CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

LITHIC DISTRIBUTIONS AND MEANING ON ISLA CEDROS, BAJA CALIFORNIA

A thesis submitted in partial fulfillment of the requirements

For the degree of Master of Arts in Anthropology

By

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ABSTRACT

LITHIC DISTRIBUTIONS AND MEANING ON

ISLA CEDROS, BAJA CALIFORNIA

By

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Master of Arts in Anthropology

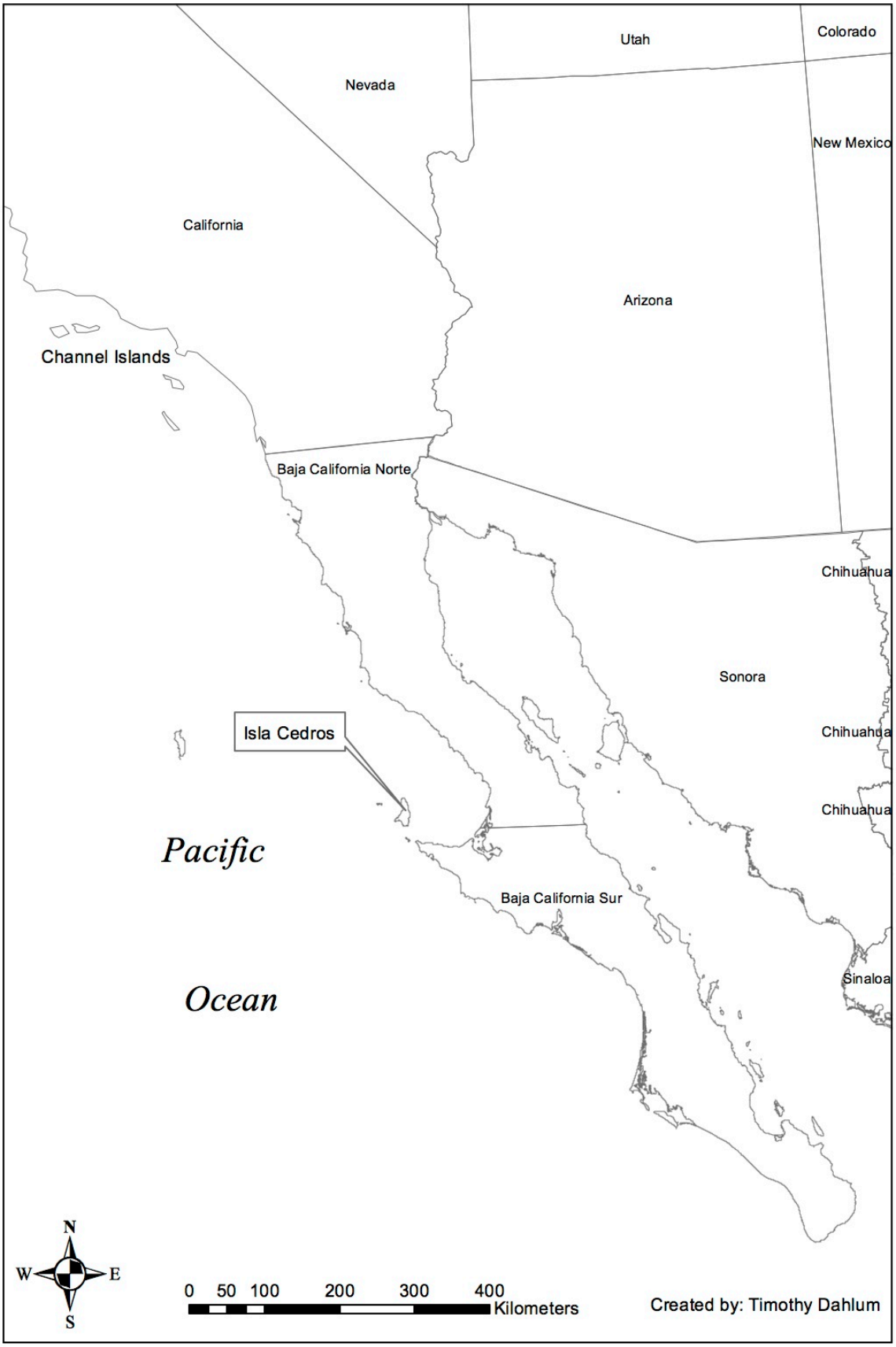
The purpose of this thesis is to analyze the existing collections of lithics from Isla Cedros for indications of social structure and context. This is accomplished by using a GIS to overlay the distribution of locally sourced stone versus imported obsidian. The patterns of distribution allow us to see social systems at work. The way obsidian was distributed from the mainland shows a fairly even distribution in later periods pointing to a system that had few just one bottleneck that would coalesce and redistribute the obsidian throughout the island. The bottleneck was the port of entry to the island from the mainland, and seems to indicate that this site was the largest and longest occupation on the island, although no further research is possible due to the modern town that has been built on top of it. The relatively even distributions, especially in later periods of occupation, the multiple funerary contexts, and the lack of evidence of retouching and therefore non-utilitarian tool use point towards a special attribute placed on the obsidian.

CHAPTER 1

INTRODUCTION

Isla Cedros is a coastal island along the Pacific Coast of North America at the southern end of the California Bight. The island is unique in the level of preservation of sites as well as surface and shallow paleosoils. Geologically, the island has two distinct zones with the southwestern portion of the island arising from a different geological formation with of a more sedimentary nature with softer calcareous types dominating the landscape, and the northern portion of the island arising from the metamorphic and granite-bearing processes that created its rugged spires. Having two unique geological zones has gifted the island and its inhabitants with many types of stone for different tools and processes. There are many different types of stone on the island that are fine grained and several cryptocrystalline that are excellent for chipped stone tools, and in some cases better than obsidian because of their durability. The nearest viable source of obsidian is not on the island, but is instead located on the far side of the peninsula along the Sea of Cortez. The land between the obsidian source at Valle de Azufre along the Sea of Cortez and the Pacific coast launching point back to the Isla Cedros at Punta Eugenia incorporates some of the most treacherous and hostile land, as well as the widest point along the entire peninsula. This then begs the question of why the islanders would go to the trouble or expense of importing obsidian when there was very serviceable and in some cases superior tool stone available on the island. Analysis of the distributions of lithic artifacts from local island sources as well as obsidian across the island on a site by site basis to understand both distribution networks and see how much they mimic each other, and whether or not they are one and the same or separate and distinct networks.

The degree of insularity or interdependence from others on the island and the peninsula is the underlying question, and why there was contact with the peninsula, was it an ecological or political or symbolic in nature.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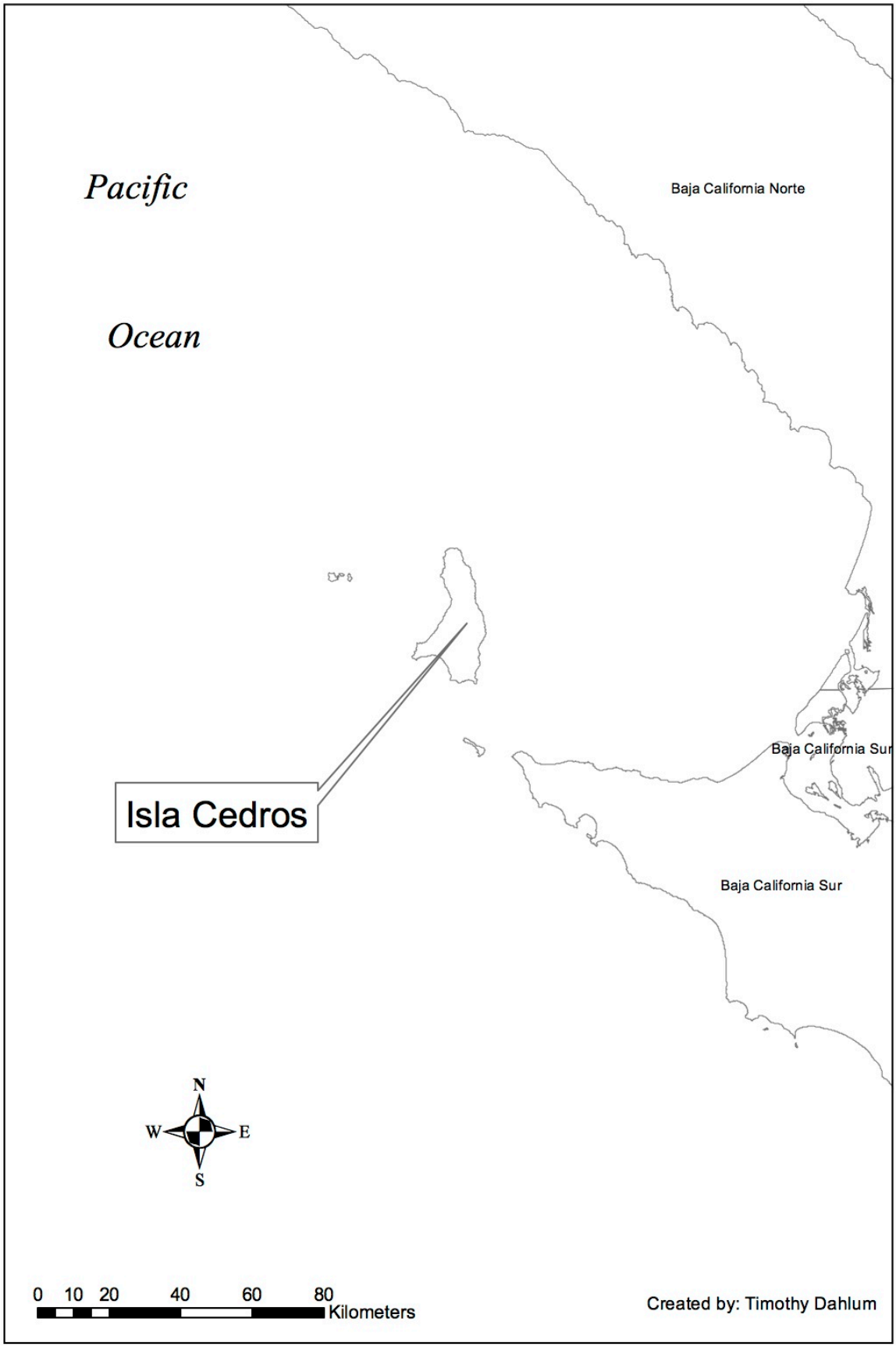
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CHAPTER 2

