Landscape Preservation on Banks Peninsula, is there enough?

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Title illustration sourced from Te Pātaka o Rākaihautū/Banks Peninsula Geopark

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Executive Summary

Research Context:
This project, completed in requirement for the GEOG309 course, ensures that the process for categorizing significant geosites on Banks Peninsula is as simple and easy to follow as possible, for the recipients of the project, Te Pātaka o Rākaihautū/Banks Peninsula Geopark. This project has significance to the community partner as it is vital for achieving their future goal of gaining United Nations Educational, Scientific and Cultural Organization (UNESCO) world heritage status. The question that has been formed to base research on was: What can be done to protect and promote the outstanding landscapes and features on Banks Peninsula and what is the importance of recognizing these sites?

Research Questions:
1. What is geo-heritage, how does NZ apply protection compared to globally?
2. What is the importance of recognising, protecting and promoting geo-heritage sites?
3. Pros and cons of the geo-preservation inventory, geoparks in NZ vs geoparks overseas
4. Best ways to implement protection on sites compared to the current protection methods
5. What could additional protections be, what is needed for a UNESCO site?

Methods:
The main outcome of the project was to produce a fully functioning ArcGIS map and workflow diagram for the Geopark. The method used to produce our final functional product was to compile knowledge and information about pre-existing geosites on Banks Peninsula and their current levels of protection. This allowed recommendations of further protection to be made. Resultant information was reflected and displayed in the ArcGIS map and workflow.

Key Finding:
The key finding of this project is that there are zero outstanding natural features (ONF's) currently recognized on Banks Peninsula. This means that there are zero sites that currently have protection placed specifically upon them as opposed to their surrounding landscape. All sites with some existing legal protection simply do so due to being located by coincidence within an area of existing protection, such as a reserve, national park or covenant.

Shortcomings:
The major shortcomings of this project were found to be a lack of pre-existing ArcGIS knowledge, which slowed the progress of the package development until sufficient upskilling had taken place. A second downfall of the project was access to knowledge of documents that were required in order to complete this project. A lockdown due to Covid-19 also took place during the project timeline, which also caused some issues when working as a team.

Suggestions for the future:
The future goal of the Banks Peninsula Geopark is to gain UNESCO world heritage status. In order to do this it has been deemed beneficial that the awareness of geopreservation is raised both with the public and with local government bodies. This is important as it is ultimately these groups who are responsible for establishing and enforcing protection upon these sites.

Introduction

Banks Peninsula is located near Christchurch city and is the highly eroded remnants of a volcanic complex made up of two large, now dormant, volcanoes that produced a series of eruptions during the Miocene. The outstanding landscapes and geological features that exist in the region today are due to the morphology of the two major volcanoes, the Lyttleton and the Akaroa (Hampton, 2010). The community partner of this project was Te Pātaka o Rākaihautū/Banks Peninsula Geopark, with the board member of this group with whom we consulted being Hamish Rennie. The group was also extremely fortunate that our University of Canterbury (UC) tutor Sam Hampton is also a member of the Geopark's board, along with being a UC staff member. The in-depth knowledge that Sam supplied and the contacts he had, enabled him to provide the group with the information necessary to complete the project and this was invaluable. Banks Peninsula Geopark was first established in 2011 with the aim to provide a greater understanding of the land by increasing awareness of the geological, cultural and also biological aspects of Banks Peninsula. The park has a vision of increasing visitor engagement in the area and allows people to have a greater connection and sense of place when visiting.

The purpose of this project, completed in requirement for the GEOG309 course, is to ensure that the legal protection of sites on Banks Peninsula is in place to aid the Geopark in meeting their goals for the future. This includes the eventual goal of gaining UNESCO world heritage status. The products we have provided to the Banks Peninsula Geopark are: a fully functioning ArcGIS map able to clearly display both the current geosites and the proposed geosites, along with the varying levels of existing legal protection that some sites fall under. To maximise the use of this ArcGIS map, a workflow has also been developed which can be used by Te Pātaka o Rākaihautū/Banks Peninsula Geopark to determine the level of protection that would be required for any new sites. This report has been written to provide an outline of all the findings of this research undertaken for GEOG309, on behalf of Te Pātaka o Rākaihautū/Banks Peninsula Geopark. The following report will contain and cover the following; concepts and content covered in the completed literature reviews, methods used to complete this project, outcomes, discussion of the groups findings and conclusions reached by completing this research project.

Background Research

What is geoheritage, how does NZ apply protection compared to globally?

