A broader view of stewardship to achieve conservation and sustainability goals in South Africa

AUTHORS:
Jaco Barendse[1,2,3]
Dirk Roux[1,2]
Bianca Currie[1,4]
Natasha Wilson[5]
Christo Fabricius[1]

AFFILIATIONS:
[1]Sustainability Research Unit, Nelson Mandela Metropolitan University, George, South Africa
[2]South African National Parks – Scientific Services, George, South Africa
[3]Marine Stewardship Council – Science and Standards Team, London, United Kingdom
[4]School of Natural Resource Management, Nelson Mandela Metropolitan University, George, South Africa
[5]World Wide Fund for Nature – Land Programme, Cape Town, South Africa

CORRESPONDENCE TO:
Jaco Barendse

EMAIL:
jaco.barendse@gmail.com

POSTAL ADDRESS:
c/o Christo Fabricius, Sustainability Research Unit, Nelson Mandela Metropolitan University, Private Bag X6531, George 6530, South Africa

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Stewardship is a popular term for the principles and actions aimed at improving sustainability and resilience of social-ecological systems at various scales and in different contexts. Participation in stewardship is voluntary, and is based on values of altruism and long-term benefits. At a global scale, 'earth stewardship' is viewed as a successor to earlier natural resource management systems. However, in South Africa, stewardship is narrowly applied to biodiversity conservation agreements on private land. Using a broader definition of stewardship, we identify all potentially related schemes that may contribute to sustainability and conservation outcomes. Stewardship schemes and actors are represented as a social network and placed in a simple typology based on objectives, mechanisms of action and operational scales. The predominant type was biodiversity stewardship programmes. The main actors were environmental non-governmental organisations participating in prominent bioregional landscape partnerships, together acting as important 'bridging organisations' within local stewardship networks. This bridging enables a high degree of collaboration between non-governmental and governmental bodies, especially provincial conservation agencies via mutual projects and conservation objectives. An unintended consequence may be that management accountability is relinquished or neglected by government because of inadequate implementation capacity. Other stewardship types, such as market-based and landscape initiatives, complemented primarily biodiversity ones, as part of national spatial conservation priorities. Not all schemes related to biodiversity, especially those involving common pool resources, markets and supply chains. Despite an apparent narrow biodiversity focus, there is evidence of diversification of scope to include more civic and community-level stewardship activities, in line with the earth stewardship metaphor.

Introduction

Over the past decade, 'stewardship' has become one of the dominant terms used to describe goals, principles and actions that aim to achieve sustainability in natural resource management, contribute to conservation priorities, and curb environmental degradation that threatens societal well-being.[1-3] Stewardship is not a new term[4], nor is it unique to a conservation perspective, e.g. in corporate management[5]. Even within an environmental context, its definition and interpretation varies greatly in its scale and application. At planetary scale, the terms 'ecosystem' and 'earth' stewardship are sometimes used interchangeably (e.g. by Chapin et al.[2,6]) to describe an overarching framework for dealing with social-ecological vulnerability and promoting general actions and systems that would enhance resilience in the light of global environmental change.[6-8]

On the other side of the spectrum, the stewardship tag is also applied in a much more focused manner, e.g. to describe market-linked incentives such as certification schemes for specific commodities such as the Marine Stewardship Council (MSC) for fisheries[9] and Forest Stewardship Council (FSC) for timber[10]. In some countries, stewardship is mostly associated with sustainability in agri-environmental systems (e.g. in the United Kingdom[11]) or with the adoption of better land and catchment management (e.g. 'Landcare' in Australia[12]), while elsewhere it may designate the management of formally protected or wilderness areas[13]. In South Africa today, 'stewardship' in a literal sense is understood to refer mainly to protecting biodiversity on privately owned land, under the banner of so-called Biodiversity Stewardship Programmes (BSPs).[14,15] Although such initiatives were identified over a decade earlier as a strategy to incentivise 'off-reserve' conservation[16], and well before adopting the term stewardship, it is now rarely used in any other context.

The broadscale, global interpretation of stewardship is based primarily on a developed country perspective, in which it is viewed by some as a possible 'successor' to earlier resource management regimes (namely steady-state and ecosystem management approaches – see Chapin et al.[2]). This view is embodied by a set of nine 'stewardship goals'[8] widely accepted as the guidelines for promoting earth stewardship[17]. These goals, grounded in the theory of social-ecological sustainability, include predominantly social aspects, e.g. equitable access to basic needs and opportunities, and sustaining ecosystem services.[3] The goals also include a number of other cross-cutting characteristics: (1) voluntary (as opposed to mandatory) participation[18]; (2) altruistic and moral-ethical connotations, sometimes associated with religion[19,20] that engender a sense of care[21] and shared responsibility, with consideration for the interests of human society, other species, and the natural world[22]; (3) an emphasis on inter-generational rather than short-term benefits[8]; (4) applicability across different spatial scales, i.e. from 'backyard to planet'[23]; and (5) the need for multiple partnerships, collaborations and linkages. Social networks and the stakeholder relationships that they represent are increasingly recognised as important features of natural resource management and conservation approaches.[24,25] Stewardship actions are often visualised as networks of actors with linkages within specific contexts, e.g. in urban ecosystems[26], at multiple scales[27], or across institutional and other divides[28].

Achieving these stewardship goals will require the implementation of practical mechanisms that could be viewed as the 'building blocks' of earth stewardship, preferably with metrics to indicate progress.[8] Such mechanisms could encompass decisions and actions at multiple scales (local, regional and global) based on the familiar principles of 'reduce, reuse and recycle'[29]. Other practical contributions may be the practice of 'civic' or 'urban' ecology: something as simple as planting a tree in the neighbourhood[28] or as complex as incorporating ecological principles into urban designs[30]. In practice, it is sometimes difficult to judge how stewardship differs from other environmental governance or natural resource management systems, or similar concepts like custodianship or trusteeship.[31] For example, co-management[32], like stewardship, is not necessarily driven purely by conservation objectives[33] but also by the need for benefit sharing[34]. In developing countries, stewardship principles are inherent to many community-based management systems[35] based on traditional and indigenous cultural values and beliefs (but for an opposing view see Fennell[36]).

One of the most compelling notions to emerge from proponents of the Earth Stewardship Initiative of the Ecological Society of America is the opportunity for less developed countries to 'leap frog' steps (e.g. steady-state resource management) on a typical Western resource management continuum directly to stewardship (see Figure 1 in Chapin et al.[2]), presumably avoiding the unsustainable practices of the past. How does this perspective relate to advancements in a developing or middle-income country context in which socio-economic disparities (e.g. developmental and income gaps) are far more pronounced and capacity to implement stewardship may be reduced? To assess this question we: (1) identified stewardship or stewardship-like mechanisms and their proponents or implementers in terrestrial, freshwater, and marine social-ecological systems in South Africa; (2) examined the relative influence and relationships between identified organisations or actors as a network; and (3) present the stewardship schemes as a simple typology, based on their objectives and operational scales. We discuss our findings relative to South African conservation and sustainability priorities, and in the wider context of Earth Stewardship Goals.[8] Our results not only provide a broader overview than the more traditional interpretation of stewardship in South Africa, but also allow us to reflect on whether stewardship has indeed emerged as a possible holistic or 'fast-track' option toward achieving conservation and sustainability goals.

Methods

Scoping and information retrieval

We anticipated considerable variation in the literal use of the term 'stewardship' and whether or how it is applied to initiatives that may be considered as stewardship activities. Therefore, during our review process, we did not take a purely systematic approach and adopted the following broad definition of stewardship:

> Any initiative, activity or voluntary involvement by an individual or organisation in the private, non-governmental or governmental sectors (including parastatal agencies), which seeks to contribute to, or promote, natural resource conservation or sustainability goals in social-ecological systems, both terrestrial and aquatic.

Further selection criteria were: (1) voluntary participation, i.e. not legislated (although a legal framework might apply); (2) non-commercial motivation, while acknowledging some operational costs (e.g. auditing costs for an eco-label); and (3) a natural resource or ecosystem management focus (as opposed to industrial processes).

We identified stewardship-related activities or initiatives ('schemes') and the most prominent organisations, individuals and other stakeholders involved in promoting and implementing these – collectively referred to as 'actors'. Importantly, compliance with our definition rather than explicit association with the term 'stewardship' was the main criterion for inclusion into our database, which was populated using both systematic and non-systematic search methods over a period of about 16 months (October 2012 – January 2014). We only considered schemes active within, but not necessarily restricted to, the Republic of South Africa. Actors could be based anywhere.

We did initial scoping through keyword searches on the Internet and in primary scientific indexing services using the terms 'stewardship' and 'Africa'. Next, we expanded our list of actors, schemes and associated terminology by a process of chain-referral (cf. snowball sampling[37]). We contacted or met with the most prominent actors, and asked about their own involvement in stewardship and for referrals to others, allowing us to identify more cryptic actors or schemes. Some referrals included suggestions to attend specific local and international meetings, including the Fynbos Forum (Cape St Francis, South Africa, July 2012), and the Symposium on Science & Stewardship to Protect & Sustain Wilderness Values at the 10th World Wilderness Congress (Salamanca, Spain, October 2013). Finally we conducted a more exhaustive round of searches based on two models of information retrieval: the 'berrypicking' model of Bates[38], and the 'Web moves' behavioural model of Choo[39]. The first is an 'evolving' search approach in which the cognitive response to results by the researcher may lead to on-the-fly modifications to the search process, e.g. by adding additional terms such as 'custodianship' or 'conservancies', or doing searches on a specific organisation, to broaden the sample. The latter model describes a progression of 'moves' whereby the researcher, starting on one website, follows links to other sites with relevant content ('chaining'), scans browsing results for most prominent returns, and differentiates between various results while bookmarking or capturing useful information. It includes an element of 'monitoring' whereby the sites are checked for updates and changes, and 'extraction' whereby a site is systematically searched for pertinent information (including type of scheme and its objectives, scale and mechanism of action).[40] These approaches enabled us to satisfy the objective of capturing the most readily available information on representative examples of stewardship within the region, including websites and primary scientific, academic and grey literature. As a minimum, for an initiative to be included, it had to comply with our definition and criteria, and we recorded additional information needed to identify the type of actor and scheme (detailed below).

