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INVASIVE SPECIES AND THEIR IMPACTS

What Should We Do?

Report by Micahel Reid

2019 Churchill Fellow Awarded by the Winston
Churchill Memorial Trust



INVASIVE SPECIES AND THEIR IMPACTS

What Should We Do?

(n.) Invasive species - an organism that is not indigenous or native to a particular area.

(v.) do - an action verb indicating actions or activities that can be performed, suggesting taking some form of action or activity.

“ There is no reason to believe that bureaucrats and politicians, no matter how well-meaning, are better at solving problems than the people on the spot, who have the strongest incentive to get the solution right.”



Elinor Ostrom
Nobel Prize Winner - Economics 2009

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge university press.

THE WINSTON CHURCHILL MEMORIAL TRUST

Report by Michael Reid, Churchill Fellow


2019 Churchill Fellowship to investigate community-led responses that support the management of weeds and pest animals.

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A handwritten signature in black ink, appearing to read "Michael Reid". The signature is written in a cursive style with a large initial "M".

Michael Reid

Table of Contents

Preface	4	Chapter 4 Scotland	45
Executive Summary	6	4.1 Background	46
		4.2 Insights	47
		4.3 Synthesis	55
		4.4 References	56
Chapter 1 Invasive Species Biological Wildfire	11	Chapter 5 United States of America	57
1.1 Background	12	5.1 Background	58
1.2 Public problems - what shall we do?	13	5.2 Insights	59
1.3 Purpose and Approach	13	5.3 Synthesis	67
1.4 Conceptual framing	14	5.4 References	68
1.4 References	15	Chapter 6 Bringing it all together	69
Chapter 2 Aotearoa - New Zealand	17	6.1 Change is the only constant	70
2.1 Background	18	6.2 Beyond Regulation and Expertise: Understanding the Fluidity of Systems	70
2.2 Insights	18	6.3 The promise of community engagement	71
2.3 Synthesis	29	6.4 References	72
2.4 References	30		
Chapter 3 South Africa	31		
3.1 Background	32		
3.2 Insights	32		
3.3 Synthesis	42		
3.4 References	43		

Preface

Inspired by Ostrom's (see front cover) analytical insight¹, I've long held that any progress in managing invasive species—or any ecological challenge—necessitates deeply engaging those 'on the spot,' individuals with the highest incentive to getting it right. Recognising my passion for community engagement, I was nudged by my colleague, Dr. Andrew Woolnough, to explore this belief further and investigate community-led solutions outside of my comfort zone. I had previously been actively involved in community engagement processes to address the European blackberry, a significant weed in Victoria, and then shifted my focus to managing rabbits, one of the most destructive pests in the Australian landscape

While initially uncertain about the fellowship's requirements, I decided to attend a local information session aimed at promoting regional applications. During the session, I had the opportunity to hear Cathy McGowan, our local member of parliament, share her experiences as a Churchill Fellow. She had spearheaded a grass-roots community campaign and highlighted how the fellowship had influenced her leadership. She also emphasised the diverse range of projects funded by the Trust. This presentation sparked my curiosity, filling my mind with potential project ideas and igniting excitement about the possibilities.

I began pondering questions such as: Are other countries grappling with invasive species challenges like ours? How do they approach and address these issues? After several iterations of refining my project proposal and engaging in rounds of interviews, I eventually succeeded in garnering acceptance as a Churchill Fellow on my second attempt. The chosen topic for my fellowship: to explore community-led approaches to managing invasive species.

Throughout my life, I have nurtured an interest and passion for agricultural practices, sustainability, international development, and community engagement. Growing up in rural Victoria and spending time on family farms in the southern Riverina, I developed a deep appreciation for the interdependence of the environment and its people. Furthermore, during my formative teenage years, I was profoundly influenced by the transformative social changes that unfolded in post-apartheid South Africa, my father's homeland, igniting an interest and fervour in social change. With this formative passion, steered by these experiences, led me into a career in the public sector.

Working in the Victorian public sector, I have the privilege of researching and implementing innovative approaches to extension and community engagement. I have tackled a wide array of issues ranging from natural resource management to biosecurity, focusing on engagement, strategy development and organisational change. Throughout my journey, I have also been fortunate to undertake several 'mini sabbaticals', including immersions in Mozambique to gain insights into participation in natural resource management, Stanford University in California to explore the relationship between food security, agriculture, and climate, and Penn State University alongside my close mentor and friend, Professor Ted Alter (who prefers Ted) to really delve into community engagement theory and practice.

These experiences provided invaluable opportunities to challenge my conventional thinking and nurtured my desire to forge alternative paths. My fascination with diverse cultural approaches has also deeply shaped my perspectives, profoundly influencing my exploration of new ideas.

¹ Ostrom's analytical insights and framework (Ostrom, 2009) transcend more than theoretical postulation, rather it has been applied and tested across diverse locales and geographies.

Working alongside Ted, we crafted the structure of my Churchill trip and experience to ensure a collaborative and rigorous approach to learning from others and making sense of my experiences. I drew from various conceptual frameworks, using structured interview questions, taking field notes, observing people, and reflecting on these experiences.

Throughout this journey, I undertook individual and group interviews with 58 people and spent time giving seven seminars at Stellenbosch, Aberdeen, Cornell, and Penn State Universities with students and academic staff. I had the opportunity to explore the stunning landscapes of New Zealand's north island, marvel at the base of Table Mountain in Cape Town, and venture through Kruger Park. I also travelled through the English countryside and was awed by the rugged Scottish Highlands. I spent time on the moors, heaths, and mountains, finishing my journey exploring the alpine forests, waterfalls, and finger lakes of the north-eastern part of the United States.