In New Zealand geoheritage/geopreservation sites are categorised using an inventory process, known as the geopreservation index prior to specific legal protection being placed upon them. Hayward (2009) describes geoheritage and states that the Resource Management Act (RMA) is commonly used to provide low level protection to outstanding natural features (ONLs) and geoheritage sites across New Zealand. Geoheritage, has also been defined by Brilha (2018) who evaluates the exceptional element of geodiversity at a site.

Brocx and Semeniuk (2007) define geoheritage as preserving and conserving natural features associated with earth science, including naturally and artificially exposed rocks, fossils and other geomorphological features which have historical significance.

Utilising the RMA for protection is low cost and places restrictions around what can, and can not be done on the land and is reliant upon local governments to enforce and regulate. Other protections using New Zealand law include creating reserves (Parks and Reserves act, 1977), national parks (National Parks Act, 1980), regional and conservation parks, and placing covenants on the land. These protections are more costly than utilizing the RMA, as land needs to be purchased from current land-owners before protection is put in place. RMA protection is based on decisions made by local government representatives which can be problematic as non-geoscientists are often less likely to see value associated with protecting these significant sites.

What is the importance of recognising, protecting and promoting geoheritage sites?

The environment of Banks Peninsula is unique when compared to the nearby Canterbury Plains, historically Māori settlements were located on and around Banks Peninsula (Beaumont et al., 2014). Therefore the landscape is of great cultural value to New Zealand and the Rūnanga of the region (Christchurch City Council, 2015). Gaining geoheritage protection increases recognition of landscapes, and areas with ONLs and outstanding natural features (ONFs) often experience an increase in geo-tourism (Gordon, 2018). This can have social and economic benefits, such as gaining scientific knowledge, as well as spiritual and cultural connections. However, if geo-tourism is not managed properly, issues can arise. For example, increased tourism at the Kazdağı national park in Turkey prevented locals from visiting their cultural sites which resulted in cultural and social disadvantages (Ari, 2020). UNESCO uses protection through geopreservation to encourage education of the culture, science and history behind ONFs and ONLs (Singh, 2011).

Local communities surrounding geoheritage sites can benefit greatly from economic growth, poverty alleviation, improved physical health and mental health (van den Berg et al., 2015). Recognition of sites with Indigenous history, can help Indigenous people protect their culture and livelihoods when proper protection is in place.

Pros and cons of the geopreservation inventory, Geoparks in NZ vs Geoparks overseas

Geoparks are defined by UNESCO as a territory that encompasses sites of geological significance, beauty, or rarity that are under legal protection (Patzak & Eder, 1998). The sites contained within these parks can be assessed as having either scientific, educational, geotourism or recreational values. For each of these different types, there are specific criteria. Once the sites have been assessed against the criteria they can then be categorised, allowing for the required legislation and geological management to be determined (Crofts, 2020).

The UNESCO Geopark programme comprises two international action plans. These are "Agenda of Science for Environment and Development" and "the 1972 Convention concerning the Protection of the World Cultural and Natural Heritage" (Patzak & Eder, 1998). UNESCO recognition is difficult to achieve, and requires countries to place their own protections on areas to gain the status. Once recognised, a UNESCO Geopark will be protected under the authority of the country in question (Patzak & Eder, 1998).

In New Zealand, there is no straightforward legislation in place for the protection of geosites. Protection is enforced through three different acts (Kaloumaira, 2017):

1. RMA
2. The Local Government Act 2002
3. The Conservation Act 1987

Geopreservation inventories are a method of inventorying geological data and is an important step towards creating protection on land such as geosites and Geoparks (Brilha, 2016). In a study completed by Brilha (2016), it was found that inventories should include the topic, scale, value, and the use of each site.

Geopreservation inventories have their strengths and weaknesses, outlined by Lima et al. (2010). Their creation starts with a literature review which allows specialists in geoheritage to work together and determine and compare the geosites involved. The next step involves geological frameworks that can be used for inventorying a large area. However, geopreservation inventories can lead to use of unbalanced criteria which can cause issues for analysing geosites (Lima et al., 2010).

