

MAPPING LOCAL AND TRADITIONAL KNOWLEDGE: MENTAL MAPS TO GIS

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Introduction

Cultural and economic systems establish geographic patterns of resource and environmental use. These geographic patterns of use result from and depend upon an intimate knowledge of the landscape and resources upon which the inhabitants depend. In most indigenous cultures, landscape and resource knowledge is stored in the form of maps—mental, paper, or digital.

Local or traditional knowledge is that knowledge possessed by local residents based on long-term occupancy and daily use of an area. This knowledge is experientially based and detailed, covering all aspects of the environment, its resources and change. Local knowledge includes information about the physical and biotic environment. In-depth and essential information on the cultural, historical, and economic systems also is contained in local knowledge. Trails and travel routes, the behavior of sea ice or tides and current, sacred and trading sites, wildlife distribution and ecology, and soils and agriculture are examples. Local knowledge includes all that is required to survive and thrive and to function as a member of the culture. And, these local knowledge attributes are mapped by indigenous people— oral, written, and digital forms.

Use of these local knowledge maps by researchers can provide a short cut to understanding the cultures and their environments of which they are a part. This is particularly true in logistically difficult environments, when time and money are in short supply, and speed is essential. In addition, using local knowledge maps incorporates local people into research about their environment, resources, and cultures, which are very important to them.

Local knowledge is really possessed by two groups of local residents. The first are the *indigenous peoples*, which are the traditional cultures that have resided in an area for many generations, and sometimes thousands of years. These indigenous people generally have depended upon the natural resources of an area for their survival and prosperity, and thus have developed an extensive geographical and environmental knowledge base. Local knowledge is not always uniform within indigenous cultures, hence a few selected individuals or “specialists” may only possess certain kinds of knowledge. In addition, other local yet non-indigenous residents, often outsiders who have taken up residency in an indigenous community, will possess extensive geographical or environmental knowledge that could be of use to researchers. In the course of this paper when the author refers to indigenous people, it is primarily means those people of particular cultural groups that are *native* to an area, but with the understanding that non-indigenous yet local residents also could provide the same kinds of information.

This paper discusses indigenous mapping from the point-of-view of a cultural ecologist/cartographer—starting with mental maps, through paper maps, until today when indigenous peoples worldwide are busy producing geographic information system (GIS) and other maps to assert their rights and protect their lands, resources, and cultures. Modern indigenous people view maps as an essential tool in cultural survival.

Mental Maps

Indigenous cultures tend to be oral cultures. Their knowledge and history are maintained in an oral database and, until relatively recent times, permanent written documentation, including maps, was not created.

Features of geography were part of a much larger interconnected mental map that existed in the oral traditions. The world was perceived and experienced through one's history, traditions, and kin, in relationship with the animal and natural resources that one depended upon, and in union with the spirits, ancestors, and religious forces with whom one shared existence.... This indigenous knowledge was passed down in songs, stories, and rituals, and the understanding of the landscape it imparted was as sophisticated as that of any western map (Warhus 1997:3).

The maps of indigenous cultures were also mental and expressed orally. Even though they were not on paper, these mental maps were complex and sophisticated. They allowed indigenous cultures not only to survive but also to thrive, explore, and settle new lands.

In Australia, the Aboriginal peoples were wanderers, and their wanderings or *walkabouts* took them across their homelands and the homelands of other cultural groups. Early European settlers assumed because the Aboriginals were wanderers they had no concept of land tenure or the geographical distribution of land and resources. Nothing could be further from the truth.

Aboriginals, it was true, could not imagine territory as a block of land hemmed in by frontiers, but rather as an interlocking network of "line" or "ways through." "All our words for 'country'," he said, "are the same as the words for 'line'" (Chatwin 1988:56).

When the Aboriginals went on "walkabout," they would travel these lines through their homelands. Each stretch along a line (about a day's travel) was measured in a song. The song "was both a map and a direction-finder" (Chatwin 1988:13).

...Before the whites came, he went on, no one in Australia was landless, since everyone inherited, as his or her private property, a stretch of the Ancestor's song and the stretch of country over which the song passed. A man's verses were his title deeds to territory. He could lend them to others. He could borrow other verses in return. The one thing he couldn't do was sell or get rid of them (Chatwin 1988:56-57).

