Grass to Growth

"How might we develop green urban spaces with the help of Football to mutually benefit multiple natural species?"

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DES302
CAPSTONE REPORT

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1. Abstract

Figure 1 Abstract

Habitats are essential for all living organisms. As human habitats increase through urbanisation, other spaces are being underutilised and/or destroyed, resulting in a lack of habitats, placing local non-human species at risk. The research question “How might we develop urban spaces with the help of Football to mutually benefit multiple natural species?” was used throughout this project, following a quantitative experimental research methodology alongside the Design for Conservation Methodology. This was adapted from the initial stream brief "How might we share urban spaces with multiple natural species in a mutually beneficial relationship?". Through the incorporation of New Zealand's love for sport and my own personal interests, Grass to Growth uses specially designed seed-planting studs to transform under-utilised green urban spaces into habitats for local at-risk species alongside a curated casebook highlighting sustainable improvements for local football clubs.

Keywords: Habitat(s), Urban, Sport, At-risk, Species, Football.

2. Table of Contents:

Figure 2 Table of Contents

3. Design Problem, Background, and Objectives

Figure 3 Design Objectives and Background

3.1. Research Question and Problem Situation

This report is a detailed insight into the process and development of the Grass to Growth Capstone project by Harry Bushell. This project explores the co-existence of multiple natural species alongside humans in urban Tāmaki Makaurau through the sustainability stream. Addressing the declining habitats of Auckland's at-risk native species (NZ Herpetological Society, 2021), the Grass to Growth project combines New Zealand's love for sport and its benefits with Tāmaki Makaurau's green urban spaces and their potential benefits for wildlife. Beginning with the research question, *"How might we share urban spaces with multiple natural species in a mutually beneficial relationship?"* there was a quick pivot to the project's current research question*, "How might we develop green urban spaces with the help of Football to mutually benefit multiple natural species?"* to incorporate personal passions and interests.

Some of Auckland's most prehistoric and important inhabitants are becoming endangered due to a severe lack of habitats. Habitat loss affects all species in an area, not just one type. The loss of habitat and subsequent loss of resources, food and shelter is a significant threat to urban biodiversity. Tāmaki Makaurau's green spaces could be utilised to provide mutually beneficial spaces for multiple of its inhabitants. Using football, we can create new habitats and improve pre-existing ones- here's how I think we could do this. As an example, the Auckland green gecko is "Listed in the most recent threat classification as 'At Risk - Declining', due to land development/clearance of habitat" (NZHS, 2021). These geckos are primarily arboreal (tree-dwelling), although they are also found quite low to the ground in prostrate (ground-hugging) vegetation. Both can easily be implemented/combined in Auckland's green spaces.

Urban environments provide a vast and influential canvas for instigating change. Simultaneously, the symbiotic relationships among diverse natural species are crucial to advancing Auckland and the world toward a healthier future. Auckland Council characterises urban spaces as encompassing "open space, sports fields and parks, ranging from small local parks to large regional parks, walkways, greenways and cycleways, roads and footpaths, squares, plazas and some land between buildings," emphasising their significance in shaping a better future by stating that "Our urban public places will assume an increasingly vital role in the future as Auckland expands and becomes more densely populated." (Auckland Council, 2023).

Graphic highlighting green urban space in Auckland – Zoomed area represents my local spaces.

Through creating studs that can house and plant seeds, Grass to Growth utilises areas of green urban space not generally used for sport to create environmental art pieces installed from the seeds planted throughout the match. This would create unique ecosystems and habitats that showcased the exhibition game through the locations of each growing plant life species. The seed packs used are chosen to benefit the wildlife of the urban areas used specifically. The Grass to Growth events would raise awareness for greener football by using the sport to benefit multiple natural species and showcase the importance of habitat regeneration to the footballing world. Information towards how clubs could improve their pre-existing infrastructure is also provided through a casebook identifying example pitches around New Zealand and providing initiatives and changes for improving the wildlife benefits of these spaces.

3.2. Stakeholders

Stakeholders are crucial to consider and incorporate in any design project. The key stakeholders were created on assumptions and research for this project due to ethical considerations. Aside from these, the Sustainability Streams project partners were also crucial stakeholders for this project. They provided validation and support for Grass to Growth during a week 8 presentation and check-in and provided valuable insights into the future development of this project, as well as potential iterations to consider. The partners mentioned the opportunity to expand into multiple other sports. This is something that is already possible with the universal fit and commonality of studded footwear in multiple sports. However, this project chose to focus specifically on football for the moment as Gabriela Baron (sustainability stream leader) wanted a grounded and less ambitious scope to ensure that the project could be completed in the provided timeframe.

Alongside the project partners, several non-human, human, and corporate stakeholders were considered using the personas shown below:

Non-Human Persona

Define the main stakeholders involved in your project. Use as many templates as you need.

NAME *Use popular and/or scientific name*
Auckland Green Gecko

MAIN DESCRIPTOR *What type of persona is it?*
Environment user

WHERE? *Where is your non-human persona located?*
Shaded floor areas and trees around urban and rural Tamaki Makaurau

Sketch this persona

WHY? *What makes you want to protect this persona (use data if you have it)*
The Auckland Green Gecko is under threat, as they approach endangerment. Any native animal that's under threat is an issue in my opinion, so protecting them is highly important in keeping the identity of our wildlife in Aotearoa.

NEEDS *What does this persona need in this specific project context*
Auckland Green Geckos need habitats to live and breed in order to repopulate

OTHER *Describe other pertinent considerations about your persona relevant to this project*
Food and water, as well as a mix of habitats as they dwell in both trees and on the floor. Surrounding wildlife so that there isn't a clash.

LEVEL OF VULNERABILITY WITHIN THIS PROJECT CONTEXT

Barely affected *Neutral /don't know* *Deeply affected*

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Created by Gabriela Baron (2021)

Non-Human Persona

Define the main stakeholders involved in your project. Use as many templates as you need.

NAME *Use popular and/or scientific name*
NZ native bees

MAIN DESCRIPTOR *What type of persona is it?*
Environment user and worker

WHERE? *Where is your non-human persona located?*
Any areas with flowers around urban and rural Tamaki Makaurau

Sketch this persona

WHY? *What makes you want to protect this persona (use data if you have it)*
Vitally important to the environmental health of Auckland, and under threat from lack of habitat and areas to pollinate and feed.

NEEDS *What does this persona need in this specific project context*
Habitats, areas to feed and drink, flowers for pollination and nectar, areas to build beehives. Like honey bees, these native bees forage on flowers. While they collect nectar and pollen for food they pollinate the plants they visit. However, their life is very different from the domesticated honey bee.

OTHER *Describe other pertinent considerations about your persona relevant to this project*
Needs to be relatively safe from predators and human interference after certain stages

LEVEL OF VULNERABILITY WITHIN THIS PROJECT CONTEXT

Barely affected *Neutral /don't know* *Deeply affected*

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Non-Human Persona

Define the main stakeholders involved in your project. Use as many templates as you need.

NAME *Use popular and/or scientific name*
Common Auckland fly

MAIN DESCRIPTOR *What type of persona is it?*
One of the main food sources for omnivore Auckland green geckos

WHERE? *Where is your non-human persona located?*
All over Auckland and NZ. In nature as well as all around industrial areas. All over urban spaces.

Sketch this persona

WHY? *What makes you want to protect this persona (use data if you have it)*
This persona has been included due to my want to increase the population of Geckos, by increasing the population of Geckos, more flies will be eaten, thus they need to be considered as well.

NEEDS *What does this persona need in this specific project context*
Enough space to keep their population up, but through an increase in geckos it should help manage the influx of flies in urban NZ at the moment.

OTHER *Describe other pertinent considerations about your persona relevant to this project*
Need to ensure that the natural equilibrium between prey and predator isn't damaged or interrupted and is instead shifted slightly to balance better.

LEVEL OF VULNERABILITY WITHIN THIS PROJECT CONTEXT

Barely affected *Neutral /don't know* *Deeply affected*

DESIGN 4CONSERVATION

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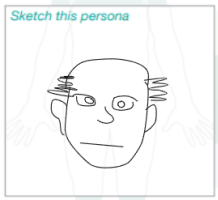
Human Persona

Define the main stakeholders involved in your project. Use as many templates as you need.

NAME *Use a realistic name*
Grant Howard

MAIN DESCRIPTOR *What type of persona is it?*
Local football club director / owner

Sketch this persona



WHO? *Personal profile segmentation: age, gender, location or any other pertinent descriptors*
Grant is a 68 year old male, he runs a business on the side, but spends most of his time looking after his football club, he get's everything set up for match days and organises everything about the club (pitches, players etc.)

QUOTE *Which is the essence of this person in a quote that they could say?*
"**Hard work beats talent when talent doesn't work hard.**"

GOALS *What is their main motivator? Which latent needs and desires?*
Grants main motivator is running a successful and sustainable football club (sustainable financially). He wants to keep the club successful on and off the field.

ATTITUDE *Describe their point of view/expectations/behaviors within the project context*
Grant is from an older generation, he would be open to improving the surrounding areas of his club and pitches if it had no impact on the facilities and didn't cost him anything.

LEVEL OF COMMITMENT WITH THE CAUSE

Not committed *Neutral /don't know* *Conservation hero*

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Human Persona

Define the main stakeholders involved in your project. Use as many templates as you need.

NAME *Use a realistic name*
Jacob Michael

MAIN DESCRIPTOR *What type of persona is it?*
Football enthusiast

Sketch this persona

WHO? *Personal profile segmentation: age, gender, location or any other pertinent descriptors*
Jacob is a 31 year old male, living in Denmark and working for Unisport as a football equipment reviewer. He has a high interest in football technology and innovation.

QUOTE *Which is the essence of this person in a quote that they could say?*
"a winner is just another loser who tried one more time"

GOALS *What is their main motivator? Which latent needs and desires?*
Jacobs main motivator is being at his very best, both on and off the pitch. He is aware of his own energy needs, and shares when he can while also knowing when he needs space.

ATTITUDE *Describe their point of view/expectations/behaviors within the project context*
Jacob is always excited with any innovation in football. Anything new, no matter if it's successful, unsuccessful, or just interesting, spikes his interest. He is interested to see how this project will develop, and if it could perhaps offer performance benefits as well as environmental ones in the future.

LEVEL OF COMMITMENT WITH THE CAUSE

DESIGN 4CONSERVATION

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Created by Gabriela Baron (2021)

Human Persona

Define the main stakeholders involved in your project. Use as many templates as you need.

NAME *Use a realistic name*
Fraser Ross

MAIN DESCRIPTOR *What type of persona is it?*
Local urban events organiser

Sketch this persona

WHO? *Personal profile segmentation: age, gender, location or any other pertinent descriptors*
Fraser works for the local council organising events for the public community. He is in his early 30s and has a young son.

QUOTE *Which is the essence of this person in a quote that they could say?*
"There is no power for change greater than a community discovering what it cares about."

GOALS *What is their main motivator? Which latent needs and desires?*
Fraser wants to create a community bond around the events and work he does, he wants people to be committed to improving their local communities, and through community events he is able to improve the livelihood of his local population.

ATTITUDE *Describe their point of view/expectations/behaviors within the project context*
Fraser is all for securing a better future for his local community. He wants a safe world for his son to grow up in, and hopes to use his community events to promote a greater way of living.

LEVEL OF COMMITMENT WITH THE CAUSE

DESIGN 4CONSERVATION

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Organisation Persona

Define the main stakeholders involved in your project. Use as many templates as you need.

NAME *Use a real name*
Sport New Zealand

TYPE *What type of organisation is it? Describe it briefly.*
Nationwide sports organisation

Paste their logo/brand

SPORT NEW ZEALAND
IHI AOTEAROA

ROLE *What is this organisation's role within this project? Why?*
Sport New Zealand would be crucial in organizing and spreading my project across the country in the future. Their support would allow my project to grow, and offer a large platform of contacts to work with.

What would this organisation provide?
- [ ] Funding
- [x] Work force
- [x] Specialists/Advice/Knowledge
- [x] Physical space
- [x] Products
- [x] Access/Connections
- [x] Outreach/Advertising
- [ ] Other:

MOTIVATIONS *What are the organisation goals (relevant to the project)? Why will this organisation be motivated to participate in your project?*
Sport NZ have been big on promoting sustainability in NZ sport since 2006, and through the use of sport in combination with sustainable practices and outcomes it allows NZ sport to promote their values through my project.

OTHER *Describe other pertinent considerations about this organisation relevant to this project*

LEVEL OF COMMITMENT WITH THE CAUSE

Not committed — *Neutral /don't know* — *Conservation hero*

DESIGN 4CONSERVATION

D4C Toolkit: UNDERSTAND www.design4conservation.com
Created by Gabriela Baron (2021)

Organisation Persona

Define the main stakeholders involved in your project. Use as many templates as you need.

NAME *Use a real name*
Auckland Council

TYPE *What type of organisation is it? Describe it briefly.*
Local Council

Paste their logo/brand

Te Kaunihera o Tāmaki Makaurau
Auckland Council

ROLE *What is this organisation's role within this project? Why?*
Has the rights to majority of urban green spaces in Auckland, and also inspired the idea of redeveloping urban green spaces. With their backing, my project could be implemented onto the urban green spaces that they currently run. They also have ownership to a lot of local parks and fields that football teams use.

What would this organisation provide?
- [ ] Funding
- [ ] Work force
- [ ] Specialists/Advice/Knowledge
- [x] Physical space
- [ ] Products
- [ ] Access/Connections
- [x] Outreach/Advertising
- [ ] Other:

MOTIVATIONS *What are the organisation goals (relevant to the project)? Why will this organisation be motivated to participate in your project?*
A healthier and more sustainable Auckland is the main focus of their "Auckland Plan 2050", and my project is attempting to build towards both of these aspects.

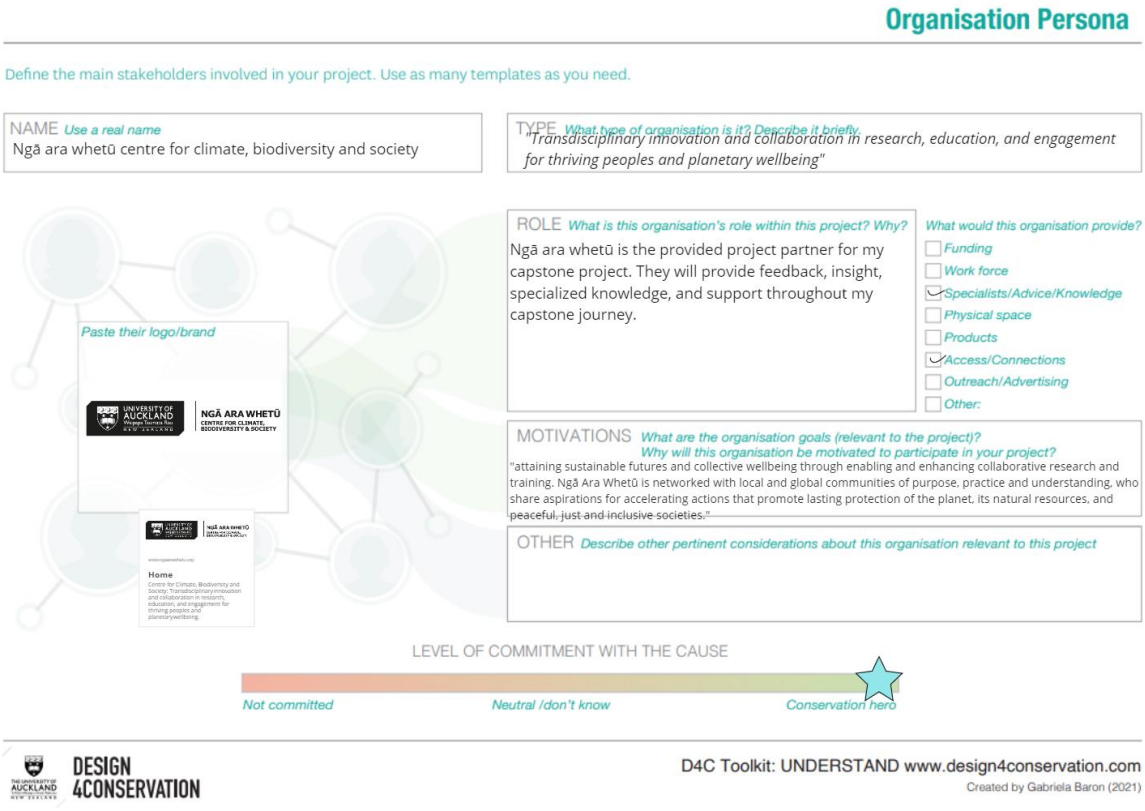
OTHER *Describe other pertinent considerations about this organisation relevant to this project*

LEVEL OF COMMITMENT WITH THE CAUSE

Not committed — *Neutral /don't know* — *Conservation hero*

DESIGN 4CONSERVATION

D4C Toolkit: UNDERSTAND www.design4conservation.com
Created by Gabriela Baron (2021)



Baron, G. (2021) Stakeholder Charecterisation. Design for Conservation Toolkit. https://www.design4conservation.com/stakeholder-characterisation

These Personas / Stakeholders were created with Grass to Growths' main beneficiaries in mind. Alongside this, personas were created to highlight impacts on unforeseen stakeholders like Aucklands fly population. As my project focuses on habitat creation to repopulate endangered species in Tāmaki Makaurau, I found it important also to consider the implications and consequences that would affect other species due to increased at-risk populations. The Auckland fly persona was created due to them being common prey for the Auckland green gecko and copper skinks. This was to ensure that the environmental equilibrium was considered and addressed, as a major shift in Auckland lizard numbers could result in ecosystem instability if introduced too rapidly. My project has a longer-term goal of slowly rebuilding at-risk populations through greater numbers of urban habitats, meaning that the ecosystem equilibrium shouldn't be dramatically affected in any way.

3.3. Objectives and Goals

The main goal of this project is to utilise the unifying power of sport to reinvigorate underutilised spaces into habitats for local wildlife, following the research question, *"How might we develop green urban spaces with the help of Football to mutually benefit multiple natural species?"*. To achieve this, a set of objectives needs to be completed. These objectives can be created by breaking down the key components of the goals/research question.