ENVIRONMENTAL AND CULTURAL CONTEXT

The promontory of Isla Cedros rises 1,300 meters above the sea and is easily visible from the peninsula. The island is located off the central Pacific coast of Baja California near the Vizcaino Desert and the lagoons of Guerrero Negro. The vast coastlines are rife with a variety of marine resources and protected shorelines and marine terraces for sheltered and defensible sites and plenty of fresh water. The combination of fresh water and plentiful marine resources as well as a good selection of terrestrial flora created a veritable oasis compared to the desert and salt lagoons of the mainland peninsula just a short trip across the water.

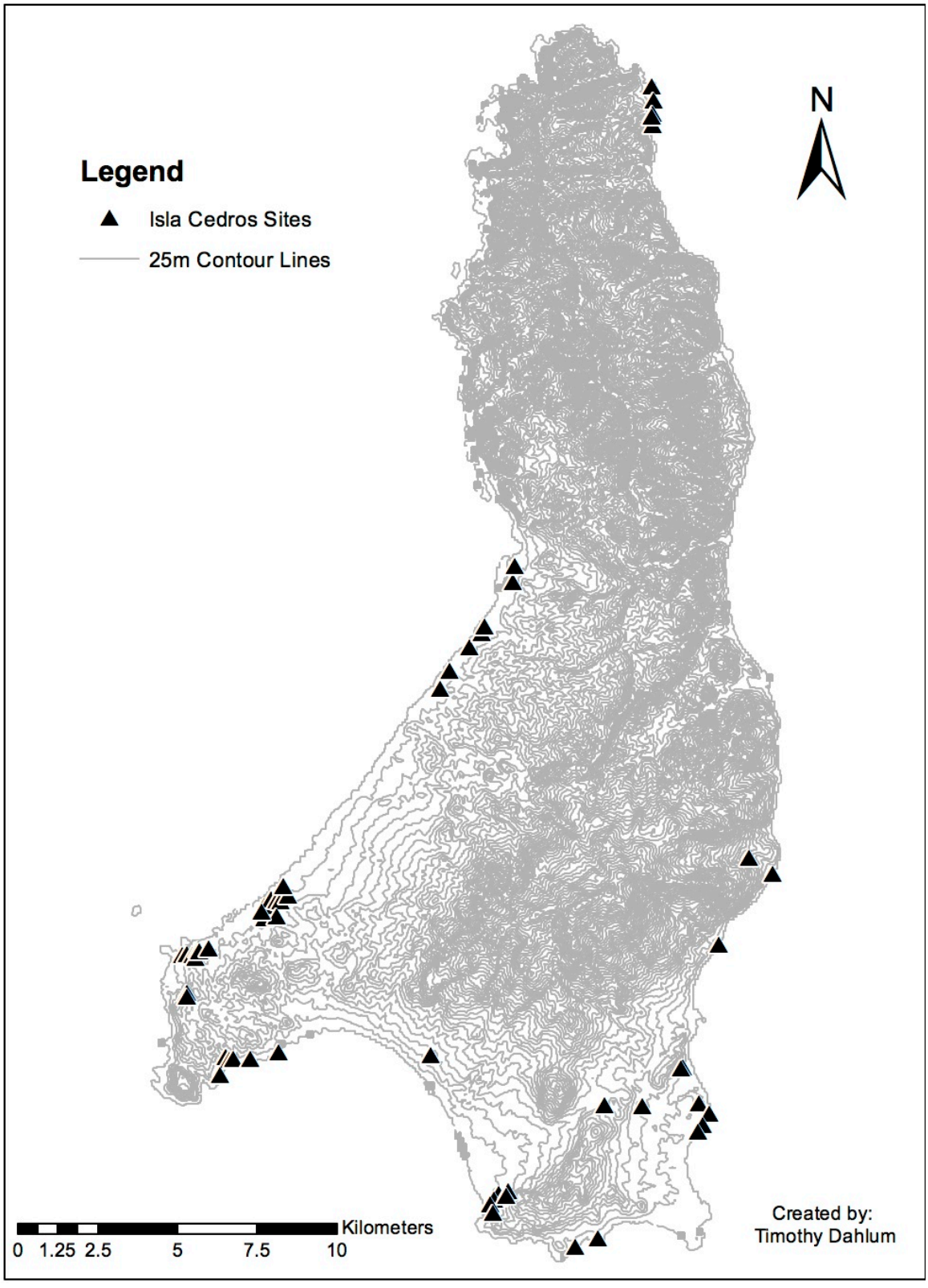
The geological composition of Isla Cedros is extremely varied at the southern half of the island while the northern portion is largely pillow-structured volcanics, breccias, and plutonic igneous rocks such as diorite. There are more sources of potable water from springs on the island than are present on the adjacent peninsular mainland, and as such make the island a unique oasis along the Pacific coast of Baja California. The interior is quite rugged and steep terrain and the location of the origins of most of the islands springs, although the waters are also accessible nearer the coastline. The coast has three primary types: rocky shore, open beach and sheltered sandy beach. The northern half of the island is almost exclusively rocky shore, with the southern half a mix of sheltered sandy beach and rocky shore, with the exception of the stretch of open beach that encompasses most of central western coast.

The island's geographical features are craggy and very difficult to traverse in the interior especially along the backbone of the island. The coast is a patchwork, in the

south, of rocky cliff lined shore and sandy beaches, and in the north is very inhospitable to coastal landing and access, except for a very few spots because of the steep cliff faces of very tough volcanic rock. The craggy nature has led to a potential for massive effluvial discharge during 50-150 year extreme storm events that hit the island and cause the thin soil and dirt that coat the island to run off in the major drainages of the island and choke out the shellfish beds and kelp forests along the sandy shoreline. This has led to the placement of villages at locations that can withstand the loss of a small amount of fishing territory and in exchange have to potentially travel a slightly greater distance for fresh water.

The movement of obsidian across the Baja peninsula is a direct linkage to the movement of humans across the landscape. What are the reasons for the movement of this resource across the peninsula almost always in an east to west direction? The significance can be found in caches of obsidian artifacts as well as from the ethnohistoric account from the people in the region and their neighbors. In a way, the movement of obsidian across the landscape, and the scope of time, also illuminates the evolution of the socialization of the landscape. The interconnectedness of the groups of people on the peninsula and their counterparts on Isla Cedros via their trade or exchange of goods, ideas, and culture gives us insight into the group dynamics and relationships at play in the region. We can also look to the way landscape is perceived by the inhabitants of Cedros and how this played into their decision making behind local stone and obsidian distributions. We know that elsewhere, "ancient human groups also can be analyzed as having perceived and occupied landscapes through strategies of flexible networks . . . This strategy is identifiable in human social groups at different levels of complexity

ranging from hunter-gatherers through ancient chiefdoms and states." (Smith 2005), and that humans "conceptualize landscapes as discrete packets of resources, rather than as homogenous territorial wholes." (Smith 2005)