Personally, this trip has left me feeling inspired. Yet alongside this inspiration, there's a sense of impatience. Immersing myself in diverse landscapes, has deepened my appreciation for our ecosystems' intricate complexity and dynamic nature. However, it has also heightened my awareness of the significant, disruptive, and destructive impact invasive species are having – an issue I believe is still greatly underestimated in our societal discourse. After returning to Australia, my thoughts often drift into darker realms, contemplating the vast scale of ecological change. Invasive species, in this context, appear not just as threats but as harbingers of impending ecological catastrophe. These thoughts often led me to ponder my children's future interactions with nature, stirring moments of anxiety and concern. Yet, amidst these uncertainties and complex challenges we face, I also found hope. This hope is firmly rooted in people. I am inspired by the stories of everyday individuals who, with unwaveringly commitment, work tirelessly towards making a difference. This passion is palpable, and their actions embody the very values they advocate for. Witnessing these individuals in action

instills in me a renewed sense of optimism, reinforcing my belief that positive change is achievable. As Elinor Ostrom eloquently puts in the opening quote, true action is possible when those “on the spot,” the ones with the strongest incentives to get it right, are actively involved in decision-making processes.

The professional experience I have gained through this trip has emphasised the crucial role of scholarship in supporting community engagement and invasive species management. Despite the dismissive use of terms like ‘soft skills’ relating to community engagement, it is evident that such skills require navigating emotions, vulnerabilities, and bridging differences—far from being “soft.” Also, I often sense another tone underlying such accusations. One is that community engagement is not a real science, is not rigorous and structured, and is made up ‘on the fly’. As someone passionate about the work, there are projects I have seen and been involved with where this is the case. With little consideration given to the practice, the theory, and the people engaged. However, this experience has reaffirmed that community engagement in invasive species management has a strong foundation in theory and practice. We can draw upon various disciplines such as sociology, political economics, behavioural and cognitive science, facilitation and group theory, and concepts like social change, ethics and justice. Additionally, our personal growth and inner transformation play a significant role in shaping institutions and society positively.

Finally, I firmly believe that focusing our efforts on understanding and improving the human dynamics of invasive species management can lead to significant gains. Moreover, collaborating with others and learning collectively across our diverse backgrounds can bring immense benefits. By bringing together individuals from different fields and sharing insights, we can learn from one another's experiences and enhance our approach to invasive species management. This experience has reinforced my conviction in the value of transdisciplinary scholarly and collaborative inquiry when tackling the complex challenges associated with invasive species management.

Executive Summary

Invasive species, species that establish and spread with negative impacts on biodiversity, local ecosystems, agriculture and other species, present an alarming threat to ecosystems, biodiversity, and the well-being of communities worldwide. As I pen this report, the Intergovernmental Platform on Biodiversity and Ecosystems Services has released a report primer for its Assessment Report on Invasive Alien Species and their Control – a release expected to paint a dire picture. Yet, I feel a sense of scepticism. Amidst many technical framings of sustainability challenges like invasive species, there is often scant commentary on how we can support and catalyse change. As we well know, convincing people about the facts and issuing dire warnings, unfortunately, doesn't bring about change. Rather, it is about connecting with human values, experiences and capacities for action.

As the world grapples with the formidable threat of invasive species, there is an urgent call for innovative and effective approaches that can yield tangible results. This executive summary outlines key recommendations based on an exploration of community-led approaches to invasive species management across New Zealand, South Africa, the United Kingdom, and the United States of America.

Traditionally, invasive species management in Australia has primarily focused on technical solutions. While this perspective provides valuable insights into the ecological impacts of invasive species and control measures, it often falls short in providing actionable solutions that effectively address the issue. The challenges posed by invasive species extend beyond technical considerations alone. Understanding the behavioural, social, economic, and political aspects that influence decision-making and drive effective action is equally critical. At the core of the invasive species challenge lies the human dimension, which requires a shift from normative positions dictating “what should be done” to fostering a collaborative and inclusive approach of

“what we should do” to tackle the issue and “why.”

By delving into community-led initiatives across diverse geographical settings, this report aims to unveil the power of incorporating local perspectives, the importance of listening, building strong partnerships, and embracing innovative leadership in the fight against invasive species. The following sections highlight key recommendations that hold promise for revolutionising invasive species management, ensuring lasting positive outcomes for ecosystems and communities alike.

Recommendation 1: Understanding Invasive Species Management as a Human Endeavor

At first glance, this may seem like a bold (and maybe countercultural) philosophical stance to start with for a report on invasive species. I think, in part, this can be attributed to how technical framing influences our perception. But let me explain why it's so crucial. This trip of observing and interacting across various countries and programs has reinforced my belief that at the heart of managing invasive species lies our collective human experience – how we come together, navigate our differences, and through this evolutionary dialectic, transform our approach to this complex, often insurmountable challenge.

Invasive species management isn't just an ecological problem; it's a deeply human one. Different perspectives on what constitutes success lead to conflicts at various levels, encompassing moral decisions about involvement, ethical considerations regarding control methods, and local-level politics among land managers, communities, and governments. As highlighted in this report, there are also broader, ‘big P’ political decisions made by governments. All these factors contribute

to making it a 'wicked issue' – if it were simple, we would have solved it by now.

This practical reality leaves us with the question: invasive species, what should we do? It invokes the need for us to come together to embrace a political, moral and ethical engagement that affords space for and respects human differences. Our perceptions, shaped by the technical framing of the issue, can obscure these equally important human dimensions, including practical local knowledge and experiences, and the innovative potential that people and communities bring to the table.

In our effort to reframe, we must create spaces for open, inclusive conversations where everyone – from local residents to scientists and policymakers – feels heard and valued. Engaging the same people with the same perspectives and ideas often leads to the same solutions and can lock us into path dependency.

There is not only a philosophical position here but also an ethical layer to engagement and participation. This isn't about utilitarianism, which too often limits who gets to participate. It's about an ethical approach that values all voices and experiences, striving for solutions that are equitable and resonate with diverse stakeholders. In doing so, we are also moving into new territory. By taking this ethical position, we are opening ourselves up to non-redundant information – this becomes the basis for individual learning, and if done together, collective learning. Engagement becomes the sustainability glue, through strong interpersonal relationships underpinned by trust and mutual respect, and supporting individual and collective learning, and creativity and innovation.

Managing invasive species is as much about understanding and harnessing human potential as it is about ecological strategies. Both are equally important. However, by shifting our focus to this human dimension, we open new pathways for innovative, inclusive, and effective management of invasive species.