Types of protection methods for landscapes and features in New Zealand

Landscapes and features of national importance, with significant ecological, cultural or historical values are required to be protected under the RMA (Peart et al., 2021). There are different types of protection that can be enforced through the RMA. National parks are the highest level of protection that can be put on land as it puts restrictions on activities and must allow for public entry (Department Of Conservation, n.d). However, due to the highly modified state of the Banks Peninsula, it is unlikely to become a national park (Wilson, 1998). Through The Reserves Act 1977 eight different types of reserves can be created including national, recreation, historic, scenic, nature, scientific and wilderness areas. These can be managed by the Department of Conservation (DOC) or a local authority, iwi or organisation (Department Of Conservation, n.d). Conservation covenants are put in place when organisations such as the QEII Trust work with landowners to form covenants on private land. There is also Ngā Whenua a Rāhui Kawenata, which puts protection on land that has historical, cultural, spiritual and ecological values on private Māori owned land under the Reserves Act 1977 (Peart et al., 2021).

Depending on the location of the ONLs and ONFs different methods of protection should be used. For example farmland is most likely to become covenanted, while other ONFs and ONLs may be found in protected reserves.

What could additional protections be, what is needed for a UNESCO site?

A paper by Migoń (2014) discusses the criteria needed for UNESCO world heritage sites. By creating UNESCO world heritage sites, natural and cultural heritage are both able to be protected. The paper focuses on the role that geomorphology plays as a criteria for a UNESCO world heritage site. For a piece of land to become a UNESCO world heritage site, it must have outstanding universal value (OUV). Using OUV is a subjective way of measuring different sites, so a question that Migoń (2014) highlighted was what makes a certain geomorphological process or assemblage so significant and what gives it OUV? Despite this, the paper did not address how specific geomorphological environments could interact with biological and ecological factors. Geomorphological environments and their interactions with areas of cultural significance is also not discussed. In the paper written by Migoń (2014), he suggests that an official definition for 'significance' should be made when describing the significance of the geomorphic feature. This paper could help the group to understand the steps we would need to take to work towards gaining UNESCO recognition across the Banks Peninsula, and some of the issues that could arise with determining the significance of geomorphic features.

Methods

To create an interactive map for use by the Geopark, ArcGIS online was used. ArcGIS online is a cloud based complete mapping and analysis software. The base layer World Imagery (Firefly) was added to give a detailed satellite view of Banks Peninsula and surrounding areas. Then the current geosites were added from the geopreseration inventory website. On another layer proposed geosites to be included in the Geopark were manually added. From there the 13 key layers of protection were sourced and added to the map. Canterbury Maps was used to source the following layers; Areas of Banks Peninsula to be Maintained in Present Natural State, New Zealand Archaeological Sites, Banks Peninsula Tracks, Banks Peninsula Parks, Selwyn District Plan, and DOC Areas. Christchurch City Council kindly provided the group with district plan zones, maps of cultural significance, ecological significance and outstanding natural landscapes and features. Heritage Sites were sourced from the Heritage NZ website and QEII Trust also provided their covenants map.

Once the map was completed each geosite was then assessed in terms of protection measure and the level of protection this provided. The level of protection for each site was based upon several factors; ownership of the land containing the site, current protection measures on the site, likely activities to occur within the vicinity of the site, and the geological elements of the site in question. Each site was given a vulnerability ranking related to the preservation of its natural state.

The ranking was decided by adapting the pre-existing geopreservation inventory guide for assessment of vulnerability to human damage (New Zealand Geopreservation Inventory, n.d) (Table 1). The protection level of the land is related to both current overall protection measures on the site and the human activities occurring (Table 2). The table is adapted from the guide to site legal protection status in Brilha (2016).

Table 1: Site assessment of vulnerability to human damage

Highest	Vulnerable to complete destruction by human-related activities
High	Vulnerable to significant damage by human-related activities
Moderate	Robust and not considered to be vulnerable to most human-related activities
Low	Values (e.g. rock exposure) could be improved by targeted human-related activities
None	No vulnerability to any human-related activities

Table 2: Protection level of a site relating to its legal protection and human activities

High	Site has legal protection and/or is within a legally protected area and human-related activities are controlled
Moderate	Site is located in an area of legal protection with some control of human-related activities
Low	Site is not legally protected but human-related activities on the site are controlled
None	No legal protection and human-related activities are not controlled

Two examples of differing levels of protection on a geosite would be one located within private farmland compared to another being located within the Regional Environment Coastal Plan (RECP). The site located on the farmland would be categorised as having low protection as there is no individual recognition of the importance of the geosite. There would also be a potential of animal grazing to take place on the site which could cause increased erosion. This is extremely different to a site located in the RECP which would be classed as having high protection. The plan requires all land contained to be maintained in its natural state and restricts all development in the area to ensure there are no adverse effects on the surrounding environment.

