tradition, with its emphasis on non-local materials, and the implications this has in terms of mobility and territoriality.

All of these characteristics suggest that the differences between the Susquehanna Tradition and Small Stemmed Point Tradition cultural patterns can be explained in terms of intensification as described by Binford (2001). The problem with the utilization of this kind of explanatory framework is that it requires an assumption that these two traditions represent dissimilar adaptations to what must be assumed to be similar demographic factors.

I would argue that increased population density led to higher reliance on residential mobility for local Small Stemmed Point Tradition subsistence units, because larger subsistence units resulted in quicker depletion of resources within the available

foraging radius of habitation sites. Additionally, because an upper limit would have to exist in terms of the number of people that could live together in subsistence units, that splintering of local populations would lead to a situation where numerous local groups were packed into regional territories, as each local group probably did its best to maintain its local territorial range. It was under these circumstances that people of the Small Stemmed Point Tradition, as modeled here, learned to exploit all of their available environmental zones, which in this case would include West Rock Ridge.

I would further argue that characteristics of the Susquehanna Tradition cultural system, which I will describe in some detail below, indicate that subsistence was organized around bulk acquisition of vegetative and/or aquatic resources adjacent to habitation sites. According to Binford (2001) this is the type of subsistence focus that occurs due to reorganization of the economic base as a result of mobility pressure caused by increased hunter-gatherer population density. The obvious question that must be answered, if intensification is to be used as an explanatory model for both of these cultural systems is, "If these cultural groups actually did co-exist in Southern New England, then why is it that they developed such different adaptations to what must be assumed to have been similar levels of population pressure?"

Possible answers to this later question can be suggested because of the inherent flexibility of Binford's (2001) intensification theory. Due to its emphasis on the development of new strategies and techniques allowing for intensive exploitation of vegetative and/or plant resources adjacent to habitations, this theory allows for technological innovation as an explanation of the kinds of cultural variability found in Southern New England during the Terminal Archaic Period.

Additionally because Binford (2001) stresses that different trajectories of intensification will occur, depending on the specific resources available in different ecological settings, it can be postulated that the Small Stemmed Point and Susquehanna Traditions represented adaptations which targeted different ecological niches (for instance interior large rivers on the part of the Susquehanna Tradition as opposed to coastal environments and their associated uplands for the Small Stemmed Point Tradition). If this later scenario is plausible then persistence of these cultural patterns could be explained due to differences between immediate (Small Stemmed Point Tradition) and delayed return (Susquehanna Tradition) economic systems in terms of individual choices and the possibility of avoiding potentially hierarchical social relations; which according to Woodburn (1998) are closely associated with the development of delayed return economies.

The characteristics of Susquehanna Tradition settlement pattern and subsistence described above have been documented by numerous researchers in Southern New England. Ritchie and Funk (1973:242) report that the majority of important Susquehanna Tradition camps in New York State are located on high, sandy river terraces, and that little use was made of inlands and rockshelters. McBride (1984:280) confirms this site distribution for the lower Connecticut River Valley, indicating that terrace edges overlooking the floodplains of prominent rivers and streams are the most typical location for Susquehanna Tradition habitation sites. Pagoulatos (1986:257) describes a similar distribution for Susquehanna Tradition sites in Connecticut's Northeastern Lowlands, which he reports as being mostly situated on the terrace edge overlooking the river floodplain, while uplands were exploited using field camps.

Differences between Susquehanna and Small Stemmed Point Tradition subsistence focus have also been commonly cited. Turnbaugh (1975) hypothesized that Susquehanna Tradition broad points were actually implements used in the exploitation of migratory fish along the Atlantic coastline river channels. He based this hypothesis on the distribution of these point types which coincided with locations where migratory fish were available and sees this as having provided an adaptive advantage allowing Susquehanna populations to push their way into the Northeast from the Middle Atlantic States.

Snow (1980) and Dincauze (1974) take a somewhat different tack, arguing that Susquehanna Tradition cultures intensively harvested plant species such as *Chenopodium* from river floodplains. Pagoulatos (1986:278–279) has noted that numerous Susquehanna Tradition sites in the Connecticut River Valley have produced evidence of storage pits, plant processing tools and *Chenopodium*.

McBride (1984) contrasts Small Stemmed Point and Susquehanna Tradition mobility strategies directly. In the quote given below McBride's (1984:370) Tinkham phase is a local manifestation of the Small Stemmed Point Tradition while his Salmon Cove Phase is a local manifestation of the Susquehanna Tradition from the lower Connecticut River Valley.

> The Tinkham Phase (Ca. 2200-900 B.P.) is the earliest phase for which we have adequate information on the nature and distribution of occupations. The Tinkham pattern is most similar to what Binford referred to as a "foraging" system. It is characterized by a number of residential moves throughout the year as reflected by a relatively high frequency of seasonal camps and task-specific locations in the system. This pattern appears to persist until around 900 B.C. , at least in the upland areas. Beginning about 1600 B.C. and persisting until approximately 700 B.C. a much different pattern is associated with the Salmon Cove phase in the

> lower Connecticut Valley. The pattern suggests reduced mobility, as indicated by the lack of upland seasonal camps, reduction of task-specific locations, and an increase in the frequency of temporary camps.

Pagoulatos (1986:272) suggests that because Susquehanna Tradition camps in the Connecticut Valley were located along river terrace edges, this allowed for close proximity to wetland, woodland and mast forest resources, which in turn made more sedentary habitation possible. This specialization of lowland resources meant that they exploited uplands only on a seasonal basis and used logistical procurement activities to do so. Pagoulatos (1986:275) further suggested that Susquehanna cultural groups had greater access to long distance trading partners by way of Southern New England's major river systems. Within this context they developed their unique cultural pattern including broad spear points and several elaborate mortuary sites.

