

**How do social and personal identity, sense of place,  
connectedness to nature and environmental  
understanding influence the implementation of  
collective, large-scale biodiversity stewardship  
initiatives in South Africa?**

A thesis submitted in fulfilment of the requirements for the degree of

Master of Science

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**Abstract**

Biodiversity stewardship is a mechanism that is used to conserve high value biodiversity assets. Biodiversity stewardship programmes focus on areas that are under immediate threat from development or under medium to long term threat from degradation or transformation that will result in habitat loss. Biodiversity stewardship provides a solution to the resource crisis being faced by many state and provincial conservation agencies, NGO's (Non-Governmental Organisations) and PBO's (Public Benefit Organisations) in that it facilitates the declaration, and the subsequent improved conservation management, of private or communally owned land whilst still retaining the existing tenure.

The rate of habitat loss can often be slowed, or even reversed, by proactively securing these areas and facilitating management decision-making with a focus on biodiversity outcomes without the capital investment required by the State to purchase the land. In return for conservation management actions, certain land-use restrictions and the associated opportunity costs, the State offers a suite of incentives and benefits that are, where possible, tailored to meet the needs of the landowner. Particular regions of South Africa lend themselves well to the development of biodiversity stewardship initiatives which are designed to secure ecological processes and ecosystems across a landscape or an ecological feature at scales of tens of thousands of hectares.

When developing landscape level biodiversity stewardship initiatives, negotiations tend to be focussed on groups of landowners. This requires collaboration and the collective alignment of natural resource management decision-making and conservation actions amongst neighbours. Gaining a better understanding of how the social constructs of ecological understanding, place attachment, connectedness to nature, occupational

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*How do social and personal identity, sense of place, connectedness to nature and environmental understanding influence the implementation of collective, large-scale biodiversity stewardship initiatives in South Africa?*

identity and social and personal identity influence decision-making, behaviour and group structure is a critically important factor when developing a tool to predict the likelihood of landowners to collectively commit to long-term, legally binding biodiversity stewardship programmes.

The overarching hypothesis was that the social constructs listed above influence group dynamics within the context of collective pro-conservation behaviour. Social dynamics associated with large-scale biodiversity stewardship initiatives become complex when multiple landowners are involved. Could social cohesion and group culture be influenced by aspects of identity and do these in turn develop into barriers or motivators to coordinated and sustained conservation efforts? Further influences on the successful implementation of landscape scale biodiversity stewardship initiatives could include ecological understanding, connectedness to nature and place attachment.

Structured interviews were held with the landowners engaged in two separate large-scale biodiversity stewardship sites, the Compassberg Protected Environment and the Baviaanskloof Hartland, in the Eastern Cape Province of South Africa. The interviews were followed up with surveys containing psychometric scales related to the influence of ecological understanding, place attachment, connectedness to nature and aspects of identity on commitment to collective long-term, large-scale biodiversity stewardship initiatives.

The results from a set of non-parametric (exact) Wilcoxon rank-sum tests showed that scores on the new ecological paradigm scale and the place attachment scale latent variables were significantly different at the two study sites, at the 10% level of significance.

Demographic differences between the two study sites influenced group dynamics, collective decision-making and commitment. The relationship between the latent variables (the five psychometric scales measured) and the ancillary variables (the demographic data describing the respondents) cannot be considered conclusive; however they do provide relatively useful insights into the development of a scale or tool to measure conservation opportunity.

The thesis concludes with a proposed conservation opportunity assessment tool that can be utilised alongside the existing, well refined, conservation priority assessment tools to assist in decision-making when planning large, landscape scale biodiversity stewardship initiatives in South Africa.

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## Abbreviations

AIQ	Aspects of Identity Questionnaire
AIQ – IV	Aspects of Identity Questionnaire, fourth iteration
AIS	Aspects of Identity Scale
BNR	Baviaanskloof Nature Reserve
BSP	Biodiversity Stewardship Programme
CBNRM	Community Based Natural Resource Management
CEO	Chief Executive Officer
CEPF	Critical Ecosystem Partnership Fund
CFR	Cape Floral Kingdom
CFRWHS	Cape Floristic Region World Heritage Site
CnO	Conservation Opportunity
CNS	Connectedness to Nature Scale
COV	Conservation Opportunity Value
COVS	Conservation Opportunity Value Scale
CPE	Compassberg Protected Environment
CEPELA	Compassberg Protected Environment Landowners Association
CPF	Community Policing Forum
CREW	Custodians of Rare and Endangered Wildlife
DEA	Department of Environmental Affairs
ECPAES	Eastern Cape Protected Area Expansion Strategy
ECPTA	Eastern Cape Parks & Tourism Agency
EKZNW	Ezemvelo KwaZulu Natal Wildlife
FSz	Farm Size
GEF 5	Global Environment Facility, fifth round
HEP	Human Exemptionalism Paradigm
masl	Meters above sea level
MEC	Member of the Executive Council
MoT	Mother Tongue
MPAH	Maputoland-Pondoland-Albany Hotspot
NBA	National Biodiversity Assessment
NEM: BA	National Environmental Management: Biodiversity Act
NEM: PAA	National Environmental Management: Protected Areas Act
NEP	New ecological paradigm
NFEPA	National Freshwater Ecosystem Priority Area
NGO's	Non-Governmental Organisations
NPAES	National Protected Area Expansion Strategy
NRM	Natural Resource Management
OIS	Occupational Identity Scale
PA	Protected Area
PAMA	Protected Area Management Agreement
PAS	Place Attachment Scale
PBO's	Public Benefit Organisations

PE	Protected Environment
PFMA	Public Finance Management Act
PtS	Planning to sell within five years
SANBI	South African National Biodiversity Institute
SES's	Social-Ecological Systems
RoD	Record of Decision
SMP	Strategic Management Plan
USA	United States of America
VBN	Value Belief Norm
YrF	Years Farming
YrO	Years of Farm Ownership

## **Chapter One**

### **Introduction**



**Figure 1: Eastern reaches of the Baviaanskloof Valley (photo credit: Tracey Potts 2010)**

## 1.1 Introduction to the problem

### *The impacts of global climate change on agriculture*

South Africa's current network of protected areas is inadequate to effectively combat the predicted impacts of anthropogenic climate change on biodiversity (NBSAP, 2005).

Exploding human populations and an ever increasing demand for resources are resulting in accelerated climate change (Bellassen & Gitz, 2008). One of the many predicted impacts of global climate change is variations in agricultural productivity and food security (Wheeler & von Braun, 2013) with the most severe impacts being likely in developing countries (Rosenzweig et al., 2014). The twin problems of an increasing need for resources and unpredictable agricultural production are resulting in habitat transformation and ecosystem degradation which is putting unprecedented pressure on biodiversity (Staudinger et al., 2012).

South Africa, as a developing nation, has a very high dependence on land and natural resources, with over 85% of the land area being utilised for agriculture (Mills et al., 2003). South Africans rely on the agricultural sector for jobs and food security, with more than 19 million people living on farms (World Bank 2012). Predicted climate change impacts threaten to reduce the agricultural productivity of South Africa which would in turn impact the welfare of thousands of people (Mills et al., 2005). The Eastern Cape is the poorest province in South Africa with over 90 per cent of the population relying on land and natural resources either directly or indirectly for their livelihoods (Palmer et al., 2004). When the predicted climate change threats affect the Eastern Cape, natural grazing and browsing as well as crop farming will be significantly impaired (Palmer et al., 2004).

Ecosystem function is important for both the persistence of species and the environmental goods and services that ecosystems provide (Mace, Norris, & Fitter, 2012). Healthy natural ecosystems provide agricultural benefits to farmers, such as pollination and pest control services. By continuing to degrade ecosystems through unsustainable agricultural practices, landowners and land users become trapped in a vicious cycle of needing to intensify or increase their extractive practices in order to

maintain productivity which ultimately leads to a decline in the state of the ecological infrastructure (Altieri, 1999). Ecosystem health, function and resilience are therefore integral to food security. The South African government spending priorities are focused on addressing the injustices of the past as well as ensuring an equitable future for generations to come through nine strategic areas for growth and development, of which “revitalising agriculture” is listed second (Nene, 2015). Thus, one of the corner stones upon which a revitalised agricultural sector should be built is maintaining, or restoring where needed, healthy ecosystem function.

#### *Off-reserve conservation*

Land is an emotive topic and debate around issues such as nationalisation or foreign ownership induces largely polarised responses (Peters, 2004). Land carries significance beyond livelihoods for many cultures (Raymond, Singh, Benessaiah, Bernhardt, & Levine, 2013; Gustanski & Wright, 2015) with connections to traditions such as rites of passage, religious practices and sense of place being emotionally significant. Historical protected area expansion mechanisms, such as the large-scale outright purchase of land and subsequent forced removal of local communities can no longer be considered feasible or financially sustainable, thus, the biodiversity conservation mechanisms that are developed to secure important biodiversity need to be innovative and ensure that they can be aligned with government priorities and supported politically (Pence, Botha, & Turpie, 2003).

To address the need to expand the conservation footprint without the outright purchase of land, the United States of America (USA) federal and state agencies developed a programme of conservation easements and land trusts where rights of ownership, specified land-uses and activity restrictions were sold to, or donated in favour of, different parties (Merenlender, Huntsinger, Guthey, & Fairfax, 2004). For example, a landowner may sell the hunting rights of a property to an NGO conservation agency which in turn restricts the hunting of a particular species over a certain season, annually, whilst the landowner retains all remaining title rights. The conditions of the easement are governed by a contract and the conservation practices are guided by a management plan (Rissman et al., 2007). Similarly, the mineral title can be separated from a portion of land

and the landowner, or free holder, only pays “property taxes on the remaining value of the land” (Merenlender et al., 2004). By 2012 the National Conservation Easement Registry had more than 7,2 million hectares of land registered (Comerford, 2013).

Australian off-reserve conservation efforts are divided into two major programmes, the first being the Natural Resource Management (NRM) programmes. These programmes are funded by federal grant cycles and operate in geographically defined systems. The programmes aim to guide and influence land-use practices, with the Western Australian Government defining NRM as follows:

The ecologically sustainable management of the land, water, air and biodiversity resources of the State for the benefit of existing and future generations, and for the maintenance of the life support capability of the biosphere. It does not include mineral resources but includes coastal and marine resources up to the State three nautical mile boundary (Dawes, 2002, unpagged).

The second main Australian off-reserve conservation programme is the Nature Conservation Covenant Programme which is legally structured in a very similar manner to the programmes in the USA and Canada in that they are administered at state/territory level (Comerford, 2013). Australia has more than 4000 registered covenants binding over 30 000 km<sup>2</sup> (Adams & Moon, 2013).

Although these programmes strive for improved land stewardship and a contribution to the greater good by improving or maintaining ecosystem provisioning, they do not result in protected area expansion (Rissman et al., 2007). In South Africa, the Biodiversity Stewardship Programme (BSP) is a programmatic approach to off-reserve conservation that results in protected area expansion for two of the four available categories (Cumming et al., 2015). Biodiversity stewardship is a mechanism that facilitates the declaration of statutory protected area status on privately or communally owned land without altering the title or ownership status of that land. The BSP is enabled by South Africa’s legislative framework and finds expression in the National Environmental Management: Protected Areas Act (NEM: PAA), Act 57 of 2003 (DEA 2003) and the

National Environmental Management: Biodiversity Act (NEM: BA) Act No. 10 of 2004 (DEA 2004). National implementation guidelines and systematic conservation planning ensure provincial conservation agencies and NGO's operate within the bounds of the Public Finance Management Act (PFMA) Act No. 1 of 2009 (Treasury 2009) when implementing biodiversity stewardship programmes. Conservation targets set out in the South African National Protected Area Expansion Strategy (NPAES) (DEA 2008) and the Eastern Cape Protected Area Expansion Strategy (ECPAES) (ECPTA 2012) prioritise activities and support the collaboration of state and civil society organisations.

Biodiversity stewardship is a voluntary commitment made by a landowner, or group of landowners, to accept a portion of the state's burden to conserve areas of critically important biodiversity. The state and the landowner(s) enter into an agreement that is contractually binding and together they form a partnership to capacitate landowners to manage their land with conservation outcomes as one of the drivers of decision-making. In order to be effective in significantly increasing the protected area network, where the landscape allows and to make progress towards achieving protected area expansion targets defined in the NPAES and the ECPAES, implementers increase the scale of their negotiations and focus on landscapes or ecological features. With this change of scale, BSP negotiators enter into the complex and challenging realm of working with multiple landowners on a single stewardship solution.

The commitment required of a community to act collectively and sustainably towards contributing to the greater good whilst incurring some opportunity costs over extended timeframes is seemingly contrary to the tragedy of the commons (Vollan & Ostrom, 2010). Because participation in the BSP is voluntary, biodiversity stewardship implementers who work towards securing large, landscape scale sites spend great amounts of resources negotiating an agreement and these investments can potentially show little or no return if the agreement is not successfully concluded. Thus, the ability to accurately predict the likelihood of a community's ability to act collectively would improve efficiency and return on investment in the resource scarce off-reserve conservation and protected area expansion field.

Landowners working collectively to achieve conservation outcomes is not a new concept in South Africa, with conservancies having been introduced as an off-reserve natural resource management mechanism in the 1970's by the then Natal Parks Board currently Ezemvelo KZN Wildlife (EKZNW). According to the National Association of Conservancies of South Africa's (NACSA) website, conservancies are a voluntary association of environmentally conscious landowners "who choose to cooperatively manage their natural resources in an environmentally sustainable manner without necessarily changing the land-use of their properties". Conservancies are recognised by provincial departments and conservation agencies; however they are not formally recognised as protected areas by NEM: PAA. While still a popular and common practice, conservancies have limited success in terms of protected area expansion and long-term, sustainable conservation action. Because there are no contractual obligations, conservancies are dependent on the commitment of the landowners to maintain appropriate management actions. Thus, in the case of a change of land ownership or land-use, there is no safeguard in place to ensure the sustainability of the initiative. Conservancies are, however, a useful stepping stone towards biodiversity stewardship and can sometimes provide a valuable entry point for interaction with a community or group of landowners.

Biodiversity stewardship offers a solution to build on the foundation laid by conservancies and includes safeguards to ensure the sustainability of the established and agreed upon management objectives. Protected Environments (PE's) are the least secure protected area designation defined in NEM: PAA and offers the most tolerance in terms of land-use. A PE agreement, as a mechanism, is very well suited to large landscapes that require a collective conservation or natural resource management intervention, but, where it would be detrimental to restrict certain forms of extractive land use such as agriculture. Large-scale, landscape level biodiversity stewardship initiatives seek to optimise synergies between the need to conserve intact ecological features for ecosystem health and function and climate change adaptation refugia and the social and economic needs of food security.

In terms of Section 28 of NEM: PAA, "the purpose of a PE is to:

- a) regulate the area as a buffer zone for the protection of a special nature reserve, national park, world heritage site or nature reserve;
- b) enable landowners to take collective action to conserve biodiversity on their land and to seek legal recognition for such initiative;
- c) protect the area if it is sensitive to development due to its:
  - i. biological diversity;
  - ii. natural characteristics;
  - iii. scientific, cultural, historical, archaeological or geological value;
  - iv. scenic and landscape value; or
  - v. provision of environmental goods and services;
- d) protect a specific ecosystem outside of a special nature reserve, national park, world heritage site or nature reserve; or
- e) ensure that the use of natural resources in the area is sustainable.”

Commonly, PE's are proclaimed over multiple properties in partnership with multiple landowners, thus necessitating the collective alignment of natural resource management principles amongst all landowners within the PE. NEM: PAA specifies minimum criteria for the Strategic Management Plan (SMP) content and each criterion needs to be collectively agreed upon and adhered to by all landowners within the protected environment. These actions are governed by legally binding contracts, known as Protected Area Management Agreements (PAMAs) and are used as a safeguard to ensure sustained conservation outcomes.

#### *Social constructs within the context of landscape scale biodiversity stewardship*

Social relationships and interactions associated with large-scale biodiversity stewardship initiatives become complex when working towards a common outcome with multiple landowners. Do personal and/or social identity influence an individual's capacity and likelihood to become, and remain, committed to the same objectives as his/her

neighbour? Do these aspects of identity in turn develop into barriers or motivators to coordinated and sustained conservation efforts?

Stern's value-belief-norm (VBN) theory of environmentalism (Stern, Dietz, Abel, Guagnano, & Kalof, 1999) suggests that pro-conservation behaviours are triggered in response to the personal moral norms of individuals who believe and understand that anthropogenically induced environmental degradation poses a risk to other people, other species or the biophysical environment and, importantly, that their own actions have the potential to mitigate those risks. VBN theory also suggests that there is an underlying relationship between an individual's moral norms, their ecological understanding and the belief that their actions have the potential to positively influence the wellbeing of other people, other species or the biophysical environment (Stern, 2000). Non-monetary factors, such as personal values, have been shown to significantly influence the participation of landowners in NRM programmes (Raymond, Brown, & Robinson, 2011) which is in support of the VBN theory. Personal norms, values and beliefs instigate pro-environmental behaviour and these personal norms are motivated by an understanding of ecology and the fact that humans are an integrated function of ecology (Kaiser, Wolfing Kast, & Fuhrer, 1999). It has been shown that one of the drivers in the formation of attitude is values (Homer & Kahle, 1988) and this implies that there is a structural or progressive development of attitude.

The new ecological paradigm scale was developed in the late 1970's and is commonly used to measure environmental attitude (R. E. Dunlap & Catton, 1979). The new ecological paradigm scale was designed to measure a respondents understanding of ecology at local, regional or planetary scale within the context of anthropogenic impact on the health and function of those ecosystems (Dunlap, Van Liere, Mertig, & Jones, 2000).

Nature connectedness is an expression of the extent to which nature contributes to the identity of an individual. The connectedness to nature scale (CNS) is used to measure an individual's emotional connection and feelings towards a specific place in nature (Mayer & Frantz, 2004). Connectedness to nature is comprised of three main elements, which are (i) the cognitive component, the fundamental element of nature connectedness, which

refers to the level of integration an individual feels with nature; (ii) the affective component which relates to an individual's sense of duty to care for nature; and (iii) the behavioural component which is determined by an individual's commitment to protect nature (Schultz, Shriver, Tabanico, & Khazian, 2004). The three elements listed above combine to form the social construct and are necessary for an individual to feel connected to nature (Frantz, Mayer, Norton, & Rock, 2005). It follows, then, that if an individual is connected to nature, their value system may drive pro-conservation behaviour. The VBN theory places emphasis on actual behaviours and it was hypothesised that particularly the second and third components of the connectedness to nature construct may influence pro-conservation actions.

Understanding how an individual develops a feeling of belonging to, identifying with and being dependent on a biophysical space gave rise to the contemplation of the place attachment construct in this study. Modern society has not resulted in a decline in meaning or significance of a place, but rather, it has impacted on how that meaning is formed (Cilliers, de Villiers, & Roodt, 2002). Initially developed to measure place attachment in the recreational use of protected areas, the place attachment scale is now used in studies with landscape conservation focused research associated with behaviour prediction (Raymond et al., 2011).

Thus, it was hypothesised that if an individuals' personal norms and values include a duty of care for nature and the individual has a modern understanding of ecological principles, and has developed an attachment to a specific place, they were more likely to exhibit pro-conservation behaviours. Because the focus of this study was on collective, large-scale biodiversity stewardship initiatives, there was a need to develop context and understanding of social interactions and group behaviours. Individuals develop a ranking system that prioritises various features and traits when forming their self-definition (Sampson, 1978). The result is known as an individual's identity orientation and can be measured using the aspects of identity questionnaire (AIQ) that was developed by Sampson in 1978. The initial aspects of identity questionnaire delineated the two main domains of social (external) identity and personal (internal) identity. The third iteration split off several characteristics to quantify communal or collective identity. In 1994 the fourth iteration, aspects of identity questionnaire-IV, included a focus on intimate

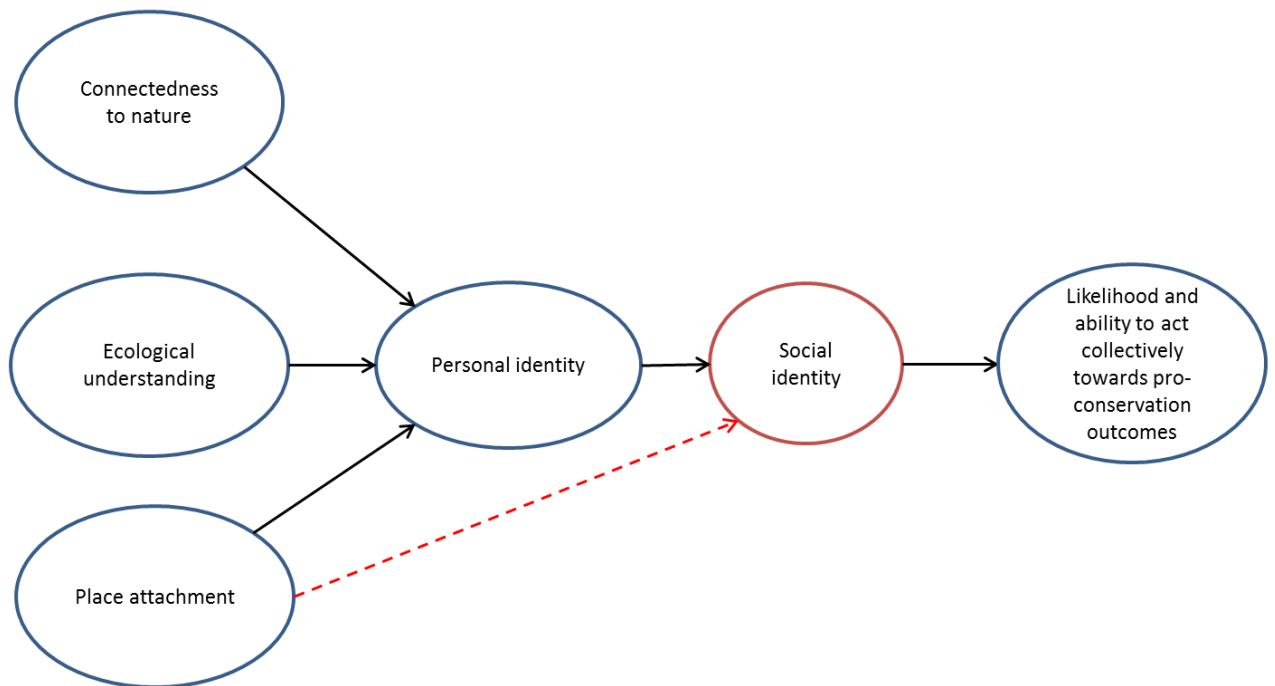
relationships (relational identity) and is the iteration used in this research (Cheek et al., 1985, Cheek 1989, Cheek et al., 1994). It is these latter identity orientations that are of particular interest when working with multiple landowners.

A fifth scale was developed to measure the potential impact that a change of land-use could have on personal identity and was named the occupational identity scale for the purposes of this research. For example, could farmers perceive carbon to be an agricultural product? If farmers do not view carbon or water as “farmed products”, would it still be possible to facilitate the transition from “traditional” production farming, for example small stock farming, to more “ecological” production farming, such as carbon sequestration via restored thicket? Or, would the potential change in product influence the personal identity of a “farmer”?

## 1.2 Thesis objectives

The objectives of this study were to determine if social and personal identity, place attachment, connectedness to nature and environmental understanding influence the implementation of collective, large-scale biodiversity stewardship initiatives in South Africa.

It was hypothesised that place attachment; ecological understanding and connectedness to nature are drivers of pro-conservation behaviours. It was further hypothesised that personal and social identity influence the likelihood and ability of landowners to act collectively when making pro-conservation decisions and developing good ecological practice as depicted in the conceptual model, Figure 2 below.



**Figure 2: Conceptual model of the hypothesis**

### 1.3 Research questions

- a) Do personal and social identity influence the likelihood and ability of an individual to participate in, and commit to, collective large-scale biodiversity stewardship initiatives?
- b) Is there a relationship between place attachment, connectedness to nature, ecological understanding and collective pro-conservation behaviour?

## Chapter Two

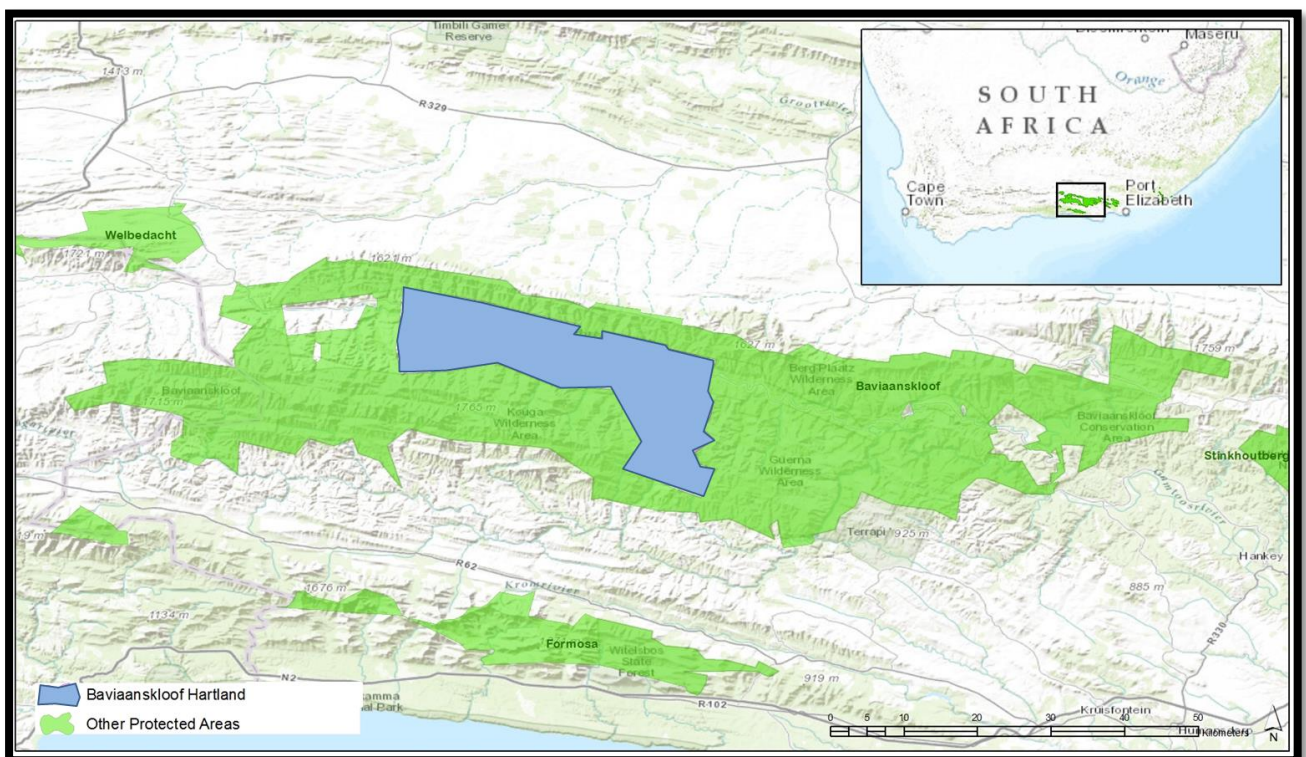
### The study area



**Figure 3: Baviaanskloof River (photo credit: Tracey Potts 2011)**

## 2.1 The Baviaanskloof Hartland

The Baviaanskloof Hartland is the first of two collective, large-scale biodiversity stewardship initiatives focussed on in this study. The Baviaanskloof Hartland is completely surrounded by the Baviaanskloof Nature Reserve which is located in the Sarah Bartman District Municipality of the Eastern Cape, and is a 75 km long valley running between the Kouga Mountains in the south and the Baviaanskloof Mountains in the north, see Figure 4 below.

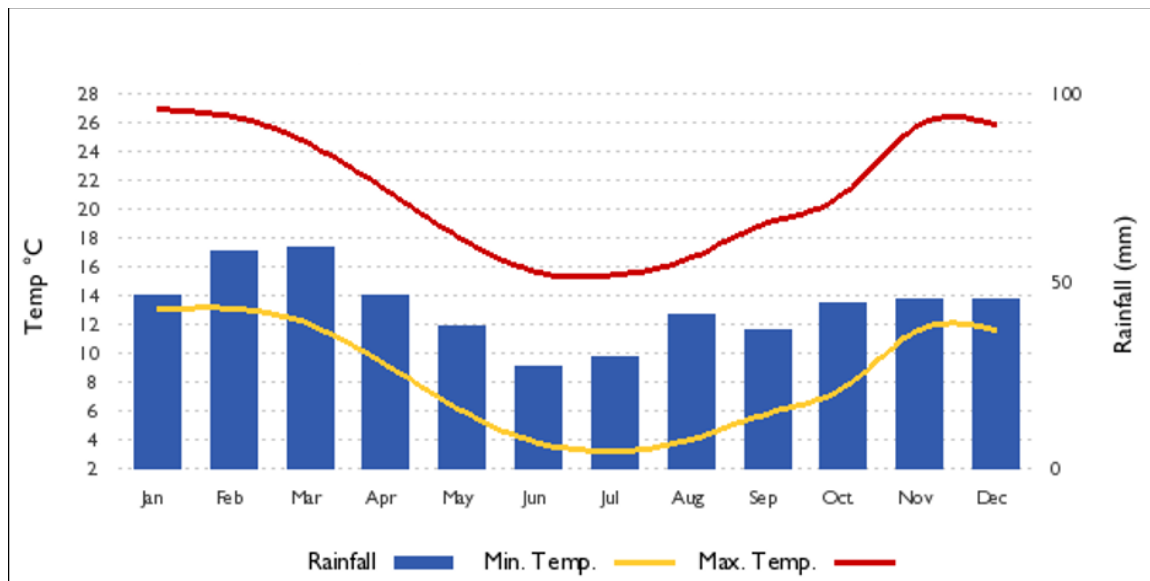


**Figure 4: Locality Map of the Baviaanskloof World Heritage Site**

The Baviaanskloof Hartland (English translation: Baviaanskloof Heartland) is the brand developed by landowners living and farming in the privately owned annulus surrounded by the Baviaanskloof Nature Reserve (BNR). The BNR is included in the Cape Floristic Region World Heritage Site (CFRWHS) due to its globally significant, outstanding natural beauty and biodiversity. The BNR has extraordinary biodiversity. There are over 1,000 recorded plant species, including at least 52 Red Data Book and 20 endemic plant

taxa (Boshoff, 2005). The portion of the greater landscape referred to as the study area is the 40 000 hectares of privately owned land in the valley, hereafter referred to as the “Baviaanskloof Hartland” and the term is used to create a distinction between the state owned land. The BNR is situated in an area that receives rain throughout the year (Buckle, 1989), with the drier months occurring from December to February (Teague et al., 1989). The rainfall ranges from 500 to 700 mm per year in the east and the west receives approximately 300 mm per year (Teague et al., 1989). There is a marked longitudinal difference in the rainfall, with the Kouga Mountains to the south receiving an average of 547 mm per year and the Baviaanskloof Mountains to the north receiving an average of 451 mm per year (Buckle, 1989). The BNR also experiences a further aridity gradient whereby the southern slopes receive slightly more rainfall than northern slopes (Euston-Brown, 2006; Powell, 2009).