Legend
Isla Cedros Sites
25m Contour Lines
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Kilometers
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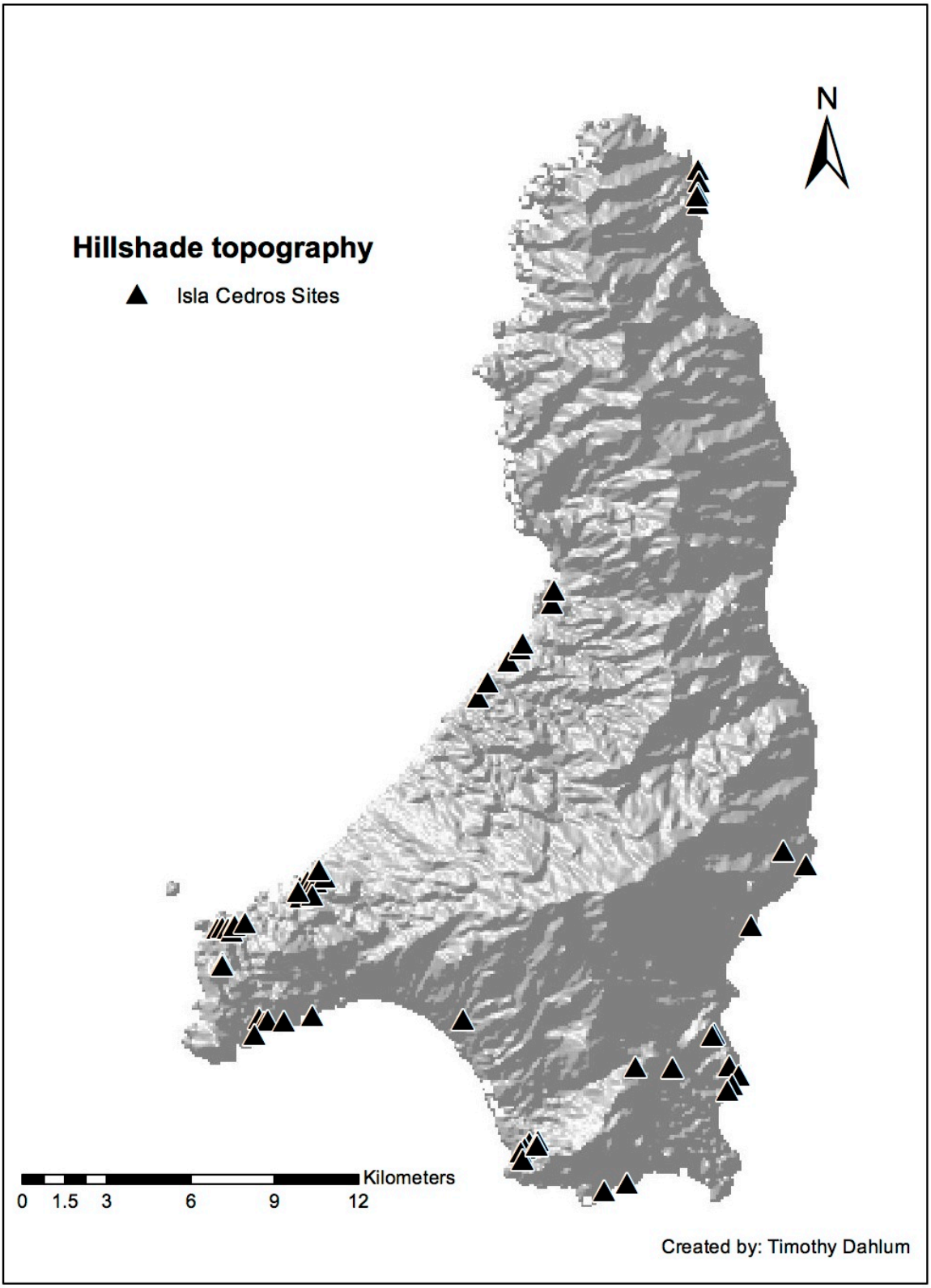
Timothy Dahlum

Of particular interest is the movement of obsidian to Isla Cedros on the central Pacific Coast of Baja California. Isla Cedros does not have an existing source of obsidian either on the island or on the nearby coastal mainland. The source of all of the obsidian found and sourced thus far is from the Valle de Azufre source on the gulf coast of the peninsula (Des Lauriers, 2005). The Valle de Azufre is a very high quality source of obsidian, which has seen the highest level of exploitation on the peninsula and possibly in the southwestern United States. (Shackley et al 1996:718) The intervening distance while mostly flat across this portion of the peninsula is the driest and most inhospitable portion of the peninsula, coupled with a large salt marsh. The huge difficulty involved in the procurement of obsidian instead of the use of the perfectly viable sources of siliceous outcrops on Isla Cedros portends an importance placed upon obsidian. While the definition of the importance may not currently be discernible the abject importance can be found in the high concentrations of obsidian found in the cremation pits on Isla Cedros (Des Lauriers 2005a:303-307). The high concentrations in the cremation pits may be indicators of social status and power, and potentially spiritual power for the owner of the obsidian or the recipient of the offering. This use on Isla Cedros gives evidence for the association of obsidian with power, and not the necessity of obsidian as a tool source.

One of the earliest recorded dates form Isla Cedros of approximately 9,000 B.P. and therefore does not reflect the earliest dates for mainland occupation. With further record searches and further dating of obsidian and other artifacts from the regions surrounding and between Valle de Azufre and Isla Cedros, the picture should become more complete. A comprehensive image of the relevant dating and spread of obsidian

use will aid in expanding our knowledge of the interconnections of the people on the mainland and Isla Cedros.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Hillshade topography
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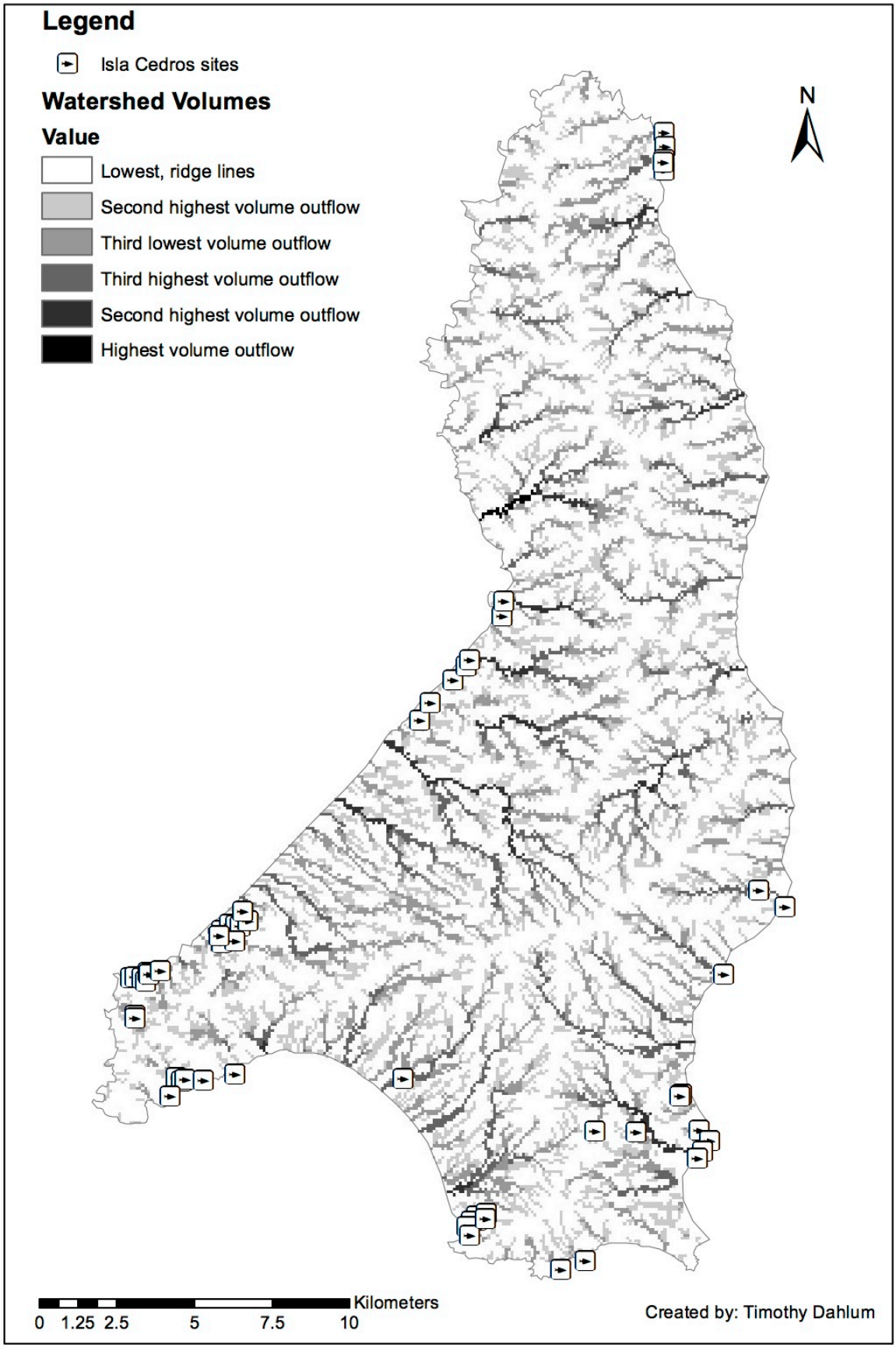
The regularized transhumance on the peninsula was not just for direct procurement of food and resources. (Moore 2001) There are regularized intervals and places for meeting with members of the same group that might have split up or from neighboring groups for trade, idea exchange, marriages, ceremonies, and rituals. Obsidian was transported across the peninsula from each source to the interior and to the Pacific coast; all of the sources are on the eastern side of the peninsula, to many of the site locations on the western side of the peninsula. There is evidence for certain marine resources moving across the peninsula. The marine and obsidian resources are involved in transpeninsular migration indicates the movement of whole groups of people, or the existence of networks of exchange and trade. The latter is the most plausible, and this would indicate the existence of complex forms of social interaction on the peninsula.

The existence of sites in the interior containing not only obsidian in varying quantities, but also shellfish from both the Gulf of California and the Pacific point to sites where there was a common ground for different groups of people. This implies there is significance to certain interior sites. I visited three sites in the interior of the San Quintin/El Rosario project area that included these features. One site was spring fed oasis that was heavily used for a long period of time, it included on the surface, as well as in erosion cuts, obsidian and other lithic source artifacts, as well as shellfish indicative of both the Pacific and gulf coasts. A "female puberty" ritual site associated heavily with the long rattlesnake motif included rock piled caves and a spring inside the cave. Rock art was very abundant at the site, as well as fossil-encrusted rock with trilobites and other segmented animals, which could have added significance due to the similarity of body

form of the animals with the rock art symbology for the rattlesnake. There was also evidence for transpeninsular visitors including obsidian.