The interpretation (1986) made by Pagoulatos potentially sheds light on the type of organization of lithic technology utilized by Susquehanna Tradition peoples. Parry (1989:32) observed that the Susquehanna Tradition represents an exception to a general trend that he observed in terms of increasing utilization of expedient core technologies in later portion of the prehistoric period in North America. According to Parry (1989:32) Susquehanna Tradition tool kits possessed large, thin pentagonal bifaces, "which served simultaneously as heavy-duty tools, preforms for other bifacial tools, and flake cores." The inference on Parry's (1989:32-33) part was that these represented portable tool kits that were designed for use in a highly mobile contexts. An emphasis on high quality lithic raw material resulted in a technology that was organized around the usage of formalized cores to the same extent as earlier Paleo-Indian populations.

Although these conclusions may seem somewhat contradictory at first, they need not be. In the context of Small Stemmed Point Tradition lithic technology it was emphasized earlier that despite a high degree of residential mobility inherent in this cultural pattern, that lack of access to exotic lithic raw materials demanded that bipolar techniques were utilized during early stages of lithic processing, while expedient cores played at least a significant role in their overall organization of technology. According to Pagoulatis (1986:283) much greater accessibility to exotic lithic raw materials from Southern and Northern New England, as well as the Middle Atlantic States, is explainable in terms of better access to transportation systems and the utilization of dugout canoes. The mere incorporation of high quality lithics into the Terminal Archaic cultural system may have represented a cultural factor which made formalized core technology more advantageous for these people.

It is equally important, however, to consider carefully how mobility is defined. As modeled here Small Stemmed Point Tradition mobility involved numerous seasonal moves, but because territories are thought to have been somewhat circumscribed, these movements on the part of family groups would probably not have tended to be very far. On the other hand, utilizing a collecting mobility strategy, Susquehanna cultures may have practiced less residential mobility; but at the same time logistical exploitation meant that special task groups had to travel great distances and camp for extended periods of time away from the habitation. I would argue that this would have been an ideal context for the development of a formalized core technology because groups of specialists maintaining themselves at great distances from their base camps would likely have required highly portable tool kits.

The following discussion will serve both to suggest avenues of future research as well as providing some insight into the potential flexibility of Binford's (2001) theory of intensification for explaining variability in the organization of hunter-gatherer societies. One suggestion would be that technological innovation, or at least the role of technology within the overall organization of mobility and subsistence, was an important factor for the evolution of Susquehanna Tradition cultural pattern. This can be suggested in at least two possibly related ways.

The first would be that the innovation of soapstone bowls made for more efficient exploitation of vegetative resources adjacent to habitations. The second is that Susquehanna Tradition peoples were reliant to a far greater degree on canoe travel than were peoples of the Small Stemmed Point Tradition. Pagoulatis (1986:283) made the observation that canoes allowed for access to exotic lithic raw materials as well as contacts with distant groups, the latter of which may have been implicated in the development of their unique cultural pattern with broad spear points and elaborate mortuary sites. Canoes may also have facilitated logistical exploitation of resources, allowing them to maintain residence at base camps for relatively longer periods of time.

Ames (2002:19-20) made the point that the utilization of watercraft will have important implications in terms of the mobility strategy employed by hunter-gatherers:

> First, it has long been recognized that in contrast with terrestrial, pedestrian hunter-gatherers, aquatic hunter-gatherers tend to have higher population densities, to be residentially more stable, i.e., more sedentary , and to perhaps be more socially and economically complex than most terrestrial hunter-gatherers. Explanations for the causes of these apparent distinctions commonly focus on the relative or absolute productivity and dietary value of aquatic relative to terrestrial resources. In these discussions, lip service is paid to the importance of "transport technologies," but their importance is rarely investigated. However, access to

> waterborne transportation alone can have a significant positive impact on population size and stability. This implies a more complex interplay between environment and technology in the evolution of mobility strategies than is generally appreciated.

The importance of soapstone bowl technology and watercraft for transportation may also have been related. For instance Snow (1980:240) observed that the utilization of soapstone bowls made necessary a reliable means of transporting these heavy vessels, which he interpreted as meaning that dugout canoes were more important to Susquehanna Tradition peoples than had been the case for the Small Stemmed Point Tradition.

From this perspective it is at least possible to envision that the Susquehanna Tradition cultural pattern was influenced by a reorganization of the subsistence base where: 1) intensive exploitation of local vegetative and/or aquatic resources, 2) more sedentary habitation, and 3) logistical exploitation of those resources not available adjacent to habitations; was made possible due to soapstone bowl technology and access and/or increased reliance on watercraft. The former may have facilitated more efficient processing of plant foods. The latter perhaps either making long distance logistical forays easier to conduct and/or increased the production of aquatic resources. The implication being technological innovation in this case had allowed for the evolution of a new cultural pattern for the Susquehanna Tradition, which contrasted in terms of subsistence focus and mobility strategies from the Small Stemmed Point Tradition.

The other suggestion that becomes possible based upon Binford's (2001) intensification theory is that Susquehanna and Small Stemmed Point Tradition cultural patterns evolved in different ecological niches. In this way perhaps even minor differences in demographic factors or the mix of available resources led to different

organizational adaptations despite fairly similar demographic pressures throughout a much broader region. This hypothesis finds support by the fact that at least some archaeologists have ventured an interpretation that the Susquehanna Tradition cultural pattern had its origins to the south and/or southwest of New England. For instance Wright (1978:37) concluded that elements of, if not the whole Susquehanna Tradition complex, had its origins in the Southeast where broad Savanah River points in association with soapstone bowls were radiocarbon dated at 1944±250 B.P. at the Gaston site in North Carolina (Coe 1964).

Seen in this way the Susquehanna Tradition cultural pattern may have represented a somewhat different adaptation that was influenced by increasing population density and territorial packing, but which because of local variation in terms of demographic or ecological pressures led to a reorganization of the subsistence base in a direction somewhat opposite that of the Small Stemmed Point Tradition.

