Calculating the Biocapacity of the Saugeen Ojibway Nation Claims of Title and Treaty

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ABSTRACT

This paper explores a land claim case initiated by the Saugeen Ojibway Nation (SON) concerning their traditional territory in Ontario, integrating the principles of the two-eyed seeing approach by bringing the Ecological Footprint and Biocapacity (EFB) methodology into the case as support alongside cultural and Indigenous views. EFB is an environmental indicator used to understand the amount of Earth's resources an area can provide to support human activities. Using geomatics and EFB research, we quantify the regenerative capacity and environmental significance of SON's territory. The analysis reveals that cropland, distinguished by Ontario's high yield factor and fertile soil, possesses the highest Biocapacity within the region, indicating its potential to sustain Indigenous livelihoods. The calculated Biocapacity of SON's traditional territory underscores its ability to support a population of 594,572 people, emphasizing the vast number of ecological resources available within the territory. We look at the juxtaposition of Indigenous knowledge with scientific analysis within this case and how it can help support Indigenous land claims cases. Through this interdisciplinary approach, the paper contributes to the broader discourse on Indigenous land rights and environmental stewardship, advocating for the recognition and preservation of the ecological heritage of Indigenous lands within the framework of the two-eyed seeing approach.

KEYWORDS: Ecological footprint; biocapacity; land claims; geomatics; environmental indicators

Human activity affects the Earth's ability to regenerate resources and sustain ecosystems. This recognition has led to the development of various environmental indicators aimed at quantifying the relationship between human activity and ecologically available resources. Among these, the Ecological Footprint and Biocapacity (EFB) framework has emerged as a widely recognized tool for assessing human demand on nature relative to the planet's ability to provide resources (Rees, 1992; Wackernagel, 1994). The EFB framework measures how much built-up land, grazing land, cropland, forest products, fishing grounds, and terrestrial carbon sequestration area are required to support human consumption: biocapacity quantifies the availability of those ecological assets. These measures have been extensively applied at various levels, ranging from individual households (*Métis-Focused Ecological Footprint Calculator,* 2023) to entire nations (Footprint Data Foundation, n.d.), offering insights into sustainability and environmental management. National Ecological Footprint and Biocapacity Accounts have been produced for all countries and the world as a whole since 1961, with regular updates to its method (Lin et al., 2018).

Despite its utility, EFB has faced criticism for failing to adequately capture the cultural dimensions of land use (Kish & Miller, 2024), creating a barrier to its adoption by localized and Indigenous communities and policymakers. Potential practitioners highlight the importance of integrating cultural, spiritual, and historical considerations into ecological policies and assessments: therefore, there is an increasing need to adapt and refine EFB methodologies to better align and integrate with Indigenous worldviews, with particular opportunities in cases concerning land rights and sovereignty.

A crucial framework for bridging Indigenous and Western knowledge systems is Two-Eyed Seeing (Etuaptmumk), a concept developed by Mi'kmaw Elders Albert and Murdena Marshall. Two-Eyed Seeing encourages seeing the world through both Indigenous and Western perspectives, recognizing the strengths of each, and integrating them to create more holistic understandings of complex problems (Bartlett et al., 2012). By employing Two-Eyed Seeing, our research seeks to balance both knowledge systems. We do so by using biocapacity calculations to demonstrate the land's ecological significance while simultaneously acknowledging the historical and cultural dimensions of the Saugeen Ojibway Nation's (SON) relationship with their territory. This approach helps move beyond purely economic valuations of land, reinforcing Indigenous sovereignty and stewardship in ways that align with both Western and Indigenous frameworks.

This paper also contributes to larger discussions on the use of Biocapacity calculations in legal arguments about Indigenous land claims and its potential role in Indigenous-led economic and ecological stewardship. This research incorporates geospatial analysis of the SON's territory and applies a Two-Eyed Seeing lens. It explores how many multiple knowledge systems can be synthesised to create a holistic framework for ecological assessment when considering land claims.

In this case study, we build on previous applications of EFB, shifting to a localized scale to better capture the environmental significance of SON's disputed territory: our research incorporates geospatial analysis of SON's territory and applies a Two-Eyed Seeing lens, exploring how multiple knowledge systems can be synthesised to create a holistic framework for ecological assessment when considering land claims. This is especially important because SON's land claims are being actively considered before several courts. The case's legal arguments, which concern Indigenous title alongside treaty claims, highlight the acknowledgement of land and water rights. Biocapacity emerges as a particularly useful metric in this context: using EFB to assess the environmental dynamics of the land and waters in question offers a compelling articulation of the ecological value of SON's territories and their role in sustaining the community. Furthermore, by quantifying the land's contested biocapacity, this paper provides a scientific basis for grasping the ecological value of the SON's territory, along with its potential role in Indigenous-led economic and ecological stewardship.

Ultimately, we argue that using biocapacity as a tool to support Indigenous land claims strengthens legal arguments for Indigenous stewardship while expanding the scope of sustainability metrics beyond their conventional quantitative applications. That is, integrating quantitative ecological assessments into Indigenous-led land governance frameworks captures a more holistic understanding of land value, one that moves beyond material attributes alone.

