

**LETTER**

The dynamics of proclaimed privately protected areas in South Africa over 83 years

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Abstract

Views that protected area (PA) expansion relies predominantly on land purchased by government are increasingly being challenged. The inclusion of privately owned PAs (PPAs) in national conservation strategies is now commonplace, but little is known about their long-term persistence and how it compares to that of state-owned PAs. We undertook the first long-term assessment of the dynamics of a national system of terrestrial PPAs, assessing its growth, as well as its resilience to downgrading, downsizing, and degazettement (PADDD). Between 1926 and 2018, 6.2% of all private nature reserves established in South Africa were degazetted, compared to 2.2% of state-owned nature reserves. Privately owned PA growth exceeded that of state-owned PAs. Trends in PA establishment differed between privately owned and state-owned PAs, reflecting different legislative, political, and economic events. Our findings highlight the value of enabling legislative environments to facilitate PPA establishment, and demonstrate the potential of PPAs as a long-term conservation strategy.

KEYWORDS

PADDD, privately protected areas, protected area dynamics, protected area expansion, protected area resilience, South Africa, voluntary land rights transfer

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1 | INTRODUCTION

The expansion of protected areas (PAs) is considered key to achieving global biodiversity conservation goals (Watson, Dudley, Segan, & Hockings, 2014). In recent years, however, static views of PA targets have been increasingly criticized (Cook, Valkan, Mascia, & McGeoch, 2017), with widespread evidence of PA downgrading, downsizing, and degazettement (PADDD) (Cook et al., 2017; Mascia & Pailler, 2011). PAs are increasingly recognized as dynamic, social-ecological systems that respond to each other, the landscapes in which they exist, and to changes in and demands from society (Cumming & Allen, 2017). This perspective is leading conservation agencies to recognize the need to diversify their land protection strategies. The voluntary relinquishment of private property rights to establish privately owned PAs (PPAs) is one option for achieving expansion goals (Kamal, Grodzińska-Jurczak, & Brown, 2015; Stolton et al., 2014). PPAs contribute hectares to the global conservation estate at minimal public cost (Stolton et al., 2014), diversify PA management models (Clements, Baum, & Cumming, 2016), enhance connectivity of PA networks (Maciejewski, Baum, & Cumming, 2016), and foster sustainable tourism (de Pegas & Castley, 2014). PPAs can also reduce impacts on habitats and populations, and protect biodiversity complementary to state-owned PAs (Clements, Kerley, Cumming, De Vos, & Cook, 2018; Gallo, Pasquini, Reyers, & Cowling, 2009).

For these reasons, conservation organizations are increasingly seeking private land use rights (Kamal et al., 2015). In the United States, extensive research has cast light on the effectiveness (e.g., Rissman et al., 2007) and socio-economic consequences (Horton, Knight, Galvin, Goldstein, & Herrington, 2017) of conservation easements, and the permanence of conservation covenants in Australia has also received recent attention (Hardy, Fitzsimons, Bekessy, & Gordon, 2017). Generally, however, we lack understanding of the permanence of private land rights transfers to the state (Cumming & Allen, 2017). It is thus unclear whether PPAs can be relied upon to conserve biodiversity in perpetuity. Similarly, we still know very little about the influence of governance, conservation policies, and institutional dynamics (e.g., changes in laws relating to tax or land rights) on the initial establishment (Stolton et al., 2014) and subsequent resilience (Cumming & Allen, 2017) of PPAs in different contexts.

One reason for these knowledge gaps is that PPA tenure is far more varied than in state-owned PAs (Kamal et al., 2015). PPAs are defined as PAs under private governance (Stolton et al., 2014); encompassing a diverse set of rights transfer mechanisms (e.g., conservation easements, covenants, and

stewardship agreements; Kamal et al., 2015). Some arrangements are formalized through a legal gazettement process, while others use a legally binding contract between landowners and conservation organizations, or less formal agreements (Kamal et al., 2015; Stolton et al., 2014). While some PPAs are established and managed by formal programs, others rely on independent action by individual landholders (Kamal et al., 2015). The diversity of approaches to establishing PPAs, and the number of individuals and organizations involved, make it difficult to obtain data to analyze temporal patterns in PPA establishment and persistence (Rissman, Owley, L'Roe, Morris, & Wardropper, 2017). Well-recorded conservation agreements (such as covenants and easements) have, in most cases, not been around for more than 30 years, and older PPAs have often not officially been recorded, or have been recorded inconsistently.

