

Archaeological Data Recovery in the Piceance and Wyoming Basins of Northwestern Colorado and Southwestern Wyoming

Edited by

Matthew J. Landt
(Principal Investigator)

Matthew J. Landt, Charles A. Reed, Jenn Mueller, Jeremy Omvig,
Rand A. Greubel, Jaclyn Mullen, Iraida A. Rodriguez,
Abbie L. Harrison, Michael J. Prouty, Jack E. Pfertsh,
Tracy L. Hoose, Sara A. Millward, Alan D. Reed,
Jonathon C. Horn, Justin P. Williams,
Stephanie Dudash, and Martha Bright



ARCHAEOPRESS ARCHAEOLOGY

ARCHAEOPRESS PUBLISHING LTD
Gordon House
276 Banbury Road
Oxford OX2 7ED

www.archaeopress.com

ISBN 978 1 78491 795 1
ISBN 978 1 78491 796 8 (e-Pdf)

© Archaeopress and the individual authors 2018

Cover: A refit biface from site 5MF3687.
Map showing distribution of Formative-period components by site type.

All rights reserved. No part of this book may be reproduced, in any form or
by any means, electronic, mechanical, photocopying or otherwise,
without the prior written permission of the copyright owners.

Printed in England by Oxuniprint, Oxford
This book is available direct from Archaeopress or from our website www.archaeopress.com

Contents

List of Figures.....	ix
List of Tables	xiii
Abstract.....	xvii
Acknowledgements	xix
Chapter 1: Introduction	1
by Alan D. Reed and Matthew J. Landt	
Project Background.....	1
Chapter 2: Effective Environment	3
by Rand A. Greubel, Jenn Mueller, Alan D. Reed, and Matthew J. Landt	
Physiography	3
Topography	3
Geology	4
Soils.....	4
Drainages	4
Flora.....	5
Fauna	5
Modern Climate	6
Paleoenvironment.....	6
Summary of Environmental Settings.....	7
Chapter 3: Culture History.....	9
by Jenn Mueller, Rand A. Greubel, Jonathon C. Horn, Alan D. Reed, and Matthew J. Landt	
Prehistory	9
Paleoindian Era	9
Archaic Era.....	11
Formative Era	12
Protohistoric Era.....	13
Historic Native American Period	14
Ute	14
Shoshone.....	15
Historic Euroamerican Period.....	16
Early Exploration and the Fur Trade	16
Transportation	17
Settlement, Ranching, and Agricultural Development	18
Mineral Resources	18
The Auto Age, Recreation, and Tourism	19
Chapter 4: Methods.....	21
by Matthew J. Landt, Alan D. Reed, Jonathon C. Horn, Justin P. Williams, Michael J. Prouty, Jenn Mueller, Abbie L. Harrison, Martha Bright and Stephanie L. Dudash	
Field Methods.....	21
Site Mapping.....	21
Remote Sensing.....	21
Excavation Methods	21

Laboratory and Analysis Methods	23
Flaked Stone Tool Analysis (by Alan D. Reed)	24
Debitage Analysis (by Justin P. Williams)	24
Raw Material	24
General Categories	25
Minimum Analytical Nodule Analysis	26
Techno-Morphological Class	27
Size Grade	28
Maximum Length	28
Dorsal Cortex	29
Ground Stone Analysis Methods (by Michael J. Prouty)	29
Morphology	29
Use Wear	30
Ground Stone Artifact Types	31
Handstones	31
Netherstones	31
Bowls	31
Personal Ornaments	31
Generic Fragment	31
Sub-Types	32
Obsidian Analysis	32
Ceramic Analysis	32
Faunal Analysis Methods (by Jenn Mueller)	32
Macrobotanical Remains (by Abbie L. Harrison)	33
Ancillary Analysis	34
Pollen	34
Starch	34
Organic Residue	34
Protein Residue	34
Geochemistry	35
Laser Induced Breakdown Spectrometry	35
Chronometric Analysis	35
Historic Artifact Analysis	35
Geomorphological Methods (by Stephanie L. Dudash)	35
Curation (by Martha Bright)	36
Chapter 5: Site Distribution and Settlement Patterns	37
by Jeremy Omvig and Iraida A. Rodriguez	
Radiometrics (by Jeremy Omvig)	37
The Project Dataset	37
Sample Selection	37
Discussion	38
Cultural Landscapes: A GIS and Drainage Catchment Analysis (by Iraida A. Rodriguez)	40
Previous Studies	45
GIS Landscape Approach	46
Archaeological and Physical Datasets	46
Methods	46
Results	48
Spatial Distribution of Sites	48
Temporal Distribution of Sites	50
Conclusion	50
Summary of Site Distribution and Settlement Patterns	61