Each of the above mentioned sites work well with the ethnohistoric accounts for places of cyclical gathering in Baja California. An account of this transhumance follows, "the southernmost of the Kumiai communities, located on the eastern edge of the great Ojos Negros Valley and at the base of the Sierra Juarez, this community's 6268 hectares include fertile soil and plentiful springs, giving it rich agricultural potential, as its name La Huerta (The Orchard) suggests. In the past, when indigenous groups were more mobile, the site of La Huerta represented an important encampment in the yearly migration from the coast up to the mountains. Many Huertenos also remember the tradition of cultural and economic exchange with the Cucapa who came up from the Colorado River delta region every summer, creating a link with other groups of the Colorado River region and beyond." (Wilken-Robertson, 1997)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Isla Cedros sites
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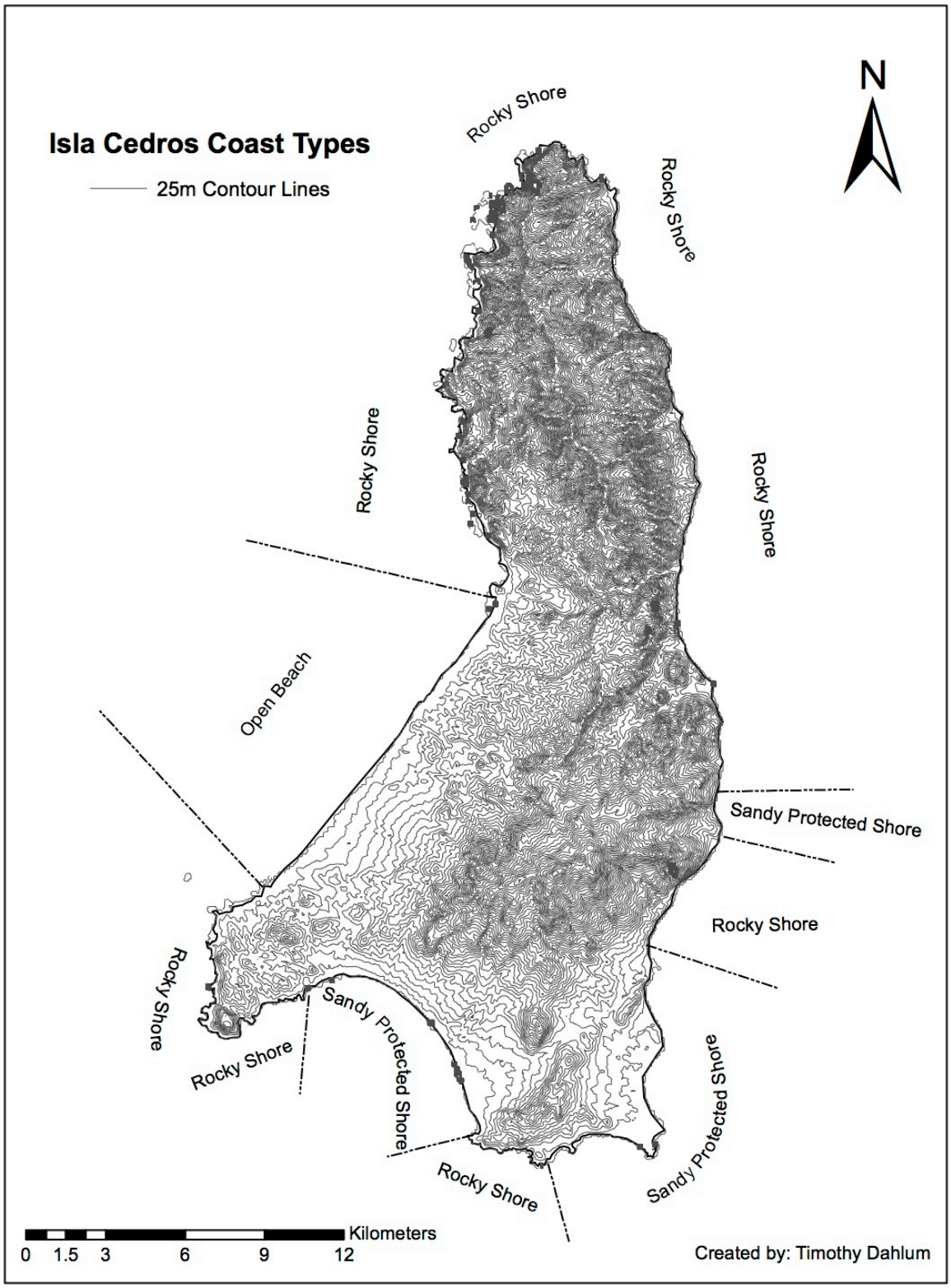
What routes would have been used in order to move the obsidian from the Valle de Azufre source to Isla Cedros? There are three major routes to consider from a walking and watercraft perspective. The first, and most obvious, would be a straight route from the Valle de Azufre sources to the Guerrero Negro peninsula. The second route would go from the Valle de Azufre source across the narrowest part of the peninsula to the Pacific coast and the move along the coast up to the Guerrero Negro peninsula. The third route would go north along the gulf coast to a narrow crossing and then across the peninsula to the Pacific coast and around to the Guerrero Negro peninsula tip. From the tip of the Guerrero Negro peninsula, the obsidian could then make the 14-mile trip to Isla Cedros.

Each of the routes have their problems. The direct route would include a trip across some harsh desert and then salt marshes. This route would mean the need for a person or group of people to transport a shallow-water watercraft across a large portion of the interior. This route also covers the most difficult environment for the duration. Either of the alternatives makes use of the coast, and therefore a potentially more hospitable environment. The direct route would take about 163 miles to travel from the Valle de Azufre source to the tip of the Guerrero Negro peninsula.


Isla Cedros Coast Types
25m Contour Lines
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Rocky Shore
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Open Beach
Sandy Protected Shore
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The northerly route would entail moving north along the coast and crossing where the peninsula narrows and then across to the Pacific coast. Once at the Pacific coast the movement could either be walking along the coast or via watercraft shirting the coast to the tip of the Guerrero Negro peninsula. Unlike the direct route this one makes use of the Pacific coastline adding a possible advantage to this route. If the obsidian moved by one people across the inland portion of the Baja peninsula the people of Cedros could have met at the point of emergence from the interior instead of at the tip of the Guerrero Negro peninsula. The distance just to the Pacific coast would be 126 miles, and the trip to the tip near Isla Natividad would be a total of 199 miles fro the source.

Use of the southerly route would have meant moving from the Valle de Azufre source to the Pacific coast along the narrowest portion of the Baja peninsula from the source. Once again there are options for the rest of the trip once it reaches to Pacific coast, either a land-based route along the coast or in watercraft. The watercraft option could be performed either by the original transporters form Valle de Azufre, or a different people with maritime experience and resources. The trip from Valle de Azufre to the closest point along the Pacific Coast is 90 miles, and the total distance to continue to the tip of the Guerrero Negro peninsula is 204 miles.

Consideration of the mechanisms behind the exchange of obsidian are also important to understanding the interrelationships of the people of the mainland and the people of Isla Cedros. There are three viable options for the movement of the obsidian from Valle de Azufre to Isla Cedros: direct access, central place, and down-the-line. Each option has its own implication for the interactions of the people of the mainland and the island.

Down-the-line exchange implies a network of active exchange or trade ongoing between the island and the mainland. This would involve the multiple exchanges before reaching its final destination, allowing for the free interaction of multiple groups of people along the way of its up to 200 mile journey. The archaeological signature for this type of movement would be the presence of obsidian along the route as well as in a radiating pattern of movement into other areas. There would be tell-tales of exchange from the island at the same sites throughout the interior on the mainland. (Laylander 2009b)

Direct access to the Valle de Azufre source by the people of Isla Cedros is another possibility for the movement of obsidian to the island. This scenario would mean the movement by watercraft from the island to the mainland and either use of the watercraft to traverse the salt marshes and lagoons before leaving the watercraft and walking across the interior desert tot he source, or using the watercraft to move along the coast to the shortest land route and then moving across the mainland to the gulf side where the source is. Evidence for this in the archaeological record would include evidence of Isla Cedros materials at the Valle de Azufre source but very little to no traces anywhere else on the mainland. And yet, "the distribution of obsidian in every major village or residential site also implies social and economic contacts between settlements". (Des Lauriers 2005a:12) The potential is for a kin based geographic model (Peterson et al 1997:238) to be at play here. The absence of Cedros materials on the mainland would be due to the bypassing of trade with anyone else along the route and the direct extraction of the resource by the islanders, or the simple fact that the items traded from the island were not highly durable,

such as seal skins, and as such have not survived in the record unlike the highly durable obsidian.

Viewing the Valle de Azufre source as a central place is the third possibility to consider. This would mean the cyclical gathering of large groups of people from the surrounding areas that all had some ideological tie to each other. Archaeological correlates would be evidence at the Valle de Azufre source and the surrounding area for large gatherings of people from diverse locations, the faunal and floral remains would indicate food and resources coalescing from other regions with differing flora and fauna. These short-term gathering events could possibly be coupled with a small group of permanent residents, but the signature from the gatherings should be readily observable.