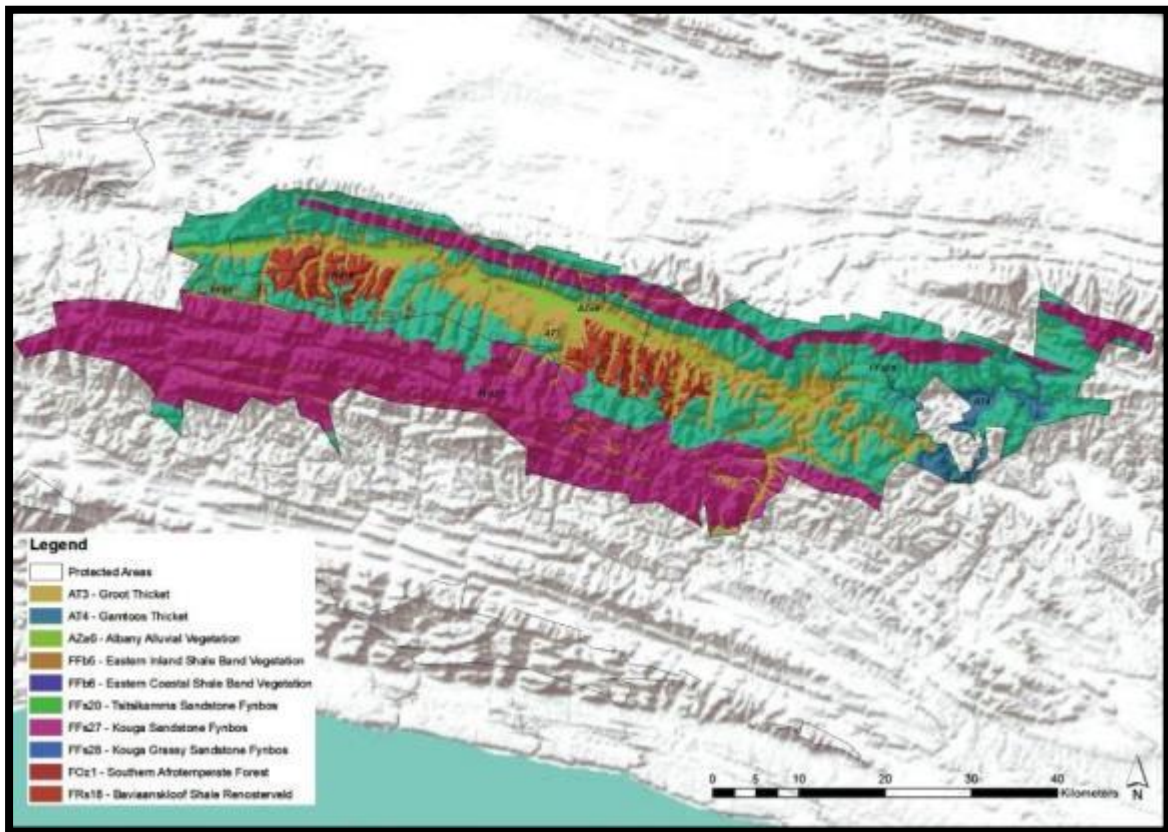
The Baviaanskloof is described as a semi-arid region with a Mediterranean climate (Powell, 2009). The area is characterised by warm summers when maximum temperatures can reach 45°C, and relatively mild winters when temperatures range from 5°C to 31°C, with average annual temperatures of 17°C to 18°C (Buckle, 1989) as shown in Figure 5 below. Higher altitude areas experience temperatures below 13°C (Teague et al., 1989) and the mountain peaks are often covered in snow in winter (Buckle, 1989). Although not common, frosts do occur (Teague et al., 1989). Figure 5, below, shows climate data, sourced from WorldClim, depicting 50 year monthly averages.



**Figure 5: Average climate data for the Baviaanskloof Hartland**

A high proportion of the valley floor of the BNR, including the Baviaanskloof Hartland, is covered by fault-fractured quartzite, Bokkeveld shale and Enon conglomerate. There are areas of deeper soils that only occur on the valley floor and the plateaus (Hesp et al., 1989), and these tend to be less rocky with greater clay content (Campbell, 1985). The mountainous areas consist of quartzite and shales of the Table Mountain and Witteberg groups (Hesp et al., 1989). This gives rise to acidic, nutrient poor soils that are coarse grained, rocky and shallow (Teague et al., 1989).

The BNR occurs within the transition zone between the Cape Floristic Region (CFR) and the south-western reaches of the Maputuland-Pondoland-Albany Hotspot (MPAH) (Mittermeier et al., 2004) subtropical thicket (Boshoff, 2005). This transitional area contains tracts of seven of the nine South African biomes (Mucina & Rutherford, 2006), which are the Fynbos, Grassland, Savanna, Albany Thicket, Nama Karoo, Succulent Karoo and Forest biomes (Mucina & Rutherford, 2006). Due to the highly diverse topography, soil types and microclimates (Vlok, 1989), the BNR has 69 vegetation types (Figure 6), which are dominated by fynbos and sub-tropical thicket elements (Mucina & Rutherford, 2006). Thirty one of these vegetation types are endemic and 16 near endemic to the area (Mucina & Rutherford, 2006). Following on from the map below is a table detailing the key to the codes used on the map (Table 1).



**Figure 6: Vegetation map of the Baviaanskloof Nature Reserve**

**Table 1: Baviaanskloof Nature Reserve vegetation map key based on the classifications of Mucina & Rutherford, 2006**

MAP CODE	NAME	CONSERVATION STATUS	BIOME	GROUP	BIOREGION
AT3	Groot Thicket	Least threatened	Albany Thicket Biome	Albany Thicket	Albany Thicket
AT4	Gamtoos Thicket	Least threatened	Albany Thicket Biome	Albany Thicket	Albany Thicket
AT6	Sundays Thicket	Least threatened	Albany Thicket Biome	Albany Thicket	Albany Thicket
AZa6	Albany Alluvial Vegetation	Endangered	Azonal Vegetation	Alluvial Vegetation	Alluvial Vegetation
AZi6	Southern Karoo Riviere	Least threatened	Azonal Vegetation	Inland Saline Vegetation	Inland Saline Vegetation
FFb5	Eastern Inland Shale Band Vegetation	Least threatened	Fynbos Biome	Shale Band Vegetation	Eastern Fynbos-Renosterveld Bioregion
FFb6	Eastern Coastal Shale Band Vegetation	Endangered	Fynbos Biome	Shale Band Vegetation	Eastern Fynbos-Renosterveld Bioregion
FFs20	Tsitsikamma Sandstone Fynbos	Vulnerable	Fynbos Biome	Sandstone Fynbos	Eastern Fynbos-Renosterveld Bioregion
FFs27	Kouga Sandstone Fynbos	Least threatened	Fynbos Biome	Sandstone Fynbos	Eastern Fynbos-Renosterveld Bioregion
FFs28	Kouga Grassy Sandstone Fynbos	Least threatened	Fynbos Biome	Sandstone Fynbos	Eastern Fynbos-Renosterveld Bioregion
FRs16	Uniondale Shale Renosterveld	Least threatened	Fynbos Biome	Shale Renosterveld	Eastern Fynbos-Renosterveld Bioregion
FRs17	Langkloof Shale Renosterveld	Endangered	Fynbos Biome	Shale Renosterveld	Eastern Fynbos-Renosterveld Bioregion
FRs18	Baviaanskloof Shale Renosterveld	Least threatened	Fynbos Biome	Shale Renosterveld	Eastern Fynbos-Renosterveld Bioregion
SKv12	Willowmore Gwarrieveld	Least threatened	Succulent Karoo Biome	Rainshadow Valley Karoo Bioregion	Rainshadow Valley Karoo Bioregion
SKv14	Steytlerville Karoo	Least threatened	Succulent Karoo Biome	Rainshadow Valley Karoo Bioregion	Rainshadow Valley Karoo Bioregion

The major factors that determine the distribution of these vegetation types are soil type, soil fertility, rainfall, and fire (Vlok, 1989). The Fynbos elements are located on the nutrient poor soils of the mountains (Boshoff, 2005), with Wet Mountain Fynbos occurring on the moist upper portions of the steep south facing slopes that receive more than 800 mm rainfall per year and Mesic Mountain Fynbos occurring on the mid, south facing slopes where the rainfall ranges from 400 to 600 mm per year. Arid Mountain Fynbos occurs on the drier, north facing slopes that receive between 300 mm and 400 mm rainfall per year, and Grassy Fynbos occurs on the loamy north facing slopes (Vlok, 1989). All the Fynbos types are driven by fire regimes, which are a critical ecosystem process (Boshoff, 2005).

The Albany Thicket elements are found on the deeper, more nutrient rich soils of the valley floor and plateaus with Albany Thicket occurring on the lower valley slopes, and Spekboom Thicket higher up (Mucina & Rutherford, 2006). The Subtropical Thicket vegetation types are highly diverse due to the transitional nature of the BNR that gives rise to a large number of sub-tropical thicket mosaics and occurs when the thicket forms clumps within other vegetation elements such as Fynbos and Succulent karoo (Boshoff, 2005).

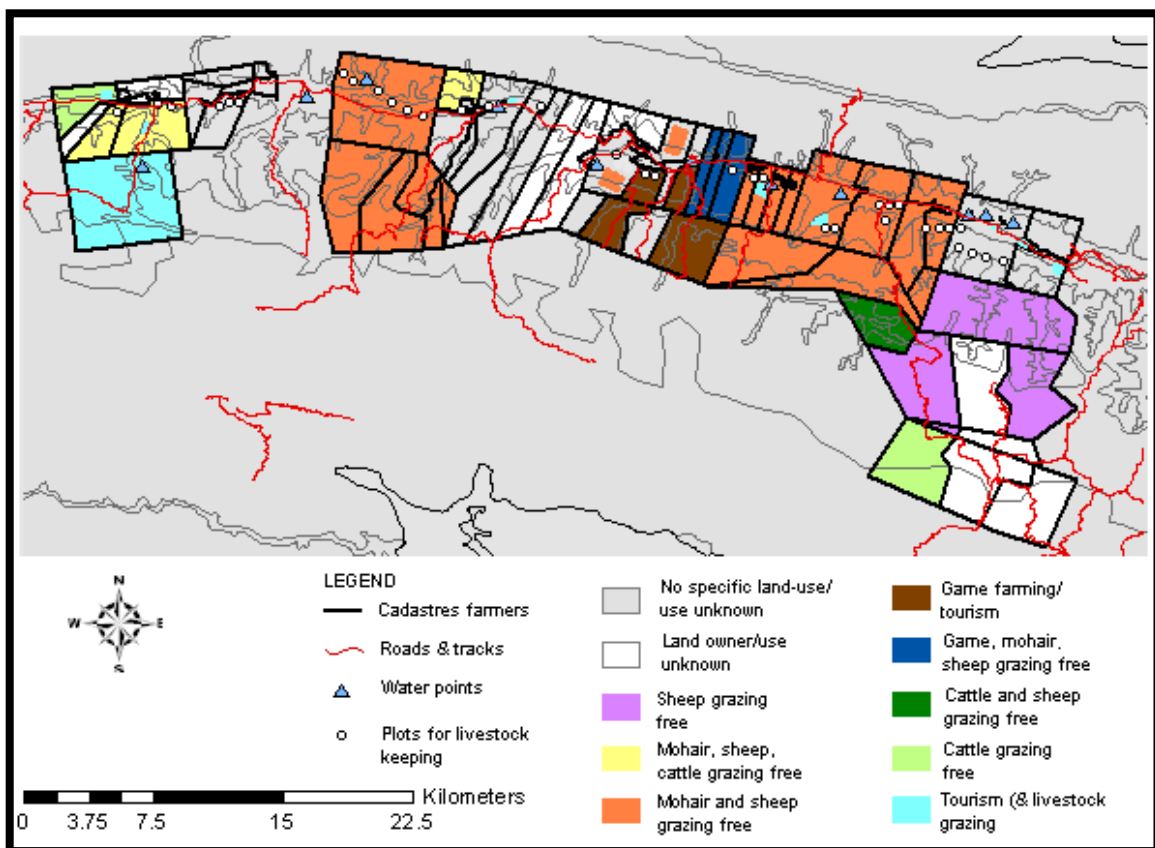
The remainder of the vegetation types are made up of Nama Karoo and Succulent Karoo elements which occur on the relatively low rainfall areas to the north and west of the BNR. The Grassland biome elements occur on the foothills and the Savanna biome elements occur on the alluvial soils of the river floodplains. The Forest biome elements occur in riverine areas and sheltered ravines (Mucina & Rutherford, 2006).

The Baviaanskloof Hartland has been inhabited by humans since the Middle Stone Age (100,000 to 30,000 years ago), although the prime local evidence of human presence in the Baviaanskloof is from the Khoisan hunter-gatherers. The Baviaanskloof is believed to be in a meeting place of the Khoisan people, who occupied the region until the Khoekhoen herders arrived about 2000 years ago (Henley, 2000) .

Europeans began settling in the Baviaanskloof region in the 18th century, with the first farm being registered in 1817, leading to the marginalization of the Khoisan and the loss of their traditional way of life (Boshoff, Cowling, & Kerley, 2001). Farmers reached the

valley, or “*kloof*” as it is known colloquially, by means of a handmade “*ossewa*” (ox wagon) trail from the west. The most common farming activity was pastoralism, however some commercial crops were cultivated where the soil allowed (Boshoff et al., 2001). Today, non-tenured inhabitants are from various different cultures, mainly Afrikaans, Xhosa, Cape Coloured and KhoiSan descendants.

The Baviaanskloof Hartland is a marginally agriculturally productive landscape with land-uses ranging from small scale onion seed production and small stock farming in the far western areas, high-value game species breeding and olive orchards in the central region to large stock farming in the eastern reaches. The small scale cropping and orchards have not significantly contributed to the degradation of the ecosystem and thus are not mapped in Figure 7 below.



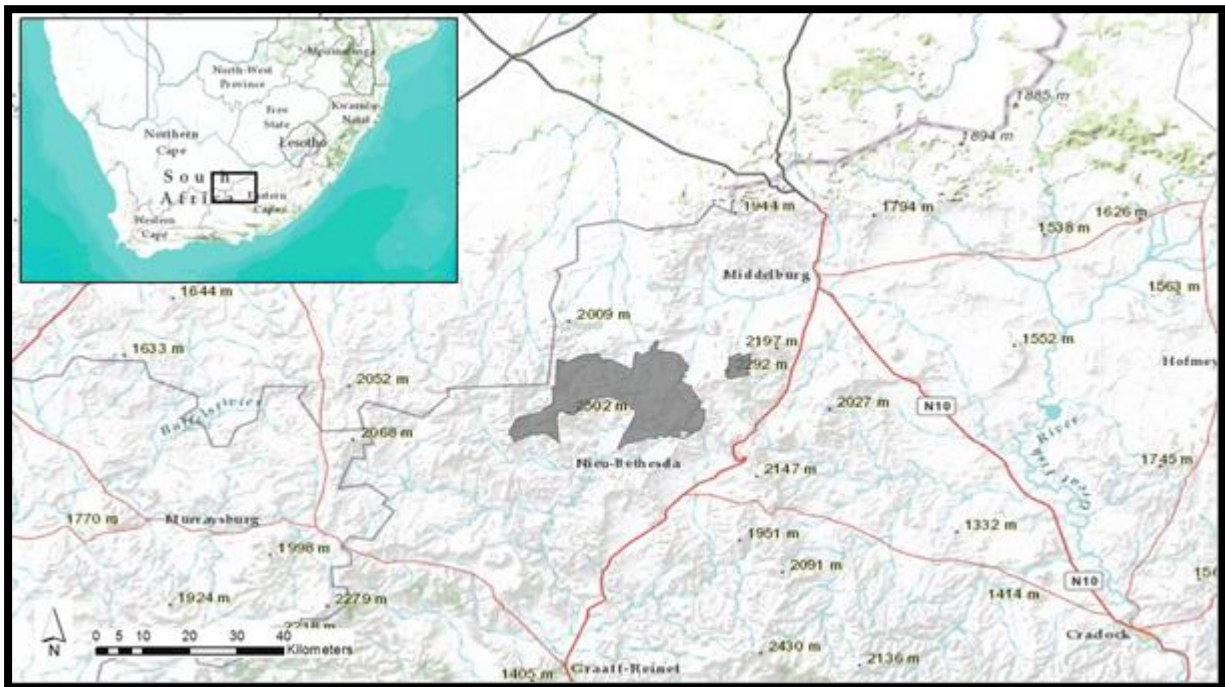
**Figure 7: Livestock land-use patterns in the Baviaanskloof Hartland (Stokoff, 2010)**

Historical overgrazing brought about by excessive stocking rates of high impact species such as goats, and mismanagement of the water resources in the area has resulted in a

decline in the health and functioning of the ecosystem, impacting local human well-being (Mighall et al., 2012). Landowners have expressed a desire to conserve, and where necessary restore, the biodiversity assets of the Baviaanskloof Hartland, whilst at the same time generating opportunities to improve rural livelihoods (Stokoff, 2010). The current land-use practices employed to secure rural livelihoods exert pressure on increasingly marginal farmland and water resources as declining returns on agricultural production threaten financial sustainability.

## 2.2 The Compassberg Protected Environment

The Compassberg Protected Environment (CPE) lies in the mountainous escarpment of the Karoo and includes Compassberg the highest peak in South Africa west of the Maluti-Drakensburg mountain chain, see Figure 8 below. At 2 500 meters above sea level (masl) it towers 500 meters above the rest of the Sneeuberg escarpment. It represents a unique geological feature, habitat and altitudinal refuge. There are at least two endemic species including the plain adder (*Bitis inornata*), a small snake and the Compassberg skolly (*Thestor compassbergae*), a butterfly.

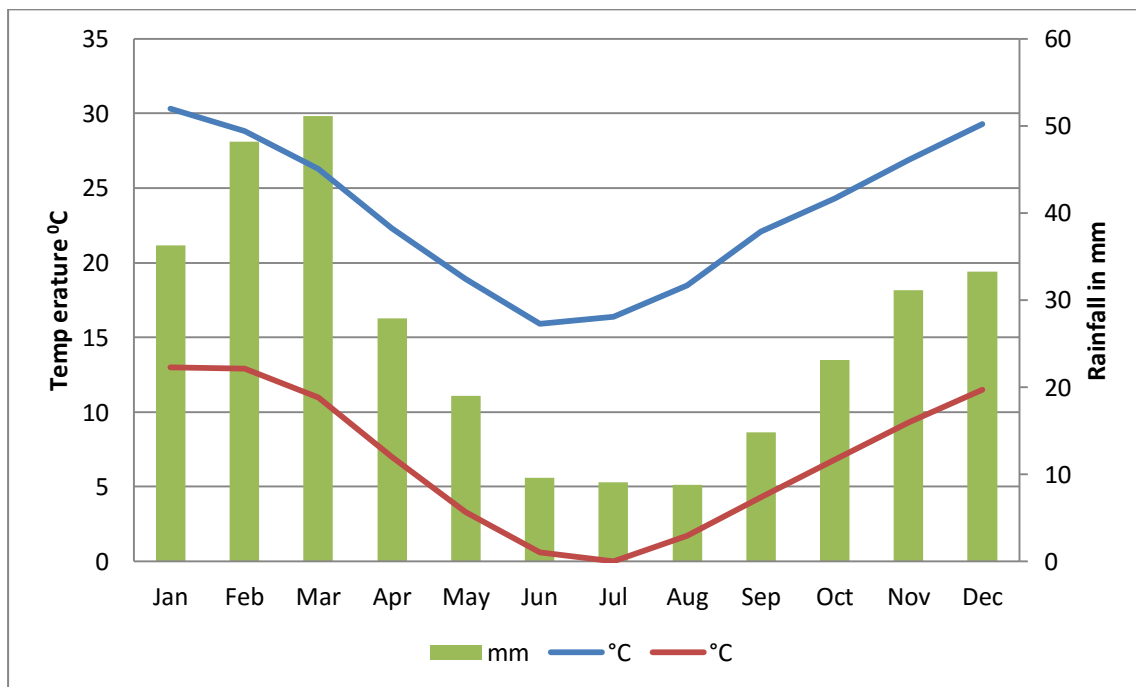


**Figure 8: Locality map of the Compassberg PE (Reeves, 2011)**

The Compassberg PE falls into the summer rainfall region with between 72% and 80% of the rain falling in summer months (Keay-Bright & Boardman, 2006). The long-term rainfall shows strong autumn and weak spring peaks as described generally for the eastern Karoo (Hoffman et al., 1987). Approximately 50% of the rain is frontal and the remainder from convective thunderstorms. The dominance of thunderstorms means that a large number of rainfall events are very localised and severe with large amounts of rain falling in a short period of time.

The rainfall is highly variable in its monthly distribution within any year, the amount between years and the local spatial distribution of rainfall which is illustrated by the fact that only one in five years' total rainfall is within 100 mm of the long term average rainfall. There is a strong altitudinal gradient in rainfall with rainfall appearing to double between 1 700 and 2 000 masl (du Toit, 2011).

The climate of the Compassberg PE is characterised by extremes in temperature ranging in any year from  $-15^{\circ}\text{C}$  to  $44^{\circ}\text{C}$ . The winters are cold with an average daily minimum temperature of  $1^{\circ}\text{C}$  and maximum temperature of  $9^{\circ}\text{C}$  in July. There is an annual average of eight snowfall events at 1 700 masl (Gaynor *pers comm.*, 2012). Figure 9 below shows climate data, sourced from WorldClim, depicting 50 year monthly averages



**Figure 9: Average climate data for the Compassberg Protected Environment**

Seasonality and predictability of rainfall and temperature determine the species composition and structure of flora in Southern African arid areas. It distinguishes the Succulent Karoo from the Nama Karoo and determines the relative dominance of grasses in relation to karoo shrubs (Cowling et al., 1999). Productivity and plant growth is also constrained by these two dominant features of the climate.

The Compassberg PE covers a large altitudinal range from 1 400 masl to 2 500 masl. The terrain morphology of the Compassberg PE is composed of mountains forming the top of the escarpment. The geology of the area consists of horizontal sedimentary layers of Jurassic mudstones, sandstones and slate. Late Jurassic dolerite intrusions, in the form of horizontal sills, and vertical dykes coincide with quaternary erosional products (mainly alluvium) of the Beaufort sedimentary rock, dolerite features and calcrete. The calcrete is formed by continuous cycles of evaporation of soil water containing dissolved calcium contained in the sedimentary soils which results in layers of calcium carbonate being deposited on or near the surface that builds up to form a calcrete deposit (Foster et al., 2012).

In semi-arid and arid regions soils form slowly (Watkeys, 1999). The soils in the Compassberg PE are generally shallow and poorly developed with impermeable bedrock lying shallowly underneath and protruding in places. The soils in the Compassberg PE and the Karoo in general are rich in minerals (Lovegrove & Siegfried, 1989). The mudstones and dolerites have a good mix of minerals and because of the arid climate and medium to poor drainage these minerals have not been leached out (Palmer et al., 2004).

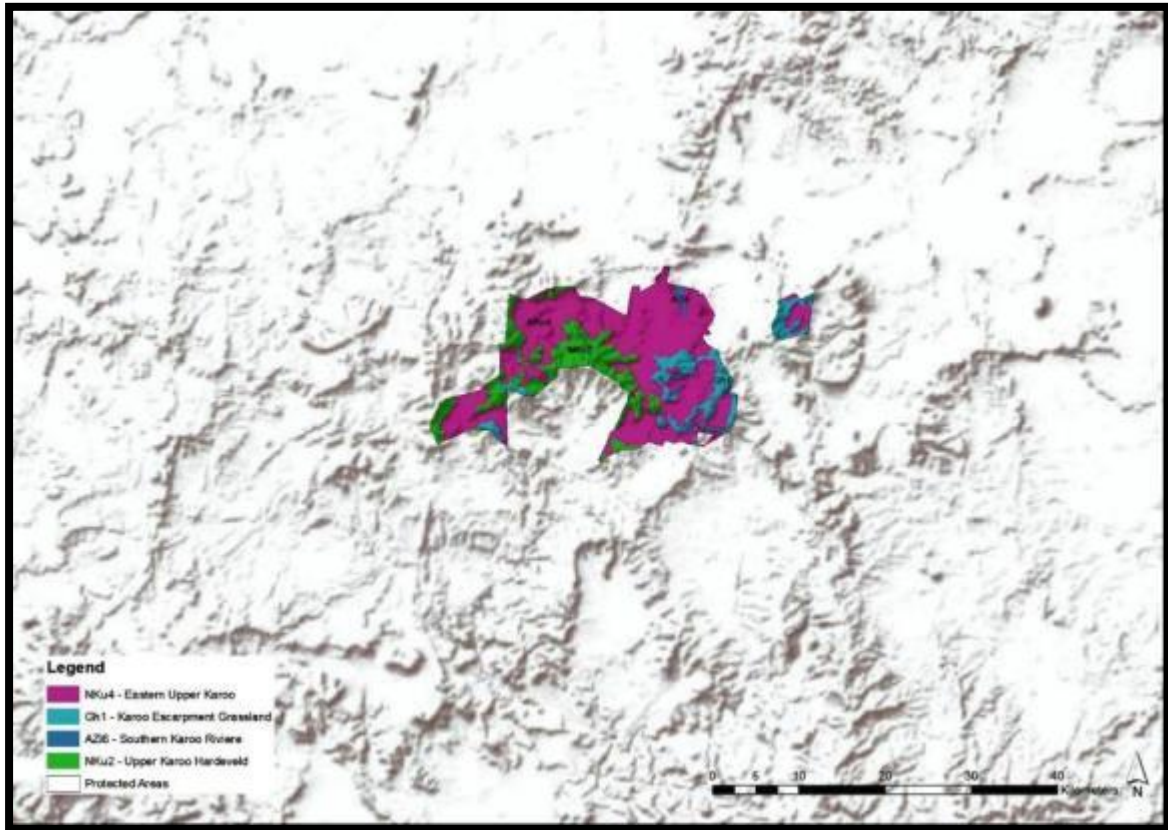
The Compassberg PE is the upper catchment for three river systems. To the north-east, the Vanwyk's River flows into the Klein Brak which flows north and then east past Middelburg to join the Great Fish River. To the north-west the Klein-Seekoei River flows east and then north to join the Seekoei River near Hanover which then flows north to join the Orange River at Vanderkloof dam. To the south the Diepkloof River and other unnamed tributaries flow south to join the Gats River at Nieu Bethesda which flows south to join the Bloukraans River which joins the Sundays River just north of Graaff-Reinet.

The upper reaches of the catchments are steep, consisting of mountain streams flowing over bedrock. Most of the upper mountain streams flow for up to ten days after a rainfall event of 20 mm or more. These steep upper mountain streams run into channels in the valleys where the shallow gradient, accumulation of alluvial sands and underground damming by dolerite dykes running across the valleys allows sub-surface storage of

water and some maintenance of base flow. The result is that the larger valleys in the Compassberg PE support perennial rivers that flow in most years.

The Compassberg PE is situated in a broad ecotone between shrubland and grassland (Avery, 1991; Hoffman et al., 1999). It is a dynamic system that has historically seen shifts in the proportion of the two vegetation types and continues to shift in response to rainfall and stocking rates (Hoffman et al., 1995). Bousman & Scott (1994) noted a change from grasses to woody *Asteracaea* that started 300-400 years ago before settler agriculture since the 1990's researchers have observed a change from Karoo shrubs to grassland in response to a change in the timing of summer rainfall (du Toit, 2011).

The Compassberg PE consists of four vegetation types, namely Karoo Escarpment Grassland; Upper Karoo Hardeveld; Southern Karoo Riviere and Eastern Upper Karoo (Mucina & Rutherford, 2006). Each vegetation type is associated with a different part of the landscape. The Karoo Escarpment Grassland occurs on the mountain plateaus. The Upper Karoo Hardeveld is associated with the rocky slopes of the mountains. The Eastern Upper Karoo occurs on all the lower lying land and the Southern Karoo Riviere occurs on the watercourses that have shrub thicket cover. Of the 1995 species recorded by Clark et al., (2008), 33 species (2.8%) are endemic and 13 (1.1%) are near endemics. The vegetation map, Figure 10, and associated key, Table 2, below provide details of the vegetation type distributions.