The unifying power of sport/help of football – Sports, more specifically for the scope of this project, Football, has unified people for decades. Over 1.5 billion people watched the FIFA

World Cup final in 2022, providing 1/5 of the world's population unified through one event (FIFA, 2023). With this, unifying people through sport is a crucial objective for Grass to Growth and provides the platform for this project's end goal.

Reinvigorating underutilised spaces/Developing green urban spaces – Identifying underutilised green urban spaces and transforming them into habitats is another key objective for this project. Achieving this the way I've proposed requires the aforementioned power of sport to get people in and around the spaces to transform them. Alongside this, creating habitats is a key objective in aligning with the sustainability stream's values, my personal values, and my project partner's values, as it promotes environmental and ecosystem sustainability.

Mutual benefits for multiple natural species – Creating a project that mutually benefits multiple natural species was the objective I identified first for Grass to Growth. The initial how might we statement from the Sustainability Stream brief stated, "*How might we share urban spaces with **multiple natural species in a mutually beneficial relationship**?"* instantly identifying mutualism between multiple natural species as a key focus. This was a critical shift in this project, as an instant importance was placed on creating something that benefits multiple natural species, which led much of the early research for what I wanted to create.

4. Design process and methods

Figure 4 Design Process and Methods

4.1. Overview

The Grass to Growth capstone project utilised the Design for Conservation (D4C) Design Methodology developed by Gabriela Baron. The D4C framework emphasises that humans are just one species in a complex ecosystem, and our success and well-being depend on maintaining balance within that ecosystem (D4C, 2021). This approach is well-suited to the sustainability stream brief, as it focuses on sustainability, environmental connection, and positionality. Additionally, the D4C process provides an open and user-friendly toolkit with templates for visually displaying thought processes throughout the project's journey. The D4C process is described as an iterative process consisting of 5 core stages that can overlap and change in order. The Grass to Growth design process began with the understand phase, followed by the propose and validate phase, plan for impact, and deploy sustainably, while revisiting the (re)connect phase multiple times as the project progressed. However, the Design for Conservation methodology is not perfect. There is a heavy focus on sustainability but more on environmental sustainability than any other aspect. Sustainability is a massive topic, and focus must be placed on other parts (economic, social, etc.) to properly achieve the circular sustainable system that D4C proposes. A combination with IDEO's Human Centered Design methodology (IDEO HCD, 2015) or collaboration with sustainable business models would offer consideration for environmental, social, and economic sustainability, creating a more complete, sustainable cyclic system.

Tools used for each phase

4.2. Project Scope

To plan and scope this project, three similar plans were created, each with varying ambition and deliverables, but all focused on creating the same experience and delivering the same end goal of utilising the power of sport to reinvigorate underutilised green urban spaces into habitats for local wildlife.

Scope Plan A: My most ambitious plan is to create an event using an area of green urban space not normally used for sport. The event would focus on creating a more sustainable football world, while also showcasing a way that football could transform urban spaces into habitats for local wildlife and plantlife. This would be achieved through the creation of seed-planting studs, as well as a seed-dropping football and an information booklet. By utilising this urban space an art piece would be installed from the seeds planted throughout the game. This would create a 1 of 1 layout of plantlife that showcased the exhibition game that took place there. This would be represented through a scaled pitch mock-up, as well as a pitch mock-up for how clubs could have their pitches in the future. the seed packs used in the studs could be chosen to benefit the local wildlife of the urban areas used specifically. The event could also showcase to clubs that are involved how they could have a more positive impact on the environment (through fertilisers, plant life around fields, paints used, water used, etc.). This could be done through the information booklet mentioned earlier. This plan places a heavy reliance on the availability of materials and workspace, which, ideally, I will be able to use and access.

Final Deliverables- Functioning Seed studs, ball, pitch and urban space mock-ups, information booklet

Scope Plan B: Plan B is less ambitious than plan A, but sticks to the same core deliverables. I would still create an event with functioning seed studs, a pitch mock-up, and an information booklet. However, the seed ball would be dropped to make it more easily achieved than plan A. The pitch mock-up and information booklet are crucial parts of this assignment, as they allow me to demonstrate my project visually, as well as propose my project's narrative with evidence from the booklet. Plan B, while still focusing on creating an event, would place greater importance on functional final deliverables than the event. Creating a conceptual event is another ambitious step in scope, thus being a greater part of Plan A than Plan B. This

plan still relies on the availability of materials and workspace. However, by removing one of the physical final deliverables, fewer materials will be needed.

Final Deliverables- Functioning Seed studs, urban space mock-ups, information booklet

Scope Plan C: Plan C is the most achievable plan/scope for my capstone project. There is less focus on creating a functional product and more on presenting and validating my idea. With this, there would be a greater focus on developing the information booklet, while also creating a less ambitious stud prototype. Research would be an even more crucial tool with a focus on the booklet, as my idea would have to be conveyed without a functioning product, instead with a detailed concept. Plan C places more reliance on my computer work and deliverables that can be created with less reliance on materials.

Final Deliverables- Stud prototype, information booklet

4.3. Assumptions

To knowingly progress my work, I identified assumptions in and around my chosen stream and field. The assumptions used are as follows:

- I must consider the use of urban spaces
- Outcomes must be sustainable
- I need to consider multiple natural species
- I also need to consider specific environments
- Incorporate the human-nature coexistence
- Relate work to the project partner
- Assuming research used from sources is accurate
- Create outcomes with positive/neutral impacts
- Ensure that I'm positioned in a way that I'm aware of unintended consequences
- My outcomes should incorporate my interests
- Assuming Humans are considered a natural species

Many of my assumptions are focused on the consideration of multiple natural species and the human-nature co-existence. The human-nature co-existence is a dynamic yet sustainable condition where humans and wildlife coexist and adapt within shared landscapes, guided by effective institutions that prioritise long-term wildlife population sustainability, social acceptance, and manageable risk levels in human-wildlife interactions. (Biomed Central, 2020) Through this, there is a direct relationship between sustainability, shared landscapes, risk, and multiple natural species, all of which are key to my assumptions and the sustainability stream How Might We statement.

Through my assumption about creating positive/neutral impacts, one could also consider commensalism alongside mutualism. Commensalism is "where one species benefits and the other is neither harmed nor helped" (NHMUK, 2020).

Regarding my weaknesses with this project, graphic work is my weakest point in design. I've never really had a knack for art or making things look pretty, so while I understand marketing,

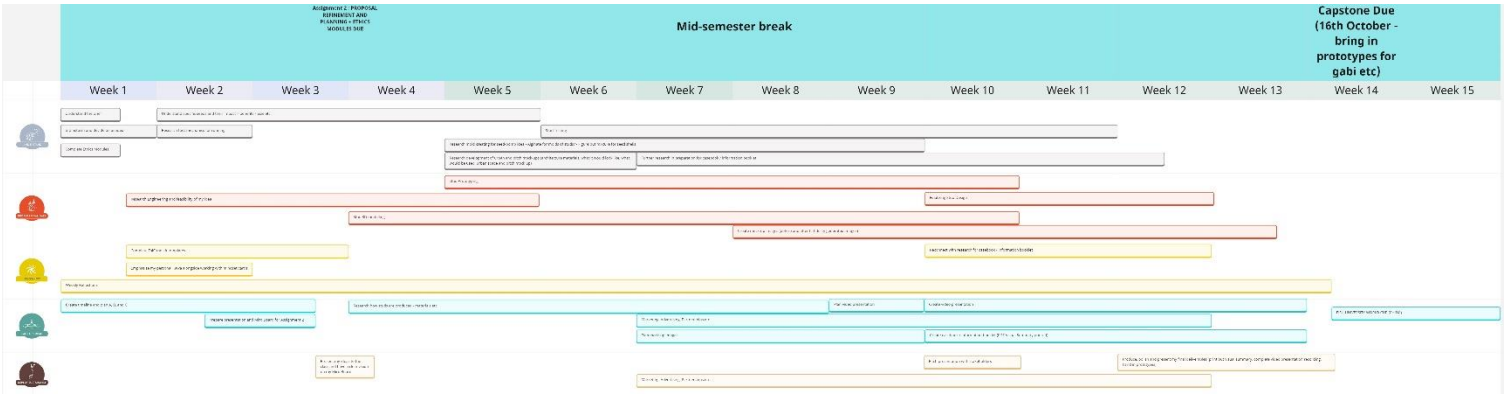
I'm not great at creating attractive graphics. I think it's good that I'm aware of my difficulties with this, and that I don't get too hard on myself when I struggle to create aesthetic work like some of my peers. Regardless of this, I still enjoy it and hope that my logo generation is up to standard for this assignment.

Furthermore, this project addresses a common issue presented throughout the world, but through a focus on utilising sports, it crosses into a research area that is extremely underdeveloped and utilised. Throughout this project, there were big gaps in the literature for what I wanted to do. Football studs have remained relatively unchanged since they were introduced in 1891 (Football History, 2023). The lack of research regarding the use of sports equipment in habit rehabilitation provided a great opportunity for innovation on an aspect that is over 130 years old.

However, it also meant that much work progressed through assumptions and personal testing, resulting in most of the project timeframe being spent prototyping, testing, and iterating. Furthermore, research on the power of sport is surprisingly underdeveloped. Sports has united different cultures for years, with its global and intercultural influence rallying numbers in the millions for good causes. The UNICEF Soccer Aid Charity matches are good examples of this, raising £14,619,005 (30,160,396.12 NZD) for children worldwide in 2023 (UNICEF, 2023). Furthermore, over 1.5 billion people watched the FIFA World Cup final in 2022, providing 1/5 of the world's population unified through one event (FIFA, 2023). This proposes the opportunity for significant change through sports unification and offers the potential for global impact.

4.4. Project Plan

A Gantt Chart was used to plan out the entire process of my project. The chart was separated into the 5 phases of the Design for Conservation Methodology, with key moments, objectives, and milestones listed next to their relevant phase. Alongside this, a weekly planner/to-do list was utilised to ensure that each major objective along the Gantt Chart was completed by finishing multiple smaller steps. Initially, these were completed as part of an early assignment and not considered past that. However, as Grass to Growth progressed, they very quickly both became invaluable tools for time management and planning. The weekly to-do list ensured that I could always ground myself back to what I needed to work on and meant that I rarely strayed on tangents and instead worked efficiently and effectively. Knowing that I had to have everything done two weeks early furthered the importance of these planning tools. I couldn't rely on keeping pace with my peers and instead had to take initiative in my own progress and time management.



5. Ethical Considerations

Figure 5 Ethical Considerations

The ethical considerations for this capstone project are primarily concerned with the land and urban spaces that will be studied, as well as the voluntary participation of individuals who will be engaged in conversation, learning, and collaboration. The following ethical considerations have been identified and will be addressed accordingly:

5.1. Ethical Considerations

Tangata Whenua and upholding Te Tiriti O Waitangi: The local Iwi of Tāmaki Makaurau are the people of the land. As a proud Tangata Tiritiri, the research will respect and consider the Tangata Whenua through Partnership, Participation, and Protection. In the event of any disputes over land or potential issues with introducing certain species, appropriate communication will be established between the researcher and Iwi to ensure that the research does not affect Te Tiriti O Waitangi or Iwi relations.

Voluntary participation: Participants in the research will be free to opt-in or out of the study at any time, up to 30 days after their participation. If a participant chooses to opt out, their results and participation records will be erased. Participants have the right to access their recorded results and may request a copy of their results via email at any time. They may also request the removal of any information they do not wish to be recorded.

Informed consent: Participants will be informed of the benefits, risks, purpose, and funding behind the study before agreeing or disagreeing to participate. Potential participants will be contacted through their public email. Suppose potential participants or areas of use are part of an organisation or group that may be represented in the study. In that case, their lead figure will be contacted prior to ensure that their approval is obtained. Consent and participant information forms will be sent via email.

Confidentiality and Anonymity: The research will not require any personal information from participants. Participants will remain anonymous, and any information they share with the researcher will be kept strictly confidential.

Potential for harm: As the research may involve physical activities, there is a slight risk of physical harm through injury. However, this risk will be minimised as much as possible.

Environmental impact of research: Any environmental harm or damage caused by conducting the research will be minimised as much as possible and will be a major consideration throughout the research process. Consent to access potential study sites and urban spaces will be requested via email from representatives of the chosen areas.

5.2. Auckland Council Permits

Along with these ethics, this project needs to acknowledge environmental permits within Auckland and from the Auckland Council when it comes to using specific reserves and land in Auckland.

5.2.1. Landowner Approval:

Activities which require council landowner approval include:

- commercial activity on a reserve like a night market
- laying stormwater and wastewater pipes in a reserve
- power, water or communications companies seeking to install infrastructure on council land
- conducting research on a park
- mobile vendors trading on a reserve or park
- creating or installing something, e.g. fencing, plants, playgrounds, small buildings, sports facilities
- accessing a construction site through a park
- easements, rights of way and other legal permissions. (Auckland Council 2023)

5.2.2. Resource consent:

"You will need to apply for resource consent if you are planning activities that have an effect on the environment. This includes if your event is longer than six days and you have more than six hours of amplified noise per day." (Auckland Council 2023)

Since my project plans to affect the environment positively, I will need earthworks consent through a resource consent application and approval.

5.2.3. Event Permits:

An Event Permit will be needed if your event:

1. is for more than 150 people
2. will be on any public open space like a park, road or the water
3. is a commercial activity
4. could cause damage to public property, the environment or surrounding roads in any way
5. will involve alcohol, excessive noise, pyrotechnics or fireworks
6. will generate any form of waste
7. will put the public and their safety at risk (the event organiser must take out public liability Insurance)
8. needs power and vehicle access
9. has food stalls or vendors (including catering or food trucks)
10. will have large structures like bouncy castles, stages, marquees or signage. (Auckland Council 2023)

RELEVANT AREAS HIGHLIGHTED IN BOLD

Due to this project's time restraints, I cannot apply for and receive these permits. However, it was still important to consider and discuss them.

5.3. Limitations / Design Constraints

The limitations / Design Constraints of this project are as follows:

Time Constraints and Ethics Approvals: The project is limited to a single semester, with a time constraint of 95 days. This restricts the potential for research and development, as there is a deadline for the work to be completed and presented. Additionally, the time limitations prevent the acquisition of Human and Animal Ethics approval and any form of permit, which significantly limits the scope of the project.

Use of Land: The proposal to use urban spaces in Auckland restricts the research to the Auckland region. This may limit access to certain areas and spaces within Auckland if consent to use them is not granted.

Financial Restrictions: The researcher's personal position as a third-year university student imposes significant financial constraints on the research. Additionally, there is no external funding available for the research.

Limited Access to Relevant Practical and Theoretical Research: This project focuses on assisting endangered animal species in Auckland. Due to the nature of these animals, it may be difficult to access relevant research about them, and without animal ethics approval, it is not possible to conduct practical research with them.

Lack of Participation from the Target Population, Access to Participants, and Lack of Depth in Data Collected from the Target Population: Due to part of the target population being endangered species in Auckland, there may be limited access and participation from this population in the research. Assumptions may have to be made based on previous research in order to reach conclusions about these populations.

6. Documentation

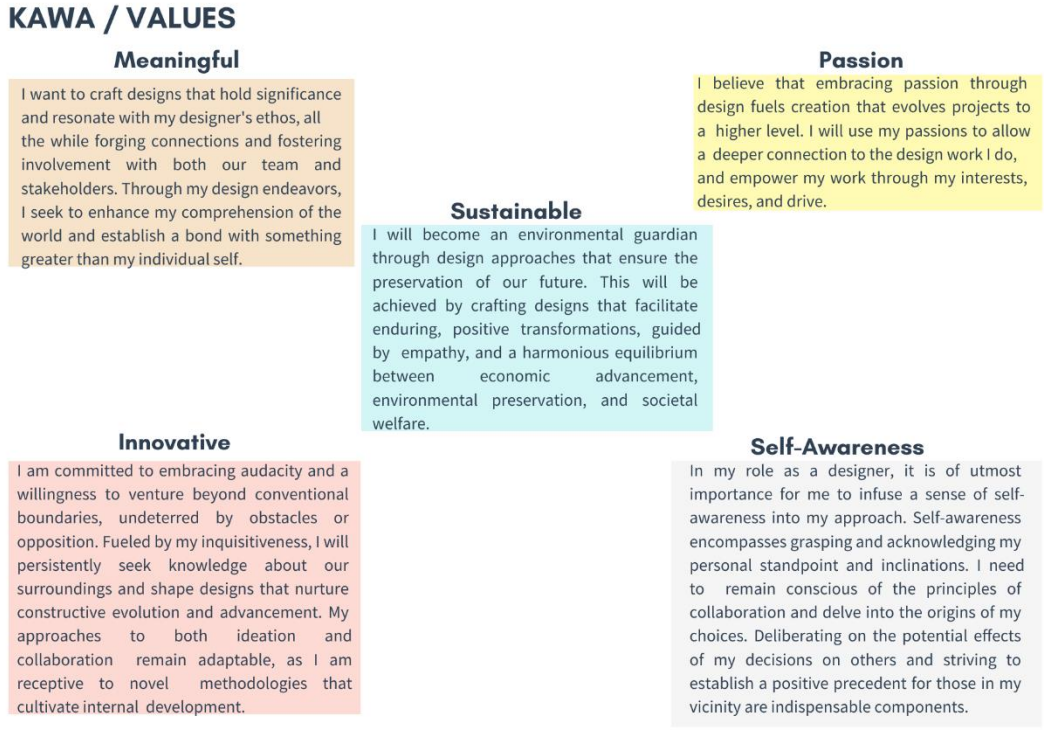
Figure 6 Documentation

6.1. **(Re)Connect**: Through the cultivation of Empathy, the (Re)Connect phase facilitates the development of essential perspectives for authentic, dedicated, innovative, and flexible problem-solving by re-establishing individuals' connections to themselves, their community, and their environment (D4C 2021). This phase of the D4C methodology was constantly revisited throughout this project's development to ensure that the project remained grounded and connected to its stakeholders and beneficiaries. This was achieved through the D4C Mindset cards, the Reconnection Ritual Canvas, and Lesley-Ann Noel's Positionality Wheel. Through these tools, a positionality statement was produced:

My Positionality

I have to understand that I come from a position of privilege, both from where I grew up as well as the social benefits I get from being a cis-gendered white male. I have to be aware of the bias I may hold due to my upbringing and social status. I need to understand that due to my advantaged societal position, there will be stigmas held around my opinions. I also need to ensure that I'm aware of the advantages I've had throughout my life due to my privilege, and be thankful for the opportunities I've had, while also working towards ensuring that these opportunities become equitable.

