Lithic-Rich and Lithic-Poor Environments

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I have been using the concept of lithic-rich (L-R) and lithic-poor (L-P) environments in my writings of pre-agriculture peoples since the early 2000s. Yet, it only recently occurred to me that I had never defined the two terms as I understand them and there is sparse literature on the subject, especially the behavior associated with each. So, this paper is a mind dump of my observations and opinions of lithic assemblages from around the world as it relates to these two environments. Also, it is written with the assumption that the sites and assemblages, discussed herein, are pristine. In different words, they have not been disturbed by collectors and/or archaeologists. There are no references at the end and the only citations are to my own web papers.

To me the world is divided into only two lithic environments; the L-R and the L-P. So those environments that are not L-R are therefore L-P. Additionally, the L-R is the smaller of the two. How much smaller, I can't say because I have not seen all the land that makes up the world. But, based on what I have seen, the L-R is definitely the smaller of the two. Finally, the L-R environments are not continuous. They are patches that are surrounded by L-P environments, somewhat like the spots on a leopard. However, unlike the leopard's spots these L-R patches vary greatly in size and location around the world.

Natural Characteristics of L-R and L-P Environments are not just different in terms of the presences or absences of abundant lithic material. An L-R environment, as I define the term, must also have food and water so people stay there the vast majority of the time. L-R environments are the desirable locations or sweet spots on the landscape.

Behavioral Characteristics of People Who Inhabit L-R and L-P Environments are diametrically different. People who inhabit L-R environments have a wasteful lithic technology. Conversely, people who inhabit L-P environments have a conservative lithic technology. These technologies are visually very different from each other in the archaeological record and will be described later in this paper. The variation in the technologies between peoples (cultural groups if one prefers) in one of these environments is less than the variation between the same people in the two different environments. As an example, the variation in the lithic technologies between Solutrean and Folsom in an L-P environment is less that the variation between just Clovis people in L-R and L-P environments. Without the diagnostic *type fossil* of the Clovis projectile, the Clovis L-R technology would be so different from the L-P one that an analyst would suggest they are two different archaeological cultures.

The word *inhabit* in the above paragraph means the people lived there all or the majority of the time. Traveling to an L-R environment to acquire lithic material to take away is not inhabiting the L-R environment. The people must live in the L-R environment to develop the wasteful technology. The same concept applies to an L-P environment; the people spent the large majority of their time there to become conservative about their technology. I will have more to say about inhabiting the environments in the next sections.

Assemblage Characteristics of L-R and L-P Environments are the product of the above described behavior differences. To appreciate and understand these characteristics I ask the reader to forget about projectiles and imagine the other lithic artifacts that make up the archaeological record. Imagine a large site or a number of sites in each environment that represent an assemblage of at least 10,000 -20,000 artifacts[1]. They can represent a single temporal horizon or multiple temporal horizons. The temporal position does not affect the characteristics I am discussing here. Table 1 is then a summary of the differences, which I am aware of, between these L-R and L-P assemblages.

Note 1 -- The term artifact used herein means a piece of lithic material that has been modified by human hands. I divide artifacts into tools and flakes. Flakes are artifacts with no visible retouch or use wear. Tools are all other pieces.

Table 1
Summary of L-R and L-P Assemblage Characteristics

Characteristic	***L-R Environment***	***L-P Environment***
Type of Lithic Material	Local material with only an occasional piece of exotic material	Large percent of exotic material with some low quality local material
Size of Artifacts (includes flakes)	Large	Small
Presence of Cortex on Tools (not flakes)	Found on more than 1/2 of the tools	Found on less than 1/3 of the tools
Flake Platforms	Opportunistic	Non-Opportunistic
Presence of Blades and Blade Cores	Often abundant	Blades are rarely found Blade cores are absent
Presence of Bifaces (not projectiles)	Abundant	Rarely found
Presence of Unifacial Tools	Rare	Abundant
Presence of Outre-Passé Flaking	Common	Rare
Presence of Recycled Artifacts	Rare, but still twice as much as found in L-P environments	Rare

The **Type of Lithic Material** found in sites located in L-R environments is local material, which I define as having been acquired from less than 40 kilometers away. This observation should be intuitively obvious. However, what is not so obvious is that occasionally there will be a tiny percentage of exotic material, also. In L-P sites the percentage of exotic material increases dramatically. And, unlike an L-R site that has only one type of local material, an L-P site can have numerous types of exotic material, which can come from the four directions of the compass. Depending on the L-P environment there may be some low quality, knappable material available in small amounts and this can appear in the assemblage(s). As a result, I caution the reader to not make the judgment of the environment type based on only one small site/assemblage. This judgment should be based on a large palimpsest site or a number of small sites in the area.