South Africa offers a rare exception to the general data scarcity on PPA persistence. Thanks to legislation dating back to the 1940s, private landowners have been able to proclaim their land as legally protected for eight decades, through a process recorded in government gazettes (Cumming & Daniels, 2014). As all PAs are proclaimed in terms of the National Protected Areas Act (2003), regardless of ownership, these PPAs are considered equal in protection status and permanence to state-owned PAs of the same category, and are included in the country's PA estate (Cumming & Daniels, 2014; DEA, 2013; Supporting Information Appendix S1).

We analyzed 115 years of national-level data on terrestrial South African PAs (83 years of which include PPAs), focusing on patterns of establishment and degazettement, to provide a first quantitative comparison of the dynamics of PPAs to those of state-owned PAs. We expected to find (a) significant differences in establishment rates between state-owned PAs and PPAs; and (b) that PPAs would be less resistant to PADDD than state-owned PAs. While state-owned PA establishment is driven by the government's political agenda, as well as conservation planning policies and the availability of funds (Pressey, Visconti, & Ferraro, 2015), PPA establishment should have a more diverse set of drivers, including enabling policies and programs that provide incentives for rights transfers (e.g., financial incentives through tax breaks), philanthropic motives of individuals, and the profitability of a wildlife or nature-based land use relative to alternatives such as agriculture (Selinske, Coetsee, Purnell, & Knight, 2015; Stolton et al., 2014). Since PPAs are less likely to belong to larger networks of PAs owned and/or managed by a single agency (Kamal et al., 2015), they may also be less buffered against environmental and economic turbulence, and therefore more likely than state-owned PAs to be degazetted. South African law enables PAs to be degazetted upon

request by the Minister of Environmental Affairs, the relevant provincial minister, or the other party. For PPAs, the other party is often a single owner or small number of owners; whereas for state-owned PAs, this party is a national or provincial government organization, which is likely to have more stringent processes for making such a decision. Our analysis has important and interesting implications for understanding the role of PPAs in building the resilience of PA estates to PADD more generally.

2 | METHODS

2.1 | Protected area data

South African PAs are gazetted in terms of the National Environmental Management: Protected Areas Act (2003). We included national parks, nature reserves, protected environments, and mountain catchment areas in this study (S1). All types of PAs can exist on private land (Cumming & Daniels, 2014).

We compiled a PA spatial data set, consolidated using ArcGIS 10.5 with Albers Equal Area projection (ESRI, 2017). We obtained data from the 2018 release of the national PA register (PACA, DEA, 2013), and combined it with a data set assembled by De Vos & Cumming (Supporting Information Appendix S1, De Vos & Cumming, in prep.). There were 1,611 PA entries at reserve level, comprising 18,355 parcels. Of these, six reserves and nine portions were without confirmed gazette dates, and were excluded from our analysis. We followed Mascia, Pailler, and Krithivasan (2012) in our definition of “downsizing” and degazette,” but aligned with the South Africa’s National Protected Area Act (2003) in our interpretation of protection level, thus defining a “downgrade” as an event in which a PA has officially been gazetted as a PA type of a lower conservation status.

2.2 | Constructing a timeline of key conservation events

To provide a context for PPA change, we constructed a non-comprehensive timeline of the occurrence of key events, establishment of key organizations, and publishing of key policies and strategic plans of relevance to the establishment of private and state PAs in South Africa. We identified key events from texts that reviewed the history of conservation in South Africa (mainly Carruthers, 1995, 2008; Child, Musengezi, Parent, & Child, 2012), and used websites that summarized environmental policies (e.g., <https://www.ru.ac.za/environment/resources/envirolegislation/>). We searched for conservation ordinances and PA legislation in the government gazettes, accessed through the Sabinet database

(Sabinet Legal, 2019). Key events were debated among authors in a workshop setting for inclusion in the paper.

