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GIS Maps and the Amazon Borderlands

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53 ✳ *GIS Maps and the Amazon Borderlands*

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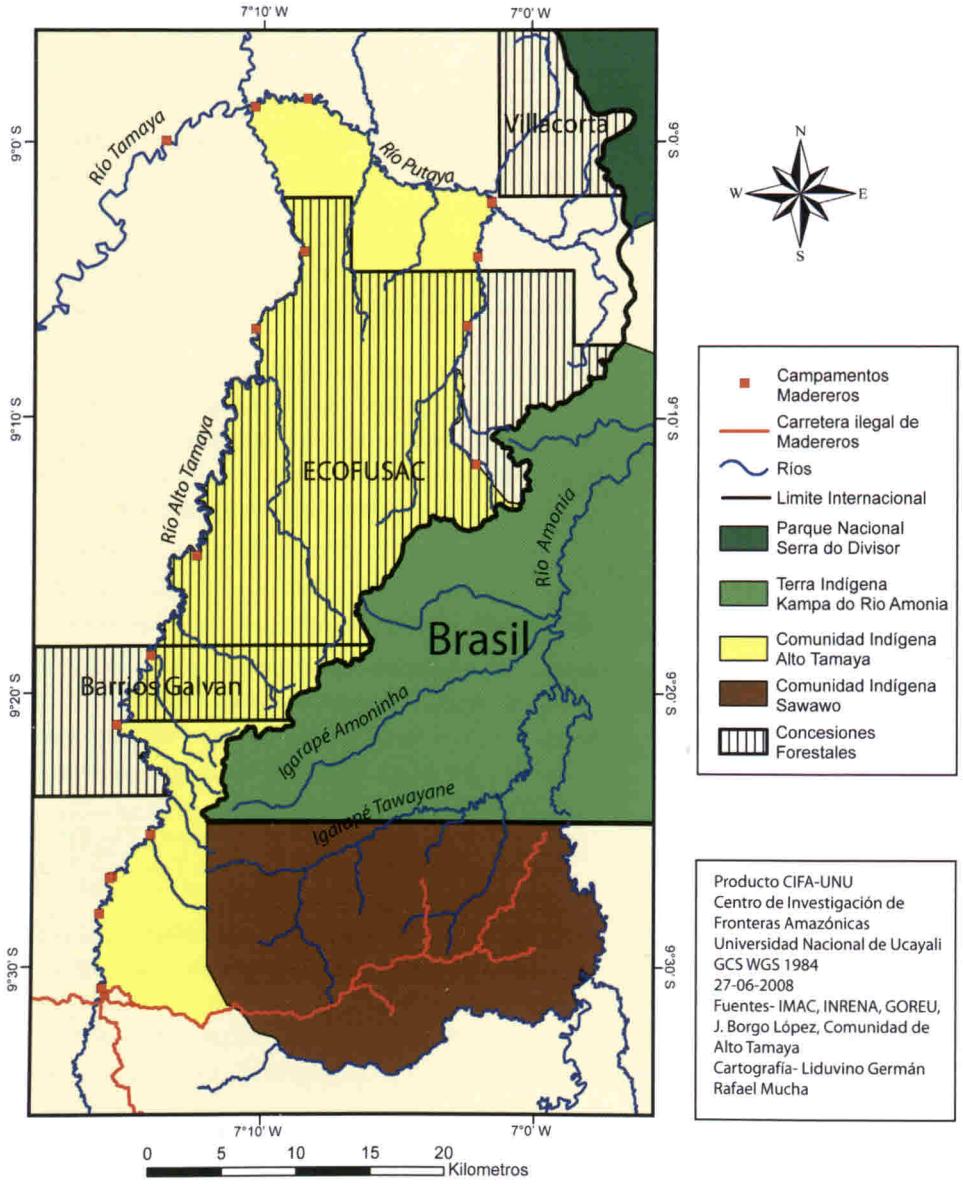

Figure 53.1. Centro de Investigación de Fronteras Amazónicas, Universidad Nacional de Ucayali, Perú, *Actividad maderera en la comunidad indígena Alto Tamaya* [Woodcutting activities in the indigenous community of Alto Tamaya], 2005. Used with permission of Universidad Nacional de Ucayali.