Chapter 6: Subsistence	63
by Abbie L. Harrison, Jenn Mueller, and Matthew J. Landt	
Protein Residue Analysis (by Matthew J. Landt)	63
Results	63
Site 5MF2993 (Mud Spring Gulch Site)	64
Site 5MF3006 (Aught-Six Site).....	64
Site 5MF3012 (Guard House Site).....	66
Site 5MF3687 (KibRidge-Yampa Site).....	66
Site 48SW8810 (Sudden-Storm Site).....	66
Site 48SW16971 (The Red Lakes-Divide Site).....	66
Summary	66
Faunal Remains (by Jenn Mueller).....	67
Subsistence Strategies Over Time	70
Numic Exploitation of Highly Ranked Resources	74
Formative Era Diet Breadth	76
Correlations with Protein Residue Analysis	76
Fish Research.....	76
Directions for Future Research.....	78
Bone Processing (by Jenn Mueller).....	78
Paleoethnobotanical Evidence (by Abbie L. Harrison)	81
Methodology.....	83
Archaeologically Significant Plant Remains	84
Macrobotanical Evidence.....	84
Propagule Data	84
Wood Data	88
Pollen Evidence	90
Starch Evidence.....	94
Formative Era Floral Diet Breadth (2000–650 cal B.P.)	99
Domesticated Plant Subsistence Through Time	99
Corn	99
Beans	99
Gourd/Squash.....	99
Wild Plant Subsistence Through Time	100
Wood Use Through Time	100
Future Research	100
Seasonality (by Jenn Mueller)	100
Summary of Subsistence Analyses	104
Chapter 7: Prehistoric Technology	107
by Rand A. Greubel, Jaclyn Mullen, Jeremy Omvig, Michael J. Prouty, Charles A. Reed, and Jenn Mueller	
Projectile Point Chronology (by Jaclyn Mullen).....	107
Methods.....	108
Projectile Point Types	108
The Elko Series	108
Elko Corner-Notched	109
Elko Side-Notched.....	110
Elko Eared.....	111
Gatecliff Series.....	111
Gatecliff Contracting Stem	111
Gatecliff Split Stem	112
Northern Side-Notched.....	113
San Rafael Stemmed	114

Rosegate Series	114
Uinta Side-Notched.....	116
Cottonwood Triangular.....	116
Desert Side-Notched.....	117
Trends in the Data	118
Contribution of the Project Data	118
Large-Site Sampling Bias	119
The Terminal Archaic Decline	119
Temporal Distribution of Projectile Points.....	121
Summary	124
Differentiating Dart and Arrow Points (by Jaclyn Mullen).....	125
Methods.....	126
Full Dataset Analysis	126
Basal-Width Distribution	127
Shoulder-Width Distribution	127
Elko and Rosegate Analysis	130
Basal-Width Distribution	130
Shoulder-Width Distribution	131
Trends in the Database	132
Summary	135
Organization of Flaked Lithic Technology (by Rand A. Greubel)	135
Reduction Strategies	135
Discussion of Data Compilation Methods.....	137
Results.....	138
Atemporal Variability	138
Synchronic Variability	146
Paleoindian Period	146
Pre-Spring Creek Anthrosol	147
Settled Period/Opal Phase	147
Transitional Period/Pine Spring Phase	147
Formative Period/Uinta Phase	147
Protohistoric	147
Diachronic Variability	149
Suggestions for Future Research.....	160
Lithic Raw Material Use	161
Regional Lithic Sources	161
Green River Oolitic Chert.....	161
Morgan and Madison Chert.....	163
Bridger Chert	163
Browns Park Chert	164
Research Questions	164
Results.....	164
Green River Oolitic Chert.....	165
Uinta Quartzite.....	165
Morgan-Madison Chert.....	168
Bridger Chert	173
Conclusions	173
LIBS and MAN (by Jeremy Omvig and Charles A. Reed)	176
Background (by Charles A. Reed)	176
LIBS Analysis	176
MAN Analysis.....	176
Sample Selection and Bias	177
Results of LIBS Analysis (by Jeremy Omvig)	179

Quarry Frequency Over Time.....	179
Quarry Frequency	180
Spatial and Temporal Use of Bridger Chert: Summary and Conclusions.....	184
LIBS and MAN Correlation (by Charles A. Reed).....	184
Methodology and Dataset.....	184
Results.....	185
Morphology.....	188
Keyword Simplification.....	188
Summary and Conclusions	193
Future Directions	194
Obsidian (by Jenn Mueller)	194
Ground Stone (by Michael J. Prouty).....	195
Methods.....	195
Results	196
Ground Stone Tool Function and Assemblage Composition.....	196
Material Type.....	197
Level of Wear	199
Intensity of Manufacture	199
Temporal Trends of Ground Stone Tools	203
Summary	204
Worked Bone and Shell (by Jenn Mueller)	205
Temporal Trends in Worked Bone	212
Ceramics (by Jenn Mueller)	215
Summary of Technological Analyses	215
Chapter 8: Thermal Features	219
by Sara A. Millward	
Methods	219
Thermal Features Through Time.....	220
Feature Distribution by Site Function.....	223
Fire-Cracked Rock	224
Storage Features and Caches.....	225
Thermal Feature Summary	226
Chapter 9: Prehistoric Architecture	227
by Charles A. Reed and Matthew J. Landt	
Basin Houses (by Charles A. Reed).....	227
Definition of a Basin House	229
Project Dataset	230
Methods.....	232
Shape.....	233
Utilized Methods	233
Diameter	234
Area	234
Volume.....	234
Basin House Metrics	235
Project Sites	235
Diameter and Depth.....	235
Area	236
Non-Project Dataset.....	237
Summary	238
Variation by Region	239
Metric Summary.....	239

