

Article

Relational Values of Cultural Ecosystem Services in an Urban Conservation Area: The Case of Table Mountain National Park, South Africa

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Abstract: This paper assesses how residents of a developing city in the Global South, recognize and value the multiple diverse cultural ecosystem services associated with freshwater ecosystems, as provided by different landscape features originating in an urban protected area. This objective was achieved by establishing who benefits from freshwater ecosystem services, uncovering the spatial and temporal relationships these beneficiaries have with landscape features, and determining the relational nature of ecosystem service values, benefits and trade-offs as experienced by the different users. Recreation, aesthetic and existence services were valued highest by respondents. People who live closer to the park use, and benefit from, the park's freshwater ecosystems more frequently than those living further away. Park visitors want ease of access in terms of distance to specific freshwater ecosystems, and then once there, they want a diversity of activity options, such as recreation opportunities, as well as places to reflect and meditate. This study of cultural ecosystem services improves our understanding of social-ecological systems in urban areas by exploring the relationships between park and people which can guide management to ensure equitable and sustainable ecosystem service provision to all city residents.

Keywords: cultural ecosystem services; freshwater features; urban protected area; Table Mountain National Park; Cape Town; Global South



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1. Introduction

As urban environments have expanded and continue to grow [1], so too has the recognition of human dependence on nature for the provision of vital goods and services [2,3]. National parks within cities are critical components of urban ecosystems, holding valuable green (e.g., grasslands and forests) and blue (e.g., rivers and wetlands) infrastructure, which includes freshwater systems and their functioning. Freshwater ecosystems, in particular, provide a variety of cultural ecosystem services (ESs), ranging from spiritual enlightenment to recreation [4,5]. These urban parks are key elements of the social-ecological landscape where biophysical, social, economic and cultural factors are inextricably intertwined [6].

Cities and urban parks represent a new class of ecosystem shaped by the dynamic interactions between ecological and social systems [7] and as such need to be considered as social-ecological systems (SES), which are composed of organized assemblages of humans and nonhuman life forms in a spatially determined geophysical setting [8]. The functioning of SES is complex, heterogeneous and often structured by dynamic processes [9] with environmental variables influencing natural systems across space and time. Understanding the complexity of ecological systems is crucial if we are to comprehend human interactions that result in critical changes in the goods and services an ecosystem can provide.

Cities, such as Cape Town, which have seen rapid expansion in recent decades [10], should be considered as SES as there are multiple demands on urban land use to meet development and conservation needs [11,12]. When projecting the expansion of current cities, one must become more proactive in allowing for reconciliation between human development and environmental sustainability [12–15]. Understanding the links between urban protected areas and the cities in close proximity to them, as well as the relationships between ESs and people, particularly within African contexts, requires an SES approach [16–18].

Urban parks play a vital role in generating ESs that are important for human well-being, a role which is becoming increasingly well recognized [2,19–25]. Nature-based recreation provides an opportunity for both physical and mental stimulation and relaxation [26–28], and numerous studies have shown that access to water in urban natural spaces correlates with higher levels of physical activity [23,28–30]. Additionally, the need to experience nature and escape from the city constitutes an important reason for people to visit urban parks [31]. Relaxation, quietude, nature appreciation, stress relief, combatting fatigue, social interactions, and aesthetic enjoyment are stated as important reasons for using blue infrastructure in urban natural spaces and protected areas [3,22,23]. However, understanding the nuances, nature and workings of cultural ESs, especially in an urban context in the Global South, has yet to be adequately achieved [32,33]. Rapid urban growth in sub-Saharan Africa makes work in this area particularly pertinent [19,34].

While cultural ESs have been included in all seminal typologies relating to ESs [3,35,36], they have received less attention in the mounting body of empirical ecosystem service (ES) research and assessments [20,23,32,37–42]. Ecosystem service research, and more specifically a spatial understanding of the working of services, has grown substantially in the past decade [43–47]. Several dedicated tools and applications (e.g., SolVES) have been created to develop a better spatial understanding [47,48] of ES delivery as well as being used to establish and enhance key ES frameworks (e.g., the Common International Classification of Ecosystem Services (CICES), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), etc.) [49]. Several techniques have also been developed for the localization of cultural ESs valued by urban residents through participatory mapping [40,48,50–54]. The identification of locations of high ES delivery has been helpful in understanding the spatial determinants of ES provision, and its associated value to society [42,47,55]. Further, mapping techniques are playing an important role in informing landscape management, and offer researchers an opportunity to capture cultural benefits and trade-offs at a landscape level [46,56].

Cultural ESs are heterogeneous in space and evolve through time [57]. This heterogeneity over different scales suggests that the properties of ESs that people regard as useful or valuable may change over time or across different points in a landscape, even if the ecological system itself remains in a relatively constant state [16]. Being spatially explicit is important to consider the spatial heterogeneity of ES flows and of the social-ecological values and trade-offs that can be assigned to ESs [13,50,58–60].

These socio-ecological relationships have an immense impact on the relational valuation of ES [61], defined as the preferences, principles, and virtues of human-nature relationships [62–64]. Current conservation and land-use planning tools, including ES frameworks, tend to measure instrumental values (i.e., the value of an entity as merely a means to an end [64–70]), whereas we should seek to value and protect relationships amongst components of ecosystems, including humans. Dominant discourses and approaches emphasize the dichotomy between instrumental (anthropocentric) versus intrinsic (non-anthropocentric) dimensions of nature [71]. Instead, a relational value perspective tends to emphasize the value of the interactions between people and nature and those among individuals in society. Thus, relational values fill a gap left by inadequacies and ambiguities in the common application of the instrumental valuation paradigm [72]. Recently, the IPBES (2015) included the category of relational values in its conceptual framework, in addition to instrumental values. This high-level acknowledgment of the way in which values are articulated and assigned reveals possible areas for action [72], as well as pointing

to how values are shared and negotiated among groups of people, enabling them to act together as a community and creating a sense of belonging [61,62]. This recognition of how important relational values are to communities has a significant bearing on both ES policy and practice.

The value of protected areas is often judged in terms of their importance to society [73]. However, this importance, and the complex ways in which people relate to and interact with protected areas, cannot be captured by instrumental and intrinsic value framings alone. Rather, our understanding of the role of urban protected areas in society needs to take account of people's relational values concerning nature [73–75].

The overarching aim of this study was to develop an understanding of the cultural ESs, namely the underlying landscape factors and features determining their relational value and importance as perceived by users of a national park in a metropolitan setting, and the related benefits associated with use. To this end, we focused on freshwater ecosystems and features within the Table Mountain National Park (TMNP). We were guided by two research questions. Firstly, we investigated which cultural services and disservices emerge from different users in relation to freshwater features in the landscape, and secondly what the spatial factors are that may influence how users of cultural ESs value freshwater features in the TMNP. Our samples provided overviews of the diversity of perspectives within built and blue infrastructure and nuanced insight into the complex phenomena underlying water-related cultural ESs according to the state of water features in the TMNP, the section in which these features are located, and the accessibility of these features.

2. Materials and Methods

2.1. Study Site

Instituted in 1998, the TMNP located in the city of Cape Town is South Africa's only large urban national park and is the most visited of all South Africa's national parks [76], receiving over 4 million visitors per year of which 2.8 million are residents of Cape Town, visiting for outdoor recreational purposes such as hiking, biking, swimming, picnicking, bird watching, wildlife viewing, etc. [77,78] (See Table A1). Non-residents, comprising national and international visitors, make up the remaining 1.2 million visitors to the TMNP annually. The park covers an area of 221 km² and is almost entirely surrounded by the metropolitan area of Cape Town (Figure 1). It largely functions as an open-access system, as most of the park is unfenced [79], with 20 formal access points of which six are payment points (Table A2 in Appendix D). The park has an established network of over 500 km of trails for hiking, running and walking, as well as overnight accommodation facilities [77].

The park is comprised of three distinct sections: Northern (Table Mountain), Central (Silvermine) and Southern (Cape of Good Hope) sections. The Northern and Central sections are mountainous and are separated by developed urban areas on intervening terrain. The Southern section comprises most of the land on the southern peninsula of Cape Town.

TMNP has obtained World Heritage Site status in line with its global importance as a hotspot of biodiversity for higher plants and invertebrates. The park contains several natural and human-made freshwater landscape features, including rivers and streams, wetlands, pools, dams, reservoirs and waterfalls, 39 of which are included in this study. One of the main reasons why the park area has been protected is because of its early recognition as an important mountain catchment area for freshwater provision [80] for the residents of Cape Town, and it still performs this function today.