Recommendation 2: Harnessing the power of storytelling to find common ground and learn new ways of doing things.

To effectively address the impact of invasive species, raising awareness and garnering support from decision-makers, industries, and communities is imperative. Moreover, we need to be able to work across differences to find common ground and learn new ways of doing things. A powerful approach to achieve this is through the art of storytelling.

Stories that not only highlight the diverse impacts of invasive species but also tap into emotional connections are crucial for engaging audiences on the importance of this issue. Emotionally resonant narratives can significantly influence public attitudes and drive behavioural change. Stories also help us to see and understand the issues from different perspectives, and that may help us to re-frame and look for new ways of doing things.

These stories of invasive species can take various forms and scale and encompass different mediums. From national narratives inspiring change ([see example of Predator Free](#)), to stories highlighting outcomes of successful programs ([e.g., community restoring land from invasives species in South Africa](#)), and even through innovative communication methods like airline videos, there are countless avenues to engage the public.

Other examples include harnessing geographical data to tell an engaging narrative ([see example of Story Mapping here](#)) or delivering well produced documentaries to capture the wider public's interest (e.g. *Uninvited: The spread of Invasive Species*)

By incorporating voices which are often marginalised in these discussions, such as First Nations people ([see Taurikura Anamata wānanga](#)), or young people in Scotland ([see Introduction to Biosecurity – by Bualnaluib Primary School](#)), we can create a more inclusive and empathetic understanding of the issue.

With an ever-growing emphasis on the use of narratives, what I recommend is not to get caught on the narrative itself but rather question whose telling the narrative, how it is being shared, and how it can inspire us, shift our learning, and understanding of the other.

Finally, there are multiple organisations, including all tiers of government, not-for-profit and the university sector that could help tell stories, and tap into creative arts industry in Australia. There is even a role for our national air-carrier, Qantas, to help promote the story of biosecurity.

Recommendation 3: Supporting distributive leadership and unlocking Innovation through diverse ‘ecologies’ of organisations

To propel forward in invasive species management, it’s pivotal that we transcend the traditional paradigm of solely relying on governmental initiatives. Instead, we should champion a diverse ecology of organisations, drawing from innovative business models and collaborative approaches that holistically and actively involve communities and various entities.

A holistic approach mandates the inclusion of non-profit entities, private enterprises, industry associations, academic institutions, and governmental agencies. Such a collaborative ethos not only leverages a wealth of resources and expertise but also seeds a fertile ground for fresh, effective ideas.

Furthermore, collaborations between governmental bodies and private businesses and industry, underpinned by shared, distributive leadership which supports others, at various levels to lead, can reimagine invasive species management as a shared mission. This multi-faceted, polycentric approach crafts a resilient framework to bridge existing gaps and proactively address forthcoming challenges.

Embracing radical² distributive leadership in invasive species management represents a necessary paradigm shift beyond simply

being a novel approach. This evolution recognises the intricate interplay of ecological challenges with socio-cultural and political contexts, advocating for comprehensive, actionable solutions with genuine impact.

Supporting this shared leadership paradigm often requires governments to rethink their role (see New Zealand on system stewardship) and unique business models, (such as the Scottish Invasive Species Initiatives), or public-private partnerships through crown entities like Predator Free.

Collaborative efforts spanning various sectors, regions, and stakeholders can magnify impact and pool resources. Such unity underscores the shared wisdom of diverse contributors, from indigenous communities enriched by generational insights to scientific authorities equipped with the latest research.

Recommendation 4: Revamp Policy Frameworks for Inclusive Community Engagement, Comprehensive Evaluation, and a Critical Review of the Invasion Curve.

The persistent threat of invasive species, despite our modern scientific approaches, signifies an escalating challenge. From different regions, I’ve discerned a spectrum of perspectives: debates over eradication vs. management, discerned impacts, preferred strategies, and ethical dilemmas, such as the treatment of squirrels in Scotland. The animal welfare debates surrounding cats and the controversial use of chemicals, like the 1080 episode in New Zealand, further illustrate diversity and polarity in perspectives.

The diversity of settings and contexts in which we tackle invasive species underlines the multifaceted interests that steer strategies over time. Navigating this multifarious landscape requires us to expand beyond traditional disciplinary boundaries. We need a holistic policy framework that reassesses our present challenges, values a broad spectrum of

² I have chosen the word radical because, in many of my experiences, we don’t think of leadership through these terms. This form of leadership sits outside of central locus of decision making.

insights, and paves the way for innovative solutions. It's paramount that we adopt an integrated approach, prioritising community collaboration and emphasising a transdisciplinary strategy.

Our emphasis should shift towards policy structures that:

- **Champion community engagement:** Prioritising community participation and valuing lived experiences, spotlighting the importance of collective action in addressing shared challenges.
- **Inclusive Evaluation:** A shift from merely looking at program outputs to evaluating the broader outcomes and contributions of community-led initiatives. This should also consider the effectiveness of community-led programs for more traditional investments.
- **Reassess the Invasion Curve:** Traditionally, the biosecurity curve guided invasive species decisions. However, this model isn't without its potential flaws or "ecological fallacies." For example, some strategies, especially those on the curve's latter end where they are well established, can occasionally mischaracterise ongoing management efforts as inertia. This perspective neglects the essential actions geared towards suppression and eradication, a trend visible in New Zealand's approach. Furthermore, the curve might not uniformly apply to all situations or species, and its projected economic returns might not always align with long-term effects of species management.

Given these nuances, a re-examination of the invasion curve is essential. This effort should synthesise insights from biological sciences, economic perspectives, on-ground experiences, and broader policy knowledge. Platforms like international symposiums or global conferences on invasive species can serve as ideal venues for such enriched dialogues.

Recommendation 5: Co-developing an integrated online toolkit

Addressing invasive species presents a two-fold challenge: the biological-

technical side and the human-socio-political side. Historically, efforts have been disproportionately directed towards the technical, often sidelining the human-centric aspects. However, any successful strategy requires an intricate understanding of both. The varied dynamics of community engagement, particularly as evidenced in approaches like those of the Australian government, highlight the need for more effective strategies.