If you knew the proper songs, you could go anywhere you wanted. Thus, the songs were the geographical keys to the lines and land— directions for moving across your land or, using the songs of neighbors, to cross the lands of others.

In the islands of Oceania, elaborate mental maps were used for the legendary sailing voyages of trade, exploration and settlement (Gladwin 1970; Lewis 1972). These mental navigation charts were based on knowledge of astronomy, star compasses, wind compasses, imaginary navigational features (*Etak*), and mnemonic sailing directions, such as sailing the "Great Trigger Fish." A simple star map is shown in Figure 1, giving the sailing directions from Tureture village, Western Province, Papua New Guinea, to Otamabu Reef, approximately 50 km offshore (Eley 1988).

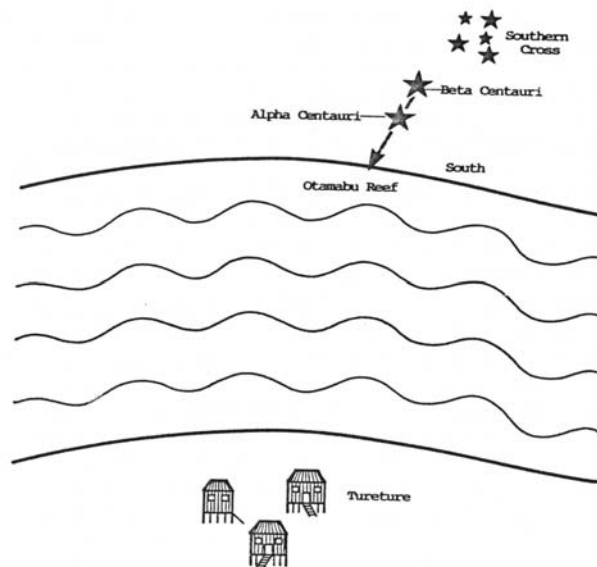


Figure 1. Sailing directions based on stars from Tureture village, Papua New Guinea, to Otamabu Reef, Torres Strait (From Eley 1988).

Mental maps contained geographical, historical, and environmental information essential to an individual's and culture's success and perpetuation. Written maps were not required, but the passing of oral traditions, including mental maps, from one generation to another was imperative.

Written Maps

The first "written" indigenous maps probably were drawn in the sand or snow with fingers, knives, or sticks. Today, Iñupiat Eskimo on the Northwest Coast of Alaska use story knives to draw elements of a story or legend in the snow. These stories often include geographical descriptions of areas where events occur, thus they contain temporary maps.

A number of early indigenous maps have been found that were made on animal skins, bark, and rocks. Pacific island navigators needed to understand the impact of wind and currents and how to correct for them in their voyages. Stick charts (Figure 2)

showing wave and current patterns around various island systems were used to train navigators, and some stick charts were carried on voyages (Thrower 1996; Lewis 1972).

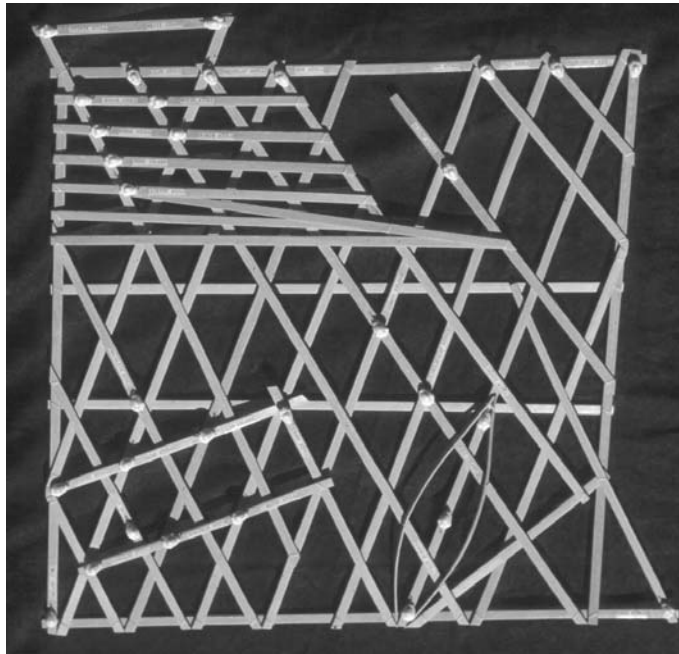


Figure 2. Marshall Island stick chart (Photo by Professor Cheryl Northon-Eley).

