Intermountain Archaeology

Edited by
David B. Madsen and Michael D. Metcalf

The University of Utah Press
Salt Lake City
Lithic Sources in the Rocky Mountains of Colorado

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This study describes the nature and scope of flaked stone sources used prehistorically in the Rocky Mountains of Colorado. Data on known sources were compiled from searches of the computerized files of the Office of Archaeology and Historic Preservation (OAHP) in Denver, followed by collation of information provided on standard Colorado site forms. Two field searches were done: one on the 29 counties in Colorado all or partially covering the Southern Rocky Mountains physiographic province, and a second on all sources situated at or above 6,000 ft (1,800 m) elevation. Thirteen defined, the database includes 1,800 sources in the 29 mountain counties, and 57 additional sources above 6,000 ft elevation outside the 29-county area. Factors included in the study of these sources are geologic formation, material type(s), elevation, quarry features present, core reduction strategies, and evidence for associated nonprocurement activities. This study attempts to characterize prehistoric procurement systems throughout the upland environments in Colorado, and provides directions for future research.

INTRODUCTION

In reviewing literature on the archaeology of the Colorado mountains, it is not uncommon to find references to the presence of lithic (especially flaked stone) materials using such general terms as "local chert," "Dakota quartzite," or more specifically "Kremmling chert," "Parker petrified wood," etc. Yet the basis for the assignment of these labels often involves no more than macroscopic, visual rock attributes and the investigator's personal familiarity with a few large or local prehistoric quarries. The implications of extrapolating prehistoric group mobility, territorial size and range, and exchange patterns from such information are huge, but the assumptions that the artifacts we find on mountain sites were made from materials available nearby or in large, well-known quarries are not always well-founded. To begin to clarify the true availability of lithic resources in the mountains, this paper provides a catalog of recorded quarry sites. In that survey coverage in the Colorado mountains averages less than 5 percent per county, the results of this compilation should be seen as no more than a starting point for more accurate interpretations of past landscape use.

Another fact that became clear in researching this subject is how few detailed studies on specific quarries have been done. One of the largest in the mountains also was one of the first to be studied, the Trout Creek source zone within the Arkansas River system in Chaffee County (Chambellin et al. 1984). Survey, test excavation, and petrographic analysis (Heinrich 1984) were completed for this important chert source. Another abundant material called Kremmling chert was the subject of a more recent study by Metcalfe et al. (1991), who conducted excavations at two sites in Middle Park (Upper Colorado River Basin) and sponsored a geological study on Kremmling chert and other materials as represented at 12 sites in the area (Miller 1991a). Nearby, the major quartzite source on Windy Ridge near Rabbit Ear Pass has been investigated via excavations by archaeologists from the University of Colorado-Boulder (Bamforth 1994), but a final report is not yet available.

Geochemical and other source characterization research likewise has not been a very common endeavor in the Colorado mountains. Burns (1981) studied several obsidian sources in the San Juan Mountains, but could not confirm that prehistoric quarrying had occurred at many of them. Also in southwestern Colorado, Mauz (1993) completed trace element analyses on chert, quartzite, and obsidian artifacts from Snow Mesa, finding evidence both for local procurement and importation of raw materials. Cassells (1995) tried three different methods of distinguishing materials from a variety of well-known sources in the Front Range region, and found that ultraviolet light response was quite useful. Benedict (1981) also provides helpful geological data on Front Range sources.

Regionally, research at quarry sites and more general investigations on the use and movement of lithic materials in prehistoric societies have been of greater interest to archaeologists. Studies of sources on the plains are quite numerous (e.g., Alder 1977; 1986; Church 1994a; Coffin 1955; Greiser 1983; Haury 1984; Hoard et al. 1993; Ives 1984; Saul 1969). North and west of Colorado, much of the interest naturally has focused on the numerous obsidian sources of the region (Davis et al. 1993; Hughes 1984; Nelson 1984; Nelson and Holmes 1979) but there are important exceptions (e.g., Elston and Raven 1992). It should be obvious that source studies in states adjacent to Colorado must be utilized in research that seeks to define prehistoric landscape use partially or wholly within the Southern Rocky Mountains.
GOALS AND METHODS OF THE STUDY

The primary goal of the present study was to document the number and diversity of toolstone sources in the mountains of Colorado, using the computerized site files at the Office of Archaeology and Historic Preservation (OAHP) in Denver. Beyond this rather mundane task was the attempt to characterize prehistoric procurement systems in upland settings. What core reduction strategies were represented, and in what proportions? What other lithic tool production data were available? What kinds of nonquarrying activities were in evidence? As will become clear, the quality of the database varied widely and some topics of interest could not be addressed with the information at hand.

The methods utilized were quite simple. Two searches were made of OAHP's computerized files. One listed all lenticular sources in the 29 counties all or mostly within the mountainous central 40 percent of the state, and the second was to identify all such sources in Colorado above 6,000 ft (1,829 m) elevation. These searches were completed in June 1993 and were updated in April 1995 but, because of a data entry backlog, the database does not include information from site forms received at OAHP between about October 1992 and July 1993. Thus defined, the list of sources included 194 sites in the 29 mountain counties and 48 additional sites outside those counties at elevations exceeding 6,000 ft. Many of the listings were deleted upon further investigation, including sites with multiple site numbers, historical rock quarries, and paleontological quarries. Several others were added to the list based on the author's personal familiarity with recently recorded sites. The final total, then, is 180 sites in the 29 mountain counties and 57 other sites above 6,000 ft elevation.

