

Addressing cross-scale conservation efforts within overlapping areas in the Orinoco River watershed

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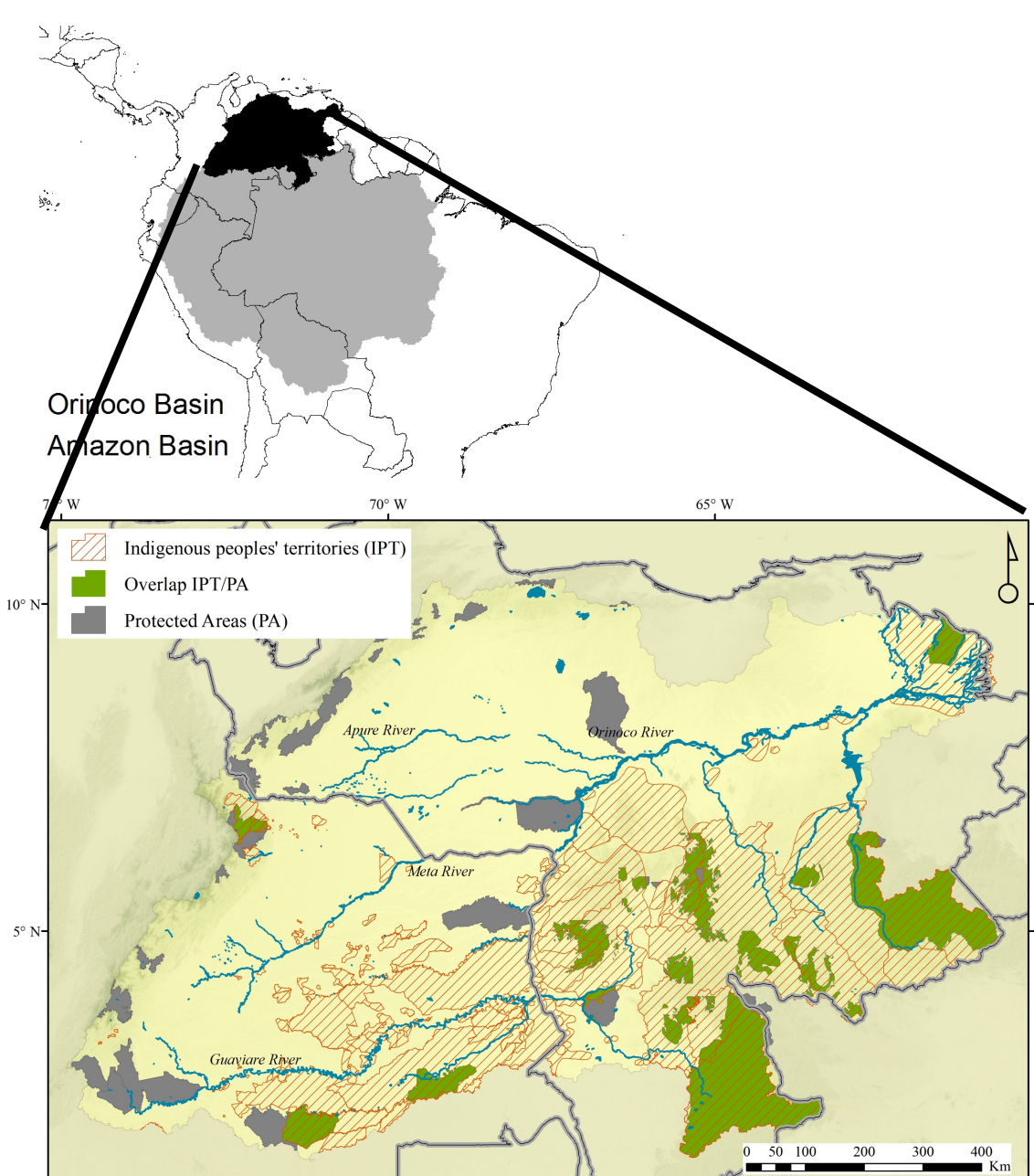
Abstract