Before delving into the potential contribution of an online toolkit, it's essential to acknowledge that more than just informational resources are required. Effective programme implementation hinges on building trust and mutual respect among stakeholders. This foundation ensures that everyone involved shares a vision for the management programme and is invested in a successful outcome. Acknowledging this prerequisite is critical as we consider the development of tools and strategies for invasive species management. With this understanding, the opportunity to collaboratively construct an online toolkit becomes even more pertinent. This toolkit, by focusing on the human elements of invasive species management and integrating principles of social change and community engagement, along with diverse global experiences, could revolutionise our approach.

Broadening our scope to appreciate the symbiotic relationship between technical solutions and their pragmatic applications is crucial. Embracing social theories can bridge these two worlds, merging socio-cultural knowledge with biological-technical expertise. This integration enhances our understanding of what determines success in combating invasive species.

The proposed online toolkit, designed to be universally accessible, aims to harmonise theoretical insights with practical experiences. Such a resource could stimulate existing initiatives and foster cohesive collaborations among field experts, scholars, and local communities. It could serve as a dynamic hub for exchanging insights, promoting cooperative education, and exploring the intricate facets of invasive species control.

An illustrative example of this approach's effectiveness is the 'Community-Based Deer Management: A Practitioner's Guide'. Similar to the Community Deer Advisor website (<https://deeradvisor.dnr.cornell.edu/>), this guide underscores the potential of comprehensive toolkits in managing wildlife, balancing community engagement with technical know-how. Such examples, along with other initiatives like Drawdown (<https://drawdown.org/>) and The Carbon Almanac (<https://thecarbonalmanac.org/>), underscore the potential of these comprehensive toolkits. By developing a toolkit that combines these elements, we can create a more cohesive and effective approach to invasive species management, one that respects and incorporates both the biological-technical and the human-social aspects, underpinned by trust and mutual respect among stakeholders.

An illustrative example is the "Community-Based Deer Management: A Practitioner's Guide", which shines a light on innovative and nuanced methods of community-centric wildlife management. Furthermore, online initiatives in the climate sphere, like Drawdown and The Carbon Almanac, stand as testament to the potential of such toolkits.

Recommendation 6: Contemplating Next Steps: Engaging with Socio-Political and Ecological Uncertainty

Through this trip, my understanding of invasive species, in both ecological and socio-political contexts, has deepened, leading me to appreciate the dynamic nature of these systems. They're influenced by multiple of factors - factors like climate change, our human activities, and technological advancements. We're continually balancing between continuity and change, facing a myriad of uncertainties, which leads to two final insights.

Embracing Uncertainty as a Catalyst for Innovation: Firstly, uncertainty shouldn't be seen just as a challenge; it can actually be a catalyst for innovation. When we step into uncharted territories, embracing the unknown, innovative solutions often come to the fore. For instance, the 'Working for Water' initiative in South Africa after the first democratic election is a prime example of how embracing uncertainty can lead to inventive and effective management strategies. This initiative shows how venturing into "new waters", underpinned by a collective willingness to experiment, and learn, can foster groundbreaking approaches in invasive species management.

Distributive Leadership for Adaptability: The role of distributive leadership is crucial adaptive response to the evolving socio-political and environmental landscape. Characterised by its agility and responsiveness, distributive leadership is essential in the unpredictable world of invasive species management. By decentralising decision-making, it empowers those most familiar with the challenges to adjust strategies swiftly. This is informed by being at the coal face of the issues, with direct experience and local knowledge. A good example of this approach is evident in New Zealand, particularly through the Predator Free and community partnership programs.

By acknowledging and effectively embracing the uncertainty and human interdependence and difference inherent in both the ecological and socio-political spheres, we can develop evolving strategies for invasive species management grounded in a politics of engagement that are not just resilient but 'antifragile'³. Our approach, therefore, not only tackles the immediate challenges but also paves the way for sustainable, long-term solutions that thrive amidst, rather than just withstand, the complexities and unpredictability of our natural ecology.

³ This concept, introduced by Nassim Nicholas Taleb, refers to systems that actually benefit from disorder

Chapter 1

Invasive Species Biological Wildfire

“In nature, nothing exists alone,
everything is connected.”



Rachel Carson
Silent Spring, 1962

“He aha te mea nui tea o?
He tangata he tangata, he tangata!”

What is the most important thing in the world? It is people, it is people, it is people!

We put ourselves at the centre of the ecosystems - if we don't change, nothing will improve. We need to take responsibility for that change.

Korehāhā Whakahau

Predator Free Landscape Scale project, 2023

1.1 Background

At the end of 2022, Inger Anderson welcomed guests in New York for the countdown to the United Nations Conference on Biodiversity (COP27). In her speech, Inger painted a dire picture, warning participants that it was one minute until midnight. She attributed the dispersion of invasive species as one of the five horsemen of the biodiversity apocalypse. She noted that it was a significant driver and, notably, one that needs to be better understood.

Scientific analyses and synthesis of global trends also reflect her concerns - biological invasions of pest plants and animals are causing widespread and wholesale ecological, economic, cultural, and social impacts - a leading cause of biodiversity loss worldwide (Simberloff et al. 2013). A study published in *Nature Communications* noted that invasive species have been responsible for more than half of the global biodiversity loss since 1900 (Chapple et al., 2022). Furthermore, the spread of invasive species is estimated to cost the global economy over \$1.28 trillion annually (Pyšek et al., 2012). In a period of increasing food security, invasive species also directly impact agricultural production. Moreover, these negative impacts will be confounded further by climate change, as invasive species are characterised by being supreme adaptors to new conditions.

Pointing to the lack of awareness around invasive species, Turbelin et al. (2023) work suggests that globally, damage costs from biological invasions and natural hazards (fire, floods etc) are similar. Yet, fire and floods often do better at capturing our collective attention.