We begin with an overview of the case and the methodological choices that guided our biocapacity calculations. By situating a Western metric like EFB within an Indigenous-specified boundary, we seek to generate a more nuanced understanding of the land's value while also respecting diverse knowledge systems. Adopting a Two-Eyed Seeing approach ensures that our assessment recognizes both the scientific and cultural significance of SON's lands. This synthesis of perspectives not only enriches biocapacity assessments but also aligns with Indigenous principles of land stewardship while advancing ecological research.

Background

SON is made up of two First Nations: the Chippewas of Nawash Unceded First Nation and the Chippewas of Saugeen First Nation. Their traditional territory stretches along the eastern shores of Lake Huron and Georgian Bay, in what is now Ontario, Canada. Spanning over three million hectares of land and water, SON's territory includes the Saugeen (Bruce) Peninsula as well as parts of the mainland. For generations, SON has fought for formal recognition of its land and water rights, emphasizing that these areas are both central to their cultural identity and vital to ecological and economic sustainability.

SON's legal case challenges long-standing legal standards; additionally, it compels the courts to adjudicate on Indigenous title, potentially changing the handling of land and water claims throughout Canada. This particular case, standing as it does at the forefront of a rapidly developing legal discourse and with the potential to establish a truly important precedent, requires a deep examination of Indigenous communities' relationships with their territories, as well as the breadth of government ownership claims over these lands and waters. SON is navigating largely uncharted and often complicated legal territory. The case will affect their community. The SON case's outcome will have significant ramifications for the SON community, as well as for

Indigenous land and water claims across the country, affecting legal frameworks to come and shaping how Indigenous title is acknowledged in environments that are both land and water based.

The Legal Case

SON asserts its claim to 3,036,589 hectares of land and surrounding waters in midwestern Ontario, arguing that the Crown violated *Treaty 45* (1836) and *Treaty 72* (1854) by failing to uphold its promises of protection and stewardship. The Saugeen (Bruce) Peninsula, the land stretching from Goderich to Collingwood, and the waters of Georgian Bay and Lake Huron (Townshend, 2022) are at the heart of this claim.

Treaty 45.5, often referred to as the *Saugeen Tract Agreement,* was signed between SON and the British Crown on August 9, 1836, at Manitoulin Island, Ontario. Lieutenant Governor Sir Francis Bond Head signed on behalf of the Crown, while several SON leaders represented their Nation. The treaty was framed as an exchange: in ceding approximately 1.5 million acres of land in what is now southwestern Ontario, the Crown promised to protect SON's remaining lands, particularly the Saugeen (Bruce) Peninsula, from settler encroachment. However, SON contests the legitimacy of this treaty, arguing that it was signed under coercion and misrepresentation. The British, eager to open fertile lands for settlement, exploited the Nation's vulnerable position, applying pressure amid increasing settler encroachment and economic hardship. Moreover, the treaty may be in direct violation of the Royal Proclamation of 1763, which established a legal precedent requiring Indigenous land cessions to be made with free, informed, and uncoerced consent. SON maintains that the Crown's failure to uphold its duty of protection constitutes a breach of fiduciary responsibility rather than a fair and equitable agreement.

Treaty 72, also known as the *Saugeen Peninsula Treaty,* was signed on October 13, 1854, in Owen Sound, Ontario. The Crown sought further land concessions, this time pushing SON to surrender most of the Saugeen (Bruce) Peninsula, under the premise that SON was unable to effectively defend their lands from increasing settler expansion. The treaty was signed by Crown representatives and SON leaders, who were placed under immense pressure to agree, fearing continued encroachment and economic decline. The terms of *Treaty 72* allowed much of the Saugeen Peninsula to be sold to settlers, with a portion of the proceeds supposedly held in trust for SON. However, SON argues that the treaty was signed under duress and that the Crown misrepresented its intentions, violating the spirit of *Treaty 45.5.* Additionally, SON contends that many parcels of land were sold without their consent or outside the agreed-upon conditions, further undermining their rights.

Legal Implications and Current Litigation

SON's legal claim centers on the argument that these treaties were invalid or breached due to coercion or misrepresentation and failure to uphold fiduciary responsibilities. SON asserts that the Crown's actions directly contravened Section 35 of the Constitution Act, 1982. This Act protects Aboriginal rights, including title to traditional lands and waters. The case is important as it includes Indigenous title claims to portions of Lake Huron and Georgian Bay, marking a significant precedent in Canadian legal history. In their ongoing litigation, SON seeks a) formal recognition of Aboriginal title over unsold lands and portions of the surrounding waters, b) financial compensation for the wrongful sale of lands and loss of economic opportunities, and c) a declaration affirming that the Crown breached its fiduciary duty by failing to protect SON's lands as promised.

As part of the case, SON has also appealed aspects of more wide-ranging legal matters that include several local authorities. Some disputes have ended: see, for example, SON's agreement with the town of Saugeen Shores that, on February 28, 2022, ceded 1.7 hectares of land and provided financial compensation to SON. However, wider-ranging claims against federal, provincial, and municipal governments remain active (Town of Saugeen Shores, 2022), with SON requesting legal recognition of its rights to unsold lands, along with financial compensation totaling $80 billion in total damages and $10 billion in punitive reparations.