Social network visualisation

We classified actors into five broad categories: (1) non-governmental organisations (NGOs), including registered charities or not-for-profit organisations; (2) funds – organisations that provide financing for schemes but do not normally undertake implementation; (3) governmental entities, including national and provincial ministries, departments or agencies; (4) private entities, including profit-driven companies and industry associations; and (5) partnerships – other groupings that do not fit the statutory entities described by (1)–(4), including collaborative networks, associations or programmes. All these actors represented the 'nodes' in our network. We then identified direct linkages ('edges') between pairs of nodes from stated collaborations on web pages and other documents, or implied through co-branding or logos on stewardship schemes, with each link assigned an arbitrary weight of one (i.e. multiple collaborations between the same actors would result in a weight greater than one). It is important to note that deriving linkages in this way did not allow us to assign directionality. We visualised relationships between actors as a social network using the software Gephi 0.8.2 beta[41]. We used the betweenness centrality – the number of times a node rests between two others which themselves are not linked – as a measure of relative prominence in stewardship (calculated with the algorithm of Brandes[42]). Actors with high betweenness centrality are considered important for long-term resource management planning, bringing together disconnected segments of a network.[43]

Typology

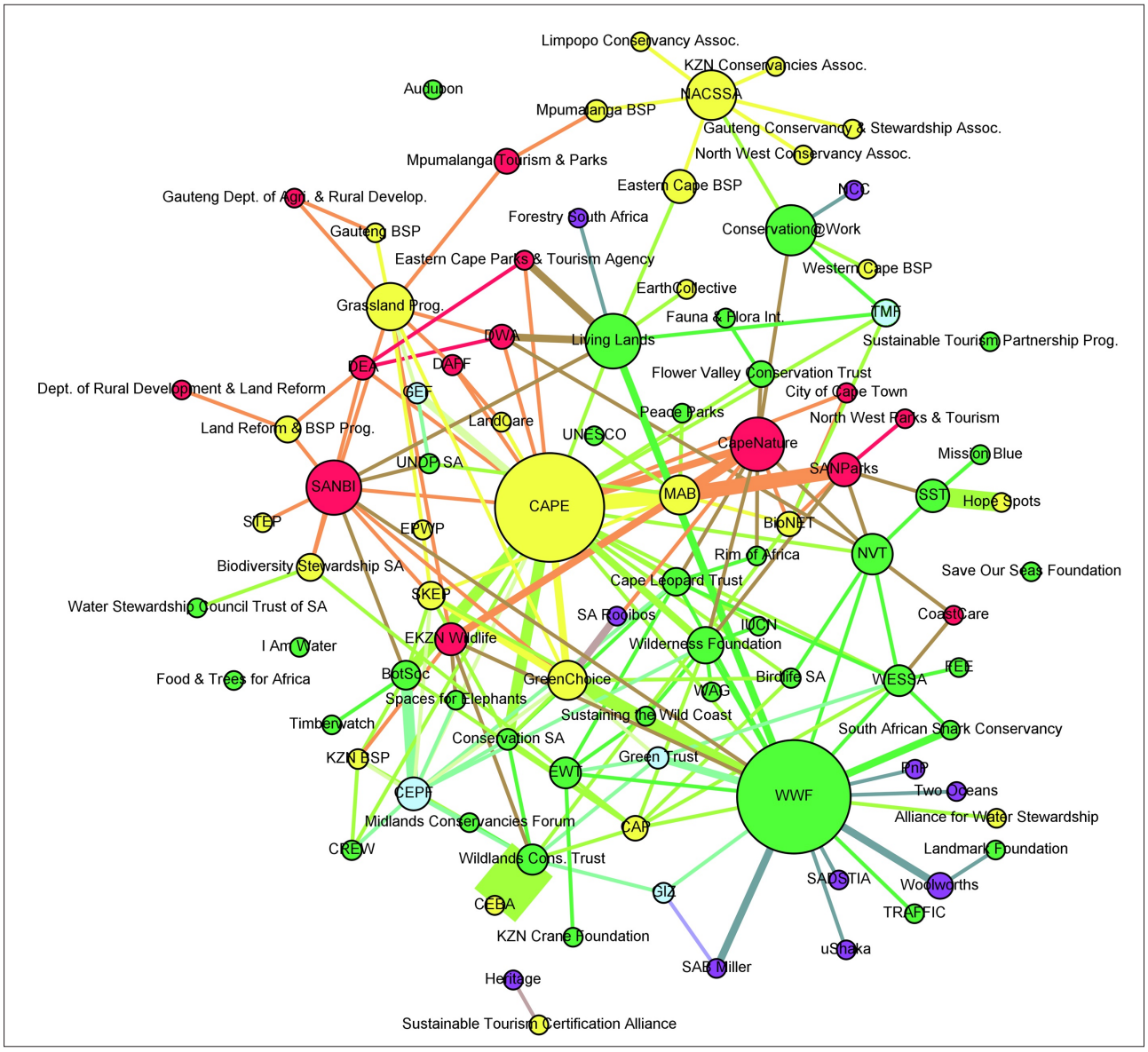
We identified broad types of stewardship schemes compliant with our definition, and based on information available about their objectives (e.g. focus on biodiversity or ecosystem services), mechanism of action (e.g. conservation on private land or market-based incentives), operational scale or footprint (global, national, sub-national or local). Despite some overlap between schemes and a lack of quantitative measures, we

could, during a workshop, agree on several major types, some of which had sub-types; we summarised these types and identified representative examples. Without consistent information available for each scheme, the types were subjectively placed on a conceptual plane based on our perceptions about: (1) the scale of their operational footprint (local to global); (2) their scope (extent of benefit or participation) ranging from individual to society; and (3) their 'tangibility' ranging from schemes that could be achieved through practical implementation to those needing more philosophical or ethical mind-shifts. Where available, we recorded any measurable indicators or documented achievements or challenges associated with specific types of schemes.

Results

Stewardship network and typology

Our final database included 38 NGOs, 14 governmental entities, 10 private entities, 5 funds and 27 partnerships (between any of the recorded actors). These 94 nodes and 180 edges between them formed the basis for the social network visualisation (Figure 1; see also Appendix 1 and the supplementary material). Among these there were seven global NGOs, and three global funds; most other NGOs were national ($n=18$) or sub-national ($n=10$), noting that international NGOs with South African branches were considered 'national', e.g. the World Wide Fund for Nature (WWF-SA) and Conservation South Africa. Partnerships were mostly national ($n=7$) or sub-national ($n=16$) with three examples of global and one local partnership. The network appears well-connected with many linkages but relatively few prominent actors, and some disconnected nodes. Most prominent with the highest betweenness centrality values were NGOs and partnerships that relate to biodiversity and landscape conservation initiatives, notably the Cape Action Plan for People and the Environment (CAPE) – a systematic conservation plan for the Cape Floristic Region, initiated in 1998 with funding from the Global Environmental Facility's Critical Ecosystem Partnership Fund (CEPF) and coordinated by WWF-SA[44]. National (e.g. South African National Biodiversity Institute) and sub-national governmental agencies (e.g. CapeNature) also feature as important bridging nodes.



Note: green = non-governmental oganisations; yellow = partnerships; red = government entities; blue = funds; lilac = private entities

Figure 1: Main actors involved in conservation and sustainability stewardship schemes in South Africa as a social network with 94 nodes and 180 edges (visualised in Gephi 0.8.2 beta). The thickness of links is relative to the number of collaborations and associations between nodes. The nodes are sized on an arbitrary scale (5–50) relative to their betweenness centrality as an indicator of relative prominence or involvement within the network. (See Appendix for full labels and types).

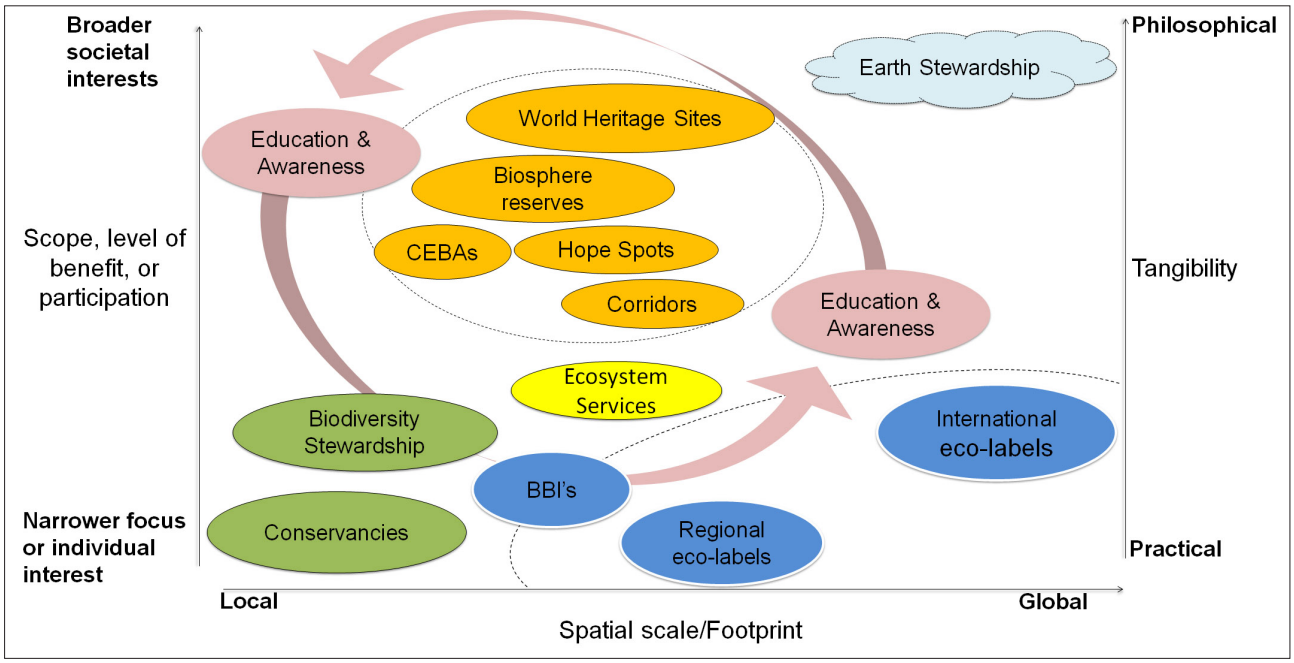
We distinguished six main types of stewardship schemes (defined in Table 1), some with sub-types or some degree of overlap. In terms of scale, 5 schemes were operational at a global scale, 2 at the African continent level, 13 at national, 38 at sub-national (i.e. coverage limited to one or more of South Africa's nine provinces), and 19 at local level (i.e. limited to smaller areas such as a city or catchment). Based on the above we positioned the main stewardship types or sub-types on a conceptual plane (Figure 2) and describe and present examples of each type in more detail below (also see Table 1).

Conservancies

Conservancies represent the oldest form of voluntary conservation on private land in South Africa – the first conservancy was established by a group of farmers in 1978 in the Balgowan District of KwaZulu-Natal (KZN), through encouragement by the former Natal Parks Board (now Ezemvelo KZN Wildlife). Although conservancies are required to be registered with the regional conservation authority, there is no binding agreement between these parties. Conservancies are viewed as the entry-level to more formal stewardship agreements, but are not

Table 1: Definitions of main types of conservation and sustainability stewardship schemes identified in South Africa

Type of scheme	Definition
Conservancies	Registered voluntary associations, established between like-minded landowners, residents, communities and other users, in a specified area with the shared aim of co-operative management of its natural resources in an environmentally sustainable manner, without necessarily changing the land use on the properties.
Biodiversity stewardship programmes	Mechanism to incentivise formal conservation on private lands with high biodiversity conservation value. Different participation levels are available but the ultimate aim is to proclaim such areas as formally protected by national laws.
Land- and seascape initiatives	Initiatives that focus at a land- or seascape level, often determined by unique or specific biophysical or other characteristics or features (e.g. geological or heritage), to promote resilience of protected areas through inclusion of buffer areas, or enhanced connectivity between formally protected areas through multiple mechanisms.
Market-linked schemes	Initiatives that focus on the production, management, or value chain of specific commodities or services and aim to promote sustainability by incentivising consumers to support such schemes, thus harnessing market forces to reward such producers.
Ecosystem services	Initiatives that broadly address issues around maintenance or restoration of ecological infrastructure or ecosystem services through practical or policy interventions.
Education and awareness initiatives	Initiatives aimed at education or raising awareness in specific or multiple sectors of society (e.g. the youth, or consumers and retailers) about particular or broader issues relating to sustainability or conservation, thus encouraging the voluntary adoption of behaviours and attitudes that contribute to such causes.



BBIs, Biodiversity and Business Initiatives; CEBAs, Community Ecosystems Based Adaptation sites of the Wildlands Conservation Trust

Note: Orange shapes (bound by dashed ellipse) are land- and seascape schemes and blue shapes (bound by dashed curve) are market-based schemes; curved arrows from and to education and awareness schemes (pink) indicate cross-cutting functions.