2.3 | Analyzing dynamics of PAs

We used establishment and degazette dates and spatial boundaries for each PA to plot the number of PAs in South Africa and their spatial extent over time, differentiating between (a) state-owned and privately owned PAs and (b) different PA types (Supporting Information Appendix S1). To detect significant changes in the rates of increase in the number of state PAs and PPAs over time, we used segmented generalized linear models (R package: `segmented`; function: `segmented.glm`) (Muggeo, 2008). Starting with a linear model, we incrementally increased the number of break-points in each segmented model and selected the optimum number of break-points (if any) using Akaike’s Information Criteria (AIC) (Akaike, 1974). If the AIC scores of multiple models differed by less than 2, the model with the lowest number of break-points was selected (Burnham, & Anderson, 2002). We used years at which the best-fit segmented model detected break-points in the relationship between year and number of PAs to identify time periods with unique rates of change in PA number (Supporting Information Appendix S2, 1). The best-fit segmented models for private and state PAs were compared with null (linear) models using likelihood ratio tests, to assess whether break-points significantly increased model fit.

3 | RESULTS

The first state-owned PA to appear in the government gazettes was a nature reserve, established in 1903 (Figure 1a,d). The first state-owned national park was established in 1926 (Figure 1b,e), directly after the promulgation of the National Parks Act (Table 1). By 2017, there were 19 state-owned national parks and 510 state-owned nature reserves (collectively referred to as “state PAs”). The rate of increase in the total number of state-owned PAs was nonlinear between 1903 and 2017, with three significant changes in rate after 1948, 1971, and 1995, respectively (Figure 2; Supporting Information Appendix S2). The rate of increase was highest between 1971 and 1995 (Figure 2; Supporting Information Appendix S2).

The first PPA in South Africa was a contract national park declared in 1935 (Figure 1b,e). It took until 1950 before the first private nature reserve was declared (Figure 1a,d). Mountain catchment areas and protected environments emerged in 1973 and 1985, respectively (Figure 1c,f). By 2017, there was private land in 10 national parks, as well as 888 private nature reserves, 16 mountain catchment areas, and 24 protected environments (collectively referred to as “PPAs”). The rate of increase in the total number of PPAs

TABLE 1 Timeline of key policies and events of relevance to protected area establishment in South Africa

Key policies, organization establishments, and events	Year	Details
National parks act	1926	The National Parks Act created a parastatal authority (now called South African National Parks) to manage national parks at a national level. From its inception, the parastatal was created to self-generate funding to fulfil its mandate through tourism (Biggs et al., 2014) and to consolidate the laws relating to national parks. Private landowners were, at this time, not allowed official protection status (although unofficial private nature reserves, which were gazetted later, did exist).
Provincial game ordinances	1937–1949	The provincial games ordinance allowed for the management of game on private land. Although private nature reserves could not initially be proclaimed under these ordinances, they enabled amendments (which followed in the 1940s and early 1950s), which allowed private land to be gazetted as PAs.
Amendments to provincial game ordinance	1947–1954	Amendments to game ordinances allowed people to form private reserves under certain conditions. At this time, rules and implications for private reserve owners were not clearly articulated.
Arusha conference	1963	At the twilight of colonial Africa, many of the leading conservationists who met at the Arusha conference on the “conservation of nature and natural resources in modern African states” emphasized that a radical new approach was needed to conserve wildlife. Delegates believed this approach should be led by Africans, and that wildlife needed to become an economic asset on private land. Thereafter, several studies were undertaken that highlighted the benefits of wildlife production (as opposed to farming) in semi-arid regions of southern Africa (Child et al., 2012).
Nature conservation ordinances	Act 8 of 196 (Free State) Act 26 of 1965, Act 19 of 1974 (Cape Provinces) Act 15 of 1974 (Natal) Act 12 of 1983 (Transvaal) Ciskei Nature Conservation Act of 1987 Boputhatswana Nature Conservation Act 3 of 1973	From the 1960s/1970s until 2003, private nature reserves were proclaimed in terms of provincial conservation ordinances. Conservation ordinances outlined the rules and rights of land proclaimed as private nature reserves and private wildlife reserves. Today, private nature reserves are still proclaimed at a provincial level, but through the protected areas act of 2003. Provincial biodiversity management acts have replaced the old ordinances.
Mountain catchment areas act	Act 63 of 1970	Provides for the conservation, use, management, and control of land situated in mountain catchment areas.
Game theft act	Act 105 of 1991	Provides certain ownership rights to landowners over wild animals held within adequately enclosed areas.
Democracy	1994	At the end of the apartheid regime, the South African government underwent a major restructuring. International sanctions were lifted, and South Africa re-emerged into the global economy. Its ecotourism sector expanded rapidly to meet increasing global demand (Van Amerom, 2006)
National environmental management act (NEMA)	Act 107 of 1998	NEMA supports co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance, and procedures for co-ordinating environmental functions exercised by organs of state.
National environmental management: protected areas act	Act 57 of 2003	This act provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; and for intergovernmental co-operation and public consultation in matters concerning protected areas.