**Figure 10: Vegetation map of the Compassberg Protected Environment**

**Table 2: Compassberg Protected Environment vegetation map key based on the classification of Mucina & Rutherford, 2006**

MAP CODE	NAME	CONSERVATION STATUS	BIOME	GROUP	BIOREGION
AZi6	Southern Karoo Riviere	Least threatened	Azonal Vegetation	Inland Saline Vegetation	Inland Saline Vegetation
Gh1	Karoo Escarpment Grassland	Least threatened	Grassland Biome	Dry Highveld Grassland Bioregion	Dry Highveld Grassland Bioregion
NKu2	Upper Karoo Hardeveld	Least threatened	Nama-Karoo Biome	Upper Karoo Bioregion	Upper Karoo Bioregion
NKu4	Eastern Upper Karoo	Least threatened	Nama-Karoo Biome	Upper Karoo Bioregion	Upper Karoo Bioregion

Less than one per cent of the Compassberg PE area is transformed by invasive alien plants. Levels of infestation are very low with only stands of grey poplar (*Populus canescens*) posing any potential threat to natural vegetation. Ten per cent of the 1 995

plant species in the Compassberg PE are classified as alien species, of which less than one per cent are classified as Category one species (Clark et al., 2008).

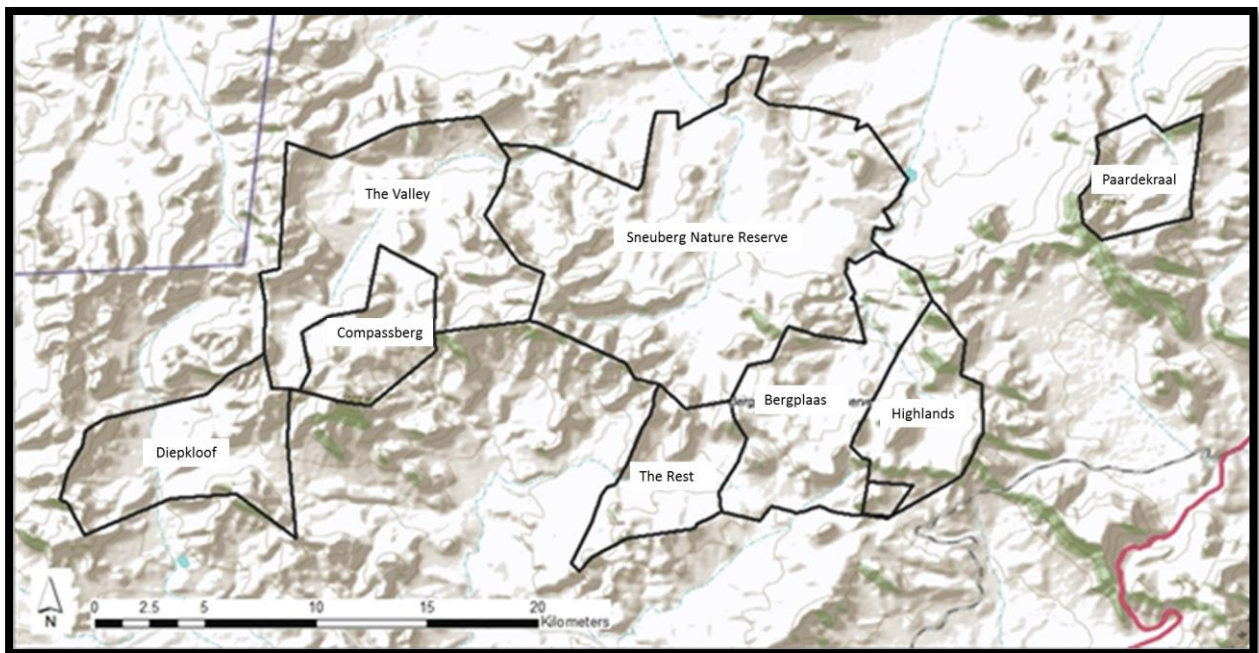
Evidence of human utilization of the Compassberg PE includes Khoi-Khoi herding Nguni cattle and fat-tailed sheep 2 000 years ago. The first trek Boers moved into the area in 1750-1776 (Keay-Bright & Boardman, 2006). They were mobile, had little capital and practiced transhumance. It is thought that they introduced the first prickly pear plants (*Opuntia spp.*) as a supplementary fodder (Beinart & Whosela, 2012). This allowed them to maintain high stocking densities even through drought years. From the 1830's till the turn of the century trek Boers were replaced by more sedentary colonial farmers who had more capital and started a settled stock farming industry buoyed largely by demand for wool from overseas. Merino sheep were first introduced into the Sneeuwberg in the 1850's and the commercial farming enterprise was firmly established. Concurrent with this were numerous technical advances aimed at increasing productivity and profitability. These marked a significant intensification of the agricultural enterprise.

The area was historically degraded by over grazing, and small live-stock was stocked at two to three times the current stocking rate (Keay-Bright & Boardman, 2006). Degradation also resulted from cultivating lands in inappropriate areas on highly erodible soils. By the time the first aerial photographs were taken of the area in 1945 almost all the degraded land and gully systems that are currently in the area had been developed and the gullies eroded to bedrock (Keay-Bright & Boardman, 2006).

A general decrease in stocking rates and complete removal of stock in some cases, have halted environmental decline and has resulted in a 15% reduction in degraded areas in the Compassberg PE (Keay-Bright & Boardman, 2006). Almost in contradiction to the above statement, is the observation that there has not been a reduction in topsoil erosion over the past 70 years based on sediment yield in dams in the Compassberg PE (Foster et al., 2007).

Currently 78% of the Compassberg PE land is owned by landowners whose primary income is not farming, see Figure 11 below for a map of the landholdings. Four thousand hectares is considered the minimum economically viable farm size in the area if the enterprise is solely dependent on farming for an income. Farmers have recently

transitioned from sheep and other small stock farming towards cattle farming, particularly the Nguni and Tuli breeds which are hardy, disease resistant, and indigenous. This move has been in response to increased numbers of black-backed jackal (*Canis mesomelas*) and caracal (*Caracal caracal*) as well as the belief that cattle do not utilize the land with as much impact as sheep. Farmers have moved to high intensity short duration grazing in an effort to force animals to graze non-palatable species and keep them “soft” i.e. in a shooting stage where they are more palatable.



**Figure 11: Landholdings of the Compassberg Protected Environment (Reeves, 2011)**

Tourism has become a secondary income generator for many farmers with almost all the owners in the Compassberg PE having some form of accommodation infrastructure.

## Chapter Three

### The influence of five social constructs on translating conservation priority into conservation opportunity



**Figure 12: Smitskraal day visitor facility, Baviaanskloof Nature Reserve (photo credit: Tracey Potts 2011)**

### 3.1 Abstract

Habitat loss, fragmentation and degradation outside of formally protected areas is threatening biodiversity and impacting on ecosystem function and resilience. Biodiversity stewardship aims to protect intact habitat through voluntary contractual agreements with private and communal landowners. In return for conservation management actions and certain land-use restrictions, the State offers a suite of incentives and benefits that are, where possible, structured to meet the needs of the landowner. Where the environment allows, biodiversity stewardship initiatives can secure ecological processes and ecosystems across a landscape or an ecological feature. When developing these landscape level biodiversity stewardship initiatives, negotiations are focused on groups of landowners.

The overarching hypothesis was that social constructs affect pro-conservation behaviour. Gaining a better understanding of how these constructs influence collective decision making and group behaviour is a critically important factor when translating a conservation priority into a conservation opportunity.

Structured interviews were carried out in two separate large-scale biodiversity stewardship sites, the Compassberg PE and the Baviaanskloof Hartland, in the Eastern Cape Province of South Africa. The interviews were then followed up with surveys containing five psychometric scales.

Scores on the new ecological paradigm scale and the place attachment scale latent variables were significantly different at the two study sites, at the 10% level of significance. Latent variables are variables which cannot be directly observed but are inferred by using a scale or a model from other variables that can be directly observed. For example, ecological understanding cannot be directly observed but the scores from a respondents' new ecological paradigm scale can be used to infer ecological understanding. The Compassberg PE respondents' new ecological paradigm scores were higher than those of the BH respondents and, conversely, the place attachment scale scores for the BH respondents were higher than those of the Compassberg PE respondents. The conclusion drawn is that ecological understanding is a key driver of pro-conservation behaviour.

### 3.2 Introduction

The five social constructs contemplated in the study were ecological understanding, place attachment, connectedness to nature, social identity and personal identity. The operational definitions of these five social constructs within the context of large-scale, landscape level biodiversity stewardship initiatives are listed below in Table 3.

The objectives of this study were to determine if these five social constructs influenced the implementation of this type of stewardship initiative and if they did, were the influences of a positive or negative nature? The benefits of understanding the relationships between the latent variables and the outcome of a collective, large-scale biodiversity stewardship initiative are two-fold. Firstly, one would be able to assess potential candidates before project implementation and thereby reduce the resources invested in wasted negotiations. Secondly, depending on whether one of the five social constructs is shown to be negatively correlated to the successful implementation of collective, large-scale biodiversity stewardship initiatives, one could develop proactive advocacy programmes to address the shortfalls of potential stewardship participants' ecological understanding, place attachment or connectedness to nature.

**Table 3: Operational definitions of the five social constructs**

<b>Construct</b>	<b>Operational Definition</b>
Ecological Understanding	“A measure of endorsement of a “pro-ecological” world view. It is used where differences in behaviour or attitudes are believed to be explained by underlying values, a world view, or a paradigm” (Dunlap, 2000).
Place Attachment	“A three-dimensional person-process-place framework. The person dimension of place attachment refers to its individually or collectively determined meanings. The psychological dimension includes the affective, cognitive, and behavioural components of attachment, which is sometimes further divided into place identity and place dependence. The place dimension emphasizes the place characteristics of attachment, including spatial level, specificity, and the prominence of social or physical elements” (Milligan, 1998).
Connectedness to Nature	“The extent to which an individual’s view of nature is incorporated into their perception of their own sense of self, including physical, cognitive and emotional elements of that relationship” (Schultz, 2002).
Occupational Identity	“The principal means through which personal identities are developed and expressed. Occupational identity is instrumental to social life because it provides a context for deriving meaning from daily experiences and interpreting lives over time” (Phelan, 2009).
Personal Identity	“The relative importance that individuals place on various identity attributes or characteristics when constructing their self-definitions” (Cheek, 1989).
Social Identity	“The perception of oneness with a group of persons. Social identification stems from the categorization of individuals, the distinctiveness and prestige of the group, the salience of outgroups and the factors that traditionally are associated with group formation” (Cheek, 1994).

In order to follow the shift in society’s thinking from the HEP towards the new ecological paradigm as the dominant or most commonly endorsed paradigm (Riley E. Dunlap et al., 2000), it is logical to also shift management considerations to encompass the human cognitive, social and emotional aspects of ecosystem management such as those expressed as place attachment and connectedness to nature (Williams & Stewart, 1998). Williams et al., (1992) also state that existing research shows that place attachment is responsive to psychometric scaling (quantitative measurement of the construct) in other forms of social surveys (Williams et al., 1992, Jorgensen & Stedman, 2001).

It is being shown regularly and on all scales that increasing anthropogenic impacts on diminishing natural resources and collapsing ecosystems is reaching disastrous magnitudes (Suzuki, 1997; Dietz et al., 2003). This has prompted numerous studies that examine the relationship between humans and nature, including the concept of environmental altruism and environmental ethics (Degenhardt, 2002; Schultz, 2002; Mayer & Frantz, 2004; Orr, 2008 and Nisbet et al., 2009). To understand those relationships better, a fundamental component of future research should include working towards an understanding of what drives individuals to develop altruistic behaviours, even when there are associated opportunity costs (McMichael et al., 2003).

Aldo Leopold, in his book *A sand county almanac. With essays on conservation from Round River*, (1949) said that “All ethics evolved so far rest upon a single premise: that the individual is a member of a community of interdependent parts.” (p. 202). Said in another way, in order to develop environmental ethics one needs to completely comprehend the truism that if you cause harm to the system, you ultimately cause harm to yourself. Leopold goes on to say that “our intellectual emphasis, loyalties, affections, and convictions” need to embrace the whole natural environment (p. 210). Leopold argued that the importance of developing and extending the understanding of the strong link between human emotion and environmental ethics was an important progression in the concept of ecology.

When we see land as a community to which we belong, we may begin to use it with love and respect. ... That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics. (pp. xviii - xix).

The intangible, emotive feelings about nature that have been shown to be associated with pro-environmental behaviours are largely unexplored (Klinger, 1998), particularly with respect to measurement. However, being able to quantify and measure these emotions and understand their role in intrinsically motivating environmental ethics and pro-conservation behaviours can play a pivotal role in shaping incentives and beneficitation for off-reserve conservation efforts (Oskamp, 2002; Mayer & Frantz, 2004). Historically, involvement in, and commitment to, off-reserve conservation programmes has been

incentivised by external beneficiation mechanisms such as tax breaks and subsidies (Degenhardt, 2002; Kales & Maes, 2002; Osbaldiston & Sheldon, 2003; and Raymond et al. 2010), which may be shown to be less effective than the internal motivations of connectedness to nature, place attachment or ecological understanding.

Ties and connections are made through interaction and experiences with the environment and as a result of the cumulative impact of those experiences, ordinary places become places filled with meaning, and it is those meanings which serve as the objects of attachment (Casakin & Kreitler, 2008). Research towards the understanding of mobility trends, urbanization and other environmental themes has shown that people relate to places in a unique way and that it is different to how people relate to other environmental aspects (Brown et al., 2002). There is no commonly recognised definition of place attachment; however, the one offered by Milligan (1998) interprets place attachment “as an emotional link formed by an individual to a physical site that has been given meaning through interaction” (p.2).

Place attachment is a complex social construct which is not only based on an emotional response to a place, but also includes a mixture of cognitive responses such as value systems and beliefs, attitudes and memories which integrate to form meaning for a specific place. The formation of that meaning is reliant on experiences with that particular place (Eisenhauer et al., 2000; Kyle et al., 2004). It has been shown that place attachment has a significant impact on an individual’s personality and behaviour (Hummon, 1992; Giuliani, 1993; Manfredi et al., 1996). Place attachment is entrenched in an individual’s personality and influences the formation of complex characteristics such as personal identity (Fullilove, 1996) and sense of belonging (Twigger-Ross, 1996).

In their study, Raymond et al., (2010) developed a five-dimensional model to measure landholder attachments in a rural context. The purpose of developing a combined methodology to measure place attachment was to incorporate the sometimes contradictory constructs and multiple place attachment terms presented in the literature. The five-dimensional model, which is comprised of place identity, place dependence, nature bonding, family bonding, and friend bonding, all of which combine to form the social construct of place attachment, was shown to be an effective measure of rural

landholder attachment. Raymond et al., (2010) argue that an individual's attachment to a place is not developed as an isolated response to a single encounter with nature or meaningful experience with friends or family at that specific place, and that it is further influenced by the manner in which individuals form their own identity through their land-use histories.

The Connectedness to nature scale is mainly focussed on gaining an understanding of how an individual identifies himself with the natural environment and how he relates to nature. Schultz (2002) showed that the greater the extent to which an individual's self-identity includes nature the more accurately one can predict the quality of the bond that individual has with nature (Schultz, 1999; Schultz, 2002 and Schultz et al., 2004). There is strong consensus in the literature the higher the connectedness to nature scale score and the stronger the relationship between the individual and nature, the more likely an individual is to demonstrate pro-conservation behaviours. This means that emotive and intrinsic motivators that drive participation in off-reserve conservation initiatives should be considered at policy level (Kals et al., 1999; Vaske and Kobrin, 2001).

Operating under the assumption that your occupation is your chosen profession, i.e. you have not been forced by the socio-economic climate of your country or region to be employed in a unskilled labourer position when your calling and qualifications are suited to teaching mathematics at a tertiary learning institution, Christiansen (1999) argues that occupation is the primary mechanism through which an individual develops and articulates their personal identity. He goes on to show that by expressing your identity through your occupation you can gain significance from daily experiences and when these daily experiences cumulate, they give meaning to lives over time (Christiansen, 1999). In modern society, particularly once society progressed from hunter-gatherer divisions of labour, the development of an individual's occupational identity can be challenging to the point where that individual experiences stress (Skorikov & Vondracek, 2011). The occupational skill, knowledge and understanding that an individual gains over time is very seldom developed in isolation from other people because individuals learn with and from others, and help others to learn (Brown, 1996).

Ashforth & Mael (1989) describe social identification as a feeling of solidarity with a group of people. The categorisation of individuals within the group, the uniqueness and status of the group and the manner in which the group gained structure all play a role in the formation of social identification. Henri Tajfel and colleagues articulated the social identity theory in the 1970's and the use of the terms "ingroup" and "outgroup" became more common (Tajfel, 1970). In sociology, an "ingroup" is defined as a social group of people with whom an individual identifies and has a sense of belonging to (Tajfel et al., 1971) and, an "outgroup" is defined as a social group of people with whom the individual feels no affinity towards. For instance, people may feel a sense of kinship and meaning when being associated with a group known for protesting against pollution or environmental harm, such as Green Peace, and this contributes to the development of their social identity. The association with groups that can contribute to the development of social identity can be broad and varied and may include religious factions, trade unions or even gender (Tajfel et al., 1971).

When members within a group interact, there are two possible outcomes: cooperation or conflict, and the same is true for interactions between groups (Dovidio et al., 2009). It is plausible that neutrality is a third potential outcome, but, neutrality in itself can be viewed as not obstructive and would lean towards cooperation rather than conflict. Without formal structure a group is merely the coincidental occurrence of a number of people in the same place at the same time (Levine & Moreland, 2002). Structure is driven by important processes within the group such as the emergence of leaders and the influence they have on members of the group, power balances and cohesion and the success of the group in meeting its objectives (Beal et al., 2003; Brewer & Chen, 2007). The sustainability of group structure depends on a number of factors which include defined roles and functions of individual group members (Worchel & Shackelford, 1991). Groups whose members have distinct and recognised roles are more efficient, effective, and adaptive thus leading to greater resilience (Firestone et al., 1975; Peterson et al., 2000). The efficacy of the structure in maintaining group function directly influences the groups' sustainability (Harris & Fiske, 2006).

The two sites focused on in this study, namely the Baviaanskloof Hartland and the Compassberg PE described in detail in chapter 2, are both considered Conservation

Priorities (ECPTA, 2012). In addition to this they are large-scale biodiversity stewardship initiatives (targeting areas of similar size) with a similar level of ownership complexity (they have comparable numbers of landowners) in the Eastern Cape Province of South Africa. However, beyond those three commonalities, the two sites have distinct differences which are important, i.e. their social demographics and the different levels of commitment to concluding binding, long-term contractual agreements which they have demonstrated.

The demographic composition of the landowners in the Baviaanskloof Hartland was relatively homogenous with 100% of survey respondents being Afrikaans speaking males; 72% of the respondents were aged between 30 and 44 years old; 14% were aged between 45 and 59 years and 14% were older than 60 years of age.

The demographic composition of the landowners in the Compassberg PE was relatively heterogeneous with 50% of survey respondents being female; 71% of respondents were English speaking and 29% were Dutch; 14% of the respondents were aged between 30 and 44 years old; 29% were aged between 45 and 59 years and 57% were older than 60 years of age.

The collective Baviaanskloof Hartland biodiversity stewardship negotiation has been in progress for four years and has not resulted in the successful conclusion of a collective, binding contract. Landowners have either elected to proceed with negotiations individually or to temporarily suspend negotiations. Thus, for the purposes of this study, this initiative is being considered unsuccessful to date.

The Compassberg PE biodiversity stewardship negotiation was successfully concluded within seven months and has resulted in the proclamation of a protected environment which is 40 280 hectares in extent. The Compassberg PE is managed according to a SMP which has been recommended by the CEO of the Eastern Cape Parks & Tourism Agency (ECPTA) and approved as meeting the requirements laid out in NEM: PAA by the Honourable Mr M. Jonas, Member of the Executive Council (MEC) for Economic Development, Environmental Affairs and Tourism for the Eastern Cape. The Compassberg PE landowners formed and constituted a Landowners Association (CPELA) to whom Management Authority was delegated by MEC Jonas. The CPELA

has also entered into a legally binding, long-term PAMA with the ECPTA which commits both parties to achieving the objectives agreed upon in the SMP for a minimum period of 50 years.

Both biodiversity stewardship initiatives were coordinated by the same conservation practitioner and were guided by ECPTA policy, implementation guidelines and standards.

In analysing the potential reasons for the varying degrees of successful implementation of the two biodiversity stewardship initiatives, a unique opportunity emerged to gain insights into the factors that influence conservation behaviour. These observations gave rise to the following research questions:

- a) Do personal and social identity influence the likelihood and ability of an individual to participate in, and commit to, collective large-scale biodiversity stewardship initiatives?
- b) Is there a relationship between place attachment, connectedness to nature, ecological understanding and collective pro-conservation behaviour?

I hypothesised that these social constructs act as influencers on decision-making, planned and actual behaviour as detailed in Figure 2 above.

### 3.3 Methods

The five social constructs contemplated in this study were ecological understanding, place attachment, connectedness to nature, social identity and personal identity.

An initial, structured interview was carried out with all seven resident landowners at each of the two study sites (see Appendices A and B). The interviews were conducted by independent field researchers, in the interviewee's language of choice, at the landowners' homesteads. During the initial interviews, respondents were prepared for a follow-up survey and were left with a small incentive to complete and return the second survey independently (see Appendices C and D).

The decision to use independent field researchers was made in an effort to mitigate any bias due to respondents associating this research with historical interactions and relationships with the ECPTA and other conservation organisations.

#### 3.3.1 Ecological Understanding

The new ecological paradigm scale is constructed from individual responses, either agreement or disagreement, to fifteen statements that measure ecological understanding (Dunlap, 2008). There are seven statements that endorse the HEP, which are the even numbered items. Should a respondent answer positively to these items by indicating a response value of one or two, it would reflect an endorsement of the HEP. The remaining eight statements, the odd numbered items, endorse the new ecological paradigm. Should a respondent answer positively to these items by indicating a response value of one or two, it would demonstrate an endorsement of the new ecological paradigm, see Table 4 below. Using a Likert scale, a commonly used rating scale developed by Likert (Bertram, 2007) that measures cognitive and affective components of attitudes, interviewees are requested to show how strongly they agree or disagree with a given statement or item on a sliding scale of one to five (one = strongly agree, two = agree, three = unsure, four = disagree and five = strongly disagree), and the scores are then summed (Dunlap, 2008). In order to give an indication of the reliability of the responses, items 4, 12, and 13 are reversed scored. For a reverse scored item, the "strongly disagree" and "disagree"

responses make up the favourable score and the “strongly agree” and “agree” responses make up the unfavourable score. Those scores are then re-valued during statistical analysis and the adjusted scores are summed. The total scale score ranges from a minimum possible total score of 14 to a maximum possible total score of 75.

**Table 4: The Revised New Ecological Paradigm Scale (Dunlap et al., 2000)**

1	We are approaching the limit of the number of people the Earth can support
2	Humans have the right to modify the natural environment to suit their needs
3	When humans interfere with nature it often produces disastrous consequences
4	Human ingenuity will insure that we do not make the Earth unliveable
5	Humans are seriously abusing the environment
6	The Earth has plenty of natural resources if we just learn how to develop them
7	Plants and animals have as much right as humans to exist
8	The balance of nature is strong enough to cope with the impacts of modern industrial nations
9	Despite our special abilities, humans are still subject to the laws of nature
10	The so-called “ecological crisis” facing humankind has been greatly exaggerated
11	The Earth is like a spaceship with very limited room and resources
12	Humans were meant to rule over the rest of nature
13	The balance of nature is very delicate and easily upset
14	Humans will eventually learn enough about how nature works to be able to control it
15	If things continue on their present course, we will soon experience a major ecological catastrophe

### 3.3.2 Place Attachment

The three major elements that give depth to this construct are the emotional bond the individual has with the place, the meaning of the place to the individual and the interactions that occur between the individual and the place (Raymond, Brown, & Weber, 2010). When focusing on the first element only, which is the emotional bond that the individual has developed with the place, then place attachment is defined as “an emotional connection of an individual to a physical location” (Jorgensen & Stedman, 2001). The feelings associated with that connection can be positive, negative or neutral (Fuhrer et al., 1993; Guillian & Feldman, 1993). When unpacking the second element, meaning, it is important to realise that thinking about a place may initiate a wide variety of emotional responses such as sentiments of belonging, needing, happiness or contentment and Gustafson (2001) suggests that the meaning an individual gives to the

place gives rise to the emotional bonds. The third component, the interactions that occur between the individual and the place, create the meaning of the place. Thus, for an individual to develop place attachment, that person would need to have a meaningful interaction with the place that was significant enough to evoke an emotional response which is then internalised as meaning. The type of trigger and response is associated with the personal identity of the individual (Milligan, 1998).

Daniel Williams, in his extensive research into environmental psychology, consumer behaviour and recreation in natural places generated a list of 61 potential place attachment items. He tested the items for validity and dependability by requesting university students to contemplate their responses with respect to a "wilderness, backcountry, roadless or natural area" they had recently been to (Williams, 2000). Interviewees are requested to respond to the items on a five point Likert scale. The 61 potential items, for example "This place means a lot to me" and "I wouldn't substitute any other area for doing the type of things I did here" are scaled down to a truncated list and tailored to suit to site. Depending on the needs of the study, some researchers use specific place names when developing items rather than "this place" or "here" (Vorkinn 2001) as I have in this study, see Table 5 below.

**Table 5: The Place Attachment Scale, tailored for the Baviaanskloof Hartland, adapted from Williams (2000)**

1	The Baviaanskloof is very special.
2	Living in the Baviaanskloof says a lot about who I am.
3	My relationships in the Baviaanskloof are very special to me.
4	The Baviaanskloof means a lot to me.
5	I get more satisfaction living in the Baviaanskloof than I would from any other place.
6	I feel that the Baviaanskloof is part of me.
7	The things I do in the Baviaanskloof I would enjoy just as much at another site.
8	Most of my friends are in some way connected with my use of the Baviaanskloof.
9	I identify strongly with the Baviaanskloof.
10	I would feel less attached to the Baviaanskloof if the indigenous plants and animals that live here disappeared.
11	I would not substitute any other area for the activities I do in the Baviaanskloof.
12	I use the Baviaanskloof to help define and express who I am.
13	I am very attached to the Baviaanskloof.

### 3.3.3 Connectedness to Nature

Quantifying the notion of connectedness to nature has been attempted by using a variety of measures (Schultz, 2002; Mayer & Frantz, 2004; and Nisbet et al., 2009). The connectedness to nature scale (CNS) is a 14 item measure, see Table 6 below, was developed Mayer and Frantz (2004) and has its foundations in the inclusion of nature in self (INS) concept proposed by Schultz in 2002. The connectedness to nature scale measures the emotional component of nature connectedness (Mayer & Frantz, 2004). The validity of the construct has been tested and shows a correlation with Schultz's single item INS (Mayer & Frantz, 2004; Frantz et al., 2005), as well as with additional proxies for pro-conservation behaviours (Mayer et al., 2009).

**Table 6: The Connectedness to Nature Scale (Mayer & Frantz, 2004)**

1	I often feel a sense of oneness with the natural world around me.
2	I think of the natural world as a community to which I belong.
3	I recognize and appreciate the intelligence of other living organisms.
4	I often feel disconnected from nature.
5	When I think of my life, I imagine myself to be part of a larger cyclical process of living.
6	I often feel a kinship with animals and plants.
7	I feel as though I belong to the Earth as equally as it belongs to me.
8	I have a deep understanding of how my actions affect the natural world.
9	I often feel part of the web of life.
10	I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.
11	Like a tree can be part of a forest, I feel embedded within the broader natural world.
12	When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.
13	I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.
14	My personal welfare is independent of the welfare of the natural world.

### 3.3.4 Occupational Identity

In their research, West et al., (2006) explored how changes in agriculture and the contemporary pressures on farmers are impacting on farmers' self-concepts and attitudes. Farmers are having to adjust the time horizon context of their planning from multi-

seasonal to multi-generational to become climate change resilient. There has also been a shift from traditional gender-based roles and the division of labour in farming enterprises (Bryant, 1999).

In spite of an increasing perception that farmers are progressively more occupied with, and planning for, the conservation of natural resources, farmers' self-concepts are still governed by production-oriented identities (Burton & Wilson, 2006). The scale used in this study, Table 7 below, was developed to elicit responses along the linear transition (West et al., 2006).

**Table 7: The Occupational Identity Scale, developed for use in the study by the author and adapted for each study site**

1	Carbon is not an agricultural product.
2	Water is not an agricultural product.
3	Changing my current land-use practices is a matter of survival, not choice.
4	If I could maintain my current income levels from non-consumptive land-uses, I would change my land-use immediately.
5	Conservation and farming cannot work together on the same farm.
6	<i>Die Baviaanskloof Hartland</i> gives me a sense of community.
7	I believe the ECPTA is doing their best for the environment in the Eastern Cape.
8	The Baviaanskloof Municipality takes our needs seriously.
9	To be able to call myself a farmer, I must produce an agricultural product.
10	My biggest fear when considering a change in land-use is having to rely on others for skills and knowledge.

### 3.3.5 Social and Personal Identity

To encourage landholders to conserve or restore biodiversity on their properties, government and civil society organisations develop programmes such as Community Based Natural Resource Management (CBNRM); conservation easements, covenants and servitudes; corridors and refuges; that provide support and incentives to landowners and land-users as enablers of conservation actions (Cocklin et al., 2007; Vaccaro & Norman, 2008). Until now, those endeavours have failed to mitigate global biodiversity loss and there seems to be no evidence that the rate at which biodiversity is declining is reducing (Whitten et al., 2001; Hamblin, 2009; Hajkowicz, 2009; Stokstad, 2010; Greiner & Gregg, 2011).