Figure 2: Conceptual representation of selected stewardship types and sub-types identified in South Africa based on their spatial extent and perceived focal scope of benefit, participation and tangibility.

generally recognised as components of BSPs (see below). Participation is often based on shared aims and a sense of identity (e.g. expressed through logos displayed in media forums and individual farm signage), which may enable members to access funds to implement conservation action, if they so choose. Each conservancy is made up of individual landowners, while individual conservancies are organised into provincial associations. Since 2003, provincial associations have unified under the National Association of Conservancies (and Stewardship) South Africa (NACSSA).[45,46] Conservancies are found in all nine South African provinces, with the number of those registered indicated: KZN (126), Free State (152), Western Cape (70), Northern Cape (8), Eastern Cape (34), Gauteng (50), Mpumalanga (39) and Limpopo (17) (Wesson J 2013, written communication, September 4). These conservancies include rural, urban, township and industrial sites (e.g. landfills) covering a total estimated 3 000 000 ha.[45,47] However, not all are registered and specific information such as conservancy names, GPS coordinates and areal extent are not readily available (Young A 2013, written communication, September 3).

Biodiversity stewardship

The conservation of biodiversity using so-called 'stewardship agreements' was conceived at national level by the South African National Biodiversity Institute (SANBI) but is implemented sub-nationally by provincial conservation agencies and NGOs. Biodiversity stewardship is most prominent in the Western Cape where it was piloted as the 'Conservation Stewardship Programme' in late 2002 by CapeNature and the Botanical Society[48] as part of the CAPE strategy[49-51]. The approach was later adopted in other provinces such as KZN.[52] The underlying objective of these BSPs is to improve protection of critical biodiversity and threatened ecosystems occurring on private and communal land as determined by national conservation plans and spatial assessments.[53,54] This protection is to be achieved by encouraging formal conservation agreements between the conservation agency and landowners through financial (e.g. tax relief[55,56]) and in-kind (extension services – habitat and land management advisory) incentives. The programme recognises various levels of participation, namely biodiversity agreements, protected environments and contract nature reserves (as defined in the *Protected Areas Act*[57]) that differ in degree of legal protection status, land-use restriction (on title deeds) and minimum duration of management tenure: 10 years for biodiversity agreements, 30 years for protected environments and 99 years for contract nature reserves[48,51]. By 2010 in the Western Cape there were 33 contract nature reserves (45 261 ha), 17 biodiversity agreements (11 336 ha) and 21 voluntary sites (20 446 ha).[58] By 2013 in KZN there were 9 contract nature reserves (35 953 ha), 1 protected environment (238 ha) and 3 biodiversity agreements (4274 ha), with a further 34 630 ha in the final stage of proclamation in the first two categories, and nearly 175 000 ha under negotiation (Martindale G 2013, written communication, August 29). In other provinces (e.g. Gauteng and Eastern Cape), BSPs are more recent (post-2009) and outcomes are not readily available. As the programme has developed, more local authorities and NGOs have expressed interest in adopting this model.

Land- and seascape initiatives

These schemes share a broad focus at land- (or sea-) scape level, usually determined by unique or exceptional biodiversity, geographical features or other characteristics, sometimes in combination. They aim to improve the protection of an area by raising awareness about the unique features or conservation profiles through special listings or other means of recognition. They vary in spatial scale from sub-national to regional, although some are international initiatives e.g. the United Nations Educational, Scientific, and Cultural Organisation's (UNESCO) Man and the Biosphere (MAB) Programme[59] and World Heritage Sites[60]. Landscape initiatives often correspond closely with national (e.g. CAPE) or international (e.g. IUCN 'Key Biodiversity Areas') bioregional programmes.

Corridors

One of the most diverse sub-types of landscape initiatives involve the concept of corridors. These include corridors that link formally protected areas primarily for conservation of biodiversity and processes (e.g. Gouritz River Initiative[61] and Eden to Addo[62]) to those that would enhance wildlife movement (e.g. for African elephants (*Loxodonta africana*) – the Lubombo Spine Corridor). Increasingly, corridors have evolved beyond biodiversity conservation tools to also include building resilience and adapting to climate change or provision of ecosystem services (e.g. freshwater stewardship or river catchment corridors). For example, the Climate Action Partnership between Conservation South Africa and other NGOs has identified 45 such corridors in KZN and 14 in the Eastern Cape (in collaboration with the Wildlands Conservation Trust). Finally, the corridor concept is also used in the context of eco-tourism routes to promote human–nature experiences (e.g. Segarona Heritage Park Hike between Pilanesberg and Madikwe Game Reserves[63]), to raise awareness about ecosystems and their conservation (e.g. Rim of Africa – a >600 km hiking trail in Western Cape mountains[64,65]) or even to conceptually link miscellaneous important 'heritage sites' at a continent scale, so furthering the notion of earth stewardship (see 'Africa Alive Corridors' concept[66]).

Sites with special features

The sites of many of the corridors (see above) are closely tied to existing biodiversity stewardship sites, protected areas and other landscape-level initiatives such as mega-reserves (e.g. Baviaanskloof). These sites also include MAB reserves of which there are eight, which together cover over 7 million ha: Kogelberg, 103 629 ha; Cape West Coast, 378 240 ha; Kruger to Canyons, 2 474 700 ha; Waterberg, 414 571 ha; Cape Winelands, 322 030 ha; Vhembe, 30 701 ha; Gouritz Cluster, 3 187 892 ha; and Magaliesberg, 357 870 ha in South Africa[59], the oldest being Kogelberg (designated in 1998), and the most recent the Gouritz Cluster and Magaliesberg MAB[65], both proclaimed in 2015. South Africa has eight listed World Heritage Sites under the World Heritage Convention of which four are for cultural features, three for natural features (Cape Floral Region, iSimangaliso Wetland Park and Vredefort Dome), and one mixed natural-cultural (Maloti-Drakensberg)[60]. Notably absent is marine and coastal coverage. However, the concept of International Hope Spots – part of Sylvia Earl's Mission Blue[67] – is being championed by the local NGO, Sustainable Seas Trust[68], with five proposed sites (Algoa Bay, Aliwal Shoal, Cape Whale Coast, Knysna and Plettenberg Bay).

Market-based schemes

These schemes focused on environmental sustainability objectives (we did not consider primarily social ones such as Fair Trade) at the resource production or ecosystem level of a value chain, by trying to influence consumers to reward more sustainable supplies of a product (e.g. seafood) or service (e.g. tourism) through their choices.[69] There were two sub-types: eco-labels and business and biodiversity initiatives.

Eco-labels

Eco-labels rely on a certification standard for a specified commodity or service; its adoption entitles the producer/service provider to use the eco-label mark as a marketing tool. These included leading international third party eco-labels: one MSC certified fishery (South African demersal 'Cape' hake (*Merluccius* spp.) trawl fishery of ca 120 000 t per year, first certified in 2004); 20 forestry management areas certified by the FSC covering >1.48 million ha; and the Blue Flag tourism eco-label for 36 beaches, 4 marinas, and 3 whale-watching boats implemented by the Wildlife and Environment Society of South Africa (WESSA)[70]. There were several national eco-labels addressing specific issues, e.g. badger-friendly honey, predator-friendly meat[71], sustainable golf courses (e.g. one in Audubon Cooperative Sanctuary Program) or tourism accommodation (e.g. Green Leaf). At a continental level, the African Eco-Labelling Mechanism[72] has developed draft standards for the agriculture, fishery and forestry sectors. It is important to note that national or regional eco-labels do not always make use of third-party verification or traceability mechanisms for certified products.

Business and biodiversity initiatives

Business and biodiversity initiatives (BBIs) focus on production systems for specific products by making a 'business case' for biodiversity conser-

vation and sustainable harvesting during production of specific products. It advocates voluntary adoption of better on-farm conservation practices and the setting aside of land for conservation (through BSPs), while the participant can use membership (including on-product information) as a potential marketing advantage. The first BBI was the Biodiversity & Wine Initiative, established in 2004 in the Western Cape winelands through a multi-stakeholder partnership.[73,74] The model is expanding to include other production sectors within the Cape Floristic Region and other bioregions, for example, rooibos (*Aspalathus linearis*) (note also three producers certified by the Rainforest Alliance[75]); 'Biodiversity &…Citrus, Red Meat, Rooibos, Ostrich, and Potato Initiatives; Grasslands Programme Red Meat; and Cape parrot (*Poicephalus robustus*) friendly pecan nuts[76]. In 2010, 280 BBI members had a total footprint of 250 153 ha of natural habitat, mainly in the Western Cape.[77]

Ecosystem services

These schemes focus on restoration of specific ecosystem services. They include primarily government-driven initiatives, but with more or less voluntary adoption (or in lieu of financial payments for ecosystem services[78]) by private landowners, such as the state-funded Expanded Public Works Programme of which the best known is Working for Water (WfW)[79]. Established in 1995 to provide low-skill employment opportunities for poor communities while restoring water run-off by clearing alien invasive plants from catchments[80], WfW treated over 1.3 million condensed hectares[81] between 2002 and 2008, mainly on public land (e.g. in National Parks). The model has been expanded to include Working for Wetlands (e.g. restoration through constructing gabions), Working for the Coast (e.g. coastal clean-ups and resource user monitoring) and Working on Fire (e.g. combating wild fires, or reducing fuel loads through invasive plant removal) programmes.[82]

Other schemes more specific to agricultural production include state initiatives such as the National LandCare Programme[83] which addresses, inter alia, soil management and erosion control on farms. Others are driven by NGO and private/corporate partnerships, like the Sustainable Sugarcane Farm Management System (known as SUSFARMS).[84] Some water stewardship initiatives focus strongly on the link between the supply chain and catchment management, e.g. WWF Water Futures Partnership with SABMiller on hops production[85], or the standards set by the Alliance for Water Stewardship that have now been adopted by South African producers of export stone fruits[86,87].

Education and awareness

These schemes either focus on a specific cause, e.g. sustainable seafood, or incorporate information about multiple causes into a 'basket' of sustainable options aimed at the general public. They also promote more sustainable living among specific sectors, e.g. scholars, through actions such as saving water and energy or recycling. For example, the Southern African Sustainable Seafood Initiative (SASSI) which encourages seafood consumers to consult a 'traffic-light' species list of sustainable seafood choices when buying fish[88,89]; through this market pressure its influence may extend into regulatory or policy areas[90]. Eco-Schools[91] is a sustainable schools programme from the international NGO Foundation for Environmental Education, but implemented in South Africa by WESSA with 1200 registered schools. Often, because education and awareness are ancillary functions to the main objectives of NGOs, such schemes were difficult to isolate, and tend to have a cross-cutting function (represented by the arrow in Figure 2) by linking multiple schemes, e.g. GreenChoice which markets a 'basket' of sustainable options from different schemes (including eco-labels and BBIs) to the general public[92].

Discussion

Our broad overview of stewardship schemes in South Africa is, to our knowledge, the first such at a countrywide scale. Our findings represent a much wider perspective on stewardship than has ever been used in any developing country. We present our findings under broad themes that aim to capture the key features of stewardship in South Africa, while maintaining a global context.