By staking claim to parts of Lake Huron and Georgian Bay, SON seeks legal recognition of their ancestral ties to and rights over the waters, asserting that the Crown breached its promise to safeguard the Saugeen Peninsula indefinitely on behalf of SON (Henderson, 2016; Wagner, 2021). While this claim hinges on the interpretation of treaties, this is also the case for several historical agreements between Indigenous communities and the Crown across Canada. The allegation that the Crown breached its promise underscores these treaties' significance, emphasizing their lasting impact on SON's territorial integrity and the Crown's enduring commitment to care for the land and water if SON are not able to themselves. Together, these dual claims challenge historical injustices and seek legal redress for treaty violations, making it a strong example of the broader struggles faced by Indigenous communities across Canada (Brown et al., 2012; Koggel, 2020; Sandlos & Keeling, 2016). Ultimately, SON's case underscores the complex interplay between historical agreements, dispossession, and the ongoing pursuit of reconciliation.

Indeed, SON's legal pursuit encompasses multiple layers of historical injustice, including the dispossession of traditional lands, the violation of treaty promises, and the Crown's continued use of Indigenous-claimed territory (Farrell et al., 2021; McCrossan & Ladner, 2016; White, 2002). Beyond reclaiming land, this case carries profound significance for SON's identity and intergenerational legacy, shaping the future of a vast geographical territory. Its outcome has far-reaching implications—not only for SON but for Indigenous land claims across Canada—challenging the Crown's treaty obligations, the recognition of Indigenous sovereignty, and the role of legal and environmental frameworks in addressing historical injustices.

By integrating biocapacity calculations into the legal discourse, this paper introduces a novel dimension to the case by illustrating the ecological value of the contested lands. In doing so, it reinforces SON's argument for territorial sovereignty and sustainable stewardship, offering a perspective that extends beyond legal precedent to include ecological well-being.

Court Ruling and Ongoing Dispute

In 2022, Justice Wendy Matheson of the Ontario Superior Court issued a ruling on SON's two distinct claims: the Aboriginal title claim to portions of Lake Huron and Georgian Bay and the Treaty Land claim concerning the Crown's failure to uphold its obligations under *Treaty 45.5* and *Treaty 72.* The court recognized that SON presented substantial evidence of their historical use of these waters, including fishing, ceremonial practices, and established travel routes, all of which demonstrated their deep connection to the region.

However, Justice Matheson ultimately concluded that SON did not meet the Tsilhqot'in Nation Test, a legal standard established in the landmark case *Tsilhqot'in Nation v. British Columbia* (2014 SCC 44), which built upon the precedent set in *Delgamuukw v. British Columbia* (1997 SCC 101). This test requires claimants to demonstrate continuous, substantial, and exclusive occupation of the territory prior to Crown sovereignty in 1763, using evidence of land use and control that aligns with Indigenous law and customs (Olthuis Kleer Townshend LLP, 2022). The ruling underscores the rigid application of this legal benchmark, which remains a standard in Indigenous land claims cases within Canada.

Justice Matheson did, however, rule in favor of SON in recognizing that the Crown failed to uphold its treaty commitments (Olthuis Kleer Townshend LLP, 2022; Saugeen Shores, 2022). The ruling determined that *Treaty 45.5* and *Treaty 72* were breached, affirming that the Crown had a duty to protect SON's interests but then failed to do so. Despite this acknowledgment, the court ended up ruling that the Crown's actions did not constitute a breach of fiduciary duty, as SON had argued. Justice Matheson explained that while the Crown did not act in SON's best interest, the legal criteria for fiduciary duty, which required an obligation to prioritize the other party's welfare, were insufficiently met.

This ruling concluded the first phase of the legal process, although it is now being reviewed by the Ontario Court of Appeal. After the adjudication of appeals, the second phase will address compensation and restitution, focusing on obtaining judicial declarations regarding treaty violations. The broader claim will include SON's claims over unsold Crown lands and municipal-controlled areas such as roads and shorelines, although the municipalities have contested their inclusion in these claims, arguing they should be exempt from treaty-based restitution.

As the case moves forward, it represents a critical moment for SON. The ruling highlights the evolving interpretation of treaty obligations and the stringent, and often difficult, requirements placed on Indigenous nations to prove ongoing and historical territorial occupation. This study seeks to reinforce SON's case by quantifying the ecological productivity of the disputed lands, demonstrating the long-term economic and environmental value provided to those who own and occupy them. This serves as both a comparative measure for assessing compensation and as further validation of the territory's essential role in sustaining SON's cultural and economic livelihoods.

Methods

Geospatial Analysis and Boundary Mapping

To calculate the biocapacity of SON's traditional territory, we employed a systematic methodology using Geographic Information Systems (GIS) technology. The boundaries of the claimed land were mapped using ArcGIS and QGIS, utilizing available cartographic data, historical records, and existing land use studies. Because SON does not provide publicly available shapefiles for the territory, we estimated the boundary based on historical treaty descriptions and land claim documents. This step is acknowledged as a limitation of the study, as the estimated boundaries may not perfectly align with SON's understanding of their territory.

The first step in the mapping process was defining the southern boundary of the land claim area using documented treaty descriptions. From there, the US-Canada border to the west was incorporated, creating an estimated polygon overlaying the disputed territory. This polygon was digitized into QGIS to create a functional shapefile that could be used in biocapacity calculations. While this method allows for a systematic and replicable approach to mapping, it does not replace the necessity for Indigenous-defined spatial data, which remains a key consideration in land claims research.