The type of material in a site is the strongest characteristic (indicator) that the site is located in an L-R or L-P environment. As a rule of thumb, if the assemblage contains 30% or more exotics by weight then it probably came from a site located in an L-P environment. This means that the 30+% of lithic material was carried at least 40 kilometers. People who choose to live in environments where this has to be done are going to be very conservative with their lithic material. They will waste very little.

The **Size of Artifacts** found in sites in L-R environments are visually larger than those from L-P sites. Quantitatively, the average L-R artifact (~14 grams by my research) is more than seven times as large by weight, than the average artifact from an L-P site. If the flakes are removed from the calculations, the size difference decreases to only slightly more than two times, but still in favor of the L-R sites. To possibly explain this difference, I ask the reader to consider an individual who is sitting on a pile of good quality local material. It is easier for that individual to discard a large flake, which has become dull from cutting and/or scraping, and to replace it with a new large flake than it is to resharpen it. This is, in fact, how the discarded flake became a tool. It was a large flake that was used to the extent that an archaeologist could see the utilization. In an L-P environment the decision to discard a dull tool and start with a new flake is not even a consideration when one has to carry the material 40+ kilometers. The user chooses to resharpen the tool and, therefore, it becomes smaller. In an L-P environment, this same decision is made over and over again until the tool is too small to use. I will discuss this again in the section on Unifacial Tools.

My **Presence of Cortex** definition is that if there is any visible cortex, then it is called present. This is a yes or no answer, there is no gray area. Even if the cortex is only visible on the platform, it is considered present. Additionally, I have limited my discussion to tools less bifaces, so I am writing only about unifacial tools, which of course also excludes flakes. Bifaces were excluded because sites in L-R environments have a disproportionately large share of bifaces, which I will elaborate on later in the paper. So, approximately 60% (by count) of the unifacial tools have the presence of cortex in an L-R environment. This is to be compared to

only in the neighborhood of 30% of the tools in an L-P environment. The obvious explanation is that material was not wasted in an L-P environment. It was re-worked (retouched) over and over again, which removes more of the cortex and ultimately all of it. As a result, cortex is present on fewer pieces in an L-P environment.

Flake Platfoms listed in Table 1 are defined by the strange adjectives of *opportunistic* and the opposite *non-opportunistic*. The first is a selected platform and the second is a created one. I chose these terms in-lieu of more conventional knapping terms like *flat* and *faceted* because they are more descriptive for my purposes herein. In an L-R environment, the main knapping objective is to create flakes.[2] In the early stages of extracting flakes from a piece of raw material, the knapper selects naturally occurring platforms, many of which are cortical. As the reduction continues, the knapper may incidentally create a new platform location, but the fact is as the reduction continues the number of opportunistic platforms diminishes. Ultimately, the knapper is force to create his own platform on the core, or start over with a new piece of material. Guess what reader, the knapper starts over with a new piece of material if he is located in an L-R environment. It is quicker and easier. As a testimonial for this, I remember one summer doing survey archaeology on the North Slope of Alaska, which is an L-R environment. During that summer, I tried to find flakes with non-opportunistic platforms and, to my surprise, they were almost non-existent. I might have seen only two or three in the six weeks I was there.

Note 2 – Although projectiles are the focus of a vast number of lithic studies, they were not the focus of the knapper's time and energy. I suggest that they consumed less that 10% of knapper's time.

In an L-P environment, the goal of the knapper is to preserve material. As a result, he will refurbish his dull tools or modify them into different tools, until they become so small that they cannot be utilized for anything. When it is time to make a new flake, the knapper will create platforms on his core material that will minimize his material lost. Time and ease are not a concern. Returning to the above discussion of Artifact Size, non-opportunistic platforms correlate strongly with small artifacts.

The **Presence of Blades and Blade Cores** is strikingly different between L-R and L-P environments. But before I discuss this difference, I want to define a blade. To me a blade is a long, narrow flake that has been struck from a core that *has had* or *will have* more long, narrow flakes removed from it. It is the knapper's intent to make a number of long, narrow flakes from the single core that makes them blades. Therefore the finding of a single long, narrow flake or a single long, narrow flake scar in an assemblage is not evidence for a blade technology.