Outcomes

The report will now outline the workflow used to carry out the evaluation of existing and required protection on a geosite in question; then it will run through two examples of different geosites contained within the Banks Peninsula Geopark. This involves the use of the workflow that was produced by the group, this can be seen in Figure 1 below; along with the support of the Banks Peninsula ArcGIS map.

Workflow

The workflow contains five questions, each requiring information related to the geosite. The answers to the questions then allow the person to deduce what the next step for the geosite may be. It starts off by asking the user to outline the background of the site, its creation process and what unique elements it holds. This then follows into what current protection measures currently are placed on the site and the surrounding land, i.e. if it is contained in any district plans or covenants etc. The third question then wants the user to decide whether this current status provides enough protection and recognition to the elements of the site. If the user believes that there is sufficient protection on the site, then the process can be stopped there. However, if they think the site requires further measures then the workflow continues. The last two questions look at the significant values the site holds. Initially it asks if the site only holds landscape importance, if the answer is yes then recognition of the site as an ONL is recommended. However, if it holds any of geological, ecological, mana whenua, or historical values too then the workflow recommends one of the protection measures correlating with the values contained in the table at the end.

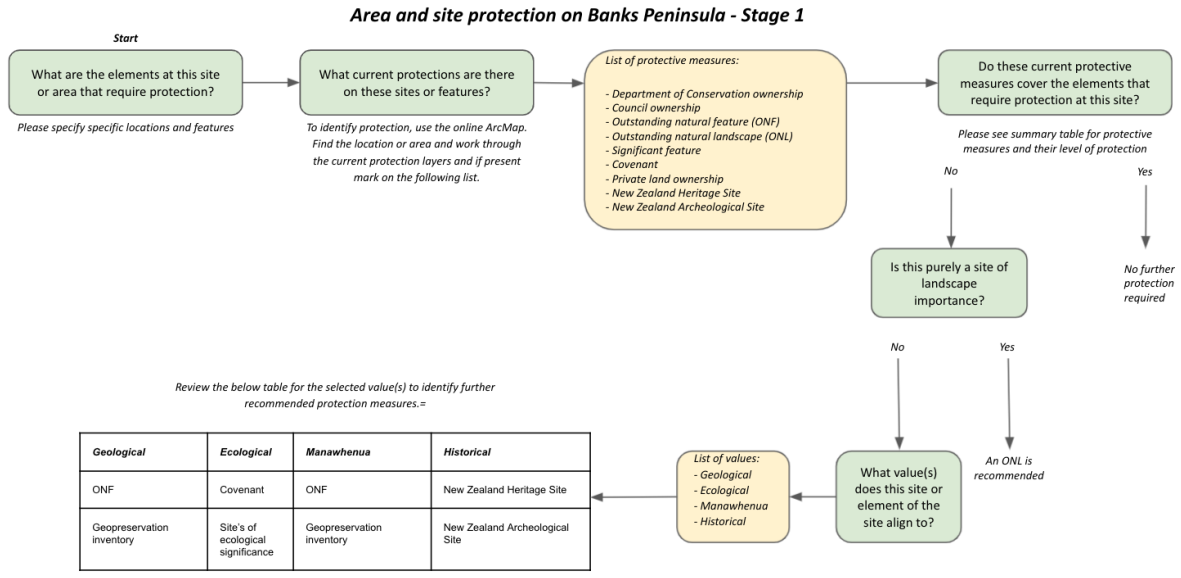

Figure 1: Workflow diagram to determine site protection level and any further protection measures required.

Case Study 1: Stony Bay Peak - High Protection

Figure 2: Image of Stony Bay Peak overlooking Akaroa harbour. *Photo acquired from https://hikingscenery.com/hinewai-reserve-stony-bay-peak/*