Two-Eyed Seeing in the Methodology

Although this study did not involve direct collaboration with Indigenous partners, we applied a Two-Eyed Seeing framework by integrating Indigenous perspectives into our methodological approach. As previously mentioned, Two-Eyed Seeing is a guiding principle that encourages the integration of Indigenous and Western knowledge systems to create more holistic and contextually appropriate understandings of environmental and land-based research (Bartlett et al., 2012; Reid et al., 2021). This methodology does not merely place Indigenous perspectives alongside Western science but seeks to braid them together in a way that acknowledges the validity of both worldviews (Reid et al., 2021; McGregor, 2018).

In this study, we incorporated Indigenous perspectives by framing land not as a passive commodity but as a relational entity with intrinsic ecological and cultural significance (Simpson, 2017; Kimmerer, 2013). Indigenous knowledge systems recognize land as kin, with reciprocal responsibilities guiding land stewardship: this perspective is fundamentally different from conventional Western ecological models that often prioritize extractive and economic value (Whyte, 2018; Atleo, 2011). This approach aligns with the SON's historical and contemporary governance structures, which emphasize intergenerational land management, biodiversity conservation, and sustainable harvesting practices (Borrows, 2010). By recognizing these Indigenous governance traditions within our biocapacity assessment, we ensured that our analysis moved beyond a purely quantitative ecological framework to one that acknowledges the deeper cultural and legal relationships embedded within SON's land claims (McGregor, 2009).

Further, our methodology acknowledges that mapping itself is an act of power—a tool that has historically been used to erase Indigenous territories and impose a colonial spatial logic that does not reflect Indigenous conceptions of land and place (Johnson et al., 2006; Bryan, 2011). Western cartography is rooted in static territorial delineations, whereas Indigenous knowledge systems often conceptualize land through fluid, relational, and seasonal spatial understandings (Tuck & Yang, 2012). In response, we approached GIS-based biocapacity mapping not as a definitive claim over SON's land but as an approximation that recognizes the limitations of Western spatial data in fully capturing Indigenous land relationships (Cajete, 2000). This aligns with Indigenous critiques of environmental management that argue for a shift from state-controlled mapping processes toward participatory, Indigenous-led GIS that centers Indigenous land tenure, traditional land use, and governance priorities (Rundstrom, 1995; Louis et al., 2012).

By embedding Two-Eyed Seeing into our methodological approach, this study challenges the dominance of Western scientific frameworks in land assessment and demonstrates that Indigenous perspectives on land use, sustainability, and governance must be included in environmental valuation methodologies (McGregor, 2018; Simpson, 2017). While we recognize the limitations of not directly collaborating with Indigenous partners, our approach provides a critical entry point for integrating Indigenous conceptualizations of land stewardship into biocapacity analysis. Future research should aim to deepen this integration through codeveloped methodologies that foreground Indigenous decision-making and governance structures (Latulippe & Klenk, 2020).

Mapping the Land

Once the boundaries were mapped and established, we qualified the environment's landscape elements within these boundaries. We used the *Southern Ontario Land Resource Information Systems (SOLRIS)* for this purpose, as it represents the Crown's current method of classifying land and thus provides a standardized basis for classification. After each landscape element was qualified, it was then related to the biocapacity framework (see Table 1 for the classification of the biocapacity elements). We also used the Ontario Land Cover Compilation (OLCC), accessed through the *Ontario GeoHub,* a repository managed by the Ontario Ministry of Natural Resources and Forestry (2014). The OLCC dataset provided comprehensive coverage and thus provides essential information on land cover types for biocapacity calculations. Unfortunately, there was no available spatial data estimating landscape composition in 1854. As a result, we cannot be sure what portion of the lands were forested versus cropped historically: we can only calculate contemporary measures.

TABLE 1
Definitions of the Six Components of Biocapacity

Component	Definition
Carbon	Amount of forest land required to sequester CO_2 emissions (primarily from burning fossil fuels, international trade, and land use practices) after accounting for CO_2 uptake by oceans.
Forest	Area of forest required to support annual harvets of fuel wood, pulp, and timber products.
Cropland	Area required to grow all crops needed for human consumption (food and fibre) and to grow livestock feed, fish meal, oil crops, and rubber.
Grazing Land	Area of grassland used (in addition to feed crops) to raise livestock for meat, dairy, hide, and wool products.
Fishing Grounds	Area of marine and inland waters required to generate annual primary productions to support catches of aquatic species (fish and seafood) and aquaculture.
Built-Up Land	Area of land covered by human infrastructure such as transportation, housing, industrial structures, and resevoirs for hydroelectric power generation.