Managing invasive species is a well-known challenge for many - particularly those in rural and regional communities. The adverse effects of these species on ecosystems have been extensively documented and observed in various locations. For instance, in the Kalahari Desert, thickets of South

American *Prosopis* (mesquite) trees are homogenising these landscapes, reducing bird and insect populations. Additionally, the deep taproots of these trees have destabilised the already vulnerable landscape by lowering the water table, threatening water security and the livelihoods of communities and similarly, introduced predators such as the American minks, described to me as a voracious and effective predator in Scotland, while possums, rats, and stoats have preyed on New Zealand's native bird populations. In upstate New York, insect pests such as the emerald ash borer and hemlock woolly adelgid are altering the ecological composition of their forests. Cities are not immune to invasive species, with New York recently appointing a rat czar to address the growing rat issue, yet another introduced species. Climate change, land use change, and global trade are increasing the spread of new incursions and weakening native species' resistance, exacerbating their impact (Hellmann et al., 2008).

Australia is no stranger to these challenges, hosting a menagerie of invaders with an increased risk of more invaders coming to our shores. In 2022, the CSIRO's "Fighting Plagues and Predators" report warned of an impending disaster on our doorstep, with invasive species being the primary cause of animal and plant extinction. Invasive species have been likened to a biological wildfire, a fitting metaphor for the Australian psyche, as they can quickly spread, overpower and displace native species, and devastate our agricultural industries.

Returning to Inger's challenge, making commitments, is easy, but turning them into action is difficult. At first glance, managing invasive species may seem straightforward, but it is more complex than conventional wisdom suggests. The lived experiences of those who have dealt with invasive species recognise that managing them is a mid to long-term

game. Their sheer numbers, geographical spread, mobility, and multiple socio-political factors mean no silver bullets exist. However, the issue's complexity should not serve as an excuse for inaction but rather an opportunity to engage.

1.2 Public problems - what shall we do?

Invasive species are pervasive across our landscapes, transcending different land tenures and traversing fences, presenting a classic 'wicked' problem. Like climate change and other sustainability issues, this complex challenge has no simple or singular solution. Instead, our focus should lie on collaborative efforts to tackle their management. The selection of the report's title draws inspiration from Levine's (2022) civic theory, highlighting the significance of our collective responsibility and accountability when determining the course of action. While technical expertise informs us about what needs to be done, a gap exists between knowledge and practical application—the knowledge that concerns actionable steps. Furthermore, using the term “we” emphasises individual agency and our collective capacity to effect change.

I was acutely reminded about this early on in my trip to New Zealand, so I included a Māori proverb at the beginning of this chapter. I was in the small coastal town of Whakatāne, located in the Bay of Plenty on the Pacific Ocean. The area is considered the site of the first Polynesian settlement in 1200 CE. Fittingly, I was interviewing the team behind Korehāhā Whakahau, a Maori-led Predator Free Program. As we sat in their tearoom, they shared their program's success in addressing possums and how they have used Te Ao Māori, their perspectives, knowledge, values and way of life in the program. As the conversation neared the end, sensing a pause, their program leader shared a Maori proverb, 'He aha te mea nui tea o? He tangata he tangata, he

tangata!' which translates to 'What is the most important thing in the world? It is people, it is people, it is people!', and then finished by saying *if we put ourselves at the centre of the ecosystems - if we don't change, nothing will improve*. We need to take responsibility for that change. Reflecting on my experience in community engagement and invasive species, I was struck by this moment, which helped to verbalise some of the framings I often struggle to articulate. Namely, managing invasive species is a “public problem⁴,” a community problem, or a collective action problem.

There are written volumes about the control, impacts and interactions of invasive species. However, even with these scientific advances, it does not translate into changed action on the ground as human dimensions of the issue are not well considered. So how do we shift our framing of managing invasive species as a public problem? How do we strike a balance between planning and action? The question may sound scientific, inviting scientific expertise, which is unequivocally true, but the answer is also very much human.

1.3 Purpose and Approach

Acknowledging that managing invasive species is not limited to ecological or scientific considerations but rather encompasses a social aspect, I commenced a Churchill Fellowship in early 2023. I investigated how community-led initiatives address invasive species in New Zealand, South Africa, the United Kingdom, and the United States of America.

The research objectives of this fellowship were to;

- Understand the unique context of invasive species within each region, including history, culture, natural ecology and biological factors, politics, and economics.
- Explore various interventions to understand why and how these

⁴ John Dewey's famous work in 1927, *The Public and its Problems*, emphasises the importance of democracy and engagement in addressing societal issues.

programs were developed - and why they have not. How and why have they brought together different actors, how and why have they navigated tensions, and what outcomes were delivered.

- Learn how and why individuals' professional practice and leadership have influenced collective action to deal with invasive species

I undertook individual and group conversations, participant observation and semi-structured interviews as part of my research approach. The questions were crafted to capture primary data, eliciting participants' responses that focus not so much on what is happening but the *how* and *why* things are happening. Further, this experience has allowed me to 'step outside of my own story⁵,' recognising the limitations of my mental models and ways of understanding the world. In addition to my notes, I keep a field notes journal, which I will also include in my analysis.

During my travels, I came across some unexpected insights that I initially considered dismissing as they did not fit the conventional definition of invasive species. However, I decided to include them in my analysis. One of these insights is that ecological restoration of landscapes (by removing invasive species and re-wilding) may face similar socio-political challenges. Despite being native, these species still encounter the same political and social issues, such as finding common ground and bringing people together. It was important to acknowledge these similarities and address them accordingly.

1.4 Conceptual framing

As noted, managing invasive species is a collective action problem that requires understanding the multiple factors, the interconnectedness of socio-political and ecological facets, and the inherent complexity of both of these systems point to the inherently 'wicked nature' of the problem (Rittel & Webber, 1973). Thinking about this can hurt the brain

and understanding this can be daunting. Nevertheless, we need to 'expand our aperture' to progress change.

In approaching the Fellowship, I have drawn on my active and ongoing scholarship with Professor Ted Alter, particularly our chapter (Alter et al. In press), providing crucial ontological positioning that emphasises the importance of interdependencies in understanding and responding to sustainability issues.