Rather than relying strictly on encoded data, each site form was perused in compiling all information on quarrying activities, features, geological information, tool diversity.
and density, material types present, and any other relevant data. In a few cases, missing site forms were adequately replaced by information from associated contract reports. At a minimum, locational data were available for each of the 437 sites in the final compilation. Surprisingly, in three cases the site form made no mention of the type of rock acquired at that location and, not surprisingly, more recently completed forms tended to yield more useful information than older forms. Overall, the most disappointing part of the project was the lack of information about core reduction strategies on the site forms. Local geology was rarely mentioned, and details on artifact assemblages were spotty at best. Still, the available data provide a starting point for future studies.

MATERIAL TYPES

Six illustrations (Figures 9.1-9.6) depict the distribution of different material types in upland areas of Colorado. The raw data upon which these maps are based have been compiled in tabular form (Appendix 9.1).

Crypto-Microcrystalline Silicates

The most common materials in the Coloradoan formations are the dense, smooth-textured silicate rocks variously referred to as agate, chert, chalcedony, or jasper. No effort was made to distinguish between these potentially different materials because of the inconsistent usage of these terms by archaeologists and, more importantly, because these materials likely served similar functions in prehistoric tool kits. However, petrified wood quarries have been considered separately because of their obvious potential in sourcing studies.

There are 136 sites in this category, of which 107 are in the 29 mountain counties (Figure 9.1). Clustering of sources is evident in two general areas: Grand County (Middle Park) and a broad zone in the south-central mountains, particularly in Fremont County. Two major, well-known material types encompass most of the Grand County sites. Sites in eastern Grand County generally yield an opaque, iron-rich chert of volcanic origin termed Table Mountain jasper, occurring within the Grouse Mountain basalt (Miocene and Pliocene) and in younger, secondary gravel sources (Izet 1966; Miller 1991a:35).

Quarries in the central and western portions of the county represent procurement of a mottled translucent to opaque material called Kremmling chert, derived from the Troublesome formation (Miocene) as well as in numerous terrace gravel sources (Benedict 1981:124; Izet 1968; Metcalf et al. 1991; Miller 1991a:2-5, 1991b). Materials very comparable to, if not indistinguishable from this chert are available at several quarries mapped in Routt and Eagle counties within the Browns Park formation (Miocene), and in Jackson County within the North Park formation (Miocene). Visually comparable cherts also occur in eastern Pitkin County, but the geological context there is yet unstudied.

The cherty toolstone in the south-central mountains of Chaffee, Gunnison, Fremont, Park, Saguache, and Teller counties derive from much more variable conditions. Their relative proximity to one another is merely a fortunate coincidence, as the geology of this portion of the mountains is quite complex. Largest of these sources, and the second-largest in the database, is the well-known Trout Creek chert quarry in Chaffee County, covering 2,644 acres (1,070 ha) (Chambellan et al. 1983) in combined quarry and workshop areas. The main outcrops at Trout Creek are believed to be in the Ordovician-age Manito limestone (Heinrich 1985: 96-98); late Oligocene volcanic activity has altered some of these beds. Very similar cherts and jaspers can be found to the northeast in Park County and to the southeast in Fremont County at several sites near the Arkansas River. This zone also includes the two highest elevation sites in the sample, both small chert sources on the Continental Divide in northern Saguache County at 11,680 ft (3,550 m).

Other sources in this category are mostly scattered in widely separated sections of the mountains. The small cluster in Jefferson County is found on the west and south sides of Green Mountain near Morrison; some of this chert actually may be petrified wood from the Paleocene-age Green Mountain conglomerate (Scott 1952a). About a dozen sources are scattered in and around the San Juan Mountains in southwestern Colorado, including 3 outside the 29 central counties but at elevations above 10,000 ft (3,048 m) in La Plata County and on the Dolores-Montezuma county line. Of course, since survey coverage in the mountains averages about 2 percent per county and is no higher than 8 percent of any of the 29 mountain counties, the true number of toolstone sources must be much higher. The Fosttop Butte source in northeastern Colorado is shown for reference purposes only, as it is one of the best-known quarries in the state (Greiser 1983; Ives 1984; Hoard et al. 1992).

Petrified Wood

The distribution of the 26 petrified wood sources in the sample is quite interesting, with a notable lack of sources in the southern part of the mountains (Figure 9.2). Only a couple quarries near Pahin in the Upper Gunnison River Basin have been recorded there, with most of the remains clustered along the Front Range and in the North Park-Middle Park area. Seventeen of the 26 petrified wood sources are in the northern and central mountains. Another 8 are in the Black Forest area of east-central Colorado, where many other such sources are known but occur at slightly lower elevations. This material, locally known as Parker petrified wood, is found in large quantities within
the Dawson arkose (Paleocene and early Eocene) and in many secondary deposits. Farther north, the Jefferson County materials around Green Mountain probably derive from the correlative Green Mountain conglomerate, but silicified woods also are known from the underlying Denver formation of Upper Cretaceous and Paleocene age (Benedict 1961:116; Scott 1972a).

To my knowledge, few geological studies have been conducted on the silicified woods found west of the Front Range, which might identify distinguishing characteristics between sources. Leet (1968:14) does place the fossil woods from eastern Grand County within the Middle Park formation (Paleocene), suggesting that distinctions with contemporaneous materials from the eastern slope may not be obvious. Clearly, however, the potential is there for source-specific characterizations of silicified woods and might succeed where comparable efforts with nonfossiliferous cherts have failed.