The region we know as Latin America results in part from a wide array of maps and mapping endeavors. Indeed, this book provides a long-overdue introduction to the importance and role of maps in Latin America. Today, most maps of Latin America are made with the computer technology of geographic information systems (GIS), a development already altering the relationship between Latin American space and society. Definitions for geographic information systems vary widely: those emphasizing GIS as a tool use the word "systems" for the last letter in GIS, while others stressing the methodology substitute

"science."[1] The current range of GIS applications across Latin America is astonishingly broad, including the creation of maps to better design national parks, analyze city traffic, eradicate coca fields, place public utilities, plan for hurricane evacuations, protect indigenous homelands, control disease outbreaks, and extract natural resources, to name a few. With training, GIS can be used by all sectors of Latin American society and is the mapping tool of choice for institutions ranging from the Inter-American Development Bank to remote communities in the Amazon rain forest. Geographic information systems are thus a tool of the powerful and the marginalized and the official and the unofficial. For example, the GIS maps shown as figures 53.1 and 53.2 were constructed by university students in partnership with remote Amazonian communities but were expressly created to counter GIS maps made by the Peruvian state.[2]

In this chapter, we see how GIS maps can improve our ability to analyze conflict over resources and allow additional participation in the process of mapping, but we also confront some of the many political and technical challenges that must be overcome to construct a participatory GIS map.

Maps of Peru's Amazon borderlands are particularly interesting, given that the remote region remains a poorly understood frontier characterized by both inadequate cartography and a relative lack of state presence.[3] As they were on the western frontier of the United States of America in the early 1800s, law enforcement is rare, violence common, and justice often in the hands of the person with the most guns. Official state maps complicate matters by failing to represent the local people. Thus, official maps effectively silence the locals by "disappearing" them into the blank or silent spaces of