The City of Cape Town is located on the south-western tip of southern Africa (see Figure 1), occupies an area of roughly 2461 km² and has a population of 3.7 million people [81]. Population density in the City is measured at between 1530 [81] and 3950 people per square kilometer [82]. The broader metropolitan area of Cape Town is spatially distinct, from a development perspective [82], with areas of extreme wealth and poverty [83]. On the western and eastern flanks of the park, very affluent households reside, whereas further east of the park, poverty prevails in the poorer communities [84].

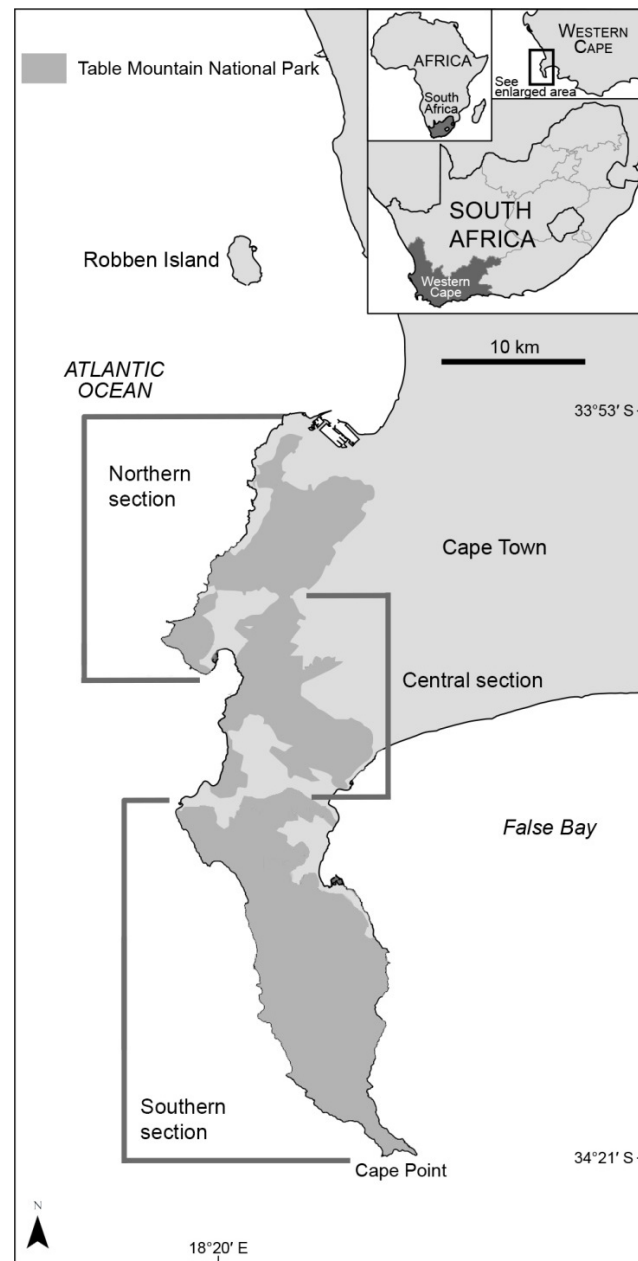


Figure 1. The Table Mountain National Park and its discontinuous sections along the Cape Peninsula, located in the Western Cape province of South Africa.

2.2. Data Gathering and Analyses

In partnership with the TMNP tourism unit, we identified 45 organized groups that use the park on a regular basis, all of which were contacted to take part in this study. User groups consisted of hiking clubs, walking groups, trail running groups, religious orders, research organizations, etc. Contact details for each of the user groups were provided by South African National Parks (SANParks), the state agency responsible for the management of governance of national parks. Emails were sent out to the administrators of each group inviting them and their group to take part in an online survey. Organized (formal) user groups who were contacted formed the majority of the sample population of this study, although the area is also a popular recreational destination for individuals and informal user groups (e.g., dog walkers). To elicit broader participation, posters that requested participation in the study were developed and displayed at shopping malls, libraries, and community centers throughout Cape Town, and at a number of the entrance points to the

park. Additionally, newspaper articles written by the study researchers were published in two free Cape Town community papers containing contact details for further participation. This study assessed the perceptions of ESs from formal and informal user groups, as these groups may appreciate cultural services in the TMNP differently [85,86].

Structured questionnaires were used [23,87] (Appendix A) to research the role and importance of an urban park. The online survey was constructed using KwikSurveys (www.kwiksurveys.com; 19 September 2017) and was active for eight months. The survey captured respondent details and asked 17 open-ended questions relating to the demographics of park users, historical and current access patterns and user behavior, present and past water-related activities, residents' proximity to the park, willingness to travel to the park and its freshwater features, as well as questions based on water-related impacts and management. Open-ended questions were designed to enrich understanding rather than draw definitive conclusions from quantitative summaries [38]. Water-related activities in this study relate to all undertakings recognized by survey respondents to be either in or near freshwater. A snowball methodology was adopted in which survey participants were encouraged to send a link to the survey to other users of the park or suggest other individuals who could be contacted to participate in the study. Measures were taken to ensure that respondents could not participate in the survey and mapping exercise more than once, which included registering for the survey using an email address. Further, we checked respondent details in spreadsheets for any duplication. A hard-copy version of the survey was also available and sent to members of the public who selected this option. A statement regarding compliance of relevant ethical standards and appropriate rules and guidelines regarding participation of human subjects was included in the terms and conditions of the online and hard-copy survey.

The online survey included a mapping application that pre-identified and numbered the park's freshwater landscape features [23,43,53]. The survey's use of a physical map focused discussion of cultural ES values on specific blue infrastructure, which helped make complex intangible concepts more concrete to respondents familiar with maps as expressions of place [38,40,55,59]. We focused on five cultural services, namely aesthetics and existence; cognitive development, learning and scientific discovery; cultural and historical; recreation; and spiritual and religious. A sixth category was added to include any disservice (negative) values assigned to particular water features. Survey respondents were asked to assign value to these freshwater features according to the six cultural ES categories. Values were derived from the number of responses a water feature receives across the six ES categories. Respondents were asked to select between five and ten freshwater features per ES category. This selection allowed for the more nuanced capturing of difference between features and showed a greater range of preferences for ES categories across the various water bodies. An option for non-applicability was also offered. The number of respondents who selected an ES category per water feature was totaled to achieve an overall cultural ES score. Negative values were subtracted from the overall score of a freshwater feature. The mapping application was written in Ruby On Rails 3 and source code was developed using JetBrains RubyMine v6. The questionnaire and mapping application are included in Appendix A (see Figures A1 and A2).

We examined the location of park entry points, residential proximity to the TMNP, and the distances users travel to access the park and its water features, as critical properties of these water features. The scoring flowchart adopted in this study is shown in Figure A3 (Appendix B). The highest number of points a water body could achieve was 15. Features that scored ten or less were ranked as not easily accessible, while those that scored 11 or higher were deemed easily accessible. These accessibility scores were used to determine how the level of access may influence ES values.

Cultural service scores were compared using the Kruskal-Wallis H test for state and section, and the Mann-Whitney U test for access. Both tests are rank-based nonparametric tests. An alpha threshold of 0.05 was used. Visual inspection of the boxplots (histograms) for each of the six cultural services for each factor suggested some deviation from normality.

Equality of variances of groups were assessed using the Levene's test of homogeneity of variances. Pairwise post hoc comparisons were used to further explore differences between groups.

3. Results

3.1. Characteristics of Respondents

We received 265 complete entries (survey and mapping exercises). Incomplete entries were discounted. There was a relatively even distribution of male and female respondents, totaling 139 (52.5%) and 126 (47.5%), respectively. The average age of male respondents was 43.7 ± 16.2 years, while that of females was 42.6 ± 14.1 years. The youngest respondent was 18, while the oldest was 82 years old. The majority (208 respondents; 57.4%) of participants have visited the TMNP for less than 30 years. Over 50% reported visiting the park weekly (139 respondents; 52.5%) and to visiting the park for less than 30 years (152 respondents; 57.4%). The largest proportion of study participants (148 respondents; 57.8%) claimed to visit the park with family or friends, in a larger group, and alone. Activities undertaken in and around the park's water features are presented in Table A1 (Appendix C). Activities such as hiking and walking were differentiated in the survey, as there are dedicated user groups that classify themselves according to these two activities, while running and trail running were combined in a single group.