Quartzites

The second most commonly encountered material type in Colorado is quartzite (there was insufficient information available on the site forms to distinguish between metaquartzites and orthoquartzites, although in most cases this probably made little difference functionally for prehistoric groups). There are 116 quartzite sources in the database, of which 83 are in the 29 central counties (Figure 9.3). Note the continued clustering of sources in the south-central mountains, most notably in Gunnison County. As those familiar with Gunnison County archaeology can attest, the number of recorded sources there is an arbitrary figure at best, as the ground is virtually paved with quartzite for long stretches in many areas. Site boundaries there are drawn more for convenience than to reflect archaeological reality. The cluster not only includes such extensive source zones—primarily in the Junction Creek formation (Jurassic)—but
also one of the smallest sites in the database where a single quartzite boulder was worked (5GN330).

Significant numbers of quartzite sources also occur in Fremont, Jefferson, Grand, and Jackson counties, and in scattered locations elsewhere. One of the larger sources in northern Colorado, for example, is the Windy Ridge quarry near Rabbit Ears Pass, which exhibits literally hundreds of pits representing huge labor investments in removing the sandstone caprock to extract the quartzite (an orthoquartzite, according to Cassells [1995:231-232]; also see Benedict 1990). As is true in many parts of the Front Range and west of the mountains near the Utah border, the Windy Ridge quartzite is exposed in an outcrop of the lower Cretaceous-age Dakota group. Scores of other quartzite sources are present in Colorado outside the 29 central counties, such as on the Uncompahgre Plateau and in southeastern Colorado, but are at relatively low elevations.

Igneous Rocks

Fine-grained to glassy volcanics usable as toolstone are not particularly abundant in Colorado, totaling 15 recorded sources of which 13 are in the 29 mountain counties (Figure 9.4). Specific materials utilized include basalt and rhyolite with 5 sources each, andesite and obsidian with 2 recorded sources each, and 1 welded tuff source. Contrary to expectations, not all such sources are in the southern portion of the mountains where volcanic deposits predominate, as quarries have been recorded in North Park, Middle Park, and Taylor Park in Gunnison County, just to name three. The largest site in the database is a rhyolite source covering over 3,246 acres (1,313 ha) at elevations up to 11,600 ft (3,536 m) on the Mineral-Rio Grande county line. It occurs in ash-flow tuffs of late Oligocene age (formation uncertain; site form data and Tweto [1973]).

Both obsidian outcrops are on the flanks of Cochetopa
Dome in Saguache County, in quartz latitic lavas of late Oligocene age (Tweto 1979). Even though no quarrying or workshop debris has been found at those sites, the trace element signature of this obsidian has been matched in collections from sites in adjacent counties (e.g., Montgomery et al. 1986). Other small sources of obsidian have been reported from the San Juan Mountains (e.g., Burns 1984) but, to date, no additional quarries have been confirmed.

Miscellaneous Material Types

Five other material types complete the inventory of toolstone sources (Figure 9.4). Silstone accounts for 8 of these sources, all of which are outside the 29 mountain counties in western and southwestern Colorado. They outcrop there in the Upper Cretaceous age Mesa Verde group (Gordon et al. 1963:13-15). The term silstone also has been used to describe the dark gray to black, fine-grained toolstone found on the Park Plateau around Trinidad, but argillite may be a more accurate identification for this material. One argillite-silstone quarry has been recorded about 6,000 ft elevation in Las Animas County. This source probably occurs within the Raton formation of Upper Cretaceous and Paleocene age (Tweto 1979).

Granitic rocks are common finds as ground stone artifacts in the mountains, but only one possible quarry for this material has been recorded, in Gunnison County. Even this source is questionable, but the description of materials on the site form renders an off-site evaluation difficult. Kramme (1977) describes another possible source of material for grinding stones, in the hogback country west of Fort Collins in Larimer County. Large, apparently ancient pits at this site are suspected sandstone quarrying features. Located within the Ingleside formation (Permian), the site contrasts with Historic period quarrying of sandstones in the nearby Lyons formation (also Permian age), although
prehistoric exploitation of the latter also is documented (e.g., Cassells 1995).

One hematite source in western Eagle County represents the only mineral pigment material in the database. This source is in the Leadville limestone of Mississippian age. Again, site documentation clearly underrepresents the frequency with which indigenous groups must have utilized such resources. Casual surface collecting may have been a more typical procedure than quarrying of concentrated deposits, however.

Finally, three lithic sources in the site files did not include a description of the material type—two are in Larimer County and one is in Huerfano County. In the latter case, known quartzite sources virtually surround the unspecified quarry and suggest a probable material type, but no such speculation is warranted for the Larimer County sites.

**SUMMARY DATA**

Putting these data together, the aforementioned clustering in Fremont (26 quarries), Grand (41 quarries), and Gunnison (44 sites) counties is reinforced (Figure 9.6). Combined, these three areas encompass fully 47 percent of the 237 sites in the sample, and nearly 62 percent of the sources in the 29 mountain counties. Sampling error is an unlikely explanation for this clustering as no more than 5 percent of these three counties has been formally surveyed. Another measure of the abundance of toolstone sources is to compare the number of recorded quarries with the total number of prehistoric sites in each county (excluding isolated finds). The same three counties also top this accounting: quarries constitute about 85 percent of the sites in Fremont County, 7 percent in Grand County, and 6 percent in Gunnison County.