Interdependence is a crucial concept and may seem difficult to grasp. However, when explained and understood, it becomes apparent how important it is to conceptualise issues. Interdependency can be considered on two broad levels, with a critical nexus. Firstly, there is our human-to-human interdependence - that is, we are impacted by each other in social, political, economic, and cultural ways. Secondly, there is the human-to-nature interdependency. This relationship between human activities on the ecosystem is evident in the Anthropocene, where human activities have fundamentally altered the earth's ecosystems. Finally, 'the rub' is the nexus of human-to-human interdependency and its linkage to the human-nature interdependence - that is how our institution's support (or hinders) our human-to-human interdependence matters to nature⁶. We cannot escape the existential reality of this nexus of interdependence - understanding nature, and we cannot escape engaging and understanding each other if we are to manage those ever-evolving changes in our natural ecosystems upon which our human existence depends. These complex, interrelated factors make addressing invasive species extremely challenging to conceptualise and address.

Secondly, I draw from Nobel prize-winning economist Elinor Ostrom's classic Social-Ecological-Systems framework (Ostrom, 2009), which provides a 'practical algorithm' to frame this inquiry for conceptualising, analysing and addressing sustainability issues globally, nationally

⁵ Prior to leaving I explored and documented my experiences and potential bias I bring to the inquiry, as part of my own self-reflective practice and learning.

⁶ This can be difficult to conceptually grasp. Daron Acemoglu's book, *Why Nations Fail*, illustrates this through looking at interdependencies at a Nation state level, more easily to understand, including examples on nature.

and locally (see Appendices for an overview). Ostrom's framework has helped me understand, dissect, and harness the complexity of managing invasive species, situating it within broader social and ecological systems. Rather than eliminating complexity, the SES framework helps us understand, dissect, and harness it. Drawing on this framework, I approach invasive species management in four subsystems: namely the resource system (e.g. Kalahari desert), resource unit (e.g. a particular invasive species), governance system that governs how people relate to one another and to invasive species (e.g. government organisations, NGO's), users attributes (actors may have different incentives to be involved, differing priorities, histories, limited capacity, or lack of awareness of the impact of the issues). Each sub-system is relatively separable but interacts dynamically with other sub-systems to produce outcomes at the SES level - whether there is cooperation and coordination of individuals, businesses, communities and governments at multiple levels coming together to work on the issue. However, achieving cooperation and coordination can be challenging.

Central to the framework is the action situation, where continuous engagement and interactions of individuals are influenced and shaped by the resource and governance sub-systems. This affects invasive species management and outcomes across the wider resource system through social learning, community capacity building, behavioural change, and environmental change. In addition, Eaton et al. (2021) conceptual framework helps progress this action situation to understand how engagement influences changes, providing a logic for thinking about the various stages of change. These outline engagement processes leading to social learning and capacity building, changes in behaviours, and linked to environmental change.

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Chapter 2

Aotearoa New Zealand



2.1 Background

Aside from a formidable rugby side, New Zealand has a well-earned reputation for its rugged mountains, beaches, forests, and unique species. None of the least includes the Kiwi - a bird which has deep meaning for the New Zealand reputation - being exported through branded rugby gear worldwide, and even their air force is called the Kiwis (I was reminded of the irony of this as a flightless bird). As I was reminded in one of the interviews of the importance of this bird on their national identity, 'we even call ourselves Kiwis'.

Much like Australia, its unique and diverse ecosystems have been impacted by the introduction of invasive species, causing significant ecological, cultural, and economic damage. The stoat, for example, is one of the most notorious offenders (*Mustela erminea*). First introduced to New Zealand in the late 1800s to control the rabbit population, it quickly got out of control and became a predator of native birds, causing a significant decline in their populations (Department of Conservation, 2021). It is now considered one of New Zealand's most significant threats to its native biodiversity.

Other invasive species in New Zealand include possums, hedgehogs, starlings, rats, mice, feral cats, feral deer, and growing recognition of wallabies (The Guardian, 2019). These species have all significantly impacted New Zealand's native biodiversity, causing the decline and extinction of many native species - particularly as many of their native species are ground-dwelling birds, unable to protect themselves. The impact of invasive species on New Zealand's cultural values is also significant. Many of New Zealand's native species hold cultural importance to Māori - losing species profoundly impacts Māori culture and identity. The economic impact of invasive species is also significant. The cost of controlling and eradicating invasive species in New Zealand is estimated to be billions of

dollars (Department of Conservation, 2021). Further, there is a health component of invasive species, with possums also carriers of bovine tuberculosis. This significantly threatens New Zealand's beef and dairy sectors, a pillar of their export-oriented economy.

The politics around invasive species in New Zealand is complex - and that complexity lies in the differing perspectives of people and the impacts on nature. Managing invasive species is complicated because many of these species have become established and are challenging to eradicate. The use of chemicals, such as 1080, can be controversial. This issue is not confined to New Zealand, with growing concerns about using chemicals, their potential harm to non-native species, and chemical contaminants after spraying. One factor cited during my visit on chemical usage was around a lack of engagement with the public on the issues, culminating in distrust and public opposition, which may talk to the importance of engaging many diverse interests to ensure a robust authorising environment to support the control of invasive species.

Despite these complexities, while many nations grapple with biosecurity and invasive species, New Zealand's government stands out with its progressive strategies. Rather than adhering to traditional, centralised 'command and control' methods, they've adopted a system stewardship model. This approach emphasizes co-governance, pivoting towards a more distributive model that empowers communities. The Predator Free movement exemplifies this, reflecting a robust national commitment to eradicating predators from New Zealand.

2.2 Insights

The following insights have been gained from the interviews and meetings with



key stakeholders across New Zealand's north island, including the Department of Conservation, Predator Free Limited, Predator Free Trust, and local government and other leaders involved in landscape-wide invasive species programs. I have supplemented them with reflections from my field notes. While not intended to be a comprehensive assessment of invasive species in New Zealand, this analysis seeks to provide a deeper understanding of the context of invasive species, explore the reasons and methods behind successful stakeholder collaboration, and unpack critical factors contributing to their success.