3.2. Analyses of Ecosystem Services Features

Respondents assigned preference values to each of the 39 freshwater features in the park according to the six categories of cultural ESs. On average, people chose to select seven water features per ES category. The ES values assigned to recreation ranked as the largest (1866 responses; 40.9%), and with those for aesthetics and existence second (1573 responses; 34.5%) (Table A3 in Appendix E). Responses for cognitive development, learning and scientific discovery (334 responses; 7.3%), cultural and historical (367 responses; 8.1%), and spiritual and religious (275 responses; 6.0%) categories were lower, with all three categories amounting to only 21.4% (976 responses) of the total number of responses. There were 143 (3.1%) responses relating to disservice values. Responses from trail runners, hikers, and walkers as well as members of some religious orders suggest that conflicts with dogs and their owners create significant tension in the usage of some water features in the park. Other tensions were reported between trail runners and mountain bikers who both use the same trails in the park.

3.2.1. Influence of the State of Freshwater Features

In a comparison of the overall cultural ES values by water feature category, the 17 rivers, streams and waterfalls, which were categorized as natural (flowing) systems, received the greatest number of survey responses, some 44.0% (1881 responses). These features were specifically valued for their aesthetics and existence, promotion of cognitive development, learning and scientific discovery, and provision of spiritual and religious services. The 15 dams and reservoirs recorded a slightly lower overall total (1872 responses; 43.8%). This result is in part bolstered by the high recreational, and cultural and historical ES values attributed to these features, although these features were noted as holding little cognitive development, learning and scientific discovery value. Human-made features recorded the highest number of negative-value responses (98 responses). The natural (stationary) systems (encompassing wetlands and pools) reported only six negative values from survey respondents, and showed the lowest values across all ES categories, except for cognitive development, learning and scientific discovery. Overall, natural (stationary) systems contributed only 12.1% (519 responses) of the total number of responses.

The cognitive development, learning and scientific discovery, cultural and historic, recreation and negative categories did not show equal variances when comparing the state of water body groups (Table A3). Tests for difference indicate that cognitive development, learning and scientific discovery, negative, cultural and historical values and negative cate-

gories showed significant differences when tested against state of the water body. Post-hoc testing indicates significant differences between human-made and natural water features in all three state of water feature categories. Built infrastructure showed a higher mean number of responses than blue infrastructure in recreation and negative value categories.

3.2.2. Influence of Section

The Northern section of the park, with 16 water features, produced the highest overall service tally, accounting for 54.8% (2340 responses) of the cultural ESs provided for freshwater. Notably, the Northern section is an important location for cultural and historical services, as well as holding high values for spiritual and religious ESs (Table A3). The five water features in the Central section yielded 1090 responses (25.5%), although the mean number of responses indicates that this section holds major ES importance across five of the six categories. Values for cultural and historical services were ranked second highest in this section. The 18 features in the Southern section reported only 842 responses (19.7%) and recorded the lowest mean values across all ES categories.

Levene's test showed that the cultural and historical, recreation and spiritual and religious categories did not satisfy the assumption of equality of variance. Tests for difference showed that all categories showed highly significant differences for all ES categories against section ($p < 0.01$), except for the cognitive categories. Post-hoc comparisons between sections are presented in Table A3, with the Southern section having consistently smaller mean ranks corresponding to lower scores.

3.3. Accessibility of Park and Features

3.3.1. Park Access Points

Of the 20 entry gates, 12 are located in the Northern section, five in the Central section, and three in the Southern section. The gates at Silvermine accounted for 27.4% (167 responses) of the overall access to the park. Only three other sites amassed more than 10% contribution, namely Cape Point (92 responses; 15.1%), Newlands Forest (75 responses; 12.3%), and Kirstenbosch (74 responses; 12.1%). Combined, these four areas accounted for 66.9% (408 responses) of the total access points to the TMNP reported by park users. Three out of four of these locations are pay-points. Sixteen respondents claimed to access the park solely outside of official entry points. Almost 81% (214 respondents) of survey takers admitted to entering the park outside of formal access sites.

3.3.2. Proximity to the Park

A total of 51 suburbs as linked to respondents' residential addresses were recorded, 29 (56.7%) of which abutted the park (Figure 2). Over 80% (41 suburbs; 80.4%) of suburbs were within 5 km of the park. Only one suburb reported in this study fell outside of a 20 km radius from the park boundary. Of the suburbs recorded by survey responses, the majority (47 suburbs; 92.1%) are categorized as either middle- or upper-income communities based on annual household income figures.

3.3.3. Distances Travelled to the Park and Freshwater Features

Respondents were asked how far they were prepared to travel to access the park, measured as the maximum distance per return trip in kilometers from their home to a park access point. The average maximum distance was measured as 19.3 ± 19.5 km. The shortest distance reported was 1 km and the largest distance recorded as 150 km (round trip).

The majority of study participants (171 respondents; 64.5%) travelled between one and nine kilometers on their return trips to visit freshwater features in the TMNP. There was a marked decline in the number of survey takers who walked for 20 km or more to water, with 93.2% (247 respondents) of park users finding their preferred freshwater features within this distance. Distances of more than 30 km were reported by just 4 (1.5%) park users. The average return trip to water was 6.8 ± 8.1 km with the lowest recorded as 100 m

and the largest distance at 65 km. These figures relate directly to water-related excursions and not to other land-based activities in the park.

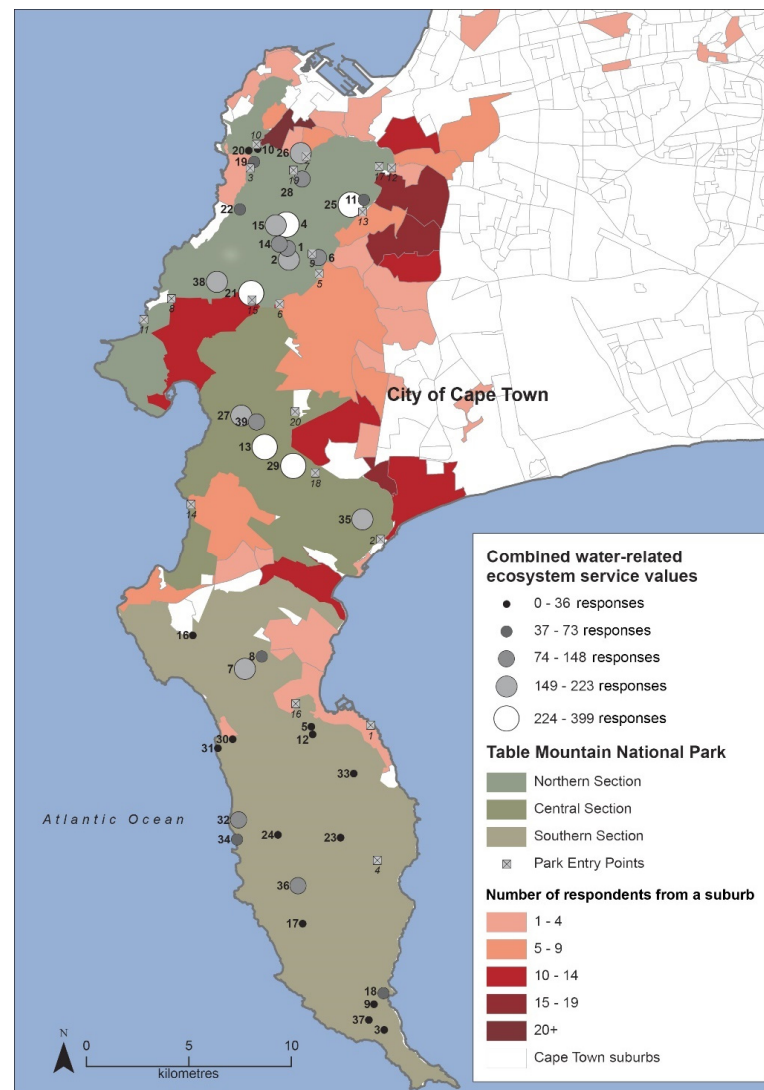


Figure 2. Combined total cultural ecosystem service responses by users of the Table Mountain National Park freshwater features. Water features are numbered from 1 to 39 and relate to Table A4 (Appendix F). The numbered crossed boxes refer to park entry points. Park entry points and numbered water features are listed in Tables A1 and A2, respectively. Suburbs are color-coded according to the number of survey participants residing there.