In locational terms, elevations of all sources in the sample range from 5,200 ft (1,585 m) at a chalcedony quarry in the Larimer County foothills to 11,680 ft (3,556 m) at the two chert quarries on the Continental Divide in Saguate County. Average elevation is 7,777 ft ± 1,255 ft (2,373 m ± 383 m; one-sigma range), and 10 sources exceed 10,000 ft (3,048 m) in elevation. Quarry sizes range from 8 sq m at a site in Roxborough State Park in Douglas County, to 3,244 acres (1,313 ha) at the rhyolite quarry on the Mineral-Rio Grande county line. Average size is 53 acres (21.5 ± 119.3 ha; one-sigma range), which translates to a site roughly 463 sq m.

However, the huge standard deviation suggests that quarry size is governed more by geological and other natural factors, rather than by patterned human behavior.

Although the geological formation was specified in only 21 cases, careful reading of the site forms suggests a more general but, perhaps, case-specific breakdown is possible—namely, distinguishing between primary bedrock sources and secondary sources in terraces, pediment gravels, alluvial fans, stream beds, and the like. In the 29 mountain counties 135 sources are primary, 34 are secondary, 2 sites have both kinds of source material, and 9 sites have descriptions too vague to make a determination. An additional 46 primary sources and 12 secondary sources are in the high-elevation sample outside the mountain counties. All told, over 75 percent of all sources in the database are at primary bedrock outcrops.

**Activity Analysis**

As previously mentioned, details on quarrying activity generally were not provided on the site forms. The presence of quarrying pits was specifically mentioned at 17 sites, at which typically only 1 to 3 pits were noted; 12–15 pits are present at 3 sites, above which the number of pits jumps drastically to uncouned numbers at the Trout Creek chert source and “now” at the Windy Ridge quartzite quarry. Pits for heat treatment of raw material were identified at Trout Creek during test excavations (Chambellan et al. 1984), and other surficial evidence of intentional thermal alteration was mentioned at 5 additional sites.

In general, core reduction strategies were not detailed on most site forms. However, 69 sites were described as having bifacial cores or bifacial blanks or preforms present, suggesting a general bifacial reduction strategy was represented at a minimum of 29 percent of the quarries in the sample. At 10 sites, a split cobble approach was mentioned. Blade cores were specifically noted at three quarries, and randomly flaked cores were described from two quarries. Two other quarries in Grand County yielded what were described as tortoise cores, suggesting the use of a Levallois-like reduction technique (e.g., Oakley 1956:49–54). At a basalt quarry in Conejos County, the archaeologist suggested raw “block transport” down the mountain had occurred more frequently than on-site reduction. In general, it would not be advisable to draw any conclusions or extrapolations about the core reduction strategies summarized above given that the typical site form failed to provide any such data whatsoever.

Compiling evidence for nonquarrying activities at lithic sources was a more successful endeavor, in that most site forms were relatively complete in documenting the presence of tools and features observed at the quarries. Interest in this aspect of the archaeological record stems from the recognition that, ethnographically, hunter-gatherer groups often follow an embedded procurement strategy for lithic materials, typically gathering raw materials for implements "incidentally to the execution of basic subsistence tasks” (Binford 1975:256). Observation of such artifacts as grinding tools and projectile points within quarries should be common if subsistence pursuits held priority over lithic procurement in prehistoric land-use strategies.

The results of the present study, however, in terms of nonquarrying features are quite diverse but not particularly abundant. Of the 35 sites where such features were noted
(i.e., 15 percent of the quarries in the database), 18 have definite firepits or cobble concentrations suspected to be firepits, and 2 sites have ash or charcoal stains. Six sites exhibit rock cairns, 6 sites have simple rock alignments, and 4 quarries co-occur with stone circles. Two lithic sources in Grand County, upon excavation, yielded the remains of simple mud-and-stick huts (Wheeler and Martin, 1982, 1984), and a third quarry in the same region exhibited three post molds from a structure of uncertain function. One site in Moffat County has two large slabs suggested to be pit-house remnants. Single occurrences of a rockshelter, burial, trail, rock art, a depression, and an Anasazi habitation complex round out the inventory of nonquarry features.

Another way to assess the prevalence of nonquarrying activities at these sites is to look at both tool diversity and specific tool classes. In considering the categories of biface, uniface, and hammerstone as classes directly related to quarrying and core reduction activity, the presence of additional tool classes then may indicate that other activities took place. Of course, the more classes represented, the more likely that nonquarrying activities actually occurred. Up to ten tool classes are present at the 275 sites in the sample—more than ten classes probably are present at some quarries but descriptions such as "some tools" and "many tools" prevented a more exact accounting. Twenty-nine sites (12 percent) have four or more tool classes present and, therefore, probably hosted activities other than toolstone procurement.

Turning to specific tool categories, only 21 site forms (9 percent) mentioned the presence of hammerstones and 1 other site exhibited a probable anvil. No other evidence of quarrying tools such as wedges was mentioned; of course, perishable tools such as wood or antler digging sticks, levers, and punches would not be expected other than from excavated contexts (e.g., Metcalf et al. 1991:42–48). Thirty sites yielded grinding implements and nine had ceramic scatters which, by themselves, probably can be taken as evidence for nonquarrying activities. Seventy-two sites (30 percent) have
projectile points or grinding tools as the most obvious evidence for food procurement activity, but 146 quarries (62 percent) have at least one tool not obviously for lithic procurement tasks (scrapers and generic flake tools are most common). These data lend only moderate support to the observation of the primacy of subsistence activities over lithic procurement in ethnographic studies, but more excavations are needed to test the accuracy of these tool frequency figures.