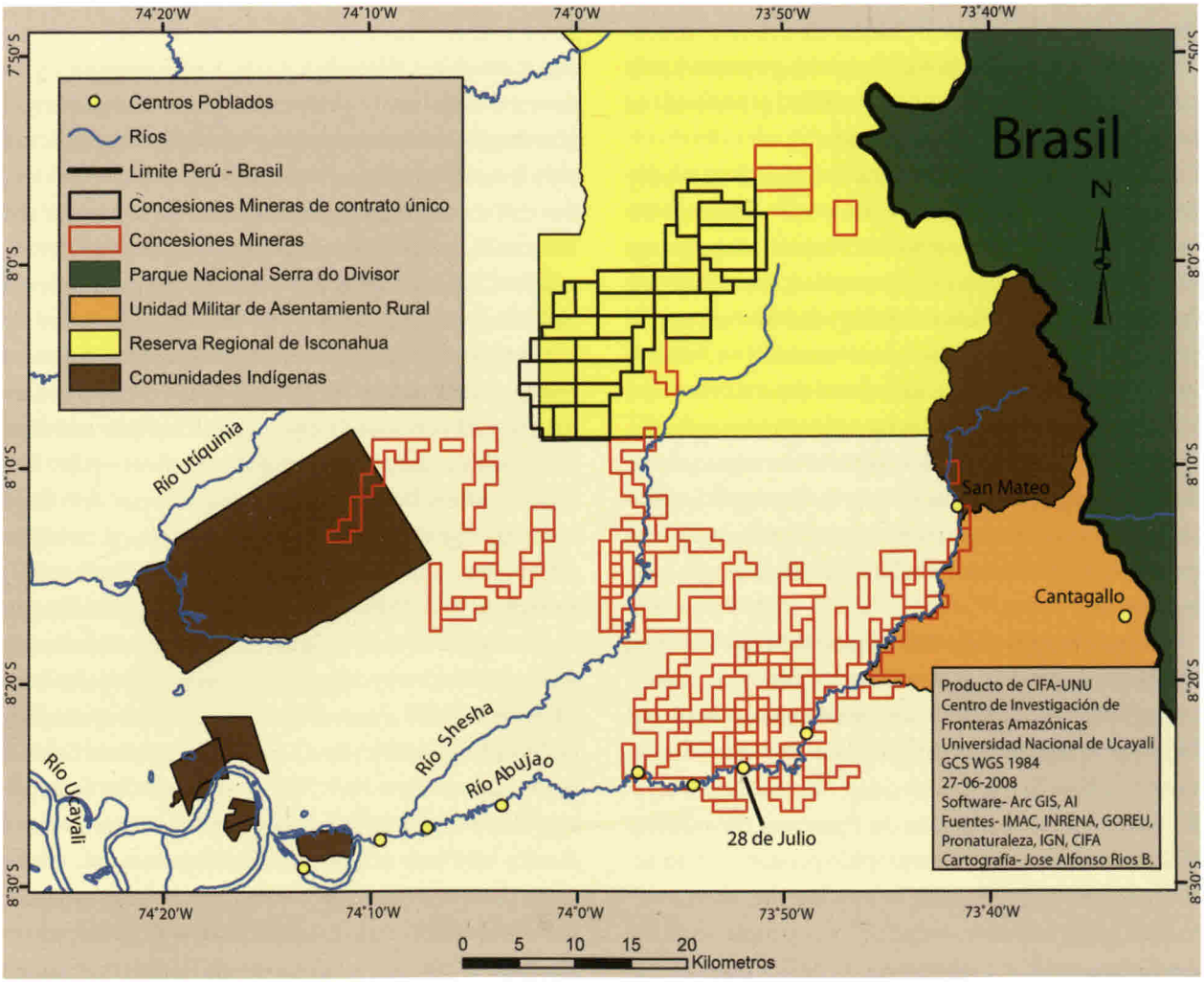

Figure 53.2. Centro de Investigación de Fronteras Amazónicas, Universidad Nacional de Ucayali, Perú, *Concesiones mineras auríferas en la frontera central Perú-Brasil* [Gold-mining concessions along the central Peru-Brazil border], 2005. Used with permission of Universidad Nacional de Ucayali.

the map. The abundance of empty space on Amazonian maps permits policy makers in Lima offices to imagine the rain forest as a tropical tabula rasa, devoid of local people yet full of valuable natural resources.[4] Lima-based policy makers use GIS to analyze official maps and draw resource concessions and development plans in the borderlands they either assume or prefer to believe are empty. However, when concessionaires arrive at their claim with official GIS maps in hand, they often find the forested landscape already populated by indigenous people, colonist farmers, illegal loggers, and even drug traffickers. Therefore, claims on the map add to existing conflicts over resources and territory on the ground, intensifying the contest between different groups capable of mobilizing varying degrees of power. Before computer-based mapping technology, only the wealthy could produce detailed, georeferenced maps, and thus, maps tended to aggravate existing power discrepancies between the state and local people. Now, however, a local person adept with global positioning system (GPS) and GIS technology can create detailed, georeferenced maps refuting the claims of the state.

Unfortunately, neither GPS nor GIS is free, readily available in remote regions, or easily self-taught. At the same time, the help of outside GIS expertise also brings potentially negative consequences, such as a reliance on "expert" agendas, external funding, and western spatial paradigms, epistemologies, and worldviews.[5] In addition, GIS cartography can freeze a fluid culture on a static map, alter local politics by reifying the mapmaker, and concentrate power in the hands of the map and data holder.[6] Despite these challenges, local people increasingly realize the importance of being on the map, and participatory GIS projects in Latin America are growing in number.