Chronology	240
Paleoclimate and Frequency	245
Sites 5MF3006, 5MF3012, 5MF7046, and 48SW8810 (SE 6 and 7, CI 4 and 5)	247
Site 48SW16971 (SE 8 and 9, CI 7 and 8)	249
Chronology and Paleoclimate Summary	249
Architectural Variation Across Time	250
Basin House Construction	250
Project Structural Materials and Features	252
Postholes and Other Structural Remnants	253
Modeling of Resource Costs	254
Structure Basins: Excavated or Occupied?	258
Entryways	259
Multi-Roomed Structures	260
Bilobed and Connected Structures	260
Intramural Thermal Features	261
Storage Technology	261
Basin House Occupation	263
Manners of Reoccupation	264
Project Sites	264
Non-Project Sites	266
Reoccupation Summary	266
Abandonment Conflagration	268
Summary	270
Future Directions	271
Duration of Basin House Occupations (by Matthew J. Landt)	271
Excavation Approach	272
Aught-Six Basin House	276
Period of Occupation	276
Dates from Extramural Areas	276
Local Environment and Diet Breadth	277
Construction Design	284
Artifact Density and Distribution	285
Intramural Area	285
Extramural Areas	285
Adjacent Areas	285
Distant Areas	286
Summary	290
Architectural Summary	290
Chapter 10: Application of Remote Sensing	295
by Matthew J. Landt	
The Aught-Six Site (5MF3006)	295
Preliminary Geophysical Results	295
Excavations	296
Geophysical Efficacy	298
The Red Lakes-Divide Site (48SW16971)	298
Preliminary Geophysical Results	300
Excavations	300
Geophysical Efficacy	300
Ground-Penetrating Radar	301
Magnetometer	301
Susceptibility	301
Electrical Resistance	304
Conductivity	304
Assessment of Geophysical Investigations	304

Chapter 11: Utility of Prehistoric Archaeological Units	305
by Matthew J. Landt	
History of Regional Archaeological Units	305
Paleoindian Era	307
Current Research	307
The Utility of the Paleoindian Unit.....	308
Archaic Era	308
Current Research	308
The Utility of the Archaic Archaeological Units.....	310
Formative Era.....	311
Current Research	311
The Utility of the Formative Archaeological Units.....	312
Protohistoric	312
Current Research	313
The Utility of the Protohistoric Archaeological Units.....	313
Summary of Archaeological Units	313
Chapter 12: Historic Research Themes	315
by Jack E. Pfertsh and Tracy L. Hoose	
Mechanisms in Settlement Patterns	316
Homestead Laws	316
Economy.....	316
Advertising	317
Plat/Parcel Data	318
Summary	319
Farming Techniques and Technology.....	321
Plat/Parcel Data	321
Summary	323
Socioeconomic Status	323
Homestead Laws	324
Parcel/Plat Data	324
The Degryse Homestead (Site 5MF5693).....	324
The Haussler Homestead (Site 5RB4930).....	325
Summary	325
Effects of National Policies and Economics.....	325
Summary	327
Dependency on the Federal Government.....	328
Naïve Optimism in the Face of Harsh Reality	329
Summary of Historic Research Themes.....	331
Chapter 13: Project Evaluation	333
by Matthew J. Landt and Alan D. Reed	
Section 106.....	333
Scientific Value	333
Chronology	333
Subsistence	334
Technology	334
Settlement Patterns	334
Site Structure	335
Cultural Affiliation/Archaeological Units	335
Research Contributions from Data Recovery	335
Future Research Goals	335
References	337

List of Figures

Figure 1. General location of the project corridor.....	2
Figure 2. Regional prehistoric chronologies.....	10
Figure 3. Flaked stone tool analysis flowchart.....	24
Figure 4. Comparison of the conventional and calibrated dates for the dataset.....	39
Figure 5. Comparison of the project and northwest Colorado radiocarbon distribution.....	41
Figure 6. Project radiocarbon frequency by date and time period.....	42
Figure 7. Comparison of charcoal and organic sediment frequencies from the project radiocarbon dataset.....	43
Figure 8. Location of the study area.....	44
Figure 9. Drainage catchments crossed by the study area (see Table 9 for the drainage catchment map key).....	47
Figure 10. Frequency of site types by drainage catchment size.....	48
Figure 11. Site density within in the study area.....	52
Figure 12. Distribution of Paleoindian-era components by site type.....	53
Figure 13. Distribution of Pioneer-period components by site type.....	54
Figure 14. Distribution of Settled-period components by site type.....	55
Figure 15. Distribution of Transitional-period components by site type.....	56
Figure 16. Distribution of Terminal-period components by site type.....	57
Figure 17. Distribution of Formative-period components by site type.....	58
Figure 18. Distribution of Protohistoric-era components by site type.....	59
Figure 19. The temporal distribution of sites with a 5-km foraging radius of RB in the Outlet Spring Creek drainage catchment.....	60
Figure 20. Sample sizes of identifiable specimens from pipeline components (excluding large outliers).....	68
Figure 21. Number of components in each 500-year interval of each cultural period.....	73
Figure 22. Number of taxa identified at sites over time, comparing sample types.....	73
Figure 23. Change in frequency of simple animal categories over time.....	75
Figure 24. Graph depicting amount of green fractures in the faunal assemblage over time (cal B.P.).....	82
Figure 25. Ubiquity of charred propagules and related plant parts through time.....	87
Figure 26. Ubiquity of wood taxa through time.....	91
Figure 27. Ubiquity of economically significant pollen taxa through time.....	95
Figure 28. Ubiquity of economically significant starch taxa through time.....	98
Figure 29. Folsom point (Artifact FS2114) from site 5MF3687.....	108
Figure 30. Elko Corner-notched dart points. The bottom row reflects representative points collected during project excavations...	109
Figure 31. Examples of Elko Side-notched from the current sample.....	110
Figure 32. Examples of Elko Eared points from the dataset.....	111
Figure 33. Examples of Gatecliff Contracting Stem from the dataset.....	112
Figure 34. Gatecliff Split Stem point was collected from site 5MF3002.....	113
Figure 35. Examples of Northern Side-Notched dart points from the dataset.....	113
Figure 36. Examples of San Rafael Stemmed points from the dataset.....	114
Figure 37. Examples of Rosegate projectile points from the dataset.....	115
Figure 38. Examples of Uinta Side-notched points from the dataset.....	116
Figure 39. Cottonwood Triangular projectile points.....	116
Figure 40. Examples of Desert Side-notched arrow points within the dataset.....	117
Figure 41. Frequency of point types by archaeological unit.....	119