Perhaps more interesting in terms of general hunter-gatherer studies would be the suggestion that the differences in these cultural patterns had important social ramifications. If Woodburn's (1998) observations concerning the development of hierarchical social organization and the production of surplus resources characterizing delayed return economies is correct, then the more important issue may have been increased autonomy and individual agency. Despite the organizational efficiency of the Susquehanna Tradition economic pattern, the price in terms of loss of egalitarian relationships may have been too much for some who preferred to continue to rely on a high degree of residential mobility despite mobility pressure imposed by increasing population density. Seen in this way individual agency may have been just as much a

factor in how certain economic systems developed and/or continued, as would have been the demographic or ecological factors which this research has focused on.

The point here is not to propose a new theoretical framework for looking at the important relationship which existed between Small Stemmed Point Tradition and Susquehanna Tradition cultures in Southern New England, but only to suggest ways in which Binford's (2001) intensification theory can provide useful insights and hypothesis concerning the study of hunter-gatherer issues using archaeological data. In this case it has been proposed that flexibility inherent in this model gives it potential for researching variability in hunter-gatherer cultures from an archaeological perspective.

Other topics came up during the West Rock Ridge project which would warrant further investigation in future research. As discussed earlier, distinguishing the importance of expedient versus formalized core technologies for the Small Stemmed Point Tradition was an issue that was not satisfactorily resolved. One of the reasons why this was the case was the inability to recognize bipolar flakes in assemblages of debitage. Kuijt, Prentiss and Pokotylo (1995) approached this issue concerning the usage of trachydacite (vitreous basalt) for prehistoric sites in British Columbia. Their approach was a mass analysis in which they were able to demonstrate that while non-orientable pieces and broken flakes were typical in both bifacial and bipolar core reduction strategies, that remnant platform bearing flakes were also common in bifacial core reduction but were infrequent in bipolar reduction. A similar experimental program, utilizing quartz as a lithic raw material, would shed light on the issue of understanding the degree to which bipolar or bifacial core reduction strategies dominated at Small Stemmed Point Tradition habitation sites.

Another issue which affected the interpretation of West Rock Ridge sites was the potential of not recognizing use-wear on quartz artifacts. This problem is also implicated in the argument above in terms of the inability to identify use-wear on unmodified flakes. Sussman (1985) produced one of the few experimental use-wear analysis studies, documented in the literature, which focused on quartz. Even in this study, the emphasis was on quartz crystals, which represent a harder and more homogenous form of quartz than vein or cobble sources. Sussman (1985:101–102) did report, however, the utilization of some vein quartz flakes in her experiment, and suggested that, despite irregular fracture properties and sugary surface texture, use-wear on vein quartz does not appear significantly different from that observed on crystal quartz. The development of – systematic techniques for recognizing use-wear on quartz artifacts would greatly aid in the analysis and interpretation of Small Stemmed Point Tradition sites.

Finally, much more should be done in terms of understanding intra-site spatial patterning at Small Stemmed Point Tradition habitation sites. Considering that hunter-gatherer campsites often include shelters which are little more than wind-breaks, the identification of houses and the lay-out of campsites can be particularly hard to identify in these contexts (Gamble and Boismier 1991). However, the added investment of time and effort in piece-plotting, re-fit studies, and mathematical modeling, offer great potential for addressing issues of Small Stemmed Point Tradition mobility, settlement and social organization. Unfortunately, these types of analysis have rarely been performed at Small Stemmed Point Tradition habitation sites in the past.

Another critique pertinent to the archaeological investigation of marginal habitats is the extent to which utilization of marginal environments can be considered systematic

of population pressure, but rarely has the effect of learning in these new environments been studied in relation to innovations and new adaptations that can result from this type of niche expansion. For instance, Cohen (1977:79) suggested that the observation, that hunter-gatherers were exploiting new and marginal habitats, was a potential indicator of the elusive variable "population pressure" in the archaeological record:

> When the inhabitants of a region become more eclectic in their exploration of microniches, utilizing portions of the environment—such as deserts, coastal areas and forests—which have previously been ignored, while continuing to exploit the old niches, demographic pressure may again be assumed.

It is interesting that while Cohen (1977:11-12) argued that the worldwide spread of the human population to all of the corners of the earth, and the subsequent lack of available space for further territorial expansion, was the "prime mover" for the near universal adaptation of agriculture in Post-Glacial Era; his theory has been criticized for a lack of appreciation for processes leading to the adaptation of agriculture in local sequences (Smith 1995:208).

A similar point must be emphasized in terms of West Rock Ridge. While the utilization of West Rock Ridge on the part of Small Stemmed Point Tradition people was modeled in terms of an adaptation to increasing population density, it also can not be denied that exposure to the diverse ecological and geological characteristics of this environment led to learning on the part of those people who familiarized themselves with this important trap-rock ridge. As a consequence the discovery of new resource

opportunities and the development of new techniques of resource acquisition was part of this mutual relationship that people developed with their local landscapes.

Specifically West Rock Ridge provided: 1) unique ambush hunting opportunities, 2) a source of local chert and quartz, and 3) information gathering or lookout sites. Although archaeological data recovered during the project was not able to confirm this fact, it is also likely that prehistoric populations learned about new plants that would have only been available at this trap-rock ridge. Ecologists (Dowen and Rozsa 1977) have noted that not only is West Rock home to a wide variety of plants and animals but is also home to rare and endangered species which can not be found anywhere else in the state. A particularly interesting issue for future research would be the role of shamans and herbalists in this process of exploration, and innovation.

Several more practical issues are also worth mentioning in this context. As stated at the outset, the West Rock Ridge project was modeled as an archaeological investigation of a landscape setting which to this date had gone unnoticed in terms of formal archaeological investigation. It was a great surprise of the research that the project actually represented one of the few formal archaeological surveys of any type undertaken in the city of modern day New Haven, Connecticut. This is because of the widespread urban development which has been characteristic of the growth of this city, which can truly be described as one of the oldest commercial centers in the United States.