Biodiversity focus and the role of NGOs and partnerships

The strong focus on biodiversity conservation on private land over the past decade is perhaps not surprising, given that much of South Africa's globally recognised biodiversity and threatened environments, especially in the Cape Floristic Region, is located outside of formally protected areas.[54] This focus not only explains the prominence of CAPE (Figure 1), but also why many aspects of BSPs, especially within the CAPE planning domain, have been examined more in-depth: policy and governance frameworks[93,94]; perceptions and motivations for participation[95], e.g. tax incentives[55,56]; the relationship between biodiversity stewardship and social learning[96]; and evaluating the contribution of BSPs to national conservation goals[49]. The CAPE partnership, together with major 'global' NGOs (e.g. WWF-SA), form dominant elements of the stewardship network, in effect combining as a 'bridging organisation'[97]. Such organisations, on the one hand, leverage external resources or 'bridging ties' like international funding (e.g. from the CEPF), while on the other hand, connect and enable diverse local actors to utilise new 'possibilities for action'[98]. Although our data set did not allow an in-depth analysis or understanding of the stewardship network, it suggests that more social network analysis could be valuable in gaining a better understanding of stewardship at specific spatial scales, within specific groups of actors, and the links between international and local conservation priorities and actions.[99] The relative prominence of NGOs with national (e.g. Wildlands Conservation Trust) or sub-national footprints (e.g. Nature's Valley Trust) that act as implementing agencies, or that collaborate with state entities such as provincial conservation agencies on more diverse stewardship approaches, suggests examples of cross-scale and scale-bridging interactions[27].

Following CAPE's success, similar partnerships were started in other bioregions, notably the Succulent Karoo Ecosystem Plan (SKEP)[100] and the Subtropical Thicket Ecosystem Plan (STEP)[101]. After being piloted in the Western Cape and KZN Provinces, the BSP model has been expanded to other provinces, correlating with other globally recognised biodiversity priority areas, e.g. the Maputaland-Pondoland-Albany centre of endemism in the Eastern Cape, and grasslands in Mpumalanga.[102] Furthermore, the BSP sites have determined target areas for implementing market-based and landscape stewardship mechanisms like biosphere reserves (e.g. Kogelberg and West Coast), corridors (e.g. Greater Cederberg Biodiversity Corridor) and BBIs in the Cape Floristic Region (e.g. wine and flowers).

Non-biodiversity goals: Common pool, markets and ecosystem services

In contrast to the above, some stewardship schemes are not necessarily tied to biodiversity and bioregional focus. For example, the establishment of conservancies pre-dates spatial prioritisations. Conservancies are found in all provinces and motivations for their establishment are more diverse, sometimes tending toward self-interest (see below). Another exception to a singular biodiversity focus is stewardship schemes dealing with common pool resources, value chains and markets, or ecosystem services. Marine and coastal ecosystems present classical examples of common pool natural resources[103] held in 'public trust' by the state on behalf of its citizens[104]. Stewardship activities by citizens or interest groups in the marine environment thus present something of a conundrum: they are trying to be co-stewards of something already under government custodianship on their behalf (but see the concept of marine citizenship[105]). In the South African context, stewardship schemes in the marine environment are predominantly market-based or educational (e.g. MSC, Blue Flag and SASSI) with seascape-level schemes such as International Ocean Hope Spots only a recent development – not unexpected when bioregional planning and prioritisation has lagged in the marine environment. Surprisingly, co-management, which is generally considered conducive to sustainable harvesting and resource stewardship[106,107], has struggled to emerge within South Africa's current fisheries management regime[108]. Increasingly, the term 'stewardship' is adopted to describe collaborative governance approaches to manage global commons such as the deep ocean.[109] This trend may reflect growing recognition that, up to now, states have failed to adequately

manage oceans as a global commons by not viewing ocean ecosystems at a planetary scale. This failure may be a result of single species or regional foci, or by ignoring ethics and the interconnectedness of ecosystems and stakeholders.[110]

Stewardship based on value chains, markets or commodities can sometimes be at odds with biodiversity conservation; for example, the FSC, which in South Africa primarily certifies monoculture plantations of exotic (often invasive) tree species like pines and gums, located in biodiverse fynbos and grassland habitats. Ironically, the only exception to this contradiction is the FSC certificate held by South African National Parks for harvesting indigenous hardwoods in the Garden Route National Park. The fact that 'plantations are not forests' is strongly advocated by some lobby groups.[111] Similarly, many conservationists dispute that any bottom trawl fishery should be certified as sustainable.[112] Focus on specific ecosystem services or concepts like biodiversity offsets (or other mitigation measures) within the stewardship discourse is likely to remain uncomfortable, if not controversial, when there is evidence that non-biodiversity objectives are not always compatible with biodiversity ones.[113]

Motivations and mechanisms

Published sources suggest that intrinsic motivations to participate in stewardship include altruism and acting in societal interest.[114] Although environmental consciousness (cf. biophilia[115]) is an assumed prerequisite for private landowners to create conservancies in South Africa, a range of reasons are reported, ranging from nature conservation (primary) and security for domestic and wild animals to securing recreational or tourism opportunities including hunting, or sometimes to oppose development.[116] Some of these reasons may be equally applicable when entering into more formal BSP arrangements, but often it is up to the proponent (e.g. provincial conservation agency and NGOs) to 'sell' the concept to the potential steward. Incentives may include financial ones[55], but also 'extension services': specialist input and management assistance relating to land and biodiversity. The type of landowner (commercial versus lifestyle farmer), land size and opportunity costs can all impact on willingness to participate in conservation.[117] Recent work using the Biodiversity & Wine Initiative as example, suggests that both intrinsic and extrinsic factors are important for farmers to join this BBI, notably their own value systems.[118] The importance of issue 'champions' as a key driver for participation was also emphasised.

International eco-labels are seen to inadvertently encourage global stewardship by empowering mainly northern hemisphere consumers to take personal responsibility for the production of a commodity elsewhere, especially in the developing world.[119] Initially, adoption of both the FSC and MSC in South Africa was motivated by the demands of the export market, rather than local consumer choice.[120,121] Some argue that payment for ecosystem services is inherently easier to leverage from a business perspective than payment for biodiversity[122], hence diversification of stewardship mechanisms to include ecosystem services[78] or value chains. Market-based interventions, together with consumer awareness schemes (e.g. GreenChoice), contribute to making a 'business case' for biodiversity conservation.[76] The notion of a business case often finds resonance and expression in corporate stewardship 'sustainability journeys' of retailers[123], although there are possible weaknesses in using 'journey' as a metaphor for measuring progress in sustainability[124].

Successes, benefits and shortcomings

Although we could not directly measure the efficacy and drawbacks of stewardship schemes from our data, some published results offer indicators of their success. These indicators include participation levels in stewardship schemes, hectares of land in BSPs, or more tangible conservation outcomes, for example, significant reduction in seabird mortality in the hake trawl as a result of MSC certification[125]. Conversely, the withdrawal of Blue Flag status at Margate in KZN because of poor water quality has been equated to a substantial revenue loss.[126] For conservancies, the growing number of voluntary participants, their presence in all provinces, and a national alliance that includes 'community level stewardship' in its vision are all positive trends. There are several recognised benefits to game ranching of consolidated estates, including more profitable (from an eco-tourism perspective) and viable wildlife populations, especially for larger species with bigger ranges.[127]

Another apparent benefit of BSPs is achieving national conservation goals at much lower cost to the state (than land acquisition). While this may be so for provincial agencies, conservation on private land is sometimes viewed as an 'unfunded mandate' by national agencies (e.g. South African National Parks) – in other words, the budgetary and human resource requirements are not commensurate with the area to be managed. Thus, while participating in BSPs is considered 'voluntary', the underlying biodiversity objectives may confound the voluntary nature of participation, as land with 'low' conservation value is not wanted, given the financial and human capacity requirements for extension services and other management costs. There must remain serious concerns regarding the statutory security of conservancies and other forms of biodiversity stewardship. The dependence of conservancies on the personal values of the participant casts doubt on whether they should be included under national conservation targets.[116] For instance, an evaluation in 2010 of 280 BBI members indicated coverage of 250 153 ha of natural habitat; however, since 2006 there has been a loss of 2827 ha to habitat transformation and 892 ha to degradation,[128] bringing some doubt over the sensibility of 'banking' on a volunteer mechanism to achieve national mandates.

Inasmuch as governmental agencies tasked with biodiversity conservation have embraced these new governance arrangements[93] to achieve conservation targets, a single-minded focus on one mechanism may have additional drawbacks. For example, it may inadvertently cause neglect on other land with equally important biodiversity, such as 'escapee' pines invading state-controlled watersheds.[129] The position of the state may even appear 'schizophrenic', especially when the state defaults on its fiduciary duty as public biodiversity custodian.[130] At times, a government's action or inaction may pose a direct threat to biodiversity inside and outside protected areas, e.g. by assigning prospecting rights for shale gas across entire bioregions, or for benthic phosphate mining[131]; by permitting coal mining adjacent to nature reserves (e.g. at Hluhluwe-Imfolozi[132]); or by on-going political support to permit angling in Africa's oldest no-take Marine Protected Area, Tsitsikamma[133,134] (recently gazetted by the Department of Environmental Affairs[135]). In such instances, civic or special interest groups or industries may adopt stewardship as an anti-measure to such threats[136], evoking Section 24 of the South African Constitution – 'a right to a healthy environment and sustainable development and use of natural resources'. Examples of this type of adoption include the South African Deep Sea Trawling Industry Association (SADSTIA) 'forcing' management actions[137] through the possible forfeiture of the MSC certification of the South African hake trawl fishery (as a result of management authority's impasse on collecting annual stock assessment data) in an arena in which political agendas sometimes appear to trump conservation ones[138]; and, most recently, SADSTIA aligning with NGOs to oppose bulk marine sediment mining authorised by the Minister of Mineral Affairs[139]. The breakdown in trust (of citizens in the state) resulting from a government's neglect of its duties as steward can be difficult to restore[104], and can lead to instances of 'extreme' stewardship, e.g. the formation of vigilante groups[140] against the abalone poaching crisis in South Africa[141]. Conversely, disparate views and apparent disasters can result in cooperative learning between diverse stakeholders, thereby improving ecosystem stewardship.[142] In many African countries where the conservation priorities are clear, yet resources and capacities are genuinely lacking, management responsibility may be readily delegated to public–private partnerships driven by international NGOs.[143]

A contrasting scenario is presented by the primarily government driven schemes for ecosystem services restoration. For example, the cost-effectiveness of WfW has been assessed at local and national scales[81,144] and, although many regard it as overwhelmingly positive, there is a sense that its overall performance needs to be improved, inter alia, by better prioritisation of alien invasive species, more targeted actions, and less emphasis on social benefits as a measure of success. Even less successful has been the ability to stimulate stewardship actions among private landowners, i.e. by maintaining cleared areas to prevent re-invasion after initial WfW clearing.

This inability may be because of uncertainty around the extent of state versus private responsibilities, and differential attitudes towards incentives or disincentives to participate.[145] Nonetheless, negligence on private land erodes overall gains made by public programmes[144] emphasising the importance of public–private relations.

Relationship to other management approaches

The stewardship approaches found in South Africa are similar to other conservation and natural resource management strategies elsewhere. For example, conservation easements in the United States of America[146,147] are very similar to biodiversity stewardship agreements in South Africa: the term 'cooperative environmental governance systems' has been used to describe such arrangements[148]. Some believe that stewardship differs from other management systems by its recognition of 'embedded values' and preoccupation with conservation and sustainability.[31] However, these traits are common to community-based natural resource management (CBNRM) – another decentralised approach to achieving environmental, social and economic goals by balancing the exploitation and conservation of valued ecosystem components.[149] In CBNRM, voluntary local civic institutional arrangements are formed to manage natural resources, suggesting that it may be viewed as a form of stewardship[150] or as a mechanism for achieving stewardship of watersheds[151], and wildlife and forests[152,153], and for sustainable rural agriculture[154]. Further, developing social capital, collaborative partnerships and networks have been highlighted as key principles of CBNRM[155], which is echoed in the stewardship metaphor[156]. It is noteworthy that CBNRM predominantly focuses on common pool resources and is often underpinned by cultural and traditional values, e.g. the conservation of sacred landscapes[157], totemic species or culturally important natural features[158].