Figure 42. Projectile point date ranges by archaeological unit.....	120
Figure 43. The temporal distribution and frequency of dart points in the dataset.....	123
Figure 44. The temporal distribution and frequency of arrow points in the dataset.....	124
Figure 45. Standardized measurements for shoulder and basal widths.....	126
Figure 46. Mean basal width of projectile points by 500-and 1000-year intervals.....	128
Figure 47. Distribution of all projectile points with intact basal widths.....	128
Figure 48. Mean shoulder width of projectile points by 500- and 1000-year intervals.....	129
Figure 49. Distribution of all projectile points with intact shoulder widths.....	129
Figure 50. Temporal distribution of basal widths by point type.....	131
Figure 51. Temporal distribution of shoulder widths by point type.....	132
Figure 52. Distribution of Elko and Rosegate projectile points by basal and shoulder widths.....	134
Figure 53. Reduction mode and percent of cortical, core, and all biface flakes by site function.....	142
Figure 54. Reduction mode by season of occupation for excavated components.....	144
Figure 55. Percentages of core flakes, all biface flakes, and expedient tools by season of occupation for excavated components.....	144
Figure 56. Reduction mode at sites with and without basin houses.....	145
Figure 57. Percentages of core flakes, biface flakes, and expedient tools at sites with and without basin houses.....	146
Figure 58. Mean reduction mode by functional site type for each temporal period.....	148
Figure 59. Mean percentages of expedient tools by functional site type for each temporal period.....	148
Figure 60. Mean percentages of core flakes, biface flakes, and expedient tools by temporal period, all functional site types combined.....	149
Figure 61. Reduction mode by archaeological unit (i.e., time period).....	151
Figure 62. Mean biface stage by archaeological unit (i.e., time period).....	151
Figure 63. Reduction modes of all dated components.....	152
Figure 64. Reduction mode by archaeological unit for all dated components (n = 138).....	152
Figure 65. Percentages of core flakes, biface flakes, and expedient tools from all dated components.....	153
Figure 66. Percentages of early and late biface flakes from all dated components.....	153
Figure 67. Mean percentages of early and late biface-manufacturing flakes by archaeological unit.....	154
Figure 68. Percentages of cortical and core flakes from all dated components.....	154
Figure 69. Percentages of core flakes and debris (shatter) from all dated components.....	155
Figure 70. Percentages of core and biface flakes from all dated basin house sites.....	157
Figure 71. Percentages of core and biface flakes from all dated sites without basin houses.....	158
Figure 72. Percentages of early and late biface flakes from all dated basin house sites.....	158
Figure 73. Percentages of early and late biface flakes from all dated sites without basin houses.....	159
Figure 74. Regional toolstone-bearing geological formations, ground-truthed lithic sources, and archaeologically documented quarry sites near the project corridor.....	162
Figure 75. Percentages of oolitic chert by distance to posited source.....	168
Figure 76. Percentages of cortical oolitic flakes by distance to posited source.....	169
Figure 77. Mean MLD of complete oolitic chert flakes by distance to posited source.....	169
Figure 78. Percentages of Uinta quartzite by distance to posited source.....	170
Figure 79. Percentages of cortical Uinta quartzite flakes by distance to posited source.....	170
Figure 80. Mean MLD of complete Uinta quartzite flakes by distance to posited source.....	171
Figure 81. Percentages of Morgan-Madison chert by distance to posited source.....	171
Figure 82. Percentages of cortical Morgan-Madison flakes by distance to posited source.....	172
Figure 83. Mean MLD of complete Morgan-Madison chert flakes by distance to posited source.....	172
Figure 84. Percentages of Bridger chert by distance to posited source.....	174