Total tool densities reach the uncounted "hundreds" at several sites, and 29 sites yielded at least ten tools total regardless of the class(es) represented. Combining data from both features and artifacts, 32 sites (22 percent) have relatively clear evidence for nonquarrying activities. As an aside, noting that 12 site forms mentioned the presence of choppers, one wonders if these "tools" might actually be production blanks, since choppers seem to be quite rare in the author’s personal experience in the mountains. In going back through the records, 11 of those 12 sites were recorded more than 12 years ago when, perhaps, the use of functional labels for tools was subject to less scrutiny.

Lastly, evidence for the presence of lithic materials other than those being quarried at each site was tabulated. The idea here is that materials from known sources document the movement of prehistoric groups across the landscape, and given sufficient data, this information can be used to begin documenting territorial ranges, group interaction, and the like. Among the 257 sites in the database, 91 (about 35 percent) contain one or more material types other than those which were being procured on-site. Thirteen of these 91 sites yielded obsidian artifacts (excluding the Coocheropa Dome source area), with which group movements and exchange systems can be more easily addressed.

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**DIRECTIONS FOR FUTURE RESEARCH**

While there is little doubt that the quality and reliability of information in OAHP’s computerized database is variable...
at best, the trends noted above certainly suggest a number of avenues for further research. From a strictly practical standpoint, the exercise of reading through roughly 200 site forms filled out over a period of about 30 years clearly showed that archaeologists need to do a much better job of describing the artifacts and features observed on surveys. Providing a laundry list of the presence of uncounted cores, flakes, bifaces, and hammerstones without bothering to write even a single sentence about core types, reduction strategies, or the suspected geological formation is not doing good archaeology.

Secondly, too few rigorous mineralogical or other geological analyses of specific toolstone sources have been completed to permit the kinds of settlement and exchange studies advocated here. There have been only a few such analyses in Colorado, and those are limited to the larger source zones such as for the Kremmling and Trout Creek cherts (Heinrich 1984; Miller 1991a). Neutron activation analysis (Maiz 1993), x-ray fluorescence (Miller 1991a), and ultraviolet light response (Cassels 1995) are among the methods far too infrequently utilized in attempts to differentiate among source materials in Colorado. Further, at only 19 sites in the database have either test excavations or large-scale excavations been undertaken. Future work at toolstone sources invariably should include the expertise of geologists or mineralogists. See Ives (1965) for a useful statement on the importance of such studies.

Given that so few quarry-specific studies have been done in the Colorado mountains, it is not surprising that research on the organization of lithic procurement among local groups has been limited. Regionally, however, such studies have generated some interesting, if not controversial, results. For example various measures and interpretations of transport costs associated with lithic procurement strategies have been included in some recent quarry studies (e.g., Elston and Raven 1992). The importance of raw material quality, availability (e.g., distance to source), and abundance in the manufacture of specific tool classes versus the organization of the lithic technology in prehistoric societies has fueled considerable debate, notably between Binford and Gould (Binford 1983; Binford and O’Connell 1984; Binford and Stone 1985; Gould 1980, 1987; Gould and Sagers 1985, among others). For his part, Binford (1972, 1990) deemphasizes distance as a component of transport cost in the Nunamuit case as “...the cost of the [lithic] procurement was not referable to the distance between the source location and the location of use, since the distance would have been traveled anyway,” given that lithic procurement was a task embedded in subsistence pursuits. How procurement strategies in the Colorado mountains compare with such models have yet to be adequately investigated.

Finally, many archaeologists familiar with the archaeology of the Colorado mountains may be surprised at the number of toolstone sources recorded there so far. Most of us typically make reference only to a few of the larger sources when discussing the possible origins of materials observed on other types of sites. Hopefully, the data presented here—however incomplete—will enhance our interpretations of both the prehistoric use of lithic resources and of settlement systems in the mountains.
## Appendix 9.1
### Catalog of Individual Lithic Sources

