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Rural Land Concentration & Protected Areas: Recent Trends from Montana and Greater Yellowstone

Julia H. Haggerty^a , Kathleen Epstein^b , Hannah Gosnell^c , Jackson Rose^a, and Michael Stone^a

^aDepartment of Earth Sciences, Montana State University, Bozeman, MT, USA; ^bAtkinson Center for Sustainability, Cornell University, Ithaca, NY, USA; ^cCollege of Earth Ocean and Atmospheric Sciences, Oregon State University, Corvallis, OR, USA

ABSTRACT

Where agricultural land use and biodiversity conservation values overlap, conservation science has tended to focus on the challenges posed by land ownership fragmentation. However, the dynamics of land concentration also affect rural landscapes and economies upon which biodiversity conservation increasingly depends. In this study, we provide a methodological approach to measuring concentration using parcel-level data to generate a description of private land-ownership trends at the boundary of the Northern Rockies and the Northern Great Plains, two ecoregions of global conservation significance. Across our 25m-acre study region in Montana, USA concentration in large land ownership increased by 7 percent between 2005 and 2018. Growth of a county's largest landholding through the agglomeration of properties into a single mega-estate emerges as a recurring trend. Other drivers contribute to concentration, suggesting a mix of conservation opportunities and challenges that merits further research and consideration by academic and resource management stakeholders.

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Introduction

Rural agricultural and working lands are critical geographies for biodiversity conservation—correspondingly, conservation strategies increasingly value sustainable rural livelihoods as a means to preserve and enhance biodiversity (Kremen and Merenlender 2018). This research note draws attention to landownership dynamics in a region of Montana where rural land use and global biodiversity conservation priorities overlap and sometimes “collide” (Nordhaus 2020; Epstein, Haggerty, and Gosnell 2021). Here, as in the rural hinterlands of many advanced economies, a rush of financial capital into agricultural land over the past two decades has amplified existing sustainability dilemmas stemming from the intensification of agriculture and rural restructuring (Gosnell and Travis 2005; Holmes 2014). While debates about biodiversity conservation, land use, and ownership have tended to focus on fragmentation and associated challenges for

CONTACT Julia H. Haggerty  julia.haggerty@montana.edu  Department of Earth Sciences, Montana State University, Bozeman, MT 59717-2360, USA.

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neighboring protected areas (Gosnell, Haggerty, and Travis 2006), this study identifies a trend of landownership concentration, a pattern that reflects aspects of land grab dynamics and the influence of systems of wealth and finance on agricultural production worldwide (Cotula 2012; Fairbairn 2020).

In and near protected areas, which depend heavily on neighboring land use to succeed in biodiversity conservation goals, landownership patterns affect multiple dimensions of local social-ecological systems. Private land use determines the quality and quantity of wildlife habitat and the provisioning of ecosystem services (Gosnell, Haggerty, and Byorth 2007; Hurst and Kreuter 2021). In rural geographies, private lands also influence opportunities for local resource use and access (Yung and Belsky 2007), characteristics that underscore the longstanding link between property and social and political power (Freyfogle 2003; Hoffman 2018). Rural land concentration hence presents as a critical indicator of social-ecological change, one emblematic of growing wealth inequality and relevant to debates around the future of rural livelihoods, resource access, and private land management.

Before its social, economic, political, ecological effects can be analyzed, however, land concentration must first be measured. Public landownership datasets typically require extensive manipulation to produce meaningful insights into patterns such as concentration (Haggerty 2004; Pritchard et al. 2012; Shrubsole 2019). In the United States, large property holdings such as ranches comprise numerous legal parcels with unique title histories, complicating accurate appraisals of who owns what and in which configurations. In this research note, we present a method to measure concentration by applying a systematic processing effort to public cadastral data. This study also briefly summarizes complementary qualitative analysis of social and economic dimensions of the concentration patterns. This snapshot of trends in land concentration near protected areas is, to our knowledge, the first in the scholarly literature.