Overlapping areas between Protected Areas and Indigenous peoples' territories are important spaces for articulating cross-scale governing institutions and augmenting socioecological adaptability in developing countries. However, cooperation hinges on conflicts resolution between local (Indigenous peoples' authorities) and national institutions (Protected Areas' federal managers), official recognition of ancestral rights to Indigenous peoples, and the investment of social and financial capital for protecting important natural resources in synchrony with local communities. For this, is necessary to improve our understanding of the impacts of cross-scale interaction on natural resources' conservation. In this research, we study these interactions on the Orinoco River watershed, one of the most important areas for the conservation of biodiversity in South America. Overlaps between Protected Areas and Indigenous peoples' territories in this watershed account for 9% of its surface area. To test the effect of different political setups on conservation, we employed conservation indicators that use spatially-defined biophysical attributes. First, we explored differences between governing units (non-overlapping Protected Areas or PA, non-overlapping Indigenous peoples' territories or IT, and overlapping areas or OV), then, we analyzed different overlapping categories (Partial, Near, None, and Full), finally, we analyzed how the recognition of ancestral rights impacts local governance by comparing Indigenous territories with rights and without rights. We found that conservation measurements were higher where any type of overlap took place, which suggests that the interaction between local and national institutions has a positive effect on the protection of important ecosystem services, furthermore, the proxies used to measure ecosystem services values indicate that areas contiguous to OV (Near overlapping category) have greater benefit than commonly expected. Our results were inconclusive regarding the effect of public recognition to local authorities on the local governance; however, this study contributes to the body of evidence about the contribution of these communities to the conservation of strategic ecosystems. This research highlights the importance of collaborative work for the conservation of natural resources, furthermore, it could support future investments of public funds on the creation and strengthening of cross-scale alliances and coalitions for the conservation and management of strategic ecosystems in the Orinoco River watershed.

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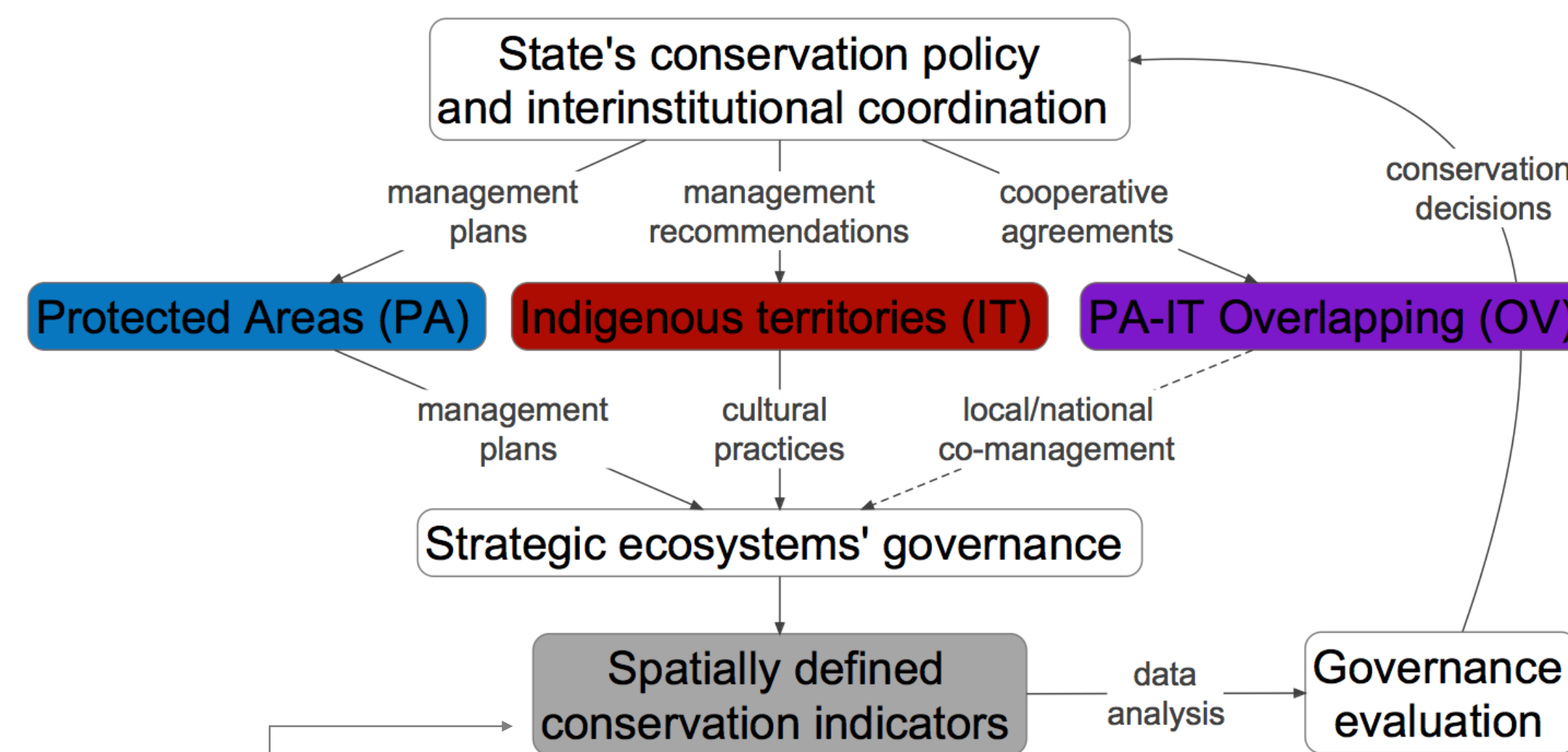
Source: RAISG - The Amazon Geo-Referenced Socio-Environmental Information Network