Tangata Whenua and upholding Te Tiriti O Waitangi - The local Iwi of Tāmaki Makaurau are the people of the land. Thus, as a proud Tangata Tiritiri, my research will consider and respect the Tangata Whenua through the three P's: Partnership, Participation, and Protection. If any disputed land or potential issues around introducing certain species arise, appropriate communication between myself and Iwi will take place to ensure that no part of my research affects Te Tiriti O Waitangi or Iwi relations. Furthermore, as mentioned in my values, I will become an environmental guardian through design approaches that ensure the preservation of our future. This will be achieved by crafting designs that facilitate enduring, positive transformations, guided by empathy, and a harmonious equilibrium between economic advancement, environmental preservation, and societal welfare.



My personal Kawa (reworked from my des300 teams values - Stephanie Townend, Clara Schroeder, Selena Wu, Skylir Chang)

KAWA / VALUES

Positive - I need to stay positive with the work I create and trust the process and journey that my project is on. I should approach the inevitable challenges of this project with a growth mindset and see all of them as an opportunity to learn and improve. My project is practically a love child between myself and football, and encapsulates my passions.

Relative - I need to be open to challenging my own assumptions and stepping back from things I think I know. Being open to new perspectives from multiple species will allow me to learn and grow as a designer, and allow my work to benefit a greater audience.

Cyclic - The design process is always a cycle. There's always opportunities to innovate and iterate no mater how early or late into the process you are. However, phases of rest need to be considered also, and change for the sake of change is a risk that needs to be considered.

Humble - Positionality is crucial to ensure that my project stays humble with it's scope and approach. Focusing on the way things work already, and building from them rather than trying to create something entirely new. I need to be aware of my own self bias, and approach my work with a want to grow and learn. I need to be aware of the intended and unintended consequences of my work.

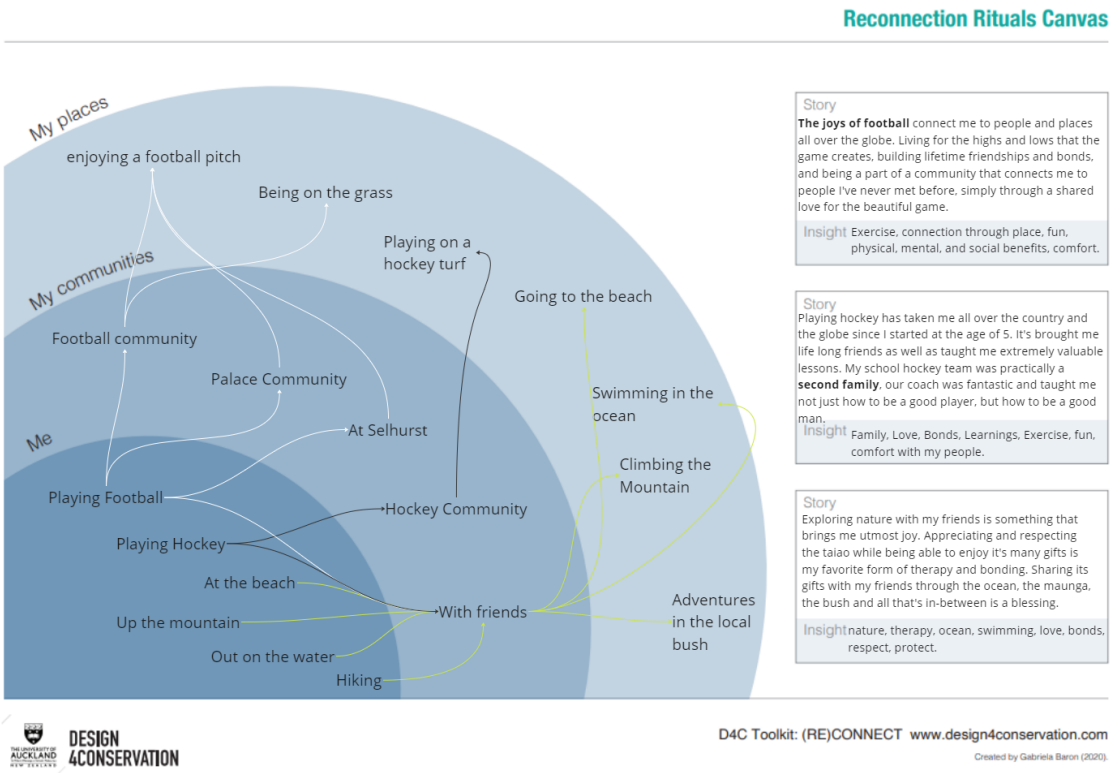
Systemic - Understanding that my project is systemic and that parts of it can easily change and shift is crucial to keeping a positive and healthy relationship with my work balance. Knowing that things will go wrong, but will eventually come right again is important, especially when following a design process.

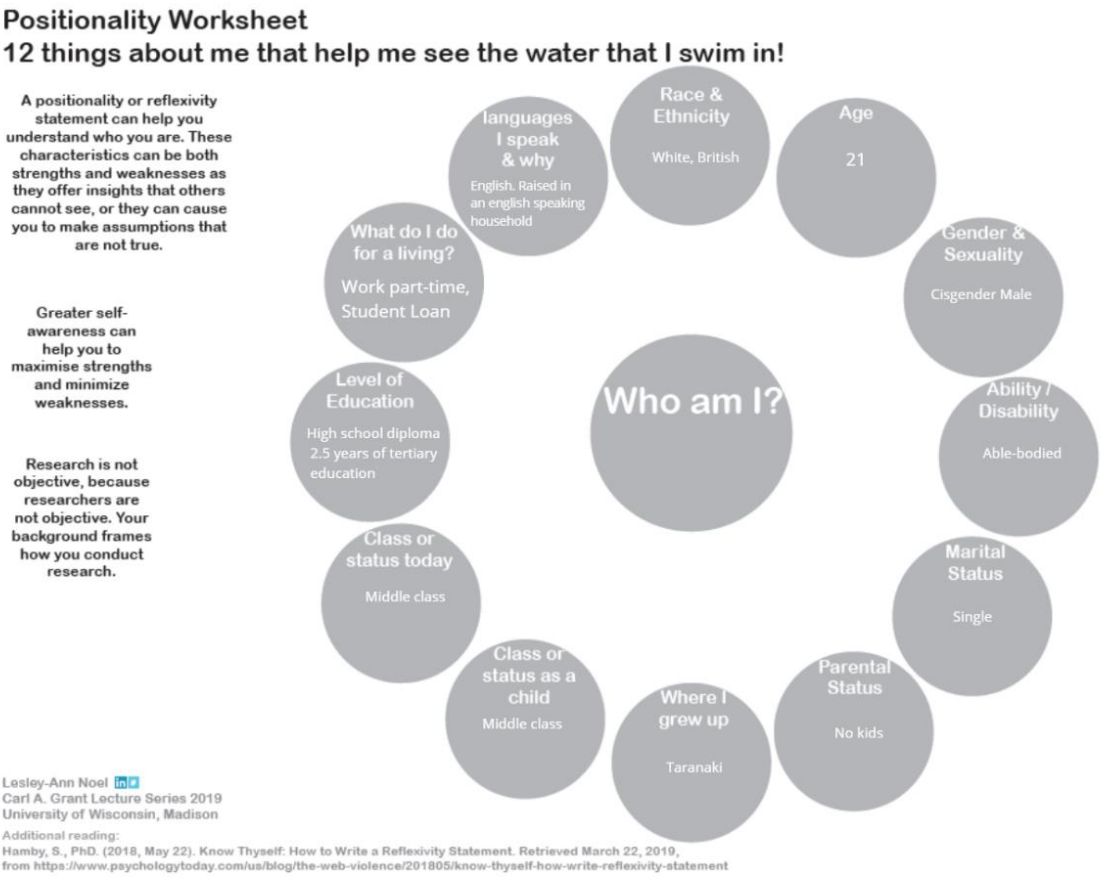
Balanced - Ensure that my interests are balanced with the brief and that my personal values work coherently with the values of the sustainability stream. Look to create an environmental balance between multiple natural species. Ensure that a healthy life balance is maintained.

Honest - For this assignment I need to ensure that I'm both honest with myself and my expectations for what I can feasibly create and deliver. Honesty is also important between myself and my classmates, so we can openly help each other with honest feedback.

Baron, G. (2021) Mindset Cards. Design for Conservation Toolkit. https://www.design4conservation.com/mindset-cards

Baron, G. (2021) Reconnection Rituals Canvas. Design for Conservation Toolkit. https://www.design4conservation.com/reconnection-rituals

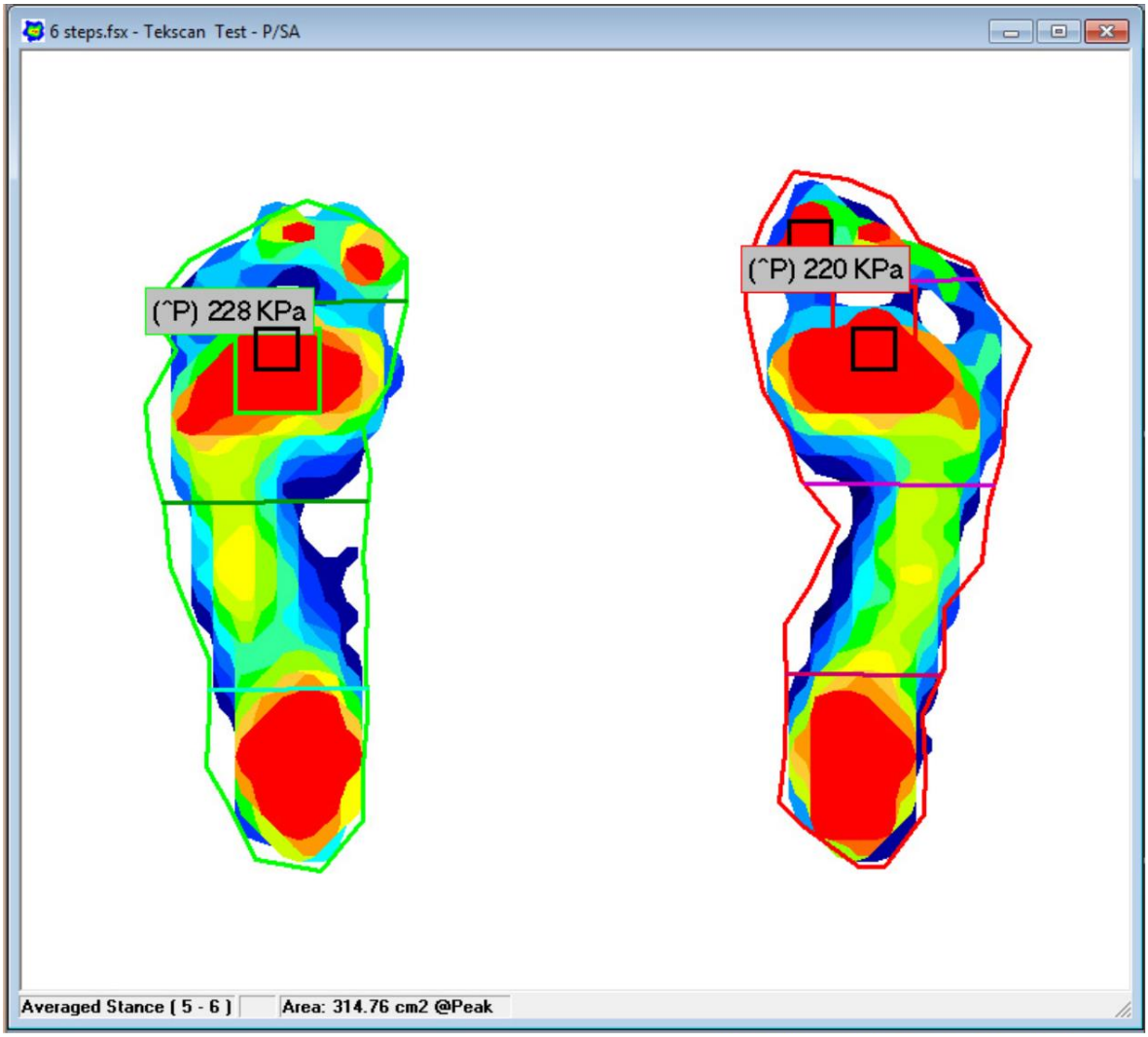




Noel, L-A. (2019) Positionality Worksheet. Decolonizing Design Thinking. https://theconversationfactory.com/podcast/decolonizing-design-thinking-with-dr-lesley-ann-noel

6.2. **Understand Phase:** The Understand Phase facilitates research and learning, focusing on developing a deep understanding of the problem being addressed by the groups affected and allowing said groups to primarily impact solutions. Comprehending environmental challenges necessitates adopting a system thinking approach, embracing uncertainty, and re-establishing connections with the origins. To conduct impartial research, we must shed our preconceived notions and recognise that those closest to the land, the species, and the issue can also be the experts (D4C 2021).

The Understand Phase was revisited multiple times throughout the progression of this project, as new concepts required background research. The most important research for the final Grass to Growth product was focused on foot biomechanics and seeds that could be worked with:



Tekscan. (2016). Pressure Offloading & Foot Function. Retrieved from https://www.tekscan.com/products-solutions/pressure-offloading-foot-function

Heat map of common pressure points for the average foot - justifies the placement of football studs and the areas that I will be focusing on with my project. The red areas represent the areas utilised most with the highest pressure/use and represent where most studs are placed on a pair of football boots.

"When you run, your foot naturally rotates inward to help absorb impact as you hit the ground." Called pronation. On average, the foot rotates 15 degrees during push-off while running, with the toes twisting inwards and the heel twisting outwards. Furthermore, players twist and pivot frequently in football (Smiths Sports, 2021).

From personal playing experience, a game of football involves pivoting, quick changes of direction, rotation, planting of the feet, and running. All of these mechanics utilise the stud plate of a football boot, the studs themselves to offer traction, manoeuvrability, bite for acceleration and deceleration, and stability, along with an average of 15° of foot and ankle rotation (Novacheck, 1998).

This provides the opportunity to work with pressure and rotation.

In terms of seed research, the following were chosen to be worked with throughout my project (Natural History Museum, 2022), (Specialty Seeds, 2022), (BBC Gardeners Magazine, 2019), (Spruce, 2022):

Manuka – Manuka seeds are small and would easily fit within studs. When grown, it creates shrub-like trees that flower beautifully. These trees offer shrubbery and shade to benefit lizards like the Auckland Green Gecko while also providing nectar, habitat space, and pollen for Auckland's native bees to feed from.

Clovers - White clovers are loved by bees and extremely easy to grow, commonly grown on lawns that are left untreated. They need minimal maintenance and provide dense cover that could also benefit Auckland's lizards. Furthermore, annual clovers self-pollinate and reseed, allowing further growth after initial seeding. Both are drought-resistant, with the natural rain cycle being more than enough for them to grow. Furthermore, the seeds are small and would easily fit within studs.

Wildflowers - Wildflowers also grow on their own, are drought resistant, provide good diversity, and don't need any form of fertiliser, manure or compost. They again attract bees and also some moths and flies, providing food for both lizards and bees, as well as being small enough to function with the limited space of a football stud.

Alongside research, the Understand Phase involved a pre-project overview:

PROJECT GOALS

GRAND CHALLENGE

Which are the main wicked problem/s that frame your conservation problem?

Sustainability in football, lack of urban habitats for auckland endangered animals

SPECIFIC PROBLEM

Which conservation problem are you addressing?

Both of the above

In relation to the conservation problem, what do you want to develop/improve? For whom?

I want to improve awareness and action around environmental sustainability in football, while also utilising underused green urban spaces to create unique habitats for wildlife (starting in Auckland).

SUSTAINABLE DEVELOPMENT GOALS

Which SDGs will your project address?

Good health and wellbeing

Life on land

Sustainable cities and communities

CONTEXT

CULTURAL OBLIGATIONS

Which are local cultural values that this project should observe?

Tangata tiriti - being a good treaty partner covers most of the local cultural values I can think of.

RELATION TO PLACE

What are the particular relations between this project and it's physical location?

Key relationship between utilizing gren urban spaces in it's physical location, as well as a key relationship between local wildlife, plant life, and communities / clubs.

VOICES

What are people saying about this problem?

Not a lot is being said, the problem has gone mostly under-the-radar, and focus is being placed on other issues around Auckland.

REQUIREMENTS

Are there particular requirementsconstraints for this project?

Time constraints are probably the biggest constraint for this project, alongside the scope that I am hoping to achieve within this time.

MAIN STAKEHOLDERS

Who is most affected by this problem / your project? Who should have a say in it? Who could be your partners?

HUMAN	NON-HUMAN	INSTITUTIONS	OTHERS
Football players	Auckland wildlife (specific focus on endangered wildlife like the Auckland Green Gecko or copper skink)	Football clubs	Underutilized green urban space
Sporty Environmentalists	Native Plant-life	Environment and Conservation Organisations of Aotearoa	Football pitches
Zoologists	Soil	Wildlife Rehabilitators Network of New Zealand	Seeds

DESIGN CHALLENGES

Write your main Design Challenges in the form: HOW COULD WE stakeholders/verb/goal?

"How might we develop urban spaces with the help of sports to mutually benefit multiple natural species?"