The Levene's test scored for level of accessibility indicated that the aesthetics and existence, cultural and historical, recreation and spiritual and religious categories did not show an equality of variance. Tests for difference indicated that all ES categories proved highly significant ($p < 0.01$) when scored by accessibility, except for the cognitive development category. Easily accessible water features scored highest across all of the cultural ES categories (Table A3). In each case, ease of access to water features is a significant driver in why certain freshwater features are valued higher than others in the TMNP.

4. Discussion

4.1. Water as a Cultural Ecosystem Service

This study demonstrates that freshwater ecosystems and ecosystem features in the TMNP are of major cultural ES value, and is aligned with similar studies [3–5,20,88–91]. The highest values measured related to recreation services. This finding is supported by

several authors [2,26] who suggest that the recreational aspects of all urban ecosystems are the highest valued ESs in cities. High aesthetic and existence values attributed to freshwater features indicate that visitors to the park came to appreciate nature, admire the beauty of the landscape, and value the existence of a natural-state system within an urban setting. This is in line with other findings which state that nature appreciation and aesthetic enjoyment were central to urban residents using urban natural spaces and protected areas [3,22,23,56]. Although the values for cognitive development, learning, and scientific discovery, spiritual and religious, and cultural and historical services did not rank as highly as the values achieved for recreation, and aesthetics and existence categories, these are still critical considerations for holistic valuations of cultural ESs. A possible justification for why these categories did not rank as highly is that ESs are often benefit dependent [57], and it is difficult to express the socio-cultural importance or value of these services [92]. Uncertainty and lack of familiarity with the ESs under valuation or the terminology used raises concerns about the factors that influence an individual's expressed preferences. Assigned values should incorporate a person's perception of the service, their held values and associated preferences, and the context of the valuation [86,93–95]. Another possibility for why these three categories did not achieve the same scores as the recreation and aesthetics and existence categories could be due to the respondent sample. The TMNP management records only physical activity groups as these are often formalized. Individuals who use the park mainly for uses which fall in to the three lower-valued categories may not have been adequately captured. However, some cultural services such as spiritual and religious values are not intuitively associated with any particular landscape attribute [43,50,85] or feature, despite some individuals, groups or communities holding strong spiritual connections with water and water-related features [65].

Identified Trade-Offs and Tensions

Urban ecosystems contribute to urban well-being but can also negatively impact humans [2,13,58,60]. In this study negative values were assigned sparingly, most notably to built infrastructure. Additionally, survey responses indicate that conflicts with dog owners were reported by trail runners, hikers, walking groups and religious orders. Generally, respondents were obliging and accepting of other park users, yet conflicts were evident between a number of activities, most notably trail runners and mountain bikers. It is thus imperative to consider that landscape features offer multiple services to various groups and individuals, based on peoples' agendas, visions and uses of nature [96,97], and are often the natural sites of tensions and conflicts between users. Some authors [13] suggest that the quantification of trade-offs among ecosystem services and their interactions with human well-being are pressing areas for research, policy derivation and management.

4.2. Linking Cultural Services to the Landscape Features

4.2.1. State of Water Features

This study shows that natural (flowing) systems are critical blue infrastructural components in the landscape, providing a multitude of services, and are ranked particularly high in the aesthetics and existence and spiritual and religious categories. This is supported in other work [98] which state that natural rivers and waterscapes are sources of inspiration and deep spiritual value, and their intrinsic beauty enhances the quality of life and the landscape through which they flow. These natural systems are also important spaces for cognitive development, learning and scientific discovery, and also hold recreational importance [26]. Globally, a wide range of sports and activities are based in and around rivers and streams [99]. The negative values attributed to the natural (flowing) water features are low, indicating that respondents either favor natural systems or tensions are limited or reduced in these waterways.

Although some respondents assigned negative values to dams and reservoirs in the TMNP, this built infrastructure scored a combined cultural ES total almost equal to that of the natural (flowing) water features. They are rated highly as both aesthetic and

recreational areas, making frequent participation in outdoor activities and other health and well-being benefits possible [27,28,51,86]. Many of these dams and reservoirs are easily accessible by well-used trails and paths, and are popular swimming sites, supporting the literature on the critical role of infrastructural requirements necessary to access ESs in urban environments [100,101]. Human-made interventions are critical elements of the landscape, providing multiple and key resources.

4.2.2. Proximity to Park

The location of parks relative to their potential users is an important factor in the assessment of accessibility [28,102,103], and is an important factor affecting peoples' park visitation [21,104]. In this study, people who live closer to a park use it more frequently, on average, than people who live farther away [28]. Communities bordering on the TMNP have the potential to benefit from close contact with a natural area, uninterrupted views and easy access to nature [78]. Properties not bordering on the park, but within walking distance or a short commute of it, enjoy the benefit of being able to access recreational and other nature-based opportunities with ease. Studies reveal that residents expressed that the maximum distance to a recreation area should not exceed one kilometer [105], be so close that they can be accessed within a five-minute walk [23], or be within five kilometers of a park when travelling by car [29,88,106]. This study confirms this view where the majority of users were prepared to travel up to 10 km (round-trip) to access the TMNP. Having to travel large distances has been indicated as one of the main reasons not to use urban green areas, often explored as the distance-decay model [103,107,108] and the blue infrastructure contained within them [109]. In contrast, other studies suggest that it is unlikely that the total travel distance is a significant barrier to park use [110]. Individuals with a greater level of attachment to the TMNP or a higher level of commitment to gaining benefits from the park might be more willing to travel greater distances to reach preferred areas in the park. This is evident in the willingness of survey participants to travel to the park's furthest flung Southern section to benefit from water-related services surrounding cognitive development, learning and scientific discovery.

4.2.3. Levels of Accessibility

With the greatest number of access points in the Northern and Central sections, it is to be expected that these entrances would be favored. This is primarily due to three factors, namely proximity to the majority of the users of the park, the variety of water features found in these sections, and the level of access to these water features. Although the Southern section has the greatest number of water features, this section has the fewest number of human-made and natural (flowing) systems, which this study shows to be favored. Formal access points to this section are limited to three, all of which are pay points.

Findings show that paying fees to access parks, or in the case of the TMNP certain areas in the park, does not cause a dramatic reduction in demand [111]. This is evident here where the most reported-as-used entrance points to the park charge entry fees. These sites do not offer additional amenities to non-pay entry points and are not managed differently. Pay-points may be perceived to reduce localized crime (e.g., car break-ins), as measures are in place to ease security concerns. Further justification for why respondents are prepared to pay to access certain areas in the park may relate to their attitude toward the environment, a site's attributes or attractions, and the cultural significance of an area [112]. In this regard, distance to these sites does not appear to be a limiting factor.

When examining the distance from entry points to freshwater features, it becomes clear that certain entry points are favored over others due to their location in the landscape and the water features near them. Most notable are the values for cognitive development, scientific learning and discovery which are not as spatially bounded as those for recreation and aesthetics and existence, which are located nearest to populous areas. The distance people will travel to reach these natural refuges for specific service benefits is evidence of the significant value of these landscapes and resources [113]. Studies suggest that these

findings may be indicative because of other features of these environments, such as their remoteness or lack of human construction [114]. This appreciation could lead to rising demand for wilderness and remoteness in the future [115] and managers should engage more with park users across different socio-economic circumstances to understand this particular preference, which will become more critical with population growth in Africa, and harder to secure.

4.2.4. Bolstering Understanding of Relational Values

The design and implementation of ES-based processes and the mainstreaming of these results in decision-making is somewhat limited [73]. We do not yet have sufficient tools to assess and apply relational values in protected areas, nor a strong understanding of the contexts in which applying relational values in practice would be most appropriate [73,116]. ES studies, like this one, do however help capture the broad importance of a range of cultural ESs, alongside relational values [62,75]. In developing city settings, capturing people's perceptions of the importance of ESs is important yet challenging, because people may hold different ES values [75], or multiple values for the same landscape feature. This experience is seen around the world [116–119], including examples from developing countries and Global South contexts [75,113,120–122].