Figure 85. Percentages of cortical Bridger chert flakes by distance to posited source.	174
Figure 86. Mean MLD of complete Bridger chert flakes by distance to posited source.	175
Figure 87. Location of LIBS quarry groups and sites.	178
Figure 88. Quarry group frequency over time.	181
Figure 89. Quarry group frequency by time period.	182
Figure 90. Quarry group frequency along the project corridor.	183
Figure 91. CG 1 baseline color frequency graph.	190
Figure 92. CG 2 baseline color frequency graph.	191
Figure 93. WG 1 baseline color frequency graph.	191
Figure 94. WG 2 baseline color frequency graph.	193
Figure 95. Distribution of GS artifacts (n = 1,249).	197
Figure 96. Percentage of wear by GS artifact type.	199
Figure 97. An informally designed mano from site 5MF7046.	200
Figure 98. A formally designed mano from site 5MF3006.	200
Figure 99. A formally shaped metate from site 5MF3006, 5 cm bar for scale.	201
Figure 100. Total percentage of GS associated with a dated component.	203
Figure 101. Percentage of GS through time, by project.	204
Figure 102. Representative awls from site 5MF1915.	206
Figure 103. Knapped bone biface from site 5MF1915.	206
Figure 104. Representative discarded beads-in-progress and a discarded broken bead from site 5MF7046.	209
Figure 105. Groove-and-snap debris from bead production site 5MF7046.	209
Figure 106. Possible pendant from site 5MF3006.	211
Figure 107. Unknown hatched jackrabbit radius from site 5MF1915.	211
Figure 108. Distribution of thermal features by age.	221
Figure 109. Distribution of feature types 1–4 by feature date.	222
Figure 110. Distribution of feature types 5–8 by feature date.	222
Figure 111. Distribution of feature Types 9–11 by feature date.	223
Figure 112. Location of project sites with structural features.	228
Figure 113. Location of non-project sites with structural features within current dataset.	231
Figure 114. Box-and-Whisker plots of length and widths of architectural features.	236
Figure 115. Box and whisker plots of the varying area estimates.	238
Figure 116. Variation of length and width by region, project and non-project sites.	241
Figure 117. Variation of depth by region, project and non-project sites.	241
Figure 118. 2-sigma calibrated age ranges, B.P., of project architectural features, overlain on Wyoming and Colorado temporal periods. The blue lines bracket the two periods in which basin houses have been most frequently observed.	243
Figure 119. Distribution of project and non-project basin houses over time, with cultural phases at top.	244
Figure 120. Distribution of pooled median calibrated structure dates, by region, both project and non-project data.	246
Figure 121. Project basin house metrics, averaged across time.	250
Figure 122. Project and non-project structure depths, averaged across time.	251
Figure 123. Non-project basin house metrics, averaged across time.	251
Figure 124. Location of project sites within mapped modern vegetation communities.	255
Figure 125. Graphical depictions of hypothetical basin houses in Table 89.	257
Figure 126. Profile of structure 3173+00 at site 5MF3012, displaying apparent alternating episodes of structural reoccupation.	265
Figure 127. Different stages of excavation at the Aught-Six site.	274

Figure 128. Artifact densities from the cultural strata of the sample units at the Aught-Six site.....	275
Figure 129. Profile view of the basin house at the Aught-Six site.....	279
Figure 130. Proveniences strongly associated with the basin house at the Aught-Six site.....	280
Figure 131. Proveniences broadly associated with the basin house at the Aught-Six site.....	281
Figure 132. Faunal densities for areas temporally associated with the basin house (Component 3).....	288
Figure 133. Artifact densities for areas temporally associated with the basin house (Component 3).....	289
Figure 134. Expanded debitage density map.....	291
Figure 135. Expanded faunal density map.....	292
Figure 136. Geophysical results at site 5MF3006.....	297
Figure 137. Anomaly testing at site 5MF3006.....	299
Figure 138. Geophysical anomalies at site 48SW16971.....	302
Figure 139. Anomaly testing at site 48SW16971.....	303
Figure 140. Regional prehistoric chronologies.....	306
Figure 141. Atemporal, cumulatively identified taxa numbers.....	310
Figure 142. General location map of the Great Divide Colony.	320

List of Tables

Table 1. Chronology of Regional Archaic Periods.....	11
Table 2. Raw Material Descriptions.	26
Table 3. Nodule Types Used within the Raw Material Analyses.....	27
Table 4. Flake Type Definitions Summarized.....	28
Table 5. Size Grades Used in the Analysis.....	28
Table 6. Dorsal Cortex Categories.	29
Table 7. General Animal Categories Used in Faunal Analysis.	33
Table 8. RB Distance to Streams and Rivers by Drainage Catchment.	48
Table 9. Drainage Catchments Crossing the Study Area.	49
Table 10. FC Distance to Streams and Rivers by Drainage Catchment.....	51
Table 11. Outlet Spring Creek Archaeological Units and 5-km Foraging Radius.	61
Table 12. Sites with Artifacts Submitted for Protein Residue Analysis.	63
Table 13. Positive Protein Residue Samples by Site.....	64
Table 14. Antisera Used in Study.....	64
Table 15. Positive Protein Residue Synthetic Results.....	67
Table 16. Top Ten Animal Resources by Rank.	69
Table 17. Frequency of Component Occurrence of Identified Genera from the Combined Pipeline Dataset.	70
Table 18. Animal Ranking of Project Components.....	71
Table 19. Faunal Data from the Cultural Periods by 500-Year Interval, Used to Generate the Tilia Frequency Graph.	72
Table 20. Radiocarbon Results from Bison Collagen Extraction at Site 5MF5403.....	76
Table 21. Sites with Positive High Confidence Protein Residue Results and the Correlation with Recovered Faunal Remains....	77
Table 22. Spiral Fractures from Project Sites.....	81
Table 23. Plant Data Used in Analysis.	83
Table 24. Charred Propagule Taxa.	84
Table 25. Presence/Absence of Charred Propagule and Related Plant Part Taxa.....	86
Table 26. Wood Taxa.	88
Table 27. Presence/Absence of Wood.	89
Table 28. Pollen Taxa.	92
Table 29. Presence/Absence of Economically Significant Pollen.....	93
Table 30. Starch Taxa.....	96
Table 31. Presence/Absence of Starch Taxa.....	97
Table 32 continued. Summary of Seasonality Data from Project Sites.....	103
Table 32 continued. Summary of Seasonality Data from Project Sites.....	104
Table 32. Summary of Seasonality Data from Project Sites.....	102
Table 33. Summary of Seasonality Data.....	105
Table 34. Summary of Date Ranges by Projectile Point Type.....	118
Table 35. Summary of Projectile Points by Archaeological Unit.....	122
Table 36. Projectile Points Present Between 7000–6000 cal B.P.....	125
Table 37. Projectile Points Present Between 6000–5000 cal B.P.....	125
Table 38. Summary of Elko Series Basal Width.....	130
Table 39. Summary of Elko Series Shoulder Width by Point Type.....	131