To align the OLCC data with SON's land claim boundaries, the Clip Raster by Mask Layer function in QGIS was utilized. This function facilitated the precise cropping of the OLCC data to match the size and shape of the newly created boundary's shapefile, resulting in a subset of OLCC data within SON's traditional territories. This subset was processed in QGIS using its Raster Layer Unique Values Report to sum the area of distinct classes of lands and water. This report was exported to Microsoft Excel to relate each attribute to a biocapacity class. As seen in Table 2, This attribution followed the concordance used in a provincially-scaled assessment of Ontario's Ecological Footprint and biocapacity (Ontario Biodiversity Council, 2021) . Next, the global hectares of productivity were calculated using the parameters detailed in the *Ontario Provincial Report on Ecological Footprint and Biocapacity,* which include the Ontario Relative Net Primary Production (rNPP) for Mixedwood Plains (an Ontario ecozone), the relative yield of an average hectare in Ontario, the Canadian Yield Factor, the Global Inter-Temporal Yield Factor, and the Global Equivalence Factor (Ontario Biodiversity Council, 2021) (Table 2).

After using the *Ontario Provincial Report*'s productivity calculations for each land cover type, the next step involved comparing the *SOLRIS* classes to the biocapacity classes and converting the numbers to hectares and ultimately global hectares. In cases where land cover type comprised a varied percentage of biocapacity classifications, the overall percentages were factored into the area. This involved multiplying the percentage by the number of hectares to determine the area covered by each classification. This calculated area was multiplied by the productivity in global hectares to obtain the total conversion for each land cover type.

Results

The data for these calculations primarily originated from the *Ontario Land Cover Complication* v 2.0 (OLCC), a comprehensive database encompassing the land cover of the entire province of Ontario. The database amalgamates information from three different land cover databases: the *Provincial Land Cover Database* (2000 Edition), the *SOLRIS* Version 1.2, and the *Far North Land Cover* Version 1.4 (Ontario Ministry of Natural Resources and Forestry, 2014). The biocapacity classifications for specific land cover types, including Alvar, Open Tallgrass Prairie, and Tallgrass Savannahs, were also included in the *Ontario Report* (Ontario Biodiversity Council, 2021) and thus were sourced from *SOLRIS* v. 3.0 and OLCC v. 2.0. The utilization of diverse and comprehensive datasets enhanced the reliability and precision of the calculated biocapacity values in Table 2.

TABLE 2
Biocapacity Derived From Area Categorized by SOLRIS Within the SON Claim's Estimated Boundary

***OLCC* (*SOLRIS* class**	**Area Within Boundary (ha)**	**Related Biocapacity Class and Weighting**	**Hectares**	**Biocapacity (ha)**	**Conversion Ratio (Gha/ha)**	**Biocapacity (gha)**	**Percent of Total**
Clear Open Water	15581193300	100% Freshwater	1,558,119	1,558,119	0.80	1,251,014	29.97%
Marsh	166329225	100% Wetlands: Other	16,633	16,633	0.35	5,761	0.14%
Swamp	1935451800	30% Forest: Sparse	193,545	58,064	0.66	38,046	0.91%
		+ 70% Wetlands: Other		135,482	0.35	46,923	1.12%
Fen	4294575	100% Wetlands: Peat Fens	429	429	0.39	169	0.00%

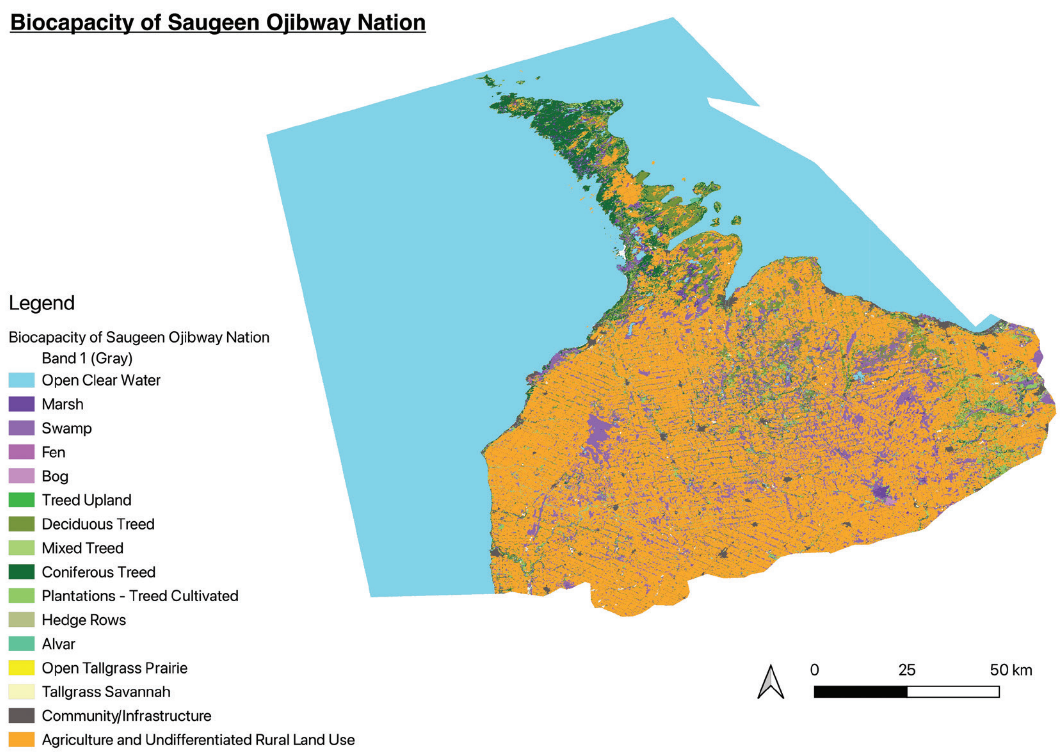
Bog	7018875	100% Wetlands: Peat Bogs	702	702	0.61	427	0.01%
Treed Upland	57215250	100% Forest: Dense	5,722	5,722	1.04	5,945	0.14%
Deciduous Treed	1046786625	100% Forest: Dense	104,679	104,679	1.04	108,764	2.61%
Mixed Treed	464957775	100% Forest: Dense	46,496	46,496	1.04	48,311	1.16%
Coniferous Treed	764718075	100% Forest: Dense	76,472	76,472	1.04	79,457	1.90%
Plantations - Treed Cultivated	184151250	100% Forest: Dense	18,415	18,415	1.04	19,134	0.46%
Hedge Rows	87761250	100% Forest: Dense	8,776	8,776	1.04	9,119	0.22%