IMPACT

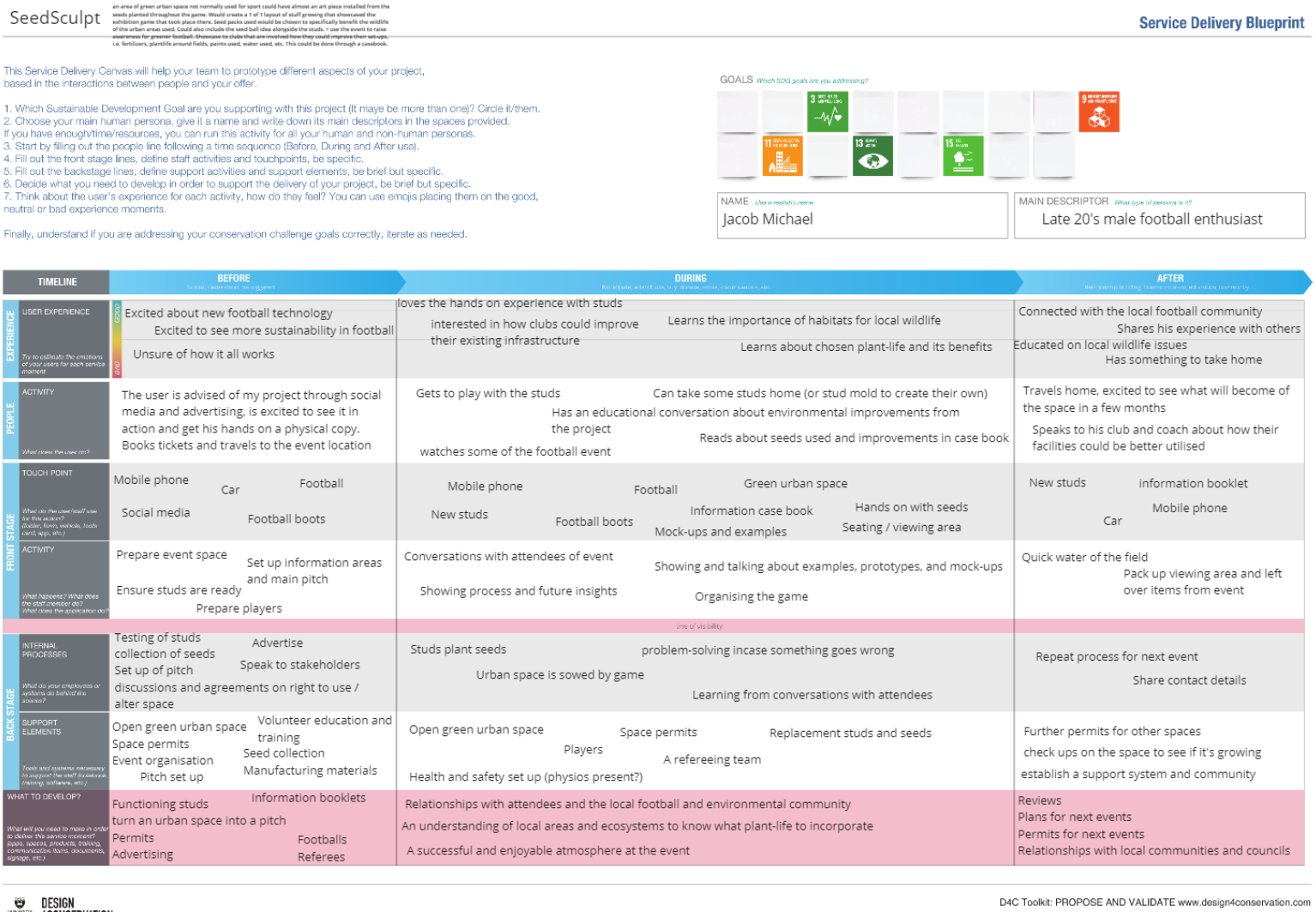
What will happen if your project works? How will you define "success"? Describe different impact indicators and speculate on how these could be measured.

	SHORT TERM	MEDIUM TERM	LONG TERM
Quantitative indicators	1 Increased number of seeds planted throughout green spaces in Auckland	2 From these seeds, a larger portion of wildlife habitats are established throughout Auckland, exhibition matches are happening more frequently and Aucklands green urban spaces are being utilized for something.	3 An increase in wildlife habitats has restored numbers of endangered species within urban Auckland, and the rest of the country is following suit.
Qualitative indicators	1 Sustainability in football is more recognized and some clubs are starting to change their view on how to establish the fields moving forwards	2 Multiple Auckland clubs have deployed a new sustainable approach to their pitch development, greater care is placed on the plantlife around the pitches as well as with what materials are used for the fields.	3 NZ Football creates sustainability criteria for all pitches across New Zealand, while also organizing nationwide exhibitions that are specilized towards local wildlife and plant-life to the areas where the games are played.

Baron, G. (2021) Conservation Challenge Canvas. Design for Conservation Toolkit. https://www.design4conservation.com/conservation-challenge

6.3. **Propose and Validate Phase:** The Propose and Validate phase draws inspiration from natural systems and represents a time-tested method for addressing challenges. By blending ancient wisdom with cutting-edge technologies, there's the potential to generate remarkably inventive and durable concepts. In the Propose and Validate phase, rapid and rudimentary prototyping is crucial. It can be achieved by embracing early testing, learning from initial setbacks, iterative development, and enhancing the clarity of initial concepts. (D4C 2021)

The Propose and Validate Phase was the most developed phase of this project. It encapsulated all of the product design, prototyping, testing, and iterating for the final deliverables. Starting with an idea selection checklist, a final vision for deliverables was created. This resulted in the creation of my final stud concept. This was carried into a service delivery blueprint, and then prototyping began. By using these D4C templates, I was able to quickly identify key elements of my ideas and come to conclusions on what I wanted to make.



Idea Selection Checklist

This tool helps teams select their best ideas. Once you have finished brainstorming, group your ideas into themes. Select the ideas that seem more desirable, feasible and viable.

1. Select your best 3 ideas and give them a clear, interesting, short name.
2. Discuss how each of the following attributes may apply to each one of them using the attached checklist.
3. Add 1 point per checked attribute.
4. Use the idea with the most points to move forward.

1 NAME: **SeedSculpt**

seed planting studs. By playing a match players would plant different seeds over green spaces. could be used for replanting over preseason or on areas not normally used for football to create individualized exhibitions?

ADEQUATE / SUSTAINABLE
- [x] functional
- [x] purposeful (noble and altruistic)
- [x] scalable/ replicable
- [x] context-related (local)
- [ ] sustainable (in all it's life cycle)

CREATIVE / INNOVATIVE
- [x] simple/clear
- [x] original/innovative
- [x] resilient
- [x] smart / challenging
- [x] resonant (beautiful/fun/ unexpected/familiar)

- [x] magical (bonus point!)

This idea allows me to incorporate my biggest passions in my life (football and design) to create something that I think could begin a powerful movement and create both meaningful and unprecedented results.

TOTAL 10

2 NAME: **PlantSoles**

Insoles that when broken can be planted in the garden and grow something or give extra nutrition to soil? - Nike created insoles from castor beans (precedent)

ADEQUATE / SUSTAINABLE
- [ ] functional
- [x] purposeful (noble and altruistic)
- [x] scalable/ replicable
- [ ] context-related (local)
- [x] sustainable (in all it's life cycle)

CREATIVE / INNOVATIVE
- [x] simple/clear
- [x] original/innovative
- [ ] resilient
- [x] smart / challenging
- [x] resonant (beautiful/fun/ unexpected/familiar)

- [ ] magical (bonus point!)

Why is it magical?

TOTAL 7

3 NAME: **Field4Future**

Exhibition field designed with tree goals, natural lines created from native flowers etc.

ADEQUATE / SUSTAINABLE
- [x] functional
- [x] purposeful (noble and altruistic)
- [ ] scalable/ replicable
- [x] context-related (local)
- [x] sustainable (in all it's life cycle)

CREATIVE / INNOVATIVE
- [x] simple/clear
- [x] original/innovative
- [x] resilient
- [x] smart / challenging
- [x] resonant (beautiful/fun/ unexpected/familiar)

- [x] magical (bonus point!)

This idea also incorporates my passions. But instead presents less of a physical product and more of an experience.

TOTAL 10

THE UNIVERSITY OF AUCKLAND NEW ZEALAND DESIGN 4CONSERVATION

D4C Toolkit: PROPOSE & VALIDATE www.design4conservation.com

Created by Gabriela Baron (2021).

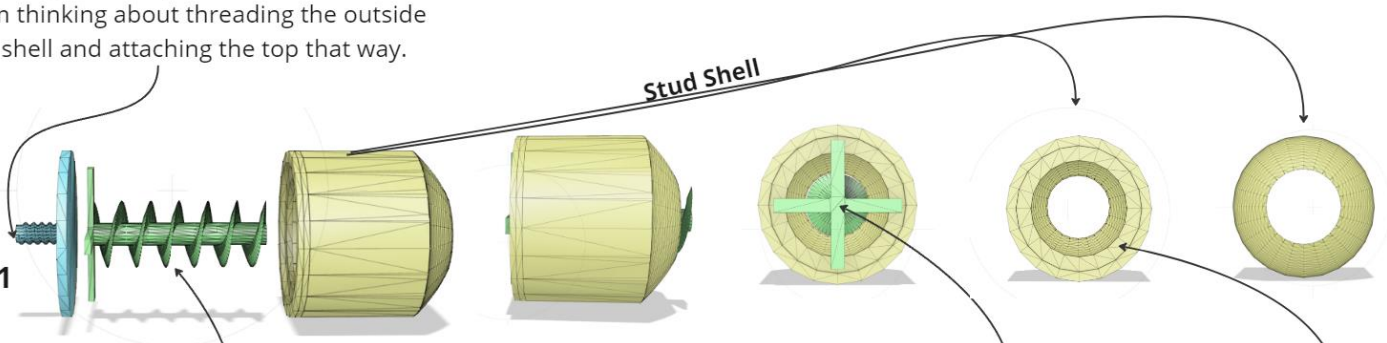
Baron, G. (2021) Idea Selection Checklist. Design for Conservation Toolkit. https://www.design4conservation.com/idea-selection-checklist

The Propose and Validate phase oversaw the majority of iterations within this project. There were nine mechanical stud prototypes (six 3D models) and three iterated seed mixes for the organic studs.

Initial mechanical prototypes looked into the functionality of ballpoint pens and cologne bottles, however, the requirement for intricate spring mechanics reduced the available space within the stud to house seeds. With this, a funnel-like system like a pepper mill (minus the grinding aspect) was established. Using gravity and an angled interior, the seeds could be directed out of the stud without excessive need for springs and could be released when the stud is twisted. The iterations of the mechanical model are shown below through 3D models.

3D Model 1

The top of the stud and the thread are still under development, I haven't yet figured out a way in which the top of the stop will attach to the rest of the shell while being removable to refill the studs and still allowing for the spiral to rotate. At the moment I'm thinking about threading the outside of the stud shell and attaching the top that way.

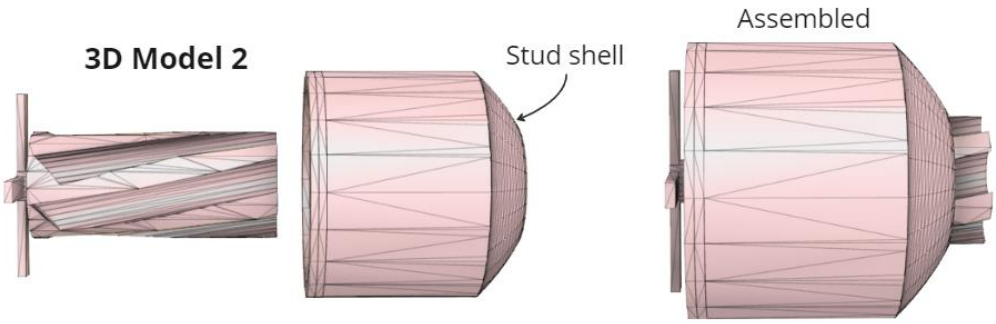


Spiral Seed carrier - Inspired by the mechanics of a pepper grinder, this spiral piece is the core of the stud, and positions itself slightly protruding from the end of the stud. This ensures that the spiral can be in contact with the ground, and thus use the ground to twist. By twisting, seeds should position themselves within the shelves of the spiral, and as the spiral twists in the ground, these seeds will move down the spiral and eventually out of the stud and into the ground.

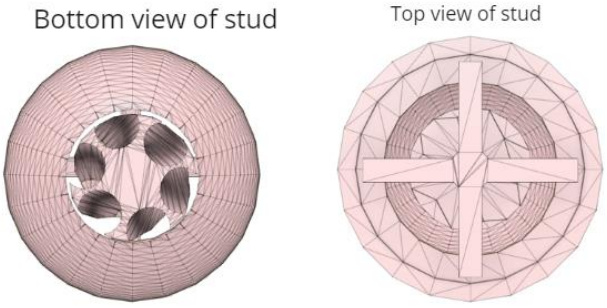
Initially built with a circular base, I realized that the seeds wouldn't be able to be replaced after the core of the stud empties, so by changing to a cross-shaped base, it still keeps the rotational ability to spin while supported, but also offers gaps for the stud to be refilled.

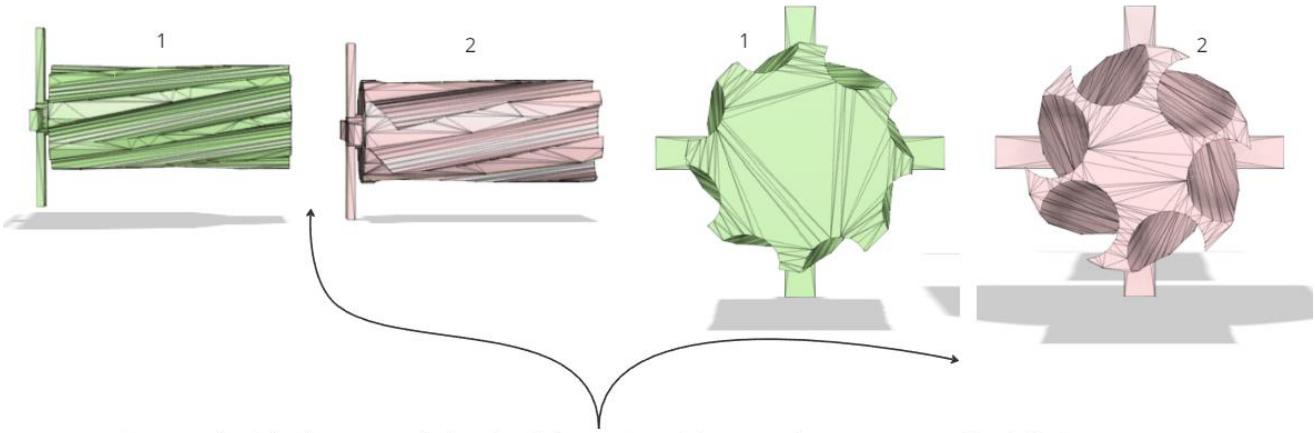
Within the stud shell, there is a small lip around the edge that sits 2.5mm in from either side of the 15mm shell diameter. this lip supports the spiral and ensures that it can rotate within the stud system without falling out or moving too much.

After feedback following model 1 highlighting the potential issues with how thin the spiral piece was, model 2 was created.



After dismantling a salt grinder, I changed the angle and depth of the spirals that are present my 3D model to something more similar to this precedent, which features much more aggressively angled groves that might produce more efficient results and provide a stronger cc piece - following comments from feedback.

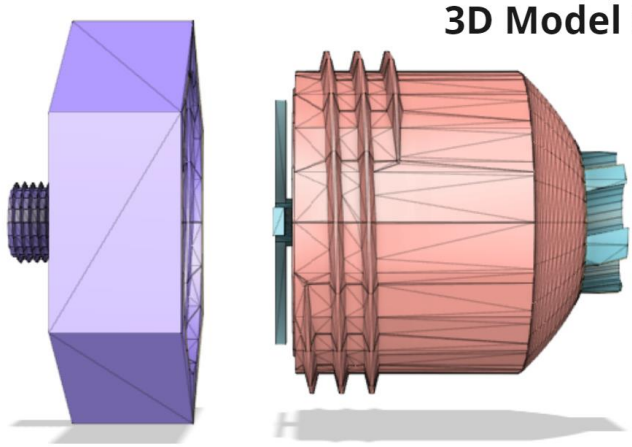




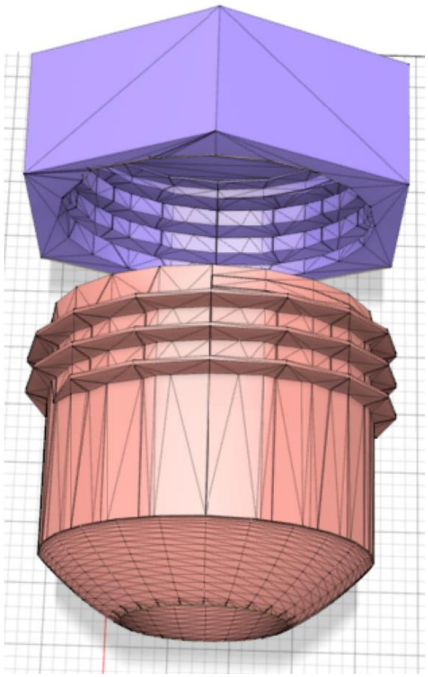
I experimented with shapes and depth of the twists ridges and came to two final designs. 1 was the first final design, it has 8 ridges, but they are much shallower. This provides more surface for the seeds to be guided with, however provides a much smaller clearance at the bottom of the stud for the seeds to go through. Design 2 features 6 deeper ridges, providing a much greater clearance at the bottom of the stud for the seeds to pass through. At the moment, both have their ridges at a 22.5 degree angle, this will potentially be increased after physical testing.

Moving into model 3, a threaded system was created to ensure that the stud system could be closed and tested.