However, the failure to slow or stop biodiversity loss is not due to a lack of ecological understanding, but rather attributable to a lack of understanding of “people and the choices they make” (Cowling et al., 2007, p135). Biodiversity conservation actions on private land are dependent on the motivations and limitations of those people undertaking the actions (Moon et al., 2012). Thus, gaining a better understanding of the personal and social dimensions of landowners should be considered vital when informing policy and designing programmes that aim to address biodiversity loss on private land, because, it is these dimensions that influence landholders’ resource use decisions and pro-conservation behaviours (Cocklin et al., 2007).

**Table 8: The Aspects of Identity Questionnaire – IV, survey instrument adapted from Cheek et al., (2002) for the Baviaanskloof Hartland**

1	My personal values and moral standards.
2	The ways in which other people react to what I say and do.
3	My personal goals and hopes for the future of the landscape.
4	My religion.
5	My reputation, what others think of me.
6	Places where I live or where I was raised.
7	My thoughts and ideas.
8	My age, belonging to my age group or being part of my generation.
9	The ways I deal with my fears and anxieties.
10	My feeling of being a unique person, being distinct from others.
11	My social class, the economic group I belong to whether lower, middle, or upper class.
12	My feeling of belonging to my community.
13	Knowing that I continue to be essentially the same person although external circumstances may change.
14	My commitment to being a concerned parent.
15	My feeling of pride in my country, being proud to be a citizen.
16	My occupational choice.
17	My commitments on political issues or my political activities.
18	My language, such as my regional accent or dialect or a second language that I know.
19	My role of being a farmer in the Baviaanskloof.

### 3.3.6 Statistical Analysis

This is a small dataset so all conclusions are to be interpreted with caution, however, it is worth noting that at each study site I achieved a 100% response rate and thus these results represent a census of the entire population. A further caveat is that two of the scales, *viz*: the connectedness to nature scale and occupational identity scale scales, do not meet the minimum levels of test-retest reliability for a scale, nor are they uni-dimensional. There are also clear signs that the new ecological paradigm scale is multi-dimensional. These facts could bias the results. There are a small number of N/A's in the dataset, in all cases these have been replaced with the median value of the variable (Difford, 2013). Table 9 below describes the abbreviations used for the variables. The key to multivariate statistics is understanding the conceptual relationship among techniques with regards to the kinds of problems each technique is suited for and the objective of each technique.

Latent-variable scores were estimated using the classical-test-theory (CTT) (Crocker & Algina, 1986) method of taking the mean score of the items in the scale. This is a maximum likelihood estimate, because the sample mean is a maximum likelihood estimate of the population mean.

The Wilcoxon rank-sum test assumes that the two sets of scores being compared have the same (or similar) distributions and that what is being tested is a so-called location-shift. The common interpretation of such a shift, if the null hypothesis of no difference in location is rejected, is that the scores in one population/group tend to be larger/smaller than those in the other population/group. The null hypothesis ( $H_0$ ) tested is that the distribution of scores in the two districts differs by a location shift of  $\Delta = 0$ , i.e. that they do not differ; the alternative is that they differ by some other shift, i.e.  $H_1: \Delta \neq 0$ . If the null hypothesis is rejected, the usual interpretation is that one group tends to have larger values than the other group.

Principal component analysis (PCA) finds the principal components of data and is an effective method used to measure data in terms of its principal components rather than on a normal x-y axis. Principal components are the underlying structure in the data and are the directions where there is the most variance. The partial least squares (PLS) technique

is widely used technique in where the number of independent variables is significantly larger than the number of data points, as was the case in this study. The PLS method finds a linear regression model by projecting the predicted variables and the observable variables to a multidimensional space. Classification and regression trees (CART), a recursive partitioning method, build classification and regression trees for predicting continuous dependent variables and categorical predictor variables. Redundancy analysis (RDA) allows the study of the relationship between two tables of variables to obtain a simultaneous representation of the observations, the X and Y variables, in two or three dimensions.

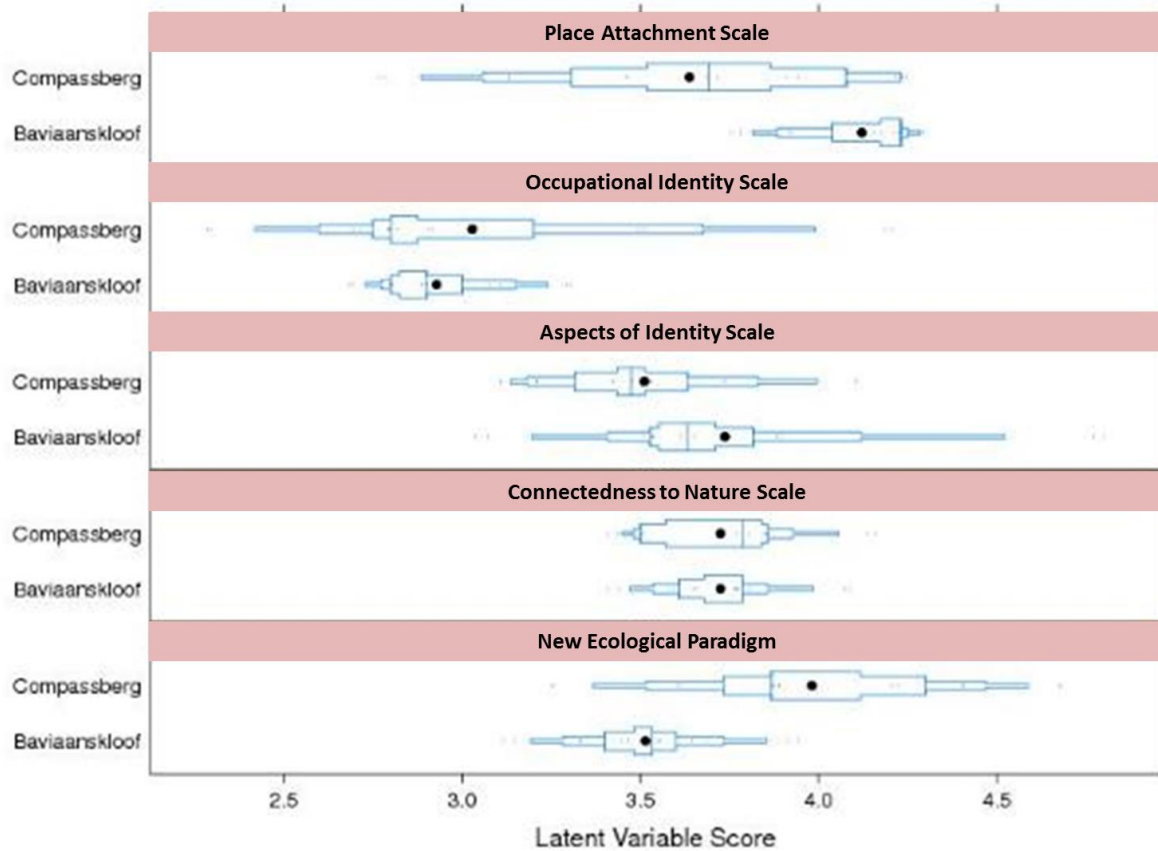
**Table 9: Abbreviations used for variables**

Abbreviation	Description	Type of Variable
<b>Scales</b>		
NEP	New ecological paradigm [Scale]	Ratio
CNS	Connectedness to Nature Scale	Ratio
AIS	Aspects of Identity Scale	Ratio
OIS	Occupational Identity Scale	Ratio
PAS	Place Attachment Scale	Ratio
<b>Ancillary Variables</b>		
Gender	Gender	Nominal
Age	Age	Nominal
MoT	Mother tongue	Nominal
Child	Number of children	Ordinal
YrF	Number of years farming	Ordinal
YrO	Number of years the farmer has owned the land	Ordinal
FSz	Size of farm in hectares	Ratio
PtS	Planning to sell within five years	Nominal
CnO	Conservation Opportunity	Nominal
District	Study Sites	Nominal

## 3.4 Results

### 3.4.1 Differences in social constructs between the two study sites

The Wilcoxon rank-sum test showed that the latent-variable scores for new ecological paradigm and place attachment scale were significantly different at the two districts, but only at the 10% level of significance. Due to the fact that at each study site, I achieved a 100% response rate and thus conducted a population census as opposed to a sample, I believe the 10% level of significance is acceptable in this instance. The latent-variable scores have largely different distributions in the two districts, with possible exceptions being connectedness to nature scale and aspects of identity scale. The Compassberg PE respondents' new ecological paradigm scores were higher than those of the Baviaanskloof respondents, as shown in Figure 13 below. Whereas, conversely, the place attachment scale scores of the Baviaanskloof respondents were higher than those of the Compassberg PE respondents. These data are detailed in Table 10 below.



**Figure 13: Box-percentile plots of latent variable (i.e. scale) scores, conditioned on district**

The data, shown in Table 10 below, are the results from the latent variable scores obtained from the responses to the five social construct scales presented to the landowners at each of the study sites, determined using the Wilcoxon rank-sum test (also known as the Mann-Whitney U test). Column *a* represents the lower quartile, column *b* in bold font represents the median and column *c* the upper quartile.

**Table 10: Exact Wilcoxon rank-sum test of district for the five latent variables**

Latent Variable	Baviaanskloof N = 7			Compassberg N = 7			Combined N = 14			Test Statistics			
	<i>a</i>	<i>b</i>	<i>c</i>	<i>a</i>	<i>b</i>	<i>c</i>	<i>a</i>	<i>b</i>	<i>c</i>	$\Delta$	CI <sub>l</sub>	CI <sub>u</sub>	Wilcoxon
NEP	3.40	<b>3.53</b>	3.60 (3.5 ± 0.25)	3.73	<b>3.87</b>	4.30 (3.98 ± 0.48)	3.48	<b>3.63</b>	3.92 (3.75 ± 0.44)	-0.467	-0.933	0.067	$Z = -1.875, P = 0.066$
CNS	3.61	<b>3.79</b>	3.79 (3.72 ± 0.20)	3.50	<b>3.79</b>	3.86 (3.72 ± 0.26)	3.52	<b>3.79</b>	3.84 (3.72 ± 0.22)	0.000	-0.286	0.286	$Z = -0.194, P = 0.869$
AIS	3.53	<b>3.63</b>	3.82 (3.74 ± 0.53)	3.32	<b>3.47</b>	3.63 (3.51 ± 0.33)	3.43	<b>3.53</b>	3.74 (3.62 ± 0.44)	0.158	-0.211	0.632	$Z = 1.028, P = 0.332$
OIS	2.80	<b>2.90</b>	3.00 (2.93 ± 0.21)	2.75	<b>2.80</b>	3.20 (3.03 ± 0.63)	2.80	<b>2.85</b>	3.05 (2.98 ± 0.45)	0.000	-0.700	0.400	$Z = 0.260, P = 0.823$
PAS	4.04	<b>4.23</b>	4.23 (4.12 ± 0.20)	3.31	<b>3.69</b>	4.08 (3.64 ± 0.55)	3.71	<b>4.04</b>	4.23 (3.88 ± 0.47)	0.462	0.000	1.077	$Z = 1.832, P = 0.076$

$\Delta$  is the location shift, *i.e.* the observed difference in location between the two districts. It is often mistakenly assumed that this represents the difference in medians of the two groups. It does not; it represents the median of the difference between a sample from one group and a sample from another group, for all possible pairwise combinations of the elements of the two groups, *i.e.* the Hodges-Lehman estimator is used.

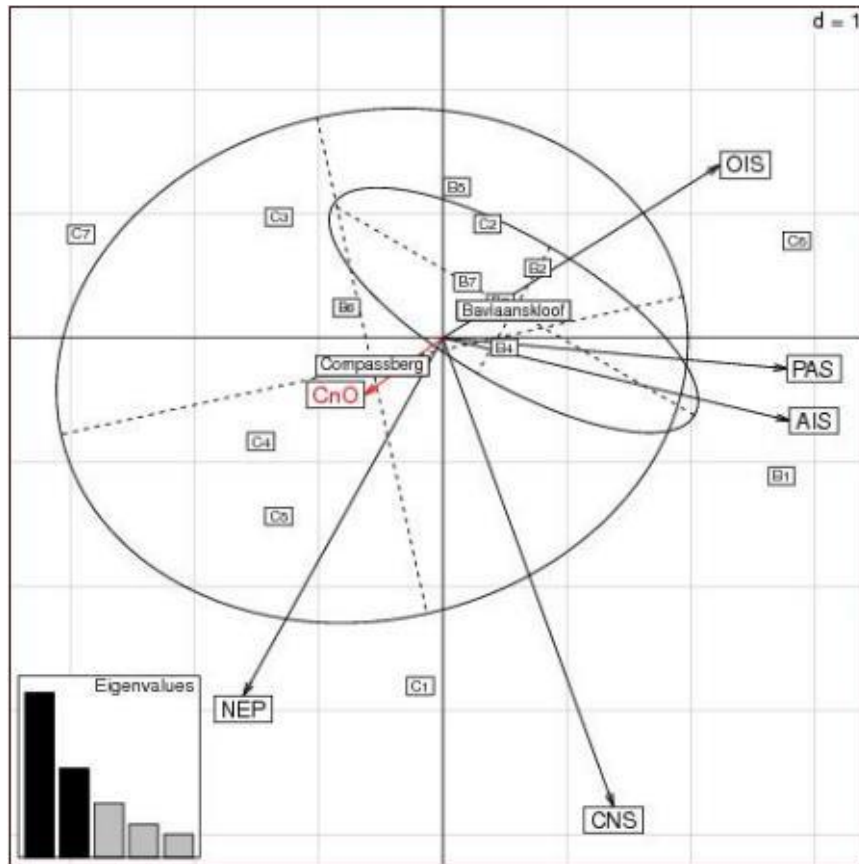
CI<sub>l</sub>/CI<sub>u</sub> are the lower/upper 95 % exact confidence intervals for the difference in location, as part of the Wilcox\_test function in package coin.

The Wilcox\_test function of the coin add-on package (Hothorn et al., 2006, Hothorn et al., 2008) for R was used to carry out the tests. Exact p-values were calculated using the “shift” algorithm of Streitberg and Röhmel (1986).

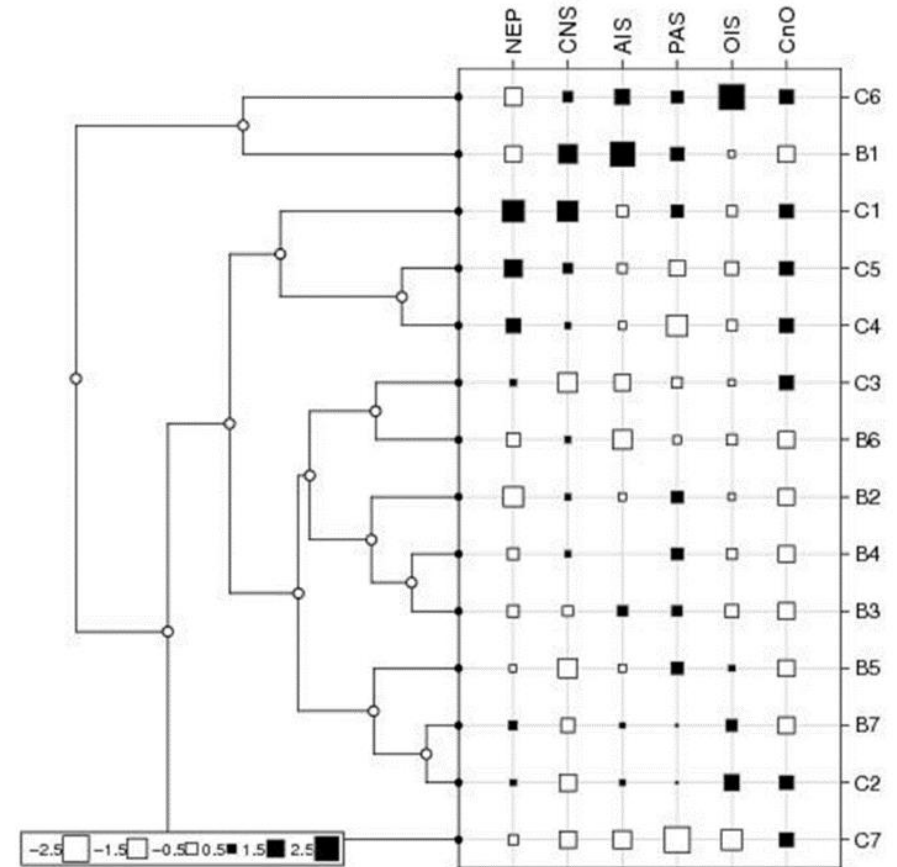
### **3.4.2 Relationships between the latent variables**

#### Exploratory Multivariate Analyses

The main analysis in this section is the biplot of a principal component analysis of the latent variables, together with conservation opportunity as the end-point or objective, shown in Figures 14 (a) and (b). Columns in the associated table of values are arranged based on column scores from the first dimension of a correspondence analysis of the raw data table (see Figure 16).



(a) Distance biplot of a PCA of the latent variables



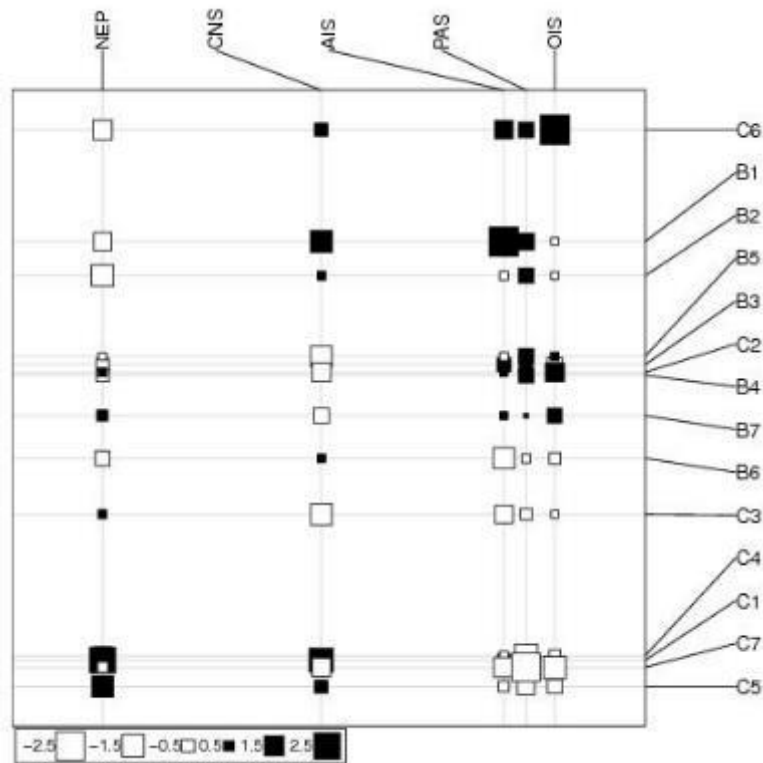
(b) Complete linkage cluster analysis with associated table of standard values

**Figure 14: Distance biplot of a principal component analysis of the latent variables**

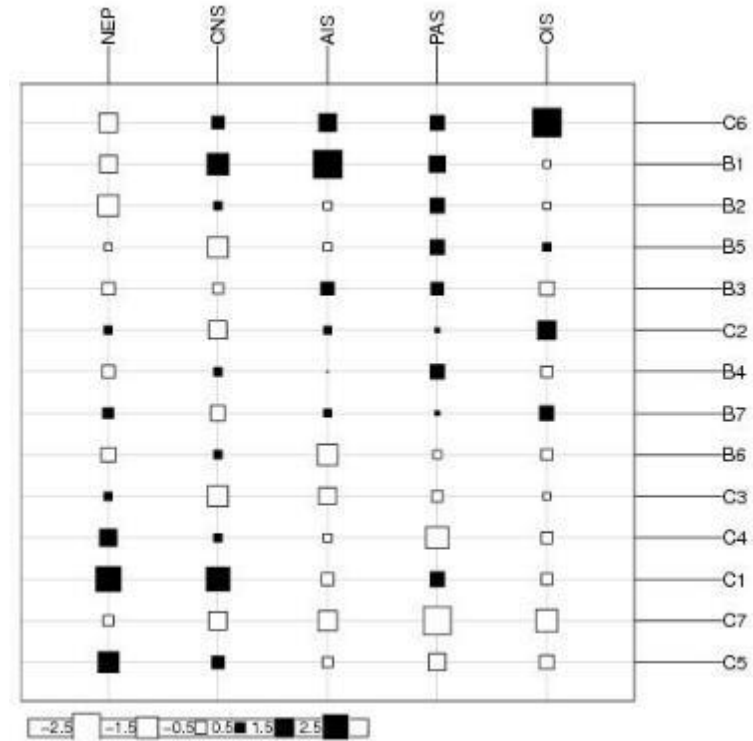
Dimensions 1 and 2 accounted for 69.6% (45.2% + 24.4%) of the inertia, thus they provide an adequate description of the full five dimensions. The first dimension is approximately twice as important as the second dimension; the third dimension explains just 14.9% of the inertia (see the inset Eigenvalues plot). Conservation opportunity (drawn in red) and the class ellipses were mapped onto the ordination after the extraction of eigenvalues, *i.e.* they are not instrumental to forming the axes. The ellipses are data ellipses (not confidence ellipses) and encircle 67% of the records in the class. The axes of each ellipse are the principal axes of the cloud of points in the class and show the main directions of variation of the class. Letters followed by numerals refer to the survey respondents.

Consequently, we see that there is much more variation in responses at Compassberg than there is at Baviaanskloof (also clearly shown in Figure 13). More especially, we see that at Baviaanskloof there is little variation in scores on new ecological paradigm, occupational identity scale, and conservation opportunity (because the main axis of the ellipse is approximately orthogonal to these vectors, so it is the short, secondary axis of the ellipse that shows the associated variation).

Figure 15 (a) shows a table-value plot of dimension 1 of a correspondence analysis of the latent variables. Dimension 1 accounts for 56.0% of the variation. Sub-figure (b) repeats sub-figure (a), but uses ranked scores to arrange the observed data, so that overlapping rows/columns can be seen. The plot uses the scores from the first dimension of a correspondence analysis to arrange the standardized observed data (the observed data in this case being the averaged scale-scores or latent variables) in a table-like arrangement. This enables visualisation of which respondents (rows) and which latent variables (columns) have similar response-patterns.



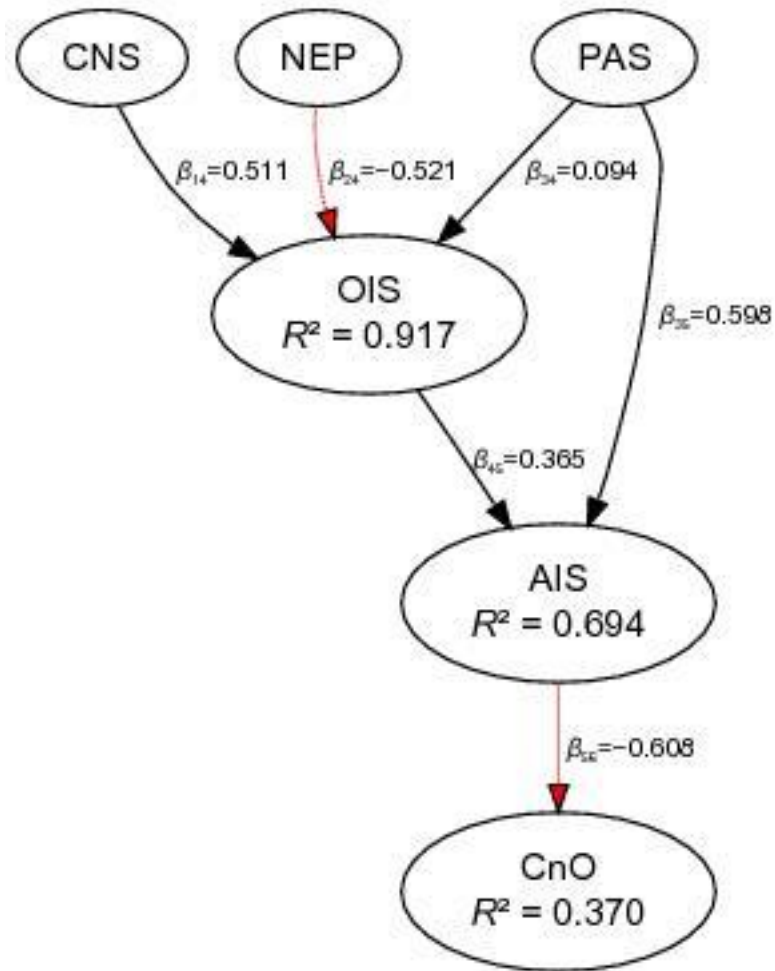
(a) Correspondence analysis table-value plot of axis 1



(b) Correspondence analysis table-value plot of axis 2

**Figure 15: Total value plot of dimension 1 for the five social constructs**

Two theoretical models were proposed and fitted based on the conceptual model of the hypothesis (Figure 2). Some latent variables are determined by the models, endogenous variables, while others are assumed to be determined by factors outside of the models, exogenous variables. An alternative model was fitted and presented because partial least squares path modelling allows estimating complex cause-effect relationship models with latent variables and is more oriented towards maximizing the amount of variance explained (prediction) rather than statistical accuracy of the estimates. The two models are illustrated below in Figures 16 and 17, and are summarized in Tables 11 and 12. In the preferred model (the first model), aspects of identity scale scores are directly influenced by occupational identity scale and place attachment, and is indirectly influenced by connectedness to nature scale and new ecological paradigm. Conservation opportunity is directly influenced only by aspects of identity scale scores. The influence is negative, meaning that an increase in aspects of identity scale scores are associated with (or causes) a decrease in conservation opportunity. All the other latent variables indirectly influence conservation opportunity, but only new ecological paradigm has a positive influence; that is, an increase in new ecological paradigm scores is associated with an increase in conservation opportunity scores.

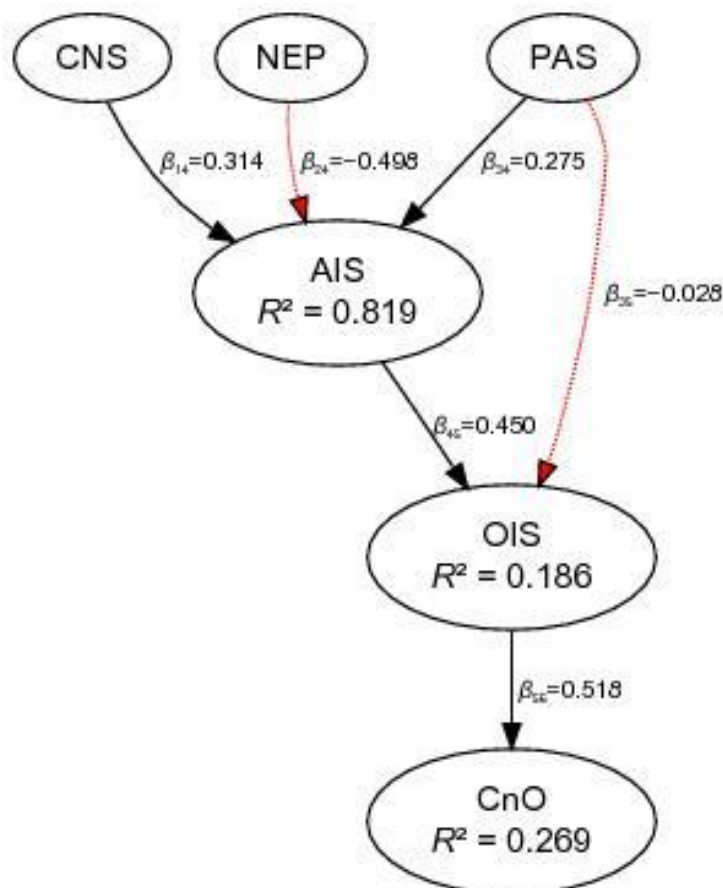


**Figure 16: Structural model of a partial least squares path model of the preferred theoretical model**

**Table 11: Summary statistics and quality indices for the preferred theory-based partial least squares path model**

LV	LV-type	Summary of Structural Model				Reliability / Dimensionality					
		MV's	Preds	R <sup>2</sup>	R <sup>2</sup> adj	Av. C	Av. R	αstd	ρdg	Eig. 1	Eig. 2
CNS	Ex.R	14	Na	Na	Na	0.185	Na	0.263	0.293	4.419	2.519
NEP	Ex.R	15	Na	Na	Na	0.319	Na	0.708	0.722	4.812	3.437
PAS	Ex.R	13	Na	Na	Na	0.478	Na	0.773	0.897	5.985	3.479
OIS	En.R	10	3	0.9175	0.8950	0.274	0.251	0.819	0.151	6.321	2.040
AIS	En.R	19	2	0.6940	0.6429	0.261	0.181	0.418	0.783	2.985	2.220
CnO	En.R	1	1	0.3700	0.3215	1.000	0.370	1.000	1.000	1.000	Na
Average				0.6605		0.300	0.216				
Model Goodness of Fit (GoF)				Value							
Global				0.4450							
Relative				0.7892							
Outer Model				0.9711							
Inner Model				0.8127							

Abbreviations: LV = latent variable/construct; MV = measurement variable; Ex.R = Exogenous, Reflective; En.R = Endogenous, Reflective; Mvs give the number of MVs (items/indicators/measurement variables) in the construct/LV; Preds gives the number of predictors of the LV;  $R^2$  is the coefficient of determination or fraction of variance explained;  $R^2$  adj is  $R^2$  penalized by degrees of freedom; Av.C is the average communality (communality index) and is the same as the average variance extracted (AVE, not shown); Av.R is the average redundancy (redundancy index);  $\alpha$  std is Cronbach's alpha (standardized);  $\rho$  dg is Dillon-Goldstein's (or Jöreskog's) rho (*aka* composite reliability); Eig.1/Eig.2 are the first and second eigenvalues from a principal component analysis of the standardized manifest variables, *i.e.* items/indicators of the construct. The structural model of a partial least squares path model for the alternative theoretical model is presented in Figure 17, below.