Adopting and developing the concept of relational values will be essential to ensure equitable provision of benefits, appropriate management of landscapes providing cultural ESs, and the recognition of ESs in supporting health and well-being, as well as other urban challenges [63]. Here, it is important to note that well-being and other cultural ES benefits received cannot simply be reduced to benefit accrual and that, instead, much derives from positive agency [123] and a direct connection with landscapes and landscape features. This change in framing fundamentally alters the way in which managers should identify and interpret the feedback between how people value nature, and people's interactions with, and perceptions of, protected areas [73], particularly in the Global South [124].

4.2.5. Management and Governance of Protected Areas and ES Provision

In several geographies and with many local and indigenous communities in the Global South, urban parks are essential repositories of ESs, notably provisioning services, providing urban residents with food, medicine, fuel, fibre and fodder [125,126]. These provisioning services may be less critical to survival or cultural identity in Global North contexts. Understanding ES provision, outside of just cultural services, is essential if parks are to be considered places of inclusion and empowerment, and managed as effective SES.

One of the greatest challenges to urban park managers is to balance the tension between providing for the diverse uses and values of landscapes and landscape features while simultaneously preserving the unique qualities of these places [96,97]. In some contexts, protected areas are managed for biodiversity goals, without considering the social influences and impacts on natural systems [127]. This is somewhat the case in TMNP, where the priority is still focused on landscape and biodiversity conservation, rather than managing the people that impact the landscape. However, because of the dynamic socio-ecological relationships between people and park, there is a need to integrate different disciplines and ways of managing and governing urban protected areas to better understand urban SES [128]. In developing countries, where projections indicate significant increases in urban populations, the need to establish planning processes based on contemporary SES approaches is vital to meet the challenges of sustainability, resilience and equity in the twenty-first century [128,129].

While park managers will still be required to protect landscapes, thus promoting ES generation and provision, city planners also need to consider the values and benefits of these protected areas, even if outside of their direct mandate, due to the nature of ES flows from park to urban residents and the influences that residents have on ESs and landscapes within an urban protected area. To support the interconnections between people and park, there is a need to enhance partnerships and communication around

the protection of landscapes to ensure ES provision [127]. These partnerships should be across institutional levels [130] and should look to include public sector actors and those from academia, non-governmental organizations and civil society. Ecosystem services in an urban context provide key links for bridging planning, management and governance practices seeking transitions to more sustainable and resilient urban protected areas and cities [89,130]. Resilience goals for developing cities and surrounding protected areas, should explicitly incorporate the value of ESs in planning and governance [89].

Integration of ESs into decision-making and the inclusion of multiple stakeholders in the management and governance of urban systems is not without its challenges. Inadequate policies and practices [127], and fragmented, disjointed or unjust urban development and land management [130,131] affect urban conservation as well as residents' preference for ESs. Therefore, managing and governing a socially equitable urban national park is an institutional change process and should be based on the diversity in needs of urban residents who benefit from ESs generated in the park [131]. Understanding benefit and trade-off accrual should inform management and associated policy where social needs and desires must be met simultaneously to conservation agendas [7].

4.2.6. Study Limitations

In most studies involving human subjects and survey instruments, there are limitations. Other studies discuss issues with adopting the ES concept and frameworks into surveys and mapping exercises, as some respondents may not have fully conceptualized cultural ES benefits prior to their participation in surveys or may find it difficult to explain cultural ES concepts [32,38,87]. To address this, we provided a simplified definition of the ES concept to respondents in the text of the mapping exercise.

Although a definition of the ES was provided, further detail regarding the nuances of cultural ES categories may have been needed. In this study, spiritual and religious values may not have been adequately captured as respondents may not have articulated these ESs in the survey or mapping exercises. A further option could have been the understanding of the concept of spiritual and religious ESs, a possible shortcoming in the design of the questionnaire or the perceptions and understanding of those sampled [38,86,94].

A disproportionate lack of access to blue infrastructure has come to be seen as both a social and environmental injustice [30] and may reduce visitation among some individuals and communities, particularly those in economically disadvantaged groups [112,125]. Entrance fees to natural attractions have significant equity, economic, administrative and political implications [113] and could place constraints on some segments of society [112,132]. Although the park functions as an open-access system as most of the park is unfenced with few entry pay-points, travel costs may still influence the willingness or ability to visit the park. In this regard, some communities may have been unintentionally excluded from this study. Future studies of this nature should look to include groups that may have historically been ignored or prevented from participating due to personal circumstances. Particular attention should be applied when trying to source information from informal user groups, particularly those not known to park management or those without adequate or formal channels through which to be contacted.

4.2.7. Areas for Future Research

There are several areas for consideration when considering future research areas. Of immediate concern is the lack of scientifically robust information detailing the status and changes in ecosystems, the drivers of change, and the consequences of management responses [133–135]. Existing information may be fragmented and incomplete, incomparable from one place to another, highly technical or unsuitable for practitioners or policymakers [136–138]. Research is needed to develop innovative methodologies, through transdisciplinary efforts [13,139,140] that ensure more comprehensive analyses and results that further our understanding of the values of urban ES [16,33,141,142], how ES generation

and provision may change over time, or the temporal changes in relational values of ESs. This research is essential to addressing gaps in the literature.

Within the spatial elements of further research, mapping and modelling approaches are needed to spatially explore ES generation, provision and perceptions. These may include socio-ecologically informed comparative modeling to promote sustainable urban policy transitions [143], or place-based SES research to analyze patterns in perceptions of ESs [90]. Further exploration into social (e.g., gender, education) and local ecological (e.g., land use and climate) characteristics will be needed to elucidate people's perceptions of which ESs are important.

As part of the interactions between people and nature, and how these may change over time, we should further explore different values and valuation approaches. The valuation of cultural ES is increasingly seen as a crucial element of inclusive research and robust decision-making [144] across multiple levels of governance and management. This is important in the context of areas demarcated as conservation areas. A key rationale for further research is the ongoing need to estimate or quantify the value of urban protected areas to assist city residents in benefitting from ESs and nature-based solutions (NBS), in order to be able to reveal the various social and economic benefits of managing and conserving these protected areas for equitable benefit accrual.

A growing area of research is identifying the nexus between ESs and NBS [91,145,146]. Addressing urban challenges with nature-based approaches can improve and protect ESs. Yet urban planning has not efficiently integrated such approaches to managing land use and landscapes [91]. Design and planning around NBS in urban settings, targeted at the needs of local systems, requires knowledge about the causal relationships and nexuses between NBS, ESs and urban challenges [145]. Within this space, we should investigate the roles that ESs and NBS can play in meeting urban challenges. We should also explore how these concepts can help transition to a green infrastructure city, help unpack stacked benefits to meet multiple objectives, and improve long-term societal, economic and environmental resilience. A hurdle here is the challenge of turning the concept of ESs into a practical tool in the formulation of day-to-day policies [147]. To address this challenge of ES integration, planning could better reconcile interests between nature conservation and urban planning, and ES supply and demand mapping may be a useful tool for such purposes [147].

5. Conclusions

It is crucial to understand how cultural services hold meaning and value to people in different contexts, as well as how these services connect to or interact across biophysical and SES. These connections, and the values they hold or yield, will be critical to enhancing our understanding of the ES concept. Considering growing population numbers in urban settings demands placed on cultural ESs will grow. This study provides insights into how visitors to urban conservation areas recognize, use and place importance on urban cultural ESs, which to date has not been adequately explored, particularly within an African developing country context. This study shows significant use and appreciation of the cultural ESs offered by the TMNP with respect to freshwater features. People use the park to undertake a variety of water-related physical activities, to enjoy the aesthetics of the environment, to reflect and learn, and for spiritual reasons, all of which are supported by findings in the global literature. This study highlights that both the built and blue infrastructure are of similar importance in producing cultural services, being assigned similar values across all the ES categories, meeting the needs of diverse user groups. This finding is significant and should be addressed by managers of the park to ensure sustainable and equitable use of freshwater features. There is further possibility of opening other freshwater features to ensure a greater spread of cultural services across the park. The results indicate that, while users were prepared to travel substantial distances both to the park and within the park to access cultural services, more easily accessed features and sections of the park had higher visitation rates. Paying to enter at access points was not found to be a deterrent. Numerous other socially and culturally informed factors can

serve as barriers of access and, while they are not addressed in this study, the high value of cultural uses for communities adjacent to the park is evident, with less representation from further neighborhoods suggesting that other barriers are in place. It can be argued that built and natural freshwater infrastructure are critical cultural features of this landscape providing multiple and key services, in this urban context, with varying degrees of use and varying tensions between the different user groups noted. Management of the park should embrace the findings that cultural services are important and that these ESs can be enhanced by creating more opportunities across both built and blue infrastructure.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of the Science Faculty at the University of Cape Town (approved November 2013) for studies involving humans.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Table Mountain National Park Water-Related Cultural Ecosystem Service Questionnaire