In practice, different conservation mechanisms are rarely applied in isolation and stewardship schemes may be seen as ancillary to tactics such as land acquisition (e.g. by the Nature Conservancy in the United States of America) that all form part of a modern strategic conservation approach[159] in areas of high biodiversity, as in South Africa[160]. For example, WWF-SA, in addition to facilitating private land stewardship, actively pursues the expansion of existing or establishment of new protected areas through land acquisitions (ca 400 000 ha or 5% of the national terrestrial protected area estate), predominantly financed through land trusts.

Earth stewardship in South Africa?

In retrospect, it is apparent that many of the described stewardship schemes could fit under the banner of 'earth stewardship': operational at multiple scales with diverse stakeholders, and recognising interconnectedness, ethics and indigenous knowledge (for a snapshot of examples see Sayre et al.[161] and papers in that volume). However, the dominance of contractual biodiversity conservation initiatives in the South African stewardship narrative has masked the emergence of a more holistic stewardship strategy as advancement on contemporary resource management approaches (as contemplated by Chapin et al.[2]).

The narrow association of stewardship with systematic biodiversity conservation plans and associated spatial priorities is perhaps not surprising, given that most post-colonial countries still develop within the 'constraints' of governance or management systems inherited from the North – much as 'global assemblages' can impact on poorer nations[162] – in effect inhibiting the emergence of earth stewardship. Furthermore, weaker governance in some developing countries has driven 'decentralised' mechanisms of environmental decision-making and policy implementation at community level.[163]

Our research approach was unlikely to provide adequate resolution to detect the emergence of local-level governance approaches, especially for tacit (e.g. CBNRM and co-management) and local grassroots level (e.g. urban greening initiatives) stewardship forms that were underrepresented in the information sources we consulted, and so more difficult to detect. In fact, the recent broadening of the stewardship narrative in South Africa – firstly by NGOs adopting the term 'earth stewardship'[164] and, secondly, through the fairly rapid diversification away from a strictly biodiversity focus to more holistic models – suggests that a shift is taking place. In countries with a legacy of post-colonial land ownership, this shift may reflect recognition of the need to acknowledge and incorporate local socio-political issues into any stewardship approaches. This new approach is typified by the Community Ecosystems Based Adaptation ('CEBA') sites of the Wildlands Conservation Trust which uses a 'basket of products' approach (including 'Green-preneurship' and restoration), with implementation strategies[165] that mirror many of the earth stewardship principles, while strongly emphasising involvement of local communities. There is thus a clear need to evolve Western-based concepts of stewardship and conservation to include indigenous values[157] or more collaborative management approaches[166].

Finally, while we believe that 'earth stewardship' may be an appropriate metaphoric term to describe the link between primarily conservation-driven schemes with more social and economic ones, it is unlikely to be an implementable 'catch-all' solution in countries with weak or ineffective governance systems (as suggested by Kinzig et al.[167]). Overuse of the term in a global or philosophical sense may eventually dilute its value and practicality in an implementation context. We contend that, to achieve sustainability or conservation outcomes, reliance on a single mechanism – whether voluntary (i.e. 'stewardship') and thus dependent on the social norms, ethics, values or behaviours of individuals, or as determined by government policies (i.e. mandatory or legislated) – is risky. This contention is important, as formalising any voluntary participation into binding agreements may result in issues similar to those faced by extant formal management systems, e.g. lack of capacity or 'non-compliance' by participants, and corruption. In a developing world context the need for complementarity between different management approaches[168] is key to achieving the desired conservation and sustainability outcomes.

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Authors' contributions

The concept was developed by J.B., C.F. and D.R. J.B. collected and analysed the data with inputs from D.R., C.F., B.C. and N.W. J.B. wrote the manuscript with contributions from D.R., C.F., B.C. and N.W.

References

1. Chapin III FS, Kofinas GP, Folke C, Chapin MC. Principles of ecosystem stewardship: Resilience-based natural resource management in a changing world. New York: Springer; 2009. http://dx.doi.org/10.1007/978-0-387-73033-2_15
2. Chapin III FS, Carpenter SR, Kofinas GP, Folke C, Abel N, Clark WC, et al. Ecosystem stewardship: Sustainability strategies for a rapidly changing planet. Trends Ecol Evol. 2010;25(4):241–249. http://dx.doi.org/10.1016/j.tree.2009.10.008
3. Raymond CM, Singh GG, Benessaiah K, Bernhardt JR, Levine J, Nelson H, et al. Ecosystem services and beyond: Using multiple metaphors to understand human–environment relationships. BioScience. 2013;63(7):536–546. http://dx.doi.org/10.1525/bio.2013.63.7.7
4. Odum E. Earth stewardship. Pan Ecology. 1991;6(5):1–5.
5. Hernandez M. Toward an understanding of the psychology of stewardship. Acad Manage Rev. 2012;37(2):172–193. http://dx.doi.org/10.5465/amr.2010.0363

6. Chapin III FS, Pickett SA, Power M, Jackson R, Carter D, Duke C. Earth stewardship: A strategy for social–ecological transformation to reverse planetary degradation. J Environ Stud Sci. 2011;1(1):44–53. http://dx.doi.org/10.1007/s13412-011-0010-7

7. Steffen W, Persson Å, Deutsch L, Zalasiewicz J, Williams M, Richardson K, et al. The Anthropocene: From global change to planetary stewardship. Ambio. 2011;40(7):739–761. http://dx.doi.org/10.1007/s13280-011-0185-x

8. Chapin III FS, Power ME, Pickett STA, Freitag A, Reynolds JA, Jackson RB, et al. Earth stewardship: Science for action to sustain the human–earth system. Ecosphere. 2011;2(8), Art. #89, 20 pages. http://dx.doi.org/10.1890/ES11-00166.1

9. Gulbrandsen LH. The emergence and effectiveness of the Marine Stewardship Council. Mar Policy. 2009;33(4):654–660. http://dx.doi.org/10.1016/j.marpol.2009.01.002

10. Pattberg PH. The Forest Stewardship Council: Risk and potential of private forest governance. J Env Dev. 2005;14(3):356–374. http://dx.doi.org/10.1177/1070496505280062

11. Dobbs TL, Pretty JN. Agri-environmental stewardship schemes and "multifunctionality". Appl Econ Persp Policy. 2004;26(2):220–237. http://dx.doi.org/10.1111/j.1467-9353.2004.00172.x

12. Curtis A, De Lacy T. Landcare, stewardship and sustainable agriculture in Australia. Environ Value. 1998;7(1):59–78. http://dx.doi.org/10.3197/096327198129341474

13. Hobbs RJ, Cole DN, Yung L, Zavaleta ES, Aplet GH, Chapin III FS, et al. Guiding concepts for park and wilderness stewardship in an era of global environmental change. Front Ecol Environ. 2009;8(9):483–490. http://dx.doi.org/10.1890/090089

14. Pence GQK, Botha MA, Turpie JK. Evaluating combinations of on-and off-reserve conservation strategies for the Agulhas Plain, South Africa: A financial perspective. Biol Conserv. 2003;112(1–2):253–273. http://dx.doi.org/10.1016/S0006-3207(02)00413-5

15. Gallo JA, Pasquini L, Reyers B, Cowling RM. The role of private conservation areas in biodiversity representation and target achievement within the Little Karoo region, South Africa. Biol Conserv. 2009;142(2):446–454. http://dx.doi.org/10.1016/j.biocon.2008.10.025

16. Pasquini L, Cowling RM, Twyman C, Wainwright J. Devising appropriate policies and instruments in support of private conservation areas: Lessons learned from the Klein Karoo, South Africa. Conserv Biol. 2010;24(2):470–478. http://dx.doi.org/10.1111/j.1523-1739.2009.01344.x

17. Colón-Rivera RJ, Marshall K, Soto-Santiago FJ, Ortiz-Torres D, Flower CE. Moving forward: Fostering the next generation of earth stewards in the STEM disciplines. Front Ecol Environ. 2013;11(7):383–391. http://dx.doi.org/10.1890/120307

18. Prakash A, Potoski M. Voluntary environmental programs: A comparative perspective. J Policy Anal Manag. 2012;31(1):123–138. http://dx.doi.org/10.1002/pam.20617

19. Hitzhusen GE, Tucker ME. The potential of religion for earth stewardship. Front Ecol Environ. 2013;11(7):368–376. http://dx.doi.org/10.1890/120322

20. Azizan MH, Wahid NA. A proposed model on environmental stewardship. Procedia Soc Behav Sci. 2012;65:587–592. http://dx.doi.org/10.1016/j.sbspro.2012.11.169

21. Nassauer JI. Care and stewardship: From home to planet. Landsc Urban Plan. 2011;100(4):321–323. http://dx.doi.org/10.1016/j.landurbplan.2011.02.022

22. Worrell R, Appleby M. Stewardship of natural resources: Definition, ethical and practical aspects. J Agric Environ Ethics. 2000;12(3):263–277. http://dx.doi.org/10.1023/A:1009534214698

23. Hobbie SE, Baker LA, Fissore C, King JY, McFadden JP, Nelson KC. Planetary stewardship begins at home. Bull Ecol Soc Am. 2011;92(4):389–391. http://dx.doi.org/10.1890/0012-9623-92.4.389

24. Crona B, Hubacek K. The right connections: How do social networks lubricate the machinery of natural resource governance? Ecol Soc. 2010;15(4), Art. #18. Available from: http://www.ecologyandsociety.org/vol15/iss4/art18/

25. Vance-Borland K, Holley J. Conservation stakeholder network mapping, analysis, and weaving. Conserv Lett. 2011;4(4):278–288. http://dx.doi.org/10.1111/j.1755-263X.2011.00176.x

26. Belaire JA, Dribin AK, Johnston DP, Lynch DJ, Minor ES. Mapping stewardship networks in urban ecosystems. Conserv Lett. 2011;4(6):464–473. http://dx.doi.org/10.1111/j.1755-263X.2011.00200.x

27. Guerrero AM, McAllister RRJ, Wilson KA. Achieving cross-scale collaboration for large scale conservation initiatives. Conserv Lett. 2015;8(2):107–117. http://dx.doi.org/10.1111/conl.12112

28. Krasny ME, Tidball KG. Civic ecology: A pathway for earth stewardship in cities. Front Ecol Environ. 2012;10(5):267–273. http://dx.doi.org/10.1890/110230

29. Peachey B. Environmental stewardship – What does it mean? Process Saf Environ. 2008;86(4):227–236. http://dx.doi.org/10.1016/j.psep.2008.02.006

30. Felson AJ, Bradford MA, Terway TM. Promoting earth stewardship through urban design experiments. Front Ecol Environ. 2013;11(7):362–367. http://dx.doi.org/10.1890/130061

31. Lertzman K. The paradigm of management, management systems, and resource stewardship. J Ethnobiol. 2009;29(2):339–358. http://dx.doi.org/10.2993/0278-0771-29.2.339

32. Olsson P, Folke C, Berkes F. Adaptive comanagement for building resilience in social-ecological systems. Environ Manage. 2004;34(1):75–90. http://dx.doi.org/10.1007/s00267-003-0101-7

33. Gray TS, Hatchard J. Environmental stewardship as a new form of fisheries governance. ICES J Mar Sci. 2007;64(4):786–792. http://dx.doi.org/10.1093/icesjms/fsl041

34. Nkhata BA, Mosimane A, Downsborough L, Breen C, Roux DJ. A typology of benefit sharing arrangements for the governance of social-ecological systems in developing countries. Ecol Soc. 2012;17(1), Art. #17. http://dx.doi.org/10.5751/ES-04662-170117

35. Kellert SR, Mehta JN, Ebbin SA, Lichtenfeld LL. Community natural resource management: Promise, rhetoric, and reality. Soc Natur Resour. 2000;13(8):705–715. http://dx.doi.org/10.1080/089419200750035575

36. Fennell DA. Ecotourism and the myth of indigenous stewardship. J Sustain Tour. 2008;16(2):129–149. http://dx.doi.org/10.2167/jost736.0

37. Atkinson R, Flint J. Accessing hidden and hard-to-reach populations: Snowball research strategies. Social Research Update. 2001;28(1):93–108.