Blades were not made in L-P environments because blade technology is an extravagant technology. I am aware that the older literature claims that blade cores yield more cutting-edge length than other cores reduction strategies and this may be true. Yet in the sites that yield blades, the vast majority of the blades were never used based on visual inspection. Only a few were cherry-picked from the many. One would never waste material like this in an L-P

environment. In my experience, it is a rare site in an L-P environment that yields even a number of long, narrow flakes, which I would classify as blades. I know of a few and in each incidence I believe the blades were made in an L-R environment and then transported into these L-P sites. I have never seen a blade core from a site in an L-P environment.

Even in L-R environments, blades are not always found. The presence or absence of blades in this type of environment is determined by culture. For example the Mesa/Sluiceway people, who lived on the North Slope of Alaska, never made blades, yet they lived in a very L-R environment. On the other hand, the later peoples that occupied the same region did. In summary, the absence of blades does not define the lithic environment, but the presence of them dictates an L-R environment.

The **Presence of Bifaces**[3] in L-P environments is sparse. Plus they generally are represented by only tiny fragments, many of which are the result of radial fracturing. The obvious explanation for this low density is again the attempt to conserve lithic material. Bifaces represent a supply of material and, therefore, they were not discarded until the material contained therein has been exhausted.

Note 3 – As stated in Table 1, bifaces excludes projectiles.

In an L-R environment bifaces and biface fragments are everywhere. For the people who subscribe to the various stages of biface manufacture, all the stages are represented. This abundance is not the result of people attempting to make hundreds and hundreds of formal bifaces. Instead it is the result of flake extraction and these bifaces are only flake cores. See *The Lithic Containers of The Archaeological Record* (http://www.ele.net/containers/lithic_containers.htm). In an L-R environment, a knapper could always start over with a fresh piece of material since there was no pressure to totally exhaust a core. Plus, a fresh piece is larger, which makes it easier to knap and remove larger flakes. The result is an assemblage that appears to have a high failure rate in biface manufacture.

Bifaces and large, flat flakes, from L-R environments, are often struck with an edge blow that is designed to break the biface or flake into two pieces. This break is not a bending break, but instead it is a large burin spall removal. See Figure 1. The larger fragment of the biface can be considered the burin and the smaller the burin spall. The 90 degree edges that result from this burination process are great tools for working hard materials, e.g., wood, antler and bone. The fragments are large enough to be hand held and, therefore, hafting is not necessary. In fact, it is easier and quicker to create these burin edges on large crude bifaces than it is to haft a flake in a scraper handle. Figure 2 illustrates a few more biface fragments that are the result of this burination process.

Figure 1

Figure 2

In L-P environments this burination process would never be considered because it is terribly wasteful of material. However, as stated in the beginning of this section, one can occasionally find small fragments of thin bifaces. These are not the result of this burination process, but instead they result from a blow to the face of the biface, which is laying flat on a flat surface. This smashing process produces bending fractures that radiate out from the point of impact. It is my opinion that these bifaces became too small to be used as flake cores or hand held tools and this radial breaking was the last good use that could be made of the material. These radial smashed fragments make excellent gravers for grooving hard materials. Plus, the 90 degree edges that often result could have had some scraping use life, but they are too small to do much work.

Unifacial Tools in sites in L-P environments are abundant as compared to L-R sites. A good measure of this abundance is the comparison of the ratio of unifacial tools to projectiles from both environments. Generally in L-P sites the count of unifacial tools will be greater than the projectile count. The reverse of this is true in L-R sites. For example, my experience in the L-P Central Rio Grande Valley of New Mexico yielded a ratio of almost two end scrapers per projectile. See *The Paleo End Scraper* (http://www.ele.net/pes/pesintro.htm). On the other hand, the eight summers I worked in the L-R North Slope of Alaska, we found, maybe, four end scrapers and over a hundred projectiles.