Name	Age	Gender	M	F
Address				
Contact details				
How long have you been visiting TMNP?				
How often do you visit the park?				
How long have you been visiting the water in TMNP?				
How has your use of the parks water changed over time?				
Is your association with TMNP personal or professional?				
What types of activities have you previously undertaken in TMNP?				
What types of water-related activities have you previously undertaken in TMNP?				
What types of water-related activities do you take part in now?				
Do you use the parks water by yourself, with your family/friends or in a group?				
Do you consider the actions of other park users to have a potentially negative impact on the parks water?				
How far do you travel to access the park?				
How far do you travel in the park to access water bodies?				
Which park entry gates do you use?				
Do you access the park outside of entry gates?				
How do you feel about the way park officials manage water?				
Do you believe that current water management may impact on the future value of water in the park?				
Do you believe that negative water-related impacts will influence the water as it flows out of the parks boundaries?				
Can you suggest other people to contact to take part in this study?				
- Please provide contact details				
Other comments				
- Please use this space to elaborate on any of the questions or to bring information to the attention of the researchers				

Table Mountain National Park Water-Related Ecosystem Service Mapping Survey

This mapping survey is the last part of the survey on ecosystem services in Table Mountain National Park. This exercise consists of a set of questions about how users value water bodies in the park according to a particular cultural ecosystem service. Ecosystem services relate to the direct or indirect benefits (goods and services) that we receive from nature which contribute to our overall well-being. Categories include:

1. Recreation
2. Aesthetics/existence
3. Cultural/historical
4. Cognitive development/learning/scientific discovery
5. Spiritual/religious
6. Negative

All water bodies are numbered for easy reference as per below:

Water bodies in TMNP

Reservoirs/dams

1. Alexandra Reservoir
2. De Villiers Dam
3. Frans Dam
4. Hely Hutchinson Reservoir
5. Jackson Reservoir
6. Kirstenbosch Dam
7. Kleinplaas Dam
8. Lewis Gay Dam
9. Matroos Dam
10. Mocke Reservoir
11. Newlands Reservoir
12. Rawson Reservoir
13. Silvermine Dam
14. Victoria Reservoir
15. Woodhead Reservoir

Other

Vleis, pools and waterfalls

31. Duiwelsvlei
32. Groot rondvlei
33. Klawersvlei
34. Klein rondvlei
35. Nellies Pool
36. Sirkelsvlei
37. Skilpadvlei
38. Waterfall in Cecelia Forest
39. Waterfall on Prinskasteel River

Other

Rivers/streams

16. Bokramspruit River
17. Booiskraal River
18. Buffels River
19. Camps Bay Stream
20. Diepsloot
21. Disa Stream
22. Kasteelpoort River
23. Klaasjagers River
24. Krom River
25. Newlands Stream
26. Platteklip Stream
27. Prinskasteel River
28. Silver Stream
29. Silvermine River
30. Schusters River

Other

Listing of important water bodies

For each section, please list each water body used or valued in each cultural category. Please complete at least rankings 1–5. A park map with numbered water features is provided for geographical reference.

Recreational

Please select water bodies in the TMNP that have RECREATIONAL significance to you. The areas should allow for sporting, hobby and outdoor activities.

Tick this box if you do not use water bodies in the park for this type of cultural ecosystem service.

	Water body name/number
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Aesthetic or existence

Please select water bodies in the TMNP that have **AESTHETIC OR EXISTENCE** significance to you. These values may include view-points, areas of natural beauty, important areas for conservation etc.

Tick this box if you do not use water bodies in the park for this type of cultural ecosystem service.

	Water body name/number
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Cultural or historical

Please select water bodies in the TMNP that have **CULTURAL OR HISTORICAL** significance to you. Areas with significant cultural or historical value may be relevant to you or others living in Cape Town.

Tick this box if you do not use water bodies in the park for this type of cultural ecosystem service.

	Water body name/number
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Cognitive development, learning, scientific discovery

Please select water bodies in the TMNP that have **COGNITIVE DEVELOPMENT, LEARNING OR SCIENTIFIC DISCOVERY** significance to you. These water bodies must inspire you to understand more about the natural environment, conservation and/or species that live in and around a particular water body.

Tick this box if you do not use water bodies in the park for this type of cultural ecosystem service.

	Water body name/number
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Spiritual or religious

Please select water bodies in the TMNP that have SPIRITUAL OR RELIGIOUS significance to you. The water bodies ranked in this section should have a positive emotional and spiritual influence on you resulting in a feeling of awe and wonder.

Tick this box if you do not use water bodies in the park for this type of cultural ecosystem service.

	Water body name/number
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Negative values

Please select water bodies in the TMNP that have NEGATIVE significance to you. These areas may influence the values for other categories, may be unsightly or unsafe, or may just be negative spaces.

Tick this box if you do not use water bodies in the park for this type of cultural ecosystem service.

	Water body name/number
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

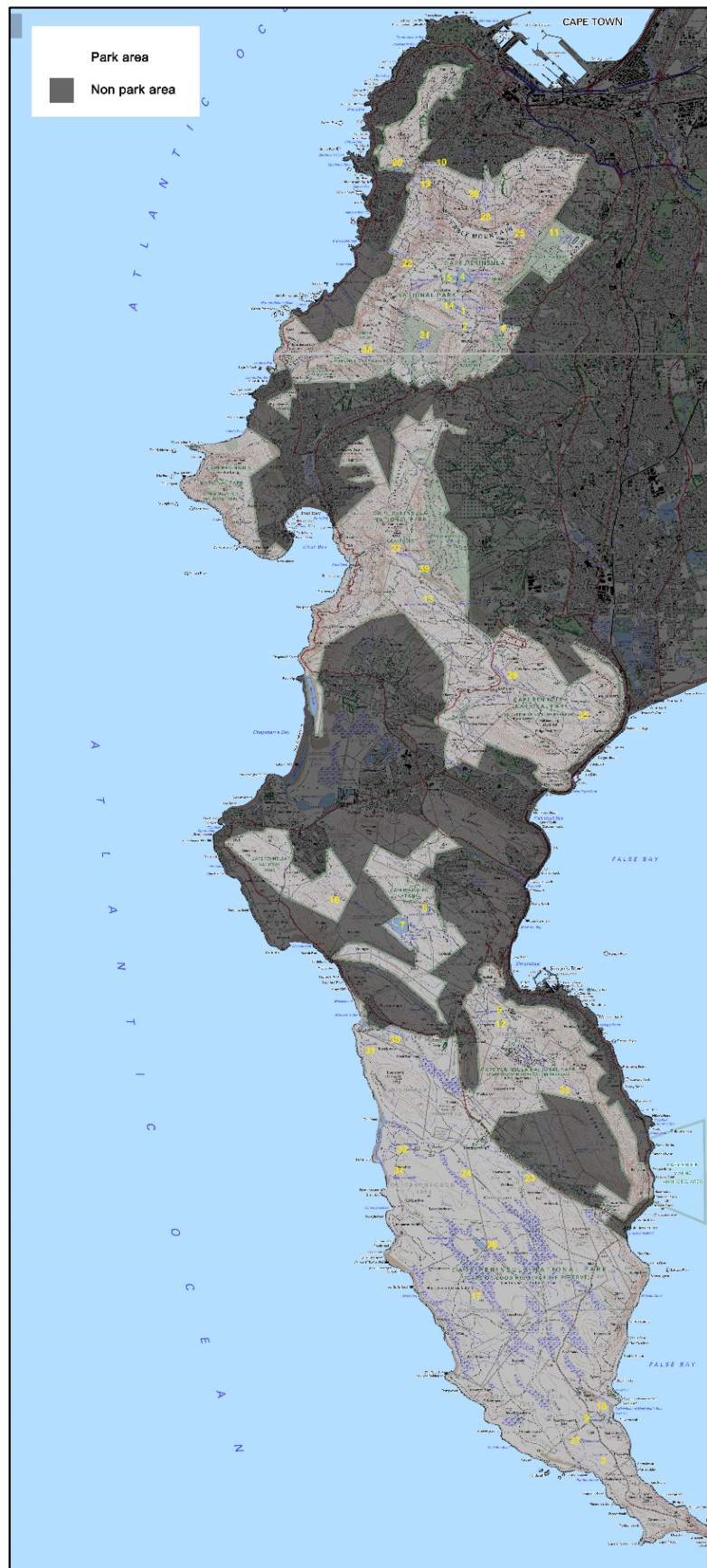


Figure A1. Map of the Table Mountain National Park with numbered water bodies relating to survey and mapping exercise on significance of water-related cultural ecosystem services.