(Continues)

TABLE 1 (Continued)

Key policies, organization establishments, and events	Year	Details
Biodiversity stewardship program	2003	The biodiversity stewardship program was initiated in one province (Western Cape) as a pilot project, and has since spread to six other provinces. Stewardship programmes are run by provincial conservation authorities with the mandate of entering into biodiversity stewardship agreements with private landowners, strategically targeting land in areas with high biodiversity value (Cadman, 2010). A range of stewardship options exist, from contract agreements to legal gazettement as private nature reserves. Biodiversity stewardship is enabled by the Protected Areas Act and the Biodiversity Act of 2004 (see below), as well as contract law.
National environmental management: biodiversity act	Act 10 of 2004	Provides for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute.
National protected area expansion strategy	2009	The main mechanisms identified for expanding the land-based protected area network were acquisition of land and contract agreements with private and communal landowners, including through biodiversity stewardship programs (Cadman, 2010).
Biodiversity economy strategy	Notice 965 of 2015	To guide the sustainable growth of the wildlife and bioprospecting industries and to provide a basis for addressing constraints to growth, ensuring sustainability, identifying clear stakeholder's responsibilities, and monitoring progress.

between 1926 and 2017 was also nonlinear, with significant changes evident after 1953, 1964, 1969, 1991, 1996, and 2002 (Figure 2; Supporting Information Appendix S2). The rate of increase in the number of PPAs was highest between 1964 and 1969, followed by a decline in the rate of increase until 1991 (Supporting Information Appendix S2). The second highest rate of increase in PPAs occurred from 1996 to 2002.

Private nature reserves had higher rates of degazettement (6.2% and 5.2% of the total number and extent of private nature reserves, respectively) than state-owned nature reserves (2.2% and 0.8% of the total number and extent of state nature reserves, respectively) (Table 2). The majority of private nature reserve degazettements occurred in the 1960s, and from the late 1980s to the early 2000s (Figure 1a). Six private and eight state nature reserves experienced downsizing events (Figures 1a and 3; Table 2).

Only one state-owned national park was degazetted in South Africa, while no degazettements of contract national parks occurred (Figure 1b; Table 2). There were 18 downsizing events in 12 state-owned national parks (3% of the total national park extent), compared to just one downsizing of a contract national park (Figures 2b and 3; Table 2). No downgrading events were recorded. No mountain catchment areas and one protected environment experienced a PADD (degazettement) event (Figure 1c; Table 2).

4 | DISCUSSION

Our analysis documents, for the first time, the remarkable growth in South Africa's privately owned PA estate over time, most notably during the 1960s and 1990s. Growth in PPA numbers far exceeded growth in state-owned PA numbers over the same period. Importantly, these trends illustrate that privately owned and state-owned PAs differed in their patterns of establishment over time, either correlating with different legislation or political events (e.g., the establishment of different acts) or responding differently to the same events (e.g., rates of private and state PA establishment increased and decreased, respectively, after a major political regime shift in 1994). As predicted, PPAs were more likely to be degazetted than state-owned PAs, though state-owned PAs were more susceptible to downsizing. The total number of degazettements in South Africa was relatively low (6.2% of all private nature reserves), mirroring the low breach rate of Australian conservation covenants (Hardy et al., 2017).