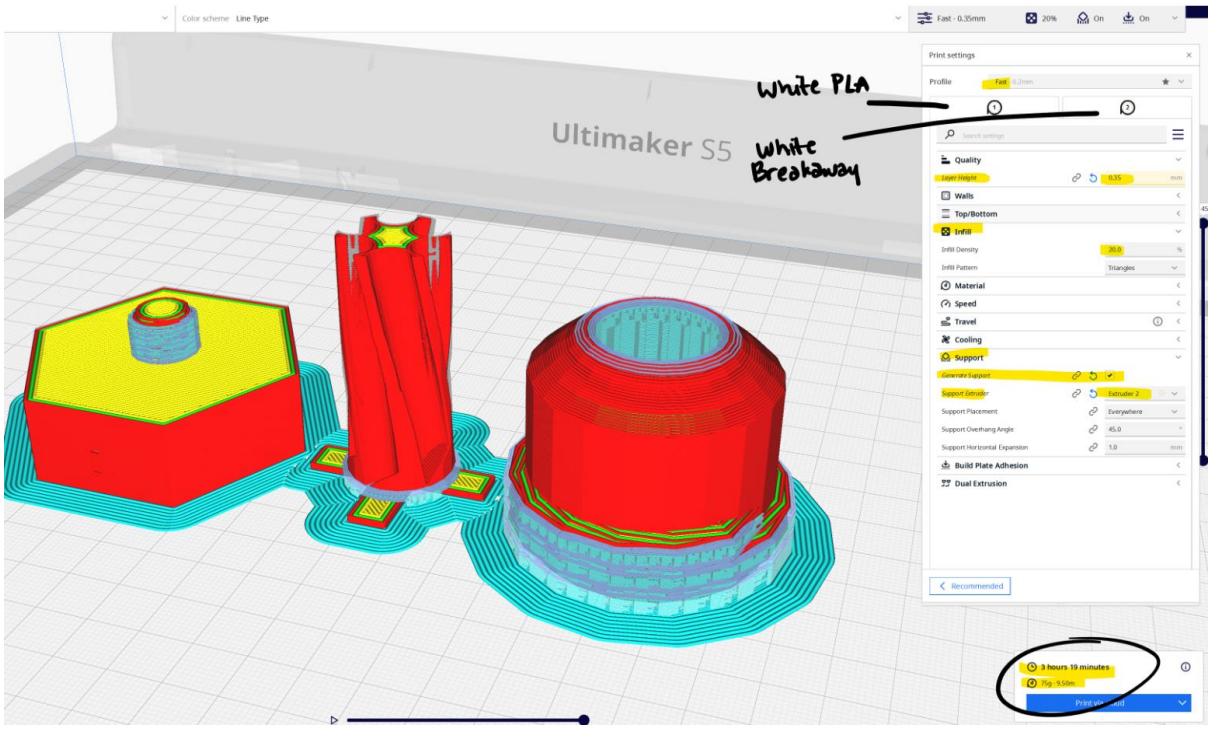
3D Model 3

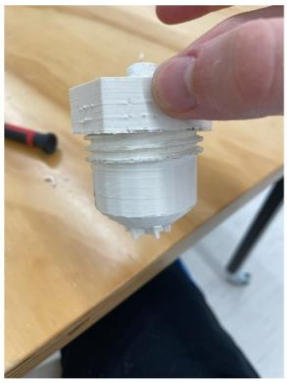


Hexagonal shape used due to the nature of most stud keys



Materials used and Ultimaker set-up

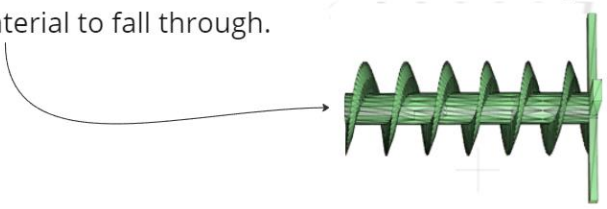


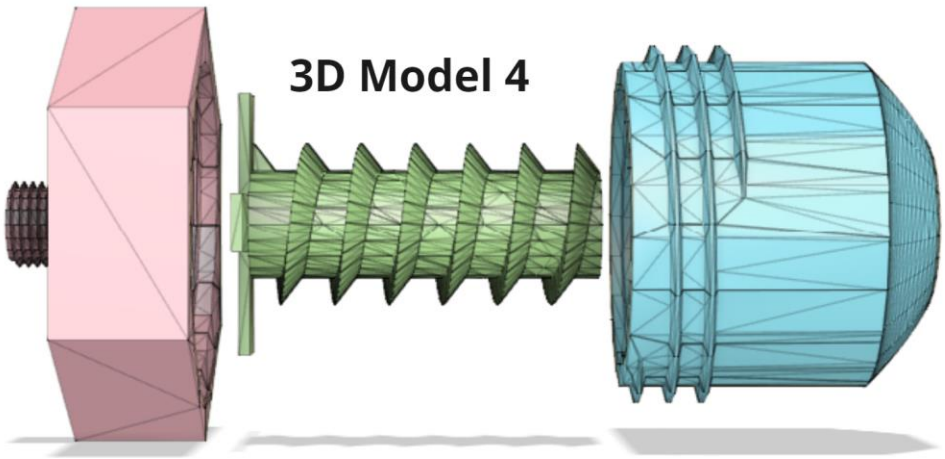


the mechanical twist-stud concept was scaled up three times and 3D printed in the FabLab. I scaled the mechanical model up because it allowed me to better see any flaws in my design, as well as reduced the risk of structural instability from 3D printing something so small. The 3D model was created using white PLA and breakaway through a .8 nozel with a triangular print pattern. These settings were chosen due to the increased printing speed and availability of material. The .8 nozel allows more material to be applied, thus decreasing the printing time, while also increasing the strength of the print. The triangular print pattern was chosen for the same reasons. These settings were then applied in a program called Cura and were transferred to the UltiMaker printers in the FabLab through a .3mf file. Cura was a fantastic tool for this, it provides a view of what your print will look like within the printer, how each layer will be printed, what materials will be used, etc.

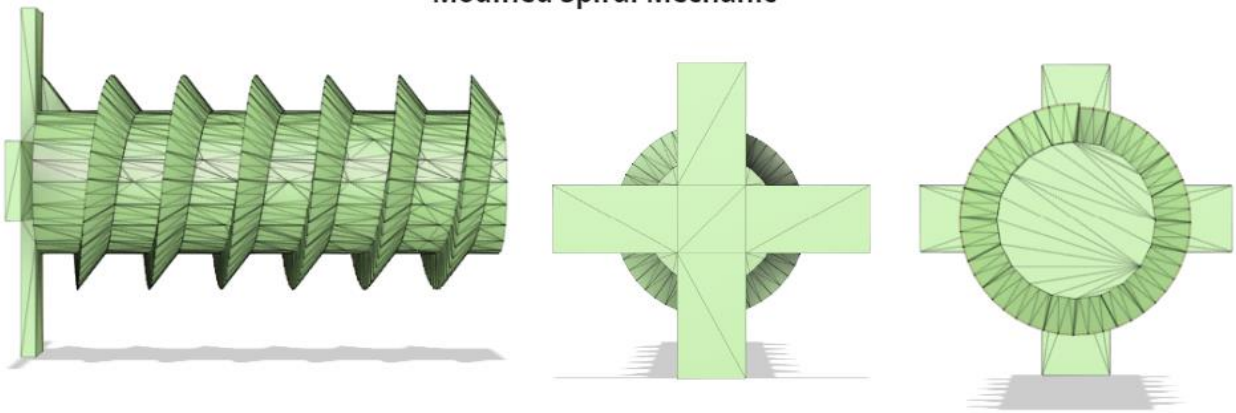
Using Rice grains for proof of concept

After testing, my 3D model definitely needs further iteration. Although the testing proved that my idea works, the gaps at the bottom of the stud are too big, and the angles of the groves aren't dramatic enough to restrict the flow of material through the stud. The twisting mechanic worked to carry material that was embedded into its groves, but the majority of material fell straight through the stud due to the gaps between the twist mechanic and the stud. Creating more dramatic angles for my twist mechanic, similar to the 3D model of my first prototype, could reduce the space for material to fall through.

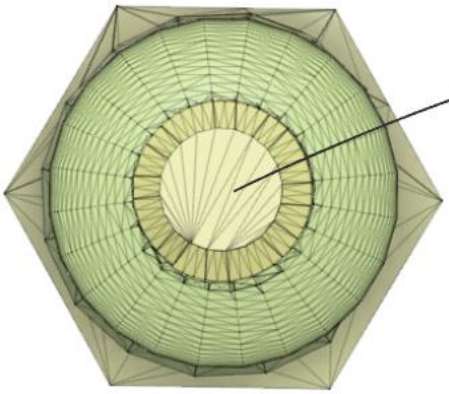




Modified Spiral Mechanic

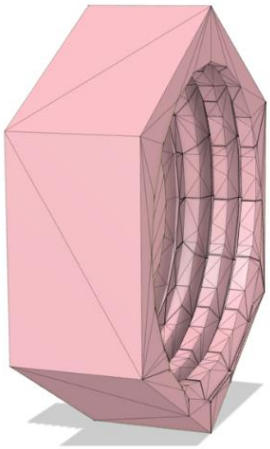


The big change from 3D model 3 to model 4 comes from the new spiral twist piece. After testing the 3D printed prototype of model 3, I found that the twist piece I had designed wasn't fitted enough for the shell, and allowed the seeds within the shell to fall out too easily. Along with this, it didn't print especially accurately due to the complex shape of the piece, resulting in a few holes on the edges. In order to fix this, I looked back at my earlier models, and how these addressed the issues stated earlier. With this, I found that by going back to a spiral pattern the opening at the bottom of the model is closed off a lot more efficiently, allowing the seeds to better stay in the shell. In order to counter the issues I found with a spiral mechanic in model 1, I thickened the central support beam as well as the ridges for the spiral itself to ensure that the model is strong enough for printing and testing.



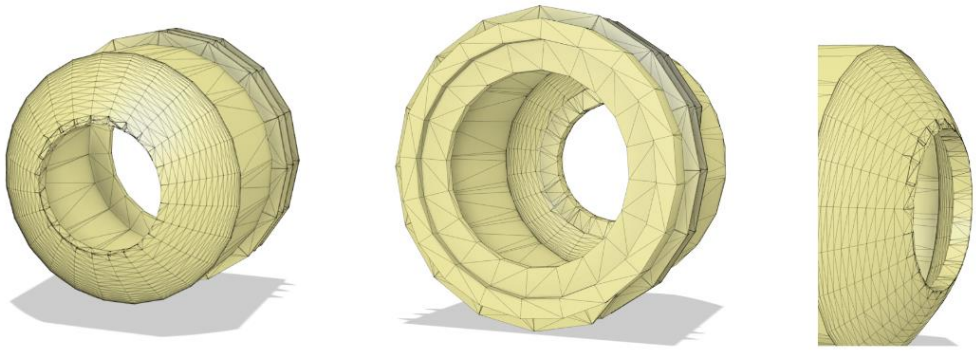
Spiral sits flush and seals off the bottom of the stud to fix the leaking seed issue of the previous model.

Edited Screw-Top



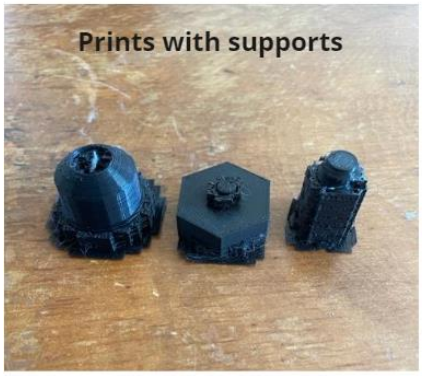
After 3D printing the previous 3D model, I found that the thread I had designed was too tight for the screw mechanics to function properly. In order to improve this, I widened the the gaps within the screw-top to accommodate the thread better, as well as expanding the space at the entrance of the screw-top to allow the thread to fit better and screw in easier.

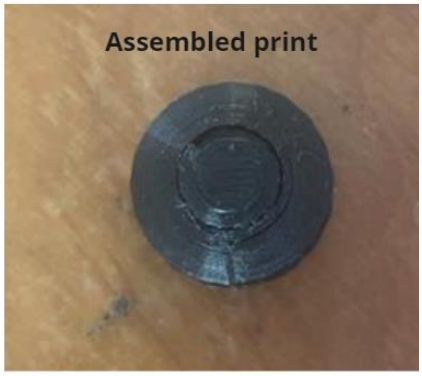
Edited Shell

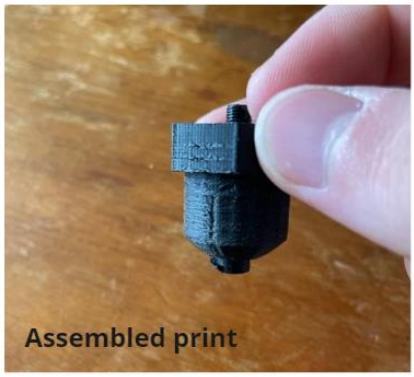


The new outer shell design for model 4 is all about little touch ups. After testing model 3, I found that the tip of the stud was quite weak, and that the threads didn't have enough tolerance to slide easily through the screw-top. With this in mind, I added reinforcement to the end point of the stud to thicken and strengthen it, and narrowed up the thread thickness as well as made them slightly shorter to hopefully allow a more smooth screw-in transition with the screw-top.

3D print of Model 4

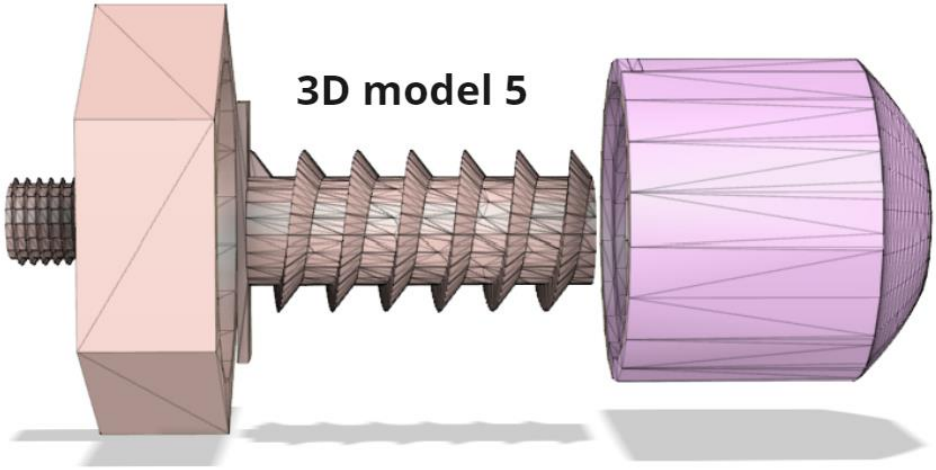




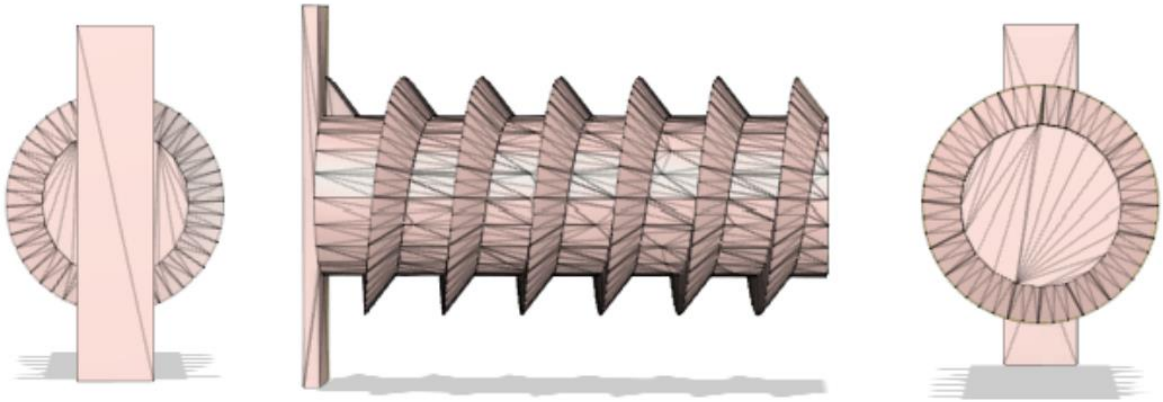


3D model 4 was printed at a 1.5x scale rather than the 3x scale used in the previous print. This was done for three reasons, firstly to test if the parts would be strong enough at a much smaller size, secondly to decrease the printing time, and thirdly to reduce the materials used. The model assembles well, although the fit is still quite tight, so the threaded part of the model will still need further refinement, the spiral piece fits much closer to the core, reducing the gap issues around the tip of the previous model.

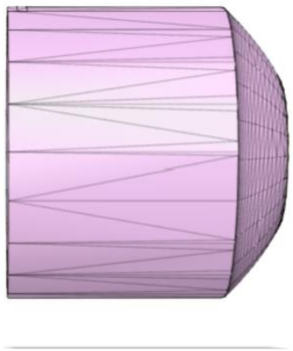
3D model 4 was tested using a 25 seed mix to ensure that a plethora of seed sizes and shapes work with my model. Some of these seeds were a tight fit however, so may have to be excluded when the model is scaled to its normal size, rather than the 1.5x scale used for this 3D print. The videos above show the testing process of model 4, starting with a shake test to see if the seeds stay in the stud (which they do). This is then followed by two twist test from different angles to show the seeds slowly working their way out of the stud shell through the use of the spiral mechanic. Overall I'm very happy with how this came out, and the proof of concept is all there. Model 4 works as intended. Minor tweaks are needed still with the thread but other than that I think that this prototype is a functioning and feasible model.



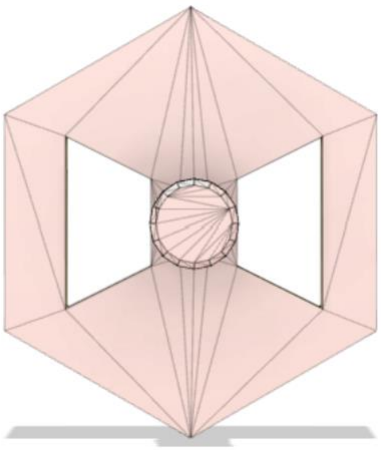
3D model 5 has been reworked due to the struggles I've been having with threading my design. Initially, threading was the only way I thought the top part of the stud shell could work, as I needed to be able to remove the top part of the stud to both assemble it as well as refill the shell with seeds. However after struggling with creating functional 3D modelled threads, I realised that by creating a tight fitting system and creating open areas on top of the shell both of these needs can be addressed without the need for threads.