Another practical consideration of the survey project was the importance of using surface survey in environmental settings which are too sloped or rocky under normal conditions to warrant the conducting of a test pit survey strategy. It was this very type of consideration which led to the discovery of the Wintergreen Notch site. This latter site in

turn represents perhaps the best evidence acquired from the survey for the importance of Connecticut's trap-rock ridges in the state's prehistory. Although the site was located on sloped and rocky ground, and under normal survey protocol would have been omitted from formal test pitting strategies, the site turned out to be a very extensive ambush hunting location utilized during the Late Archaic.

Finally, I would argue that the theme of this research is very much in keeping with the current effort to preserve Connecticut's trap-rock ridges as important natural areas still existing in the State and Southern New England. It is interesting that population pressure is perhaps one of the factors that can be identified which poses a threat to these unique components of the landscape of Connecticut's Central Lowlands.

Yet, the Late Archaic Small Stemmed Point Tradition peoples may have witnessed the increasing importance of environments such as West Rock Ridge as their once sparse hunter-gatherer densities began to fill more and more of the landscape. At this time Connecticut's trap-rock ridges provided new opportunities and more intimate relations with species and ecological habitats that had previously been less well known. Perhaps one of the greatest legacies of Connecticut's trap-rock ridges is the lessons that can be learned concerning the ways that population pressure can spurn learning and unique experiences on the part of human populations; and perhaps this all argues for the preservation of landscapes and ecological habitats, while finding better and more insightful ways for coping with the issue of increasing population stress in the future?

Summary of Research Conclusions

West Rock Ridge is one of Connecticut's largest trap-rock ridges. It represents a rugged upland diabase ridge having a steep and precipitous west facing cliff and a more gently sloping eastern face that descends at an angle of about 25º. This rugged upland is situated in the otherwise level, broad and fertile South-Central Connecticut Lowlands.

The West Rock Ridge project represented an innovative attempt to interpret data from an upland archaeological setting. Taking into account that these types of environments can produce new and unique types of data it was concluded that similarly new and unique techniques should be considered in their interpretation. In this case prehistoric land use patterns were modeled in terms of how marginal resource patches became important to hunter-gatherer cultures due to increasing population density and territorial packing. It was under these conditions that hunter-gatherer societies were predicted to incorporate previously marginal habitats into their annual movements due to an increased need to cover their available territorial ranges more thoroughly.

A hypothesis was tested that a bias on the part of Small Stemmed Point Tradition occupation of West Rock Ridge could be explained in terms of the context described above. It was proposed that increasing population density and territorial packing had led to more intensive and thorough exploitation of available habitats within those territorial ranges available to a local resident Small Stemmed Point Tradition population. This hypothesis was supported by data collected during the West Rock Ridge project.

Additionally it was concluded that aside from the demographic factors mentioned above, that aspects of cultural organization such as mobility, subsistence and technology also have strong influence on how thoroughly hunter-gatherers cover their landscapes. Specifically characteristics of the adaptation of Small Stemmed Point Tradition peoples such as: 1) high residential mobility, 2) a growing sense of territoriality, 3) a foraging mobility strategy, and 4) reliance to a significant degree on hunted resources; contributed to the thoroughness with which local subsistence units covered available territorial ranges.

Although one can not argue from negative evidence it is important to note that Susquehanna Tradition occupation of West Rock Ridge was considerably less than was the case for the Small Stemmed Point Tradition, despite the fact that these traditions appear to have co-existed in Southern New England, at least for a time. It was concluded that greater logistical mobility, and perhaps focal dependence on vegetative and/or aquatic species adjacent to habitations sites, may have resulted in an adaptation requiring much more selectivity, in terms of the types of resource patches which were exploited, by Susquehanna Tradition people.

The West Rock Ridge project demonstrated the significance of archaeological research at Connecticut's trap-rock ridges through the elaboration of techniques and resource opportunities that were less well understood previously, for instance: 1) the significance of ambush hunting, 2) lookout sites, and 3) local sources of chert; to prehistoric hunter-gatherers living in South-Central Connecticut.

Bibliography

Ames, Kenneth M.
2002 Going by Boat: The Forager-Collector Continuum at Sea. In *Beyond Foraging and Collecting: Evolutionary Changes in Hunter-Gatherer Settlement Systems*, edited by B. Fitzhugh and J. Habu, pp. 19-52. Kluwer Academic/Plenum Publishers, New York.

Andrefsky, William Jr.
1998 *Lithics: Macroscopic Approaches to Analysis*. Cambridge Press, Cambridge.

Atwater, Edward E.
1902 *History of the Colony of New Haven to its Absorption into Connecticut, Volume 2*. Journal Publishing Company, Meriden.

Barber, Michael B.
1981 Archaeological Perspective of the Northern Blue Ridge. In *Upland Archaeology in the East: Symposium Number One*, pp. 116-139. Special Publication Number 38-Part One, Archaeological Society of Virginia.

Bartram, Laurence Eugene Jr.
1993 *An Ethnoarchaeological Analysis of Kua San (Botswana) Bone Food Refuse.* Ph.D. dissertation, University of Wisconsin–Madison.

Bamforth, D. B.
1986 Technological Efficiency and Tool Curation. *American Antiquity* 51:38–50.

Bellantoni. Nicholas
2002 Personal Communication.

Bell, Michael
1985 *The Face of Connecticut: People, Geology, and the Land*. State Geological and Natural History Survey of Connecticut, Hartford.

Binford, Lewis R.
1977 Forty-Seven Trips: A Case Study in the Character of Archaeological Formation Processes. In *Stone Tools as Cultural Markers: Change. Evolution and Complexity,* edited by R. V. S. Wright, pp. 24–36. Humanities Press, New Jersey.
1979 Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological Research* 35(1) Fall 255–273.
1980 Willow Smoke and Dog's Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45(1):1-17.
2001 *Constructing Frames of Reference: Analytical Method for Archaeological Theory Building Using Ethnographic and Environmental Data Sets.* University of

California Press, Berkeley.

Bourn, Richard
1966 Pebble-made Projectile Points. *Bulletin of the Massachusetts Archaeological Society* 28(1).