Our results offer valuable insights into the development of the country's PPA network and its relationship to the development of the state-owned network, with global implications for conservation. One hypothesis suggested by our results is that having a diversity of PA tenures and types, facilitated by polycentric governance (i.e., multiple interacting levels of PA management and legislation), can strengthen

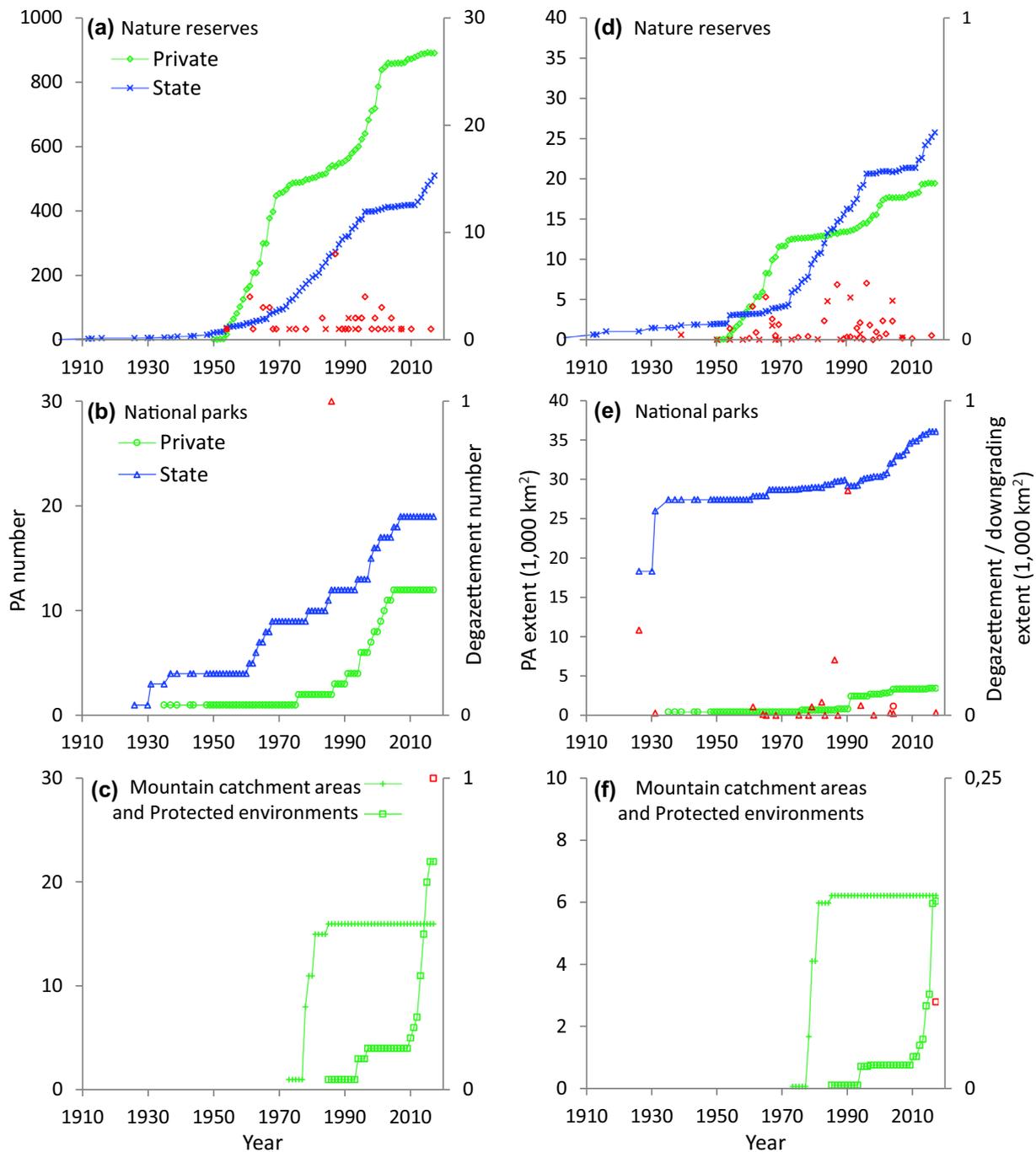


FIGURE 1 The growth in the number (a–c) and extent (d–f) of protected areas (PAs) in South Africa over the last century, differentiating between privately-owned (green lines) and state-owned (blue lines) PAs of the following types: (a, d) nature reserves; (b, e) national parks; and (c, f) protected environments and mountain catchment areas. Red points indicate for each year the number of PA degazettements in each PA and ownership type (a–c), and the spatial extent of PA degazettements and downsizing (d–f)