The evidence at present seems to point to the Valle de Azufre source acting as a central place. There were cyclical gatherings according to some historic records, and one account for the islanders showing up shortly after the founding of the Mission San Ignacio Kadakaaman. (Des Lauriers, personal conversation) This arrival could indicate the time for a gathering, or that the islanders had already heard about the arrival of the missionaries to the area. Either way it illustrates a high propensity for the central place hypothesis in regards to the obsidian movement. Survey and excavations around the Valle de Azufre source could yield more information, but further work needs to be done to attempt to discern the route the islanders would have take, and survey of those areas as well. The arrival by the islanders to the newly founded mission as well as the high concentrations of obsidian in the cremation pits on the island are strong indicators of the high potentiality of an ideological tie between obsidian and the islanders. If this is the case there is a strong ideological significance to the Valle de Azufre and Tres Virgenes

area for the people of this portion of Baja California, and especially for the inhabitants of Isla Cedros.

CHAPTER 3

THEORY

Exchange networks are the basis for much of our understanding of the prehistoric world's interdependent networks that allowed the flow of goods, ideas, and people. The use of obsidian as an indicator of movement has been a longstanding method given our ability to easily discern the original sources of obsidian as well as the desirability of the good itself for more than just utilitarian reasons. Obsidian distributions have been explained via essentially three main models, or explanations: ecological, political and symbolic (or ritual). Each of these three explanations has multiple proponents and I will therefore have several examples in each for each model. Ecological models explain obsidian distributions as a factor of distance from and the desirability of a resource and the way it has been used to fulfill basic needs. Political models have been used to explain obsidian distributions as a way for elites to control prestige goods and control of the populace through the control of utilitarian goods as well. Symbolic models include ritual items, and are not a part of the political models, are used to describe distribution models where items are exchanged because of the symbolic importance of the item. Some of the models have grey areas that can be used in more than one explanation, but here I will try to simplify examples into one category. The difficulty in parsing the theoretical underpinnings of obsidian studies is the heavily descriptive, data oriented nature of quite a lot of the work that has been done. Essentially, the wider discussion of this paper looks at the differences and similarities of material correlates we can find in the archaeological record, and the driving forces behind them.

Ecological models of obsidian distributions are largely used for the study of hunter-gatherers. Much of the literature on hunter-gatherer tool stone acquisition, and especially obsidian, tends to rely on what has become known as down-the-line models taken from an economic model and applied to the environmental constraints of acquiring raw materials. Some of the constraints could be the relative rarity of the material, the distance traveled to a source, weather or geographical concerns. Ecological models and explanations were used by Summerhayes, Specht, Ericson, Galm, Carlson, and Jackson and Ericson to describe where obsidian was sourced in different parts of the landscape in varying quantities, and its potential distribution via exchange or trade.

Evidence of an environmental models approach can be clearly seen in Glenn Summerhayes (2009) article about the spread of obsidian tools from Borneo to New Guinea and eventually to New Caledonia and Fiji, in some cases reaching all the way to New Zealand. The entire system of trade originates with the move of people colonizing the islands from Borneo to New Guinea and bringing their tool stone with them, this occurring for some time until a viable local obsidian source was found. After the local source was found, there was a noticeable drop-of of obsidian being imported from Borneo. With each wave of expansion, there was a tie to the last and closest source of obsidian as each successive wave of people would move father along the chain of islands and eventually find a local source of obsidian that was suitable for their own use, as well as for the further expansion of their territories. This expansionary explanation is rooted in the environment with an overlying social dynamic that is never really explained, especially why the social links cease in conjunction with the discovery of a closer source.

If there were a social tie, certainly there would be a continuation of the obsidian exchange from the original source even when a closer and more convenient location was found.

Environmental constraints and the difficulty of the terrain are two of the primary concerns Jonathon Ericson in his analysis of exchange systems in California (1977). Ericson takes the view that methodology is paramount in explaining the egalitarian exchange systems that occurred in California as well as between California and the Great Basin. He uses a locational geography, specifically "synagraphic mapping" (Ericson 1977:112) to plot the location and quantities of obsidian as well as a qualitative value to the relative workability of the obsidian that could be obtained at any one location as several sources included phenocrysts that would make tool production particularly tricky. Ericson finds that the spread of obsidian tends to fall off from its source per the Law of Monotonic Decrement (Renfrew 1977), wherein the further from the source the less of the material there is in the archaeological record. Ericson further allows for the influence of several variables such as the known presence of trails through the areas near obsidian sources, the sometimes difficult to traverse geography, and the ethnohistorically known ethnolinguistic boundaries. There was also the assumption made that obsidian was primarily a utilitarian good. (Ericson 1977:115) Out of the three variables that were used in the multilinear regression equation, the one that was statistically significant was: relative distance from the source. This was compared with ethnolinguistic boundaries that were proposed by Marshall Sahlins, and the size of the populations that were assumed to be present and consumers of obsidian. The statistical analysis found that the key to all of the exchange and trade was simply distance to the source, with difficulty of the terrain factored in.

The Interior Plateau of Northwestern North America is another area used to illustrate the ecological model for exchange of obsidian. Jerry Galm performed analysis on the exchange of obsidian and shell beads in the Interior Plateau and the single most significant factor in obsidian distribution was entirely environmental, the distance to a known source. The study area incorporates an area comprising the interior plateau, marine coastal areas, and the Great Basin as potential exchange areas. Much of the obsidian that was exchanged in this network came from south-central Oregon and northern California sources, as these were the most abundant and easily accessible. The earliest artifacts in known from the area are all in the southern Oregon area, indicating that this was indeed a significant early source, and pointing to the ecological nature of this resource exploitation. The spatial spread of obsidian from this point are temporally progressive and this is also eventually evident from the northern sources as well, where they also radiate out from their initial source and diminish the further they move away. This also applied to the four regional centers that eventually sprang up for the trade or exchange of goods throughout the region, each of the trade centers had the highest quantities of obsidian from the closest and most expedient sources while having the least quantities from the farthest sources.

Further use of the ecological model is seen in Roy Carlson's work in British Columbia. Carlson further emphasizes the ecological underpinnings of the region after the above study from Galm. While the ability for human accessibility to the region was limited prior to deglaciation, obsidian usage and exchange is observed as soon as humans arrive. (Carlson 1994: 312) Obsidian is also seen as just one indicator of exchange and trade of other perishable items that would not survive the processes of time and is

indicative of substantial indirect intercultural interactions, (Carlson 1994:348) although other possible examples of long-distance trade other than in obsidian are surprisingly few.

A final example of ecological models for obsidian distribution is the product of Thomas Jackson and Jonathon Ericson focusing on the exchange systems in the California culture area, as well as tangential connections to the Great Basin and Mojave Desert areas. Here some of the ecological constraints beyond source availability in the area are volcanism (the very reason for obsidian being present) that continually changed the landscape, and weather related disruptions such as excessively heavy snows or droughts that were many times brought about by ENSO (El Nino Southern Oscillation) events. In the California culture area, there was significant transactions at various sociopolitical boundaries (Jackson and Ericson 1994:408) that may have been seriously disrupted due to volcanism along the geologic boundary between California and the Great Basin, effectively shutting down trans-regional trade for some time, with local California sources taking up the slack and in some cases permanently replacing trade in some Great Basin sourced obsidian permanently. Jackson and Ericson acknowledge that many of the archaeological models for early societies in California are still based on the assumption that these were small sized and wide ranging populations that directly sourced their materials, instead of relying on an interregional wide reaching exchange network.

Where many political models and explanations of obsidian distribution have been used is where there are also chiefdom or larger scale societies present, or where these larger and more complex of societies are trading into areas with small-scale societies. The political models all see the use of trade goods, in this case obsidian, as a means to

control the populations behavior, and to maintain a flow of prestige goods as well as control over these goods. Raymond Sidrys, Arthur Joyce, Michael Spence, and Robin Torrence evoke evidence of this line of reasoning.

In the Valley of Oaxaca, Mexico, Arthur Joyce et al. (1995) discussed the implications of obsidian from far reaching places such as Michoacan and the Basin of Mexico as indicators of political trade and exchange between the regions, as well as the control by Oaxacan elites of the most prized sources of obsidian from Monte Alban and especially from Teotihuacán. The presence of obsidian that has been definitively source to the Valley of Mexico coupled with the exchange of fine pottery out of the Valley of Oaxaca into the lower Verde region, illustrates at least indirect trade and direct control by the elites of a prestige item that was tightly politically controlled. Locally sourced Pachuca obsidian is known to have moved out of the region in small quantities, as is the case with several of the obsidian sources in the area. Each had a controlling elite that only distributed their obsidian among allies and political potential allies in the area. This has created a unique distribution pattern that can aid in the understanding of the political alliances of each time period and how they changed.

In analyzing the Mayan obsidian trade, Raymond Sidrys (1976) looks at the distribution amongst large and small regional centers and their quantities of obsidian. After the excavation of 17 Maya sites was completed the tallies of obsidian in each size of center the large regional centers end up with five times more than the small regional centers. (Sidrys 1976:449) In this case the political control is visible through he use of a central place redistribution models as opposed tot the economic version of the model, the central place market model. What the elite were doing was amassing the obsidian in the

largest regional centers, where the most political power was, and form there redistribute it to the other elite throughout the region of political control. This method ensured the consolidation of wealth and the display that went along with it, for the most powerful elites, and their tight control over who received how much obsidian. Use of this central place redistribution model ensured a direct control over the rest of the population as well as the added effect of constraining such wealth to just a few places.