Methodological Approach

Study Site

Our study analyzes private landownership in twelve counties in the region linking the northern Greater Yellowstone Ecosystem (GYE) and the Northern Great Plains (NGP). The study area comprises 24.9 m acres of land encompassing mountain valley, foothills and open prairie grasslands and sagebrush-steppe systems, of which roughly half is in private acreage (Figure 1). Two complexes of protected public land bound the region: in the south, Yellowstone National Park, and in the north, the Missouri River Breaks National Monument and the Charles M. Russell (CMR) National Wildlife Refuge. The ecological endowments of these two regions have made them hotspots for scientific and philanthropic activity related to conservation. Private land ownership and management feature prominently in ongoing debates about how to sustain and improve outcomes for biodiversity (Haggerty et al. 2018; Hansen and Phillips 2018; Hendrickson et al. 2019; Middleton et al. 2020; Nordhaus 2020). In the twelve counties that comprise our study area, private land provides intact mountain and grassland habitat with important ecological benefits including the landscape-scale connectivity and corridors necessary for migratory species such as elk, bison, mule deer and pronghorn antelope, as well as a variety of specialist species (Hansen and Phillips 2018).

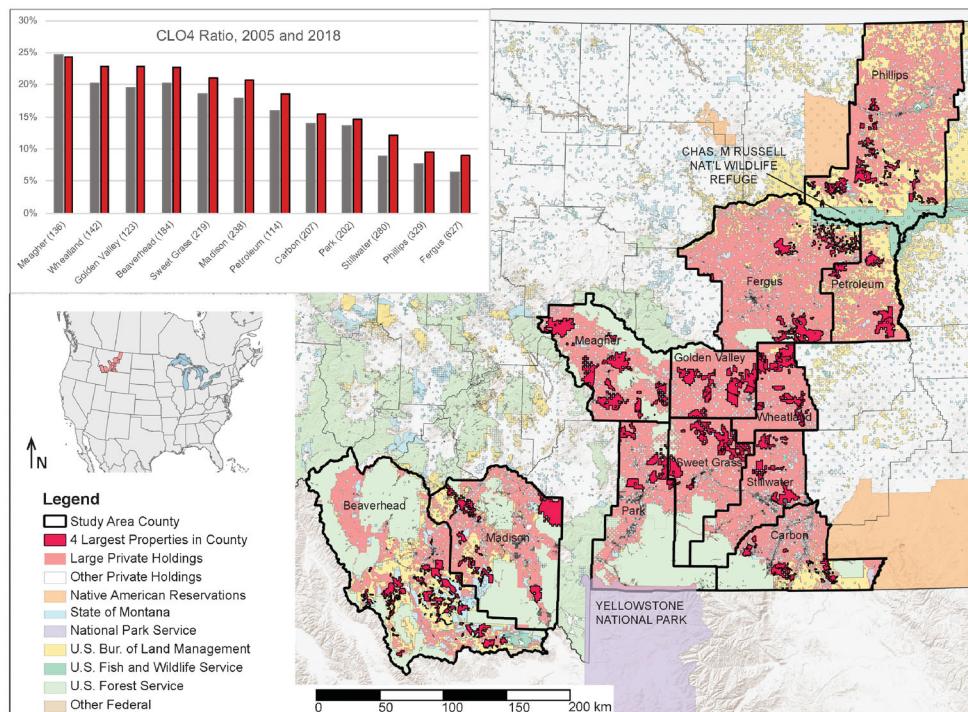


Figure 1. Land ownership concentration near public land and protected areas in Montana, USA.