Boudreau, Jeffrey
1981 Replicating Quartz Squibnocket Small Stemmed and Triangular Projectile Points. In *Quartz Technology in Prehistoric New England,* edited by Russell J. Barber, pp. 5–33. Peabody Museum, Harvard University, Cambridge.

Bradford, William
1856 *Of Plymouth Plantation* [History of Plymouth Plantation]. Reprint, Harvey Wish, editor. Capricorn Books, 1962, New York.

Bragdon, Kathleen J.
1996 *Native People of Southern New England, 1500-1650.* University of Oklahoma, Norman.

Brasser, T. J.
1978 Mahican. In *Handbook of North American Indians, Volume 15, Northeast,* edited by Bruce Trigger, pp. 198–212. Smithsonian Institution, Washington.

Brennan, L. A.
1967 The Taconic Tradition and the Coe Axiom. *New York State Archaeological Society Bulletin* 39:1–14.

Calogero, Barbara
2006 Personal Comunication.

Cantwell, Anne-Marie, and Diana diZerega Wall
2001 *Unearthing Gotham: the Archaeology of New York City.* Yale University Press, New Haven.

Cassedy, Daniel F.
1999 The Archaic Florescence: The Late and Terminal Archaic Periods of Connecticut as Seen from the Iroquois Pipeline. *Bulletin of the Archaeological Society of Connecticut* 62:125–139.
2007 From Little Falls to Long Island Sound: Archaeology of the Iroquois Pipeline. *Bulletin of the Archaeological Society of Connecticut* 69:5–37.

Ceci, Lynn
1977 *The Effect of European Contact and Trade on the Settlement Pattern of Indians of Coastal New York, 1524-1665: The Archaeological Documentary Evidence*. Ph.D. dissertation, Department of Anthropology, City University of New York.

Charnov, Eric L., and Gordon Orians
1973 *Optimal Foraging: Some Theoretical Explorations.* M.A. Thesis, Department of Biology, University of Utah.

Coleman, Margaret E.
2005 *The Goelogic History of Connecticut's Bedrock.* State Geological and Natural History Survey of Connecticut, Special Publication 2.

Coe, J. L.
1964 The Formative Cultures of the Carolina Piedmont. *Transactions of the American Philosophical Society* 54(5).

Cohen, Mark Nathan,
1977 *The Food Crisis in Prehistory: Overpopulation and the Origins of Agriculture.* Yale University Press, New Haven.

Crowell, A., and Hitchcock R.
1978 Basarwa Ambush Hunting in Botswana. *Botswana Notes and Records* 10: 37–51.

Cuzzone, Holly
2006 Personal Communication.

Dake, H. C., Frank L. Fleener, and Ben Wilson
1938 *Quartz Family Minerals: A Handbook for the Mineral Collector*. Whittlesey House, New York.

Dana, James Dwight
1891 *On the Four Rocks of the New Haven Region, East Rock, West Rock, Pine Rock and Mill Rock.* Tuttle, Moorehouse & Taylor, New Haven.

Davis, Margaret B.
1967 Late-glacial Climate in Northern United States: A Comparison of New England and the Great Lakes Region. In *Quaternary Paleoecology,* edited by E. J. Cushing, and H.E. Wright Jr., pp. 11–43. Yale University Press, New Haven.
1968 Rodgers Lake. *Ecology* Vol. 50, No. 3:409–422.

Davis, Margaret B., T. E. Bradstreet, R. Stuckenrath, Jr., and H. W. Bornes, Jr.
1975 Vegetation and Associated Environments During the Past 14,000 Years Near Moulton Pond, Maine. *Quaternary Research* 5(3):435–466.

Dincauze, Dena F.
1968 *Cremation Cemeteries in Eastern Massachusetts.* Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University Vol. 59, No. 1, Peabody Museum, Cambridge.

1971 An Archaic Sequence for Southern New England. *American Antiquity* 36:(2): 194–198.
1973 Prehistoric Occupation of the Charles River Estuary. *Bulletin of the Archaeological Society of Connecticut* 36:25–39.
1974 An Introduction to Archaeology in the Greater Boston Area. *Archaeology of Eastern North America* 2:39–66.
1975 The Late Archaic in Southern New England. *Arctic Anthropology* 12(2):23–24.
1976 *The Neville Site: 8,000 Years at Amoskeag Manchester, New Hampshire.* Cambridge, Peabody Museum Monographs, No. 4, Cambridge.

Dowhan, Joseph J., and Robert J. Craig
1976 *Rare and Endangered Species of Connecticut and Their Habitats.* State Geological and Natural History Survey of Connecticut, Hartford.

Donato, Simon,
2002 Personal Communication.
2003 Personal Communication.

Dunnell, R. C.
1992 The Notion Site. In *Space, Time, and Archaeological Landscapes,* edited by J. Rossignol and L. Wandsnider, pp. 21-41. Plenum, New York.

Ebert, James I.
1992 *Distributional Archaeology*. University of Utah Press, Salt Lake City.

Ericson, Jonathon E.
1984 Toward the Analysis of Lithic Production. In *Prehistoric Quarries and Lithic Production,* edited by Jonathon Ericson and Barbara Purdy, pp. 1–9. Cambridge University Press, New York.

Feder, Kenneth L.
2001 Prehistoric Land-Use Patterns in North-Central Connecticut: A Matter of Scale. In *Archaeology of Appalachian Highlands,* edited by Lynne P. Sullivan and Susan C. Prezzano, pp. 19–30. University of Tennessee, Knoxville.
2009 Personal Communication.

Feder, Kenneth L, and Marc Banks
1996 Archaeological Survey of the Mclean Game Refuge, Granby and Simsbury, Connecticut. *Bulletin of the Archaeological Society of Connecticut* 59:39–51.

Flenniken, J. J.
1991 The Diamond Lil Site: Projectile Point Fragments as Indicators of Site Function. *Journal of California and Great Basin Anthropology* 8: 37-49.

Flint, Richard Foster, Ph.D.
1930 *The Glacial Geology of Connecticut*. State of Connecticut Geological and Natural History Survey, Bulletin No. 47, Hartford.