End scrapers with convex scraping edges (Figures 3a-j) are probably the most familiar unifacial tool to the reader, yet gravers with sharp points (Figures 3k-p) and spoke shaves with concave scraping edges (Figures 3q-r) are also common tools. Often the combinations of two or three tools, each of which represent different functions, are found on a single piece of material. Figure 3l is a graver and a spoke shave. Figures 3a, b, and f are combinations of end scraper, graver and spoke shave. People sometimes suggest that these combinations are similar to a Swiss Army Knife since they are multi-functional tools. However, do not fall into the trap of believing that these tools, whether singletons or combinations, were initially created to the morphology that they have at the time of their finding. Instead their morphology evolved over their use life. They all began as flakes, but because of a desire to conserve material they were used, refurbished, and reused many times and this long use life created the various morphologies shown in Figure 3. Often these unifacial tools are considered to be curated tools or tools that were made, used, and saved for future use. I view this differently and argue that it was not the tool but the lithic material that was curated for future use.

In an L-R environment the desire to conserve material is missing. Therefore, the use life of the tools performing the same functions that occur in an L-P site is very short. When a flake was dulled in an L-R site, it was not resharpened, but instead it was replaced with a fresh flake because this was easier. There was no resharpening/refurbishing, which ultimately gave the dulled flake the morphology that the lithic analyst drools over. Additionally, there was no reason to haft the flake, because fresh flakes could be created large enough to be hand held. The end result is the L-R site is full of dulled flakes, which are often overlooked as tools by the analyst.

In summary, the unifacial tools from the two different environments look very different from each other, both quantitatively and qualitatively. Yet, the daily functions of cutting, scraping, and poking are being conducted in both environments. It is the conservation of lithic material, or lack of it, that causes the differences.