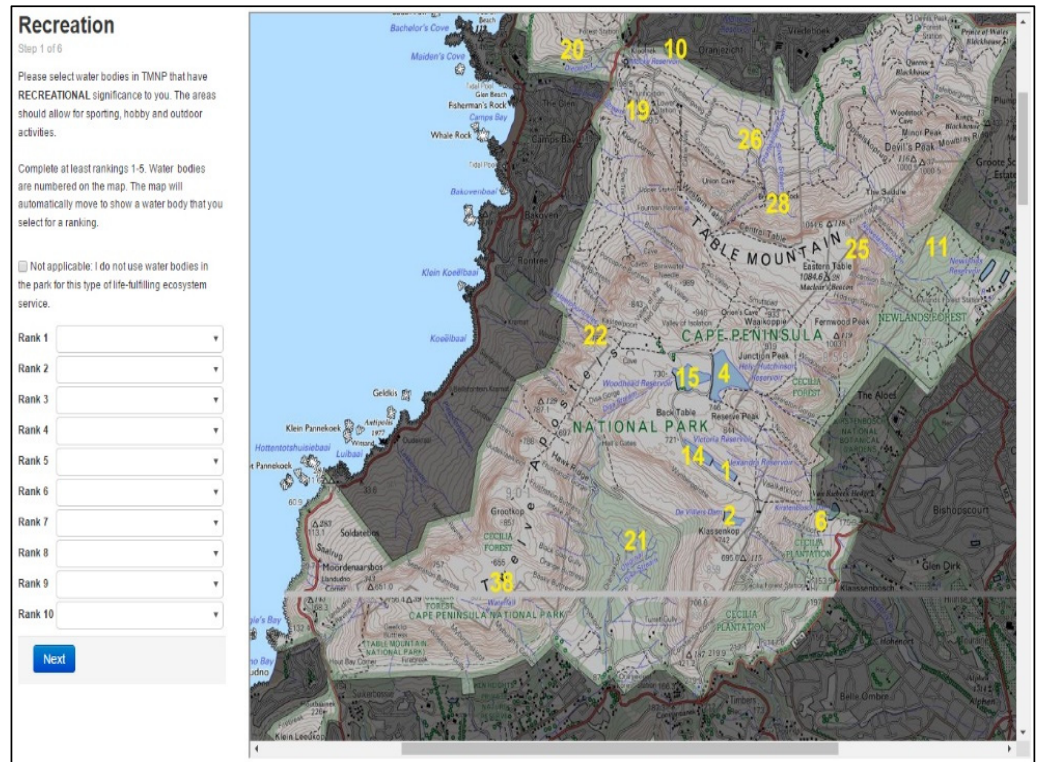


Figure A2. Screenshot of online mapping exercise detailing choice for water bodies in the Table Mountain National Park holding recreational value to survey respondents.

Appendix B. Scoring System for Accessibility of Water Bodies in the Table Mountain National Park

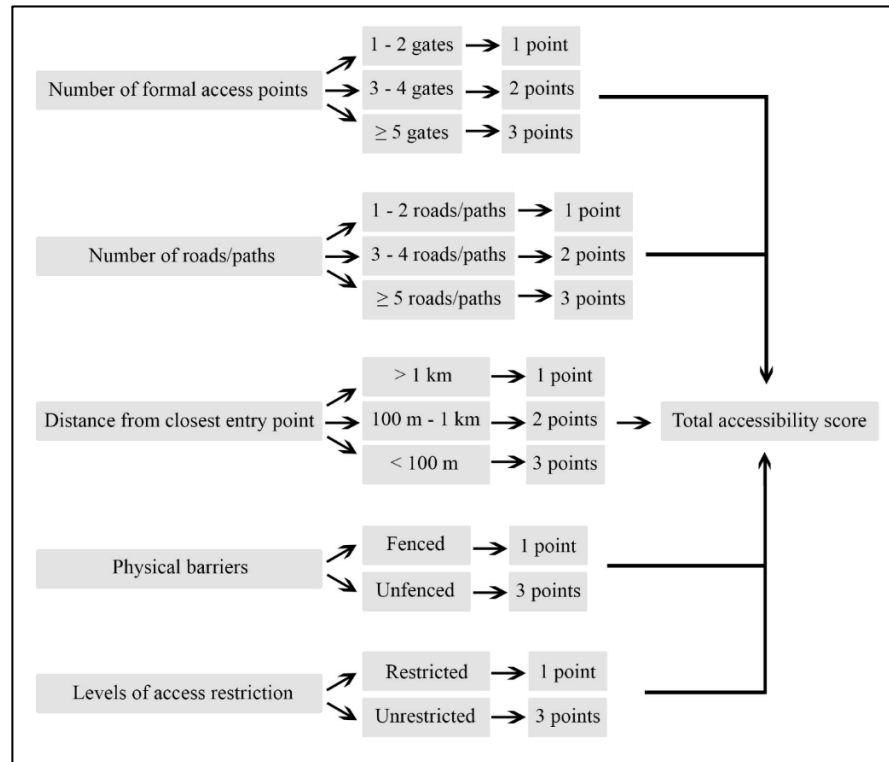


Figure A3. Flowchart highlighting how the scoring system for access points in the Table Mountain National Park was derived.

Appendix C. Water-Related Activities Undertaken in the Table Mountain National Park

Table A1. Number of responses for water-related activities in the Table Mountain National Park.

Activity	Number of Responses	Percentage Contribution
Hiking	211	79.6
Swimming	91	34.3
Running/trail running	80	30.2
Walking	77	0.0
Cycling/mountain biking	62	23.4
Dog walking	45	17.0
Picnics/braais	42	15.8
Climbing	36	13.6
Bird/wildlife watching	19	7.2
Camping/overnighting	14	5.3
Conservation management/volunteering	12	4.5
Nature appreciation	10	3.8
Photography/drawing	10	3.8
Alien clearing/vegetation clearing/rehabilitation	8	3.0
Horse riding	8	3.0
Caving	6	2.3
Research	6	2.3
Mapping/orienteering	4	1.5
Relaxation/meditation	4	1.5
Abseiling	3	1.1
Drinking water	3	1.1
Kloofing	3	1.1
Canoeing/kayaking	2	0.8
Emergency training	2	0.8
Fishing	2	0.8
Plant collecting	2	0.8
Educational activities	1	0.4
Guiding	1	0.4
Paragliding	1	0.4
Star gazing	1	0.4

Appendix D. Access Points to the Table Mountain National Park

Table A2. Access points to the Table Mountain National Park listed by section, type and class.

ID No.	Entry Gates Used	Section	Type	Class
1	Boulders	Southern	Pay point	Formal
2	Boyes Drive	Central	Non-pay point	Informal
3	Camps Bay	Northern	Non-pay point	Informal
4	Cape Point	Southern	Pay point	Formal
5	Cecilia Forest	Northern	Non-pay point	Formal
6	Constantia Nek	Central	Non-pay point	Formal
7	Deer Park	Northern	Non-pay point	Formal
8	Hout Bay	Northern	Non-pay point	Informal
9	Kirstenbosch	Northern	Pay point	Formal
10	Kloof Nek/Lions Head	Northern	Non-pay point	Formal
11	Llandudno	Northern	Non-pay point	Informal
12	Mostert's Mill	Northern	Non-pay point	Formal
13	Newlands Forest	Northern	Non-pay point	Formal
14	Noordhoek Beach	Central	Non-pay point	Informal
15	Orange Kloof	Northern	Pay point	Formal
16	Red Hill	Southern	Non-pay point	Formal
17	Rhodes Memorial	Northern	Non-pay point	Formal
18	Silvermine	Central	Pay point	Formal
19	Table Mountain Road	Northern	Non-pay point	Informal
20	Tokai Forest	Central	Pay point	Formal

Appendix E. Statistical Analyses

Table A3. Levene’s test (degrees of freedom), mean rank, median, interquartile range, chi-squared value (degrees of freedom) and significance of cultural ecosystem service variables based on state of water features, section in which water feature are located, and access to water features in the Table Mountain National Park. An § indicates significant difference between human-made and natural (flowing) variables, an # indicates significant difference between access variables. An α indicates significant difference between Northern and Southern variables, an β indicates significant difference between Central and Southern variables. NS indicates not significant.