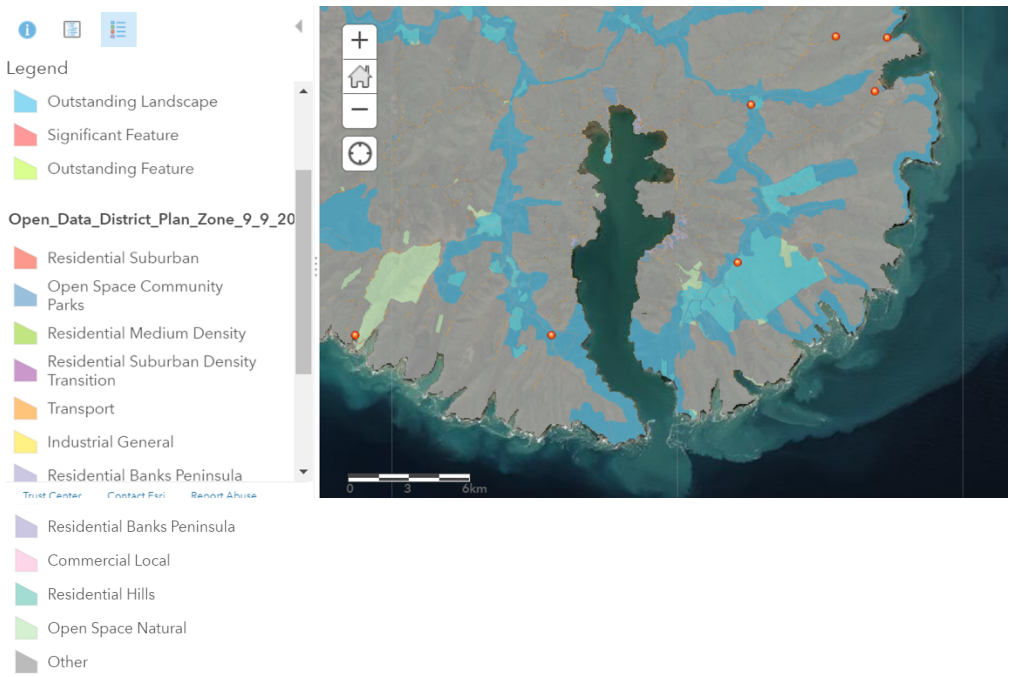

Figure 3: Stony Bay Peak located within an open natural space (light green) and outstanding landscape (blue).

Stony Bay Peak (Figure 2) is a popular site with rock climbers and hikers. By using the workflow diagram we can work out its current protection measure and whether any more is required. The elements that require protection at this site is the whole of Stony Bay Peak, which is a volcanic dome. Using the ArcGIS map we can see that the peak is located within a reserve (Hinewai reserve) and that the council has designated it within an outstanding landscape (Figure 3). The peak is currently located within two protective measures that protect the area from development, giving it a high protection level.

Therefore no further protection is required. This should be enough protection for UNESCO status, however if even more protection is required the workflow should be continued. As this site has geological features it could be given significant feature status for the highest protection level possible.

Case Study 2: Ōhinetahi Caverns - Low Protection

Figure 4: The Ōhinetahi Caverns are weathered trachyte rocks that have formed into this pattern. Image on the left shows a Pou Whenua carving, indicating the area has high cultural significance. *Photo acquired from Samuel Hampton.*

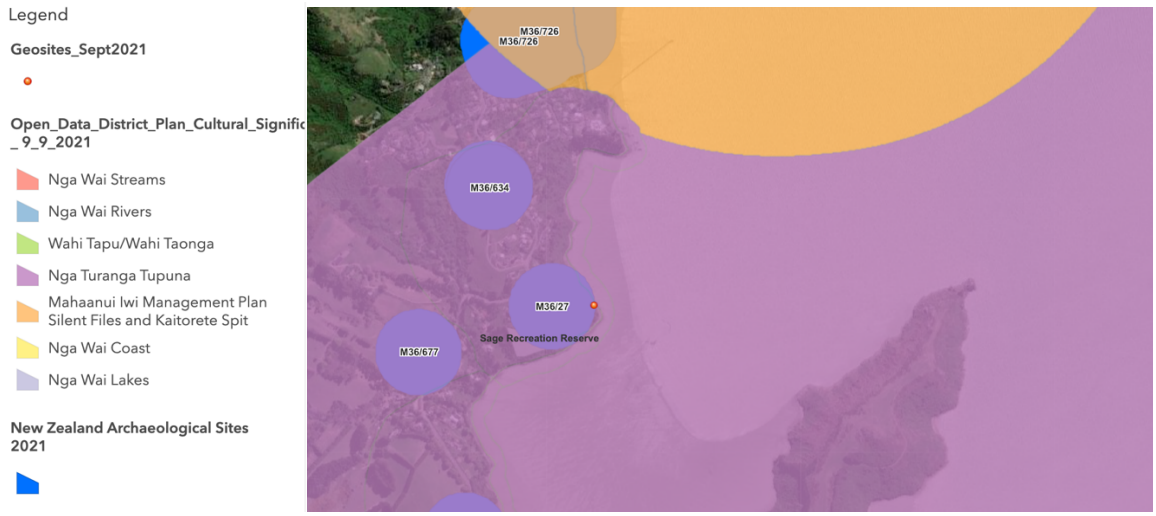

Figure 5: The ArcGIS map showing the location of the Ōhinetahi Caverns (red dot) is within an area of cultural significance (purple) and near the archaeological site of M36/27.