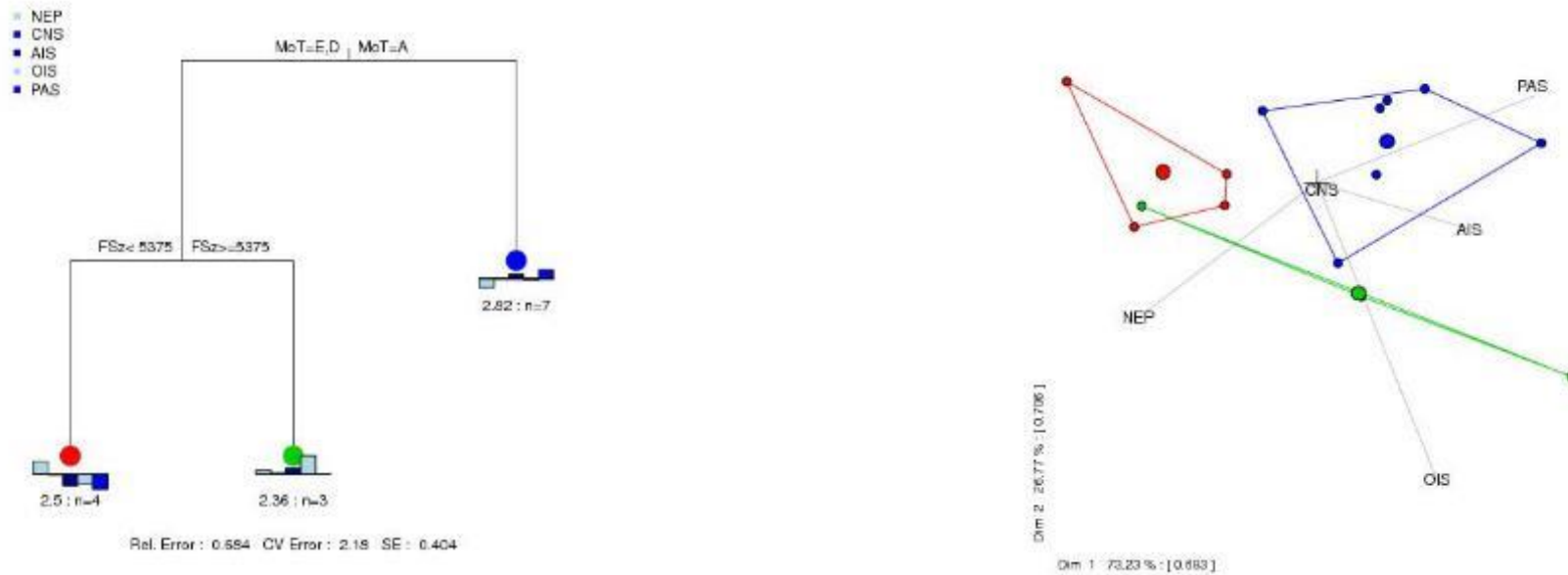


**Figure 17: Structural model of a partial least squares path model of the alternative theoretical model**

**Table 12: Summary statistics and quality indices for the alternate theory-based partial least squares path model**

LV	LV-type	Summary of Structural Model				Reliability / Dimensionality					
		MV's	Preds	R <sup>2</sup>	R <sup>2</sup> adj	Av. C	Av. R	αstd	ρdg	Eig. 1	Eig. 2
CNS	Ex.R	14	0	Na	0.0000	0.300	Na	0.263	0.662	4.419	2.519
NEP	Ex.R	15	0	Na	0.0000	0.261	Na	0.708	0.131	4.812	3.437
PAS	Ex.R	13	0	Na	0.0000	0.479	Na	0.773	0.900	5.985	3.479
AIS	En.R	19	3	0.8194	0.7701	0.303	0.249	0.819	0.851	6.321	2.040
OIS	En.R	10	2	0.1856	0.0498	0.245	0.046	0.418	0.461	2.985	2.220
CnO	En.R	1	1	0.2685	0.2123	1.000	0.268	1.000	1.000	1.000	Na
Average				0.4245		0.318	0.147				
Model Goodness of Fit (GoF)				Value							
Global				0.2673							
Relative				0.6281							
Outer Model				0.9528							
Inner Model				0.6592							

To determine what is driving the latent variables (ecological understanding, connectedness to nature and place attachment), the variance they share with aspects of identity scale and occupational identity scale was removed and 77.4% of the original variance of the three variables remains. Removing this shared variance precludes interference with any ensuing analysis aimed at determining what might be driving the variation of the three exogenous variables.

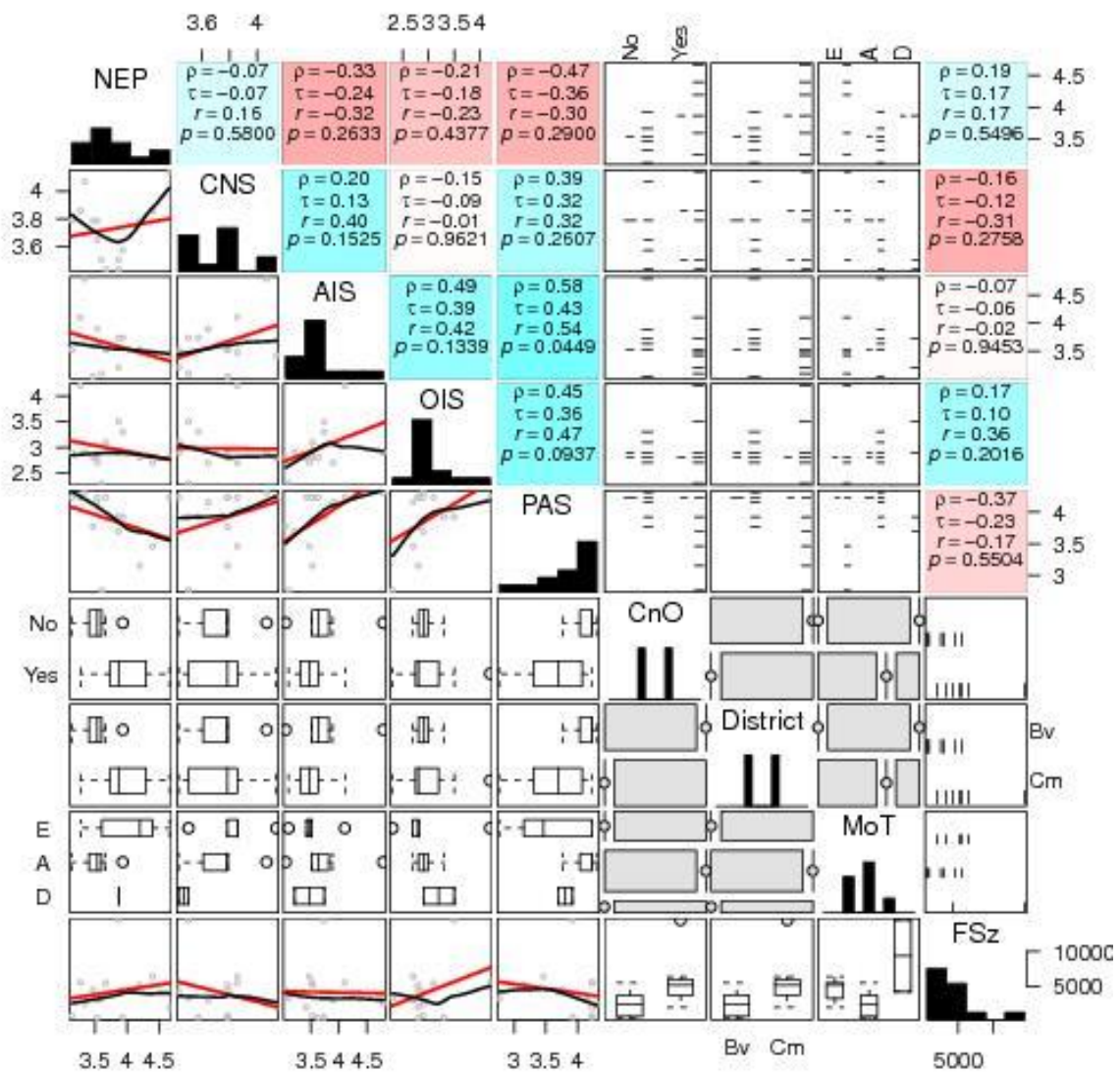


(a) Multivariate classification and regression tree of the latent variables.

(b) Distance biplot of the multivariate classification and regression tree-based redundancy analysis of the predictors of the latent variables.

**Figure 18: (a) & (b) Classification and regression trees**

The structural model of the preferred theoretical model has a pseudo  $R^2$  of 0.32, meaning it explains 31.6% of the variance of the latent variables. With three groups, just two dimensions can be extracted, meaning that the biplot shows 100% of the variation explained by the analysis (i.e. the 31.6% of the variance in the matrix of latent variables that is associated with its regression on the predictor variables). Relationships between the latent variables and the ancillary variables are summarised by the pairs plot in Figure 19 below (variance explained = 31.6%,  $p = 0.026$ , based on 50,000 repetitions of a Monte-Carlo permutation test). Pairs plots are a useful way of displaying the pairwise relations between variables in a dataset.



**Figure 19: Pairs plot of the key variables in the dataset**

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*How do social and personal identity, sense of place, connectedness to nature and environmental understanding influence the implementation of collective, large-scale biodiversity stewardship initiatives in South Africa?*

Due to the small size of the ancillary dataset, one can draw conclusions merely by looking at the data shown in Table 13 below.

**Table 13: Full ancillary data set**

##	Gender	Age	MoT	Child	YrF	YrO	FSz	PtS	CnO	District
## B1	M	30-44	A	2	21-30	21-30	2500	No	No	Baviaanskloof
## B2	M	30-44	A	3	21-30	21-30	800	No	No	Baviaanskloof
## B3	M	30-44	A	2	11-20	11-20	3000	No	No	Baviaanskloof
## B4	M	30-44	A	2	21-30	1-10	500	No	No	Baviaanskloof
## B5	M	45-59	A	2	21-30	31-40	5500	No	No	Baviaanskloof
## B6	M	60+	A	3	11-20	41-50	4500	No	No	Baviaanskloof
## B7	M	30-44	A	3	1-10	1-10	570	No	No	Baviaanskloof
## C1	M	45-59	E	1	1-10	1-10	2000	No	Yes	Compassberg
## C2	F	60+	D	3	1-10	1-10	14500	No	Yes	Compassberg
## C3	M	60+	D	3	11-20	11-20	4200	No	Yes	Compassberg
## C4	M	30-44	E	1	11-20	11-20	5200	No	Yes	Compassberg
## C5	F	60+	E	2	1-10	1-10	6400	No	Yes	Compassberg
## C6	M	60+	E	2	41-50	41-50	5550	No	Yes	Compassberg
## C7	F	45-59	E	3	21-30	31-40	3300	Maybe	Yes	Compassberg

Conservation opportunity splits perfectly with district, as does mother tongue. Afrikaans (A) is the only mother-tongue at Baviaanskloof and it only occurs there. Another notable relationship is that between gender and district, in the Baviaanskloof, only men are responsible for decision-making.

## **3.5 Discussion**

### **3.5.1 Ecological Understanding**

The new ecological paradigm scale scores were significantly higher for the Compassberg PE respondents than those of the Baviaanskloof Hartland respondents, at the 10% level of significance. The preferred theoretical model resulting from a partial least squares test shows that the new ecological paradigm score was the only social construct that has a positive influence on conservation opportunity, thus the higher the new ecological paradigm score the more likely the landowner is to enter into a legally binding, collective, large-scale biodiversity stewardship contract. Again, one needs to bear in mind that a population census was achieved at both study sites, thus I believe that the 10% level of significance is meaningful.

My finding above was also shown by Moon et al., (2012) in their study of the social and personal characteristics of landowners as factors influencing the participation in off-reserve biodiversity conservation programmes in Australia. They showed that there is a strong correlation between individuals' attitudes and their participation in programmes. This was evidenced by the responses to the items in the new ecological paradigm scale where non-participants positively responded to HEP aligned items such as "the so-called 'ecological crisis' facing humankind has been greatly exaggerated", compared to programme participants whose responses were positively aligned to pro-new ecological paradigm items such as "if things continue on their present course, we will soon experience a major ecological catastrophe" (Moon et al., 2012).

### **3.5.2 Place Attachment**

The place attachment scale scores for the Baviaanskloof Hartland were significantly higher than those for the Compassberg PE. The preferred theoretical model resulting from a partial least squares test shows that the place attachment scale score does have an influence on conservation opportunity, however, the influence is negative. The higher the place

attachment scale score the less likely the landowner is to enter into a legally binding, collective, large-scale biodiversity stewardship contract.

My findings are contrary to those of Vorkinn (2001) who found that place attachment is a significant driver of environmental concern. Similarly, Vaske & Kobrin (2001) showed that environmentally responsible behaviour is influenced by attachment to a local natural resource. They went on to further suggest that proactively developing an individual's attachment to a place will develop pro-conservation behaviour. Halpenny (2010) established the strength of influence of place attachment and how it is correlated to place-specific pro-conservation intentions.

I posit that, in this study, the high place attachment scale scores are an underlying driver of the unwillingness of landowners to commit to the collective biodiversity stewardship agreement and could be attributed to the desire of landowners to remain completely and solely responsible for decision-making on their land – something which is seen as being relinquished when entering into a collective biodiversity stewardship agreement.

### **3.5.3 Connectedness to Nature**

My results showed that connectedness to nature scale scores have the least significant influence on conservation opportunity and the two sets of scores were shown to be very similar between the Baviaanskloof Hartland and Compassberg PE respondents.

The literature supports a strong positive correlation between connectedness to nature and pro-conservation intentions and behaviour (Kals et al., 1999). In two separate studies, Mayer & Frantz (2004) also found moderate correlations between pro-conservation behaviour and connectedness to nature. Participation in native vegetation regeneration programmes increased as connectedness to nature scores increased, and the correlation was shown to be significant, although it only accounted for a moderate amount of the variation in behaviour (Gosling & Williams, 2010).

I propose that although my results show that connectedness to nature scale was the least significant of the five social constructs in this study, it remains an indirect driver of occupational identity as shown in the results from the partial least squares test in Figure 16

and Table 11. I believe that connectedness to nature plays a valuable role in determining planned behaviour, however it may not play a significant role in determining actual behaviour.

### **3.5.4 Occupational, personal and social identity**

The preferred theoretical model resulting from a partial least squares test shows that aspects of identity scale scores were directly influenced by occupational identity and place attachment, and was indirectly influenced by connectedness to nature and ecological understanding. Conservation opportunity is directly influenced only by aspects of identity scale. The influence is negative, meaning that an increase in aspects of identity scale scores is associated with (or causes) a decrease in conservation opportunity. All the other latent variables indirectly influence conservation opportunity, but only the new ecological paradigm score has a positive influence; that is, an increase in new ecological paradigm scores is associated with an increase in conservation opportunity scores.

I have shown that there was considerably more variation in responses from the Compassberg PE than there was recorded from the Baviaanskloof Hartland respondents. There was very little variation in new ecological paradigm scores, occupational identity scale scores and conservation opportunity scores between Baviaanskloof respondents. This could be due to the fact that all Baviaanskloof Hartland respondents have the same occupation, thus had similar occupational identity scale scores. Whereas, Compassberg PE respondents have diverse occupations and correspondingly diverse occupational identity scale scores.

Clayton & Brook (2005) showed that pro-environmental behaviours, such as recycling or minimising energy consumption are significantly positively correlated to individuals with an expansive environmental identity. Whitmarsh & O'Neill (2010) show that self-identity is appreciably more dominant in governing actual behaviour than the theory of planned behaviour is, however, only for specific pro-conservation actions. Arnocky et al., (2007) found that an environmentally aware self-identity that is shaped intrinsically predicts pro-conservation actions that are centred around concern for one's immediate environment, whereas, an environmentally aware self-identity that has been shaped by ingroup

influences is more likely to predict pro-conservation behaviours such as cooperative resource management.

I would encourage further research into the dynamics of group structure and how ingroup behaviour influences the long term stability of a landowners association and its capacity to maintain the mandate of being the management authority of a protected environment.

The relationship between the latent variables and the ancillary variables cannot be considered conclusive; however they do provide relatively useful insights into the development of a conservation opportunity measure.

### **3.6 Conclusion**

The purposes of this study were to determine the influence of five social constructs on pro-conservation behaviour. The study focussed on two large-scale biodiversity stewardship initiatives that have several commonalities, such as size and number of landowners. There are also several clear distinctions between the two study sites, namely their demonstrated commitment to long term, collective biodiversity stewardship agreements and their social demographics.

The statistical analysis shows that the new ecological paradigm scores are larger at Compassberg than they are at Baviaanskloof; however, the place attachment scale scores are larger in the Baviaanskloof than they are at the Compassberg.

Developing a capacity building programme focused on enhancing ecological (as opposed to environmental) understanding should be seen as an opportunity to develop the tools available to off-reserve extension workers. Targeting specific attitude and understanding gaps that would increase the score of new ecological paradigm survey responses from targeted landowners within a priority landscape could influence the success of a biodiversity stewardship initiative. The results have shown that better ecological understanding has a positive relationship with pro-conservation behaviour which is critically important to the successful implementation of large-scale biodiversity stewardship initiatives in South Africa.

Intuitively, one would be hesitant to impact the processes that form place attachment. High place attachment scale scores combined with high new ecological paradigm scores could be more influential on the outcomes of a biodiversity stewardship initiative than merely working to increase new ecological paradigm scores. It was posited earlier that one of the reasons why place attachment has a negative influence on the conclusion of biodiversity stewardship agreements is that land owners perceive a risk of relinquishing complete control of decision-making. Finding ways of mitigating the risk or influencing the perceptions of landowners is an important part of developing negotiation language.

Also, critically important to note is the role of connectedness to nature scale. Connectedness to nature appears to be the least significant of the five social constructs. This could be due to the apparently contradictory thought process that states that even though we consider ourselves part of nature, natural environments are largely described as places absent from any human interference. Although it was shown to be the least influential of the five social constructs in this particular study, it has been shown as moderately significant in the literature. Thus, I tend to err on the side of caution, and would advocate a continued focus on the relational influence connectedness to nature scale has on pro-environmental behaviour. A possible reason for connectedness to nature appearing to be the least significant of the latent variables is that the respondent's scores were very similar at both sites.

As shown in the preferred model in Chapter 3, occupational identity directly influenced personal identity which in turn influences social identity. Social identity has also been shown to significantly influence the way in which people interact with peers. Group structure and function is critically important when establishing collective biodiversity stewardship initiatives and it is the resilience of the group that will determine if the initiative will result in effective, long term conservation objectives.



**Figure 20: Landowners and conservation agency staff successfully securing biodiversity across large landscapes (photo credit: Tracey Potts 2013)**

## Chapter Four

### **An assessment tool to support decision-making during the planning of large-scale, multiple landowner biodiversity stewardship initiatives**



**Figure 21: Compassberg Protected Environment (photo credit: Tracey Potts 2013)**

#### 4.1 Abstract

When planning large, landscape-level biodiversity stewardship initiatives, conservation priorities drive and shape the project design, priority focal areas and, ultimately, resource allocation.

Large funding programmes currently active in the Eastern Cape, South Africa, such as the Critical Ecosystem Partnership Fund (CEPF) and the fifth round of grants from the Global Environment Facility (GEF 5) are focussed on coarse-scale conservation priorities and, in today's economic climate, are reliant on innovative approaches to low-cost conservation estate expansion. However, prioritisation within a focal area is seldom driven by a stakeholder assessment more in-depth than a traditional "willingness survey" in early phases of implementation.

Current biodiversity site assessment methodology focuses on assessing the biodiversity value of the site, the outcomes of which determine whether the site warrants incorporation into the biodiversity stewardship programme, and if so, at what level. The methodology is applied reactively, in response to a successful or on-going negotiation within the context of a broad focal area.

When approaching biodiversity stewardship negotiations within a landscape-level focal area, extension officers rely on a snowball approach to gain momentum across the programme footprint. This can often be time-consuming, expensive and produce limited results during the initial phases of a programme.

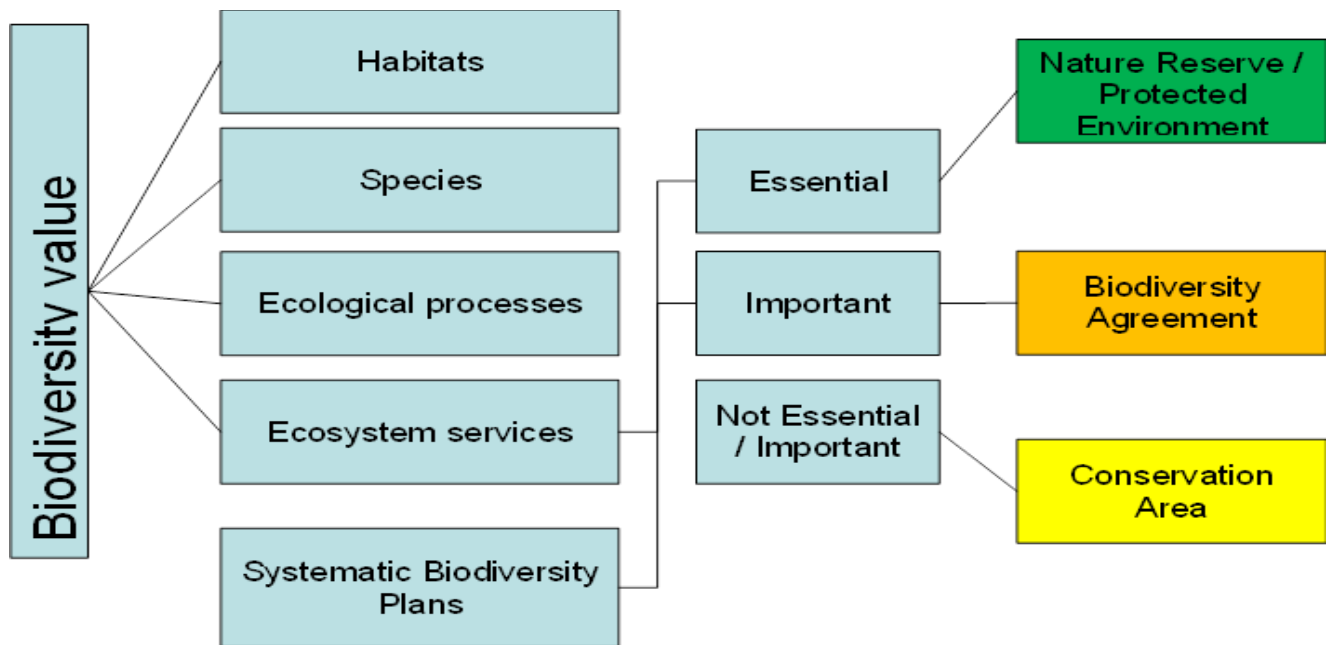
I propose an assessment tool, and present potential items, to measure the potential of landowners within a priority focal area to commit to long-term, binding biodiversity stewardship agreements. I further suggest that the outcomes of the survey should guide the interactions of biodiversity stewardship extension officers and in so doing, focus resource allocations in areas where there is a higher probability of securing long term contracts within conservation priority areas.

## 4.2 Introduction

South African provincial conservation agencies receive operational budgets handed down annually by provincial treasury and these budgets are supplemented by revenue generated by that agency from eco-tourism, wildlife sales and other income generation mechanisms. The agencies are then bound by their mandate to conserve the biodiversity contained within their province and the subsequent conservation actions and expenditure need to be auditable and defensible under scrutiny see PFMA Act 1 of 1999 (Treasury, 1999).

One mechanism used by conservation practitioners to expand and consolidate the existing protected area network is biodiversity stewardship. In the Eastern Cape, demand for participation in biodiversity stewardship programmes outweighs available resources, and land parcels need to be evaluated against a set of predetermined criteria to measure their potential to achieve conservation targets (DEA, 2009; ECPTA, 2011) using site assessment methodologies.

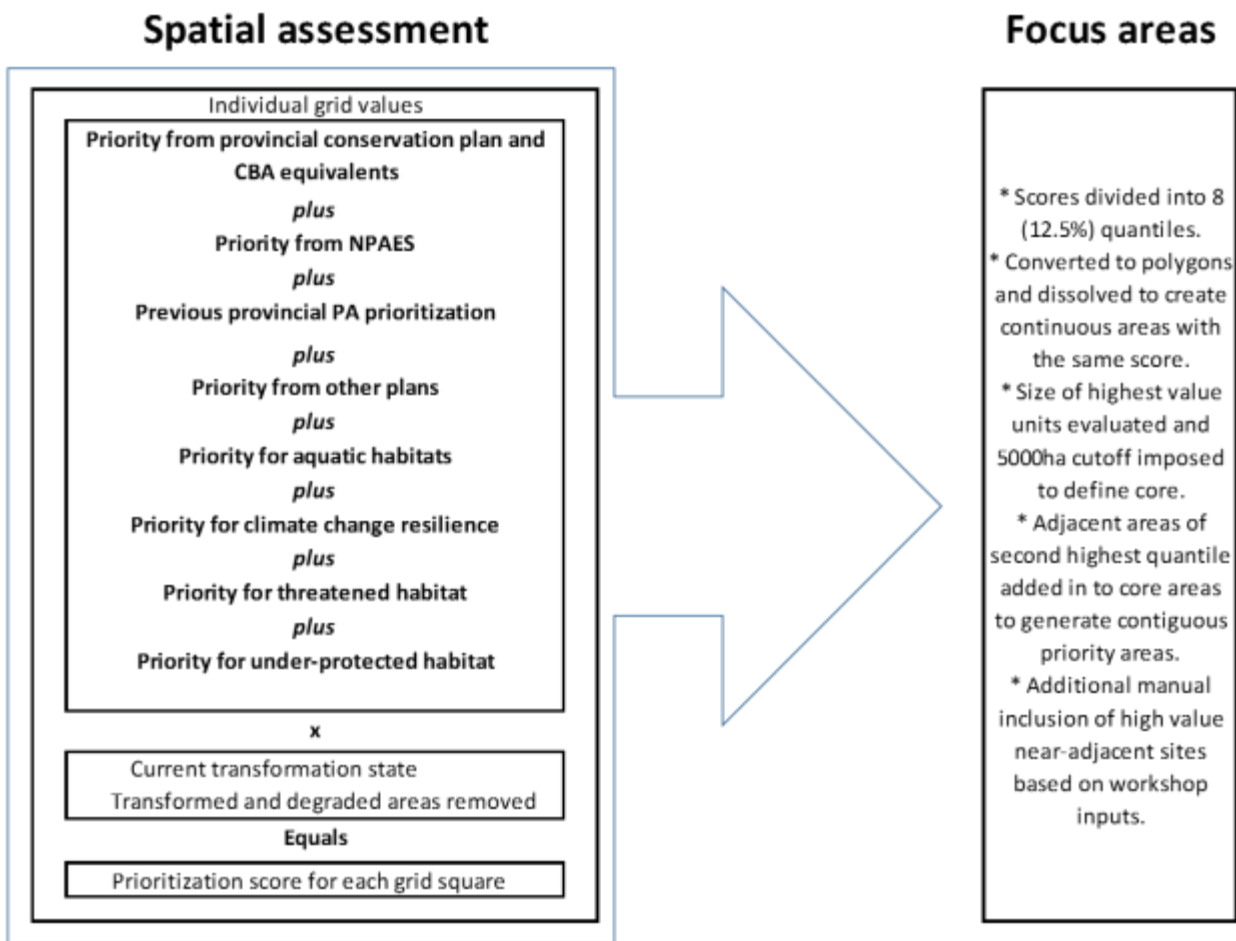
The site assessment is carried out in two phases, an initial desktop assessment and a subsequent field assessment. The desktop assessment involves an analysis of existing information about the site which is gleaned from conservation plans, databases and other sources such as landcover maps. The outcomes of the desktop assessment are then verified in the field and any further information is included in the site assessment report. The site assessment report then is used to establish the biodiversity value of the potential stewardship area and to gain an understanding of the land-use pressures and threats. Using the outcome of the multi-criteria analysis these land parcels are then prioritised in terms of resource allocation. The various components used to determine the biodiversity value are represented in Figure 22 below (the Biodiversity Assessment Form is presented under Appendix E).