Table 40. Definition of Reduction Modes Used in this Study.....	137
Table 41. Method of Assigning Reduction Mode.....	138
Table 42. Excavated Components and Selected Key Variables Used in the Study.	139
Table 42. Excavated Components and Selected Key Variables Used in the Study.	140
Table 42. Excavated Components and Selected Key Variables Used in the Study.	141
Table 43. Distance in Miles to Source for Each Excavated Site by Lithic Material Types.†.....	165
Table 44. Percentages of Lithic Material Types Identified in the Debitage Assemblages from the Excavated Components.	166
Table 45. Summary of Artifacts Submitted for LIBS Analysis.	177
Table 46. Summary of the LIBS Analysis Results.....	179
Table 47. Distance between LIBS Quarry Groups and Sites.	184
Table 48. Number of Artifacts Included in the Analysis.	185
Table 49. Sites with MANs Assigned to Multiple LIBS Sources.	185
Table 50. MAN Nodule Codes and Associated LIBS Sourced Artifacts.	186
Table 51. MAN Nodule Code Correlated to Multiple LIBS Groups.	187
Table 52. Multi-Artifact MANs Assigned to Singular LIBS Sources.	188
Table 53. Multiple-Artifact MANs with Only One Source.	189
Table 54. Example of Conversion of Original MAN Description into Keywords.	189
Table 55. Base Material Colors and Associated LIBS Source Groups.	189
Table 56. Simplified MAN Material Inclusions.	192
Table 57. Frequency of Inclusion Color and Type in Assemblage.	192
Table 58. Unique MAN Identifiers at the State Level.....	193
Table 59. Ground Stone Artifacts Recovered During Project Excavations	195
Table 60. Total Number of GS Artifacts by Site.....	196
Table 61. Distribution of GS Lithic Material.....	198
Table 62. Formal and Informal GS Tools	202
Table 63. Awls from Sites Investigated during the Project Mitigation.	207
Table 64. Bone Bead and Bone Bead Manufacturing Debris.....	208
Table 65. Recovered Bone Ornaments.....	210
Table 66. Unknown Bone Artifacts.....	210
Table 67. Worked Bone from Past Projects.....	213
Table 68. Distribution of Various Worked Bone Types Over Time.	214
Table 69. Summary of Ceramic Analysis of Sherds from Site 5MF1915.....	216
Table 70. Summary of Thermal Feature Types.....	220
Table 71. Percentages of Feature Types at Sites of Specified Functions.	224
Table 72. Frequencies of Thermal Feature Types by Site Function.....	224
Table 73. Distribution of FCR According to Feature Size and Shape.	225
Table 74. Storage Features Identified in the Pipeline Corridor.....	226
Table 75. Ground Stone Caches Recovered from Site 5MF3006.	226
Table 76. Project Sites with Architectural Structures.....	229
Table 77. Designations of Site Labels in Figure 113.	232
Table 78. Length and Depth Measurements of Project Basin Houses.	235
Table 79. Averages and Ranges of Project Structures.....	236
Table 80. Project Structure Areas.	237
Table 81. Range of Variation within the Non-Project Dataset.	238