Telling the biosecurity story

Even before stepping off the plane in New Zealand ([see here](#)), I was struck by the significance of biosecurity in the country's inflight video. Unlike the stern warnings typical in other inflight videos, such as Australia's, New Zealand's approach seemed refreshingly different. It clearly outlined the required actions for arriving passengers whilst providing a broader context through compelling landscape imagery. This approach effectively turned biosecurity into a short story, emphasising the importance of preventing the introduction of alien invasive species, pests, and diseases. The video taps into the

emotional aspect of decision-making, often overlooked, reminding us of an obligation to others rather than just a duty.

This utilisation of emotional arguments aligns with literature (Chapman et al. 2017) suggesting that evoking emotions can be highly effective in creating behavioural changes. If one wishes to delve deeper, there is a wealth of research and case studies demonstrating how emotional messaging can significantly influence public attitudes and actions in environmental conservation and biosecurity.

Predator Free - a social change movement

To understand the management of invasive species in New Zealand, it's essential to start under the broad banner of Predator Free - which at its heart was described to me as a social change movement focused on the eradication of the most damaging pest. As a social change movement, various organisations are united behind the story of a predator-free New Zealand.

Predator Free 2050

Predator Free Limited is one important organisation leading the charge in the social movement. A government-owned company, Predator Free, was established



Towards a Predator Free New Zealand



Are you looking for inspiration on using a story in under 2 minutes? Hear the story of Predator Free New Zealand.

Another example of how stories are implored in New Zealand is through the Predator Free. Here is another compelling example, bringing in different voices to tell the story of a predator-free New Zealand - click this link https://youtu.be/hF8Z_JIZoj

in 2016 to oversee the country's ambitious goal of becoming predator-free by 2050. The company's mission is to develop and implement innovative solutions to control and eradicate invasive predators, such as rats, stoats, and possums, from New Zealand's mainland and offshore islands. Predator Free Limited works closely with

local communities, iwi (Māori tribes), and government agencies to develop and implement predator control programs. The company also invests in research and development for breakthrough science, new tools to make eradication possible, and proof of concept with large-scale predator eradication.



The Predator Free 2050 website, <https://pf2050.co.nz/>. Here, you'll find a wealth of information on this innovative organisation, including stunning visual stories of the importance of predator control to conservation, cutting-edge tools and techniques for controlling predators they have invested in, and an overview of their impressive large-scale projects.

The organisation's origins were relayed to me through understanding its national political support. Described to me as 'a bit of a long shot' and a nice to have by former Prime Minister Sir John Key. At this time, New Zealand was grappling with a biodiversity crisis, and the story has it that Sir John Key was asked if he wanted to be responsible for the extinction of the kiwi, due to invasive species. The program has now gone on to gain bi-partisan support across successive governments.

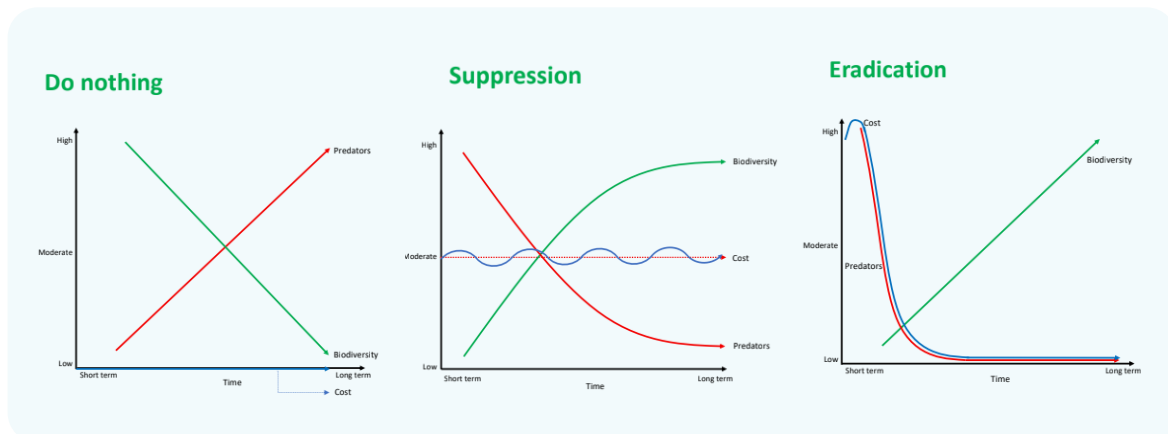
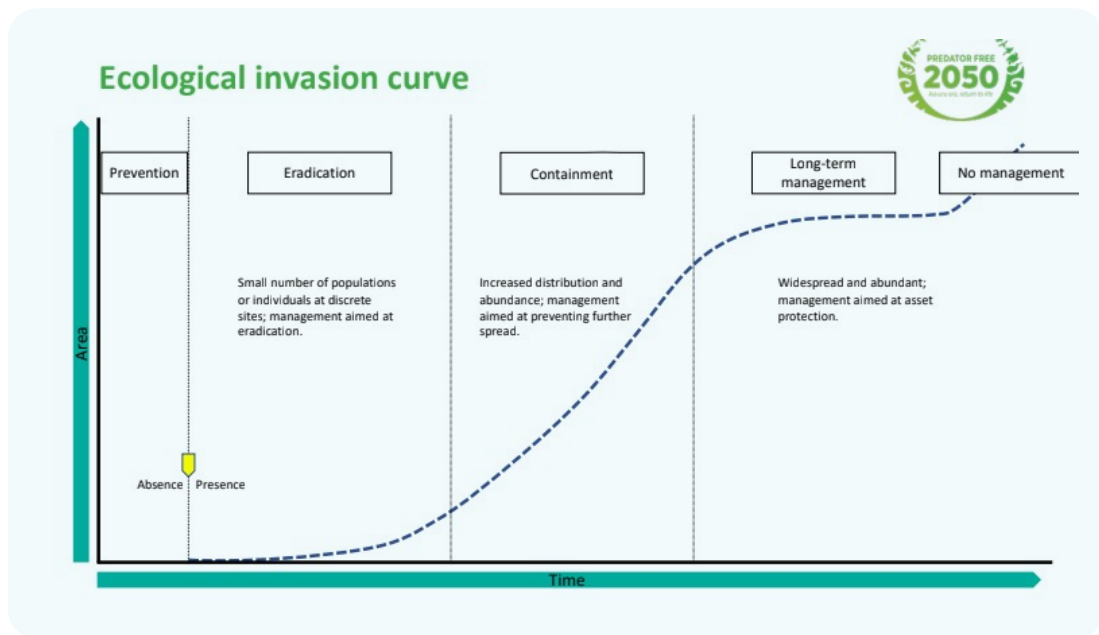
The Predator Free 2050 program is a crucial facilitator uniting various stakeholders to combat invasive species (predators), serving a practical purpose and inspiring through storytelling. The initiative sets a definitive goal of eradicating predators from Aotearoa by 2050.