**Figure 22: Schematic of the biodiversity assessment process (Reeves, 2012)**

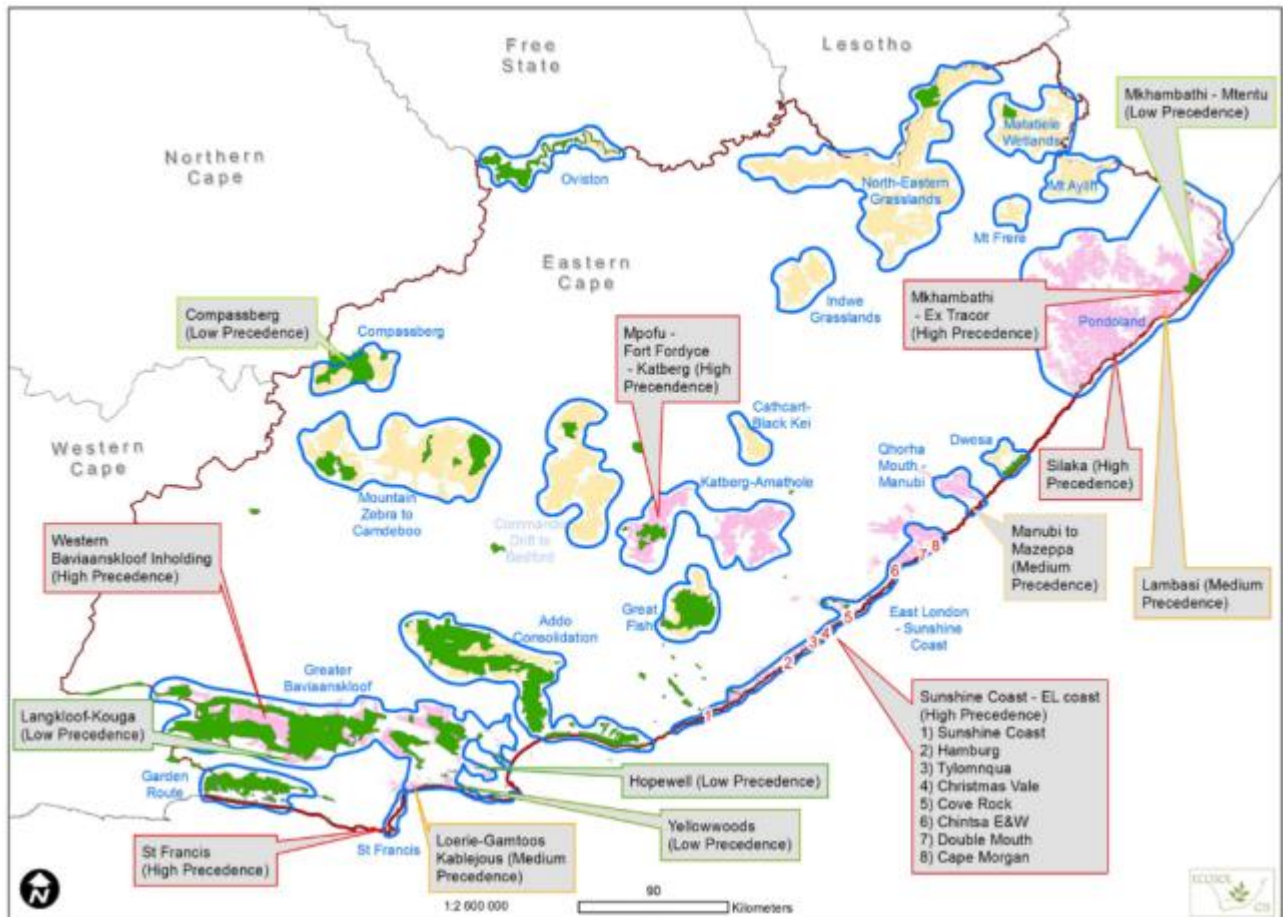
This type of biodiversity stewardship negotiation is considered reactive, in response to an interest expressed by a landowner or as a condition of a Record of Decision (RoD) as an outcome of a basic or full environmental impact assessment.

The Eastern Cape Protected Area Expansion Strategy (ECPAES) spatial analysis (Skowno et al., 2012) was based on existing analyses, specifically the Eastern Cape Biodiversity Conservation Plan (Berliner et al., 2007), the NPAES (DEA, 2008), the National Freshwater Ecosystem Priority Areas (NFEPA) (DEA, 2011), the National Biodiversity Assessment (NBA) (DEA, 2011) and assessments undertaken for the Maputland Pondoland Albany Hotspot (MPAH). The criteria selected for analysis and the qualifiers that were used to determine the high priority focal areas for protected area expansion in the Eastern Cape are represented in Figure 23 below.



**Figure 23: Spatial assessments and qualifiers for priority areas (Skowno et al., 2012)**

The results of the conservation priority assessments were then spatially represented in broad, coarse scale focal areas for the Eastern Cape where resources will be directed over the next five years (see Figure 24 below).



**Figure 24: ECPAES priority areas (Skowno et al., 2012)**

When a land parcel is identified as being a conservation priority within a focal area because, for example, it contains critically endangered vegetation types or it will secure a climate change resilience corridor, biodiversity stewardship negotiations take on a more proactive approach. Within a broad, geographically expansive focal area, biodiversity stewardship initiatives target multiple landowners simultaneously. The development of a conservation opportunity assessment tool would complement the well-established systematic conservation planning processes that determine conservation priorities (Margules & Pressey, 2000).

Knight & Cowling (2007) argue that mapping conservation opportunity within the footprint of a landscape scale initiative, as opposed to exclusively mapping conservation priorities, is beneficial because it not only highlights implementation opportunities and constraints within the planning domain, but can serve as an initial mechanism to engage with stakeholders.

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*How do social and personal identity, sense of place, connectedness to nature and environmental understanding influence the implementation of collective, large-scale biodiversity stewardship initiatives in South Africa?*

Biodiversity stewardship negotiators and project coordinators utilise a large portion of the initial phases of programmes to establish momentum across a project footprint. The development of a conservation opportunity assessment tool with items that can demonstrate the likelihood of a landowner to commit to a collective long-term, binding biodiversity stewardship contract with other landowners within the focal area will provide a mechanism to target specific individuals and improve the return on investment of resources (Cumming et al., 2015).

Self-organisation within a social ecological system is a process where some form of overall stability or coordination results from interactions between smaller components of a disordered system (Olsson, Jerneck, Thoren, Persson, & O'Byrne, 2015). When applying the learning gained in the previous chapter about the influence of the five social constructs contemplated in this study on the likelihood and ability of landowners to commit to stewardship and begin to relate it to the landscape and its biophysical attributes one can consider the conservation priority area a social-ecological system. In order to determine if a community has the potential to self-organise, one needs to first understand how social-ecological systems (SES's) function (Meffe, 2001; Carpenter & Brock, 2006; Ostrom, 2009; Epstein et al., 2013). Social-ecological systems are intricate systems that do not adapt in a logical or anticipated manner and can exist in more than one state, known as alternate stable states (Walker & Salt, 2006). In the literature focusing on the key elements that contribute to the potential of a community to self-organise, a relatively significant portion of that knowledge has emerged from case studies in developing countries (Berkes, 2004; Ostrom, 2007; Gunderson et al., 2009; Epstein et al., 2013). According to Berkes and Seixas (2004) there are four key elements common to the majority of case studies where communities have demonstrated the capacity to self-organise. The elements are a trigger event (or catalytic element); available funding (or other resources); capacity building opportunities and leadership by key players.

In a retrospective assessment of my study sites, I have determined the presence or absence of the four key elements prior to and during the negotiation phase of the two stewardship initiatives, as depicted in Table 14 below.

**Table 14: A comparative assessment between the two study sites of the four key elements required to catalyse self-organisation**

Key Element	Baviaanskloof	Compassberg PE
Trigger event	No immediate threat or disturbance and the catalytic element was not cultivated.	The threat of fracking in the Karoo was the trigger.
Available funding	There has been significant investment already made in the area, but mostly focussed on science and learning.	Internal funding was available for the initial start-up costs. ECPTA carried the declaration costs after the stewardship agreement was in place.
Capacity building opportunities	There were multiple opportunities, but very few can be considered two-way learning.	There is a structured organisation being established that is focussed on capacity and knowledge development.
Leadership	The stakeholder landscape is extremely complex making it challenging to identify clear leadership.	Excellent internal leadership and competent ECPTA guidance.

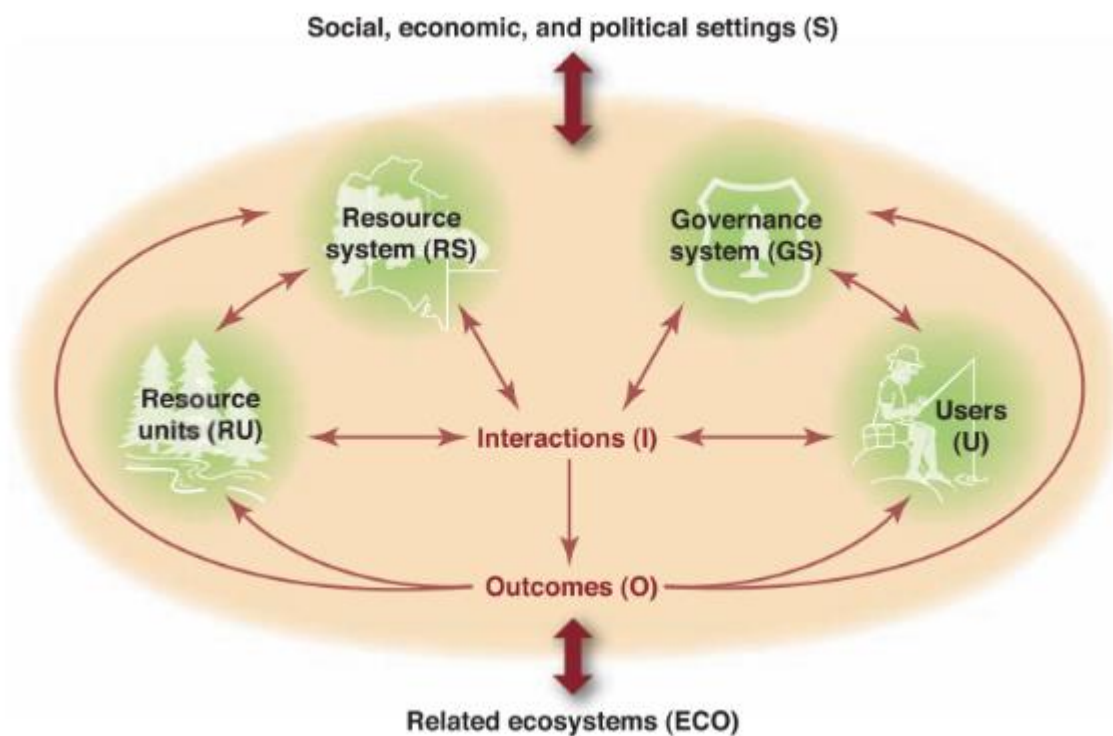
Thus, it is clear that the Compassberg PE was much more likely to self-organise than the Baviaanskloof Hartland and this assessment is verified by the fact that the Compassberg PE members have successfully entered into a collective, long-term biodiversity stewardship agreement and the Baviaanskloof Hartland members have not.

### 4.3 Assessing the potential to self-organise

#### 4.3.1 SES core sub-systems

The online Business Dictionary defines self-organisation as “the ability of a system to spontaneously arrange its components or elements in a purposeful (non-random) manner, under appropriate conditions but without the help of an external agency.”

According to Ostrom (2009) SES’s have eight core sub-systems that affect the probability of self-organisation with the intention of developing a sustainable SES. The eight core sub-systems are listed as “social, economic and political settings (S); resource systems (RS); governance systems (GS); resource units (RU); users (U); interactions (I); outcomes (O) and related ecosystems (ECO)” (p. 421) pictorially represented below in Figure 25.



**Figure 25: The core sub-systems in a framework for analysing social-ecological systems (Ostrom, 2009. p420)**

These core sub-systems are then further defined by second-level variables, listed in Table 16 below. Of the 53 second-level variables, there are ten that are most commonly identified as influencing the likelihood of users to collectively self-organise in order to manage a resource (Ostrom, 2009) and they are marked with an asterisk in Table 15 below.

These ten variables are key components of the conservation opportunity assessment tool thresholds that I have developed and present later in this chapter.

**Table 15: Social-ecological systems core sub-systems and their associated variables (Ostrom, 2009. p 241)**

Social, economic, and political settings (S)	
S1 Economic development. S2 Demographic trends. S3 Political stability. S4 Government resource policies. S5 Market incentives. S6 Media organization.	
Resource systems (RS)	Governance systems (GS)
RS1 Sector (e.g., water, forests, pasture, fish)	GS1 Government organizations
RS2 Clarity of system boundaries	GS2 Nongovernment organizations
RS3 Size of resource system*	GS3 Network structure
RS4 Human-constructed facilities	GS4 Property-rights systems
RS5 Productivity of system*	GS5 Operational rules
RS6 Equilibrium properties	GS6 Collective-choice rules*
RS7 Predictability of system dynamics*	GS7 Constitutional rules
RS8 Storage characteristics	GS8 Monitoring and sanctioning processes
RS9 Location	
Resource units (RU)	Users (U)
RU1 Resource unit mobility*	U1 Number of users*
RU2 Growth or replacement rate	U2 Socioeconomic attributes of users
RU3 Interaction among resource units	U3 History of use
RU4 Economic value	U4 Location
RU5 Number of units	U5 Leadership/entrepreneurship*
RU6 Distinctive markings	U6 Norms/social capital*
RU7 Spatial and temporal distribution	U7 Knowledge of SES/mental models*
	U8 Importance of resource*
	U9 Technology used
Interactions (I) → outcomes (O)	
I1 Harvesting levels of diverse users	O1 Social performance measures (e.g., efficiency, equity, accountability, sustainability)
I2 Information sharing among users	O2 Ecological performance measures (e.g., overharvested, resilience, bio-diversity, sustainability)
I3 Deliberation processes	O3 Externalities to other SESs
I4 Conflicts among users	
I5 Investment activities	
I6 Lobbying activities	
I7 Self-organizing activities	
I8 Networking activities	
Related ecosystems (ECO)	
ECO1 Climate patterns. ECO2 Pollution patterns. ECO3 Flows into and out of focal SES.	

\* Subset of the 10 variables found to be associated with self-organisation.

In an effort to demonstrate how these ten variables influence the likelihood of self-organisation, they are contextualised using the two study sites.

1. *Size of resource system (RS3)*. For terrestrial resource systems, such as the catchment protected by the Compassberg PE, extensive systems are unlikely to self-organize due to higher opportunity costs, such as fencing or patrolling the area. Conversely, small or fragmented landscapes do not provision abundant ecosystem

goods and services. Thus, moderate territorial size is most conducive to self-organization (Ostrom, 2009). However, as was the case in both study sites, the boundaries were clearly defined by land ownership. The distinction between the two sites is that the Baviaanskloof Hartland is geographically isolated whereas the Compassberg PE has the opportunity to expand by including neighbouring farms.

2. *Productivity of system (RS5)*. The health of an ecosystem or the abundance of a resource effect self-organization (Ostrom, 2009). Should a catchment be perceived as degraded or if an agricultural resource is plentiful, users will not feel that it is necessary to utilise the resource sustainably. Thus, there is a small window of opportunity between when users observe a scarcity and total system collapse when a community will self-organise. In the Baviaanskloof several water and land related water problems have become apparent, for example stream bank erosion and water shortages, which are having negative effects on ecosystems and on agriculture (Jansen, 2008) whereas the Compassberg PE is relatively pristine but under the potential threat of fracking.
3. *Predictability of system dynamics (RS7)*. The responses of the system brought about by collective management actions need to be adequately predictable so that users can envisage their impacts (Ostrom, 2009). Declaring a PE and restricting mining activities has a predictable outcome in terms of conserving the natural resources of the Compassberg PE. Mobilising land-use change and large-scale restoration of the Baviaanskloof Hartland has far less predictable outcomes in terms of livelihoods and farming.
4. *Resource unit mobility (RUI)*. The resource requirements of monitoring the management impacts on a system comprised of mobile resource units is relatively high when compared to systems with stationary resource units. Thus, self-organisation is less likely with mobile resource units such as wildlife populations that move between farms, than with stationary units such as catchment (Ostrom, 2009). There is little or no distinction between the two sites for RUI.
5. *Number of users (UI)*. The larger the group size is the higher the opportunity costs are. In order for users to make resource utilisation decisions collectively, there would need to be more engagements and facilitation (Ostrom, 2009). This was particularly evident in the Baviaanskloof Hartland where landowners decided

against a collective biodiversity stewardship agreement partly due to the fact that there would be a need to make decisions collectively. The Compassberg PE is comprised of seven landowners as is the Baviaanskloof Hartland, however, the Baviaanskloof has a much larger community without tenure, estimated to be approximately 850 people. Because this study is focused solely on privately tenured land within the biodiversity stewardship programme context, the impact of the non-tenured community has not been contemplated.

6. *Leadership (U5)*. When users of a resource system develop or present skills that distinguish them from other users and they can rise to positions of leadership, self-organisation is more likely (Ostrom, 2009). The actions and commitment of a well-qualified stakeholder, with a PhD from Rhodes University, in the Compassberg PE was the crucial catalyst in their self-organisation.
7. *Norms/social capital (U6)*. Users of resource systems are subject to the influences of ingroup and outgroup pressure as well as the norms of reciprocity (Ostrom, 2009). Members of the group will need to display sufficient trust in one another in order to lower the transaction costs in reaching agreements (Ostrom, 2009). This variable is particularly salient when determining the resilience of the SES. At a superficial level, one would assume that the landowners in the Baviaanskloof Hartland have a stronger ingroup structure due to the fact that most respondents have been farming in the area for more than 40 years. However, having known each other for many years, the ingroup relationships may be more accurately characterised as loyalty rather than trust.
8. *Knowledge of the SES (U7)*. When users have similar understanding of the SES and the effect of their actions on other users, they will predict lower costs of organising (Ostrom, 2009). This was evidenced by the new ecological paradigm scores of the Compassberg PE respondents, which were high and very similar. Baviaanskloof Hartland new ecological paradigm scores were low and dissimilar.
9. *Importance of resource to users (U8)*. System users who are either highly or completely dependent on the resource or users who see the resources and being very valuable are successful at self-organising (Ostrom, 2009). The Baviaanskloof Hartland respondents are all dependent on their RS for their livelihoods whereas the

Compassberg PE respondents attached a high value on conserving the resource as shown by their place attachment scale scores.

10. *Collective-choice rules (GS6)*. When users are involved in developing sustainable use thresholds and rules, it results in lower transaction costs (Ostrom, 2009). Participation in a collective, large-scale biodiversity stewardship programme is voluntary, thus giving users the choice to participate or not. The Compassberg Protected Environment Landowners Association developed their own constitution and strategic management plan, thus collectively setting their own rules.

Three linked components of SES's determine their sustainability. These are resilience, adaptability, and transformability. Because large-scale, collective biodiversity agreements are negotiated with long-term timeframes, a minimum of 30 years, the resilience of a system needs to be considered within the context of the components that dominate the systems dynamics (Walker et al., 2004). Resilience, for the purposes of this chapter, is aligned with the Walker et al., (2004) definition, namely "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks".

#### **4.3.2 Conservation opportunity assessment**

It is proposed that the conservation opportunity assessment methodology should broadly follow the current conservation priority assessment practice with an initial, high-level survey using available information and local expert knowledge, see Table 16 below. The high-level assessment is structured using the four common elements shown to be critical by Berkes and Saixas (2004) which are a trigger event, available funding, capacity building opportunities and leadership. For the leadership element, it is proposed that the proxy of existing organisations that are active and functional in the landscape be used.

**Table 16: High-level social-ecological system assessment**

<b>Social-ecological System Assessment</b>	<b>Present</b>	<b>Contact Details of Chairperson</b>
<b>Organisations active in the landscape</b>		
✓ Farmers' Association		
✓ Fire Protection Association		
✓ Neighbourhood Watch / CPF		
✓ Conservancy		
✓ Hunting Association		
✓ Civil Society Groups		
○ "Friends of ... PA"		
○ Anti-mining lobby		
○ CREW		
○ Birding groups		
○ Other		
<b>Trigger event or catalytic environment</b>		<b>Comments</b>
✓ Mining threat		
✓ Landscape transformation		
✓ Development Pressure		
✓ Degradation		
✓ Other		
<b>Available funding/resources</b>		<b>Comments</b>
✓ Investment in ecological infrastructure		
✓ Landscape/regional programmes		
✓ High priority biodiversity area		
✓ Other		
<b>Capacity building opportunities</b>		<b>Comments</b>
✓ Research programmes		
✓ Indigenous knowledge transfer		
✓ Local government LED programmes		

The high-level landscape assessment outcomes should then be entered into the accompanying spread sheet (Appendix G) where scores for the various landscape-level drivers are calculated in terms of engagement thresholds. The items are grouped in four sections, namely the trigger event with five sub-items, capacity building opportunities with three sub-items, available resources with four sub-items and leadership with one sub-item. Each sub-item has a Likert Scale of potential scores of between one and five available in a drop-down menu. The scores are then summed and considered against a threshold. The table 17 below depicts data retrospectively obtained from study site 2 (Compassberg PE).

**Table 17: High-level SES assessment outcome analysis - Compassberg Protected Environment****Focal Area: Middelberg/Nieu Bethesda****Site Name: Compassberg****Trigger event/Catalytic environment**

	Yes / No	Score
Mining threat	Yes	5
Landscape transformation	Yes	2
Development	No	1
Degradation	Yes	3
Other	No	1

**Capacity building opportunities**

	Yes / No	Score
Research programmes	Yes	4
Indigenous knowledge	Yes	4
LED programmes	Yes	3

**Available funding/resources**

	Yes / No	Score
IEI/PES	Yes	4
Landscape/regional programmes	Yes	3
High priority biodiversity area	Yes	5
Other	No	1

**Leadership**

	Yes / No	Score
Functional organisations	Yes	4

**High-level Assessment Outcomes**

	Actual Score	Min Score	Max Score
Trigger event	11	5	25
Capacity building	11	3	15
Funding/resources	13	4	20
Leadership	4	1	5
Total	39	13	65

**Thresholds**

Proceed with individual survey	35 - 65
Collate additional data	20 - 34
Do not engage	13 - 19

The high level assessment, if the score falls within the thresholds for further engagement, should then be followed up with a survey instrument aimed at unpacking the social constructs that will influence the successful implementation of the planned collective biodiversity stewardship initiative. The survey instrument, which could be called the Conservation Opportunity Value Survey (COVS), should have a preamble that introduces the concept of the planned initiative and provides useful information such as the organisations involved in the initiative, responsible individuals and contact information. The COVS can then be disseminated via the existing functional group structures identified by the high-level social system assessment.

The initial section of the proposed COVS should capture demographic details that will be useful in establishing a stakeholder database. Subsequent sections should include the new ecological paradigm, connectedness to nature scale, place attachment scale, aspects of identity questionnaire and occupational identity scale scales, refined for use in the focal area. Although it was shown in Chapter 3 that the connectedness to nature scale score had the least significant influence on actual pro-conservation behaviour, the value of acquiring these data over time and across multiple initiatives may prove invaluable. Rating scales should be developed using thresholds to determine scores and indicted with a standard Likert scale (1 to 5, with 1 being the weakest/poorest/lowest). Zero scores will be used instead of Not Applicable (N/A) scores. The full proposed COVS is included under Appendix F.

The scores of the various scales, combined with the full COVS can then be weighted and a resulting Conservation Opportunity Value (COV) composite score should be used during decision-making and resource allocation in the early phases of planning and implementation of large-scale, landscape level biodiversity stewardship initiatives.

The layout and design of the survey should result in it being adaptable to various survey media including email, post, fax and telephonic interview options. The administration methods of the COVS will be a critical factor in achieving acceptable response rates and this should be considered once the high-level assessment has been concluded. Establishing a starting point for snowballing should be guided by the information obtained during the high-level assessment.

## 4.4 Conclusion

In conclusion, there are multiple social constructs which influence the development of a conservation opportunity within a conservation priority area. These constructs need to be contemplated during the design and initial implementation phases of large, landscape-level biodiversity stewardship initiatives.

Traditional “willingness” surveys provide good guidance in terms of planned behaviour and are useful in establishing initial contact with stakeholders and their value should not be discounted, however, their limitations in predicting actual behaviour must be carefully considered when planning the implementation of large-scale biodiversity stewardship initiatives. The motivation to commit to a collective and binding set of behaviours and restrictions may not be limited to tangible or monetary incentives, but rather variables such as values, beliefs and an understanding of the consequences of actual behaviour. The development of a COVS, which when combined with current systematic conservation planning tools, may lead to more focussed resource allocation within focal areas resulting in a greater return on investment.

In a resource-scarce economic climate, efficiency of efforts is critical and bridging the gap between the in-depth knowledge and well-established community of practice developed around systematic conservation planning and the emerging community of practice surrounding conservation opportunity assessment may result in an improvement of those efficiencies.

According to “Grammarist”, an online resource, a perfect storm is an expression that describes an event where a rare combination of circumstances will aggravate a situation drastically. Contemporary uses of the term do not necessarily need to have negative connotations. Occasionally, an initiative is successful because everything falls into place at the right time. People’s willingness to think openly, stakeholders with high-scoring new ecological paradigm scales, capacitated and efficient project staff and a well-resourced, active biodiversity stewardship programme combined with a significant threat can occur in such a confluence, resulting in a SES that has self-organised and successfully implemented a

landscape level biodiversity stewardship initiative that is resilient and sustainable (the event of “unusual magnitude”).

If we can better understand the drivers of those influencers that create the perfect storm conditions then we can go about generating some of them and reacting to others thus increasing our chances of successfully implementing large-scale biodiversity stewardship initiatives.

To conclude, Fritjof Capra’s (1996) words summarise the nuance of this thesis.

“Logic does not lead us from the fact that we are an integral part of the web of life to certain norms of how we should live. However, if we have deep ecological awareness, or experience, of being part of the natural web of life, then we will (as opposed to should) be inclined to care for all of living nature. Indeed, we can scarcely refrain from responding in this way” (p. 12).

## Chapter Five

### Concluding discussion and future research



**Figure 26: Compassberg Peak, Compassberg Protected Environment (photo credit: Brian Reeves 2013)**

## 5.1 Introduction

The objectives of this thesis were to determine if the five social constructs contemplated in this study influence the successful implementation of large-scale, landscape level collective biodiversity stewardship initiatives.

In Chapter 3, I showed that ecological understanding and place attachment had the most significant influence on the successful implementation of large, landscape level, collective biodiversity stewardship agreements between the two study sites. Although the remaining constructs of connectedness to nature, personal identity and social identity did not differ significantly between the two study areas, they should not be discounted as having influence over group dynamics. As Nuzzo (2014) showed, the significance of the p-value may be overrated in some instances, and, in the emerging field of complexity science, it would be wiser to follow the precautionary principle and record those data.

Conservation estate expansion, without the outright purchase of large tracts of land, relies on innovative and cost effective mechanisms such as biodiversity stewardship to achieve targets. An outcome of the narrative contained in Chapter 4 was the development of a tool to measure conservation opportunity within focal areas of high value conservation priorities. The purpose of the COVS is to guide decision-making and resource allocation in the early implementation phases of large-scale, landscape level biodiversity stewardship initiatives.

The integration of these findings into the policy and practice of biodiversity stewardship programmes will improve the return on investment in a resource-scarce environment and improve the efficiency of extension staff in the early implementation phases of an initiative.

## 5.2 Future research

I have asked myself a series of underlying questions that initially motivated this thesis on a number of occasions whilst undertaking my journey through this research:

- a. By asking a farmer to produce non-agricultural products such as carbon or water, will he/she still be able to call himself a farmer?
- b. Can a farmer change his/her role from agricultural producer to natural resource manager and still maintain his/her occupational identity?

In drawing the conclusions together, I believe I have shown in Chapter 3 that occupational identity is at the core of self-identity and social identity and that it is deeply rooted in the social constructs that shape how people view their role as custodians of the environment. Further research directed towards the language we use when designing biodiversity stewardship solutions is needed, particularly focused on developing a mechanism where biodiversity stewardship practitioners do not place the continued existence of the landowners' occupational identity at risk.

I would also encourage further research into exploring the relationship between place attachment to an individual's own land and the length of tenure, particularly in the context of determining if place attachment remains constant or increases/decreases over time. I would also encourage further research into understanding if landscape degradation influences place attachment.

Biodiversity stewardship is a cost-effective (but not free) conservation estate expansion mechanism, but is it truly effective? I would encourage future research aimed at developing a management effectiveness tracking tool for protected areas declared on privately owned land. At the time of writing, none of the biodiversity stewardship programmes in South Africa have been in existence for more than 10 years, but, biodiversity stewardship contracts are bound by 50 – 99 year commitments by both the state and the landowner. Ensuring the conservation outcomes for the length of the agreement, and well beyond, is what will determine the sustainability of the programmes and measuring the effectiveness of those outcomes will be the ultimate test of its efficacy.

### 5.3 Conclusion

Protected area expansion without the outright purchase of large tracts of land means an inevitable need to engage with groups of landowners. When conservation practitioners and researchers are able to apply the same resources and skill to understanding SES's as has been done in the past in the systematic conservation planning sector the more balanced the approach between conservation priority and conservation opportunity will become.

Ultimately, the success of off-reserve biodiversity conservation lies in the hands of landowners who act as custodians of that biodiversity. Altruistic acts for the public good are not easily sustained unless they are motivated by intrinsic characteristics. As conservation practitioners, particularly those entrusted with the expansion of the conservation estate in a resource-scarce environment, gaining an in-depth understanding of those characteristics will improve programme efficiencies, establish a community of practice and guide implementation.

Do sense of place and self-identity and social identity influence willingness to participate in large-scale biodiversity stewardship initiatives? Yes, at the core of social identity is occupational identity and an occupation such as farming is deeply rooted to the environment in which you practice your occupation. Thus, it is critically important that biodiversity stewardship practitioners are mindful of the language we use when negotiating agreements. Any perceived threat to the continued existence of a farmer's occupational identity will put a biodiversity stewardship initiative at risk.

Do connectedness to nature and self and social identity influence willingness to participate in large-scale biodiversity stewardship initiatives? Connectedness to nature, in this study, has been shown to have the least significant influence on willingness to participate in this type of biodiversity stewardship. However, the literature shows that connectedness to nature is still an important factor in pro-conservation behaviour.

Does ecological understanding influence willingness to participate in large-scale biodiversity stewardship initiatives? Yes, the deeper and more comprehensive the landowner's ecological understanding is, the more likely they will be to enter into a collective, long-term biodiversity stewardship agreement.

I have learned a great deal whilst undertaking this study. I have learned about the process and framework of good science. I have learned about some of the insecurities facing landowners and how biodiversity stewardship can either represent a threat or a lifeline, and the perceived difference lies in the language we use during a negotiation. I have also learned that the variables seem daunting and manipulating them appears to be beyond the control of conservation practitioners, much like the conditions of a Perfect Storm converging in a single space in time. But, I have learned that with a deeper understanding of how the custodians of biodiversity react and interact, we can improve and adapt our methodologies and increase our chances of developing successful and sustainable large-scale, landscape level biodiversity stewardship initiatives.