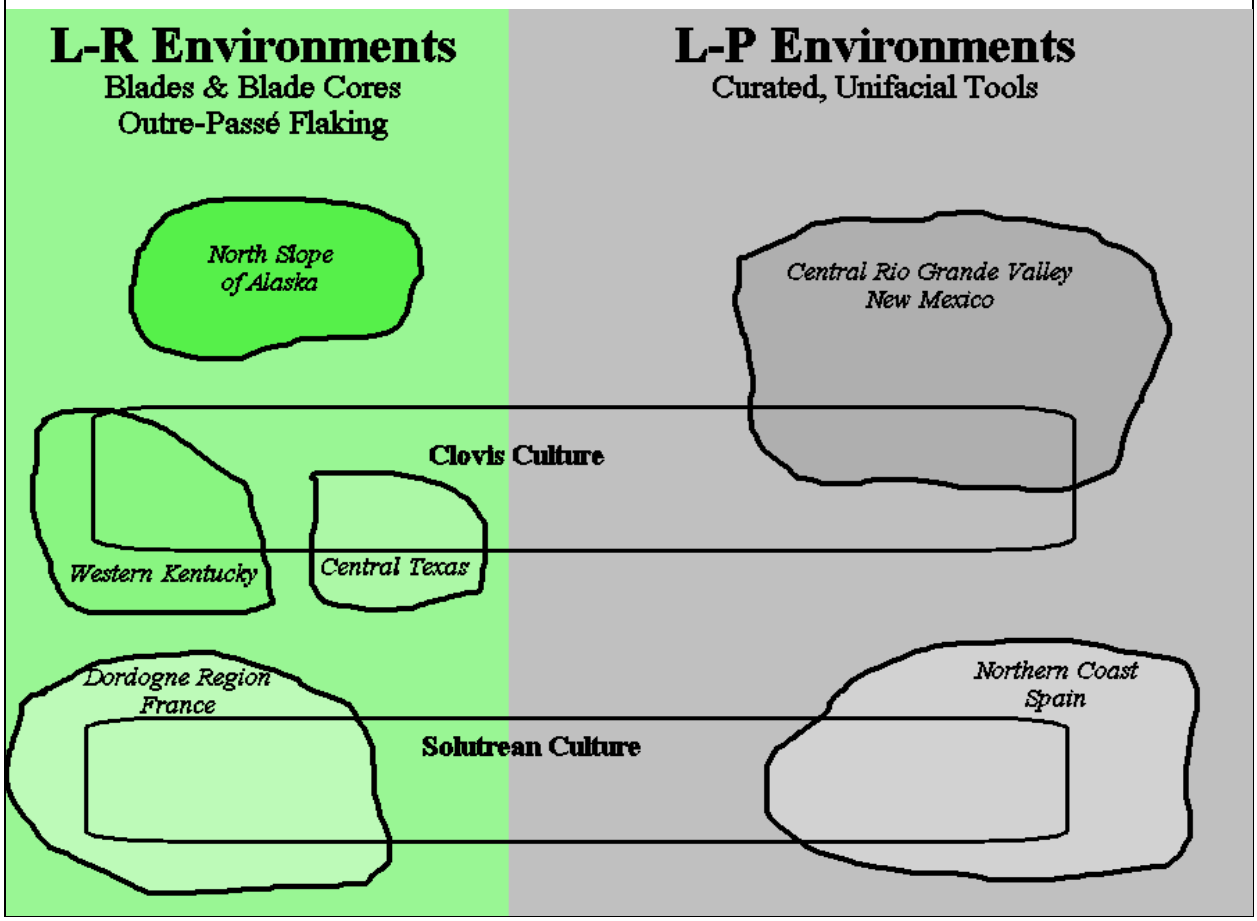
Figure 3

The **Presence of Outre-Passé Flaking** is common in L-R environments because it flattens and thins a biface with the least amount of effort or strokes. It is a bold, but wasteful technology due to a high failure rate. Because of its wastefulness, outre-passé flaking is rarely practiced in L-P environments. A few examples of this technology can be seen at *Dome & Plane (D&P) – A Biface Reduction Process* (http://www.ele.net/Carl/flt_bifa.htm).

The difference in the **Presence of Recycled Artifacts** between L-R and L-P environments is not readily apparent. This is unlike most of the other characteristics list in Table 1, yet there is a difference. I pointed out that difference in an extensive web paper on *Recycling* (http://www.ele.net/recycling/diffsurf.htm) in 2007. In that paper I defined recycling as using a piece of lithic material that had been previously discarded by someone else. This is very difficult to see in the archaeological record because one can only see those cases where the time between discard and reuse is many hundreds of years. One method is to look for differences in the patina on the chip surfaces. If a lot of time has passed between the two chipping events, then differences can be seen. Another method is to observe a temporal diagnostic trait created on top of another temporal diagnostic trait. This usually takes the form of a projectile created on/from an older projectile. The data I presented in my 2007 paper suggested that only 0.7% of the artifacts from L-P environments have been recycled. This is to be compared with 1.4% from L-R environments. These are very small percentages, yet the L-R environments still have twice the number of those from the L-P environments and the difference is statistically significant. This difference is logical because the desire to conserve lithic material in an L-P environment greatly reduces the chances of discarding a piece that is still large enough to be recycled at a later date.

My Concluding Remarks will begin by admitting that I am a lumper and I have created Figure 4 to help explain my lumping. L-R and L-P environments are two large groups for me, in which I lump all lithic assemblages. Unfortunately, some of the people from various, archaeologically defined cultures chose to live in both environments and this can create some confusion. For example, outre-passé flaking and blades are often attributed to Clovis and Solutrean. They do occur in the Clovis assemblages from Western Kentucky, Central Texas and other L-R environments. The same is true for Solutrean assemblages in the Dordogne region of France. However, they also occur on the North Slope of Alaska and Clovis and Solutrean are not found there. Further, outre-passé flaking and blades do not occur in the Central Rio Grande Valley of New Mexico, nor the Northern Coast of Spain where Clovis and Solutrean are also found, respectively. The reverse is true for curated tools. In summary, a biface with outre-passé flake scars, a blade core, or an end scraper are not cultural diagnostics for me. They are only artifacts that I can assign to one of the two lithic environments. By themselves, it is anyone's guess as to who (cultural group) made them.

Figure 4



I mentioned in the beginning that L-R environments were smaller in area than the L-P ones and I have depicted that in Figure 4. However, because the L-R environments are the most desirable locations on the landscape the associated populations were the greatest over time and this is reflected by the abundance of artifacts in the archaeological record. It has been suggested by some that Clovis first appeared in the southeast portion of the U.S. because that is where most of the Clovis points have been found. On the other hand, I argue that the density of Clovis points for this region is the result of it being a sweet spot (L-R) on the landscape and, therefore, most of the Clovis people hung out there.

Caches were not discussed in this paper because I don't believe they have any relevance here. Or, maybe I don't know what the relevance is. To me they are anomalies in the archaeological record and offer very little information about the daily lives of the average person.

Finally, this paper has been about modern Homo sapiens, yet the same L-R, L-P concept discussed in this paper applies in some respects to the earlier Homos. For example, guess where the vast, vast majority of Acheulean handaxes come from? L-R environments and this is part of the reason I believe the handaxe is not a formal tool made to a mental template. But, instead it is a biface flake core. For a lengthy discussion on this subject, see *The Acheulean Handaxe* (http://www.ele.net/acheulean/handaxe.htm).