These participatory GIS maps of Peru's Amazon borderlands present the collision of different visions of landscape and territory: unofficial versus official and local versus national. Created by two Peruvian student cartographers in the Universidad Nacional de Ucayali's Centro de Investigación de Fronteras Amazónicas (CIFA) in 2008, these cartographic products of an activist research agenda seek to overlap the often overlooked goals and knowledge of local people with the development-driven objectives of policy makers. Using GIS, students combined information on rivers, resource concessions, and indigenous territories from a variety of official and unofficial sources, including Peruvian and Brazilian government ministries, field data recorded by students with GPS receivers, and local borderland people. The Centro de Investigación de Fronteras Amazónicas presented these borderland maps to policy makers in Pucallpa and Lima to raise awareness of the conflict between local inhabitants and both state-sanctioned resource concessions and illegal resource extractors (figs. 53.1 and 53.2).

Figure 53.1 is a map highlighting the conflict over ancestral claims among the untitled Ashaninka indigenous community of Alto Tamaya, the timber interests of the state, represented on the map by "Concessiones Forestales" (forest concessions), and illegal loggers, represented by "Campamentos Madereros" (logging camps) and the "Carretera ilegal de Madereros" (illegal logging road). Also shown are the neighboring titled Ashaninka communities (given with their names, Kampa do Rio Ammonia and Sawawo),[7] the international boundary, and local rivers. Although it is an apparently straightforward map, easily overlooked is the complexity of creating a transboundary map incorporating data not only from different sources, in this case Peru and Brazil, but also data constructed using different models of the size and shape of the earth, or geodetic datums.[8] For example, CIFA cartographers adjusted the international boundary line obtained from Peruvian sources to fit the Brazilian indigenous territorial boundary and show one harmonious border. Otherwise the two boundary lines would continually crisscross each other and confuse both the map reader and the map's message. The river data from both countries also did not initially align correctly due to the different datums, forcing cartographers to use GIS calculations to transform the Brazilian river data to the Peruvian datum to avoid a 60 meter gap on the map where rivers crossed from Peru into Brazil. Throughout history cartographers have made calculated adjustments and compromises such as these to simplify map reading, and in some cases to deliberately deceive their map readers. Now, however, with GIS technology, these cartographic challenges can be solved more readily (and map readers deceived more easily). At the same time, the clean lines, vivid colors, and apparent precision of GIS maps can lend authority to maps produced by technically adept amateurs rather than trained cartographers.

Figure 53.2 resembles figure 53.1 due to a focus on

conflict between local people and state development goals. However, here the resource extraction in question is mining rather than logging: as mining concessions overlap two titled indigenous communities, a military settlement project, and a reserve created to protect the Isconahua, an indigenous group still avoiding contact with our global society. Also pictured are population centers on the Río Abujao, the international boundary, and a Brazilian national park. This map required substantial editing of the park and indigenous areas to align visually with the international boundary line. In this case, one of the problems was scale. The international boundary line data file was created at a smaller cartographic scale than the neighboring indigenous territories and national parks, thus requiring the modification and simplification of these to fit the international border.

Both maps focus on conflict in Peru but show a small portion of Brazil. While the inclusion of parts of a Brazilian indigenous territory and a national park might appear cosmetic, in reality a skilled map interpreter can anticipate relationships between the adjoining country and the conflicts involved with it. For example, not only do the forestry concessions, logging camps, and roads threaten the indigenous community of Alto Tamaya, but they also surround a vulnerable appendage of Brazilian territory (fig. 53.1). The Ashaninka residents of the Brazilian area in question have documented illegal penetration of their territory by Peruvian loggers invading from both the south and west, and they continue to lobby for the titling of the Alto Tamaya community, inhabited by their Ashaninka cousins, to better protect their lands and thus Brazil. This map strengthens their argument. The other map's inclusion of a Brazilian national park also alludes to threats from the nearby Peruvian mining concessions: for example, mercury contamination, soil erosion, and social disruption by mining boomtowns and associated migration (fig. 53.2). While the thick black line representing the international boundary forcefully divides the map into two nation-states, when reading a map we must also picture what the landscape looks like on the ground. In this case, the forceful black line misleads: both sides of the border are virtually indistinguishable from each other, as the rapidly regenerating rain forest quickly obscures any line cut through the jungle and the remote location prevents the building of any sort of fence. Thus, loggers and miners penetrating into Brazil can easily make the argument that they did not know which side of the border they were on.