Table 82. Physiographic Distribution of Architectural Sites in Wyoming and Colorado.	240
Table 83. Average Metrics of Structures by Region.	240
Table 84. Radiocarbon Samples for Project Architectural Features.	242
Table 85. Distribution of Non-Project Structures by Cultural Periods	245
Table 86. Project Structure Associated with Climate Intervals and Sediment Events.	247
Table 87. Evidence of Superstructure Material at Project Sites.	253
Table 88. Site Distance to Modern Structural-Beam Supporting Vegetation Communities.	256
Table 89. Hypothetical Basin House Metric Comparisons, after Reed et al. 2008.	257
Table 90. Structure Entry Data.	259
Table 91. Small Cultural Features Associated with Architectural Features.	262
Table 92. Area Occupied by Intramural Thermal Features of Structures.	263
Table 93. Evidence of Select Structural Reoccupation within Non-Project Dataset.	267
Table 94. Non-Project Sites with Possible Reoccupations and Longer Occupancy.	267
Table 95. Radiocarbon Dates from the Basin House at the Aught-Six Site (5MF3006).	278
Table 96. Radiocarbon Dates Associated with the Aught-Six Site Basin House Occupation.	278
Table 97. Floral Remains Associated with the Basin House.	282
Table 98. Animal Remains Associated with the Basin House.	283
Table 99. Functional Comparison of Areas in and around the Basin House.	287
Table 100. Indicator Matrix for Length of Basin House Occupation.	290
Table 101. Summary of Excavations at Site 5MF3006.	298
Table 102. Summary of Excavations at Site 48SW16971.	301
Table 103. Excavated Sites with Archaic Era Components.	309
Table 104. Sub-Periods of the Archaic Era.	311
Table 105. Sites with Excavated Formative-Era Components.	312
Table 106. Archaeological Units of the Greater Green River Basin.	314
Table 107. Land-Entry Dates and Types by Township/Range.	318
Table 108. Average Parcel Acreage per Capita and Family by Township/Range.	319
Table 109. Chronology of U.S. Management in Policy Making.	326

Abstract

In 2008 and 2009, a 14-in. natural gas liquids pipeline was constructed in Colorado and Wyoming. The 152-mi.-long pipeline is collocated with other pipelines, as it follows an existing utility corridor over most of its extent, from the Piceance Basin in Rio Blanco County northwards through Moffat County to a pipeline interconnect near Wamsutter, Wyoming. Because the pipeline crossed lands administered by the Bureau of Land Management and required federal authorizations, the National Historic Preservation Act of 1966 (as amended) was applicable. Alpine Archaeological Consultants, Inc. was hired to survey the route and to aid in compliance with Section 106 of the National Historic Preservation Act. The Colorado Bureau of Land Management State Office was the lead federal agency on the project.

Because the project is largely collocated with other pipelines in northwestern Colorado and southwestern Wyoming, it largely affect the same type of archaeological sites. Fourteen sites ranging, from Paleoindian to historic Euroamerican, were subjected to data recovery, though the details of those excavations are described elsewhere. Like previous pipeline projects in the utility corridor, Archaic basin houses were encountered at several sites. Other sites are thought to represent campsites or resource procurement and processing locations. Moderate quantities of lithic artifacts were recovered, but most sites yielded relatively low quantities of animal bones or macrobotanical remains. Project results are synthesized with data from other pipeline projects, which produces a large set of archaeological data that are synthesized herein.

The major research themes presented in this volume synthesize chronometric and spatial information (Chapter 5), subsistence (Chapter 6), prehistoric technology (Chapter 7), small cultural features (Chapter 8), prehistoric architecture (Chapter 9). Chapter 10 describes the results of remote sensing at two prehistoric sites in the project corridor and Chapter 11 discusses changes to regional prehistoric archaeological units based on project data. Chapter 12 clarifies historic research themes addressed with the project data. When appropriate, these topics were examined across time and space. Given the results presented in this volume, it is clear that the mitigation approach for historic properties within the pipeline corridor was successful in providing important archaeological information that advances local and regional understandings of past lifeways.

Acknowledgements

because 'a trustworthy historical synthesis
is certainly not to be entrusted to nor attempted
by any one single investigator.'
(Fewkes 1937:1954)

The successful completion of this archaeological data recovery program is due to many individuals and groups, to whom I am grateful. Alan D. Reed deserves enormous credit for his role as Principal Investigator during the bulk of the project and for setting its course before he retired. My deepest gratitude goes to all of the Alpine archaeologists who directed or assisted with excavations and made this project a success: Martha Bright, Rand A. Greubel, Abbie L. Harrison, Tracy L. Hoose, Sara A. Millward, Jenn Mueller, Jeremy Omvig, Jack E. Pfertsh, Michael J. Prouty, and Charles A. Reed. Jonathon C. Horn deserves special acknowledgement for being available as a consultant for a variety of different tasks. My many thanks go to Megan K. Carney Reed, Susan M. Chandler, and Jaclyn Mullen, whom were all technical editors during various stages of this project and who contributed greatly to the product you see here. I also wish to acknowledge the folks in Alpine's GeoSpatial department, who prepared graphics for analyses and reporting; these include Stephanie L. Dudash, Seth Frame, Barb Lockwood, Iraida A. Rodriguez, and Connor C. Johnen. Charles A. Reed prepared most of the photographs and Jenn Mueller prepared artifact drawings. Brenda S. Collin, Debby Patterson, Kimberly L. Redman, and Terri Voglein all assisted in myriad ways to help ensure the project's successful completion and have earned my thanks. Whether mentioned or not, a deep debt of gratitude goes to all of the individuals who worked on the data recovery program, including all of Alpine's field directors, field assistants, and field technicians, because the breadth of this project required a large and diverse group of individuals who all care about the quality of their archaeological work.

Matthew J. Landt

Chapter 1:

Introduction

by Alan D. Reed and Matthew J. Landt

Project Background

In 2008 and 2009, a natural gas liquids pipeline was constructed in Colorado and Wyoming. The 152-mi.-long pipeline was collocated with other pipelines, as it followed an existing utility corridor over most of its extent, from the Piceance Basin in Rio Blanco County northwards through Moffat County to a pipeline interconnect at Echo Springs Pump Station, near Wamsutter, Wyoming.