38. Bates MJ. The design of browsing and berrypicking techniques for the online search interface. Online Info Rev. 1989;13(5):407–424. http://dx.doi.org/10.1108/eb024320

39. Choo CW, Marton C. Information seeking on the web by women in IT professions. Internet Res. 2003;13(4):267–280. http://dx.doi.org/10.1108/10662240310488951

40. Knight SA, Spink A. Toward a web search information behavior model. In: Spink A, Zimmer M, editors. Web search. Berlin: Springer; 2008. p. 209–334. http://dx.doi.org/10.1007/978-3-540-75829-7_12

41. Bastian M, Heymann S, Jacomy M. Gephi: An open source software for exploring and manipulating networks. In: Proceedings of the Third International ICWSM Conference; 2009 May 17–20; San Jose, CA, USA. Palo Alto, CA: Association for the Advancement of Artificial Intelligence; 2009. Available from: http://aaai.org/ocs/index.php/ICWSM/09/paper/view/154

42. Brandes U. A faster algorithm for betweenness centrality. J Math Soc. 2001;25(2):163–177. http://dx.doi.org/10.1080/0022250X.2001.9990249

43. Bodin Ö, Crona BI. The role of social networks in natural resource governance: What relational patterns make a difference? Glob Environ Chang. 2009;19(3):366–374. http://dx.doi.org/10.1016/j.gloenvcha.2009.05.002

44. Younge A, Fowkes S. The Cape Action Plan for the Environment: Overview of an ecoregional planning process. Biol Conserv. 2003;112(1–2):15–28. http://dx.doi.org/10.1016/S0006-3207(02)00393-2

45. Wesson J. Conservancies – The sustainable alternative. Environment. 2010:22–25.

46. National Association of Conservancies of South Africa (NACSA). Conservancies Handbook. Johannesburg: NACSA; 2003. Available from: http://www.conservancies.org/Downloads/Condensed%20Conservancy%20Handbook.pdf

47. Lindsey JD. Conserving our future. Thola. 2013:24–26.

48. CapeNature. Stewardship operational procedures manual: The wise and sustainable use of the land [document on the Internet]. c2009 [cited 2015 Nov 15]. Available from: http://www.sanbi.org/sites/default/files/documents/documents/stewardship-operational-procedures-manual.pdf.

49. Von Hase A, Rouget M, Cowling RM. Evaluating private land conservation in the Cape lowlands, South Africa. Conserv Biol. 2010;24(5):1182–1189. http://dx.doi.org/10.1111/j.1523-1739.2010.01561.x

50. Lochner P, Weaver A, Gelderblom C, Peart R, Sandwith T, Fowkes S. Aligning the diverse: The development of a biodiversity conservation strategy for the Cape Floristic Region. Biol Conserv. 2003;112(1–2):29–43. http://dx.doi.org/10.1016/S0006-3207(02)00394-4

51. Ashwell A, Sandwith T, Barnett M, Parker A, Wisani F. Fynbos Fynmense: People making biodiversity work. Pretoria: SANBI; 2006.

52. Burns A. Farmers take stewardship of their land. Veld Flora. 2007;93(1):9.

53. Reyers B, Rouget M, Jonas Z, Cowling RM, Driver A, Maze K, et al. Developing products for conservation decision-making: Lessons from a spatial biodiversity assessment for South Africa. Divers Distrib. 2007;13(5):608–619. http://dx.doi.org/10.1111/j.1472-4642.2007.00379.x

54. Rouget M, Richardson DM, Cowling RM. The current configuration of protected areas in the Cape Floristic Region, South Africa – Reservation bias and representation of biodiversity patterns and processes. Biol Conserv. 2003;112(1–2):129–145. http://dx.doi.org/10.1016/S0006-3207(02)00396-8

55. Paterson A. Tax incentives – Valuable tools for biodiversity conservation in South Africa. S Afr Law J. 2005;122:182.

56. Van Wyk E. Tax incentives for biodiversity conservation in the Western Cape. Meditari Account Res. 2010;18(1):58–75. http://dx.doi.org/10.1108/10222529201000005

57. National Environmental Management: Protected Areas Act 57 of 2003, South Africa. Gazette no. 26025, notice no. 181.393.

58. Mortimer G. Cape Action Plan for People and the Environment, CAPE Stewardship Project [document on the Internet]. No date [cited 2015 Nov 25]. Available from: http://www.capeaction.org.za/index.php/resources/effective-protection?view=document&id=61.

59. Pool-Stanvliet R. A history of the UNESCO Man and the Biosphere Programme in South Africa. S Afr J Sci. 2013;109(9/10), Art. #a0035, 6 pages. http://dx.doi.org/10.1590/sajs.2013/a0035

60. United Nations Educational, Scientific and Cultural Organization [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://whc.unesco.org/en/statesparties/za

61. Lombard AT, Cowling RM, Vlok JHJ, Fabricius C. Designing conservation corridors in production landscapes: Assessment methods, implementation issues, and lessons learned. Ecol Soc. 2010;15(3), Art. #7. Available from: http://www.ecologyandsociety.org/vol15/iss3/art7/

62. Markham R. Conserving biodiversity outside protected areas: The Eden to Addo case. Environment. 2013:20–24.

63. Open Africa. Segarona heritage experience [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://www.openafrica.org/experiences/route/103-segarona-heritage-experience

64. Rim of Africa. Cape Mountains and trail initiative [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://www.rimofafrica.co.za/Rim_of_Africa/Welcome.html

65. Gouritz Cluster Biosphere Reserve [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://www.gouritz.com

66. Felix Toteu S, Malcolm Anderson J, De Wit M. 'Africa Alive Corridors': Forging a new future for the people of Africa by the people of Africa. J Afr Earth Sci. 2010;58(4):692–715. http://dx.doi.org/10.1016/j.jafrearsci.2010.08.011

67. Mission Blue Sylvia Earle Alliance. Hope Spots [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://mission-blue.org/hope-spots-new/

68. Sustainable Seas Trust. Hope Spots [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://www.sst.org.za/hope-spots/

69. Blackman A, Rivera J. Producer-level benefits of sustainability certification. Conserv Biol. 2011;25(6):1176–1185. http://dx.doi.org/10.1111/j.1523-1739.2011.01774.x

70. Wildlife and Environment Society of South Africa. Blue Flag [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://blueflag.org.za/index.php/25-welcome-to-blue-flag

71. Landmark Foundation. Fair game – Wildlife friendly products [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://www.landmarkfoundation.org.za/fair-game/

72. Eco Mark Africa [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://www.ecomarkafrica.com/

73. Honig MBH. Towards understanding private conservation in the Cape Winelands of South Africa: Developing a theory of change. Budapest: Central European University; 2012.

74. McEwan C, Bek D. The political economy of alternative trade: Social and environmental certification in the South African wine industry. J Rural Stud. 2009;25(3):255–266. http://dx.doi.org/10.1016/j.jrurstud.2009.03.001

75. Rainforest Alliance. Red bush tea goes green [homepage on the Internet]. No date [cited 2015 Nov 25]. Available from: http://www.rainforest-alliance.org/newsroom/press-releases/rooibos-release

76. Petersen C. The business case for biodiversity and good biodiversity practice in the Republic of South Africa. Pretoria: South African National Biodiversity Institute; 2007. http://dx.doi.org/10.5962/bhl.title.66305

77. Pence GQK. Contribution of C.A.P.E. Business and Biodiversity Initiatives to conservation of critical biodiversity, landscape connectivity and ecological support areas. Cape Town: Conservation South Africa; 2011.

78. Turpie JK, Marais C, Blignaut JN. The Working for Water programme: Evolution of a payments for ecosystem services mechanism that addresses both poverty and ecosystem service delivery in South Africa. Ecol Econ. 2008;65(4):788–798. http://dx.doi.org/10.1016/j.ecolecon.2007.12.024

79. Hobbs RJ. The Working for Water programme in South Africa: The science behind the success. Divers Distrib. 2004;10(5–6):501–503. http://dx.doi.org/10.1111/j.1366-9516.2004.00115.x

80. Woodworth P. Working for Water in South Africa: Saving the world on a single budget? World Policy J. 2006;23(2):31–43.

81. Van Wilgen BW, Forsyth GG, Le Maitre DC, Wannenburgh A, Kotzé JDF, Van den Berg E, et al. An assessment of the effectiveness of a large, national-scale invasive alien plant control strategy in South Africa. Biol Conserv. 2012;148(1):28–38. http://dx.doi.org/10.1016/j.biocon.2011.12.035

82. Department of Environmental Affairs. Projects and programmes [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: https://www.environment.gov.za/projectsprogrammes#workingfor.

83. Department of Agriculture, Forestry and Fisheries. LandCare [homepage on the Internet]. No date [cited 2015 Sep 15]; Available from: http://www.daff.gov.za/daffweb3/Programmes/LandCare

84. Hurly KM. Sustainability for a sugarcane grower in the South African sugar industry –Can SUSFARMS® add value? In: Proceedings of the 19th International Farm Management Congress; 2013 July 21–26; Warsaw, Poland. Warsaw: International Farm Management Association; 2013. Available from: http://ifmaonline.org/proceedings/19th-vol3/

85. South African Breweries. Water stewardship in the hops industry [document on the Internet]. No date [cited 2015 Sep 15]. Available from: https://www.sabmiller.com/docs/default-source/sustainability-documents/water-stewardship-in-the-hops-industry

86. Whitehead K. M&S, Ecolab and General Mills adopt water stewardship standard. Green Futures [magazine on the Internet]. 2014 May 30. Available from: http://www.thefuturescentre.org/articles/1976/ms-ecolab-and-general-mills-adopt-water-stewardship-standard

87. WWF. Water stewardship experience in the Western Cape. Cape Town: WWF-SA; 2014. Available from: http://awsassets.wwf.org.za/downloads/water_stewardship_final.pdf

88. Basson J. Not all seafood is equal. S Afr J Sci. 2011;107(5/6):8–10. http://dx.doi.org/10.4102/sajs.v107i5/6.718

89. Sink KJ, Barendse J, Bürgener M, Nel DC. Driving changes for healthy oceans: Lessons from the Southern African Sustainable Seafood Initiative. Poster presented at: 5th Western Indian Ocean Marine Science Association (WIOMSA) Scientific Symposium; 2007 October 22–26; Durban, South Africa.

90. Barendse J, Francis J. Towards a standard nomenclature for seafood species to promote more sustainable seafood trade in South Africa. Mar Policy. 2015;53:180–187. http://dx.doi.org/10.1016/j.marpol.2014.12.007

91. Wildlife and Environment Society of South Africa. WESSA Eco-Schools [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://wessa.org.za/what-we-do/eco-schools.htm

92. Sherriffs P. Good food foodie. S Afr Food Rev. 2011;38(1):38–39. Available from: http://reference.sabinet.co.za/webx/access/electronic_journals/im_safr/im_safr_v38_n1_a27.pdf

93. Fourie A, Muller K. Innovations in governance for biodiversity conservation: The case of the Conservation Stewardship Programme, Western Cape. Administratio Publica. 2011;19(1):88–103.