Michael Spence best illustrates the political model with the Teotihuacán obsidian distributions. Here the state had a very tight control over the whole of the creation and distribution of obsidian. There are two apparent distributions and manufacturing systems that are at play, but that are also intertwined and interdependent. The manufacture of goods in the workshops of Teotihuacán of the highly prized green obsidian were specifically for the uses of the state government and would be found outside of the workshops only in the context of elites, and most frequently in the caches of elites in other polities that the Teotihuacán polity was politically influencing, such as the Maya. (Spence 1981) The production of items in grey obsidian however, seems to be produced by the Teotihuacán workshops in a residential context, with the sole intent of market-based distribution, but with some political control. Distribution of the green obsidian items would have been used by the state to trade for other prestige goods from the Mayan tropical regions such as jade, shell, cotton, and feathers. The elite at Teotihuacán would have kept a very tight control on the import and distribution of such desirable prestige goods, which would have included cacao. The bulk of the green obsidian items produced in the workshops would have been for the ritual consumption of the Teotihuacán populace. Even the most insidious elite appetites could not have competed with the daily

utilitarian needs within Teotihuacán of their 100,000-200,000 populace. (Spence 1994:34) In both cases, there was a tight control over the production and distribution of obsidian items via political power, controlling the flow of a needed utilitarian good as well as the acquisition of other desirable prestige goods from outside sources via the trade of green obsidian items. The regional trade was controlled directly by the state, but much of the local production and distribution was conducted outside of the workshop context, and was most likely residentially manufactured by the same specialists that worked in the state workshops for corvee or tax-based labor for the state. Much of the obsidian produced for the local markets would probably have been distributed through the same networks used by the elites, but would have been established much earlier by the specialists.

The symbolic model could really be typified through Colin Renfrew's cognitive processualist approach to a "ritual economy" (Renfrew 2001) such as the complex at Chaco Canyon during its height. In the case of obsidian, or other items of devotional interest these would be part of the "badges" that would be obtained to take back home with them as an extension of the devotional location. Many items were being imported to Chaco Canyon, and any one of these items by simply being associated with the devotional center could be redistributed to any one of the visitors to the site. This redistributional aspect is rather unique in that the visitors do not need a local product or material, just one that they have associated with the site that they can take back home with them.

In her most recent article of Robin Torrence (2011) makes the argument for the social networking significance of obsidian in Papua New Guinea and the surrounding

Melanesian archipelago. Obsidian was not necessary for daily life in and could easily be replaced by bamboo and shell, but the unique material properties of obsidian and its visual cues would have acted as a social binder. (Torrence 2002) Obsidian distributions among the people of this area that used stemmed tools, also do not fit into the usual model of using the closest source, and instead does seem to factor distance into the item, there seems to be some other level of significance at play. The amount of time expended in the manufacture of obsidian eccentrics and stemmed blade tools is also indicative of the elevated status of the material. The rarity of the material and the significance of the locations and volcanic origins of obsidian add to the uniqueness and the social significance of the items that were made from it. All of these attributes taken together and used as a gift of significance would make any obsidian item a symbolic link to the social fabric of the islanders. (Torrence 2011:34) The manufacture and maintenance of obsidian stemmed tools would also have created and maintained a specialized class of artisan that could keep in practice in order to create and upkeep the existing collections of stemmed tools, in essence maintaining a specialized craft industry solely for the formation of society. At the larger regional scale, this distribution network was indicative of a largely egalitarian society as opposed to the groups using Lapita pottery in the same areas, which was largely economic in nature. As more attention is being paid to the distribution of stemmed obsidian items and their predecessors, it is becoming clearer that Lapita pottery was not the first indication of social networks at play in Melanesia, and is instead an extension of an preexisting social network created by obsidian ritual goods with the socially binding symbolism that brought about the networks in the first place. (Torrence 2011, 2008)

Tristan Carter has studied the Cyclades in the Mediterranean, specifically in the context of symbolic obsidian burial goods. This situation is also one in which a small number of specialists are involved in the production of especially large and long unused obsidian blades were used in conspicuous burial caches and were directly indicative of the wealth of the individual's burial. The longer the blade the more auspicious and higher the symbolic value ritually instilled in the object. The production of the blades was also a form of performance art that was part of the social ritual during the burying of the dead. The techniques used in the manufacture of such unique blades were unique to the "necrolithic" (Carter 2007) complex. The unique talents and skills would have been held by a very few, and therefore entailed a small group of traveling specialists for performing their social tasks during burials, feasts, and exhumations as part of the funerary complex.

The unique set of geological circumstances presented by Jim Specht (2011) on the island of New Britain, and specifically on the Willaumez Peninsula, has created a unique chance to look at the symbolic nature of form and level of craftsmanship as an indicator of the symbolic. Normally throughout the region in and around Papua New Guinea obsidian stemmed tools are held in very high regard, the finer the quality of the stone and the level of craftsmanship in attempting to replicate the original forms, as they were created on Borneo at the beginning of the colonization of the islands from Borneo to Fiji. In the case of the Willaumez peninsula there is a local obsidian source, but it is limited in quantity and especially in quality, not allowing the fine craft production of stemmed blades. Instead the local population made due temporarily with a local fine-grained chert that seems to have become acceptable to surrounding communities because of the

replication of the form of the obsidian stemmed tool. So, in this case, while normally obsidian was the only material that would ever be used, an hence the reason archaeologists had suspected that the obsidian itself had a symbolic significance, there is at least one peninsula on which this wasn't true, leading to the question of whether it was the obsidian or the form all along. Specht seems to land on the side of the form being the most important part of the equation, the obsidian he sees as special only because of its material structure and the ability to make the stemmed tools from it in the first place.

In central Australia, Richard Gould and Sherry Saggers are looking at the distribution of different types of lithic materials including obsidian, and their distributions across the landscape. Here Gould and Saggers (1985) have determined that there is some as yet unstated symbolic distribution at work through the presence of exotic materials in an area that cant be explained away geologically. They view social structure as an adaptive theme coupled with symbolic content as a major factor in Australian ethnology. Another factor that determined the symbolic nature of certain obsidian sources was the relative edge-holding ability of each source, and the absence of any correlation between utilitarian edge-holding and the higher frequency of the best utilitarian stone. In fact, the relative utilitarian nature of the stone had little to do with its desirability. This is not to say that the stone was unusable, but simply was not the most desirable from a material edge-holding perspective, indicating that there must be a high symbolic value for a person to haul a large piece of stone across the landscape when there is a far better utilitarian stone locally.

I would be remiss if I did not discuss economic models of obsidian distribution in this paper. Many of the ecological and political models rely on, at least at their core,

economic models of which Raymond Sidrys, Colin Renfrew, and Fred Plog typify. For instance, both the political and symbolic distribution models in Mesoamerica have economic underpinnings. In both cases, they revolve around large-scale societies such as the Maya and Teotihuacán. There is an independent procurement system such as the workshops at Teotihuacán that were able to procure their gray obsidian for local consumption and tools, while the state controlled trade-grade of green obsidian was typically destined for exported ritual object via a tribute system that was heavily politically controlled. The locally produced and market-dispersed grey obsidian objects would not have even been on the radar of the Teotihuacán elites, only the ritual goods and trade goods would have mattered to them. The local distribution of grey obsidian would have allowed for some entrepreneurial spirit to come into effect along with market dynamics, unlike with the state-tribute-produced objects.

The person that has really brought together a comprehensive discussion and review of types of exchange models and their spatial distribution correlates is Colin Renfrew (1977). He looks at the various fall-off models, linear attenuation models such as down-the-line, and looks at comparisons of the different models to examine their spatial distributions. The law of monotonic decrement is discussed at length and is explained as a function of effective distance, not just the distance between two points but also the real amount of work to move between the two places, as the major factor. Essentially, some quantity or abundance is plotted against an effective distance, and there is expected to be a decrease in frequency in correlation to distance from source. There are different curves for distance decay that can indicate different values or abundance of a resource as an expression of a logarithmic scale. Any major deviation from the

expectations of these models indicates a preferential treatment of a place or a resource. For instance, a central place is a locus of activity and will have the highest material concentrations as all of the materials from an area are brought to one place for redistribution throughout the landscape because it is acting as a supply center for the outlying portions of the territory being serviced. Central place redistributions and central place market exchange are seen by Renfrew to have similar and potentially indistinguishable spatial distributions.

In his analysis of economic exchange models, Fred Plog is largely descriptive in his discussion of network analysis and locational geography. Plog finds the following variable to be important: content, magnitude, diversity, size, directionality, symmetry, centrality, complexity of the network. (Plog 1977:129) These characteristics are his concentration because of his view that what we are observing in the archaeological record is largely the records of change, and the records of the mundane indicators of daily society are largely absent. Plog also sees the need to more tightly describe the patterns that are able to be observed in the archaeological record, and the definition of the boundaries of the major hallmarks of reciprocity, redistribution and marketing as examples. (Plog 1977:139) It is essential to focus on the data that can be analyzed for continuous variables and change patterns in order to bring to light the nature of changes in prehistory.

An example of an economic model is the Fall-off Model and the Trade Index Model that Raymond Sidrys discusses in the context of the obsidian trade of the Maya. Once again, this is a largely descriptive model that seeks a correlation between obsidian density and distance from the original geological sources. The Fall-off model is a

function of transportation costs, and expects the abundance of any object or resource to decrease in frequency with increasing distance form its geographic source. Through a diachronic analysis, the increase in efficiency was observed for the transport of obsidian through time. (Sidrys 1977) This is thought to be an effect of the increased efficiency of canoe transport along waterways and coastlines, especially throughout the Yucatan where this would be most advantageous.