Some of the earliest maps drawn by indigenous people after contact were drawn in response to a request from traders and explorers for information about local and regional geography and resources. When they were shown Western maps, indigenous peoples immediately understood the concept of maps and were able to create maps with great accuracy for their local areas. For example, *Matonabbee's Map of 1767* was drawn by Matonabbee, a Chipewyan Indian, for the factor of the Hudson's Bay Company's post at Churchill River. *Matonabbee's Map of 1767* depicts all the "rivers, lakes, coasts, and resources located throughout the area of northwestern Canada from Hudson's Bay to Great Slave Lake and north to the Arctic Ocean," (Warhus 1997:32). *Matonabbee's Map* takes oral history and tradition and converts them to graphic form. The map was used by the Hudson's Bay Company to plan and execute its expansion into north and northwestern Canada.

Similarly, *Ac ko mok ki's Map* was sketched in 1800 for Peter Fidler, a surveyor and explorer, also from the Hudson's Bay Company. Peter Fidler asked the Indian Ak ko mok ki to draw a map of the area surrounding Chesterfield House (in present-day Saskatchewan), but the end product was more than Fidler could have imagined. As related:

In all, Ac ko mok ki sketched out a detailed of more than two hundred thousand square miles of North America. His map is one of the great documents of western exploration. Copied and annotated by Fidler, it was sent back to the headquarters of the Hudson's Bay Company in London with a note stating that it showed regions "hitherto unknown to Europeans." Until Ac ko mok ki made this map, the area he represented had been unknown to the west. Ac ko mok ki's map reflects just how thoroughly the landscape was known to North America's native inhabitants (Warhus 1997:2).

Ac ko mok ki's Map gave Europeans their first glimpse and understanding of the geography of western North America. In addition, the map portrayed resources, land quality, villages, important locations, and other thematic properties.

In 1804, *Ac ko mok ki's Map* guided Lewis and Clark in their epic journey that opened the Northwest. As a footnote to the Lewis and Clark Expedition, in 1905, the State Historical Society of North Dakota commissioned a map to be made by the Mandan Indian Sitting Rabbit. *Sitting Rabbit's Map of the Missouri* was to show all the old Mandan and Gros Ventre Indian villages and the historic course of the Missouri River. Lewis and Clark recorded many of these villages in their 1804 journey up the Missouri but were shown as abandoned on *Sitting Rabbit's Map* a century later.

For those interested in the Pacific Rim, *Tupaia's Map* (Figure 3) is an excellent example of indigenous cartography. Tupaia was a knowledgeable Polynesian geographer, who developed a great friendship with Capt. James Cook, R.N. Tupaia was asked by Capt. Cook in 1769 to produce a map of the islands surrounding Tahiti. Tupaia's original map was been lost, but J.R. Forster (1778) discovered a copy made by Cook in the British Museum.

Describing Tupaia as "the most intelligent man that ever was met with by any European navigator in these isles," J.R. Forster claimed him as a natural geographer who not only "gave an account of his navigations and mentioned the names of more than eighty isles which he knew," but "having soon perceived the meaning and use of charts, he gave directions for making one according to his account, and always pointed to the part of the heavens where each isle was situated, mentioning at the same time that it was either larger or smaller than Taheitee [Tahiti], and likewise whether it was high or low, whether it was peopled or not, adding now and then some curious accounts relative to some of them...This chart I have caused to be engraved as a monument of the ingenuity and geographical knowledge of the people in the Society Isles, and of Tupaia in particular" (Forster 1778:511-512 from Lewthwaite 1966:42).

Tupaia's Map is a classic of indigenous cartography. It clearly shows that indigenous people had a good understanding of the geography of the world in which they operated—a world that could stretch thousands of miles over lands and seas that they had never traversed and had only heard about in their oral traditions.