94. Pasquini L, Twyman C, Wainwright J. Toward a conceptual framework for blending social and biophysical attributes in conservation planning: A case-study of privately-conserved lands. Environ Manage. 2010;46(5):659–670. http://dx.doi.org/10.1007/s00267-010-9548-5

95. Rossouw AS. Towards developing an understanding of biodiversity stewardship in the city of Cape Town [MEnvDev thesis]. Pietermaritzburg: University of Kwazulu-Natal; 2012.

96. Walker CI. Stewardship as an educational process of social learning and change: Two case studies conducted in the Western Cape [master's thesis]. Grahamstown: Rhodes University; 2011.

97. Crona BI, Parker JN. Learning in support of governance: Theories, methods, and a framework to assess how bridging organizations contribute to adaptive resource governance. Ecol Soc. 2012;17(1), Art. #32. http://dx.doi.org/10.5751/ES-04534-170132

98. Connolly JJ, Svendsen ES, Fisher DR, Campbell LK. Organizing urban ecosystem services through environmental stewardship governance in New York City. Landscape Urban Plan. 2013;109(1):76–84. http://dx.doi.org/10.1016/j.landurbplan.2012.07.001

99. Mills M, Álvarez-Romero JG, Vance-Borland K, Cohen P, Pressey RL, Guerrero AM, et al. Linking regional planning and local action: Towards using social network analysis in systematic conservation planning. Biol Conserv. 2014;169:6–13. http://dx.doi.org/10.1016/j.biocon.2013.10.015

100. Driver A, Maze K. The Succulent Karoo Ecosystem Plan [SKEP]. An introduction to SKEP. Veld Flora. 2002;88(1):12–13.

101. Knight AT, Cowling RM, Boshoff AF, Wilson SL, Pierce SM. Walking in STEP: Lessons for linking spatial prioritisations to implementation strategies. Biol Conserv. 2011;144(1):202–211. http://dx.doi.org/10.1016/j.biocon.2010.08.017

102. Stephens A. Making biodiversity stewardship work. BC Grasslands. 2009:32–34.

103. Ostrom E. The challenge of common-pool resources. Environ Sci Policy Sustain Develop. 2008;50(4):8–21. http://dx.doi.org/10.3200/ENVT.50.4.8-21

104. Turnipseed M, Sagarin R, Barnes P, Blumm MC, Parenteau P, Sand PH. Reinvigorating the public trust doctrine: Expert opinion on the potential of a public trust mandate in U.S. and international environmental law. Environ Sci Policy Sustain Develop. 2010;52(5):6–14. http://dx.doi.org/10.1080/00139157.2010.508666

105. McKinley E, Fletcher S. Improving marine environmental health through marine citizenship: A call for debate. Mar Policy. 2012;36(3):839–843. http://dx.doi.org/10.1016/j.marpol.2011.11.001

106. Gilmour PW, Day RW, Dwyer PD. Using private rights to manage natural resources: Is stewardship linked to ownership? Ecol Soc. 2012;17(3), Art. #1. http://dx.doi.org/10.5751/ES-04770-170301

107. Gutiérrez NL, Valencia SR, Branch TA, Agnew DJ, Baum JK, Bianchi PL, et al. Eco-label conveys reliable information on fish stock health to seafood consumers. PLoS One. 2012;7(8),e43765, 8 pages. http://dx.doi.org/10.1371/journal.pone.0043765

108. Branch GM, Clark BM. Fish stocks and their management: The changing face of fisheries in South Africa. Mar Policy. 2006;30(1):3–17. http://dx.doi.org/10.1016/j.marpol.2005.06.009

109. Mengerink KJ, Van Dover CL, Ardron J, Baker M, Escobar-Briones E, Gjerde K, et al. A call for deep-ocean stewardship. Science. 2014;344(6185):696. http://dx.doi.org/10.1126/science.1251458

110. Von Zharen WM. Ocean ecosystem stewardship. Wm Mary Envtl L Pol Rev. 1998;23(1):109.

111. Timberwatch Coalition [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://www.timberwatch.org.za/old_site/

112. Heupel E, Auster PJ. Eco-labeling seafood: Addressing impacts to vulnerable seafloor species, communities, habitats and ecosystems in data-poor regions. Mar Policy. 2013;38:8–15. http://dx.doi.org/10.1016/j.marpol.2012.05.014

113. Mason NWH, Ausseil A-GE, Dymond JR, Overton JM, Price R, Carswell FE. Will use of non-biodiversity objectives to select areas for ecological restoration always compromise biodiversity gains? Biol Conserv. 2012;155:157–168. http://dx.doi.org/10.1016/j.biocon.2012.05.019

114. Bramston P, Pretty G, Zammit C. Assessing environmental stewardship motivation. Environ Behav. 2010;43(6):776–788. http://dx.doi.org/10.1177/0013916510382875

115. Simaika JP, Samways MJ. Biophilia as a universal ethic for conserving biodiversity. Conserv Biol. 2010;24(3):903–906. http://dx.doi.org/10.1111/j.1523-1739.2010.01485.x

116. Downsborough L, Shackleton CM, Knight AT. The potential for voluntary instruments to achieve conservation planning goals: The case of conservancies in South Africa. Oryx. 2011;45(03):357–364. http://dx.doi.org/10.1017/S0030605310001559

117. Conradie B, Treurnicht M, Esler K, Gaertner M. Conservation begins after breakfast: The relative importance of opportunity cost and identity in shaping private landholder participation in conservation. Biol Conserv. 2013;158:334–341. http://dx.doi.org/10.1016/j.biocon.2012.08.028

118. Honig M, Petersen S, Shearing C, Pintér L, Kotze I. The conditions under which farmers are likely to adapt their behaviour: A case study of private land conservation in the Cape Winelands, South Africa. Land Use Policy. 2015;48:389–400. http://dx.doi.org/10.1016/j.landusepol.2015.06.016

119. Taylor PL. In the market but not of it: Fair Trade coffee and Forest Stewardship Council Certification as market-based social change. World Develop. 2005;33(1):129–147. http://dx.doi.org/10.1016/j.worlddev.2004.07.007

120. Morris M, Dunne N. Driving environmental certification: Its impact on the furniture and timber products value chain in South Africa. Geoforum. 2004;35(2):251–266. http://dx.doi.org/10.1016/j.geoforum.2003.09.006

121. Ponte S. The Marine Stewardship Council (MSC) and the making of a market for 'sustainable fish'. J Agr Change. 2012;12(2–3):300–315. http://dx.doi.org/10.1111/j.1471-0366.2011.00345.x

122. Turpie JK. The existence value of biodiversity in South Africa: How interest, experience, knowledge, income and perceived level of threat influence local willingness to pay. Ecol Econ. 2003;46(2):199–216. http://dx.doi.org/10.1016/S0921-8009(03)00122-8

123. Dos Santos MAO. Minimizing the business impact on the natural environment: A case study of Woolworths South Africa. Eur Bus Rev. 2011;23(4):384–391. http://dx.doi.org/10.1108/09555341111145762

124. Milne MJ, Kearins K, Walton S. Creating adventures in wonderland: The journey metaphor and environmental sustainability. Organization. 2006;13(6):801–839. http://dx.doi.org/10.1177/1350508406068506

125. Maree BA, Wanless RM, Fairweather TP, Sullivan BJ, Yates O. Significant reductions in mortality of threatened seabirds in a South African trawl fishery. Anim Conserv. 2014;17(6):520–529. http://dx.doi.org/10.1111/acv.12126

126. Nahman A, Rigby D. Valuing blue flag status and estuarine water quality in Margate, South Africa. S Afr J Econ. 2008;76(4):721–737. http://dx.doi.org/10.1111/j.1813-6982.2008.00208.x

127. Lindsey PA, Romañach SS, Davies-Mostert HT. The importance of conservancies for enhancing the value of game ranch land for large mammal conservation in southern Africa. J Zool. 2009;277(2):99–105. http://dx.doi.org/10.1111/j.1469-7998.2008.00529.x

128. Pence GQK. Contribution of C.A.P.E. Business and Biodiversity Initiatives to conservation of critical biodiversity, landscape connectivity and ecological support areas: Post-baseline assessment 2010. Cape Town: Conservation South Africa; 2012.

129. Cowling R, Van Wilgen B, Kraaij T, Britton J. How no-man's-land is now everyone's problem. Veld Flora. 2009;95(3):147–149.

130. Van der Schyff E. Stewardship doctrines of public trust: Has the eagle of public trust landed on South African soil? S Afr Law J. 2013;130(2):369–389.

131. Benkenstein A. Seabed mining: Lessons from the Namibian experience [homepage on the Internet]. c2014 [cited 2014 Oct 20]. Available from http://www.saiia.org.za/policy-briefings/seabed-mining-lessons-from-the-namibian-experience/

132. Barbee J, Smith D. Mining poses new threat to world's greatest rhino sanctuary. The Guardian. 2014 July 17; Conservation. Available from: http://www.theguardian.com/environment/2014/jul/17/-sp-mining-threat-south-africa-rhino-sanctuary-poaching

133. Tsitsikamma MPA shock. Fishing Industry News Southern Africa. 2007;8(2):8–10.

134. Gosling M. Mixed feelings over Tsitsikamma fishing. IOL. 2015 December 02; SciTech/Science/Environment. Available from: http://www.iol.co.za/scitech/science/environment/mixed-feelings-over-tsitsikamma-fishing-1954235

135. Department of Environmental Affairs. Government Gazette no. 39423. 2015 November 19. Available from: http://www.gov.za/sites/www.gov.za/files/39423_gon1145.pdf

136. Centre for Environmental Rights [cited 2015 Sep 15]. Available from: http://cer.org.za/

137. Field JG, Attwood CG, Jarre A, Sink K, Atkinson LJ, Petersen S. Cooperation between scientists, NGOs and industry in support of sustainable fisheries: The South African hake *Merluccius* spp. trawl fishery experience. J Fish Biol. 2013;83:1019–1034.

138. Planting S. Slippery business. State of the fishing industry. Financial Mail. 2010 June 18. Available from: http://www.financialmail.co.za/fm/2010/06/17/state-of-the-fishing-industry

139. Safeguard our Seabed Coalition. Bulk marine sediment mining in South Africa's marine environment [document on the Internet]. c2015 [cited 2015 Nov 25]. Available from: http://sadstia.co.za/images/SOSC_Letter_to_Minister_Mineral_Resources_-_30-07-2015.pdf

140. Labuschagne R. Independent group tackle abalone poaching in the Eastern Cape, South Africa [video on the Internet]. c2013 [cited 2015 Nov 25]. Available from: www.youtube.com/watch?v=HxlFVvyuDjs

141. Raemaekers S, Hauck M, Bürgener M, Mackenzie A, Maharaj G, Plagányi ÉE, et al. Review of the causes of the rise of the illegal South African abalone fishery and consequent closure of the rights-based fishery. Ocean Coast Manage. 2011;54(6):433–445. http://dx.doi.org/10.1016/j.ocecoaman.2011.02.001

142. White I, Melville M, Macdonald B, Quirk R, Hawken R, Tunks M, et al. From conflicts to wise practice agreement and national strategy: Cooperative learning and coastal stewardship in estuarine floodplain management, Tweed River, eastern Australia. J Cleaner Product. 2007;15(16):1545–1558. http://dx.doi.org/10.1016/j.jclepro.2006.07.049

143. Hatchwell M. Public–private partnerships as a management option for protected areas. Anim Conserv. 2014;17(1):3–4. http://dx.doi.org/10.1111/acv.12098

144. McConnachie MM, Cowling RM, Van Wilgen BW, McConnachie DA. Evaluating the cost-effectiveness of invasive alien plant clearing: A case study from South Africa. Biol Conserv. 2012;155:128–135. http://dx.doi.org/10.1016/j.biocon.2012.06.006

145. Urgenson LS, Prozesky HE, Esler KJ. Stakeholder perceptions of an ecosystem services approach to clearing invasive alien plants on private land. Ecol Soc. 2013;18(1), Art. #26. http://dx.doi.org/10.5751/ES-05259-180126

146. Rissman AR, Lozier L, Comendant T, Kareiva P, Kiesecker JM, Shaw MR, et al. Conservation easements: Biodiversity protection and private use. Conserv Biol. 2007;21(3):709–718. http://dx.doi.org/10.1111/j.1523-1739.2007.00660.x

147. Newburn D, Reed S, Berck P, Merenlender A. Economics and land-use change in prioritizing private land conservation. Conserv Biol. 2005;19(5):1411–1420. http://dx.doi.org/10.1111/j.1523-1739.2005.00199.x

148. Müller JJ. Assessing cooperative environmental governance systems: The cases of the Kogelberg Biosphere Reserve and the Olifants-Doorn Catchment Management Agency. Politeia. 2008;27(1):86–104.