<table>
<thead>
<tr>
<th>County/Site Number</th>
<th>Material(s)*</th>
<th>Elevation (ft)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archuleta County</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5AA758</td>
<td>Chert and quartzite</td>
<td>7,520</td>
<td>Obsidian artifacts present</td>
</tr>
<tr>
<td>5AA907</td>
<td>Quartzite</td>
<td>8,820</td>
<td>Gray, maroon, and purple colors</td>
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<tr>
<td>5AAP150</td>
<td>Chert</td>
<td>7,320</td>
<td>Red and brown colors</td>
</tr>
<tr>
<td>5AAP165</td>
<td>Quartzite</td>
<td>8,620</td>
<td></td>
</tr>
<tr>
<td>5AAP236</td>
<td>Chert and quartzite</td>
<td>7,720</td>
<td></td>
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<tr>
<td>Arapahoe County</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5AH411*</td>
<td>Petrified wood</td>
<td>6,000-6,100</td>
<td>Tan, brown, red, black colors; Parker petrified wood (PPW)</td>
</tr>
<tr>
<td>5AH682*</td>
<td>Petrified wood</td>
<td>5,975-6,100</td>
<td>Tan, brown, red, black, PPW; obsidian also present</td>
</tr>
<tr>
<td>5AH864*</td>
<td>Petrified wood</td>
<td>6,000-6,100</td>
<td>Tan, brown, red, black, PPW</td>
</tr>
<tr>
<td>Chaffee County</td>
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<td></td>
</tr>
<tr>
<td>5CF84</td>
<td>Yellow-brown and dusky red chert</td>
<td>8,700-10,000</td>
<td>Trout Creek source; obsidian and ceramics present</td>
</tr>
<tr>
<td>5CF188</td>
<td>Chert</td>
<td>8,089</td>
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<td>Quartzite</td>
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<td></td>
</tr>
<tr>
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<td>Chert and quartzite</td>
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<td>Conejos County</td>
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<td></td>
<td></td>
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<tr>
<td>5CN35</td>
<td>Gold chert</td>
<td>9,680</td>
<td>Obsidian artifacts present</td>
</tr>
<tr>
<td>5CN146</td>
<td>Basalt</td>
<td>10,600-11,200</td>
<td>“Block transport” suggested</td>
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<tr>
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<td>Red and purple chert</td>
<td>7,509</td>
<td>Gray to tan cortex</td>
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<td>Costilla County</td>
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<tr>
<td>5CR54</td>
<td>Red andesite?</td>
<td>8,089</td>
<td>“Volcanic material” source</td>
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<td>5DA171*</td>
<td>Chert, quartzite, petrified wood</td>
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<td>Multicolored materials</td>
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<td>Yellow jasper; other colors not noted</td>
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<td>Quartzite</td>
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<td>Chert</td>
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<td>Chert</td>
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Grand County

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<td>Quartzite</td>
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<td>SGA52</td>
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**Gunnison County**