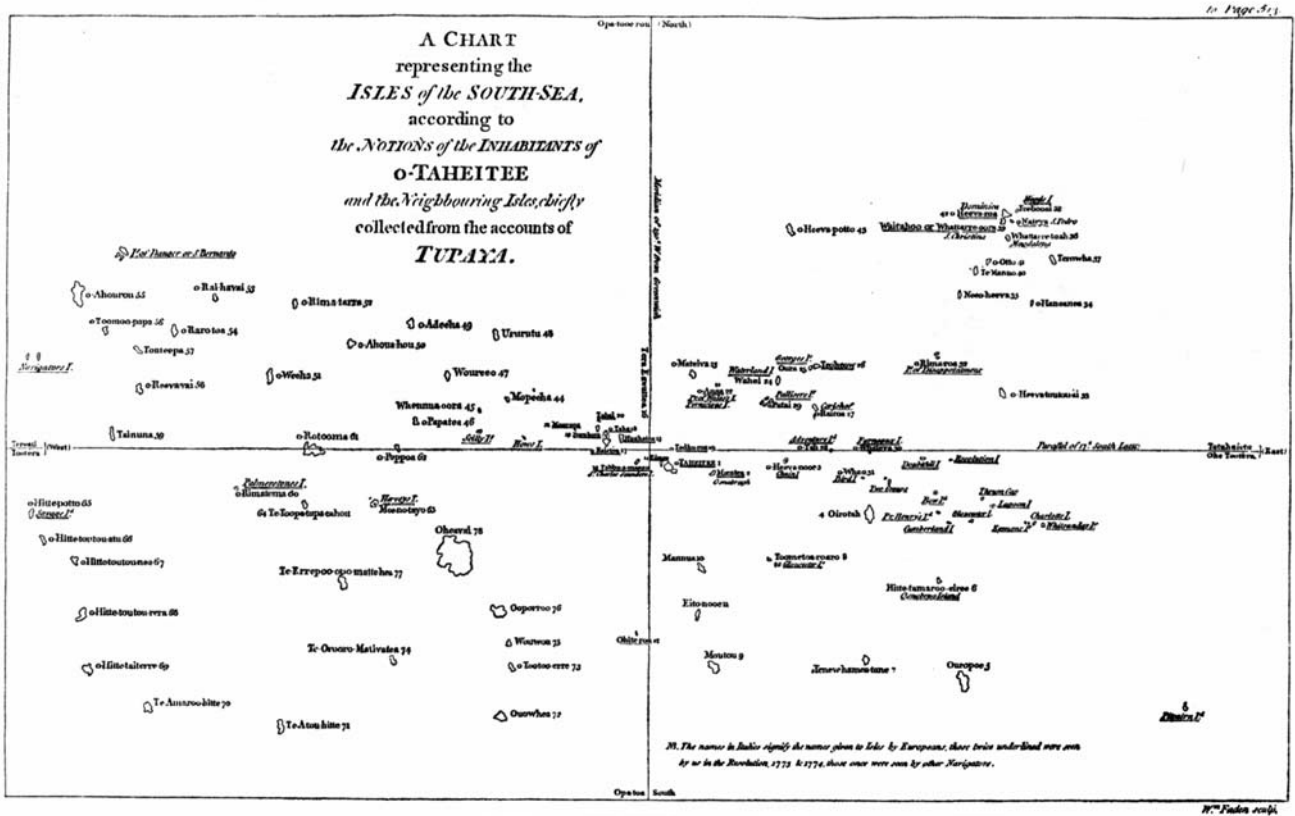


Figure 3. Tupaia's Map as redrawn by Forester 1778.

Furthermore, *Tupaia's Map*, *Sitting Rabbit's Map of the Missouri*, *Ac ko mok ki's Map* and other indigenous maps of these early times, indicate that indigenous people had a detailed and spatial understanding of their world.

Early on, indigenous peoples started to learn about maps as part of an arsenal of repression, conquest, and appropriation. It did not take long, however, before some groups began to use maps as a tool to fight the misappropriation of land by the United States Government and private individuals. There are numerous examples of maps made by indigenous cartographers to show their long-term occupancy and "ownership" of lands in the hope that their claims would be respected. Some of the classic maps of North American indigenous cartography include *Notchinigna's Map* of the Upper Mississippi; *Plan of the Pequot Country*, 1662; and *Draught of Land Desired by the Delawares*, 1757. Similar maps were produced in Latin and South America for indigenous land claims against Spain and Portugal.