Alvar	8630100	60% Low Biocapacity	863	518			
		40% Forest: Sparse		345	0.66	226	0.01%
Sand Barren and Dune	79875	100% Extraction	8	8	0		
	355950	90% Grassland	36	32	0.98	31	0.00%
Open Tallgrass Prairie		+ 10% Forest: Sparse		4	0.66	2	0.00%
	1411200	65% Low Biocapacity	141	92			
Tallgrass Savannah		+ 35% Forest: Sparse		49	0.66	32	0.00%
Sand/Gravel/Mine Tailings/Extraction	31892625	100% Extraction	3,189	3,189			

Community/Infrastructure	551564550	100% Built Up	55,156	55,156	5.60	308,785	7.40%
Agriculture and Undifferentiated Rural Land Use	9472082175	30% Cropland	947,208	284,162	5.60	1,590,842	38.11%
		22% Grazing land		208,386	0.98	214,099	5.13%
		+ 48% Grassland		454,660	0.98	446,814	10.70%
TOTALS			**3,036,589**	**3,036,589**		**4173902**	**100.00%**

Figure 1 depicts a comprehensive map crafted using QGIS to offer a visual representation of the estimated claimed area and to process the diverse land classifications in line with biocapacity categories.

FIGURE 1
Map of SON's Estimated Boundary and Biocapacity



Note. Map Produced Using Data from *OLCC* v. 2.0 on QGIS.

Figure 2 shows the biocapacity within SON's traditional territory, providing insights into its resource significance and capacity to support life within the context of the land claim case and broader ecological discourse. SON's territory is estimated to span about 3,036,589.448 hectares, encompassing a wide range of ecosystems and habitats. This area is estimated to provide biocapacity of 4,173,901 global hectares, accounting for six distinct biocapacity types, including forests, wetlands, grazing lands, built-up land, croplands, and freshwater. Forested areas provided 309,035 global hectares of biocapacity and are predominantly characterized as mixed sparse and dense forests. Wetlands contribute 53,279 global hectares and are crucial in maintaining biodiversity, water filtration, and flood mitigation. Grazing land provides 660,944 global hectares used for livestock grazing and agricultural purposes. Built-up land, including urban and developed areas, makes up 308,785 global hectares. Finally, the two highest biocapacity components are cropland, totalling 1,590,842 global hectares, and freshwater, totalling 1,251,014 global hectares. Cropland and freshwater are essential for food production, water supply, and ecosystem health. Taken as a whole, the area's total biocapacity could support the lives 600,000 Ontarians, which is greater than the population of all major cities close to SON Territory: this demonstrates the significance of the SON region's biocapacity.