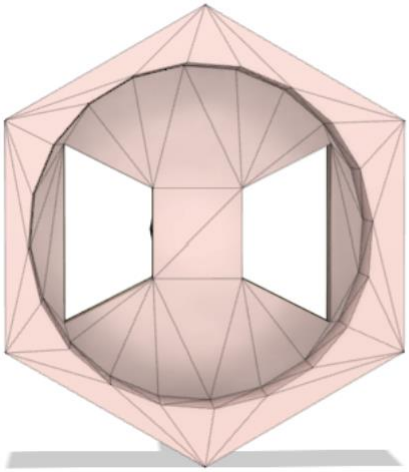


The spiral mechanic remains mostly unchanged as well, as the spiral piece functioned exactly as I had hoped for model 4. With this however, I thought it would be interesting to see if the spiral would function just as well with only 2 directional support rather than 4, thus removing the cross support. This was removed for 2 reasons. Firstly, to increase the area available for refilling the stud, increasing the efficiency of the refilling process, and secondly to save on materials.



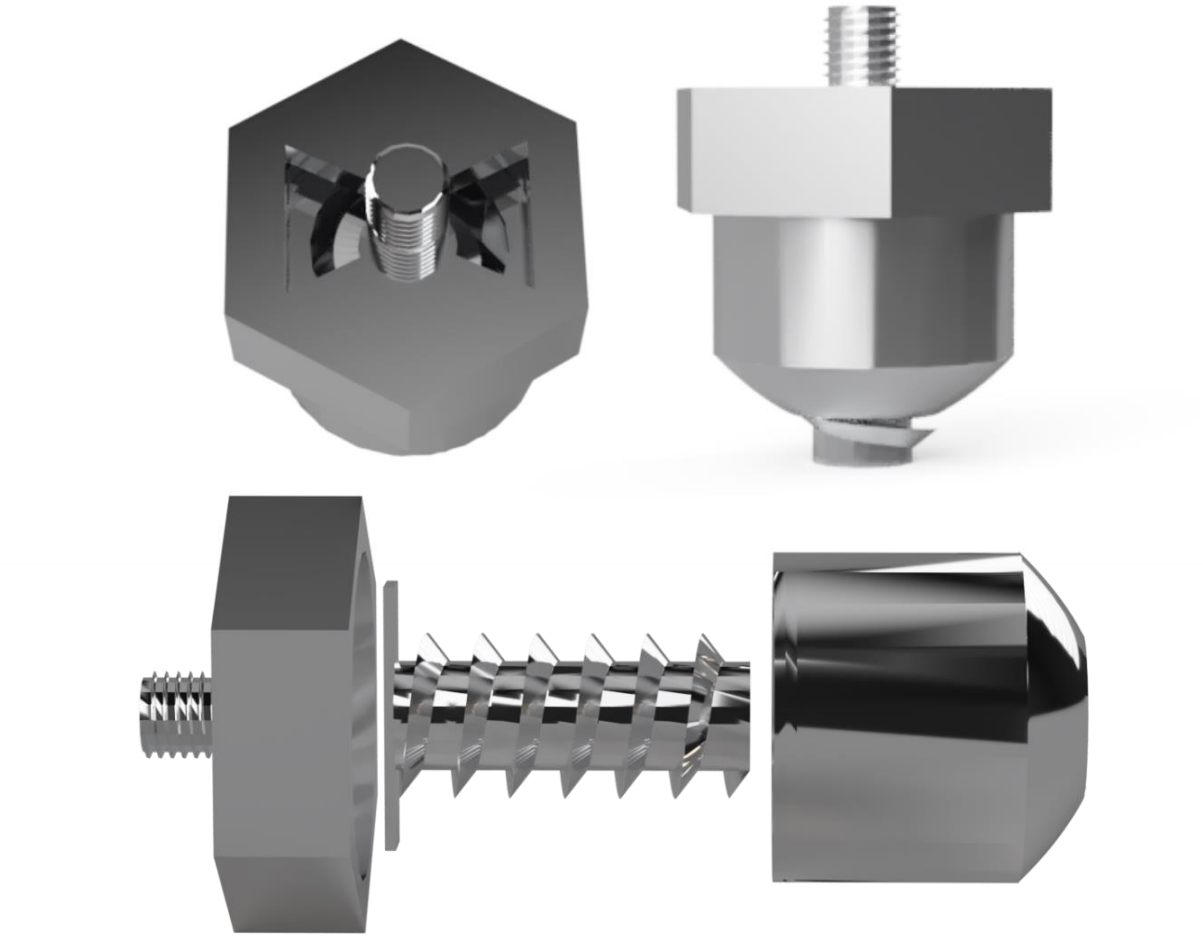
The shell for model 5 remains mostly unchanged from model 4, with the same size, shape, and internal reinforcements and features. The only difference coming with the removal of the threaded outer shell, instead using a tight push fit and potentially glue in order to put all of the models pieces together.





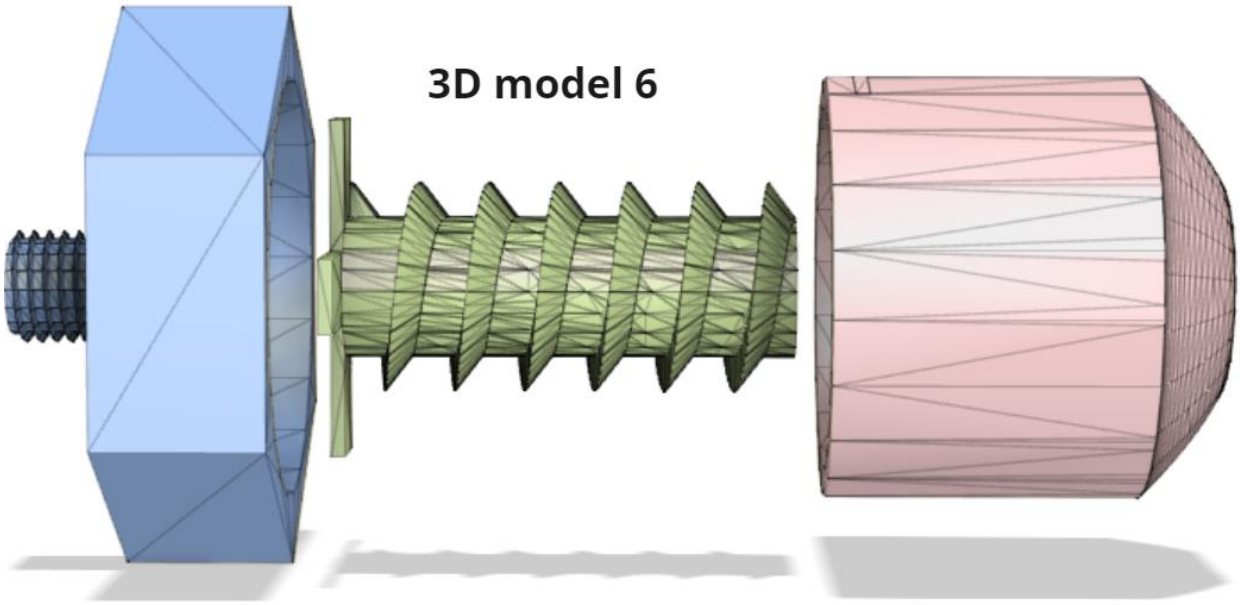
The major changes to model 5 come with the newly designed stud cap. Moving away from a screw top and instead focusing on a tightly fitting cap to close off the model. With this, there have also been cut outs incorporated to ensure that the stud can be refilled without the need of removing the lower shell, thus streamlining the refilling process further and removing the need for threads, reducing the risk of damage or accidental loss of the lower portion of the stud. Once the stud is assembled, glue can be used if needed to ensure that the cap and shell aren't separated, although from previous tests I feel that the tightness of the print should be enough.

Aluminum Renders

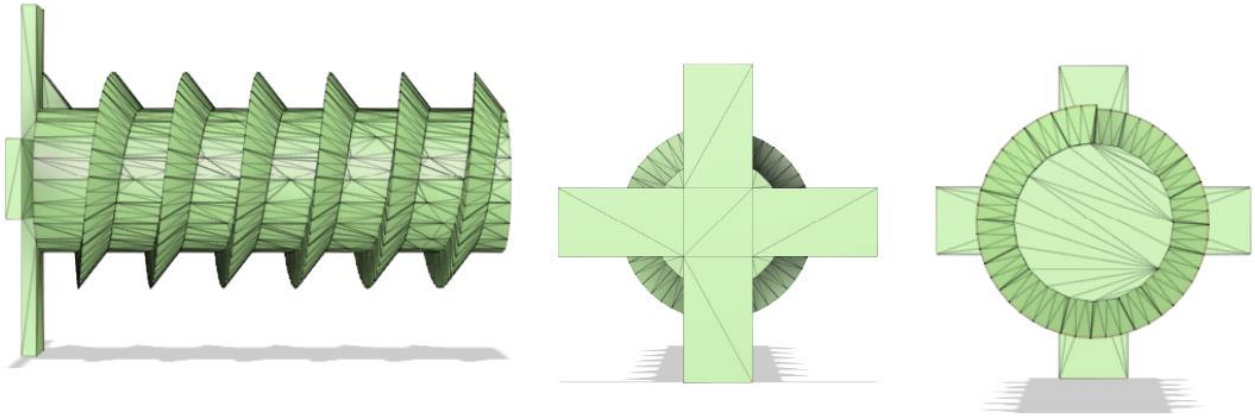


After testing, model 5 worked very very well. The top of the stud was able to be screwed on the shell, and the entire model could be assembled and refilled without needing to be taken apart! The spiral mechanic worked as it did with the previous model, and being printed at scale worked and had enough strength to be tested with seeds. The stud measures up the same size as a 15mm stud as shown in the above photos. The only issues arouse from the inaccuracies of 3D printing, as the indent inside the stud shell was too detailed to be printed accurately, resulting in the spiral model sitting slightly higher in the shell than it should've, while also wobbling around slightly when testing due to it being loose. This resulted in a final few iterations for model 6.

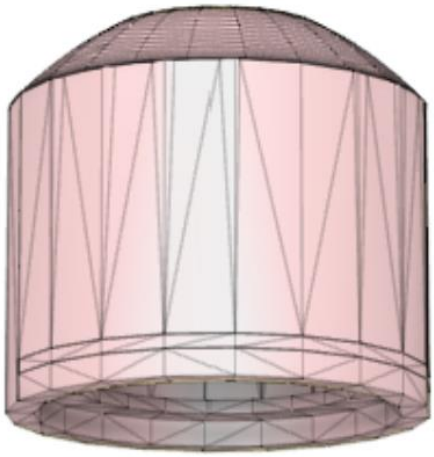
After testing model 5, the lip of the stud shell for the spiral piece isn't deep enough for the intolerance / inaccuracy of a 3D printer, so for the next model I exaggerated the depth of this inner lip slightly to ensure that the spiral model can sit within the shell and the entire model can be assembled tightly. Along with this, I reverted the support piece of the spiral mechanic back to a cross, as when printed to scale there is a lot of stress on the rectangle piece and I believe it would be best to revert back to a stronger, more supportive shape.

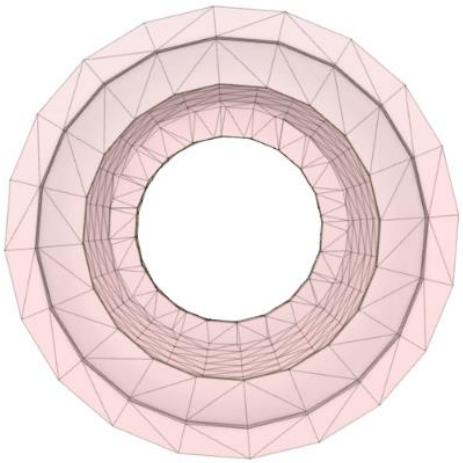


Not a lot changed with model 6, the spiral mechanic is the same as model 4, and the cap / top is the same as model 5 except the thread piece is slightly longer and wider to better fit into a boot. The only other change came with the shell itself.

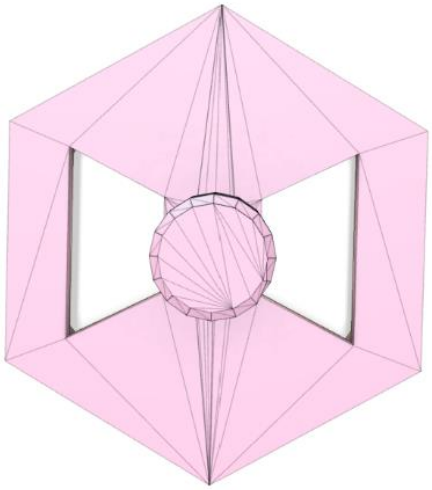


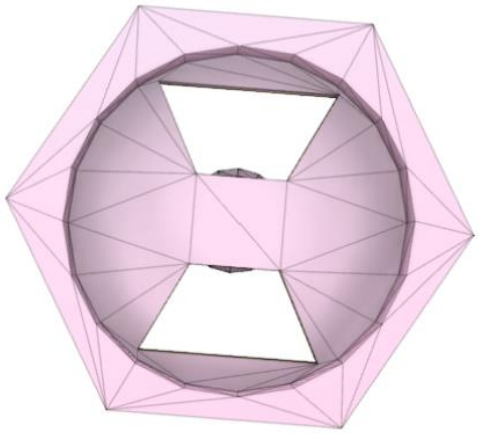
The spiral mechanic reverted back to the same as model 4. This was done as when printed to scale there is a lot of stress on the rectangle piece and I believe it would be best to revert back to a stronger, more supportive shape.

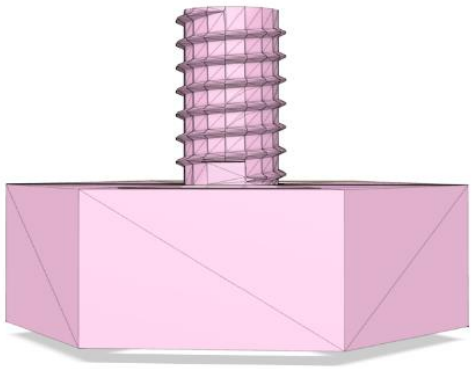




In terms of what was done with the shell, the shape was kept the same as model 5, but the inner lip support was lowered in order to combat the issues presented with the shell of model 5. This will hopefully allow the spiral mechanic to sit flusher with the shell and ensure that the entire system can close effectively.







The top piece / the cap of the stud remains mostly unchanged due to its success with model 5, however a small tweak has been done to the thread on top of the cap to try and make for a tighter and more effective fit when screwed into a football boot.

After printing and testing 3D model 6, the slightly deeper shelf in the shell allows the spiral piece to fit flusher and spin with less resistance. Along with this, the resized thread on top of the stud fits perfectly with a pair of football boots, and holds enough tension to be screwed in and out of the boot. Unfortunately, the spiral piece for Model 6 broke due to a printing error, so the spiral from model 5 was used for testing. A new spiral piece will be printed soon to complete model 6. Luckily, the spiral piece is relatively unchanged for model 6, and the main innovation for this model was the thread, which worked as intended.

The organic stud models were developed alongside the mechanical studs. Using the chosen seeds discussed earlier, and after discussion with Oliver and the FabLab technicians, the potential to go away from creating a mechanical model was realised. Using similar concepts to the seed bombs, stud shells could be created to break down over the game, removing the stress on the mechanics of the stud while also reducing potential waste.

To begin this process, a mold was created:

Ingredients and mixing

Oven settings

Kneading

Setting the shape

Baking the mold

finished mold

Mixing 2 parts flour with 1 part salt and water (for my first attempt I mixed 15mg of flour with 7.5mg of salt and 7.5ml of water) creates a dough substance that once kneaded for a few minutes becomes fairly solid. I then imprinted the stud shell and core into the dough, before baking it for 30 minutes to solidify the mold. Once baked, the mold was solid and will hopefully be functional with my seed mix. Avoiding silicone is important for my assignment, "as **Silicone isn't the most environmentally friendly material on the market**. Producing silicone uses hydrocarbons derived from petroleum, which isn't sustainable. It's difficult to recycle, and most facilities won't accept it." Whereas creating a mold from flour water and salt is something that could be eaten by birds or wildlife when the molds durability goes.

Once the mold was finished, I began to experiment with an organic stud mix.

Using 100% organic green waste compost, Jovi air-dry white clay, Manuka Tea Tree Mcgregor seeds, Yates Bee Pasture Pollen & Nectar seed mix, my salt dough mold, aluminum cores, and a multitool.




Using an old egg carton as a mixing bowl, I combined 5 parts compost to 2 parts clay. For my first batch, I combined 1 cup of compost (250g) with .2 cup of clay (50g). Before I mixed in the clay, I removed any solid bits from the compost (twigs, bark, sticks, pebbles etc.), I then sprinkled a bunch of Bee Pasture seeds into the compost. Once my compost mix was completed, I sliced up the 100g of clay into small sections and mixed it through the compost seed mix in my hands until it formed a solid ball.



I then used a flat small tool from the multitool to compact parts of the mixture into the mold. My mold had a solid hold on the aluminum cores at the bottom, allowing me to stuff in the mixture around the core and ensure that the mix is nice and compact in order for the clay to do its thing and hold solid. Once I was satisfied that no more mixture could fit in the mold, I flattened down the top of the mold as much as possible and removed any excess mixture for later use.




Once I was confident that the mixture was packed in and solid, I used pliers to remove the aluminum core and seedshell from the mold. The results are shown above! I then removed the aluminum core with my fingers so that it could be reused for the next seedshell. I repeated this process until I created 8 shells, and then waited 48 hours for the clay to set before testing.

