

A Qualitative Analysis of Unofficial Road Expansion in the Peruvian Amazon

Francisco M. Hazera, Dr. David S. Salisbury, University of Richmond

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Introduction

Road construction is a leading cause of tropical deforestation, forest fragmentation, and social conflict in Amazonia (Laurance and Bierregaard 1997; Schmink and Wood 1992). Research on the environmental and social impacts of road construction has focused on official (state built) roads rather than unofficial roads built by non-state actors (Perz et al. 2007). Even as unofficial roads remain understudied, their length and impacts continue to expand in the ecologically and culturally critical Amazon region (Perz et al. 2007). Brandão and Souza (2006) found unofficial road lengths to expand by close to 300 percent in an eleven year period in the eastern Amazon with unofficial road totals reaching 80 per cent of all roads in the study area in 2001. Perz et al. (2007) provide a four-point theoretical approach for the analysis of unofficial road construction, emphasizing local markets, land tenure, political ecology and biophysical factors in their four eastern Amazonian case studies. These case studies focused on four unofficial road types:

- A typical unofficial road spurring from an official road
- An unofficial road abandoned for other more resource rich and topographically amenable routes
- A destination-determinate road (Arima et al. 2005) with a conceptualized geographic end from the start of construction
- A contested destination-determinate road with competing public or private interests influencing route and destination

Our goal here is to build on Perz et al.'s (2007) theoretical framework and historical case studies to analyze the context, expansion, impacts, and potential future of the Ucayali-Yurua unofficial road (UYUR) in Amazonian Peru and begin to link the spatial architecture and political ecology of road building in the Amazon borderlands.

Methods

Our study uses a Geographic Information System (ArcGIS) to plot the progression of unofficial roads within the Central Borderlands of Amazonian Peru. The model captures the growth of the road from its inception to 2007 using a qualitative analysis of Landsat imagery and thematic maps. We acquired Landsat scenes 5/66, 5/67, 6/66, 6/67, between 1986 and 2002 from USGS and the University of Maryland's Landsat Data base then converted the images to Geotiff format with the UTM WGS 84 South, Zone 18 projection using ERDAS Imagine. In years where the scenes were unavailable or unusable because of cloud cover we chose the next closest year. Once we acquired all the available "complete" years, 1986/7, 1993/4, 1998, 2000, and 2002, we mosaiced the four scenes together to create a suite of five time series' of the study area's mosaic. Using these regional mosaics, we visually identified and digitized all roads potentially related (directly or indirectly) to the growth of the UYUR. Identification was facilitated by the isolated nature of the borderland site and expert knowledge of the almost total lack of roads in the area. GIS layers of indigenous territories, conservation units and population centers also contextualized our analysis.