FIGURE 2
Biocapacity of the SON Claim's Boundaries, by Type, in gha

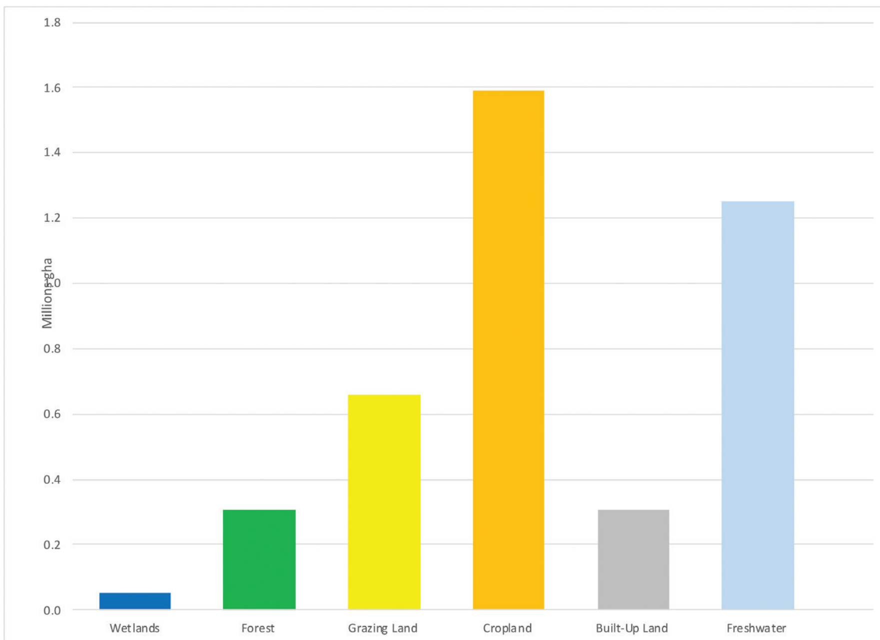


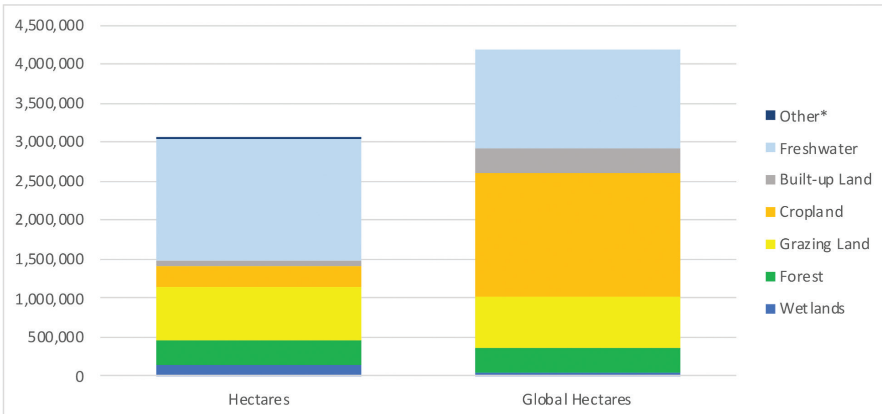
Table 3 shows the biocapacity within SON's boundaries by type in global hectares. For context, the total biocapacity of Iceland is 5,010,029 global hectares, as compared to SON's 4,173,901 global hectares.

TABLE 3
SON Estimated Biocapacity by Type in Hectares and Global Hectares

	Hectares (ha)	Global Hectares (gha)
Wetlands	153,246	53,280
Forest	319,021	309,036
Grazing Land	663,078	660,944
Cropland	284,162	1,590,842
Built-up Land	55,156	308,785
Freshwater	1,558,119	1,251,014
Other	3,807	-
Total	3,036,590	4,173,902

Finally, Figure 3 compares the total number of hectares within the SON boundary to the corresponding number of global hectares in the region. This highlights the difference between physical land area and its ecological productivity measured as biocapacity, which emphasizes the need to consider both environmental and land claim assessments.

FIGURE 3
SON Land Claim Boundaries Measured in Hectares vs. Global Hectares



Discussion

The SON legal claim case is an important moment in Canadian land claim history as it has significant implications for environmental jurisprudence. Utilizing a methodological approach applying geomatics to derive biocapacity, this case study offers a quantifiable assessment of the regenerative ecological capabilities of SON's traditional territorial lands, delineating its environmental valuation. Calculating the biocapacity helped create a quantitative delineation of SON's land productivity—namely, that cropland within SON territory provides more biocapacity per unit of area than the world average. This is consistent with Ontario cropland more generally, which produces more crops per unit area compared to global averages and is known for its high productivity (Hendry, 2023).

This increased productivity is important for the land claim, highlighting the land's potential to support SON. The biocapacity of SON's traditional territory is estimated to sustain a population of 594,572 people, where 7.02 global hectares is the estimated per capita Ecological Footprint of Ontarians (Ontario Biodiversity Council, 2021). Some might say that this undermines SON's claim, given that SON would not require the total disputed area to sustain its own population's Ecological Footprint. From a different perspective, though, this can be seen as supporting SON's claim to the land as it highlights the importance of the Crown honouring its treaty to protect the lands traditionally stewarded by SON: these territories need to be preserved for future generations. In this light, the Crown's failure to honour its duty of stewardship has significant consequences given the area's high biocapacity.

SON's claim to its traditional waters is also important. While SON maintained sole usage of multiple portions of Lake Huron and Georgian Bay, their claim was found to lack sufficient evidence. Nonetheless, these waters' biocapacity is essential for understanding the overall ecological productivity of the space: this analysis offers key understandings into the areas' readily available resources. Additionally, SON has meaningful cultural links to freshwater. As Anishinaabe Peoples, water is more than just a resource: it is a sacred entity with spiritual meaning, representing ancestral memories and playing many roles in cultural practices (McGregor, 2023).

Exploring the land within a historical context and considering both the undeveloped and developed areas helps to shed light on the effects of colonialism and development on SON's traditional territories and their ownership over resources. The biocapacity calculations post-dispossession reveal the ecological and cultural losses sustained by SON and the inadequacies of historical treaties and agreements in safeguarding ecologically significant lands for Indigenous Peoples. This oversight has had lasting repercussions on the ecological integrity of SON's traditional territories. The SON land claim case is not merely a legal dispute but a clarion call for a shift in how land claims are adjudicated and treated in the Canadian legal system. The case demonstrates the necessity of integrating both ecological and cultural considerations into the legal framework, ensuring the adjudication process will fully account for the complex relationships Indigenous communities have with their ancestral lands.