Ōhinetahi Caverns are trachyte rocks that have weathered into circular shapes and are part of the system of dykes radiating out from the extinct Lyttelton volcano (Figure 4). The original fortified Ngáti Mámoe pá was located above the site. From the ArcGIS map we can see that the Ōhinetahi Caverns fall within an area that has been recognised in the district plan as culturally significant, and is located near to a walking track that goes around the shore of governors bay (figure 5). There is also an archaeological site near to the caverns. However, there is no legal protection in place for the caverns or the area in which it is located, resulting in the site having no level of protection. This site is not purely of landscape importance, as it has high geological significance and is culturally valuable to the local iwi. Therefore the workflow recommends the site is made an ONF and added to the geopreservation inventory.

Implementing Protection to Sites

Geopreservation Inventory

Any new sites for the Geopark are recommended to be added to the New Zealand Geopreservation Inventory. The Inventory is always on the lookout for nominations of new sites, which should be sent to the convenor of the Geopreservation Inventory who is currently Bruce Hayward (New Zealand Geopreservation Inventory, n.d).

Email sites to: *b.hayward@geomarine.org.nz*

Implementing ONF to sites

After consultation with our community partner, we have established that there are two potential options that the Geopark could utilise in order to gain ONF status on significant sites on Banks Peninsula that are currently not protected.

1. The first of these potential options is the cheaper of the two and would require waiting until the Canterbury Regional Council (CRC) undergo the next revision of the regional policy statements and make submissions into the process. This option also involves making submissions to any plans that may have impacts upon the site and submissions to the district plans as they undergo revisions. The Selwyn district plan is currently under review and it is already too late to make submissions to this. The next process of review will be in ten years from now.

2. The second option developed is the more expensive of the two and involves a private plan change depending on when the Canterbury Regional Policy Statement might be reviewed. If the Geopark proposes a plan change then the council decides whether to accept, adopt or reject the plan change. If it is adopted, then it processes it as if the Council had proposed it (so that is cheapest). If it accepts it then Geopark pays costs of processing and hearings.

In both the above options the Trust needs to develop clear policy provisions for the district or regional plans. The Christchurch Regional Policy Statement says in Methods under policy 12.3.1, that Local authorities will work collaboratively to map outstanding natural features and landscapes, while having particular regard to the findings of the Canterbury Regional Landscape Study Review 2010, providing reasoning as to why areas are, or are not, considered to be ONFs or ONLs and having regard to any geopreservation sites when considering the location of ONFs If option 1 is followed then Schedule 1, Part 1 of the RMA essentially summarises the key points, but also identified the need to get in before the formal planning process in Part 1 starts. If Option 2 was followed then Schedule 1, Part 2 of the RMA is the place to look for detail on the processes that would be followed. Regardless of which of the above options is followed, the Trust needs to ensure the Christchurch City Council, Selwyn District Council and Environment Canterbury consents teams are aware of the geopreservation inventory and of the specific sites (both in and proposed to be added to the inventory) that are of interest to the Geopark.

Discussion

The results of this project are intended for use by Te Pātaka o Rākaihautū / Banks Peninsula Geopark, to make the assessment of potential Geopark sites a seamless process that is less time consuming. One target audience for this project enabled a focus on the specific needs and preferences of this community partner and resulted in a product tailored to them. Although this was beneficial it may have resulted in the project being close-minded, with repercussions of extensive protection across Banks Peninsula not being thoroughly considered. This point was raised following the presentation of the results at the GEOG309 conference, as questions were asked on whether increased protection of landscapes and features across Banks Peninsula would result in limitations on cultural or recreational land uses. An example of this question in a Geopark scenario would be if an outcrop was protected against recreational uses this could upset climbers, or conversely, if an outcrop was deemed a recreational site for climbing this could upset the local Rūnanga, if the cultural significance of the site had not been noted. Scenarios such as these are similar to those described by Ari (2020), who recounts how the protection of Sacred Natural Sites in Turkey saw the local people losing access to their sacred sites. This resulted in tension and a distressing relationship between the local communities and those who claimed to protect the area. What can be learnt from these scenarios, is that the Geopark must effectively research a site or landscape and its uses before gaining protection. This is the purpose of the workflow and ArcGIS that has been created, which can have extra stages added to ensure that no key land uses are missed.