Background

Together, States' Protected Areas and Indigenous peoples' territories cover 43% of the Orinoco River Watershed, the second-largest watershed in South America. These two, are accountable for most of the protection and conservation of strategic ecosystems in this watershed.

However, trust issues between local and national institutions and weak interaction compromise the future sustainability of the Orinoco. We analyze the potential impacts of across-scales cooperative work on conserving ecosystem services and explore how the public recognition of local communities' authority over the territory affects conservation.

Conceptual model and Methods



$$ES = \sum_i \alpha X_i$$

ES is the cumulative value of ecosystem services (X_i) α is the normalization factor. ES ranges between 4 and 20.

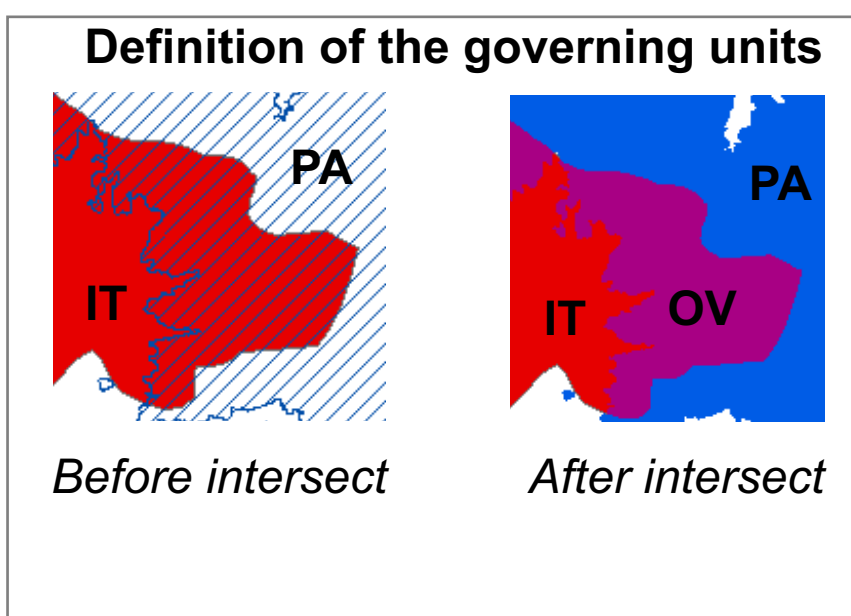
Used ecosystem services were:
Provision of Water (PW)
Mass-Flow Regulation (MFR)
Climate Regulation (CR)
Habitat Availability (HA)

Spatial analysis

Remote sensing data and existing global and local databases, for the period between 2000 and 2010, were used to calculate cumulative ecosystem services (ES) within three governing units (Protected Areas, Indigenous territories, and their overlap).

Statistical analysis

Differences between governing units were tested using four overlapping categories (*Partial*, *Near*, *None*, and *Full*) and two Indigenous territories categories (with rights or de jure and without rights or de facto).



Conservation within each governing unit

There are 50 Protected Areas. 22 overlap with Indigenous territories, from those, 18 correspond to territories without rights or 53% of all Protected Areas.

There are 183 Indigenous territories, 133 with recognized rights and 50 without (30% and 70% of the area respectively). 25 Indigenous territories overlap with Protected Areas.