Fogleman, Gary L.
1992 *Projectile Point Typology for Pennsylvania and the Northeast*. Fogelman Publishing, Turbotville.

Foss, Robert W.
1981 Blue Ridge Prehistory: A Perspective from the Shenandoah National Park. In *Upland Archaeology in the East: Symposium Number One*, pp. 91-103. Special Publication Number 38-Part One, Archaeological Society of Virginia.

Funk, Robert E.
1976 *Recent Contributions to Hudson Valley Prehistory*. New York State Museum Memoir 22, University of the State of New York, Albany.
1978 Post-Pleistocene Adaptations. In *Handbook of North American Indians, Volume 15, Northeast,* pp. 16–27. Smithsonian Institution, Washington.

Gamble, C. S., and W. A. Boismier eds.
1991 *Ethnoarchaeological Approaches to Mobile Campsites: Hunter-Gatherer and Pastoralist Case Studies.* International Monographs in Prehistory, Ethnoarchaeological Series 1, Ann Arbor.

Gardner, William M.
1974 The Flint Run Complex: Pattern and Process during the Paleo-Indian to the Early Archaic. In *Occasional Papers of the Catholic University of America* pp. 5–47, Washington, D. C.
1981 What Goes Up Must Come Down: Transhumance in the Mountain Zones of the Middle Atlantic. In *Upland Archaeology in the East: Symposium Number One*, pp. 2–42. Special Publication Number 38-Part One, Archaeological Society of Virginia.

Goddard, Ives
1978 Eastern Algonquian Languages. In *Handbook of North American Indians, Volume 15, Northeast,* edited by Bruce Trigger, pp. 70–77. Smithsonian Institution, Washington.

Gramly, Richard M.
1980 Mount Jasper: A Direct-Access Lithic Source Area in the White Mountains of New Hampshire. In *Prehistoric Quarries and Lithic Production* edited by Jonathon Ericson and Barbara Purdy, pp. 11–21. Cambridge University Press, New York.
1982 The Vail Site: A Paleo-Indian Encampment in Maine. Bulletin of the Buffalo Society of Natural Sciences, Volume 30.

Hammerson, Geoffrey A.

2004 *Connecticut Wildlife: Biodiversity, Natural History, and Conservation.* University Press of New England, Lebanon.

Hitchcock, Robert K.
1983 *Ethnoarchaeology of Sedentism: Mobility Strategies and Site Structure Among Foraging and Food Producing Populations in the Eastern Kalahari Desert, Botswana*. Ph.D. dissertation, University of New Mexico.

Horn, H.
1968 The Adaptive Significance of Colonial Nesting in the Brewers Blackbird *(Euphagus cyanocephalus). Ecology* 49:282–294.

Jochim, Michael A.
1998 *A Hunter-Gatherer Landscape: Southwest Germany in the Late Paleolithic and Mesolithic.* Plenum Press, New York.

Jones, Brian D.
1997 The Late Paleoindian Hidden Creek Site in Southeastern Connecticut. *Archaeology of Eastern North America* 25:45–80.

Juli, Harold D.
1999 Current Perspectives on Early and Middle Woodland Archaeology in Connecticut. *Bulletin of the Archaeological Society of Connecticut* 62:141–153.

Kavasch, Barrie
1981 *Guide to Northeastern Wild Edibles*. Hancock House, Blaine.
1994 Native Foods of New England. In *Enduring Traditions: The Native Peoples of New England*, edited by Laurie Weinstein, pp. 5–30. Bergin & Garvey, Westport.

Kelly, Robert L.
1995 *The Foraging Spectrum*. Smithsonian Press, Washington.

Kinsey, W. Fred III
1972 *Archaeology in the Upper Delaware Valley: A Study of the Cultural Chronology of the Tocks Island Reservoir.* Anthropological Series Number 2, Pennsylvania Historical and Museum Commission, Harrisburg.

Kooyman, Brian P.
2000 *Understanding Stone Tools and Archaeological Sites.* University of New Mexico Press, Albuquerque.

Kuijt, I., W. C. Prentiss, and D. L. Pokotylo
1995 Bipolar Reduction: An Experimental Study of Debitage Variability. *Lithic Technology* 20:116–127.

Lacy, David M.
2000 Myth Busting and Prehistoric Land Use in the Green Mountains of Vermont. In *The Archaeological Northeast*, edited by Levine, M. A., Sassman, K. E., and Nassaney, M. S., pp. 115–137. Bergin & Garvey, Westport.

La Porta & Associates, LLC
2003 *Prehistoric Quarry Survey for the Phase 1B Supplemental Investigation of Chester Golf Club Subdivision, Town of Chester, Orange County, New York.*
2000 *Phase 1B Cultural Resources Survey-Supplement: Characterization of Prehistoric Quarry Development, Smiths Basin Site, Town Hartford, Washington County, New York.* Office of Parks, Recreation and Historic Preservation, Peebles Island, New York.

Lavin, Lucianne
1984 Connecticut Prehistory: A Synthesis of Current Archaeological Investigations. *Bulletin of the Archaeological Society of Connecticut* 47:55–72.
1988 The Morgan Site, Rocky Hill, Connecticut: A Late Woodland Farming Community in the Connecticut River Valley. *Bulletin of the Archaeological Society of Connecticut* 51:7–22.

Lavin, Lucianne, and Russell, Lyent W.
1985 Excavation of the Burwell-Karako Site: New Data on Cultural Sequences and Artifact Typologies in Southern New England. *Bulletin of the Archaeology Society of Connecticu*t 48:45–87.

Larneo, Larry
1999 *Travelling the Merrit Parkway*. Images of America Series, Arcadia Press.

Leacock, Eleanor
1998 Women's Status in Egalitarian Society: Implications for Social Evolution. In *Limited Wants, Unlimited Means: A Reader on Hunter-Gatherer Economics and the Environment,* edited by John Gowdy, pp. 139–164. Island Press, Washington, D.C.