This research question focussed on what can be done to improve landscape preservation on Banks Peninsula and why this is important, by reflecting on the ArcGIS Map, workflow, and the research completed, this question has been answered. The research question was fitting to the work completed throughout the semester, research was done on the most effective methods for landscape preservation in an attempt to recommend how to put these processes in place for Banks Peninsula.

Despite answering the question, issues still arose during the project, mostly relating to the ArcGIS abilities and level of knowledge regarding the vulnerability and protection of sites within the Geopark. The ArcGIS work was completed with the help of the project tutor as the group members had either minimal or no ArcGIS knowledge. Despite this, the resultant map still meets the needs of the Geopark and can be used to assess protection levels across Banks Peninsula.

Access to council documents as well as the preexisting understanding of policy and planning may have also hindered the quality of the final project product. Due to the structure of the research, assistance from the project's community partner came late in the semester, which gave less time to create stage two of the workflow. This second workflow is the next step for the Geopark, alongside the need to raise the awareness of the Christchurch City Council, Selwyn District Council and Environment Canterbury regarding the Geopark. As global case studies show in Zhang et al., (2020), effective communication between the Geopark, regulatory bodies, and the local community, increases awareness of why landscape preservation protection is required and allows for positive relationships to be built which benefit all stakeholders.

Assessing the protection levels for Stony Bay Peak and the Ōhinetahi Caverns allowed the group to further understand the importance of the different layers within the ArcGIS map, with some being more important or helpful in the assessment process. Layers such as the current outstanding natural landscapes and features or Department of Conservation areas, are easy to understand, as these classifications consistently provide a higher level of protection for a site. In comparison, the layers that outline areas of ecological or cultural significance in the district plan are useful in assessing the importance of a site, but do not propose a clear level of protection and further information is often required. The layers of the ArcGIS map contribute to the workflow in different ways, but together are effective at assessing the importance and protection of a site on Banks Peninsula.

The Geopark gaining UNESCO recognition has been an underlying topic of our research and outcomes. Originally, it was thought that the UNESCO Geopark programme would have had a greater influence on the work that has been completed, although it may play a more important role in the next steps of the Geopark. If the Banks Peninsula Geopark is to be recognised by UNESCO, the protection of sites and landscapes becomes the responsibility of the New Zealand government (Patzak & Eder, 1998). Involving the government in the protection of the Geopark aligns with the next step of increasing awareness amongst local councils and other regulatory bodies. Such a title could also increase public interest in Banks Peninsula and allow for more people to explore and be interested in the landscape and its history.

Conclusions

The most significant finding of this project is that there are zero outstanding natural features currently protected on the Banks Peninsula. This means that there are no sites that currently have protection placed specifically upon them. All sites with some legal protection in place simply do so due to being coincidentally located within an area of existing protection, such as a reserve.

Sites that would be included in the application for UNESCO world heritage status are required to have existing protection on them, as UNESCO status does not provide any additional legal protection to the sites, as it is a universal system across the world and needs to function in different countries with different legal protections in place. With this in mind, the findings of this project will be useful for Te Pātaka o Rākaihautū/Banks Peninsula Geopark when they enter the process of applying for the park to gain UNESCO world heritage status.