CHAPTER 4

METHODS

Due to the ongoing restrictions on travel to Mexico I have modified the scope and methodology I employed. First, I analyzed site reports, records and journal entries for information about the location, quantities and temporal placement of obsidian and local island tool stone. From this I created a relational table that I plugged into a GIS and performed spatial and temporal analysis on to look for any discernable patterns. I then analyzed the distribution patterns to see if they fit into any of the pre-existing models that describe political, ecological, or symbolic exchange networks, or if this is a unique system. I looked for evidence in both locally sourced stone as well as obsidian of down-the-line networks where the material should diminish in its distribution the farther it gets from its source; clustering at certain village sites, which would indicate a political control on the distribution; or a fairly even distribution that would indicate, possibly, a symbolic distribution. I then compared the local stone versus the obsidian distributions and determine whether or not the same distribution patterns occur, and then discern what that means in the scope of things.

CHAPTER 5

ANALYSIS AND RESULTS

The data I compiled for this thesis came form 7 Late Holocene sites for which I have indicated the presence or absence of each type of island stone as well as obsidian. (Figure 1) There are many different types of stone on the island that are fine grained and several microcrystalline that are excellent for chipped stone tools, and in some cases better than obsidian because of their durability. The geological composition of Isla Cedros is extremely varied at the southern half of the island while the northern portion is largely pillow-structured volcanics, breccias, and plutonic igneous rocks such as diorite. The nearest viable source of obsidian is not on the island, but is instead located on the far side of the peninsula along the Sea of Cortez.

The source of all of the obsidian found and sourced thus far on Isla Cedros is from the Valle de Azufre source on the gulf coast of the peninsula (Des Lauriers, 2005). The Valle de Azufre is a very high quality source of obsidian, which has seen the highest level of exploitation on the peninsula and possibly in the southwestern United States. (Shackley et al 1996:718) The large distance between the source and the island's most likely launch point at Punta Eugenia, while mostly flat across this portion of the peninsula is the driest and most inhospitable portion of the peninsula, coupled with a large salt marsh. The huge difficulty involved in the procurement of obsidian instead of the use of the perfectly viable sources of microcrystalline stone on Isla Cedros points to a significant importance placed upon obsidian. While the definition of the importance may is currently discernible the definitive importance can be found in the presence of obsidian found in the cremation features on Isla Cedros (Des Lauriers 2005a:303-307). The high

concentrations in the cremation pits may be indicators of social status and power, and potentially spiritual power for the owner of the obsidian or the recipient of the offering. This use on Isla Cedros gives evidence for the association of obsidian with power, and not the necessity of obsidian as a tool source.

NAME	PAIC-07	PAIC-18	PAIC-32	PAIC-36	PAIC-38	PAIC-44	PAIC-45
METAQUARTZITE	1			1			1
BLACK ORTHOQUARTZITE						1	
OBSIDIAN	1	1		1	1		1
TABULAR RED CHERT	1			1	1	1	
GREEN CHERT	1	1		1	1		1
PINK-ORANGE CHERT	1					1	
OTHER CHERT	1	1		1	1	1	
WHITE QUARTZ			1	1	1	1	1
CHALCEDONY	1			1	1		1
AGATE	1	1					
RED OCHRE	1						

Obsidian in this case has been used as an indicator of exchange networks, due to its excellent preservation as opposed to any potentially perishable goods. Economic models have been the basis from which many distribution models have arisen, and as such are limited, especially when it comes to symbolic models that don't subscribe to the simplistic logarithmic scales of the economic models. However, there is one exchange model that spans size differences and even long-distance trade, and that is a symbolic model. The symbolic model is also unique in the way it can bridge or be described in terms of economic or political models, because in a market driven system, the symbolic has value, as well as in the political model it has value.

Ecological models of obsidian distributions are largely used for the study of hunter-gatherers. Much of the literature on hunter-gatherer tool stone acquisition, and especially obsidian, tends to rely on what has become known as down-the-line models taken from an economic model and applied to the environmental constraints of acquiring raw materials. In the case of Isla Cedros, the ecological model does not seem to fit at first glance because of the distribution over the island from south to north. The sourcing of obsidian is at the closest geographical location, but can not outweigh the length and difficulty of the material's journey only to find small quantities, and most often bi-polar reduced flakes at that when there were plenty of other sources of microcrystalline stone that were being readily utilized throughout the island's Late Holocene sites. If the distribution on Isla Cedros was governed solely by environmental factors, then we would expect to see the fall off described by the Law of Monotonic Decrement (Renfrew 1977),

and yet we do not. Instead we see the unnecessary transportation of obsidian to Isla Cedros and then the distribution of obsidian throughout the island.

Obsidian can also be seen as just one indicator of exchange and trade of what could have been perishable, and items that are not preserved in the archaeological record. In this case, obsidian is indicative of a substantial cultural interaction with the mainland. There are several ethnohistoric accounts (Des Lauriers 2010:176) of completed or finished hides of sea-mammals in Late Holocene sites stacked and potentially awaiting transport to the mainland. The evidence on Isla Cedros via the distribution of obsidian indicates more than a trading purpose. It points to the possibility of a symbolic meaning or representation potentially of the social relationships and ties to the mainland, especially because the people of Isla Cedros would have known the obsidian came from the mainland.

Symbolic models have been framed largely in a cognitive processualists view of a "ritual economy" (Renfrew 2001) like the complex described for Chaco Canyon at its climax. However, in the case of Isla Cedros, the Lapita distribution system in Papua New Guinea (Torrence 2002, 2011) fits the current case very closely. In the Melanesian archipelago, obsidian was not need for daily routine life; most of those needs could and were met by shell and bamboo as the raw material. However the unique visual cue of obsidian acted as a social binder. Obsidian distributions among the people of this area that used stemmed tools, also do not fit into the usual model of using the closest source, and instead does seem to factor distance into the item, there seems to be some other level of significance at play. The rarity of the obsidian and the significance of the specific locations and volcanic origins of specific obsidian added to the uniqueness and the social

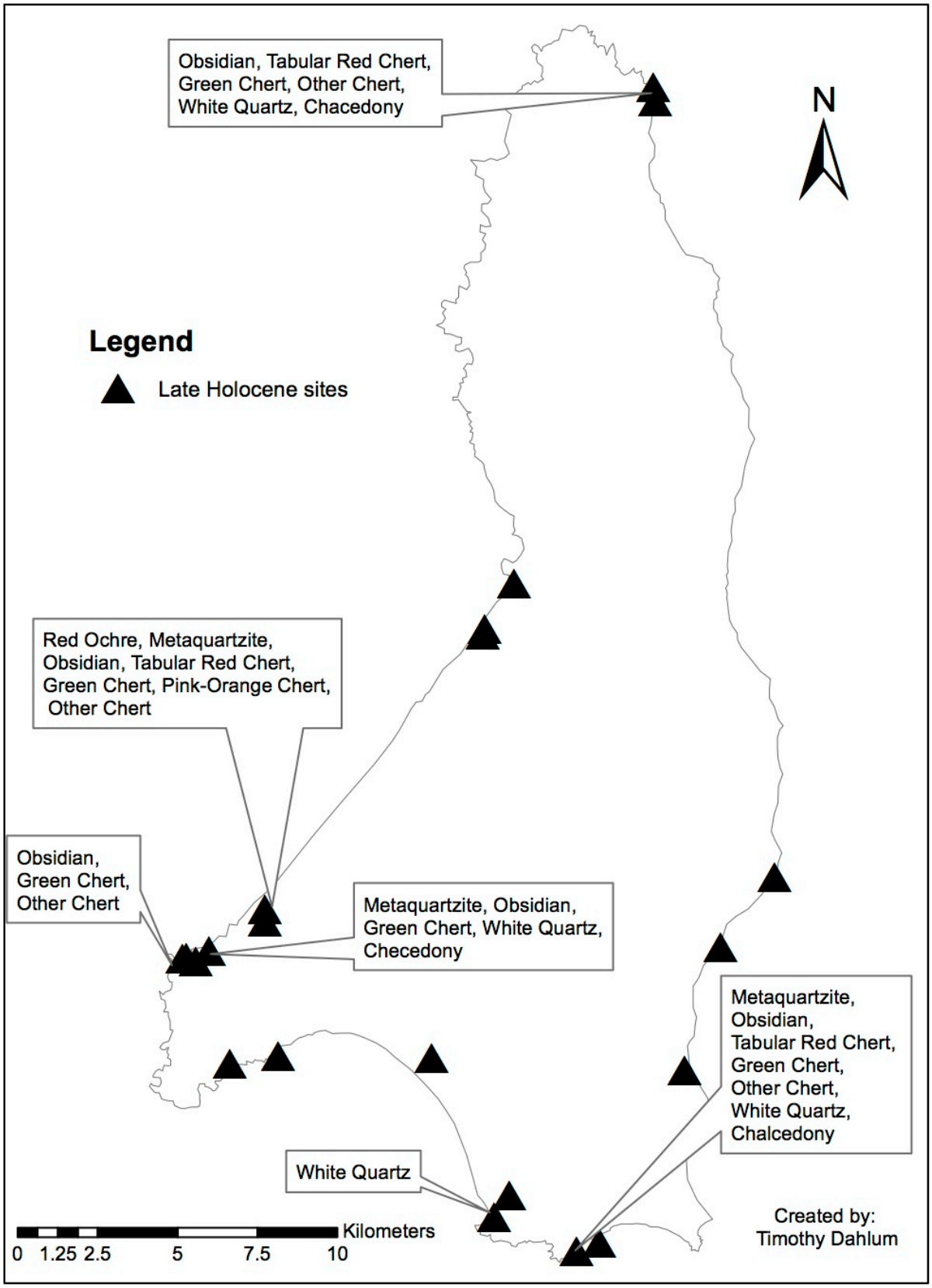
significance of the items that were made from it. All of these attributes taken together and used as a gift of significance would make any obsidian item a symbolic link to the social fabric of the islanders. Obsidian ritual goods extended and strengthened social networks with the socially binding symbolism. (Torrence 2011, 2008)

The one site on Isla Cedros with the highest concentration of obsidian is PAIC-36, and this has been indicated throughout the archaeological record, not just for the Late Holocene, to be a point where there was a higher concentration of goods. This either indicates that PAIC-36 was the landing site and point of distribution for the entire island, or that the goods were intentionally being amassed and used as political capital or something similar. It is interesting to note that although the concentration of quantities were not noted to be as high at PAIC-07, there was a marked breadth of local island microcrystalline stone as well as obsidian found, including agate and red ochre which were not noted at PAIC-36.