the ability of the entire network to persist through crises and disturbances that may not uniformly impact all types of PAs. In Zimbabwe, private and community reserves buffer against poor governance (Balint & Mashinya, 2008); and in Australia, a multi-tenure reserve network increases ecological linkages between protected areas (Fitzsimons & Wescott, 2008).

Legislation enacted at different levels of government, in combination with socio-economic trends, appears to have created enabling legal conditions to establish PAs on both state and private land (Figures 1 and 2). The National Parks Act (1926) was significant in affording legitimacy to state-owned conservation areas, but its focus on state-owned areas excluded private land (Carruthers, 1995). Provincial

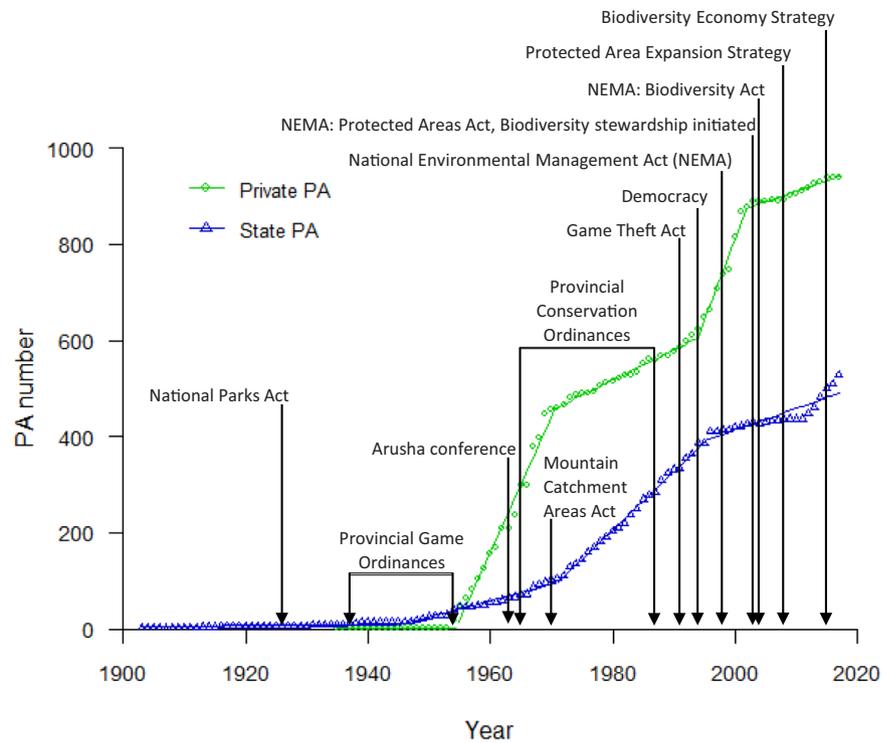


FIGURE 2 Segmented models depicting the rates of increase in the number of private and state-owned protected areas (PAs) in South Africa over the last century, as well as a timeline of key events (see Table 1 for event details)

TABLE 2 Protected area downsizing, degazettement, and downgrading in the South African state-owned and privately owned national parks and nature reserves