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[144] AP 122
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<td></td>
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<tr>
<td>5HN7</td>
<td>Chert</td>
<td>11,200</td>
<td></td>
</tr>
<tr>
<td>5HN132</td>
<td>“Weak red” rhyolite</td>
<td>9,960</td>
<td></td>
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<td>Jackson County</td>
<td></td>
<td></td>
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<tr>
<td>5JA1</td>
<td>Quartzite</td>
<td>8,340</td>
<td>Similar to cherts at SRT89</td>
</tr>
<tr>
<td>5JA2</td>
<td>Chert</td>
<td>8,900</td>
<td></td>
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<tr>
<td>5JA18</td>
<td>Quartzite</td>
<td>8,180</td>
<td>Brown cryptocrystalline rock</td>
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<tr>
<td>5JA25</td>
<td>Chert/petified wood and quartzite</td>
<td>8,250</td>
<td></td>
</tr>
<tr>
<td>5JA26</td>
<td>Petrified wood</td>
<td>8,250</td>
<td></td>
</tr>
<tr>
<td>5JA293</td>
<td>Petrifed wood</td>
<td>8,250</td>
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</tr>
<tr>
<td>5JA320</td>
<td>Petrifed wood</td>
<td>8,180</td>
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<td>5JA349</td>
<td>Chert, basalt, and quartzite</td>
<td>8,230</td>
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<td>Jefferson County</td>
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<td></td>
<td></td>
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<tr>
<td>5JV5</td>
<td>Petrifed wood, chert, and quartzite</td>
<td>5,880</td>
<td>Brown petrified wood, reddish brown quartzite, yellow-brown jasper</td>
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<tr>
<td>5JV8</td>
<td>Quartzite and chert</td>
<td>5,730</td>
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<tr>
<td>5JV9</td>
<td>Petrifed wood, chert, and quartzite</td>
<td>6,000</td>
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<tr>
<td>5JF169</td>
<td>Petrifed wood, quartzite, and jasper</td>
<td>6,035</td>
<td></td>
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<tr>
<td>5JP216</td>
<td>Quartzite</td>
<td>5,800</td>
<td></td>
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<tr>
<td>5FP77</td>
<td>Jasper and quartzite</td>
<td>6,000</td>
<td>Yellowish brown to maroon dominant</td>
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<tr>
<td>5F778</td>
<td>Jasper, chert/chalcedony and quartzite</td>
<td>6,000</td>
<td>Yellowish brown to maroon dominant</td>
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<td>5FP779</td>
<td>Jasper and quartzite</td>
<td>5,960</td>
<td>Yellowish brown to maroon dominant</td>
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<tr>
<td>5F780</td>
<td>Quartzite, jasper, and petrified wood</td>
<td>6,000–6,020</td>
<td>Yellowish brown to maroon dominant</td>
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<td>Las Animas County</td>
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<td>5IA393*</td>
<td>Siltstone/argillite</td>
<td>6,340</td>
<td>Black chert; gray siltstone-argillite</td>
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<td>Logan County</td>
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<td></td>
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<tr>
<td>5LO34*</td>
<td>Chalcedony and chert</td>
<td>4,370</td>
<td>Flatsop Butte source</td>
</tr>
<tr>
<td>La Plata County</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5LP29*</td>
<td>Quartzite</td>
<td>6,790</td>
<td>Anasazi potsherds present</td>
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<tr>
<td>5LP221*</td>
<td>Quartzite and chert</td>
<td>6,700</td>
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<tr>
<td>5LP277*</td>
<td>White and gray chert</td>
<td>11,200</td>
<td>White, gray, and red colors</td>
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<td>5LP274*</td>
<td>Chert</td>
<td>11,160</td>
<td>Anasazi habitation present</td>
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<tr>
<td>5LP644*</td>
<td>Gray quartzite</td>
<td>6,197</td>
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</tr>
<tr>
<td>5LP3880*</td>
<td>Chert, quartzite, and siltstone</td>
<td>6,150</td>
<td></td>
</tr>
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<td>LaVerne County</td>
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<tr>
<td>5LR47</td>
<td>Quartzite</td>
<td>5,500</td>
<td>Site form doesn’t match description by Kvanmee (1977)</td>
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<tr>
<td>5LR54</td>
<td>Unknown</td>
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<td>5LR111</td>
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<td>5LR148</td>
<td>Sandstone</td>
<td>Unknown</td>
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<td>5LR299</td>
<td>Quartzite and chert</td>
<td>5,500</td>
<td>Red and white inclusions</td>
</tr>
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<td>5LR272</td>
<td>Quartzite and tan chalcedony</td>
<td>5,404</td>
<td>Tabular violet and gray colors with white linear inclusions</td>
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<td>5LR955</td>
<td>Red chalcedony</td>
<td>5,200</td>
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<tr>
<td>5LR1490</td>
<td>Chert</td>
<td>7,080–7,180</td>
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</tr>
<tr>
<td>Mesa County</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5ME060*</td>
<td>White and gray chert</td>
<td>7,420</td>
<td>Clear, gold and tan colors</td>
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<td>5ME061*</td>
<td>Chalcedony</td>
<td>9,980</td>
<td>Use of source questionable</td>
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<tr>
<td>5ME0001*</td>
<td>White quartzite</td>
<td>8,220</td>
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</tr>
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<td>Mineral County</td>
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<td></td>
</tr>
<tr>
<td>5ML62</td>
<td>Pink rhyolite</td>
<td>11,000–11,600</td>
<td>Also has site 5RN169; largest site in database</td>
</tr>
<tr>
<td>-------</td>
<td>--------------</td>
<td>---------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Moffat County</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5MF938*</td>
<td>Chalcedony and chert</td>
<td>6,704</td>
<td>Cross Mountain site; reddish brown, red, black and other colors; also has ceramics</td>
</tr>
<tr>
<td>5MF1674*</td>
<td>Chert</td>
<td>7,500</td>
<td>&quot;Pumpkin&quot; and red-white colors</td>
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<tr>
<td>5MF2672*</td>
<td>Chert</td>
<td>6,240</td>
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<tr>
<td>5MF2842*</td>
<td>Quartzite</td>
<td>5,380–6,180</td>
<td>Purple, maroon, red, and pink colors</td>
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<td>5MF3461*</td>
<td>Chert</td>
<td>6,165–6,765</td>
<td>Yellow (&quot;pumpkin&quot;), brown, red, dark gray, green, purple color; also has ceramics</td>
</tr>
<tr>
<td>5MF3524*</td>
<td>Quartzite and chert</td>
<td>6,460</td>
<td>Purplish gray and white quartzite with yellow and red staining; chert colors not noted</td>
</tr>
<tr>
<td>Montrose County</td>
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<td></td>
<td></td>
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<tr>
<td>5MN3416*</td>
<td>Quartzite</td>
<td>6,360</td>
<td>Brown mottled chert; tan quartzite</td>
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<tr>
<td>5MN3417*</td>
<td>Quartzite</td>
<td>6,200</td>
<td></td>
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<tr>
<td>5MN3429*</td>
<td>Quartzite and chert</td>
<td>6,400</td>