Once the obsidian reached Isla Cedros at what seems to be the one major landing site, PAIC-36, the current evidence points to a central place redistribution system being in place. The highest concentrations of obsidian have been found at PAIC-36 se far. But there is distribution throughout the island including all the way to the northernmost tip's sites. A fall-off model would not see the distribution all the way to the tip of the island, when some of the local stone sources from far closer than the obsidian quarries of the Valle de Azufre should have been present, but were not.

To summarize, the distribution on Isla Cedros indicates a symbolic distribution system to bring the obsidian, in many cases in very small quantities, to the island from the far side of the peninsula. The distance observed from the source to the eventual

deposition in a site is amongst the highest for obsidian in Baja California. The idea that such a long distance was traveled and in many cases with quantities so small that they were bipolar reduced indicates the high value placed on the material. Once the obsidian made it to the island, most likely making landfall at PAIC-36, it was redistributed across the island from that central place.


Obsidian, Tabular Red Chert, Green Chert, Other Chert, White Quartz, Chacedony
N
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Late Holocene sites
Red Ochre, Metaquartzite, Obsidian, Tabular Red Chert, Green Chert, Pink-Orange Chert, Other Chert
Obsidian, Green Chert, Other Chert
Metaquartzite, Obsidian, Green Chert, White Quartz, Checedony
Metaquartzite, Obsidian, Tabular Red Chert, Green Chert, Other Chert, White Quartz, Chalcedony
White Quartz
Kilometers
0 1.25 2.5 5 7.5 10
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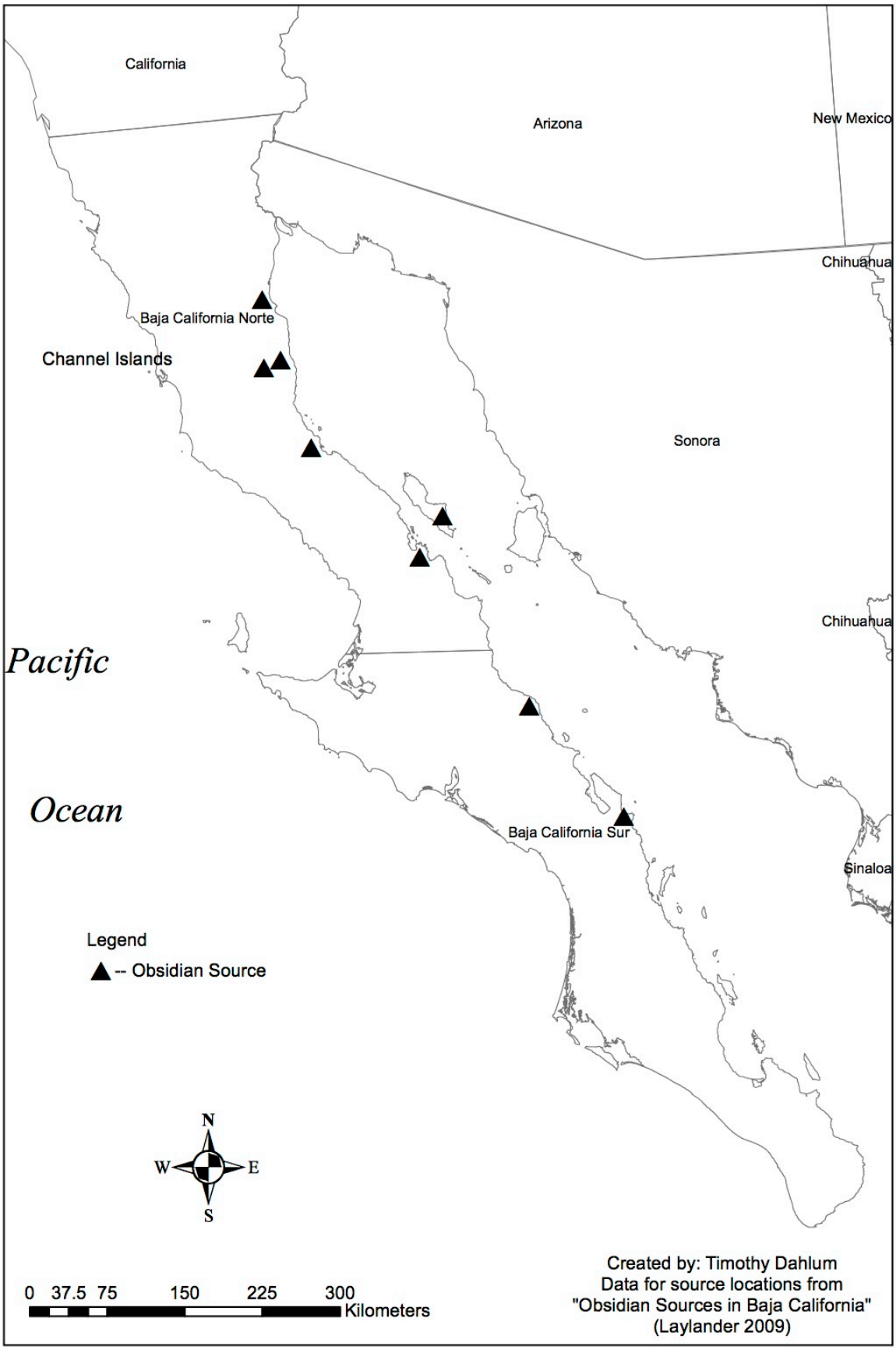
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0 37.5 75 150 225 300
Kilometers
Created by: Timothy Dahlum
Data for source locations from
"Obsidian Sources in Baja California"
(Laylander 2009)

CHAPTER 6

CONCLUSION

One of the many aspects of humanity and social systems that economic models and other simple or linear models cannot deal with is the aspect of agency. This is especially true when a single object can become a subjective and contingent process. Certain items can change and grow in value with use and reuse. (Clark 2007) These are the items that we need to create models for, not just to detect outliers in a model that then have to be explained away somehow. Much more of the archaeological record is symbolic and potentially imbued with agency. The symbolic exchange of items is known to occur in large-scale societies such as Teotihuacán as well as during the initial colonization phases in Melanesia, which most would consider small scale.

Many of the papers and books on obsidian distribution networks are data driven and highly descriptive discussions, making little use or explicit acknowledgement of any specific body of theory or the cultural processes that are the basis for systems of exchange. Obsidian can be used as an indicator of exchange networks, due to its excellent preservation as opposed to any potentially perishable goods. In most of the cases discussed in this paper, the size or perceived complexity of a society can be taken as an indication of what type of model will on average be used to describe the type or mode of exchange, with small scale societies being placed in environmental models and large scale societies or chiefdoms being described via political or economic models. Economic models are the basis from which many distribution models have arisen, and as such are limited, especially when it comes to symbolic models that don't subscribe to the simplistic logarithmic scales of the economic models. However, there is one exchange

model that spans size differences and even long-distance trade, and that is a symbolic model. The symbolic model is also unique in the way it can bridge or be described in terms of economic or political models, because in a market driven system, the symbolic has value, as well as in the political model it has value.

The unique distribution across all of the late Holocene sites of Isla Cedros is telling of the significance, most likely symbolically, of obsidian from Valle de Azufre to the Islanders. "Hostilities may have centered around blood feuds, or occasionally around particular resources, but the distribution of obsidian in every major village or residential site also implies the existence and maintenance of social and economic contacts between settlements." (Des Lauriers 2010:xxi) There is an implied ritual context in the placement of obsidian flakes within the partial cremation-burial discovered on the island (Des Lauriers 2010:163) The transportation of obsidian to the island and pervasiveness of the material in the late Holocene sites when there are plenty of sources of microcrystalline stone sources on the island with a majority of projectile points, and all styles of projectile points, being produced from local island stone indicates a kin based geographic distribution system.

In summary, the distribution of obsidian on Isla Cedros follows the pattern of a kin based geographic system with a distribution throughout all of the late Holocene sites, whereas many of the local island sourced microcrystalline stone does not get distributed throughout the island. The placement of obsidian, but not local island stone, in funerary or mortuary complexes is highly indicative of a special meaning being placed on the obsidian. All of this indicates that there was trade occurring with the mainland, although there is not any direct evidence yet from peninsular survey and excavation largely

because of the absence at present of any ongoing projects on the coastline near Isla Cedros, there is ethnohistoric evidence from Francisco de Ulloa and the Taraval expedition that sea mammal skins were stockpiled possibly for trade with the mainland.

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