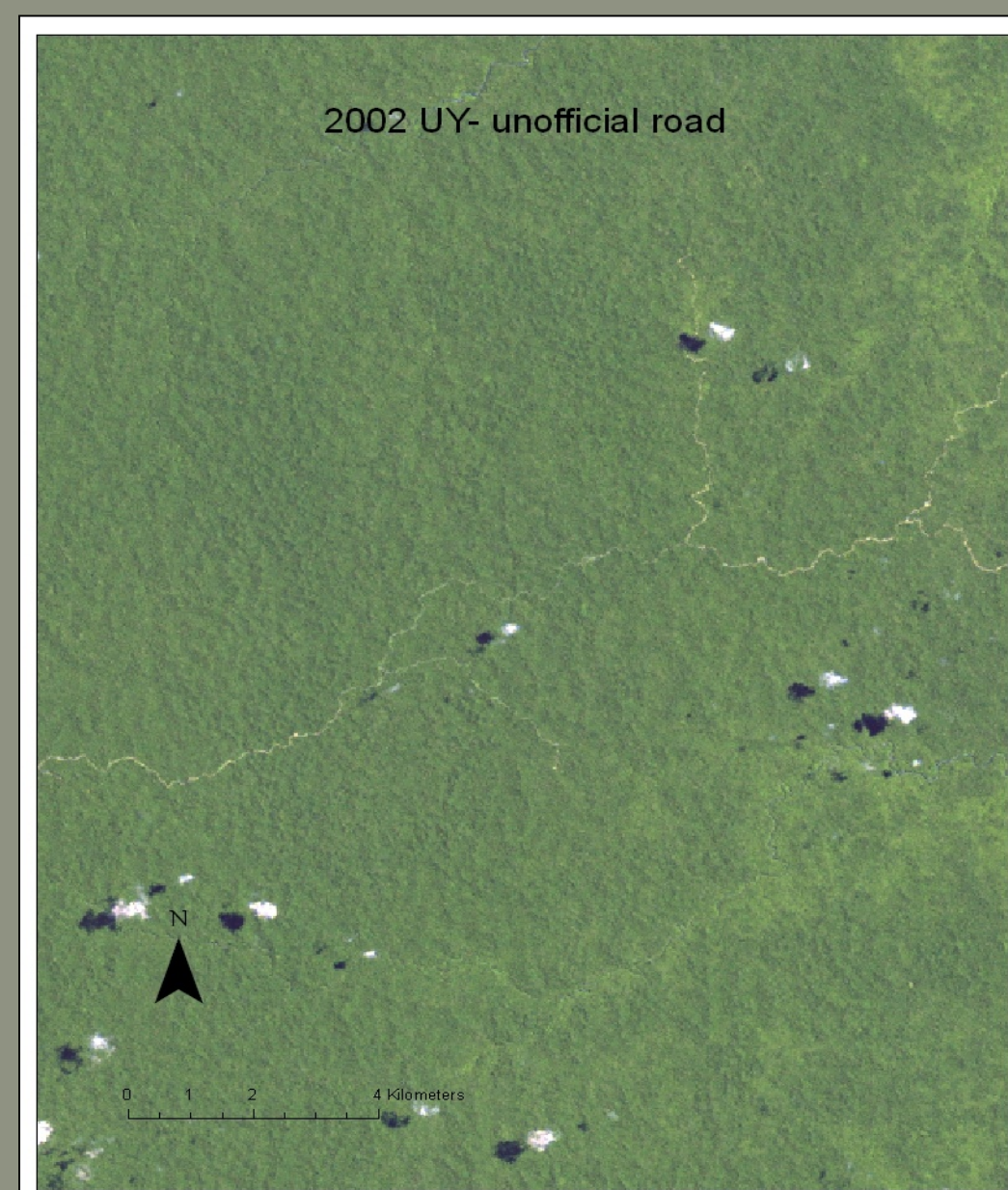
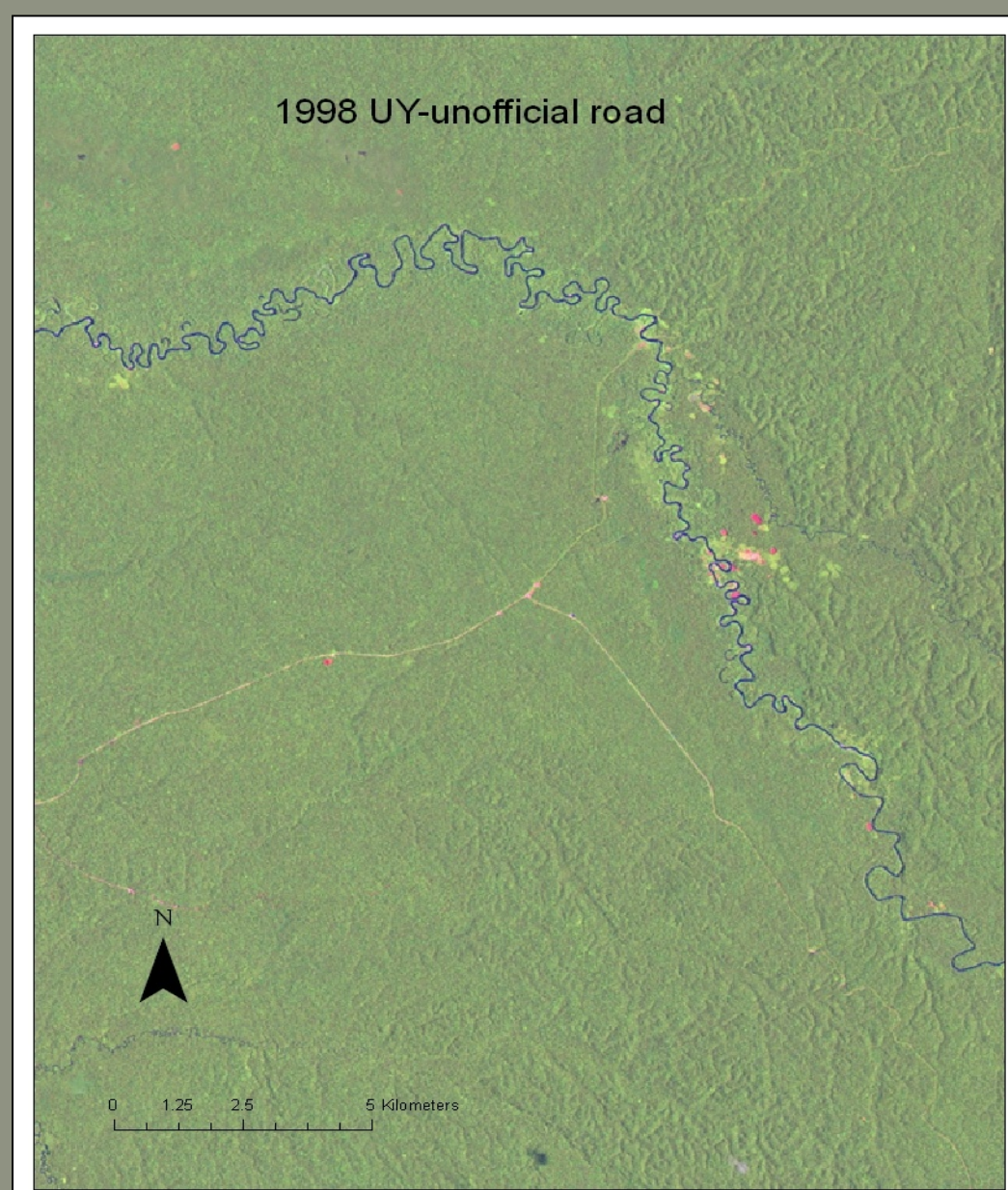
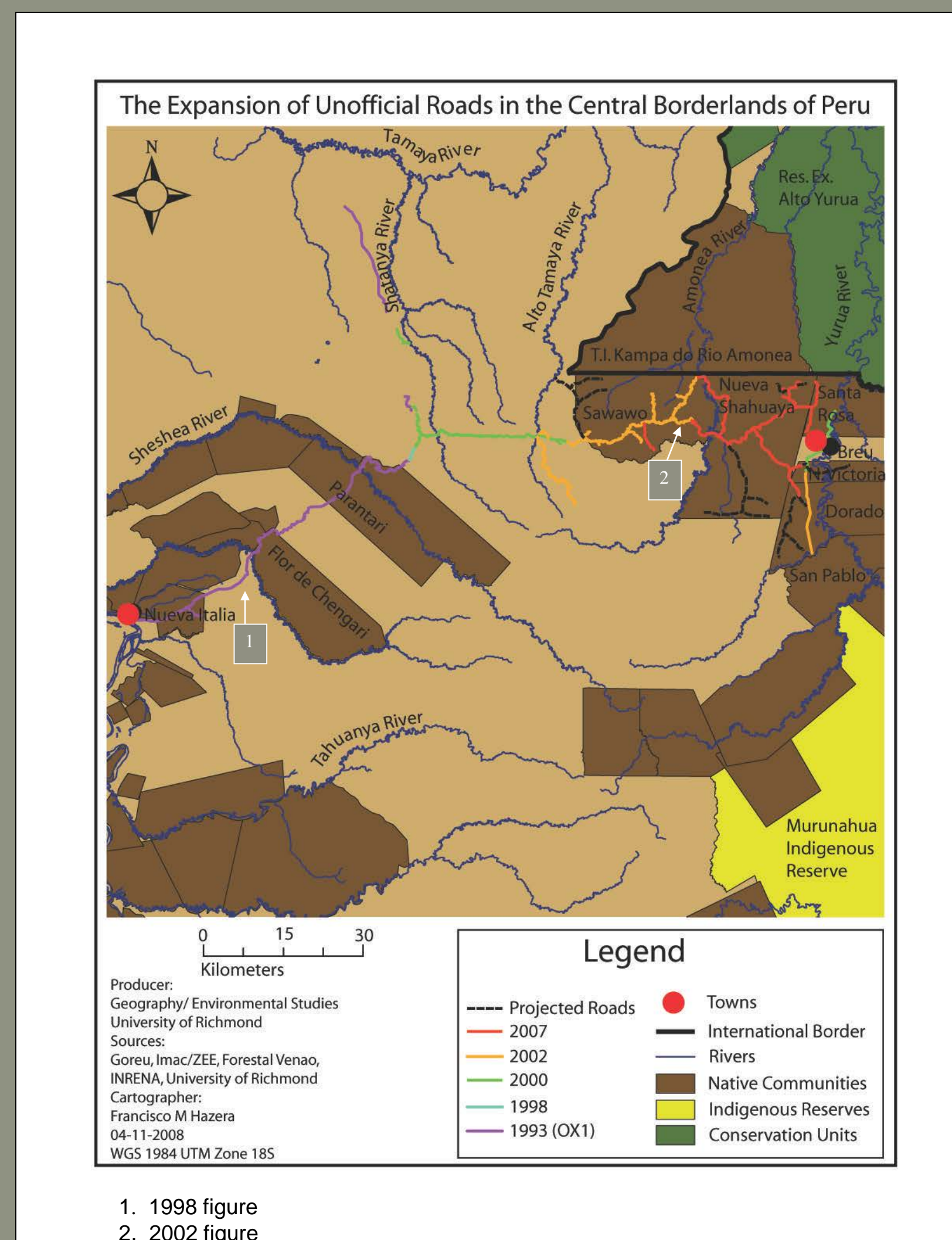
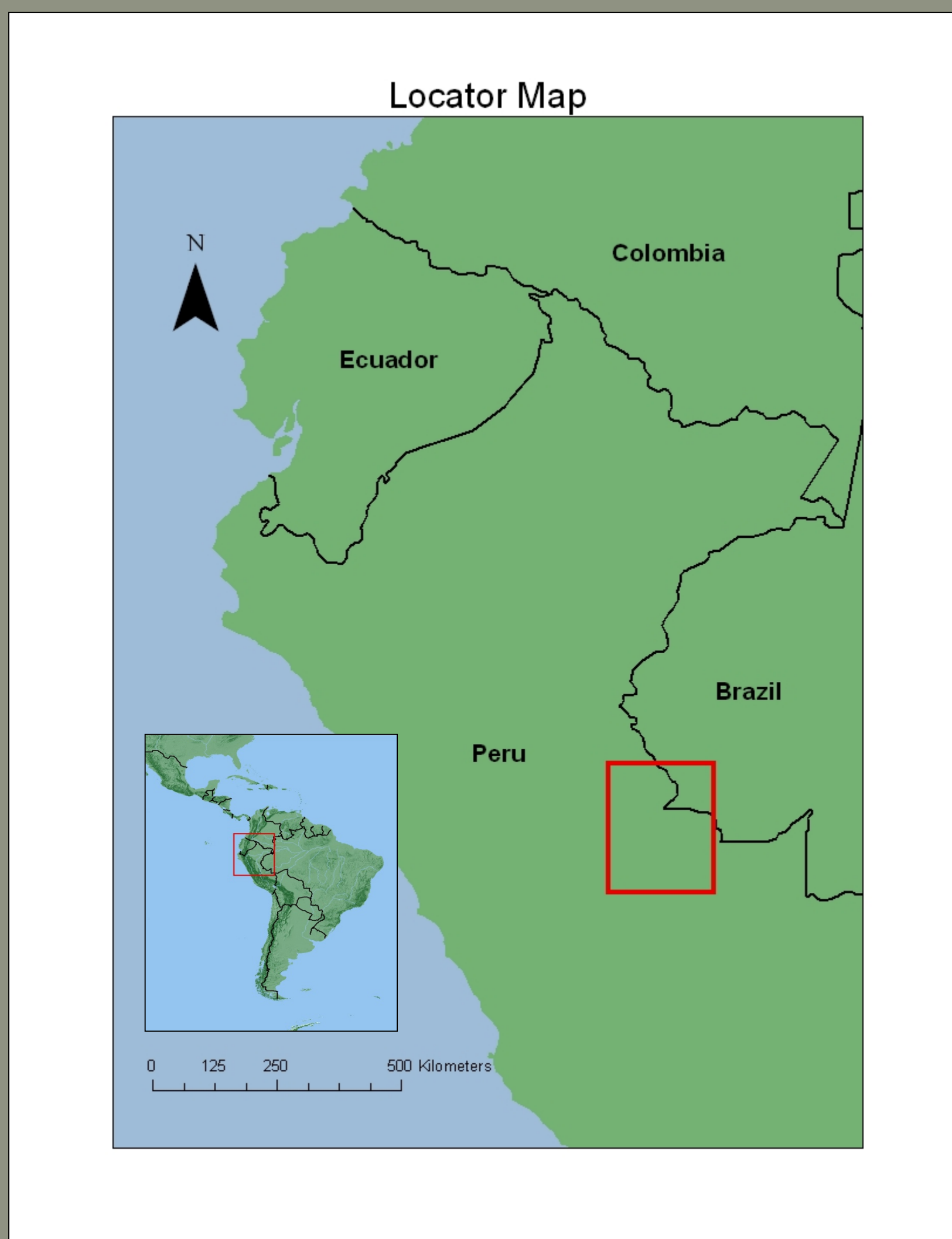
After using the Landsat images to digitize the roads within the Central Borderlands up until 2002, we used a 2007 digital map produced by the primary road building actor: Forestal Venao. The Forestal Venao map identifies not only the roads they used and built, but also roads they planned to build in the future. We used 2007 Landsat 5 imagery from I. F. Brown's library to validate the accuracy of the Forestal Venao map.