These transboundary participatory GIS maps provide a window into how GIS might be changing the mapping culture of Latin America and thus the relationship between Latin American society and space. As seen by these student-generated maps, mapping technology and spatial data are more accessible than ever before, and persuasive GIS maps can potentially alter long-standing power relations between the local and the national, the unofficial and the official. Despite this, as noted earlier, many challenges remain. For example, these maps were made by "elite" students under the direction of an "expert" professor rather than designed and produced by the very people they intend to assist. While the local data were gathered in tandem with local people, the borderlands are simply too distant to communicate easily between map iterations, forcing the mapping process to rely on good faith. This highlights the real problem that participatory mapping with GIS is seldom entirely in the hands of the marginalized, even when everyone involved in the process wants it to be (see chaps. 56 and 57). Despite this, participatory GIS maps have allowed local people to frame their geographic knowledge in the cartographic conventions of today's policy makers and defeat the state in international courts of law. However, these maps also should not stand alone. They require context, a reference map to orient the reader, and a verbal or written explanation to make their argument. Ideally, they also are accompanied by stories of place: the mining concessionaire on the Rio Abujao who forced an entire village to leave his concession, or the Ashaninka people of Alto Tamaya who toppled trees across their own creeks to prevent loggers from taking their homeland's mahogany and cedar trees. When the maps are in the hands of local people, these place-based stories empower the maps further and bring a human dimension to a computer-generated map, thus linking a marginalized society to an officially empty space through GIS cartography.

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Notes

1. Despite the various definitions, most agree that GIS includes the following five elements: the collection and preprocessing of spatial data, spatial data management and storage, data visualization, data manipulation and analysis, and product generation or application. See, for example, John P. Wilson and A. Stewart Fotheringham, *The Handbook of Geographic Information Science* (Oxford, UK: Blackwell Publishing, 2008).

2. For more on official Peruvian maps, GIS, and Amazonian communities consult the work of the Instituto del Bien Común: http://www.ibcperu.org/index.php.

3. While Peru is typically thought of as an Andean country, 75 percent of the country lies within the Amazon basin. Peru is second only to Brazil in the amount of Amazonia contained within its borders (13 percent).

4. Susanna B. Hecht is particularly gifted at outlining outsiders' visions of the Amazon; see "The Last Unfinished Page of Genesis: Euclides da Cunha and the Amazon," in "Historical Political Ecology," ed. Karl Offen, special issue, *Historical Geography* 32 (2004): 43–69.

5. In a 1995 article Robert Rundstrom examines the divide between how GIS maps portray indigenous knowledge and how the same indigenous people view the world and conceptualize space in the absence of GIS. "GIS, Indigenous Peoples, and Epistemological Diversity," *Cartography and Geographic Information Systems* 22 (1995): 45–57.

6. See chaps. 56 and 57; Nancy Lee Peluso, "Whose Woods Are These—Counter-mapping Forest Territories in Kalimantan, Indonesia," *Antipode* 27 (1995): 383–406; and Peter H. Dana, "Nicaragua's 'GPSistas' Mapping Their Lands on the Caribbean Coast," *GPS World*, eptember 1998, 32–41. Who controls the maps and information is of critical importance, as maps can be used against the very people they were made to defend. See Mac Chapin, "Mapping and the Ownership of Information," *Common Property Resource Digest* 45 (1998): 6–7.

7. The Ashaninka communities of Sawawo (Peru) and Kampa do Alto Rio Amônia (Brazil) contain the cousins of the Alto Tamaya community.

8. Peru uses the datum WGS 1984; until recently Brazil used South American Datum (SAD) 1969; see Peter H. Dana, "Geodetic Datum Overview," http://www.colorado.edu/geography/gcraft/notes/datum/datum_f.html.

Additional Readings

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