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## Appendices

**The focus of this research is to determine the relationship between Social and Personal identity, Sense of Place and Environmental Ethic, and if they in turn influence the success of large-scale biodiversity stewardship initiatives?**

<b>Date:</b>		<b>Number: __/1</b>		<b>Interviewer: Robert &amp; Ebi</b>			
<b>SECTION A: BACKGROUND INFORMATION</b>							
A.1) Name of farming enterprise:							
A.2) Name of Interviewee:							
A.3) Name of person(s) responsible for long term, strategic decision-making if different from A.2:							
A.4) Name of manager responsible for day-to-day decision-making if different from A.2 or A.3:							
A.5) Postal address: P O Box						Postal code:	
A.6) Phone:			Cell:		Fax:		
A.7) Email Address:							
<b>BIOGRAPHICAL INFORMATION OF LONG TERM DECISION MAKER (A.3)</b>							
A.8) Male		Female					
A.9) Age Group							
29 or younger		30-44		45-59		60 or older	
A.10) First Language:							
A.11) Number of generations your family has been farming:							
A.12) Do you have children? If yes, please provide details below.							
	Age	Gender	Currently at school	Tertiary Education	Current Occupation		
Child 1							
Child 2							
Child 3							
Child 4							
Child 5							
A.12) Number of years you have been farming?							
A.13) Do you belong to an association (e.g. hunters, fishing, farmers etc.)?							
A.14) If yes, please list them.							

A.15) How does membership benefit you?

**SECTION B: LAND UNIT INFORMATION**

B.1) For how many years have you and / or your family farmed this particular farm:

B.2) What is the collective size of the properties utilized in your farming enterprise (ha)?

B.3) Are you planning on selling your farm within the next 5 years? If yes reason?

B.4) What were the current (2001 – 2012) land-uses on the farm?

To estimate % land-use and contribution to income, please use the following scale:  
 1 = 1-10%, 2 = 10-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-90% and 6 = 90-100%.

	Land use description	Approximate % of land surface.	Percentage contribution to income	For how many years has this land-use been practiced on the farm?
1				
2				
3				
4				
5				
6				
7				
8				

B.5) What were the various land-uses on the farm from 1991 - 2000?

	Land use description	Approximate ha of land surface or %	Percentage contribution to income	For how many years has this land-use been practiced on the farm?
1				
2				
3				
4				
5				
6				
7				
8				



**SECTION C: ENVIRONMENTAL INFORMATION**

C.1) Please tick the most appropriate option in response to the following statements:

<b>In your opinion, over the past 50 years there has been:</b>	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
An increase in temperature.					
A decrease in temperature.					
An altered temperature range.					
A seasonal temperature variance.					
No change in temperature.					
An increase in precipitation.					
A decrease in precipitation.					
A change in the timing of rains.					
A change in the frequency of droughts.					
A change in the length/severity of droughts.					
A change in the frequency of floods.					
A change in the severity of floods.					
No change in precipitation patterns.					

C.2) Please tick the most appropriate option in response to the following statements:

	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
The condition of the fynbos vegetation on my farm is better now compared to when I first started farming it.					
The condition of the thicket vegetation on my farm is better now compared to when I first started farming it.					
The condition of riparian vegetation on my farm is better now compared to when I first started farming it.					
My agricultural decision-making is mostly influenced by financial considerations.					
My agricultural decision-making is mostly influenced by environmental considerations.					
The amount of natural vegetation cover is a good indicator of veld condition.					
My farm has the same carrying capacity it had when I started production.					

Please tell me more about why you think your carrying capacity has, or has not changed:


C.3) Please tick the most appropriate answer in relation to the timelines given below:

	3-5 yrs	5-10 yrs	10-20 yrs	20+ yrs
My agricultural decision-making is based on a goal horizon of:				


C.4) Please tick the most appropriate answer in relation to the statements given below:					
<b>Restoration of natural capital is valuable because:</b>	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
I could potentially earn some income from restored lands in the future via a PES scheme.					
It will result in a functional ecosystem.					
It will result in an improved baseflow for the catchment.					
Once my land is restored I will be able to increase my stocking rates.					
My children will be able to continue farming this land.					
It might increase the value of my land.					
<b>Restoration of natural capital is not valuable because:</b>	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
It results in a loss of income because I can't run stock on those areas.					
It takes too long to realize any benefits.					
I think PES is not possible because of our current government.					
The institutional framework is not in place yet.					
Other reasons? Please specify					
C.5) What, in your opinion, are some of the challenges facing landowners when undertaking restoration programmes?					
C.6) What, in your opinion, are some of the benefits for landowners when undertaking restoration programmes?					
<b>SECTION D: ECONOMIC INFORMATION</b>					
D.1) Please tick the most appropriate option in response to the following statements:					
	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
	For the period 2001 – 2012 I invested in the following:-				
a)	International holidays				
b)	Holidays to southern African destinations				
c)	New vehicles				
d)	Tertiary education for my children				
e)	Homestead expansion & maintenance				
f)	Investments (units trusts, retirement annuities, off-shore investments).				
g)	Capital investment in new farming infrastructure				
h)	Purchasing additional property				
i)	Nil, I am running on a turn-over budget				

D.2) Please tick the most appropriate option in response to the following statements:						
	For the period 1991 – 2000 I invested in the following:-	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	International holidays					
b)	Holidays to southern African destinations					
c)	New vehicles					
d)	Tertiary education for my children					
e)	Homestead expansion & maintenance					
f)	Investments (units trusts, retirement annuities, off-shore investments).					
g)	Capital investment in new farming infrastructure					
h)	Purchasing additional property					
i)	Nil, I was running on a turn-over budget					
D.3) Please tick the most appropriate option in response to the following statements:						
	For the period 1981 – 1990 I invested in the following:-	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	International holidays					
b)	Holidays to southern African destinations					
c)	New vehicles					
d)	Tertiary education for my children					
e)	Homestead expansion & maintenance					
f)	Investments (units trusts, retirement annuities, off-shore investments).					
g)	Capital investment in new farming infrastructure					
h)	Purchasing additional property					
i)	Nil, I was running on a turn-over budget					
D.4) Please tick the most appropriate option in response to the following statements:						
	For the period 1971 – 1980 I invested in the following:-	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	International holidays					
b)	Holidays to southern African destinations					
c)	New vehicles					
d)	Tertiary education for my children					
e)	Homestead expansion & maintenance					
f)	Investments (units trusts, retirement annuities, off-shore investments).					
g)	Capital investment in new farming infrastructure					
h)	Purchasing additional property					
i)	Nil, I was running on a turn-over budget					

D.5) Please tick the most appropriate option in response to the following statements:						
	For the period 1961 – 1970 I invested in the following:-	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	International holidays					
b)	Holidays to southern African destinations					
c)	New vehicles					
d)	Tertiary education for my children					
e)	Homestead expansion & maintenance					
f)	Investments (units trusts, retirement annuities, off-shore investments).					
g)	Capital investment in new farming infrastructure					
h)	Purchasing additional property					
i)	Nil, I was running on a turn-over budget					
<b>E: BIODIVERSITY STEWARDSHIP INFORMATION</b>						
E.1) Would you expect some form of compensation, financial or other, for changing your land-use practices?						
1. Yes						
2. No						
3. Unsure						
E.2) Please tick the most appropriate option in response to the following statements:						
	Which of the following potential benefits and support would be the most appealing to you when entering into an agreement that offered you benefits and support for sustainable land-use practices (including conservation, restoration and sustainable farming)?	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	Assistance with management of natural vegetation and riverine areas.					
b)	Restoration of degraded lands.					
c)	Founder populations of rare game species for breeding programmes.					
d)	Expansion of the World Heritage Site to include your farm.					
e)	Promotion of a “green brand” for your agricultural products.					
f)	Support with the development of a tourism marketing platform.					
g)	Access to concessions within the Baviaanskloof Nature Reserve.					
h)	Municipal rates rebates.					
i)	Tax deductions.					
j)	Support with local security.					

k)	Social development projects for farm workers.					
l)	I wouldn't need any incentives					
m)	Other (please specify)					
E.3) Please tick the most appropriate option in response to the following statement:						
	If you chose to enter into an agreement that offered you benefits and support for sustainable land-use practices (including conservation, restoration and sustainable farming), would you prefer to enter into the agreement:	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	Individually (continue to E.4)					
b)	Collectively, with all land-owners and land-users in the Baviaanskloof					
c)	With my immediate neighbours only					
Additional Comments?						
E.4) Please tick the most appropriate option in response to the following statements (skip if answered "a" above):						
	If you would prefer to enter into an agreement that offered you benefits and support for sustainable land-use practices (including conservation, restoration and sustainable farming), individually, what are your main reasons for not considering a collective agreement?	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	Lack of independence.					
b)	Other people making decisions for my farm.					
c)	Potential conflicts of interest.					
d)	I don't think other people have my best interests in mind.					
e)	Each property is unique and should be treated as such.					
f)	Other, please specify					
E.5) Please tick the most appropriate option in response to the following statement:						
	If you chose to enter into an agreement that offered you benefits and support for sustainable land-use practices (including conservation, restoration and sustainable farming), what would you consider an optimal duration for the contract:	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree



**The focus of this research is to determine the relationship between Social and Personal identity, Sense of Place and Environmental Ethic, and if they in turn influence the success of large-scale biodiversity stewardship initiatives?**

Date:	Number: __/2	Interviewer: Robert	
<b>SECTION A: BACKGROUND INFORMATION</b>			
A.1) Name of farming enterprise:			
A.2) Name of Interviewee:			
A.3) Name of person(s) responsible for long term, strategic decision-making if different from A.2:			
A.4) Name of manager responsible for day-to-day decision-making if different from A.2 or A.3:			
A.5) Postal address: P O Box			Postal code:
A.6) Phone:	Cell:	Fax:	
A.7) Email Address:			
<b>BIOGRAPHICAL INFORMATION OF LONG TERM DECISION MAKER (A.3)</b>			
A.8)	Male	Female	
A.9) Age Group			
29 or younger	30-44	45-59	60 or older
A.10) First Language:			
A.11) Number of generations your family has been farming:			
A.12) Do you have children? If yes, please provide details below.			
	Age	Gender	Currently at school
			Tertiary Education
			Current Occupation
Child 1			
Child 2			
Child 3			
Child 4			
Child 5			
A.12) Number of years you have been farming?			
A.13) Do you belong to an association (e.g. hunters, fishing, farmers etc.)?			
A.14) If yes, please list them.			

A.15) How does membership benefit you?

**SECTION B: LAND UNIT INFORMATION**

B.1) For how many years have you and / or your family farmed this particular farm:

B.2) What is the collective size of the properties utilized in your farming enterprise (ha)?

B.3) Are you planning on selling your farm within the next 5 years? If yes reason?

B.4) What were the current (2001 – 2012) land-uses on the farm?

To estimate % land-use and contribution to income, please use the following scale:  
 1 = 1-10%, 2 = 10-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-90% and 6 = 90-100%.

	Land use description	Approximate % of land surface.	Percentage contribution to income	For how many years has this land-use been practiced on the farm?
1				
2				
3				
4				
5				
6				
7				
8				

B.5) What were the various land-uses on the farm from 1991 - 2000?

	Land use description	Approximate ha of land surface or %	Percentage contribution to income	For how many years has this land-use been practiced on the farm?
1				
2				
3				
4				
5				
6				
7				
8				



**SECTION C: ENVIRONMENTAL INFORMATION**

C.1) Please tick the most appropriate option in response to the following statements:

<b>In your opinion, over the past 50 years there has been:</b>	<b>Strongly Agree</b>	<b>Mildly Agree</b>	<b>Unsure</b>	<b>Mildly Disagree</b>	<b>Strongly Disagree</b>
An increase in temperature.					
A decrease in temperature.					
An altered temperature range.					
A seasonal temperature variance.					
No change in temperature.					
An increase in precipitation.					
A decrease in precipitation.					
A change in the timing of rains.					
A change in the frequency of droughts.					
A change in the length/severity of droughts.					
A change in the frequency of floods.					
A change in the severity of floods.					
No change in precipitation patterns.					

C.2) Please tick the most appropriate option in response to the following statements:

	<b>Strongly Agree</b>	<b>Mildly Agree</b>	<b>Unsure</b>	<b>Mildly Disagree</b>	<b>Strongly Disagree</b>
The condition of the karoid vegetation on my farm is better now compared to when I first started farming it.					
The condition of the wetlands on my farm are better now compared to when I first started farming it.					
The condition of riparian vegetation on my farm is better now compared to when I first started farming it.					
My agricultural decision-making is mostly influenced by financial considerations.					
My agricultural decision-making is mostly influenced by environmental considerations.					
The amount of natural vegetation cover is a good indicator of veld condition.					
My farm has the same carrying capacity it had when I started production.					

Please tell me more about why you think your carrying capacity has, or has not changed:


C.3) Please tick the most appropriate answer in relation to the timelines given below:

	<b>3-5 yrs</b>	<b>5-10 yrs</b>	<b>10-20 yrs</b>	<b>20+ yrs</b>
My agricultural decision-making is based on a goal horizon of:				


C.4) Please tick the most appropriate answer in relation to the statements given below:						
<b>Restoration of natural capital is valuable because:</b>	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree	
I could potentially earn some income from restored lands in the future via a PES scheme.						
It will result in a functional ecosystem.						
It will result in an improved baseflow for the catchment.						
Once my land is restored I will be able to increase my stocking rates.						
My children will be able to continue farming this land.						
It might increase the value of my land.						
<b>Restoration of natural capital is not valuable because:</b>						
Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree		
It results in a loss of income because I can't run stock on those areas.						
It takes too long to realize any benefits.						
I think PES is not possible because of our current government structure.						
The institutional framework is not in place yet.						
Other reasons? Please specify						
C.5) What, in your opinion, are some of the challenges facing landowners when undertaking restoration programmes?						
C.6) What, in your opinion, are some of the benefits for landowners when undertaking restoration programmes?						
<b>SECTION D: ECONOMIC INFORMATION</b>						
D.1) Please tick the most appropriate option in response to the following statements:						
	For the period 2001 – 2012 I invested in the following:-	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	International holidays					
b)	Holidays to southern African destinations					
c)	New vehicles					
d)	Tertiary education for my children					
e)	Homestead expansion & maintenance					
f)	Investments (units trusts, retirement annuities, off-shore investments).					
g)	Capital investment in new farming infrastructure					
h)	Purchasing additional property					
i)	Nil, I am running on a turn-over budget					

D.2) Please tick the most appropriate option in response to the following statements:						
	For the period 1991 – 2000 I invested in the following:-	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	International holidays					
b)	Holidays to southern African destinations					
c)	New vehicles					
d)	Tertiary education for my children					
e)	Homestead expansion & maintenance					
f)	Investments (units trusts, retirement annuities, off-shore investments).					
g)	Capital investment in new farming infrastructure					
h)	Purchasing additional property					
i)	Nil, I was running on a turn-over budget					
D.3) Please tick the most appropriate option in response to the following statements:						
	For the period 1981 – 1990 I invested in the following:-	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	International holidays					
b)	Holidays to southern African destinations					
c)	New vehicles					
d)	Tertiary education for my children					
e)	Homestead expansion & maintenance					
f)	Investments (units trusts, retirement annuities, off-shore investments).					
g)	Capital investment in new farming infrastructure					
h)	Purchasing additional property					
i)	Nil, I was running on a turn-over budget					
D.4) Please tick the most appropriate option in response to the following statements:						
	For the period 1971 – 1980 I invested in the following:-	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	International holidays					
b)	Holidays to southern African destinations					
c)	New vehicles					
d)	Tertiary education for my children					
e)	Homestead expansion & maintenance					
f)	Investments (units trusts, retirement annuities, off-shore investments).					
g)	Capital investment in new farming infrastructure					
h)	Purchasing additional property					
i)	Nil, I was running on a turn-over budget					

D.5) Please tick the most appropriate option in response to the following statements:						
	For the period 1961 – 1970 I invested in the following:-	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	International holidays					
b)	Holidays to southern African destinations					
c)	New vehicles					
d)	Tertiary education for my children					
e)	Homestead expansion & maintenance					
f)	Investments (units trusts, retirement annuities, off-shore investments).					
g)	Capital investment in new farming infrastructure					
h)	Purchasing additional property					
i)	Nil, I was running on a turn-over budget					
<b>E: BIODIVERSITY STEWARDSHIP INFORMATION</b>						
E.1) Would you expect some form of compensation, financial or other, for changing your land-use practices?						
1. Yes						
2. No						
3. Unsure						
E.2) Please tick the most appropriate option in response to the following statements:						
	Which of the following potential benefits and support would be the most appealing to you when entering into an agreement that offered you benefits and support for sustainable land-use practices (including conservation, restoration and sustainable farming)?	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	Assistance with management of natural vegetation and riverine areas.					
b)	Restoration of degraded lands.					
c)	Founder populations of rare game species for breeding programmes.					
d)	World Heritage Site status for your farm.					
e)	Promotion of a “green brand” for your agricultural products.					
f)	Support with the development of a tourism marketing platform.					
g)	Municipal rates rebates.					
h)	Tax deductions.					
i)	Support with local security.					
j)	Social development projects for farm workers.					

k)	I wouldn't need any incentives					
l)	Other (please specify)					
E.3) Please tick the most appropriate option in response to the following statement:						
	If you could chose to restructure your current agreement, would you prefer to enter into the agreement:	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	Individually (continue to E.4)					
b)	Collectively, with all land-owners and land-users in the Compassberg PE (as it is currently)					
c)	With my immediate neighbours only					
Additional Comments?						
E.4) Please tick the most appropriate option in response to the following statements (skip if answered "a" above):						
	What were/are your concerns about maintaining a collective agreement?	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	Lack of independence.					
b)	Other people making decisions for my farm.					
c)	Potential conflicts of interest.					
d)	I don't think other people have my best interests in mind.					
e)	Each property is unique and should be treated as such.					
f)	Other, please specify					
E.5) Please tick the most appropriate option in response to the following statement:						
	If you chose to enter into an agreement that offered you benefits and support for sustainable land-use practices (including conservation, restoration and sustainable farming), what would you consider an optimal duration for the contract:	Strongly Agree	Mildly Agree	Unsure	Mildly Disagree	Strongly Disagree
a)	3-5 years					
b)	5-10 years					
c)	30 -50 years					
d)	50 – 99 years					
E.6) If you chose to enter into an agreement that offered you benefits and support for sustainable land-use practices (including conservation, restoration and sustainable farming), would you prefer to join at the beginning or join later?						
a)	Join at the beginning					
b)	Join later					



Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### New Ecological Paradigm Scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. We are approaching the limit of the number of people the earth can support.	1	2	3	4	5
2. Humans have the right to modify the natural environment to suit their needs.	1	2	3	4	5
3. Humans are severely abusing the environment.	1	2	3	4	5
4. Human ingenuity will insure that we do NOT make the earth unlivable.	1	2	3	4	5
5. When humans interfere with nature it often produces disastrous consequences.	1	2	3	4	5
6. The earth has plenty of natural resources if we just learn how to develop them.	1	2	3	4	5
7. Plants and animals have as much right as humans to exist.	1	2	3	4	5
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	1	2	3	4	5
9. Despite our special abilities, humans are still subject to the laws of nature.	1	2	3	4	5
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.	1	2	3	4	5
11. The earth is like a spaceship with limited room and resources.	1	2	3	4	5
12. Humans were meant to rule over the rest of nature.	1	2	3	4	5
13. The balance of nature is very delicate and easily upset.	1	2	3	4	5
14. Humans will eventually learn enough about how nature works to control it.	1	2	3	4	5
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### Connectedness to Nature Scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I often feel a sense of oneness with the natural world around me.	1	2	3	4	5
2. I think of the natural world as a community to which I belong.	1	2	3	4	5
3. I recognize and appreciate the intelligence of other living organisms.	1	2	3	4	5
4. I often feel disconnected from nature.	1	2	3	4	5
5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.	1	2	3	4	5
6. I often feel a kinship with animals and plants.	1	2	3	4	5
7. I feel as though I belong to the Earth as equally as it belongs to me.	1	2	3	4	5
8. I have a deep understanding of how my actions affect the natural world.	1	2	3	4	5
9. I often feel part of the web of life.	1	2	3	4	5
10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.	1	2	3	4	5
11. Like a tree can be part of a forest, I feel embedded within the broader natural world.	1	2	3	4	5
12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.	1	2	3	4	5
13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.	1	2	3	4	5
14. My personal welfare is independent of the welfare of the natural world.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### Aspects of Identity Scale

		Not important to my sense of who I am	Slightly important to my sense of who I am	Somewhat important to my sense of who I am	Very important to my sense of who I am	Extremely important to my sense of who I am
1.	My personal values and moral standards.	1	2	3	4	5
2.	The ways in which other people react to what I say and do.	1	2	3	4	5
3.	My personal goals and hopes for the future of the landscape.	1	2	3	4	5
4.	My religion.	1	2	3	4	5
5.	My reputation, what others think of me.	1	2	3	4	5
6.	Places where I live or where I was raised.	1	2	3	4	5
7.	My thoughts and ideas.	1	2	3	4	5
8.	My age, belonging to my age group or being part of my generation.	1	2	3	4	5
9.	The ways I deal with my fears and anxieties.	1	2	3	4	5
10.	My feeling of being a unique person, being distinct from others.	1	2	3	4	5
11.	My social class, the economic group I belong to whether lower, middle, or upper class.	1	2	3	4	5
12.	My feeling of belonging to my community.	1	2	3	4	5
13.	Knowing that I continue to be essentially the same person although external circumstances may change.	1	2	3	4	5
14.	My commitment to being a concerned parent.	1	2	3	4	5
15.	My feeling of pride in my country, being proud to be a citizen.	1	2	3	4	5
16.	My occupational choice.	1	2	3	4	5
17.	My commitments on political issues or my political activities.	1	2	3	4	5
18.	My language, such as my regional accent or dialect or a second language that I know.	1	2	3	4	5
19.	My role of being a farmer in the Baviaanskloof.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### Occupational

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Carbon is not an agricultural product.	1	2	3	4	5
2. Water is not an agricultural product.	1	2	3	4	5
3. Changing my current land-use practices is a matter of survival, not choice.	1	2	3	4	5
4. If I could maintain my current income levels from non-consumptive land-uses, I would change my land-use immediately.	1	2	3	4	5
5. Conservation and farming can't work together on the same farm.	1	2	3	4	5
6. <i>Die Baviaanskloof Hartland</i> gives me a sense of community.	1	2	3	4	5
7. I believe the ECPTA is doing their best for the environment in the Eastern Cape.	1	2	3	4	5
8. The Baviaanskloof Municipality takes our needs seriously.	1	2	3	4	5
9. To be able to call myself a farmer, I must produce an agricultural product.	1	2	3	4	5
10. My biggest fear when considering a change in land-use is having to rely on others for skills and knowledge.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

**Place Attachment Scale**

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The Baviaanskloof is very special.	1	2	3	4	5
2. Living in the Baviaanskloof says a lot about who I am.	1	2	3	4	5
3. My relationships in the Baviaanskloof are very special to me.	1	2	3	4	5
4. The Baviaanskloof means a lot to me.	1	2	3	4	5
5. I get more satisfaction living in the Baviaanskloof than I would from any other place.	1	2	3	4	5
6. I feel that the Baviaanskloof is part of me.	1	2	3	4	5
7. The things I do in the Baviaanskloof I would enjoy just as much at another site.	1	2	3	4	5
8. Most of my friends are in some way connected with my use of the Baviaanskloof.	1	2	3	4	5
9. I identify strongly with the Baviaanskloof.	1	2	3	4	5
10. I would feel less attached to the Baviaanskloof if the indigenous plants and animals that live here disappeared.	1	2	3	4	5
11. I would not substitute any other area for the activities I do in the Baviaanskloof.	1	2	3	4	5
12. I use the Baviaanskloof to help define and express who I am.	1	2	3	4	5
13. I am very attached to the Baviaanskloof.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### New Ecological Paradigm Scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. We are approaching the limit of the number of people the earth can support.	1	2	3	4	5
2. Humans have the right to modify the natural environment to suit their needs.	1	2	3	4	5
3. Humans are severely abusing the environment.	1	2	3	4	5
4. Human ingenuity will insure that we do NOT make the earth unlivable.	1	2	3	4	5
5. When humans interfere with nature it often produces disastrous consequences.	1	2	3	4	5
6. The earth has plenty of natural resources if we just learn how to develop them.	1	2	3	4	5
7. Plants and animals have as much right as humans to exist.	1	2	3	4	5
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	1	2	3	4	5
9. Despite our special abilities, humans are still subject to the laws of nature.	1	2	3	4	5
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.	1	2	3	4	5
11. The earth is like a spaceship with limited room and resources.	1	2	3	4	5
12. Humans were meant to rule over the rest of nature.	1	2	3	4	5
13. The balance of nature is very delicate and easily upset.	1	2	3	4	5
14. Humans will eventually learn enough about how nature works to control it.	1	2	3	4	5
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### Connectedness to Nature Scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I often feel a sense of oneness with the natural world around me.	1	2	3	4	5
2. I think of the natural world as a community to which I belong.	1	2	3	4	5
3. I recognize and appreciate the intelligence of other living organisms.	1	2	3	4	5
4. I often feel disconnected from nature.	1	2	3	4	5
5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.	1	2	3	4	5
6. I often feel a kinship with animals and plants.	1	2	3	4	5
7. I feel as though I belong to the Earth as equally as it belongs to me.	1	2	3	4	5
8. I have a deep understanding of how my actions affect the natural world.	1	2	3	4	5
9. I often feel part of the web of life.	1	2	3	4	5
10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.	1	2	3	4	5
11. Like a tree can be part of a forest, I feel embedded within the broader natural world.	1	2	3	4	5
12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.	1	2	3	4	5
13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.	1	2	3	4	5
14. My personal welfare is independent of the welfare of the natural world.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### Aspects of Identity Scale

		Not important to my sense of who I am	Slightly important to my sense of who I am	Somewhat important to my sense of who I am	Very important to my sense of who I am	Extremely important to my sense of who I am
1.	My personal values and moral standards.	1	2	3	4	5
2.	The ways in which other people react to what I say and do.	1	2	3	4	5
3.	My personal goals and hopes for the future of the landscape.	1	2	3	4	5
4.	My religion.	1	2	3	4	5
5.	My reputation, what others think of me.	1	2	3	4	5
6.	Places where I live or where I was raised.	1	2	3	4	5
7.	My thoughts and ideas.	1	2	3	4	5
8.	My age, belonging to my age group or being part of my generation.	1	2	3	4	5
9.	The ways I deal with my fears and anxieties.	1	2	3	4	5
10.	My feeling of being a unique person, being distinct from others.	1	2	3	4	5
11.	My social class, the economic group I belong to whether lower, middle, or upper class.	1	2	3	4	5
12.	My feeling of belonging to my community.	1	2	3	4	5
13.	Knowing that I continue to be essentially the same person although external circumstances may change.	1	2	3	4	5
14.	My commitment to being a concerned parent.	1	2	3	4	5
15.	My feeling of pride in my country, being proud to be a citizen.	1	2	3	4	5
16.	My occupational choice.	1	2	3	4	5
17.	My commitments on political issues or my political activities.	1	2	3	4	5
18.	My language, such as my regional accent or dialect or a second language that I know.	1	2	3	4	5
19.	My role of being a farmer in the Compassberg PE.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### Occupational

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Carbon is not an agricultural product.	1	2	3	4	5
2. Water is not an agricultural product.	1	2	3	4	5
3. Changing my current land-use practices is a matter of survival, not choice.	1	2	3	4	5
4. If I could maintain my current income levels from non-consumptive land-uses, I would change my land-use immediately.	1	2	3	4	5
5. Conservation and farming can't work together on the same farm.	1	2	3	4	5
6. <i>The Compassberg Protected Environment Landowners Association</i> gives me a sense of community.	1	2	3	4	5
7. I believe the ECPTA is doing their best for the environment in the Eastern Cape.	1	2	3	4	5
8. The Local Municipality takes our needs seriously.	1	2	3	4	5
9. To be able to call myself a farmer, I must produce an agricultural product.	1	2	3	4	5
10. My biggest fear when considering a change in land-use is having to rely on others for skills and knowledge.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

**Place Attachment Scale**

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The Compassberg PE is very special.	1	2	3	4	5
2. Living in the Compassberg PE says a lot about who I am.	1	2	3	4	5
3. My relationships in the Compassberg PE are very special to me.	1	2	3	4	5
4. The Compassberg PE means a lot to me.	1	2	3	4	5
5. I get more satisfaction living in the Compassberg PE than I would from any other place.	1	2	3	4	5
6. I feel that the Compassberg PE is part of me.	1	2	3	4	5
7. The things I do in the Compassberg PE I would enjoy just as much at another site.	1	2	3	4	5
8. Most of my friends are in some way connected with my use of the Compassberg PE.	1	2	3	4	5
9. I identify strongly with the Compassberg PE.	1	2	3	4	5
10. I would feel less attached to the Compassberg PE if the indigenous plants and animals that live here disappeared.	1	2	3	4	5
11. I would not substitute any other area for the activities I do in the Compassberg PE.	1	2	3	4	5
12. I use the Compassberg PE to help define and express who I am.	1	2	3	4	5
13. I am very attached to the Compassberg PE.	1	2	3	4	5



## Eastern Cape Biodiversity Stewardship: Site Assessment

### Part 1: Property and Contact Information

Information Supplied by	ECPTA Region and Municipal Area	Date

*Instructions: Complete the sheet below. In the case of multiple landowners, complete a separate Property and Contact Information sheet for each landowner involved*

**Property:** \_\_\_\_\_ **Size:**    ha

**SG Ref / Erf number:** \_\_\_\_\_

**Location:** \_\_\_\_\_

**Contact**

**Telephone:**                      **Land-line**    **Cell:** \_\_\_\_\_

**Landowner:**

**Telephone:**                      **Land-line**    **Cell:** \_\_\_\_\_

**E-mail:** \_\_\_\_\_

**Postal Address:** \_\_\_\_\_

\_\_\_\_\_

**Postal code:** \_\_\_\_\_

**Agreement Negotiator:** \_\_\_\_\_ **Contact no.:** \_\_\_\_\_

**Extension officer:** \_\_\_\_\_ **Contact no.:** \_\_\_\_\_

\_\_\_\_\_

**Site Assessment Team:** \_\_\_\_\_

\_\_\_\_\_



## Eastern Cape Biodiversity Stewardship: Site Assessment

### Part 2: Site Information

#### Overall Objectives of the Site Assessment

1. Determine the biodiversity value of the proposed biodiversity stewardship area;
2. Determine land-use pressures and threats to the proposed biodiversity stewardship area;
3. Determine whether the proposed biodiversity stewardship area warrants incorporation into the Eastern Cape Biodiversity Stewardship programme and to establish the preferred biodiversity stewardship category;
4. Begin the process of developing a management plan for the proposed biodiversity stewardship area; and
5. Establish a baseline for evaluation of management effectiveness.