	Downsizing	Degazettement	Downgrading
State-owned national parks and nature reserves	Twelve national parks experienced downsizing events on 18 occasions, amounting to a total of 1149.87 km ² (3% of the total national park extent) Eight nature reserves experienced downsizing events on 10 occasions. This amounted to 188.52 km ² , or 0.75% of all nature reserves.	One national park (176.33 km ² , 3% of total national parks area) was degazetted. Eleven nature reserves (0.78 % of all state-owned nature reserves) were degazetted.	No downgrading of status in terms of the protected area act has been reported. However, 10 (half) of national parks had portions change ownership from state-owned to private (communities) following land claims. Four national parks and 61 nature reserves had sections change ownership from the state to private communities.
Contract national parks and Private nature reserves	Contract nature reserves experienced one downsizing event, amounting to 29.36 km ² , or 0.9% of all contract national parks, and 0.03% of the total estate. Six nature reserves lost 170.32 km ² (0.085 % of all private nature reserves) in six private nature reserves on eight occasions.	No contract national parks have been degazetted. Fifty five (55) private nature reserves were degazetted (1051.15 km ² , or 5.23% of all private nature reserves), comprising 0.94% of the total protected area estate.	There was no downgrading of privately owned protected areas.
Protected environments and Mountain catchment areas	No downsizing events occurred.	One protected environment (69.96 km ² , 1% of all PE, and 0.06% of the total conservation estate) was degazetted.	No downgrading events occurred.

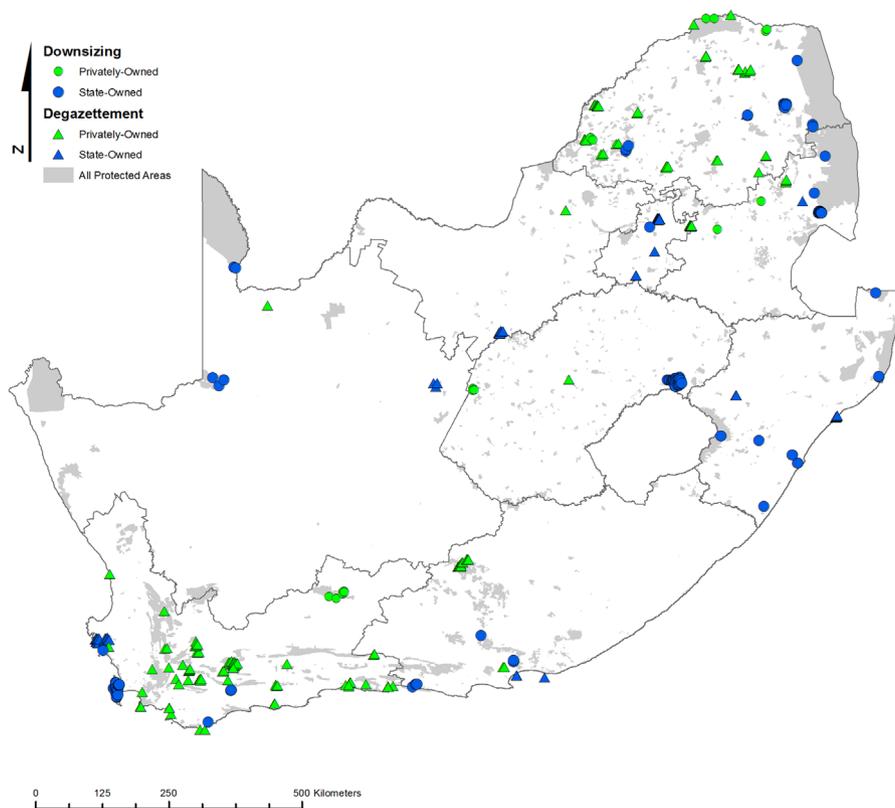


FIGURE 3 The spatial extent of downsizing events (circles) and degazettement (triangles) events in the privately owned (green) and state-owned (blue) conservation estate between 1903 and 2018. The complete PA estate is shown in gray shade

ordinances that allowed for game management and ownership on private land in the late 1930s paved the way for legislation that allowed PPAs to be proclaimed. The subsequent provincial nature conservation ordinances, predominantly enacted in the 1970s, clarified the rules of private land conservation. This clarity and the legitimacy afforded by becoming a PPA were important in motivating landowners to transfer property rights to the state (Carruthers, 2008) and could at least in part be credited for the wave of PPA proliferation that began in the 1960s.