By highlighting the intersection of legal, ecological, and methodological dimensions, our application of biocapacity to the SON land claim offers a complementary perspective to existing legal arguments. Rather than positioning land purely as an economic or geographic entity, this approach recognizes its ecological productivity and regenerative capacity, demonstrating its role in sustaining human and non-human life. While we do not claim to have captured the full cultural and spiritual significance of the land as understood by SON, our methodological framework—guided by Two-Eyed Seeing—suggests that environmental metrics such as biocapacity can contribute to a broader, more holistic argument for land protection and stewardship within legal disputes. This aligns with calls to incorporate ecological valuation into Indigenous land claims as a means of reinforcing arguments for self-governance and stewardship rights (Costanza et al., 2014). Future research should extend this work by collaborating with Indigenous communities to integrate Indigenous-led ecological indicators alongside biocapacity measures, ensuring that land valuation reflects Indigenous knowledge systems, governance principles, and relational responsibilities rather than being limited to Western ecological frameworks.

The outcomes of the case study are significant. The integration of biocapacity into legal proceedings would mark a significant advancement in environmental jurisprudence, advocating for a more informed and science-based approach to land claims, which is required for sustainable outcomes (Boyle & Freestone, 1999). The application of biocapacity is also advocated for in literature on sustainable development environmental planning, as metrics play a crucial role in informing policy decisions (Bell & Morse, 2008). The case also emphasizes the necessity of recognizing Indigenous relationships with their ancestral land within legal processes, as the land provides greater ecological benefit to the people than simply acreage; such an approach is consistent with international calls for the protection of Indigenous lands, territories, and resources (United Nations, 2007).

Most significantly, there is a growing need in land management for the integration of cultural values and ecological science: an interdisciplinary approach is required to holistically and ethically respond to complex challenges. Combining Indigenous wisdom with scientific knowledge is useful for ecological sustainability (Kimmerer, 2013) and encourages a Two-Eyed Seeing approach. This paper adopts the Two-Eyed Seeing lens by proposing that biocapacity should be used to complement the cultural argument for the importance of SON land.

Limitations

This study has several limitations that should be acknowledged to ensure a transparent interpretation of its findings. The first major limitation is that the statistics rely on estimated boundaries for SON's traditional territory. Due to the absence of publicly available shapefiles, the territorial boundaries were constructed using historical treaty descriptions, cartographic projections, and legal land claim documents. While these estimations follow standard GIS methodologies, they may not reflect SON's own spatial understandings of their territory. This limitation reinforces the need for Indigenous-led GIS methodologies in future research.

Secondly, while the study applied a Two-Eyed Seeing framework, it did so without direct collaboration with SON representatives. Two-Eyed Seeing encourages the braiding of Indigenous and Western knowledge systems, which includes meaningful engagement with Indigenous communities. The absence of this engagement means that while the study incorporates Indigenous methodological perspectives, it does not claim to represent SON's cultural or governance perspectives. Future research will aim to codevelop methodologies with Indigenous partners to ensure that biocapacity assessments integrate Indigenous-led ecological knowledge and land stewardship principles more authentically.

Finally, this study is based within the Canadian legal framework for land claims and, therefore, does not account for the evolving legal dynamics surrounding SON's ongoing case. While biocapacity analysis is a complementary tool for understanding land value, it is ultimately one component of a larger political discourse. The conclusions drawn here should, therefore, be interpreted within the broader legal and policy context that governs Indigenous land rights in Canada.

Given these limitations, our future work will focus on codeveloped methodologies that incorporate Indigenous-led data sovereignty, traditional ecological knowledge, and governance principles. Additionally, further research should explore how environmental valuation tools like biocapacity can be adapted to better align with Indigenous knowledge systems, ensuring that sustainability metrics reflect Indigenous worldviews rather than solely Western ecological paradigms.

Conclusion

Applying biocapacity to the SON land claim case presents a new approach to understanding land disputes by bringing together Indigenous knowledge with scientific methods. This approach highlights the ecological value of the land, which can be used alongside arguments related to the deep connection Indigenous communities have with their ancestral territories. By considering both the environmental and cultural significance of the land, this case study sets an important precedent for additional material scholars can use to demonstrate just how ecologically diverse, productive, and significant a People's land is. By demonstrating how much ecological productivity is derived from the traditional territories of Indigenous Peoples, biocapacity models a respectful and inclusive way of evaluating land claims that acknowledges the importance of both Indigenous traditions and scientific analysis.

The method employed in this case study has the potential to inform policy deliberations and legal adjudications concerning land management and what might be owed to the people of a specific territory. This method has the potential to look at historical biocapacity compared to post-dispossession biocapacity and measure how much was lost due to colonization over time and, thus, the amount of biocapacity an Indigenous nation irreversibly lost. It could also extrapolate the economic worth of ecosystem services within the lands, adding a numeric value that could be important for some discussions. For SON's case, the methodology's outcomes provide evidence of the land's ecological significance and reinforce the argument that SON's traditional territory is culturally important and plays a critical role in sustaining biodiversity and supporting ecosystem services. The quantitative data derived from our biocapacity assessments can inform the scale and nature of reparations owed to Indigenous communities and provide a tangible measure of the loss incurred.

By applying this method, our case study has the potential to contribute to more informed and equitable resolutions of land claims while also promoting a broader understanding of land's intrinsic value. We argue that there needs to be a shift in perspective to recognizing land as a source of life and sustenance whose value cannot be fully captured by economic metrics or by use of the land alone. Doing so would lead to a more sustainable and just approach to land governance, where decisions are made with consideration of both ecological and cultural significance.

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