One of the major criticisms of these early indigenous maps, both at the time they were drawn and today, is that they lack

traditional conventions, symbology, and scale. As David Turnbull opined:

[Indigenous maps] differed from post-Renaissance European maps in two fundamental respects: geometrical structure and the selection and ordering of information content. European maps have a projective geometry based on a co-ordinate system. [Indigenous] maps are topologically structured conserving connectivity between the parts by distorting distance, angles, and, hence, shape. European maps have standardised representation, but [Indigenous] maps served specific function in particular contexts (1993:19).

"The map is not the territory" is a cartographic truism (Turnbull 1993). The map's function in indigenous culture is to assert a people's place and a culture's identity. Indigenous people depicted on their maps those things that they perceived as essential, in the scales they felt were appropriate. An inch-to-the-mile scale may not always be appropriate for particular cultural purposes. Cartographic paradigms may vary between cultures, however, just because paradigms are different does not mean one is better or "more correct" than the other.

Local residents often possess considerable knowledge about their environment and biota, and this local knowledge can play an important part in understanding geography and ecosystems. Documentation, utilization, and mapping of local knowledge may provide the cornerstone of conservation programs that could sustain both the resources and the local people who depend upon them. If local knowledge and techniques have worked and evolved for hundreds of years, they might still offer solutions for emerging problems, and they involve local residents in the protection of their resources and way-of-life by utilizing their expertise and customary systems. As the marine biologist Robert Johannes aptly stated:

In areas where recorded knowledge of local environments and biota is inadequate, the knowledge possessed by local residents can play a vital role...For the marine environment of the tropics; it is local fishermen who possess this knowledge. Further, an understanding of their customary patterns of marine resource use is essential in designing management programs compatible with local customs and sentiments (1982:258).

Johannes (1981:x) also found that:

This kind of research...offers a shortcut to some of the basic natural history data we need in order to understand these vast and valuable resources. Such information has to be quantified and blended with more sophisticated forms of biological research...before it can be put to optimum use, and this is no small matter. But I gained more new (to marine science) information during the sixteen months of fieldwork using this approach than I had during the previous fifteen years using more conventional research techniques (1981:x).

The collection and utilization of this local knowledge has provided insights and understanding that would not have been had for many years, due to the cost and time for detailed studies and logistic impediments of working in difficult areas (Eley 1988; Johannes 1981, 1978, & 1977; Nietschmann 1984; and Nelson 1983, 1973, & 1969). Mapping of the knowledge has been as helpful as the collection of the knowledge. Placing the knowledge in a spatial context allows for other assessments and analyses, and has produced ideas that were not initially evident. Thus, indigenous mapping has moved from providing outsiders with general geographical knowledge, awaiting verification by a "true research" and investigation, to a partnership in mapping and use of local knowledge to supplement the data collected by conventional scientific research. Local knowledge and locally made maps have evolved into valuable sources of data in their own right.

Indigenous Mapping and Cultural Survival

"Ethnic groups run restaurants. We are a people. We have maps and an army. We want self-determination!"

—Brooklyn Rivera, MISURASATA leader, statement made during peace negotiations with the FSLN in San Francisco, CA, 1985.

Maps are tools for control. If the map is viewed as reality, then he or she who makes the map has the power to control reality. Maps are also symbols and instruments of power that can be used by indigenous peoples to assert their human and land rights. Governments opposing indigenous peoples have attempted to control the possession and use of maps and mapping technology. In Sarawak, it is illegal for Penan people to possess a map. Maps purchased from the government of Papua New Guinea have registration numbers, and are registered to the purchaser. When this writer asked why the maps were registered, he was told by a PNG Government official, "we don't want them to fall into the wrong hands! If they do, we will know how they got the maps." Now, indigenous people are creating maps to rename, reclaim and protect lands. This mapping is variously called *indigenous mapping*, *power mapping*, *counter mapping* or *defending lands and seas with maps*.