Changes in South Africa's private conservation estate also resulted from changes in broader society, the country's relationship with the international community, and initiatives by other sectors of government, such as agriculture (Table 1). A conference in the 1960s encouraged those calling for conservation efforts in southern Africa to look beyond state-owned land, as well as initiating research that showed the economic value of wildlife-based land uses (Metcalf, 1993). This may have contributed to the increasing PPA trend (Child et al., 2012). The reduced rate of PPA establishment and the high number of PPA degazettements in the 1980s (Figure 1) may have been related to agricultural subsidies that increased incentives to convert land from conservation to agriculture. Conversely, a surge in the establishment of PPAs followed South Africa's post-1994 transition from one-party rule to democracy (Figure 2); the concomitant removal of agricul-

tural subsidies (Carruthers, 2008) and the removal of international sanctions opened the country to a growing international ecotourism market (Child et al., 2012; Van Amerom, 2006). In addition, an increasing number of foreign buyers invested in land for conservation (Van Amerom, 2006).

While the growth of the state-owned PA estate slowed during South Africa's transition to a multi-racial democracy, the PPA estate had the flexibility to expand, as the rules and rights encoded in voluntary land rights transfer to the state still allowed for wildlife-based economic activity. PPAs could respond to opportunities that state-owned areas were not privy to, such as generating wildlife revenues from hunting (Child et al., 2012), as in neighboring Namibia (Lindsey et al., 2013). PPAs might also be more vulnerable to pressures that state-owned areas are buffered against. For example, recent proposals by the South African government to restrict foreign ownership of land, as well as political pressures to redistribute "unused" land, may have a stronger impact on the private conservation estate than the state-owned one.

The interaction between enabling legislation and societal attitudes can also be seen in less obvious ways. As in other parts of the world (Ernst & Wallace 2008; Ryan, Erickson, & De Young, 2003), private landowners in South Africa may regard conservation as a public responsibility, not just an economic opportunity (Carruthers, 2008). Clements et al. (2016), for example, found that protecting nature was rated as an

important goal by 83% of PPA owners and that 8–19% of PPAs (depending on PPA type) did not have a for-profit objective. Conservation motivations spurred private landowners to lobby for changes in legislation related to wildlife management and ownership of wildlife on private land (Carruthers, 2008), including formal gazettement of private conservation land.

Conservation progress cannot be assessed solely on the rates of PA establishment. For example, PPA declaration rates declined after the establishment of dedicated biodiversity stewardship programs in the early 2000s (Figure 2). Driven by commitments made to the Convention on Biological Diversity, these programs were mandated to encourage and facilitate PPA establishment. By systematically identifying private land with high biodiversity value, and actively supporting landowners in establishing and managing their PPAs (Cadman, 2010), they have placed quality over quantity, contributing in a different, plausibly more effective way to conservation. Similarly, the finding that PPAs at a national scale are relatively secure over time is critically important, but should be considered in conjunction with their actual effectiveness in protecting biodiversity. PA persistence does not necessarily imply effective management or resilience to biodiversity loss (Di Minin & Toivonen 2015; Jones et al., 2018), nor ensure effective placement (Joppa & Pfaff 2009) or contributions to landscape connectivity (Fitzsimons & Wescott 2008). Conversely, PADDD events may not always have negative consequences for PA resilience or biodiversity (Kareiva, 2010). A better understanding of the context, drivers, and processes that lead to PADDD events, as well as their social-ecological consequences at different scales, is thus critical to the interpretation of PADDD events, and an important avenue for future research.

Amidst increasing change and uncertainty, the global conservation community needs to constantly reassess the effectiveness of its strategies for conserving biodiversity (Cumming & Allen, 2017). In the longest temporal analysis of dynamics in a country's complete PA estate, this study suggests that the increasing diversification of PA tenure types around the world (Kamal et al., 2015; Stolton et al., 2014) and a stronger engagement of the private sector in conservation are promising strategies for increasing the resilience of global conservation networks.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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