In addition to remote sensing and GIS analysis, we also incorporated ethnography and document research (in English, Spanish, and Portuguese) to gather information about the UYUR and confirm our mapping efforts. Finally, we conducted a literature review of remote sensing, GIS, and social analyses of unofficial and Amazonian roads and their environmental and social impacts.

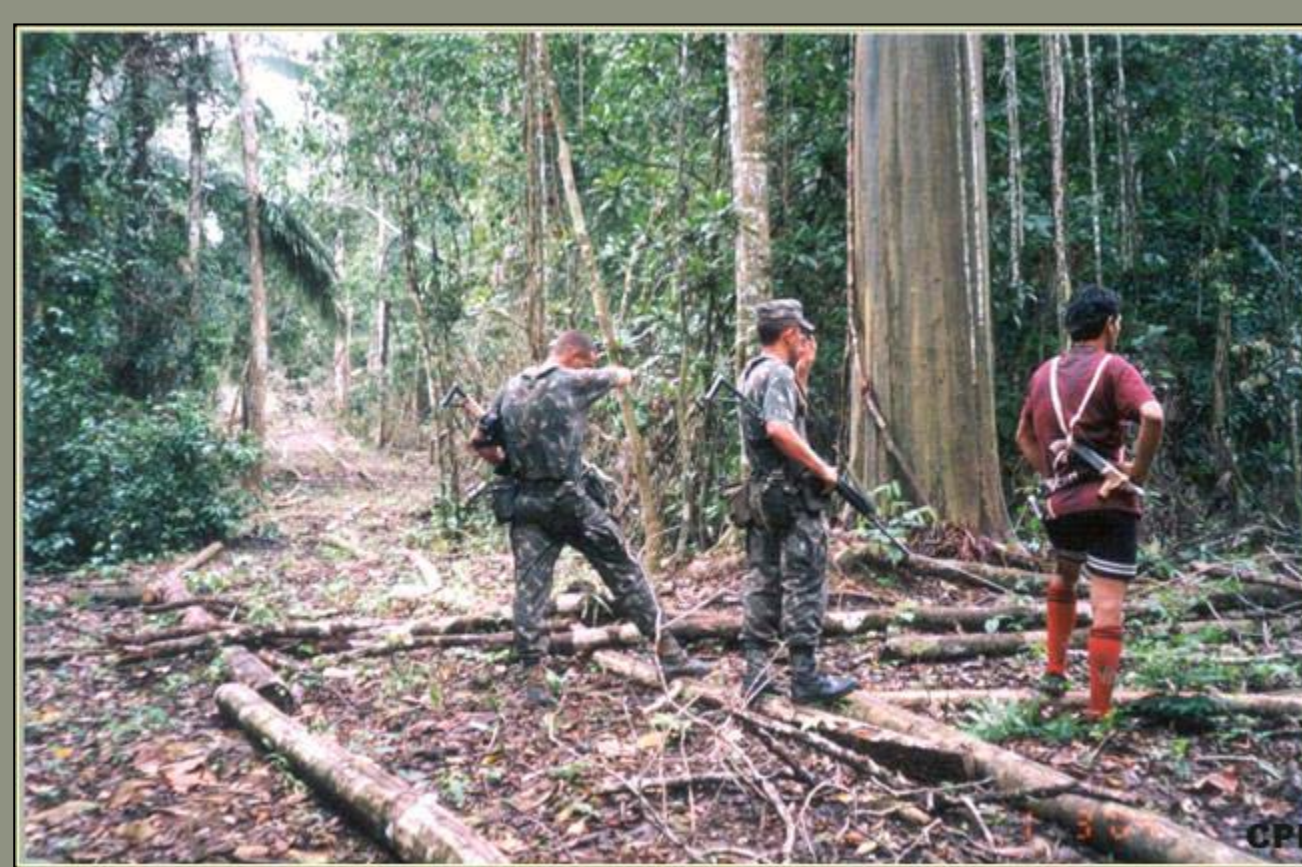
Combining the geospatial techniques with qualitative research and an in-depth literature review, we approximate how far the UYUR grew during each period and assess some of the underlying geopolitical and cultural implications behind this growth. The result is a first approximation of the growth of the UYUR and the associated environmental and social impacts of that growth. Ground truthing with GPS, in depth ethnographic fieldwork in the region, and shorter time gaps between Landsat images will provide the more nuanced view of the region necessary for further research.