Cultural Ecosystem Service Category	State/Section/ Access	Variable	Levene’s Test (df)	Mean Rank	Median	IQR	Chi-Square/U Value (df)	p-Value
Aesthetics and existence	State	Human-made	F(2,36) = 0.649; p = 0.53	18.57	29.00	63.00	χ ² (2) = 1.26	NS
		Natural (flowing)		22.29	31.00	68.50		
		Natural (stationary)		17.50	25.00	51.00		
Cognitive development, learning and scientific discovery	State	Human-made §#	F(2,36) = 5.08; p = 0.011	10.40	2.00	4.00	χ ² (2) = 19.82	<0.01
		Natural (flowing) §		23.71	7.00	10.00		
		Natural (stationary) #		31.57	12.00	13.00		
Cultural and historical	State	Human-made #	F(2,36) = 14.65; p < 0.001	25.40	12.00	27.00	χ ² (2) = 6.63	<0.05
		Natural (flowing)		18.18	3.00	11.00		
		Natural (stationary) #		12.86	1.00	5.00		
Recreation	State	Human-made	F(2,36) = 3.72; p = 0.034	22.50	50.00	99.00	χ ² (2) = 3.54	NS
		Natural (flowing)		20.74	21.00	61.00		
		Natural (stationary)		12.86	7.00	38.00		
Spiritual and religious	State	Human-made	F(2,36) = 0.95; p = 0.397	16.97	4.00	9.00	χ ² (2) = 2.59	NS
		Natural (flowing)		23.26	8.00	13.00		
		Natural (stationary)		18.57	2.00	8.00		
Negative	State	Human-made #	F(2,36) = 7.17; p = 0.002	13.47	6.00	10.00	χ ² (2) = 9.17	0.01
		Natural (flowing)		22.82	1.00	5.00		
		Natural (stationary) #		27.14	0.00	2.00		
Aesthetics and existence	Section	Northern α	F(2,36) = 3.11; p = 0.057	24.94	36.00	16.30	χ ² (2) = 16.81	<0.01
		Central β		32.00	72.00	54.00		
		Southern αβ		12.28	9.00	16.30		
Cognitive development, learning and scientific discovery	Section	Northern	F(2,36) = 0.20; p = 0.822	16.63	5.50	6.00	χ ² (2) = 3.67	NS
		Central		27.40	12.00	10.00		
		Southern		20.94	7.00	10.00		
Cultural and historical	Section	Northern α	F(2,36) = 5.64; p = 0.007	25.53	13.00	23.00	χ ² (2) = 11.80	<0.01
		Central		26.50	12.00	21.00		
		Southern α		13.28	1.00	4.00		
Recreation	Section	Northern α	F(2,36) = 5.32; p = 0.009	26.38	70.50	69.00	χ ² (2) = 19.17	<0.01
		Central β		30.30	70.00	125.00		
		Southern αβ		11.47	6.00	17.00		
Spiritual and religious	Section	Northern α	F(2,36) = 6.56; p = 0.004	25.44	8.50	13.00	χ ² (2) = 15.40	<0.01
		Central β		29.80	10.00	5.00		
		Southern αβ		12.44	1.50	3.00		
Negative	Section	Northern α	F(2,36) = 3.03; p = 0.061	14.91	5.00	8.00	χ ² (2) = 10.31	<0.01
		Central		14.10	6.00	12.00		
		Southern α		26.17	0.00	2.00		
Aesthetics and existence	Access	Easily accessible	F(1,37) = 7.33; p = 0.010	29.22	71.50	68.80	U(1) = 36.50	<0.01
		Not easily accessible		13.59	13.00	23.00		
Cognitive development, learning and scientific discovery	Access	Easily accessible	F(1,37) = 0.27; p = 0.606	21.59	7.00	9.00	U(1) = 158.50	NS
		Not easily accessible		18.89	7.00	10.00		
Cultural and historical	Access	Easily accessible	F(1,37) = 11.69; p = 0.002	27.06	14.50	24.00	U(1) = 71.00	<0.01
		Not easily accessible		15.09	2.00	7.00		
Recreation	Access	Easily accessible	F(1,37) = 5.79; p = 0.021	29.66	76.50	62.00	U(1) = 29.50	<0.01
		Not easily accessible		13.28	8.00	36.00		
Spiritual and religious	Access	Easily accessible	F(1,37) = 5.23; p = 0.028	29.91	10.00	9.00	U(1) = 25.50	<0.01
		Not easily accessible		13.11	2.00	3.00		
Negative	Access	Easily accessible	F(1,37) = 1.22; p = 0.276	14.25	5.00	7.00	U(1) = 92.00	<0.01
		Not easily accessible		24.00	0.00	5.00		

Appendix F. Water Features in the Table Mountain National Park

Table A4. Water features in Table Mountain National Park listed by section, state and level of accessibility. Natural (f) relates to flowing water features, such as rivers and streams; natural (s) refers to natural stationary water features such as pools, wetlands, etc.

ID No.	Water Body	Section	State	Accessibility (Score)
1	Alexandra Reservoir	Northern	Man-made	Not easily accessible (9)
2	De Villiers Dam	Northern	Man-made	Easily accessible (11)
3	Frans Dam	Southern	Man-made	Not easily accessible (9)
4	Hely Hutchinson Reservoir	Northern	Man-made	Easily accessible (12)
5	Jackson Reservoir	Southern	Man-made	Not easily accessible (9)
6	Kirstenbosch Dam	Northern	Man-made	Not easily accessible (10)
7	Kleinplaas Dam	Southern	Man-made	Easily accessible (11)
8	Lewis Gay Dam	Southern	Man-made	Not easily accessible (8)
9	Matroos Dam	Southern	Man-made	Not easily accessible (9)
10	Mocke Reservoir	Northern	Man-made	Not easily accessible (10)
11	Newlands Reservoir	Northern	Man-made	Not easily accessible (9)
12	Rawson Reservoir	Southern	Man-made	Not easily accessible (10)
13	Silvermine Dam	Central	Man-made	Easily accessible (13)
14	Victoria Reservoir	Northern	Man-made	Not easily accessible (9)
15	Woodhead Reservoir	Northern	Man-made	Easily accessible (11)
16	Bokramspruit River	Southern	Natural (f)	Not easily accessible (9)
17	Booiskraal River	Southern	Natural (f)	Not easily accessible (9)
18	Buffels River	Southern	Natural (f)	Not easily accessible (9)
19	Camps Bay Stream	Northern	Natural (f)	Easily accessible (12)
20	Diepsloot	Northern	Natural (f)	Easily accessible (13)
21	Disa Stream	Northern	Natural (f)	Easily accessible (13)
22	Kasteelpoort River	Northern	Natural (f)	Not easily accessible (10)
23	Klaasjagers River	Southern	Natural (f)	Not easily accessible (9)
24	Krom River	Southern	Natural (f)	Not easily accessible (9)
25	Newlands Stream	Northern	Natural (f)	Easily accessible (15)
26	Platteklip Stream	Northern	Natural (f)	Easily accessible (13)
27	Prinskasteel River	Central	Natural (f)	Easily accessible (11)
28	Silver Stream	Northern	Natural (f)	Easily accessible (13)
29	Silvermine River	Central	Natural (f)	Easily accessible (14)
30	Schusters River	Southern	Natural (f)	Not easily accessible (9)
31	Duiwelsvlei	Southern	Natural (s)	Not easily accessible (9)
32	Groot Rondevlei	Southern	Natural (s)	Not easily accessible (9)
33	Klawervlei	Southern	Natural (s)	Not easily accessible (9)
34	Klein Rondevlei	Southern	Natural (s)	Not easily accessible (9)
35	Nellies Pool	Central	Natural (s)	Not easily accessible (10)
36	Rawsons Reservoir	Southern	Man-made	Not easily accessible (10)
37	Skilpadvlei	Southern	Natural (s)	Not easily accessible (9)
38	Waterfall in Cecilia Forest	Northern	Natural (f)	Not easily accessible (10)
39	Waterfall on Prinskasteel River	Central	Natural (f)	Easily accessible (11)

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