Maps are being produced to delineate and mark land to assist in having other peoples and powers respect indigenous land rights. Cartography assists indigenous peoples in illustrating their rights, needs, and changes of their communities and resources. Maps

form the basis for managing resources. Conventional paper and GIS maps are viewed as cultural and historical records that document the habitation that in turn reflects the centuries that indigenous people have been on the landscape. Today indigenous cultures and peoples are emerging as important social, political and economic forces in contemporary society. Their cultural survival, economic development, and resource-based well-being are being charted with maps. As the historian Michael Warhus (1997:211) wrote: "They [indigenous peoples] have begun a cartographic dialog with the larger society."

One of the first steps in modern indigenous cartography is renaming places, using indigenous names or traditional spelling. Indigenous maps with indigenous place names reflect worlds within worlds that outsiders may have never known existed. More maps are being produced that use indigenous place names both alone or in conjunction with names given to places by outsiders. Figure 4 is an excerpt from *Iñupiat English Map of the North Slope Borough*, produced by Alaska's North Slope Borough in 2000. The presence of both names has been popular throughout Alaska. In Canada, the *Inuit Place Name Map Series of Nunavik* has been equally popular, and there the Inuit elders mandated that the names of the land be recorded so that the Inuit's geography would not be forgotten. Warhus also wrote that:

Inuit place names provided orientation, they outlined the routes of travel and trade, they identified the sites of the culture's heritage, and they marked the meeting places where the Inuit gathered to dance, sing, and pass on their traditions (1997:25).

Similar maps have been produced for other areas of Alaska, Canada, and Latin America. In addition, some maps have been produced that use only indigenous names, completely removing any non-native annotations.



Figure 4. Portion of the *Iñupiat English Map of the North Slope Borough*, Alaska (2000).

The next cartographic step that some indigenous peoples have taken is to produce their own atlases. The most famous one that has recently been published is the *Maya Atlas: The Struggle to Preserve Maya Land in Southern Belize* (Figure 5) a project of the Maya People of Southern Belize in conjunction with the Toledo Maya Cultural Council - Toledo Alealdes Association and the Department of Geography, University of California Berkeley. As the Toledo Maya Cultural Council stated:

This atlas aims not only to show the boundaries of the Maya Homeland but also to bring out the dynamic interactions of the various communities and their relationship to the environment. In the *Maya Atlas*, we explain current challenges to our traditions and the struggle to preserve our religious beliefs and relationship with Mother Nature. In addition, the atlas gives us an opportunity to explain our links to the sacred Mayan

temples dotting the country of Belize and tells you how we have preserved our traditions and culture (1997:2).

This atlas illustrates what indigenous people, and not outsiders, consider is important to portray. The atlas has become a model for other indigenous groups, and several atlases, in both digital and paper formats, are in production.

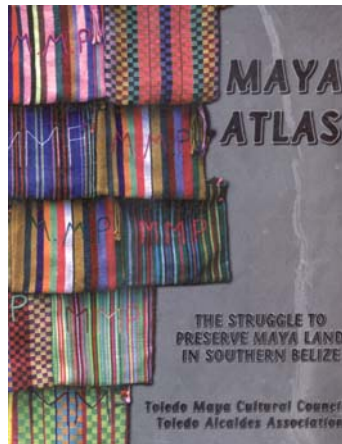


Figure 5. *Maya Atlas*, 1997.

Indigenous peoples have traditionally viewed maps as tools and symbols of conquest and destruction of cultures and appropriation of their lands. Fortunately, not all indigenous cultures have disappeared due to outside pressures nor are they stagnant artifacts of prehistory. They have continued to survive and evolve, and, today, they are emerging with their cultures intact. They are adapting western culture tools and technologies of domination, repression and misappropriation to instruments of protecting and enhancing their cultures. Maps, imagery, global positioning systems (GPS), and GIS are used to protect lands, waters, and resources and to enhance economic development (Figure 6). As the late Professor Bernard Nietschmann wrote describing indigenous mapping by the Miskito Indians along the Caribbean coast of Nicaragua:

To defend their sea territory against...intrusions, the Miskito communities decided that first it would be necessary to demonstrate that the sea territory and its resources were indeed theirs. This is why the communities are using sail, scuba and satellite to map and inventory their reefs and waters in their language and in their traditional knowledge classifications (1995:34).