#### Procedure for the Site Assessment

1. The Site Assessment can be conducted by an ECPTA ecologist or any other appropriately qualified individual (including NGO representative or environmental consultant) recognised by the Eastern Cape Biodiversity Stewardship program;
2. Depending on the requirements of the site, the assessor may assemble an Assessment Team to support the assessment;
3. The sections shaded in green should be completed primarily by the Assessment Team;
4. The sections shaded in yellow should be completed by the Assessment Team, supported by input from the landowner;
5. The Site Assessment comprises a Desktop Assessment and a Field Assessment component; and
6. The Desktop Assessment is completed ahead of the Field Assessment using the appropriate data.

#### Data required

The following spatial data layers should be consulted during the Desktop Assessment of the site:

- Orthophoto (if available);
- Satellite image (if orthophoto not available);
- 1 : 50 000 topographical map;
- Property boundaries;
- Vegetation types (depending on location of site; give preference to fine-scale plans if they exist);
  - Baviaanskloof vegetation (Euston-Brown 2006; <http://bgis.sanbi.org>);
  - GRI vegetation (Vlok et al. 2008; <http://bgis.sanbi.org>);
  - Little Karoo vegetation (Vlok et al 2005; <http://bgis.sanbi.org>);
  - NMBM vegetation (Stewart et. al. 2009; [www.srk.co.za](http://www.srk.co.za));
  - SA vegetation (Mucina & Rutherford 2006; <http://bgis.sanbi.org>);
- Ecosystem Threat Status of vegetation types (NBA 2011, or from respective biodiversity plans);
- Critical Biodiversity Areas (depending on location of site – give preference to fine-scale plans if they exist : Baviaanskloof, NMBM, GRI, Little Karoo, Eastern Cape Biodiversity Conservation Plan);
- National Freshwater Ecosystem Priority Areas (2011);
- Eastern Cape Protected Area Expansion priority areas (2012);
- Transformation / landcover layer (specifically mapped for site from aerial photography, from biodiversity plans or national landcover – give preference to the most fine-scale transformation data);
- Species of special concern (NMBM, ECBCP or other reputable species databases);
- Rivers;
- Roads; and
- Protected areas.

#### The following maps should be attached to the Desktop Assessment (A4)

1. Topographical map of site;
2. Map of site in relation to ECPAES priority areas;
3. Map of site in relation to critical biodiversity areas; and
4. Map of the vegetation types occurring on the site with hatched transformation layer overlaid.

#### The following maps should be produced for the Field Assessment (A3) to record any relevant features

1. Orthophoto (or satellite image), with rivers and roads; and
2. 1: 50 000 topographical map.

1. BIODIVERSITY PLANS			
1.1	Has a systematic biodiversity plan identified the site as falling within a <b>Critical Biodiversity Area</b> ?		
	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%; background-color: #d9ead3;"><b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No</td> <td style="width: 50%; background-color: #d9ead3;"><b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </table>	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No
	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Examine relevant systematic plans and determine whether the site falls within a CBA. Record which systematic biodiversity plan was used.	Verify that the area identified as CBA contains untransformed natural habitat and is in good condition	
Comment:	Comment:		
2. HABITATS			
2.1	Does the site contain threatened <b>habitats</b> or <b>vegetation types</b> ?		
	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%; background-color: #d9ead3;"><b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No</td> <td style="width: 50%; background-color: #d9ead3;"><b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </table>	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No
	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	
	List the vegetation types on the site and their ecosystem threat status. Indicate which vegetation type layer was used. Identify indicator species to support field verification. Record which systematic biodiversity plan was used to determine vegetation type and ecosystem threat status.	Verify that the vegetation types occur on the site.	
Comment:	Comment:		
2.2	Does the site contain vegetation types that are not adequately conserved in the existing protected area network? What is the <b>ecosystem protection level</b> of the vegetation types present?		
	<table border="1" style="width: 100%;"> <tr> <td style="width: 80%; background-color: #d9ead3;"><b>Desktop assessment</b></td> <td style="width: 20%; background-color: #d9ead3;"><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </table>	<b>Desktop assessment</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<b>Desktop assessment</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
In the vegetation stats table, record how much of each vegetation type present is conserved in statutory reserves. Record which systematic biodiversity plan was used. Comment:			
2.3	Does the site make a significant contribution (> than 5 % of the target) to <b>biodiversity target achievement</b> for vegetation types?		
	<table border="1" style="width: 100%;"> <tr> <td style="width: 80%; background-color: #d9ead3;"><b>Desktop assessment</b></td> <td style="width: 20%; background-color: #d9ead3;"><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </table>	<b>Desktop assessment</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<b>Desktop assessment</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	In the vegetation stats table (see appendix): 1. Calculate the proportion of the extent of the vegetation types contained within the property using the following formula: <i>Untransformed extent of vegetation type within property / total extent of vegetation type x 100 = % extent of vegetation type within property</i> 2. Calculate the properties potential contribution to biodiversity targets for vegetation types using the following formula: <i>Untransformed extent of vegetation type within property / vegetation type target x 100 = potential contribution of property to biodiversity target</i> If a target has already been achieved for a specific vegetation type, do not consider any additional area of this vegetation type from the site to be a contribution to target achievement.		
Comment:			

2.4	Are the vegetation types / habitats in a relatively natural <b>condition</b> ?			
	Desktop assessment <input type="checkbox"/> Yes <input type="checkbox"/> No		Field verification <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Using a habitat transformation / landcover layer, indicate the level of habitat transformation for the site and the individual vegetation types.		Assess the condition of the vegetation types – consult an expert if necessary.	
	Comment:		Comment:	
2.5	Are the vegetation types / habitats on the site relatively <b>unfragmented</b> ?			
	Desktop assessment <input type="checkbox"/> Yes <input type="checkbox"/> No		Field verification <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Using a habitat transformation / landcover layer and aerial photos, comment on fragmentation.		Verify the degree of fragmentation of natural areas on the site.	
	Comment:		Comment:	
2.6	Do degraded areas on the site have a good potential for <b>rehabilitation</b> ?			
	Desktop assessment <input type="checkbox"/> ? <input type="checkbox"/> Yes <input type="checkbox"/> No		Field verification <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Evaluate the potential to rehabilitate degraded areas of the site.		Evaluate the potential to rehabilitate degraded areas of the site.	
	Comment:		Comment:	
<b>3. SPECIES</b>				
3.1	Do any <b>threatened</b> or <b>range restricted</b> species occur on the site?			
	Desktop assessment <input type="checkbox"/> Yes <input type="checkbox"/> No		Field verification <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Using species databases, or other reputable sources, list species of special concern. Note the data source and whether species records are based on actual occurrences or modelled or historic data.		If possible, confirm that the species of special concern listed in the desktop assessment occur on the site. Consult an expert, if necessary. Note any additional species of special concern that have been observed during the field assessment or that have been confirmed to occur on site.	
	Species:	Source:	Species:	Source:
3.3	Can the site contribute to the <b>recovery of threatened species</b> (e.g. through reintroduction of threatened species)?			
	Desktop assessment <input type="checkbox"/> ? <input type="checkbox"/> Yes <input type="checkbox"/> No		Field verification <input type="checkbox"/> Yes <input type="checkbox"/> No	
	According to available information does the property appear to be suitable for the recovery of threatened species (e.g. does the site fall within the known distribution range of threatened species, does it have suitable habitats for threatened species, do populations of threatened species occur in similar situations nearby)?		Confirm suitability for species recovery.	
	Comment:		Comment:	

4. ECOLOGICAL PROCESSES								
4.1	Does the site have an exceptionally high level of <b>habitat heterogeneity</b> ?							
	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No</td> <td style="width: 50%;"><b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </table>	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No					
	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No						
	Examine a map of vegetation types and comment on the habitat heterogeneity on the site.	Confirm habitat heterogeneity on the site. Include any additional habitats not listed in the desktop assessment.						
Comment:	Comment:							
4.2	Does the site contribute to the conservation of <b>ecological processes</b> at the <b>scales</b> listed below?							
	<b>Desktop assessment</b>							
	Compare the size of the property in relation to the suite of ecological processes that occur at various scales for the particular habitat types concerned.							
	Comments:	<table border="0" style="width: 100%;"> <tr> <td style="width: 80%;">Small-scale (e.g. pollinator-plant relationships, seed dispersal by insects, birds, and small mammals, predation by small predators)</td> <td style="width: 20%;"><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td>Medium-scale (e.g. mesoherbivory, predation by medium-sized predators, seed dispersal large mammals)</td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td>Large-scale (e.g. natural fire regimes, megaherbivory, predation by large predators)</td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </table>	Small-scale (e.g. pollinator-plant relationships, seed dispersal by insects, birds, and small mammals, predation by small predators)	<input type="checkbox"/> Yes <input type="checkbox"/> No	Medium-scale (e.g. mesoherbivory, predation by medium-sized predators, seed dispersal large mammals)	<input type="checkbox"/> Yes <input type="checkbox"/> No	Large-scale (e.g. natural fire regimes, megaherbivory, predation by large predators)	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Small-scale (e.g. pollinator-plant relationships, seed dispersal by insects, birds, and small mammals, predation by small predators)	<input type="checkbox"/> Yes <input type="checkbox"/> No						
Medium-scale (e.g. mesoherbivory, predation by medium-sized predators, seed dispersal large mammals)	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Large-scale (e.g. natural fire regimes, megaherbivory, predation by large predators)	<input type="checkbox"/> Yes <input type="checkbox"/> No							
4.3	Will the property be able to contribute to <b>biological adaptations to climate change</b> (does it contain significant altitudinal gradients)?							
	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No							
	Consult map of climate change resilience areas (Holness & Bradshaw 2012) and indicate importance for climate change resilience. Also calculate altitudinal gradients using the following formula: <i>Highest point on property - lowest point on property = altitudinal gradient</i>							
	Comments:							
4.4	Is the site a <b>critical ecological process</b> area or vital <b>corridor</b> or ' <b>stepping stone</b> ' for the movement of species?							
	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No</td> <td style="width: 50%;"><b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </table>	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No					
	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No						
	Has the site been identified in a systematic biodiversity plan as a corridor area or a critical ecological process area?  Examine the map of vegetation types and a transformation / landcover layer in the context of the landscape within which the site falls. Does the property serve as a corridor or stepping stone for the movement of species?  Indicate land use on surrounding properties.	Confirm that any identified corridors or stepping stones exist (i.e. that they have not been transformed subsequent to date of production of the data).						
Comments:	Comments:							

4.5	Is the property of strategic value as a <b>buffer</b> to protected areas or as a protected area <b>consolidation</b> or <b>expansion</b> area?		
	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No		
	Consult the Protected Areas layer. Is the property adjacent to a protected area? Does it support consolidation of protected areas? Examine the Eastern Cape Protected Areas Expansion Strategy layer. Is the property identified as a priority area for protected area expansion? Comment on the opportunity for expansion of the biodiversity stewardship site.		
	Comment:		
<b>5. ECOSYSTEM GOODS AND SERVICES</b>			
5.1	Do important <b>provisioning services</b> occur as a result of the natural systems on the site (i.e. are products obtained from the natural systems)?		
	<b>Field assessment</b>		
	Evaluate the (provincial) significance of provisioning services provided by the site by checking the boxes. If not applicable, leave the boxes unchecked.		
	<b>Provisioning services</b>	<b>Nature of product</b>	<b>Significance</b>
	Clean water production (natural vegetation function)		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Water purification (wetland function)		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Food		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Medicinal plants or products		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Harvesting of plant material (thatch, poles, firewood etc)		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Grazing		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Pollination		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Animal harvesting		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Other		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
Comments:			
5.2	Do important <b>regulating services</b> occur?		
	<b>Field Assessment</b>		
	Evaluate the (provincial) significance of regulating services provided by the site by checking the boxes. If not applicable, leave the boxes unchecked.		
	<b>Regulating services</b>	<b>Nature of regulating service</b>	<b>Significance</b>
	Regulation / attenuation of floods and water supply		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Carbon sequestration		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Other		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
Comments:			

5.3	Rate any important <b>cultural services</b> (non-material benefits) occur?		
	<b>Field assessment</b>		
	Evaluate the (provincial) significance of cultural services provided by the site by checking the boxes. If not applicable, leave the boxes unchecked.		
	<b>Cultural services</b>	<b>Nature of cultural service</b>	<b>Significance</b>
	Education		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Recreation		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Aesthetics		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Spiritual or cultural		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	Other		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
Comment			

## 6. THREATS

6.1	<b>Field assessment</b>		
	Rate the significance of the following threats to biodiversity on the site (also add any threat not captured below)		
	<b>Threat</b>	<b>Nature of threat (e.g. species of invasive alien plants)</b>	<b>Significance</b>
	a. Invasive alien plants		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	b. Poaching / illegal harvesting		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	c. Fire		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	d. Grazing		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	e. Accelerated soil erosion		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	f. Extra-limital / alien animals		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	g. Land-invasion		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	h. Mining		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	i. Water abstraction / dams		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	j. Pollution		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	k. Uncontrolled Access		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
	l. Other		<input type="checkbox"/> High <input type="checkbox"/> Mod <input type="checkbox"/> Low
Comment:			

## 7. MANAGEMENT ISSUES

7.1	<b>Field assessment</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Has the landowner invested any resources in alien plant eradication? Indicate hectares cleared and funds invested. If possible, map cleared areas.	

	Comment:
7.2	<b>Field assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No
	Has the Working for Water Programme been active within the property? What forms of assistance have been provided?
	Comment:
7.3	<b>Field assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No
	Determine if there is a written management plan for the property and, if so, what is its status (e.g. in development, draft plan or completed plan).
	Comment:
7.4	<b>Field assessment</b>
	What is the current burning regime on the site?
	Comment:
7.5	<b>Field assessment</b>
	Provide details around the grazing system used (rotational system, stocking rate, time of year, domestic livestock and indigenous game)
	Comment:
7.6	<b>Field assessment</b>
	Describe the notable management or restoration actions required (e.g. erosion control, de-stocking, fencing).
	Comment:
7.7	<b>Field assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No
	Does the landowner have any specific management needs or has the landowner requested any specific support from ECPTA or other agencies?
	Comment:
7.8	<b>Field assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No
	Are there any veterinary restrictions imposed on the proposed biodiversity stewardship area?
	Comment:

## 8. PARTNERSHIP OPPORTUNITIES AND DEVELOPMENT

8.1	<b>Field assessment</b> <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span>
	Are there other current partnerships, memberships or existing statuses to note (e.g. Conservancy, Fire Protection Association, Water users Association, Natural Heritage Site, Registered Commercial Game Farm or Registered Important Bird Area)?
	Comment:
8.2	<b>Field assessment</b> <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span>
	Do any conditions or agreements applying to property (e.g. Trusts, MoA's, MoU's, permissions, permits, EIA applications, development conditions, liabilities and directives in terms of any legislation, land claims or servitudes).
	Comment:
8.3	<b>Field assessment</b> <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span>
	Does the landowner have any development intentions for the area proposed for conservation?
	Comment:
8.4	<b>Field assessment</b> <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span>
	Does the landowner have any intentions of selling the property in the near future
	Comment:

## 9. LAND CLAIMS

9.1	<b>Desktop assessment</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Field verification</b> <input type="checkbox"/> Yes <input type="checkbox"/> No
	Is there a land claim on the property? If yes, determine at what stage the land claim is.	Verify if there is a land claim on the property is and determine the stage in the process.
	Comment:	Comment:

## SUMMARY

### CONTRIBUTION TO CONSERVATION

Rate the significance (at a provincial scale) of the site's contribution to the biodiversity conservation

Contributes to conservation of vegetation types	<input type="checkbox"/> Essential	<input type="checkbox"/> Important	<input type="checkbox"/> Not Essential or Important
Contributes to conservation of species	<input type="checkbox"/> Essential	<input type="checkbox"/> Important	<input type="checkbox"/> Not Essential or Important
Contributes to conservation of ecological process	<input type="checkbox"/> Essential	<input type="checkbox"/> Important	<input type="checkbox"/> Not Essential or Important
Contributes to conservation of systems that provide ecosystem services	<input type="checkbox"/> Essential	<input type="checkbox"/> Important	<input type="checkbox"/> Not Essential or Important

NEMA PAA CHECKLIST	
<b>Tick the appropriate box</b>	
2 b (i) has significant features or biodiversity	<input type="checkbox"/>
2 b (ii) is of scientific, cultural, historical or archaeological interest	<input type="checkbox"/>
2 b (iii) is in need of long-term protection for the maintenance of its biodiversity or for the provision of environmental goods and services	<input type="checkbox"/>
2 c provides for a sustainable flow of natural products and services to meet the needs of a local community	<input type="checkbox"/>
2 d enables the continuation of such traditional consumptive uses as are sustainable	<input type="checkbox"/>
2 e provides for nature-based recreation and tourism opportunities	<input type="checkbox"/>

<b>Give a summary of 4 or 5 major reasons for suggested biodiversity stewardship status.</b>
<b>Describe the most important conservation Management Objectives for the property.</b>
<b>Comments and Additional Information:</b>
<b>RECOMMENDED CATEGORY</b>
<b>Recommend an appropriate category</b>
<input type="checkbox"/> Nature Reserve <input type="checkbox"/> Protected Environment <input type="checkbox"/> Biodiversity Agreement <input type="checkbox"/> Conservation Area <input type="checkbox"/> None
Comment:
<b>Indicate the landowner's preferred category</b>
<input type="checkbox"/> Nature Reserve <input type="checkbox"/> Protected Environment <input type="checkbox"/> Biodiversity Agreement <input type="checkbox"/> Conservation Area <input type="checkbox"/> Undecided
Comment:
<b>MAPS</b>

## Conservation Opportunity Value Survey

<b>Date:</b>		<b>Method:</b>		<b>Interviewer:</b>	
<b>SECTION A: BACKGROUND INFORMATION</b>					
A.1) Name of farming enterprise:					
A.2) Name of Interviewee:					
A.3) Name of person(s) responsible for long term, strategic decision-making if different from A.2:					
A.4) Name of manager responsible for day-to-day decision-making if different from A.2 or A.3:					
A.5) Postal address: P O Box				Postal code:	
A.6) Phone:		Cell:		Fax:	
A.7) Email Address:					
<b>BIOGRAPHICAL INFORMATION OF LONG TERM DECISION MAKER (A.3)</b>					
A.8)	Male		Female		
A.9) Age Group					
29 or younger		30-44		45-59	60 or older
A.10) First Language:					
A.11) Number of generations your family has been farming:					
A.12) Do you have children? If yes, please provide details below.					
	Age	Gender	Currently at school	Tertiary Education	Current Occupation
Child 1					
Child 2					
Child 3					
Child 4					
Child 5					
A.12) Number of years you have been farming?					
A.13) Do you belong to an Association (e.g. hunters, fishing, farmers etc.)?					
A.14) If yes, please list them.					
A.15) What is your role within the Association(s) (e.g. Chairperson)?					
A.16) How does membership benefit you?					
A.17) How long has the Association(s) been active?					
A.18) How many years has the current leadership structure of the Association(s) been in place?					
<b>SECTION B: LAND UNIT INFORMATION</b>					
B.1) For how many years have you and / or your family farmed this particular farm:					
B.2) What is the collective size of the properties utilized in your farming enterprise (ha)?					
B.3) Are you planning on selling your farm within the next 5 years? If yes, what is the reason?					

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### **New Ecological Paradigm Scale**

	Strongly Disagree	Disagre e	Neutra l	Agre e	Strongly Agree
1. We are approaching the limit of the number of people the earth can support.	1	2	3	4	5
2. Humans have the right to modify the natural environment to suit their needs.	1	2	3	4	5
3. Humans are severely abusing the environment.	1	2	3	4	5
4. Human ingenuity will insure that we do NOT make the earth unlivable.	1	2	3	4	5
5. When humans interfere with nature it often produces disastrous consequences.	1	2	3	4	5
6. The earth has plenty of natural resources if we just learn how to develop them.	1	2	3	4	5
7. Plants and animals have as much right as humans to exist.	1	2	3	4	5
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	1	2	3	4	5
9. Despite our special abilities, humans are still subject to the laws of nature.	1	2	3	4	5
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.	1	2	3	4	5
11. The earth is like a spaceship with limited room and resources.	1	2	3	4	5
12. Humans were meant to rule over the rest of nature.	1	2	3	4	5
13. The balance of nature is very delicate and easily upset.	1	2	3	4	5
14. Humans will eventually learn enough about how nature works to control it.	1	2	3	4	5
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### Connectedness to Nature Scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I often feel a sense of oneness with the natural world around me.	1	2	3	4	5
2. I think of the natural world as a community to which I belong.	1	2	3	4	5
3. I recognize and appreciate the intelligence of other living organisms.	1	2	3	4	5
4. I often feel disconnected from nature.	1	2	3	4	5
5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.	1	2	3	4	5
6. I often feel a kinship with animals and plants.	1	2	3	4	5
7. I feel as though I belong to the Earth as equally as it belongs to me.	1	2	3	4	5
8. I have a deep understanding of how my actions affect the natural world.	1	2	3	4	5
9. I often feel part of the web of life.	1	2	3	4	5
10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.	1	2	3	4	5
11. Like a tree can be part of a forest, I feel embedded within the broader natural world.	1	2	3	4	5
12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.	1	2	3	4	5
13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.	1	2	3	4	5
14. My personal welfare is independent of the welfare of the natural world.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### Aspects of Identity Scale

		Not important to my sense of who I am	Slightly important to my sense of who I am	Somewha t important to my sense of who I am	Very important to my sense of who I am	Extremely important to my sense of who I am
1.	My personal values and moral standards.	1	2	3	4	5
2.	The ways in which other people react to what I say and do.	1	2	3	4	5
3.	My personal goals and hopes for the future of the landscape.	1	2	3	4	5
4.	My religion.	1	2	3	4	5
5.	My reputation, what others think of me.	1	2	3	4	5
6.	Places where I live or where I was raised.	1	2	3	4	5
7.	My thoughts and ideas.	1	2	3	4	5
8.	My age, belonging to my age group or being part of my generation.	1	2	3	4	5
9.	The ways I deal with my fears and anxieties.	1	2	3	4	5
10.	My feeling of being a unique person, being distinct from others.	1	2	3	4	5
11.	My social class, the economic group I belong to whether lower, middle, or upper class.	1	2	3	4	5
12.	My feeling of belonging to my community.	1	2	3	4	5
13.	Knowing that I continue to be essentially the same person although external circumstances may change.	1	2	3	4	5
14.	My commitment to being a concerned parent.	1	2	3	4	5
15.	My feeling of pride in my country, being proud to be a citizen.	1	2	3	4	5
16.	My occupational choice.	1	2	3	4	5
17.	My commitments on political issues or my political activities.	1	2	3	4	5
18.	My language, such as my regional accent or dialect or a second language that I know.	1	2	3	4	5
19.	My role of being a farmer in the Baviaanskloof.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

### Occupational

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Carbon is not an agricultural product.	1	2	3	4	5
2. Water is not an agricultural product.	1	2	3	4	5
3. Changing my current land-use practices is a matter of survival, not choice.	1	2	3	4	5
4. If I could maintain my current income levels from non-consumptive land-uses, I would change my land-use immediately.	1	2	3	4	5
5. Conservation and farming can't work together on the same farm.	1	2	3	4	5
6. <i>Die Baviaanskloof Hartland</i> gives me a sense of community.	1	2	3	4	5
7. I believe the ECPTA is doing their best for the environment in the Eastern Cape.	1	2	3	4	5
8. The Baviaanskloof Municipality takes our needs seriously.	1	2	3	4	5
9. To be able to call myself a farmer, I must produce an agricultural product.	1	2	3	4	5
10. My biggest fear when considering a change in land-use is having to rely on others for skills and knowledge.	1	2	3	4	5

Please answer each of these questions in terms of the way you generally feel. There is no right or wrong answer. In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

**Place Attachment Scale**

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The Baviaanskloof is very special.	1	2	3	4	5
2. Living in the Baviaanskloof says a lot about who I am.	1	2	3	4	5
3. My relationships in the Baviaanskloof are very special to me.	1	2	3	4	5
4. The Baviaanskloof means a lot to me.	1	2	3	4	5
5. I get more satisfaction living in the Baviaanskloof than I would from any other place.	1	2	3	4	5
6. I feel that the Baviaanskloof is part of me.	1	2	3	4	5
7. The things I do in the Baviaanskloof I would enjoy just as much at another site.	1	2	3	4	5
8. Most of my friends are in some way connected with my use of the Baviaanskloof.	1	2	3	4	5
9. I identify strongly with the Baviaanskloof.	1	2	3	4	5
10. I would feel less attached to the Baviaanskloof if the indigenous plants and animals that live here disappeared.	1	2	3	4	5
11. I would not substitute any other area for the activities I do in the Baviaanskloof.	1	2	3	4	5
12. I use the Baviaanskloof to help define and express who I am.	1	2	3	4	5
13. I am very attached to the Baviaanskloof.	1	2	3	4	5

**Focal Area: Western Baviaanskloof****Site Name: Baviaanskloof Hartland****Trigger event/Catalytic environment**

	<b>Yes / No</b>	<b>Score</b>
Mining threat	No	1
Landscape transformation	No	1
Development	No	1
Degradation	Yes	4
Other	No	1

**Capacity building opportunities**

	<b>Yes / No</b>	<b>Score</b>
Research programmes	Yes	4
Indigenous knowledge transfer	No	2
LED programmes	Yes	3

**Available funding/resources**

	<b>Yes / No</b>	<b>Score</b>
IEI/PES	Yes	4
Landscape/regional programmes	Yes	3
Hih priority biodiversity area	Yes	4
Other	No	1

**Leadership**

	<b>Yes / No</b>	<b>Score</b>
Functional organisations	Yes	4

### **High-level Assessment Outcomes**

	Actual Score	Min Score	Max Score
Trigger event	7	5	25
Capacity building	9	3	15
Funding/resources	12	4	20
Leadership	4	1	5
Total	32	13	65

### **Thresholds**

Proceed with individual survey	35 - 65
Collate additional data	20 - 34
Do not engage	13 - 19

**Focal Area: Middelberg/Nieu Bethesda****Site Name: Compassberg****Trigger event/Catalytic environment**

	<b>Yes / No</b>	<b>Score</b>
Mining threat	Yes	5
Landscape transformation	Yes	2
Development	No	1
Degradation	Yes	3
Other	No	1

**Capacity building opportunities**

	<b>Yes / No</b>	<b>Score</b>
Research programmes	Yes	4
Indigenous knowledge transfer	Yes	4
LED programmes	Yes	3

**Available funding/resources**

	<b>Yes / No</b>	<b>Score</b>
IEI/PES	Yes	4
Landscape/regional programmes	Yes	3
Hih priority biodiversity area	Yes	5
Other	No	1

**Leadership**

	<b>Yes / No</b>	<b>Score</b>
Functional organisations	Yes	4

### **High-level Assessment Outcomes**

	Actual Score	Min Score	Max Score
Trigger event	11	5	25
Capacity building	11	3	15
Funding/resources	13	4	20
Leadership	4	1	5
Total	39	13	65

### **Thresholds**

Proceed with individual survey	35 - 65
Collate additional data	20 - 34
Do not engage	13 - 19

**Focal Area:**

**Site Name:**

**Trigger event/Catalytic environment**

	<b>Yes / No</b>	<b>Score</b>
Mining threat	Yes	1
Landscape transformation	Yes	1
Development	No	1
Degradation	Yes	1
Other	No	1

**Capacity building opportunities**

	<b>Yes / No</b>	<b>Score</b>
Research programmes	Yes	1
Indigenous knowledge transfer	Yes	1
LED programmes	Yes	1

**Available funding/resources**

	<b>Yes / No</b>	<b>Score</b>
IEI/PES	Yes	1
Landscape/regional programmes	Yes	1
Hih priority biodiversity area	Yes	1
Other	No	1

**Leadership**

	<b>Yes / No</b>	<b>Score</b>
Functional organisations	Yes	1

### **High-level Assessment Outcomes**

	Actual Score	Min Score	Max Score
Trigger event	5	5	25
Capacity building	3	3	15
Funding/resources	4	4	20
Leadership	1	1	5
Total	13	13	65

### **Thresholds**

Proceed with individual survey	35 - 65
Collate additional data	20 - 34
Do not engage	13 - 19

## **Social Scales**

Yes / No    Score

NEP

PAS

CNS

OIS

AIS

Yes  
No

1  
2  
3  
4  
5

Nature Reserve  
Protected Environment  
Biodiversity Agreement  
Conservation Area