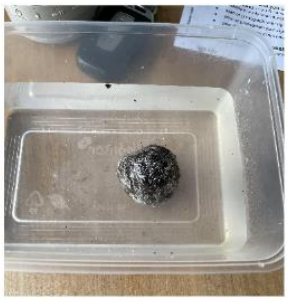
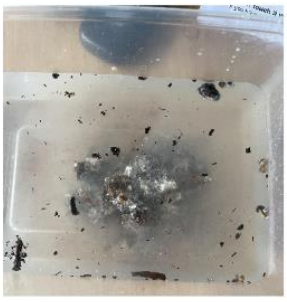






Implementing the first few models onto a pair of boots for display and testing was fairly straightforward. The mold did a good job in ensuring that the studs were solid enough to withstand twisting with a stud-key when being screwed into the boots, as well as leaving enough room at the top of the thread for the studs to be secured tightly (although some were shorter than others). For the initial testing and images, I replaced four screw in studs on the left boot (2 at the front and 2 at the back). Each stud was replaced with a 15mm SeedShell prototype. The first model I made crumbled pretty quickly, but I luckily made 2 extra shells that slid over the aluminum core and allowed for easy replacement (something that I want to implement further for when the studs are actually used).

Solubility test for Prototype Mix 1

Mix one was decently soluble, although it took some contact while wet in order to break up the mixture. This is good, as for the stud shells to be successful they need to be weakened by water, but not completely solvent in it. Therefore mix 1 successfully pasted the water solubility test.

Mix one was also fairly durable when not wet, although some of the first few crumbled as they weren't packed together in the molding process strong enough, the later shells were decently durable, could withstand enough force to be screwed tightly into the boots, as well as be dropped from over a meter and not break on impact with the ground.

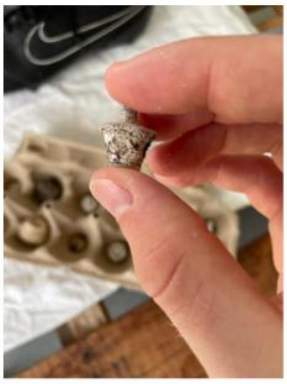
After testing, I moved on to mix two (2).




Using the same base materials as the previous mix, I increased the compost clay ratio from 5:1 to 3:1, hopefully increasing the durability of the mix when in contact with soil and moisture. I then followed the same method as mix one, by slicing up the clay into smaller pieces and mixing it in with the seeds and compost by hand. This process was repeated until I had a solid ball of materials that could be used with my stud mold.



I then followed the same process as before, using a flat small tool from the multitool to compact parts of the mixture into the mold. My mold had a solid hold on the aluminum cores at the bottom, allowing me to stuff in the mixture around the core and ensure that the mix is nice and compact in order for the clay to do its thing and hold solid. Once I was satisfied that no more mixture could fit in the mold, I flattened down the top of the mold as much as possible and removed any excess mixture for later use.


The finished prototypes look much the same as the first batch, however I'm hoping that by increasing the compost-clay ratio that they will last longer when tested. I will also allow for a longer drying period to see if that accommodates greater results. One thing I have noticed is on some of the prototypes the clay compost split is visible, and this could be a contributing factor to the low durability. If this is the case after testing, the next batch will have to use finer pieces of clay, meaning I'll probably end up cutting them into much smaller pieces in order to negate the obvious separation between the materials and create what is hopefully a stronger mixture.


Before beginning physical testing, I screwed my studs into the soleplate of my boot. For mix 2 I chose to skip the solubility water test as this concept was already proven with the testing for mix 1. This proved that the clay, compost, and seed mix was soluble in water, thus removing the need to test solubility with further mixes as despite ratios changing, the core materials are the same and their chemical makeup and ability to be soluble is also the same, however it may increase / decrease in time depending on the ratio of materials in the mix.

During Testing






Post Testing



4 Studs post testing

After testing mix 2, the results were extremely promising. I spent 15 minutes running on slightly damp grass with the boots on, doing directional cuts and other movements common with a game of football, and as seen above, the studs more or less degraded, but not until around the 15 minute mark. This is exactly what I wanted after mix 1s durability being too low. a 15-20 minute lifespan is perfect for allowing enough time for a game to flow, while also ensuring that the studs break down enough to plant a meaningful amount of mix throughout the game. A 15 - 20 minute life span allows roughly 5-6 breaks within a game to replace the studs, which for an exhibition / event game is perfectly reasonable.

With this, I think the mixture ratio for mix 2 is exactly what I wanted, and will be closely followed for the next mix (presentation mix).

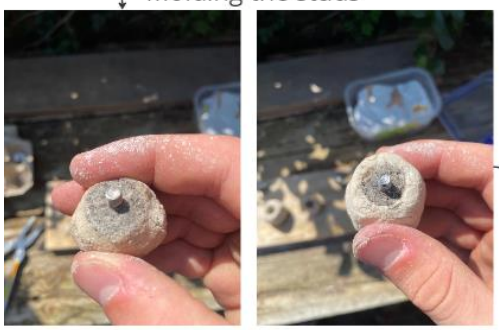
Reproducing mix 2 for a full stud set

Mixing the seed mix

Kneading it all together

Getting the molds ready

Molding the studs

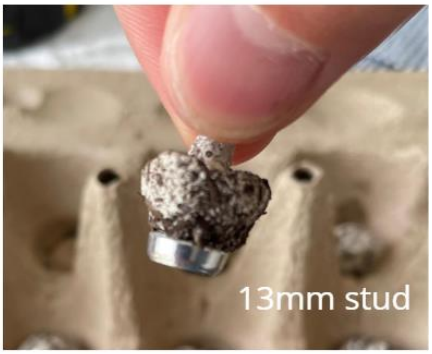


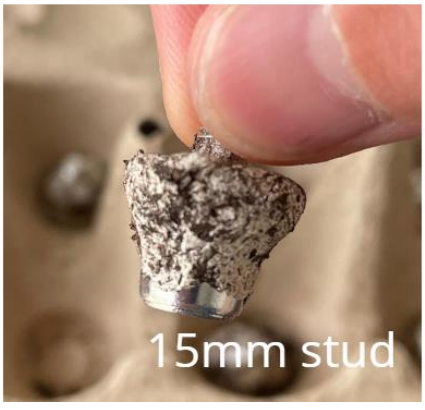
Finished 6 stud set

Finished stud set

Full 6 stud set up on boot - 2x 15mm heel, 4x 13mm forefoot.

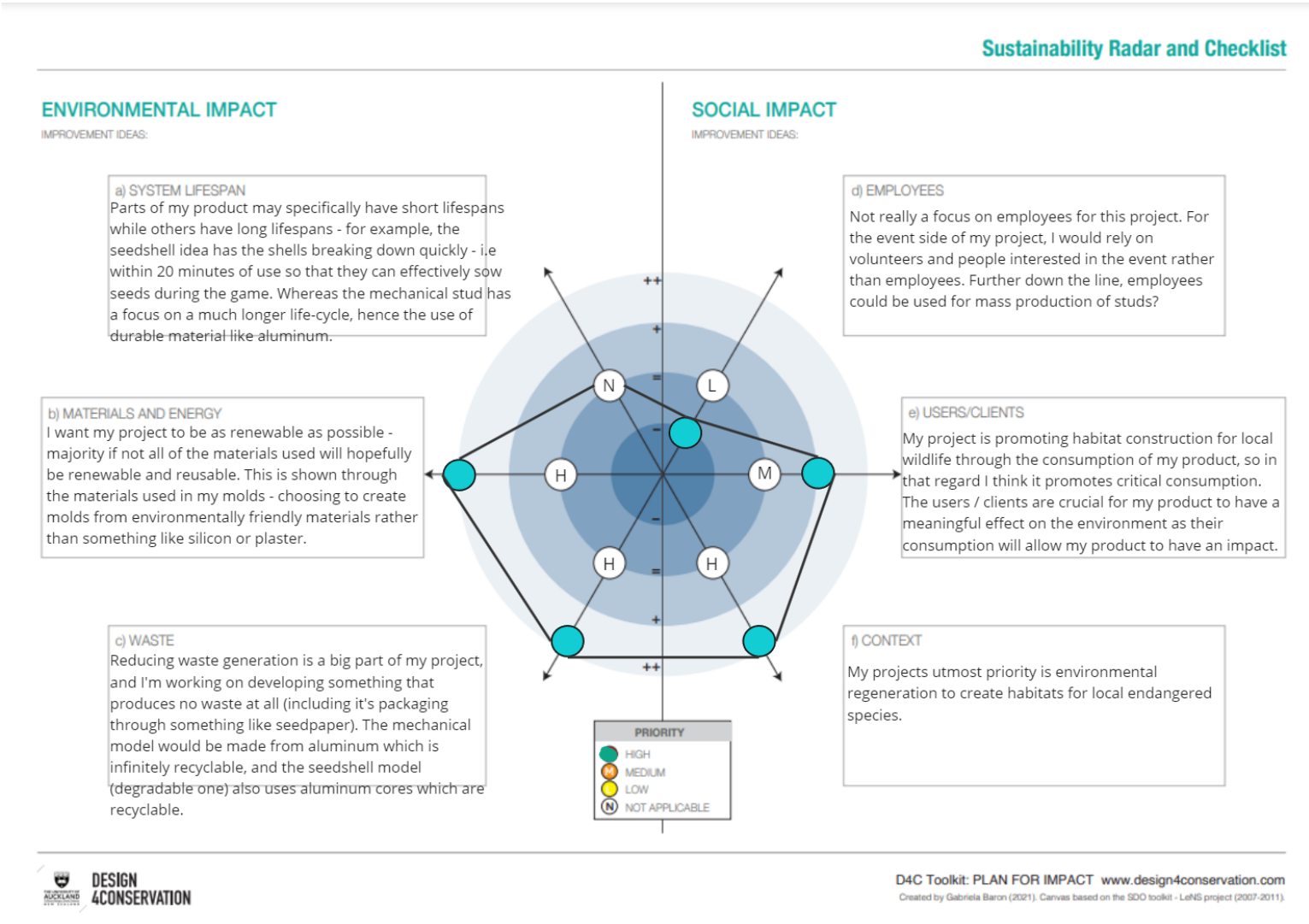
12 Studs for packaging - 4x 15mm, 8x 13mm.





6.4. **Plan for Impact:** Assessing impact holds paramount significance within environmental projects. The Plan for Impact phase offers a practical route, enabling the implementation of agile variations of impact assessment methods that demand fewer resources for execution. This is crucial for creating a cyclic sustainable model - ensuring that everything is ready and utilised efficiently to allow sustainable deployment in the next phase. (D4C 2021).

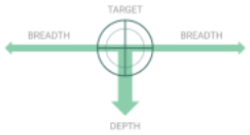
The Plan for Impact Phase focused on ensuring that as many consequences as possible are considered and prepared for. This was achieved through multiple D4C templates. This phase is where most work towards developing the casebook and video deliverable took place, alongside ethical considerations, permits, limitations, etc. The casebook was addressed to local football clubs and councils in New Zealand, and addressed sustainable solutions for playing surfaces, field chemicals, lighting, space utilisation, and provided examples of how this could be achieved using local pitches.



Baron, G. (2021) Sustainability Radar and Checklist. Design for Conservation Toolkit. https://www.design4conservation.com/sustainability-radar-and-checklist

Impact Planning

INTENDED IMPACTS



Goal/s of the project: Create new habitats and promote greener, more sustainable sport

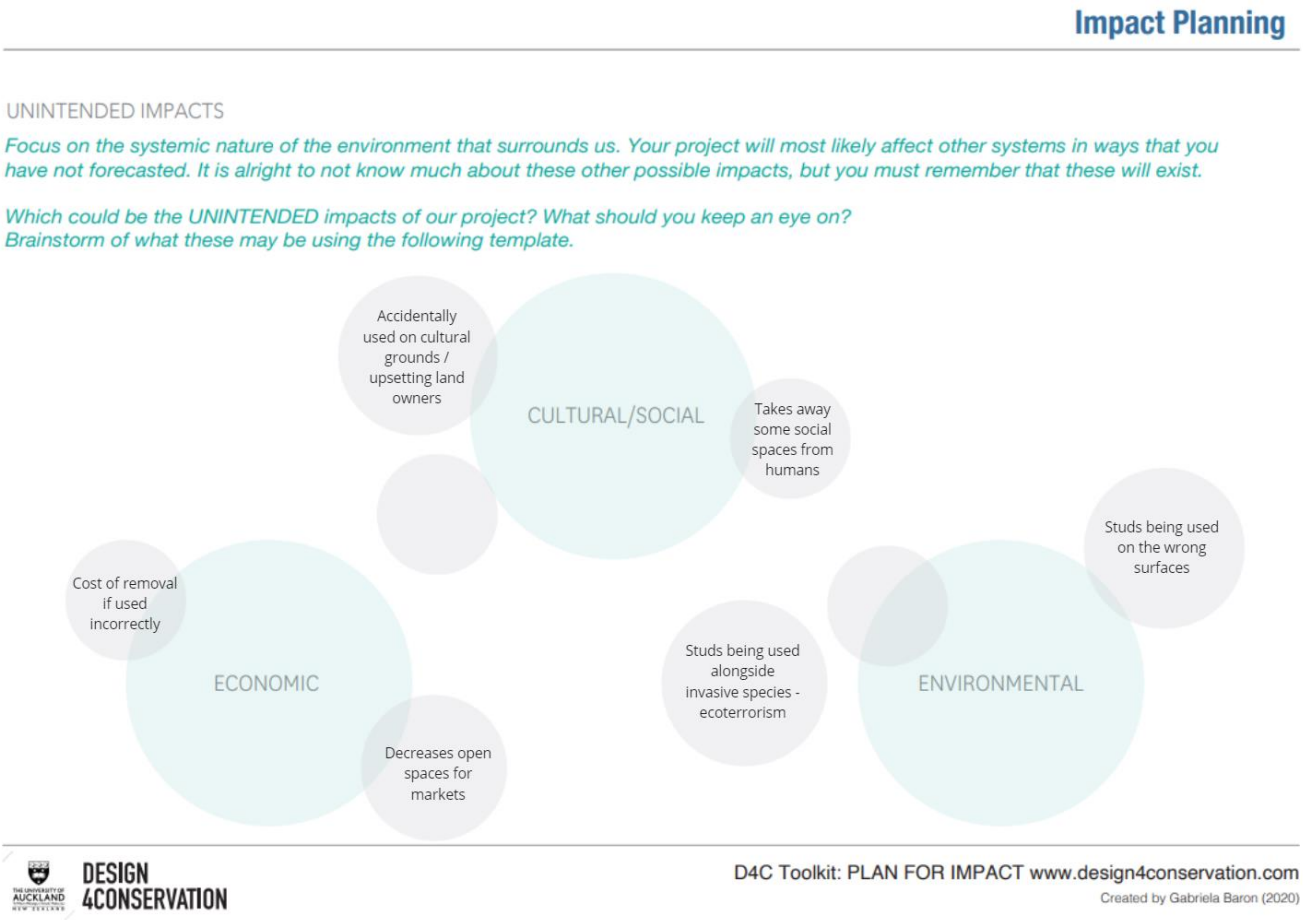
IMPACT	QUESTIONS *What do you want to find out?*	QUANTITATIVE INDICATORS	TOOLS *How will you measure this?*	QUALITATIVE INDICATORS	TOOLS *How will you gauge this?*
BREADTH *How many people/places /species/etc will your project reach?*	How great an impact my project has, it's potential for habitat regeneration, and how well it recovered endangered species?	People talking about it, Habitat regrowth in green urban areas, increase in population of natural species	Social media interactions, number of new habitats, increase in population		
DEPTH *How deep has your project's influence been?*	Will my project have a positive influence on wildlife? How about urban space? The footballing community? Will football clubs be on board?			Footballing partnerships, increased habitats, increased population numbers, being talked about within footballing communities.	Number of potential partnerships, amount of posts about the project online. Increase in number of habitats.
TARGET *How focused is this impact in relation to your main GOAL?*	"New football technology in the market" "**Increase in wildlife habitats**" "**Increase in population of local species**" "**Better utilised urban spaces**" "People playing football"	Positive change to the football boot world More attractive urban spaces Less open urban spaces **Primary goals - increased habitats, population numbers, and better utilised urban spaces** Good for the football community		Measure impact and discussion about project in football boot communities Survey locals about new look of urban spaces and if less open space was an issue for them Measure new habitats and local wildlife populations Measure amount of people playing football in local communities	

DESIGN 4CONSERVATION

D4C Toolkit: PLAN FOR IMPACT www.design4conservation.com

Created by Gabriela Baron (2020)

Baron, G. (2021) Impact Planning. Design for Conservation Toolkit. https://www.design4conservation.com/impact-planning



Baron, G. (2021) Impact Planning. Design for Conservation Toolkit. https://www.design4conservation.com/impact-planning

6.5. **Deploy Sustainably:** Deployment involves refining concepts to facilitate their practical implementation. This process encompasses a set of tools that aid in finalising projects. Regardless of whether it pertains to a for-profit or non-profit endeavour, most of these initiatives typically commence at a local and modest scale before expanding and duplicating, allowing conceptual deployment at both a local and global scale. (D4C 2021)

The Deploy Sustainably phase utilised further templates from the D4C toolkit to visualise a future deployment and market entry for Grass to Growth. Market research and brand identity were developed in this phase through colour theory, font research, and packaging design. A stakeholder motivation matrix was used to visualise how each stakeholder would benefit from collaborating with my project and how they interlink with each other. This provided insight into where my stakeholders may clash but also where collaboration would flourish. A contextual systems map was created to highlight the impacts of my project on each stakeholder and how the project could flow in the future. This created a visual representation of the most essential aspects of Grass to Growth and what should be focused on to create a successful, sustainable, and cyclic system. For brand identity, green was chosen as a predominant colour due to its psychological representation of peace, growth, and health (Honigman, 2017). Font-wise, I

continued to use Glacial Indifference as it is what was used for my research proposal and presentations.

Stakeholder Motivation Matrix

Creating influence groups is key to deploying a successfull project.

This is a visualization tool that represents the solution from the point of view of the individual motivations/benefits of each stakeholder of the system. Ask yourself: Why would they be interested in participating in this project?

1. Write down the name of each stakeholder on the gray boxes on both sides of the double-entry table (write each name twice, once on the horizontal row and once on the vertical column).
2. Write down the main motivations of each stakeholder in the green boxes.
3. Write down the specific partnership benefits at the intersection of each pair of stakeholders.