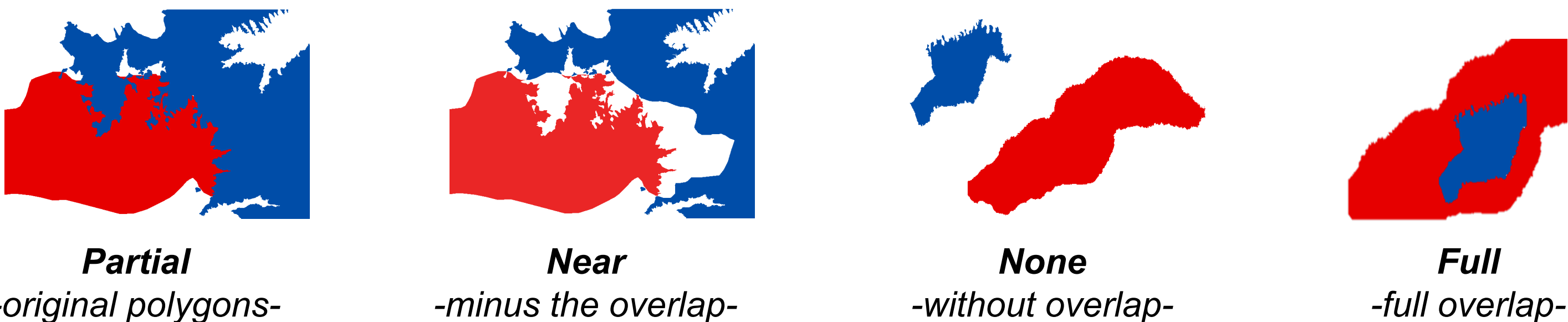
There are 40 overlapping areas. The overlapping area corresponds to 24% of the overall Indigenous territory and 64% of the Protected Areas.

The ES average for the Orinoco River Watershed was 13.4. When compared, we found significant differences between the three governing units. ES was the highest within OV followed by IT and PA. PA values were lower than the watershed's average.

		Defined governing units			Pairwise test of differences †
		IT	PA	OV	
Ecosystem services	<i>n</i> *	180	34	40	
	PW (m³/year)	204,604	93,232	221,282	** for IT/PA; OV/PA
	MFR (kg/year)	0.75	5.44	1.88	** for all pairs
	CR (MgC/ha)	78.56	94.93	128.57	** for IT/OV; OV/PA
	HA (Species richness)	9.20	8.93	9.53	
	ES	14.10	13.21	15.46	** for IT/OV; OV/PA

* *n* values after having extracted fully overlapped areas
† Wilcoxon test based on $p < 0.05$ (*) $p < 0.01$ (**)

Overlapping categories



Differences in ES values between overlapping categories were most significant when comparing *None* against *Partial*, *Near* and *Full* (). Furthermore, *Near* had the highest ES, followed by *Partial* and *Full*.

Indigenous-peoples-rights recognition and its effect on conservation

Significant differences between Indigenous peoples' territories categories were found. Those without rights had higher ES values (15.92) compared to those with rights (14.72). This trend was held when comparing Protected Areas that overlapped Indigenous territories without rights (15.73) and with rights (14.44).

Other key findings

Measurements of cumulative ecosystem services consistently showed differences between governing units and levels of analysis.

Among the four measured ecosystem services, Habitat Availability did not show significant differences for any of the levels of analysis.

Conclusions

Four important conclusions were obtained from this study:

1. Significant differences between overlapping categories suggest that interaction between Indigenous territories and Protected Areas has the potential to improve the conservation of strategic ecosystem services in the Orinoco.
2. Areas contiguous to overlapping areas were found to have the highest ecosystem services, suggesting that collaborative efforts not only affects the overlapped area but the performance of involved institutions.
3. Although public recognition to local authorities is pivotal for effective local governance, the results from this research do not contribute the clarify its impact on conservation in the Orinoco. Further research is needed to explain what factors lead to low measurements of ecosystem services within Indigenous territories with rights.
4. Conservation indicators based on ecosystem services measurements could be successful, however, the inclusion of Habitat Availability might not contribute to finding significant differences between the here studied governing units.

Overall, the findings from this research highlights the importance of collaborative work for the conservation of natural resources, and it could support future investments of public funds on the creation and strengthening of cross-scale alliances and coalitions for the conservation and management of strategic ecosystems.

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