A Mixed Methods Approach for Assessing Ownership Dynamics

This study involved two-fold approach for assessing property ownership dynamics in the study region. First, we applied a systematic methodology for cleaning and manipulating public property ownership records to create a spatial dataset of private land holdings for two points in time (2005 and 2018) by using publicly-available parcel data that include shapefiles and attributes for taxable and tax-exempt parcels. The specific methods build on earlier work (Gosnell and Travis 2005) adding automated processing and a new focus on documenting concentration over time. To aid in the transferability and reproducibility of this work, we offer detailed step-by-step methodology in an online supplement. In summary: the ownership data are cleaned and manipulated in an extensive multi-step, script-assisted process to consolidate parcels with common ownership (homogenization). The parcel dataset resulting from owner homogenization undergoes manual quality assurance and adjustment followed by GIS processing to produce an accurate spatial dataset of ranch ownership—with the caveat that our methods will carry forward any errors in the generation of digital parcel data by state and local governments. The aggregated and homogenized parcel record information can then be assessed for patterns of concentration.

We complement our spatial data set with qualitative data on the dimensions and drivers of the region's ownership patterns. More specifically, we drew from 67 key-informant interviews conducted in 2017–2020 with representatives from the ranching and real estate professions (for methods, see Epstein, Haggerty, and Gosnell 2019; Epstein, Haggerty, and Gosnell 2021). We paired interviews with a systematic review of

online and print media including local and national newspapers and relevant public web sites. Thematic analysis of this combined data set enabled us to describe social characteristics of the region's concentration trends.

Results

Concentration of land ownership in the study area increased from 2005 to 2018. The total number of landowners of holdings 640 acres in size or greater declined 6.4% from 2,993 to 2,801 (Table 1). Correspondingly, the average size of single large landholdings (4,141 acres in 2018) grew by 7%. Measured as the share of the four largest properties in each county of the total land area of all large landholdings, the four-property concentration ratio (CLO4 after (Desmarais et al. 2015)) increased in 11 of 12 study counties (Figure 1). Averaged across all counties, it grew from 14% to 16%.

Assemblage of extra-large properties at the top of the property ownership cohort stands out as a feature of concentration in the study area. The total area of the 48 holdings that comprise the top 4 properties by size in each of the study counties expanded by just under 235,000 acres between 2005 and 2018, of which 164,000 acres (70%) accrued to the largest properties. In two counties, the largest landholdings doubled in size between 2005 and 2018. On average, the size gap between the first- and second-largest landholding quintupled between 2005 and 2018 (Figure 2).

Ownership trajectories of the study area's largest properties illuminate the diversity of drivers contributing to large land ownership patterns in the region. New investment in the region explains much of the land ownership concentration: In 4 of the 5 counties that witnessed a doubling or more of the gap between the largest and second largest properties, new landowners entered the land market and agglomerated the largest holding in the county through multiple purchases during the study period.

While acquisitions by the region's burgeoning mega-estates manifest the vast scale that defines contemporary land grabs (Cotula 2012), according to media reports and interviews we conducted with informants, they also defy easy categorization. The owner of the largest property in one county assembled his/her holdings as an attempt to control a speculative oil play. In another, a pair of wealthy energy developers and owners of one of the largest properties in the US created controversy by closing off access to an inholding of public land popular for hunting. Another of the largest landowners in the study area is a "green grabbing" nonprofit aiming to assemble blocks of private land with extensive intact habitat into the largest private nature preserve in the continental US (Holmes 2014; Nordhaus 2020). In contrast, in the neighboring county, a fortune earned in software development enabled the largest landowner to assemble several ranches into a single intensive agricultural operation, upon which he undertook the very practice the nature preserve seeks to prevent—conversion of native vegetation for crop agriculture. In two other notable expansions of the largest property in the county, the buyers were existing absentee owners—namely the Koch family, present in the area since 1953, and Farmland Reserve, the farming corporation of the Mormon Church. Both enterprises are among the largest agricultural landowners in the US.

Table 1. Land ownership in study area.