In 1987, the Zunis of New Mexico used GIS to produce the maps *Zuni Land Taken since 1846*. The map depicted visible changes in Zuni land holdings from pre-contact times, throughout the Spanish Era and into the U.S. and State of New Mexico eras. As the Historian Warhus wrote concerning the Zuni Map:

The Zunis' ability to continue as a viable economic and cultural entity requires that they control their land and their resources. To do so the Zunis have had to adapt the tools of western culture. The use of GIS data and western cartographic techniques is just another example of their adaptations. The maps illustrate the persistence of the Zunis' vision. Their desire to assert their place and be recognized as part of the larger society is reflected in the words of the governor of the [Zuni] Pueblo when he announced the Zunis comprehensive development plan: "Zunis want to retain their identity—not the moccasin and feather image—but the cultural and historical identification any man uses to reflect pride of his forefathers and their accomplishments and contributions to society" (1997: 221-222).

In turn, the Zunis' attorneys used maps to fight for monies owed the Zuni for appropriation of their lands. Indigenous cartography is now an essential tool in cultural survival and cultural empowerment.

Summary

The "mapping" of indigenous or local knowledge is not a new phenomenon but has occurred since time immemorial. The first indigenous maps were mental maps—written maps were of little use to oral and highly mobile cultures. Outsiders were quick to appreciate and exploit local geographical knowledge as an aid to exploration, settlement, development and expansion. Maps were elicited from locals and drawn to explain to early explorers and exploiters the local and regional geography. In some cases, early indigenous maps were created to illustrate the extent of lands used or owned to the colonial powers, in generally feeble attempts to protect land rights. Maps were also prepared to help researchers record indigenous knowledge on many geographical

and environmental topics. Today, modern indigenous people are using maps and atlases as tools of power. These conventional paper and GIS maps are vehicles for asserting cultural rights, managing natural and economic resources, and recording cultural data and history. Indigenous mapping has evolved from mental to paper to digital constructs—from aids to resource exploitation and travel to weapons in the war for cultural survival. As the late Geography Professor Bernard Nietschmann stated, "More indigenous territory can be reclaimed and defended by maps than by guns" (Poole 1995:1).

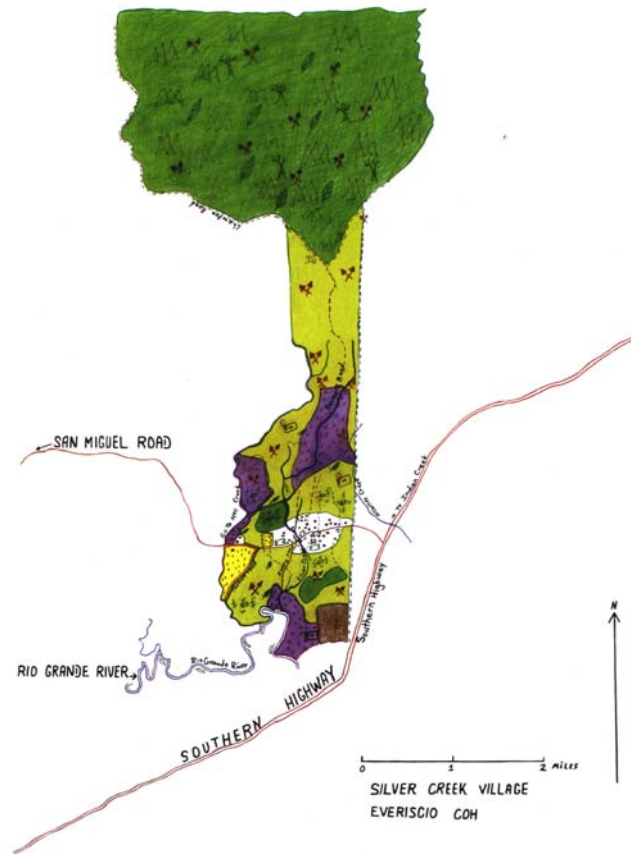


Figure 6. *Maya Atlas* map of land ownership and land use for Silver Creek village, Belize (1997).

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