<td></td>
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<tr>
<td>5MN3488*</td>
<td>Quartzite</td>
<td>6,060</td>
<td></td>
</tr>
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<td>Montezuma County</td>
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<td></td>
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<tr>
<td>5MT19239*</td>
<td>Chert</td>
<td>6,130</td>
<td>Mottled yellow color with black-brown bands and swaths; also has Anasazi ceramics</td>
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<tr>
<td>5MT9299*</td>
<td>Quartzite and chert</td>
<td>6,050</td>
<td>White, gray, reddish, and green quartzites; ceramics also present</td>
</tr>
<tr>
<td>5MT9801*</td>
<td>Quartzite</td>
<td>6,060</td>
<td>Also has site 5DI1425; pink and white quartzite; green welded tuff</td>
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<tr>
<td>5MT10357*</td>
<td>Welded tuff, quartzite and chalcedony</td>
<td>10,095</td>
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<tr>
<td>5MT10512*</td>
<td>Quartzite</td>
<td>6,650</td>
<td>Tan, green and red banded chert; cream-colored quartzite</td>
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<td>5MT10574*</td>
<td>Oolitic chert and quartzite</td>
<td>6,170</td>
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</tr>
<tr>
<td>5MT11633*</td>
<td>Quartzite and chert</td>
<td>6,200–6,260</td>
<td>White and brown chert; gray quartzitic sandstone</td>
</tr>
<tr>
<td>Park County</td>
<td></td>
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<tr>
<td>5PA18</td>
<td>Petrified wood</td>
<td>8,700</td>
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</tr>
<tr>
<td>5PA125</td>
<td>Deep red quartzite</td>
<td>8,945</td>
<td>Gold dendritic chert similar to Trout Creek source; pink and white quartzite; obsidian present</td>
</tr>
<tr>
<td>5PA148</td>
<td>Agate</td>
<td>9,140</td>
<td></td>
</tr>
<tr>
<td>5PA486</td>
<td>Chert and quartzite</td>
<td>9,200</td>
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<tr>
<td>5PA521</td>
<td>Jasper, chalcedony</td>
<td>9,150</td>
<td></td>
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<tr>
<td>Pitkin County</td>
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<td></td>
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<tr>
<td>5PTB7</td>
<td>Chert, chalcedony</td>
<td>8,080</td>
<td>White chert-chalcedony, resembles Kremmling chert</td>
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<tr>
<td>5PTB8</td>
<td>Chert, chalcedony</td>
<td>8,060</td>
<td>White chert-chalcedony, resembles Kremmling chert</td>
</tr>
<tr>
<td>Rio Blanco County</td>
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</tr>
<tr>
<td>5RB1719*</td>
<td>Tan silstone</td>
<td>6,200</td>
<td>Tan and banded gray-brown colors</td>
</tr>
<tr>
<td>5RB1723*</td>
<td>Tan silstone</td>
<td>6,120</td>
<td>Tan and banded gray-brown colors</td>
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<td>5RB1726*</td>
<td>Silstone</td>
<td>6,000</td>
<td>Tan and banded gray-brown colors</td>
</tr>
<tr>
<td>5RB1729*</td>
<td>Silstone</td>
<td>6,160</td>
<td>Brown algalitic chert; brown and gray solid chert; tan silstone; obsidian also present</td>
</tr>
<tr>
<td>5RB1730*</td>
<td>Silstone</td>
<td>6,260</td>
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</tr>
<tr>
<td>5RB2856*</td>
<td>Chert and silstone</td>
<td>7,280–7,360</td>
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<tr>
<td>Rio Grande County</td>
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<tr>
<td>5RN169</td>
<td>Jasper</td>
<td>8,100</td>
<td>See 5ML62</td>
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<tr>
<td>5RN262</td>
<td>Chert/jasper</td>
<td>8,940</td>
<td>Gold, orange, brown, and red colors</td>
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<td>Rout County</td>
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<tr>
<td>5RT32</td>
<td>Basalt</td>
<td>9,650–9,725</td>
<td>Yellow-brown and white-clear colors, the latter similar to Kremmling chert and to cherts at 5J422</td>
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<tr>
<td>5RT39</td>
<td>Chert</td>
<td>8,720</td>
<td>Also has site 5RT48</td>
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<td>5RT41</td>
<td>White quartzite</td>
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<td>5RT43</td>
<td>Chalcedony</td>
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<td>5RT44</td>
<td>Chalcedony</td>
<td>7,180</td>
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<td>County</td>
<td>Location</td>
<td>Type</td>
<td>Color/Description</td>
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<td>------------------------------------------</td>
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<tr>
<td>San Joaquin</td>
<td>SJA167</td>
<td>Gray chert</td>
<td>8,840 On Continental Divide</td>
</tr>
<tr>
<td>Saukache County</td>
<td>3SH1113</td>
<td>Green chert</td>
<td>11,680 Green, gold and brown colors; on Continental Divide</td>
</tr>
<tr>
<td></td>
<td>3SH1114</td>
<td>Chert</td>
<td>11,680 Red and gold Jasper; cream-colored chert</td>
</tr>
<tr>
<td></td>
<td>3SH1125</td>
<td>Jasper and chert</td>
<td>11,000 Cochetopa Dome source; no artifacts observed</td>
</tr>
<tr>
<td></td>
<td>3SH1318</td>
<td>Gray-black obsidian</td>
<td>9,000 Cochetopa Dome source; no artifacts observed</td>
</tr>
<tr>
<td></td>
<td>3SH1319</td>
<td>Gray-black obsidian</td>
<td>8,970 Cochetopa Dome source; no artifacts observed</td>
</tr>
<tr>
<td>San Miguel</td>
<td>5SM904*</td>
<td>Chalcedony, chert, quartzite, siltstone</td>
<td>6,080-6,180 Gray quartzite; other colors not noted</td>
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<td>5SM209*</td>
<td>White quartzite</td>
<td>7,600 Gray and tan quartzite; green and mottled gray-tan chert</td>
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<td>5SM205*</td>
<td>White quartzite</td>
<td>6,360 Gray and white quartzite; gray, white and green chert</td>
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<td>5SM2116*</td>
<td>Chert and quartzite</td>
<td>6,480 Gray and white quartzite; gray, white and green chert</td>
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<td>5SM2124*</td>
<td>Chert and quartzite</td>
<td>6,850 Gray and white quartzite; gray, white and green chert</td>
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<td>5SM2412*</td>
<td>White quartzite</td>
<td>7,050 Gray and white quartzite; gray, white and green chert</td>
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<td>5SM2631*</td>
<td>Quartzite</td>
<td>7,000 Includes gray-tan mottled type</td>
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<td>5SM2636*</td>
<td>Gray quartzite</td>
<td>7,250 Gray, red-gray, green, gray-green, white and red chert; gray, white and pink-gray quartzite</td>
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<td>5SM2668*</td>
<td>Chert and quartzite</td>
<td>6,800 Gray, red-gray, green, gray-green, white and red chert; gray, white and pink-gray quartzite</td>
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<td>5SM2672*</td>
<td>Red chert</td>
<td>6,800 Other colors present</td>
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<td>5SM2673*</td>
<td>Chert</td>
<td>6,800 Off-white and greenish gray colors</td>
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<tr>
<td>Teller County</td>
<td>5TL101</td>
<td>White chert</td>
<td>6,240</td>
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</table>

* = site outside 29 mountain counties  
** = color specified if known (see Comments for diverse colors)  
[additional details on individual sites available upon request]

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