	Total land area (acres)	Private land in holdings 640 acres or larger			Number of owners of private land in holdings 640 acres or larger			Average size of private land holdings greater than 640 acres		
		2005	2018	Percent Change	2005	2018	Percent Change	2005	2018	Percent Change
Beaverhead	3,566,341	1,016,370	1,000,755	-2%	201	184	-8%	5,057	5,439	8%
Carbon	1,317,043	500,292	485,788	-3%	216	207	-4%	2,316	2,347	1%
Fergus	2,783,889	1,813,265	1,917,110	6%	662	627	-5%	2,739	3,058	12%
Golden Valley	751,440	681,994	639,469	-6%	139	123	-12%	4,906	5,199	6%
Madison	2,305,561	892,681	903,931	1%	241	238	-1%	3,704	3,798	3%
Meagher	1,530,928	921,716	916,188	-1%	150	136	-9%	6,145	6,737	10%
Park	1,799,453	649,744	642,201	-1%	214	202	-6%	3,036	3,179	5%
Petroleum	1,062,205	570,196	578,113	1%	118	114	-3%	4,832	5,071	5%
Phillips	3,308,105	1,512,138	1,526,557	-1%	373	329	-12%	4,053	4,639	14%
Stillwater	1,147,180	752,043	757,024	1%	305	280	-8%	2,466	2,704	10%
Sweet Grass	1,198,785	780,220	773,337	-1%	227	219	-4%	3,437	3,531	3%
Valley	3,155,397	1,300,854	1,319,475	-1%	464	446	-4%	2,804	2,958	5%
Wheatland	912,591	735,919	735,520	0%	147	142	-3%	5,006	5,180	3%
Totals	24,838,918	12,127,432	12,195,468	n/a	n/a	n/a	n/a	3,885*	4,141	

Note: Total number of owners for region not reported as individual owners may be found in multiple counties.

*Numbers shown are 10-county averages

Source: Author calculations using Montana cadastral data.