149. Armitage D. Adaptive capacity and community-based natural resource management. Environ Manage. 2005;35(6):703–715. http://dx.doi.org/10.1007/s00267-004-0076-z

150. Breen CM, editor. Community based natural resource management in southern Africa: An introduction. Bloomington, IN: AuthorHouse; 2013.

151. Hibbard M, Lurie S. Creating socio-economic measures for community-based natural resource management: A case from watershed stewardship organisations. J Environ Plan Manage. 2011;55(4):525–544. http://dx.doi.org/10.1080/09640568.2011.614093

152. Ayoo C. Community-based natural resource management in Kenya. Manag Environ Qual. 2007;18(5):531–541. http://dx.doi.org/10.1108/14777830710778292

153. Musumali MM, Larsen TS, Kaltenborn BP. An impasse in community based natural resource management implementation: The case of Zambia and Botswana. Oryx. 2007;41(3):306–313.

154. Agriculture Investment Sourcebook. Washington DC: World Bank; 2005.

155. Gruber JS. Perspectives of effective and sustainable community-based natural resource management: An application of Q Methodology to forest projects. Conserv Soc. 2011;9(2):159–171. http://dx.doi.org/10.4103/0972-4923.83725

156. Svendsen E, Campbell LK. Urban ecological stewardship: Understanding the structure, function and network of community-based urban land management. Cities & The Environment. 2008;1(1):4.

157. Cocks ML, Dold T, Vetter S. 'God is my forest': Xhosa cultural values provide untapped opportunities for conservation. S Afr J Sci. 2012;108(5–6):52–59. http://dx.doi.org/10.4102/sajs.v108i5/6.880

158. Bernard PS, Kumalo S. Community-based natural resource management, traditional governance and spiritual ecology in southern Africa: The case of chiefs, diviners and spirit mediums. In: Fabricius C, Koch E, Magome H, Turner S, editors. Rights, resources and rural development: Community-based natural resource management in southern Africa. London: Earthscan; 2004. p. 115–126.

159. Groves CR, Jensen DB, Valutis LL, Redford KH, Shaffer ML, Scott JM, et al. Planning for biodiversity conservation: Putting conservation science into practice. BioScience. 2002;52(6):499–512. http://dx.doi.org/10.1641/0006-3568(2002)052[0499:PFBCPC]2.0.CO;2

160. Heydenrych BJ, Cowling RM, Lombard AT. Strategic conservation interventions in a region of high biodiversity and high vulnerability: A case study from the Agulhas Plain at the southern tip of Africa. Oryx. 1999;33(3):256–269. http://dx.doi.org/10.1017/S003060530003060X

161. Sayre NF, Kelty R, Simmons M, Clayton S, Kassam K-A, Pickett STA, et al. Invitation to earth stewardship. Front Ecol Environ. 2013;11(7):339. http://dx.doi.org/10.1890/1540-9295-11.7.339

162. Ogden L, Heynen N, Oslender U, West P, Kassam K-A, Robbins P. Global assemblages, resilience, and earth stewardship in the Anthropocene. Front Ecol Environ. 2013;11(7):341–347. http://dx.doi.org/10.1890/120327

163. Agrawal A, Ostrom E. Collective action, property rights, and decentralization in resource use in India and Nepal. Polit Soc. 2001;29(4):485–514. http://dx.doi.org/10.1177/0032329201029004002

164. Galliers C, Barnes G. Earth stewardship: A new approach to the protection of South Africa's natural capital. Environment. 2013:62–64.

165. Wildlands Conservation Trust [homepage on the Internet]. No date [cited 2015 Sep 15]. Available from: http://www.wildlands.co.za

166. Hoole A, Berkes F. Breaking down fences: Recoupling social–ecological systems for biodiversity conservation in Namibia. Geoforum. 2010;41(2):304–317. http://dx.doi.org/10.1016/j.geoforum.2009.10.009

167. Kinzig AP, Ehrlich PR, Alston LJ, Arrow K, Barrett S, Buchman TG, et al. Social norms and global environmental challenges: The complex interaction of behaviors, values, and policy. BioScience. 2013;63(3):164–175. http://dx.doi.org/10.1525/bio.2013.63.3.5

168. Leménager T, King D, Elliott J, Gibbons H, King A. Greater than the sum of their parts: Exploring the environmental complementarity of state, private and community protected areas. Global Ecol Conserv. 2014;2(0):238–247. http://dx.doi.org/10.1016/j.gecco.2014.09.009

Appendix: Types of stewardship nodes and their labels shown in Figure 1

Node label	Full name	Type
Alliance for Water Stewardship	Alliance for Water Stewardship	Partnership
Audubon	Audubon International	Non-governmental organisation (NGO)
Biodiversity Stewardship SA	Biodiversity Stewardship South Africa	Partnership
BioNET	BioNET	Partnership
Birdlife SA	Birdlife South Africa	NGO
BotSoc	Botanical Society of South Africa	NGO
CAPE	Cape Action Plan for People and the Environment	Partnership
CAP	Climate Action Partnership	Partnership
Cape Leopard Trust	Cape Leopard Trust	NGO
CapeNature	CapeNature	Government
CEBA	Community Ecosystems Based Adaptation	Partnership
CEPF	Critical Ecosystem Partnership Fund	Fund
City of Cape Town	City of Cape Town	Government
CoastCare	CoastCare	Government
Conservation@Work	Conservation at Work	NGO
Conservation SA	Conservation South Africa	NGO
CREW	Custodians of Rare and Endangered Wildflowers	NGO
DAFF	Department of Agriculture, Forestry & Fisheries	Government
DWA	Department of Water Affairs	Government
DEA	Department of Environmental Affairs	Government
Dept. of Rural Development & Land Reform	Department of Rural Development and Land Reform	Government
EarthCollective	EarthCollective	Partnership
Eastern Cape BSP	Eastern Cape Biodiversity Stewardship Programme	Partnership
Eastern Cape Parks & Tourism Agency	Eastern Cape Parks and Tourism Agency	Government
EKZN Wildlife	Ezemvelo KwaZulu-Natal Wildlife	Government
EWT	Endangered Wildlife Trust	NGO
EPWP	Expanded Public Works Programme	Partnership
Fauna & Flora Int.	Fauna and Flora International	NGO
FEE	Foundation for Environmental Education	NGO
Flower Valley Conservation Trust	Flower Valley Conservation Trust	NGO
Food & Trees for Africa	Food and Trees for Africa	NGO
Forestry South Africa	Forestry South Africa	Private
Gauteng BSP	Gauteng Biodiversity Stewardship Programme	Partnership
Gauteng Conservancy & Stewardship Assoc.	Gauteng Conservancy and Stewardship Association	Partnership
Gauteng Dept. of Agri. & Rural Develop.	Gauteng Department of Agriculture and Rural Development	Government
GEF	Global Environmental Facility	Fund
GIZ	Deutsche Gesellschaft for Internationale Zusammenarbeit	Fund
Grassland Prog.	Grassland Programme	Partnership
Green Trust	Green Trust	Fund

Node label	Full name	Type
GreenChoice	GreenChoice Alliance	Partnership
Heritage	Heritage Environmental Management Company	Private
Hope Spots	International Hope Spots	Partnership
I Am Water	I Am Water Ocean Conservation Trust	NGO
IUCN	World Conservation Union	NGO
KZN BSP	KZN Biodiversity Stewardship Programme	Partnership
KZN Conservancies Assoc.	KwaZulu-Natal Conservancies Association	Partnership
KZN Crane Foundation	KwaZulu-Natal Crane Foundation	NGO
Land Reform & BSP Prog.	Land Reform and Biodiversity Stewardship Programme	Partnership
LandCare	National LandCare Programme	Partnership
Landmark Foundation	Landmark Foundation	NGO
Limpopo Conservancy Assoc.	Limpopo Conservancy Association	Partnership
Living Lands	Living Lands	NGO
MAB	Man and the Biosphere Programme	Partnership
Midlands Conservancies Forum	Midlands Conservancies Forum	NGO
Mission Blue	Mission Blue	NGO
Mpumalanga BSP	Mpumalanga Biodiversity Stewardship	Partnership
Mpumalanga Tourism & Parks	Mpumalanga Tourism and Parks Agency	Government
NACSSA	National Association of Conservancies/Stewardship South Africa	Partnership
NCC	Nature Conservation Corporation	Private
North West Conservancy Assoc.	North West Conservancy Association	Partnership
North West Parks & Tourism	North West Parks and Tourism	Government
NVT	Nature's Valley Trust	NGO
Peace Parks	Peace Parks Foundation	NGO
PnP	Pick n Pay	Private
Rim of Africa	Rim of Africa Initiative	NGO
SA Rooibos	SA Rooibos Council	Private
SAB Miller	SAB Miller	Private
SADSTIA	SA Deep Sea Trawling Industry Association	Private
SANParks	South African National Parks	Government
Save Our Seas Foundation	Save Our Seas Foundation	NGO
SKEP	Succulent Karoo Ecosystem Plan	Partnership
SANBI	South African National Biodiversity Institute	Government
South African Shark Conservancy	South African Shark Conservancy	NGO
Spaces for Elephants	Spaces for Elephants Foundation	NGO
SST	Sustainable Seas Trust	NGO
STEP	Succulent Thicket Ecosystem Plan	Partnership
Sustainable Tourism Certification Alliance	Sustainable Tourism Certification Alliance	Partnership
Sustainable Tourism Partnership Prog.	Sustainable Tourism Partnership Programme	NGO
Sustaining the Wild Coast	Sustaining the Wild Coast	NGO

Node label	Full name	Type
Timberwatch	Timberwatch	NGO
TMF	Table Mountain Fund	Fund
TRAFFIC	TRAFFIC East/Southern Africa	NGO
Two Oceans	Two Oceans Aquarium	Private
UNDP SA	United Nations Development Program South Africa	NGO
UNESCO	United Nations Educational, Scientific and Cultural Organisation	NGO
uShaka	uShaka Marine World	Private
WAG	Wilderness Action Group	NGO
Water Stewardship Council Trust of SA	Water Stewardship Council Trust of South Africa	NGO
WESSA	Wildlife and Environment Society of South Africa	NGO
Western Cape BSP	Western Cape Biodiversity Stewardship Programme	Partnership
Wilderness Foundation	Wilderness Foundation	NGO
Wildlands Cons. Trust	Wildlands Conservation Trust	NGO
Woolworths	Woolworths	Private
WWF	World Wide Fund for Nature (South Africa)	NGO

Note: This articles includes supplementary material.