The utility corridor crosses private lands, lands administrated by the Bureau of Land Management (BLM), the Colorado Division of Parks and Wildlife (CDOW), and the State of Colorado Land Board. Because the pipeline represents interstate natural gas transportation across federal properties, certifications by the Federal Energy Regulatory Commission (FERC) and the BLM were necessary. Because federal lands and authorizations were necessary, Section 106 of the National Historic Preservation Act of 1966 (as amended) applied to the projects. Section 106 is a process intended to ensure the consideration of important cultural resources prior to development projects. The Colorado BLM State Office was the lead federal agency on the project. Alpine Archaeological Consultants Inc. (Alpine) was hired to conduct cultural resource investigations.

This document serves as the record for the archaeological data recovery efforts associated with the project. The data recovery efforts exposed 168 small cultural features and 16 basin houses at 14 sites, which resulted in the collection of 41,250 artifacts, 7,245 animal bones, and hundreds of ancillary study specimens, as well as producing notes and maps pertaining to the contextual relationships of these materials. The data resulting from the analysis of these materials are summarized in the following and provide the basis for interpretations. An attempt has been made to include enough information that other researchers can evaluate the logic behind the report's interpretations and derive other interpretations.

ARCHAEOLOGICAL DATA RECOVERY IN THE PICEANCE AND WYOMING BASINS OF
NORTHWESTERN COLORADO AND SOUTHWESTERN WYOMING

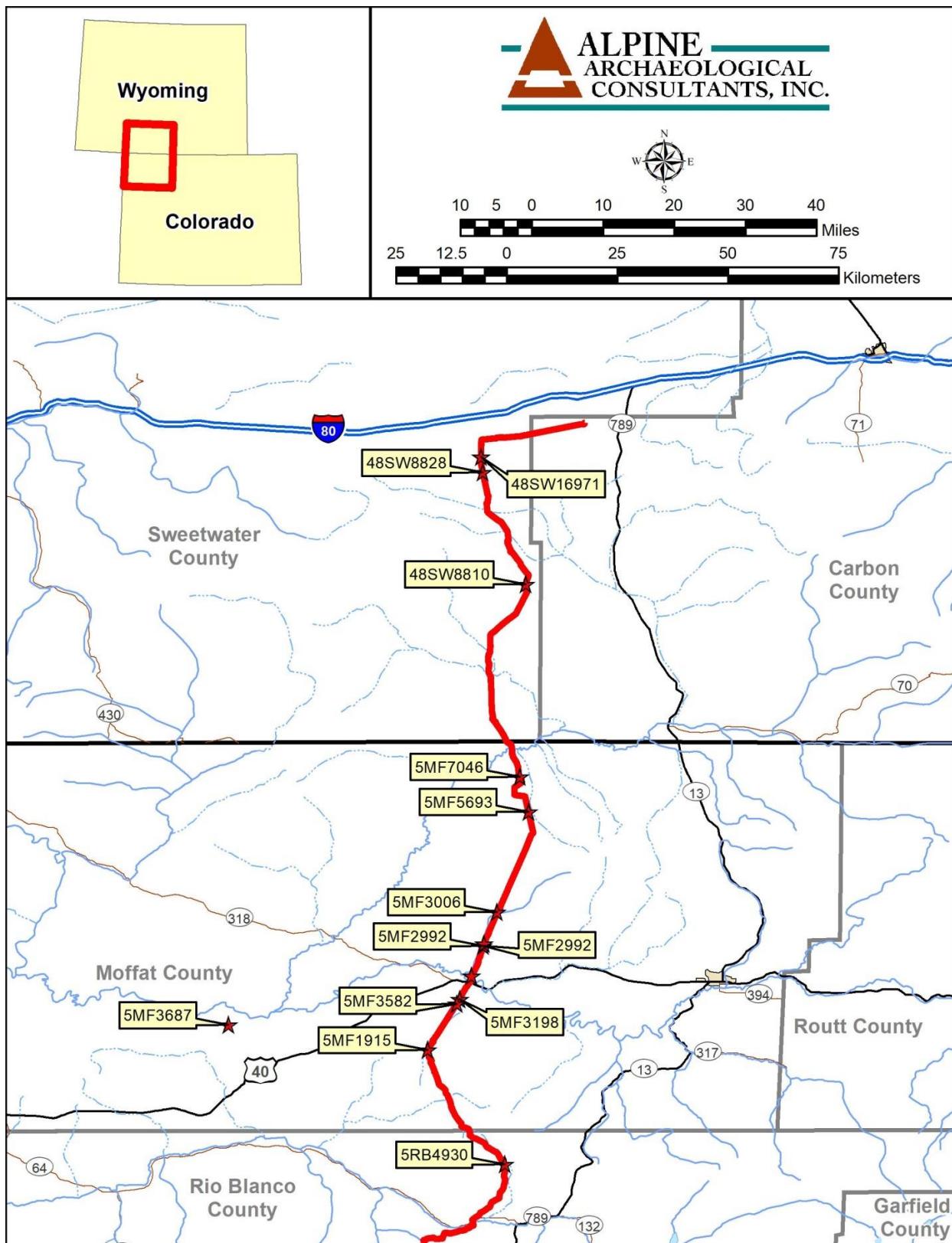


Figure 1. General location of the project corridor.