Resources

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Year	Growth (km)	Indigenous Lands Penetrated	Rivers Reached
1993 (OX1)	108	3	3
1998	3	0	0
2000	67	1	3
2002	99	3	1
2007	99	4	2
Projected	94	0	2



Case Study

The Amazonian borderlands of Peru provide fertile ground for unofficial road expansion given these roads tend to penetrate where land rights and government control is limited (Brandao Jr et al. 2006). However, unofficial roads in the Brazilian Amazon often rely on the official road network as a starting point, whereas Peru's Amazonian road network is much less developed. The case here describes the borderland portion of a bi-modal transportation network connecting the timber rich borderlands with the Ucayali river, the sawmills of Pucallpa, and the ports of Lima.

The UYUR initially began as a 108 km destination-determinate road (road OX1) opened in 1988 by Occidental Petroleum to link their Ucayali River port of Nueva Italia with their perforated wells at Platana on the middle Tamaya River. While Occidental discovered oil, the resource was not of the quality or quantity to merit intense exploitation, and the road was abandoned by the company between 1990 and 1993. The condition of the road worsened due to the elements and lack of maintenance and the small populations on the Tamaya saw little benefit in using the road to arrive at the upper Ucayali River. In 1998, the road had not expanded although a portion had been rehabilitated on the north side of the Sheshea River. The next year the Peruvian government titled the Ashaninka indigenous territory of Sawawo which housed a splinter group from Brazil's Kampa do Rio Amonia reserve since 1994. That same year, the Ashaninka of Sawawo began working for a logging company rehabilitating road OX1 with the goal of extending it to the Yurua River (Pimenta 2002: 297-304). Largely inaccessible from the rest of Peru except by plane, the Peruvian portion of the Yurua River still contains valuable stands of mahogany (*Swietenia macrophylla*), tropical cedar (*Cedrela odorata*) and other timber species. Sawawo's leaders took advantage of the financial and political resources of the logging company to travel to Lima to obtain an official license to log their territory (Aquino 2004). A year later the logging company rehabilitating the OX1 and extending it to Sawawo was denounced by both the Brazilian press and Peruvian authorities for trespassing into Brazil to extract mahogany and tropical cedar (Pimenta 2002) and for building a non-state sanctioned road respectively (El Patriota 2007). According to El Patriota (2007), the President of the Ucayali region in 2000 signed an agreement with the logging company and native communities of the region allowing the company to build roads in the Yurua valley. Thus, the road was approved by authorities at the local and state levels, but remained unauthorized by Peru's Transportation Ministry. This multi-scalar variation in authorization is a characteristic of the blurred legality of resource extraction in frontier zones where state presence is weak. The legacy of the OX1 road contributes to the quasi-legal status of the existing road as the logging company can defend their road expansion as simply rehabilitating an existing road on national lands and building logging roads within indigenous lands with the appropriate community and Peruvian National Institute of Natural Resources (INRENA) authorization (Carta Aclaratoria 2007; Smartwood 2007).

While some local communities co-operated with the logging company to exploit natural resources, gain employment, and improve access, others feared the road building would not only bring outsiders and change power dynamics but also allow the logging company to facilitate the titling of interloper indigenous communities and continue a cycle of expansion (ACONAYADISH 2004). In May of 2005, the community of Nueva Shahuaya, made up of indigenous immigrants from the distant central jungle (WWF 2007), received title to 47,500 hectares of land and five months later obtained an INRENA permit to manage 94% of those hectares for timber extraction and forestry purposes (Smartwood 2007). To undermine the existing local indigenous federation and validate their borderland resource extraction goals, the logging company facilitated the creation of another local indigenous coalition called the Union of Frontier Indigenous Communities (UCIF) (WWF 2007). UCIF has brought legal action against a variety of institutions trying to clarify the relationship between the logging company, local indigenous people, and road building (Defensoria del Pueblo personal communication). In 2007, following an evaluation by Smartwood of the Rainforest Alliance, the logging company received approval to sell their timber as certified by the Forest Stewardship Council (FSC Watch 2007). This certification was followed immediately by denunciations from indigenous federations and non-governmental organizations from both Peru and Brazil (FSC Watch 2007). Brazilian indigenous and environmental organizations continue to accuse the logging company of transboundary timber extraction. Despite this, a follow up audit by Smartwood found no wrong doing by the company and road building continues apace.

Our map of 2000-2002-2007 road expansion hints at a strategic quest for the timber resources of indigenous territories. The proposed roads mapped directly from the logging company's website continue this logic, but also provide access to a secondary port on the Alto Tamaya should the existing road ever be cut off (www.forestalvenao.com). Most importantly, the company's map proposes to cross the Yurua River, thus allowing access to not only additional titled indigenous territories but also the Murunahua Reserve for Indigenous People in Voluntary Isolation and the Alto Purus National Park. This expansion strategy follows the road template outlined by Maki et al. (2001): a road guided by a private company's profit and resource driven logic rather than a concern for ecological and cultural diversity.

Conclusion

This case study demonstrates the validity of the Perz et al. (2007) framework for unofficial road construction but also attempts to link the spatial architecture and political ecology of the road. The road primarily follows the natural resource goals (here selected species of timber) by one logging company taking advantage of the unique land tenure status of titled indigenous lands. The UYUR political ecology bears particular attention given the conflicting accounts, uncertain information, and disparate amounts of power wielded in the remote borderlands of Peru. Our map indicates how one company might impact and possibly control hundreds and potentially thousands of kilometers of territory and resources through road building. This opportunity and the favorable economic, land tenure, and political characteristics of the region drive the company to build despite the uneven topography, multiple rivers, and challenging climate.