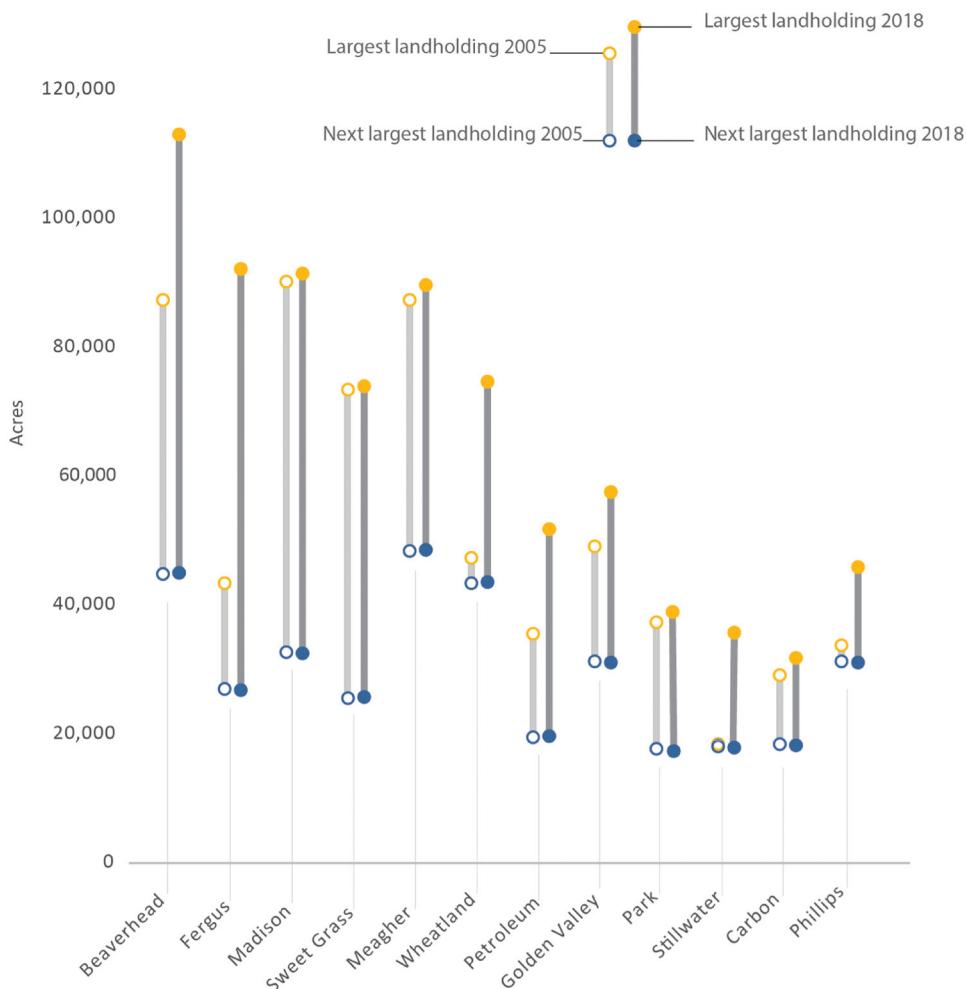


Figure 2. Size gap between two largest landholders, 2005 and 2018, by County.

Concluding Discussion

Both the approach used in this study and its initial findings merit further consideration. In the absence of existing public datasets to document landownership concentration, our approach, which relies both on automation and expert local knowledge, has value as a proof of concept. Scaling this effort up to larger geographic areas and longer time series will require extensive coordination among nodes of regional expertise and will be highly labor intensive. Future research could fruitfully explore the potential for artificial intelligence techniques to overcome these inefficiencies. On the other hand, as long as countries like the US lack a consistent national protocol for tracking landownership, errors and inconsistencies associated with variations in reporting constrain the accuracy of any analysis; data out are only as good as data in. Furthermore, complementary qualitative data and analysis are essential—not only to overcome fundamental data limitations, but also to make sense of the implications of observed patterns.

Indeed, these data suggest that landownership change and concentration are interacting to make vast private estates a defining feature of one of the world's priority conservation landscapes. As such, they add a new twist to the long-standing concern about fragmentation as a dominant pattern in landscapes of high amenity value (Riebsame, Gosnell, and Theobald 1996; Gude et al. 2006; Hansen and Phillips 2018). That new twist is a pattern where individuals can gain profound influence over biodiversity and rural economic futures (Epstein, Haggerty, and Gosnell 2021). Empowered by a legal regime that privileges individual property rights, the owners featured in this study wield considerable power to control not only whether but also how conservation unfolds. Thus, concentration of ownership also accompanies a *concentration of power* amongst an increasingly small and elite few to dictate land use and ultimately conservation futures. This aspect of land concentration has relevance for resource agencies and their managers, who amidst growing recognition of private lands as focal geographies of conservation (Drescher and Brenner 2018), increasingly look toward customized programs to enhance private land habitat and ecosystem service provisioning (Carrigan, Bennet, and Pejchar 2018).

Members of rural societies and advocates for rural landscapes, including members of conservation communities focused on preserving intact habitat in GYE and the NGP, must address challenges and opportunities for livelihoods and communities arising as large landholdings consolidate near-monopoly positions in local land markets. Our brief discussion has highlighted the ways that concentration has the potential to disrupt the logics that inform existing models of conservation and resource management on private lands, such as assumptions about shared values that inform collaboration or access regimes. In this context, land concentration serves as a powerful indicator of rural change and should be used to inform rural land policy and conservation practice. Adaptation, expansion, and refinement of this method constitute future research priorities; we look forward to discussions and collaborations with the readers of this journal about the measurement and analysis of rural land concentration.

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ORCID

Julia H. Haggerty  <http://orcid.org/0000-0003-2073-4063>
Kathleen Epstein  <http://orcid.org/0000-0002-7500-671X>
Hannah Gosnell  <http://orcid.org/0000-0002-2108-945X>

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