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References

- Ari, Y. (2020). Protecting biocultural diversity at Kazdağı national park, Balikesir, Turkey: The role of sacred natural sites. *Human Geographies, 14*(2), 215-238.
- Beaumont, L., Carter, J., & Wilson, J. (2014). Banks Peninsula contextual historical overview and thematic framework.
- Brilha, J. (2016). Inventory and quantitative assessment of geosites and geodiversity sites: a review. Geoheritage, 8(2), 119-134.
- Brilha, J. (2018). Geoheritage: Inventories and Evaluation. In E. Reynard & J. Brilha (Eds.), *Geoheritage* (pp. 67-86). Elsevier Inc.
- Brocx, M., & Semeniuk, V. (2007). Geoheritage and geoconservation ñ history, definition, scope and scale. *Journal of the Royal Society of Western Australia*(90), 53-87.
- Christchurch City Council (2015). *Te Pātaka o Rākaihautū / Banks Peninsula Landscape Study.* http://resources.ccc.govt.nz/files/policiesreportsstrategies/chapter9-naturalandculturalheritage-s32-appendix3.5-tepatakaorakaihautu-ngaitahuculturalvaluesaddendum.pdf
- Crofts, R. G., J.E. Brilha, J. Gray, M. Gunn, J. Larwood, J. Santucci, V.L. Tormey, D. Worboys, G.L. (2020). *Guidelines for geoconservation in protected and conserved areas. Best Practice Protected Area Guidelines Series No. 31.* IUCN. https://doi.org/https://doi.org/10.2305/IUCN.CH.2020.PAG.31.en
- Department Of Conservation. (n.d). *Categories of conservation land*. https://www.doc.govt.nz/about-us/our-role/managing-conservation/categories-of-conservation-land/
- Gordon, J. (2018). Geoheritage, geotourism and the cultural landscape: Enhancing the visitor experience and promoting geoconservation. *Geosciences (Basel), 8*(4), 136.
- Hampton, S. J. (2010). Growth, Structure and Evolution the Lyttelton Volcanic Complex, Banks Peninsula, New Zealand.
- Hayward, B. (2009). Protecting fossil sites in New Zealand (Sauvegarde de sites fossilifères en Nouvelle-Zélande). *Carnets de Geologie, 2008*, 49-67.
- Kaloumaira, J. (2017). *Exploring the UNESCO Geopark concept as a pathway to a geotourism attraction: A Kaikoura case study, Canterbury, New Zealand* (Doctoral dissertation, Lincoln University).
- Lima, F. F., Brilha, J., & Salamuni, E. (2010). Inventorying Geological Heritage in Large Territories: A Methodological Proposal Applied to Brazil. *Geoheritage, 2*(3-4), 91-99. https://doi.org/10.1007/s12371-010-0014-9
- Migoń, P. (2014). The significance of landforms – the contribution of geomorphology to the World Heritage Programme of UNESCO. *Earth Surface Processes and Landforms, 39*(6), 836-843. https://doi-org.ezproxy.canterbury.ac.nz/10.1002/esp.3546
- New Zealand Geopreservation Inventory. (n.d). *Inventory Fields*. http://www.geomarine.org.nz/NZGI/
- Patzak, M., & Eder, W. (1998). "UNESCO Geopark" A new programme - A new UNESCO label. *Geologica Balcanica,* 28(3-4), 33-35.

- Peart, R., Woodhouse, C., Schlaepfer, S., Koolen-Bourke, D., & Taylor, L. (2021). Caring for the Landscapes of Aotearoa New Zealand.
- Resource Management Act 1991. https://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html
- Singh, J. P. (2011;2010;). *United nations educational, scientific, and cultural organization (UNESCO): Creating norms for a complex world*. Routledge.
- Wilson, H. D. (1840). Living in Raoul country: the changing flora and vegetation of Banks Peninsula. *Ettienne Raoul and Canterbury Botany*, *1996*, 101-121.
- Zhang, D., Ni, J., & Wang, S. (2020). A practical framework for national park management and protection in china: A case study of Nanshan national park. *International Journal of Geoheritage and Parks, 8*(4), 250-254.

Appendices

Appendix A

Final ArcGIS Map of *Geopark Landscape Protection Investigations*

Access via https://ucnz.maps.arcgis.com/

For login details, contact Sam Hampton samuel.hampton@canterbury.ac.nz

Appendix B

Legislation

The three principle pieces of legislation that are used to establish reserves and covenants that protect various aspects of New Zealand's earth science heritage are:

The **Reserves Act 1977** provides "for the preservation and management for the benefit and enjoyment of the public, areas of New Zealand possessing ... natural, scenic, ... geological, scientific, educational ... features of value; ensuring ... the preservation of representative samples of all classes of natural ecosystems and landscape which in their aggregate originally gave New Zealand its own recognisable character".

The **National Parks Act 1980** provides "for the preservation in perpetuity ... areas of New Zealand that contain scenery of such distinctive value, ... and natural features so beautiful, unique or scientifically important that their preservation is in the national interest".

The **Queen Elizabeth II National Trust Act 1977** encourages and promotes the provision, protection and enhancement of open space for the benefit and enjoyment of the people of New Zealand. Open space includes any area "... that serves to preserve ... landscape of aesthetic, ... scenic or scientific ... interest or value."

Under the **Resource Management Act 1991** and Coastal Policy Statement, a lower level of protection is able to be provided for our earth science heritage, irrespective of its ownership. This is through the planning and consent processes of the many territorial local authorities.

The purpose of the Resource Management Act is "to promote the sustainable management of natural and physical resources". Section 6(b) states that "the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development" is a matter of national importance.

Among the national priorities set out in the **New Zealand Coastal Policy Statement 1994** is the protection within the coastal environment of "(i) significant representative examples of each landform which provide the variety in each region; and (ii) visually or scientifically significant geological features" (Policy 1.1.3a).