Lee, Cara
1985 *West Rock to the Barndoor Hills: Traprock Ridges of Connecticut.* State Geological and Natural History Survey of Connecticut, Hartford.

Lentz, David
1999 Personal Communication.

Little, Richard D.
1986 *Dinosaurs, Dunes, and Drifting Continents: The Geohistory of the Connecticut Valley, 2nd Edition.* Greenfield Community College.

Ludwig, Frances

1981 *The Lake Wintergreen Property*. A report prepared for the South Central Connecticut Regional Water Authority, New Haven, Connecticut.

MacArthur, R. H., and E. R. Pianka
1966 On Optimal Use of a Patchy Environment. *American Naturalist* 100:603–609.

MacCurdy, Gregory G.
1914 The Passing of a Connecticut Rockshelter. *Bulletin of the Archaeology Society of Connecticut* 31:9–17.

Mann (Roy Mann Associates)
1981 *A Use Plan for West Rock Ridge State Park.* CT DEP Office of Parks and Recreation.

Marquardt, W. H., and C. L. Crumley
1987 Theoretical Issues in the Analysis of Spatial Patterning. In *Regional Dynamics: Burgundian Landscapes in Historical Perspective*, edited by C. L. Crumley and W. H. Marquardt, pp. 1-18. Academic Press, San Diego.

McBride, Kevin A.
1978 Subsistence in the Lower Connecticut River Valley: Evidence from Woodchuck Knoll. *Man in the Northeast* 15-16:124–132.
1984 *Prehistory of the Lower Connecticut Valley.* Ph.D. dissertation, University of Connecticut.

McBride, Kevin A., and Robert E. Dewar
1981 Prehistoric Settlement in the Lower Connecticut River Valley. *Man in the Northeast* 22:37–66.

McNett, C. A.
1985 *Shawnee Minisink.* Academic Press, New York.

Menta, John
2003 *Cultural Conflict in Southern New England: A History of the Quinnipiac Indians*. Yale University, New Haven.

McWeeney, Lucinda
1994 *Settlement Patterns and Vegetation Dynamics in Southern New England in the Late Quaternary*. Ph.D. dissertation, Yale University.

Moeller, Roger A.
1980 *6LF21: A Paleo-Indian Site in Western Connecticut*. American Indian Archaeological Institute, Occasional Paper No. 2.

Munich, Adrianne

1976 *New Haven Outdoors: A Guide to the City's Parks*. Citizens Park Council of New Haven.

Murray, Jim,
2002 Personal Communication.

Odell, George H.
2004 *Lithic Analysis*. Kluwer Academic/Plenum Publishers, New York.

Pagoulatos, Peter
1986 *Terminal Archaic Settlement and Subsistence in the Connecticut River Valley.* Ph.D. dissertation in Anthropology, University of Connecticut.

Parry, William J.
1989 The Relationship Between Lithic Technology and Changing Mobility Strategies in the Middle Atlantic Region. In *New Approaches to Other Pasts,* edited by W. Fred Kinsey, III and Roger W. Moeller, pp. 29-34. Archaeological Services, Bethlehem.

Parry, Willian J., and Robert L. Kelly
1987 Expedient Core Technology and Sedentism. In *The Organization of Core Technology,* edited by Jay K. Johnson and Carol A. Morrow, pp. 285–312. Westview Press, Boulder.

Parsons, Nancy
2006 *West Rock Nature Center Site: The Analysis of Lithic Tools of a Pre-Colonial Indigenous Culture.* Thesis Paper at Southern Connecticut State University.

Pfeiffer, John E.
1984 The Late and Terminal Archaic Period in Connecticut. *Bulletin of the Archaeological Society of Connecticut* 47:73–88.

Reeve, Stuart A., and Katherine Forgacs
1999 Connecticut Radiocarbon Dates: A Study of Prehistoric Cultural Chronologies and Population Trends. *Bulletin of the Archaeological of Connecticut* 62:19–66.

Renfrew, Colin, and Paul Bahn
1991 *Archaeology: Theories, Methods and Practice.* Thames and Hudson, New York.

Rick, John W.
1976 Downslope Movement and Archaeological Intrasite Spatial Analysis. *American Antiquity* 41(2):133–144.

Ritchie, Duncan
1981 Quartz Reduction Sequences from Small Stemmed Point Contexts in the Taunton Basin, Southeastern Massachusetts. In *Quartz Technology in Prehistoric New England* edited by Russell J. Barber, pp. 95–115. Peabody Museum, Harvard University, Cambridge.

Ritchie, William A.
1965 *The Archaeology of New York State*. Purple Mountain Press, Fleischmanns.
1969 *The Archaeology of Martha's Vineyard*. Natural History Press, Garden City.
1971 *A Typology and Nomenclature for New York Projectile Points, Second Edition.* New York State Museum and Science Service Bulletin 384, Albany.

Ritchie, William A., and Robert E. Funk
1971 Evidence for Early Archaic Habitation on Staten Island. *Pennsylvania Archaeologist* 41(3):45–59.
1973 *Aboriginal Settlement Patterns in the Northeast.* Memoir 20, The University of the State of New York, Albany.

Robbins, Maurice
1960 *Wapanucket No. 6: An Archaic Village in Middleboro, Massachusetts.* Cohannet Chapter, Massachusetts Archaeological Society, Attleboro.

Robertson, James A.
1980 *Chipped Stone and Socio-Cultural Interpretations*. Masters Thesis, University of Illinois.

Rodgers, John, Robert M. Gates, and John Rosenfield
1956 *Explanatory Text for Preliminary Geological Map of Connecticut, 1956.* Connecticut State Geological and Natural History Survey, Bulletin No. 84, Storrs.

Rouse, Irving
1980 Ceramic Traditions and Sequences in Connecticut. *Bulletin of the Archaeological Society of Connecticut* 43:57–75.

Rozsa Ronald, and Joseph J. Dowhan
1977 *A Summary and Map of the Biotic Communities of West Rock Ridge.* Connecticut Geological and Natural History Survey.