STAKEHOLDERS	Project Partners	Native Bee Species	Native lizard Species	Local Football clubs	NZ Football
Project Partners	Assisting the next generation in creating meaningful solutions	One of our project partners specialises in NZ native bee species, so benefitting them, especially the endangered species, is something he is passionate about.	One of our project partners specialises in NZ native lizard species as well, so benefitting them, especially the endangered species, is something he is passionate about.	Project Partners are on board with increasing utilising green spaces in Auckland, and through partnering with local football clubs there is a greater area of potential land to transform into habitats.	Project Partners are on board with increasing utilising green spaces in Auckland, and through partnering with NZ football there is a greater potential of moving the project nationally.
Native Bee Species	One of our project partners specialises in NZ native bee species, so benefitting them is something he is passionate about.	Recovering habitats, and increase in population	The types of habitats that I'm hoping to create are beneficial to both these species, and offer space for them to live alongside each other.	Increase in bee numbers means an increase in pollination, hopefully benefiting the quality of plantlife and soil for pitches in the off-season	Bees are seen as an extremely important part of our global ecosystem, and through improving their livelihood it would improve NZ footballs global image
Native lizard Species	One of our project partners specialises in NZ native lizard species as well, so benefitting them, especially the endangered species, is something he is passionate about.	The types of habitats that I'm hoping to create are beneficial to both these species, and offer space for them to live alongside each other.	Recovering habitats, and increase in population	An increase in local lizard species will create a decrease in invasive species like house flies and sandflies, something that may cause annoyance for football communities.	An increase in local lizard species will create a decrease in invasive species like house flies and sandflies, something that may cause annoyance for football communities.
Local Football clubs	Project Partners are on board with increasing utilising green spaces in Auckland, and through partnering with local football clubs there is a greater area of potential land to transform into habitats.	Increase in bee numbers means an increase in pollination, hopefully benefiting the quality of plantlife and soil for pitches in the off-season	An increase in local lizard species will create a decrease in invasive species like house flies and sandflies, something that may cause annoyance for football communities.	Better green image	NZ football is always looking to improve community football, and through this partnership they could improve the livelihood of areas around football and thus improve the image of community football in NZ.
NZ Football	Project Partners are on board with increasing utilising green spaces in Auckland, and through partnering with NZ football there is a greater potential of moving the project nationally.	Bees are seen as an extremely important part of our global ecosystem, and through improving their livelihood it would improve NZ footballs global image	An increase in local lizard species will create a decrease in invasive species like house flies and sandflies, something that may cause annoyance for football communities.	NZ football is always looking to improve community football, and through this partnership they could improve the livelihood of areas around football and thus improve the image of community football in NZ.	Potential for world recognition and a more sustainable footballing culture in Aotearoa

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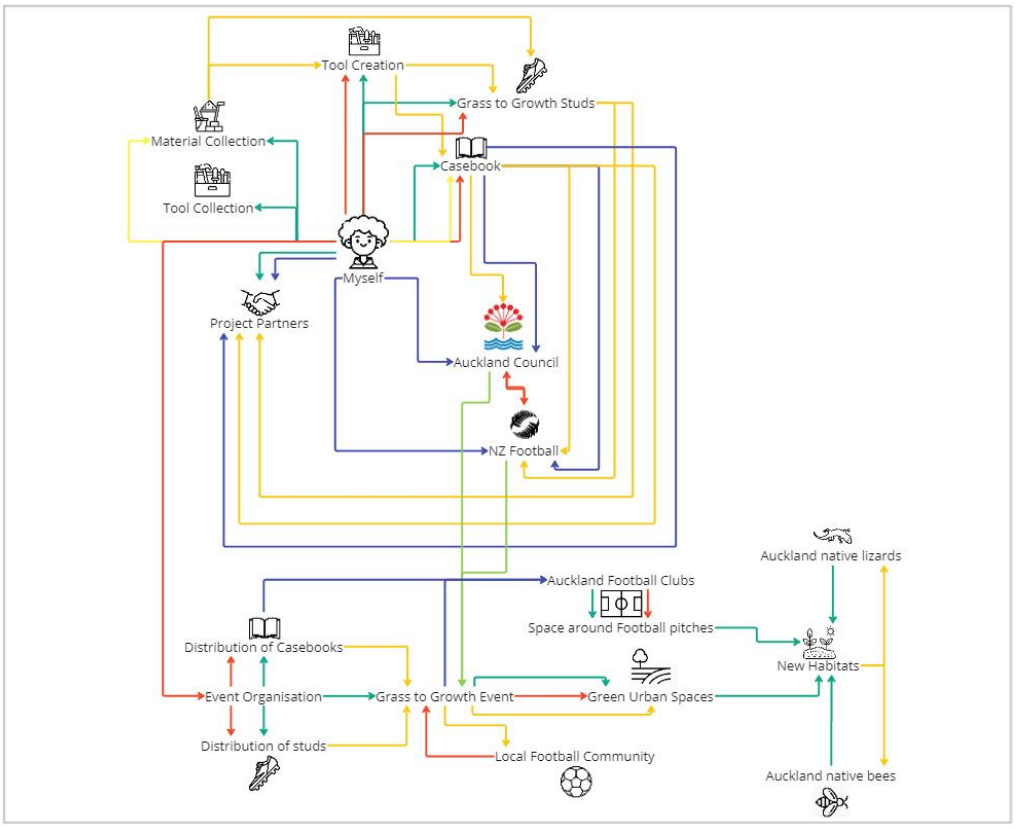
D4C Toolkit: DEPLOY www.design4conservation.com
Created by Gabriela Baron (2021). Canvas based on the SDO toolkit - LeNS project (2007-2011).

Baron, G. (2021) Stakeholder Motivation Matrix. Design for Conservation Toolkit. https://www.design4conservation.com/stakeholder-motivation

Contextual System Map

SYSTEM MAP



This is a tool for visualizing the system that supports your project, making it contextually feasible and outlining key relationships.

This system will involve stakeholders (human and non-human, institutions, etc.) relationships between these (information flows, labour flows, material flows, life-energy flows, monetary flows, etc) and locations.

You can use logos, icons and words, add more types of flows and anything else you want!

1. In a spare paper draw your offer in the centre and all the stakeholders involved around it, then draw arrows to represent flows. You might need to add locations, other stakeholders, or new flows.

2. Once you have a good system map, copy it in this template in a more organised/readable way. Make sure that you have all the relevant info needed to explain your project comprehensively.

REFERENCES

- *Energy flow*
- *Information flow*
- *Material flow*
- *Labour flow*
- *Monetary flow*

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Created by Gabriela Baron (2021). Canvas based on the SDO toolkit - LeNS project (2007-2011).

Baron, G. (2021) Contextual Systems Map. Design for Conservation Toolkit. https://www.design4conservation.com/contextual-system-map

Packaging Design.

7. Conclusions

Figure 7 Conclusions

7.1. Summary of Reflections

In summary, the reflection process carried out throughout this project has provided a forced platform for reviewing my week and holding myself accountable to my work. Accounting for 20% of this papers grade, reflective practice was a requirement for this paper. While initially sceptical of this, after months of blogging my work and looking back at what I have done, I think creating a graded relationship with reflections was important. Looking back over my weekly blog, I noticed that reflecting on my work allowed me to ground myself and appreciate what I was doing. It provided a base to go back on while also highlighting all the work I had done week by week. This helped my stress levels massively. By reflecting on each week as it passed, I was able to see how hard I had worked, what I had achieved, and how well I had stuck to a plan. This then provided a platform for the following weeks, allowing me to improve on identified weaknesses as well as be aware of things that were out of my control. I have never really been a big fan of writing reflections or keeping a blog, as I prefer to reflect on what I have done verbally and with peers. However, looking back, it's clear that this is an extremely valuable tool, and something that I will continue to do in the future.

7.2. Final Results (hero shots)

Final mechanical 3D prints. Fully functional, universally fitting studs.

Casebook hero shot.

Display hero shot of organic studs.

Packaging hero shot for organic studs.

Plastic and organic shells together.

Full set of organic studs on a boot.

In conclusion, I am extremely proud of my final deliverables as a result of this project. I was able to deliver everything I planned to do for Project Plan A but created two types of stud models rather than a ball. My final prototypes are all functional which was a massive personal goal I set for myself at the start of the project. Unfortunately, the time restraints of this project

don’t allow the results of the seeds deposited from the studs to be recorded. However, the testing area used has begun to sprout some wildflowers.

Overall, Grass to Growth resulted in an exciting, enjoyable, and educational experience.

7.3. Future Development

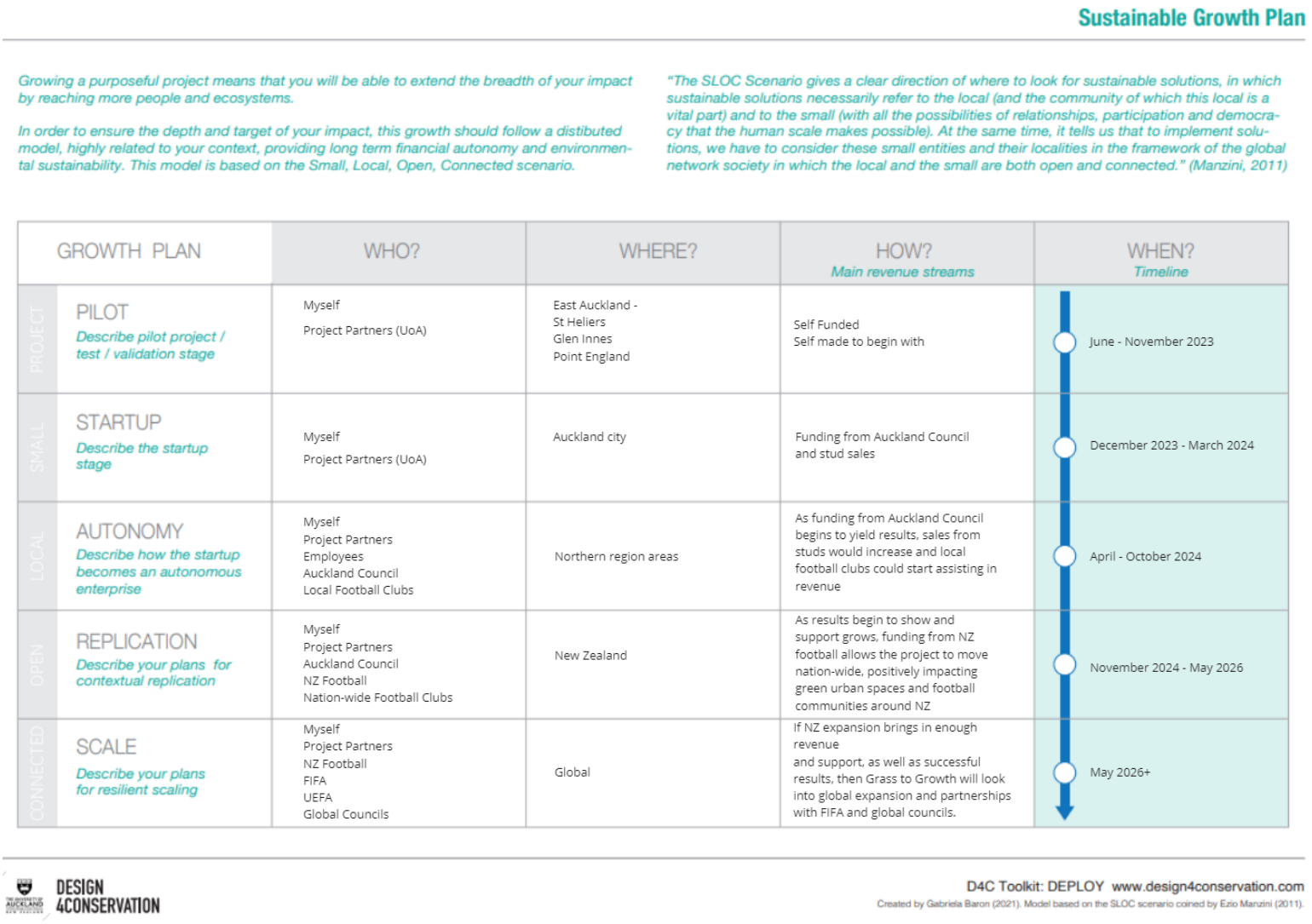
Acknowledging ableism and inclusivity for partly-abled participants is an essential step in providing an event that caters to all. Access would be considered and prioritised for future events to ensure that anyone is able to spectate. Taking part is more challenging to address as the Grass to Growth project relies on physical movement. However, support can be achieved by anyone and is a crucial part of the expansion and impact of this project.

Regarding market expansion, a transition to using sport as a whole - rugby studs, ultimate frisbee, etc. Reverting to a broader how might we statement, "*How might we develop urban spaces with the help of sports to mutually benefit multiple natural species?*" would be the first step in deploying my project to other sporting codes.

Improving inclusivity and expanding to other sporting markets would require multiple partnerships. The proposed future partnerships could be NZ Football, Local communities (expanding outside of Auckland), Local football clubs (expanding outside of Auckland), Regional Football organisations, and FIFA. Furthermore, for multi-code expansion, partnerships with Sports New Zealand would provide a beneficial platform.

Regarding future materials for the mechanical model, aluminium would be used as it is a relatively cheap, light, and durable metal. Predominantly used with pre-existing football studs. Furthermore, it can be used with 3D printers.

The Deploy Sustainably Growth Plan template showcases a future plan for Grass to Growth.



Sustainable Growth Plan

Growing a purposeful project means that you will be able to extend the breadth of your impact by reaching more people and ecosystems.

In order to ensure the depth and target of your impact, this growth should follow a distibuted model, highly related to your context, providing long term financial autonomy and environmental sustainability. This model is based on the Small, Local, Open, Connected scenario.

"The SLOC Scenario gives a clear direction of where to look for sustainable solutions, in which sustainable solutions necessarily refer to the local (and the community of which this local is a vital part) and to the small (with all the possibilities of relationships, participation and democracy that the human scale makes possible). At the same time, it tells us that to implement solutions, we have to consider these small entities and their localities in the framework of the global network society in which the local and the small are both open and connected." (Manzini, 2011)

	GROWTH PLAN	WHO?	WHERE?	HOW? *Main revenue streams*	WHEN? *Timeline*
PROJECT	PILOT *Describe pilot project / test / validation stage*	Myself Project Partners (UoA)	East Auckland - St Heliers Glen Innes Point England	Self Funded Self made to begin with	June - November 2023
SMALL	STARTUP *Describe the startup stage*	Myself Project Partners (UoA)	Auckland city	Funding from Auckland Council and stud sales	December 2023 - March 2024
LOCAL	AUTONOMY *Describe how the startup becomes an autonomous enterprise*	Myself Project Partners Employees Auckland Council Local Football Clubs	Northern region areas	As funding from Auckland Council begins to yield results, sales from studs would increase and local football clubs could start assisting in revenue	April - October 2024
OPEN	REPLICATION *Describe your plans for contextual replication*	Myself Project Partners Auckland Council NZ Football Nation-wide Football Clubs	New Zealand	As results begin to show and support grows, funding from NZ football allows the project to move nation-wide, positively impacting green urban spaces and football communities around NZ	November 2024 - May 2026
CONNECTED	SCALE *Describe your plans for resilient scaling*	Myself Project Partners NZ Football FIFA UEFA Global Councils	Global	If NZ expansion brings in enough revenue and support, as well as successful results, then Grass to Growth will look into global expansion and partnerships with FIFA and global councils.	May 2026+

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D4C Toolkit: DEPLOY www.design4conservation.com

Created by Gabriela Baron (2021). Model based on the SLOC scenario coined by Ezio Manzini (2011).

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8. Relation to global challenges, socio-economic and/or political contexts

Figure 8 Relation to global challenges, socio-economic and/or political contexts

Global challenges, socio-economic and/or political contexts are all interlinked. Economics and politics are key tools to address global challenges due to the cost of addressing a global challenge and the positionality of addressing something considered a challenge. To address a global challenge, no matter how small, there will be both a social cost and a monetary cost, thus the socio-economic context. Politically, labelling something as a challenge will divide opinion regardless, especially when discussing the social and monetary costs of addressing said challenge. Specified through the United Nations Sustainable Development Goals (United Nations SDG, 2015), this project addresses the global challenges of; SDG 3 Good Health and Wellbeing, SDG 9 Industry, Innovation, and Infrastructure, SDG 11 Sustainable Cities and Communities, SDG 13 Climate Action, SDG 15 Life on Land.

8.1. SDG 3 Good Health and Wellbeing – Through promoting the utilisation of green urban spaces through involvement in football and physical activity, Grass to Growth advocates good health and wellbeing through community-organised sport. Focus on good health comes from the physical benefits of sport, while well-being comes from uniting communities with shared passions.

8.2. SDG 9 Industry, Innovation, and Infrastructure – Grass to Growth is looking to innovate wild infrastructure through the development of pre-existing green urban space into habitats for local wildlife, as well as innovating existing football club infrastructure to be more sustainable and environmentally friendly.

8.3. SDG 11 Sustainable Cities and Communities – Grass to Growth was created from a sustainable beginning through the Sustainability Stream. With a focus on cyclic product lifecycles, as well as creating sustainable cities, sports clubs, and communities for multiple natural species, SDG 11 has an extreme prevalence over the work and progress of this project.

8.4. SDG 13 Climate Action – although not a primary goal, Grass to Growths focuses on the better utilisation of green urban spaces and provides positive conclusions for action against climate change. Through increased habitats for crucial pollinators, natures natural climate activists can continue to restore balanced ecosystems.

8.5. SDG 15 Life on Land - Improving life on land is a crucial aspect. With the key target audience being land-dwelling species, Grass to Growth looks to mutually benefit these species through rehabilitated habitats and the promotion of healthier lifestyles with the help of exercise.

9. Acknowledgements

Figure 9 Acknowledgements

I wish to first register the most profound gratitude to my family, Kevin Bushell, Lisa Holland, and Philippa Bushell, for their continued selfless support throughout my life. Through their guidance and blessings, I am in the position I am today.

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11. Table of Figures