Salwen, Bert
1978 Indians of Southern New England and Long Island: Early Period. In *Handbook of North American Indians, Volume 15, Northeast*, edited by Bruce Trigger, pp. 160–189. Smithsonian Institution, Washington.

Sargent, Howard B.
1952 A Preliminary Report on the Excavations at Grannis Island. *Bulletin of the*

Archaeological Society of Connecticut 26:30–50.

Seymor, Tom
2002 *Foraging New England*. The Globe Pequot Press, Guilford.

Sgarlata, Cosimo
2002 *Wintergreen Notch Site: An Archaeological Study of a Strategically Placed Prehistoric Hunting Camp in New Haven, Connecticut*. Report prepared for the State of Connecticut Historical Commission.
2006 The Archaeology of West Rock: The Importance of Trap-Rock Ridges in Connecticut Prehistory. *Bulletin of the Archaeological Society of Connecticut* 68:11–27.

Sheehan, Michael S.
2004 Ethnographic Models, Archaeological Data, and the Applicability of Modern Foraging Theory. In *Hunter-Gatherers in History, Archaeology and Anthropology,* edited by Alan Barnard, pp. 163–173. Berg, New York.

Simmons, William S.
1978 Narragansett. In *Handbook of North American Indians, Volume 15, Northeast,* edited by Bruce Trigger, pp. 190–197. Smithsonian Institution, Washington.

Smith, Bruce D.
1995 *The Emergence of Agriculture.* Scientific American Library, New York.

Smith, Carlyle Shreeve
1950 *The Archaeology of Coastal New York.* Anthropological Papers of the American Museum of Natural History Vol. 43, Part 2, New York.

Smith, Eric Alden
1983 Anthropological Applications of Optimal Foraging Theory: A Critical Review. *Current Anthropology* Vol. 24, No. 5, December: 625–651.

Snow, Dean R.
1980 *The Archaeology of New England*. Academic Press, New York.

Steward, Julian H.
1938 Basin-Plateau Aboriginal Socio-Political Groups. *Bureau of American Ethnology.* Bulletin 120.

Stewart, Michael R.
1981 Prehistoric Settlement Patterns in the Blue Ridge Province of Maryland. In *The Upland Archaeology in the East: Symposium: Number One,* pp. 43–90. Special Publication Number 38-Part One, Archaeological Society of Virginia.

Struever, S., and E. Holton
1979 *Koster: Americans in Search of the Prehistoric Past.* Anchor Press, New York.

Sussman, Carole
1985 Microwear on Quartz: Fact or Fiction? *World Archaeology* Jun. 17(1):101–111.

Swigart, Edmund K.
1974 *The Prehistory of the Indians of Western Connecticut*. The American Indian Archaeological Institute, Inc., Washington, CT.

Tarbuck, Edward J. and Lutgens, Frederick K.
1976 *The Earth: An Introduction to Physical Geology, Fourth Edition*. Macmillan Publishing Company, New York.

Thomas, David H.
1975 Nonsite Sampling in Archaeology: Up the Creek Without a Site? In *Sampling in Archaeology*, edited by James W. Mueller, pp. 61–81. University of Arizona Press, Tucson.

Tooker, William Wallace
1911 *The Indian Place-names on Long Island and Islands Adjacent, with Their Probable Signification.* G.P. Putnam's Sons, New York

Townshend, Charles H.
1900 *The Quinnipiac Indians and Their Reservation*. Tuttle, Morehouse & Taylor, New Haven.

Tuck, James A.
1978 Regional Cultural Development: 3,000 to 300 B.C. In *Handbook of North American Indiands, Volume 15, Northeast*, edited by Bruce Trigger, pp. 28–43. Smithsonian Institution, Washington.

Turnbaugh, W. A.
1975 Toward an Explanation of the Broadpoint Dispersal in Eastern North American Prehistory. *Journal of Anthropological Research* 31(1):51–68.

United States Department of Agriculture Soil Conservation Service
1979 *Soil Survey of New Haven County*.

Wadleigh, William M.
1981 Settlement and Subsistence Patterns in the Northeastern Highlands of Connecticut. *Man in the Northeast*, 22:67–84.

Waters, Michael R.
1992 *Principles of Geoarchaeology: A North American Perspective*. University of

Arizona Press, Tucson.

Wheeler, Girard
1937 *The West Wall of the New England Triassic Lowland*. Connecticut State Geological and Natural History Survey, Hartford.

Whittaker, John C.
1994 *Flintknapping: Making & Understanding Stone Tools*. University of. Texas Press, Austin.

Whitthoft, J.
1949 An Outline of Pennsylvania Indian History. *Pennsylvania History* 16(3):3–15.

Willey, Gordon R.
1953 *Prehistoric Settlement Patterns in the Virú Valley, Perú*. Smithsonian Institution Bureau of American Ethnology, Bulletin 155, Washington.

Williams, Roger,
1643 *A Key into the Language of America.* Gregory Dexter, London.

Winters, Howard D.
1969 *The Riverton Culture*. The Illinois State Museum, Reports of Investigations, No. 13, and The Illinois Archaeological Survey, Springfield.

Wobst, H. M.
1977 Stylistic Behavior and Information Exchange. In *Papers for the Director: Research Papers in Honor of James B. Griffin,* edited by C. E. Cleland, pp.317–342. University of Michigan Anthropological Papers, Volume 61, Ann Arbor.

Wojciechowski, Franz L.
1985 *The Paugussett Tribes : Ethnohistorical Study of the Interrelationships of the Indians of the Lower Housatonic River Area.* The Netherlands Catholic University of Nijmegen, Department of Cultural and Sociological Anthropology, Nijmegen.

Wood, William.
1977 *New England's Prospect*. University of Massachusetts Press, Amherst.

Woodburn, James
1998 Egalitarian Societies. In *Limited Wants, Unlimited Needs: A Reader on. the Hunter-Gatherer Environment,* edited by John Gowdy, pp. 87–110. Island Press, Washington, D.C.