The meeting with Predator Free 2050 staff highlighted several important themes. One of these was the invasion curve, a policy framework developed by the Victorian Government. The invasion curve has been globally recognised to explain investment in invasive species (and biosecurity). However, over my career, I have seen how this framework can justify inaction regarding established invasive species - they are too widespread to worry about, so *it's best we focus our action on the new and emerging*. Although there is a logic in focusing on keeping the next invasive species out - an ounce of prevention is better than a pound of cure - more is needed to respond to the challenges, with many local communities who want to take action on widespread invasive species despite stylised policy frameworks.

Predator Free staff explained how they have been successful in 'turning the

invasion curve on its head, a feat, they emphasise, that has not been achieved anywhere else. Why? They tell me that inaction will not lead to biodiversity recovery, and suppression and eradication are important. To truly protect biodiversity, continuous efforts are necessary. While the initial investment costs exploring, they decrease over time. This disruptive approach challenges some conventional logic in managing invasive species; as one member reflected, sometimes you need to prove that it can be done.... Being disruptive can put you on the outside. However, it takes time for collaborative approaches to grow and behaviours to change.

Sitting together as a group and hearing their approach, we were able to explore some of their insights in terms of engagement, which include:



- **Effective relationship management is crucial for successfully executing large-scale investments in invasive species.** When pressed on what partnership means, their Chief Executive explained that *many companies provide a check for work; our approach is working through the problems with the people.* This involves navigating challenges such as finding common ground and managing tensions between areas of expertise. Adopting this approach requires a commitment to building strong and enduring relationships.
- **The management of invasive species can create tension between technical expertise and practical action** - the modality for addressing invasive species needs to include scientific expertise, social science, and community expertise. Sometimes there is a rub between what invasion science says is achievable and what the community says is possible - with science being more conservative and community being more optimistic.
- **Invasive species management requires a multi-faceted approach considering the species' ecological, social, and economic impacts.** Technical solutions must be evaluated alongside community engagement and stakeholder consultation. Failure to consider these factors can lead to ineffective or unsustainable management practices. Therefore,

technical experts must collaborate with stakeholders and decision-makers to develop holistic management plans that balance technical feasibility with broader governance considerations. This approach can ensure that invasive species management strategies are effective, equitable, and sustainable in the long term.

- In explaining their engagement, they caught me with a catchy phrase, ***We are more ecotist rather than an egotist*** - being an ecotist for them was about finding common ground between different actors and helping people set aside their views and interests.
- **Enabling leadership and involvement** off all players is a priority.
- Finally, they related that trust is a primary currency - *something that you can't muck around with*, warning me that the quickest way to lose this currency is through what they describe as attribution theft - not acknowledging people for their contributions. *Attribution theft is a passion killer - if you don't acknowledge people, they won't want to work with you.... You are ever in doubt, give it to the community.*

Apart from their strategy and influence as a governance mechanism uniting people, what truly resonated with me about Predator Free was their focus on the human elements of engagement -



At the Predator Free office in Wellington



A possum trap located in a local reserve in New Zealand.

respecting and collaborating with others. This people-centric leadership, rooted in humility, is vital. Equally important is setting realistic expectations and timeframes for management interventions. Invasive species issues are not swiftly resolved; they require persistent efforts over many years for even modest progress. Community leaders must recognise the long-term commitment required, ensuring programmes are sustainable and continually evaluating their effectiveness.

Another exciting part of the Predator Free Trust is how they support innovation -- particularly investing in local businesses, who through funding, can develop new approaches and technologies to support the program, such as developing new innovative traps.

Predator Free 2050 Landscape-scale projects

Predator Free 2050 has initiated several large-scale landscape projects aimed at eradicating predators. These projects can be understood through the Ostrom framework, which views them as localised governance structures that unite various actors to deliberate, invest, and drive social and ecological outcomes in invasive species. However, I am conflicted as I have only scratched the surface of these

projects, and there is considerable lived experience that could be gathered. Nonetheless, I have attempted to extract some key highlights from the work.

Whakatāne: Power, agency and traditional knowledge

After my insightful time in Auckland, I journeyed south to Whakatāne, eager to engage with a local project spearheaded by Iwi. My visit to Korehāhā Whakahau, the first Iwi-led Predator Free 2050 project, was a pivotal moment in my journey. The project is , seeking to eradicate possums from 4,700ha of public and private land within the rohe of Ngāti Awa without using toxins. It is an ambitious project, with an equally dedicated program team. As their program manager describes, *“Our focus has always been people. It is the stand-out for the project. Amongst us, Maori is part of Whakapapa⁷ - that’s the most important. If you get that right, everything around it will fall into place.”*

During the visit, we engaged in a meaningful dialogue with the program’s representatives. We formed a discussion circle in their tearoom, where people joined in and shared their experiences. To ensure the accuracy in our report, we shared several edited versions of the conversation with the group. This section of the report

⁷ Whakapapa is a fundamental concept in Māori culture that encompasses genealogy, lineage, and the interconnectedness of all things

Restoring our island song together

Waiheke Island, a short trip from Auckland, you can find the Te Korowai o Waiheke, a charitable trust set up to eradicate stoats and rats from the island. (Waiheke Island is fortunate in that it has never had possums)



Te Korowai o Waiheke
TOWARDS PREDATOR FREE WAIHEKE

Funded through Predator Free 2050 Limited, Auckland Council and Foundation North., the charitable trust, is working with all parts of the community. While there are 117 predator free islands in New Zealand there are none with 9000 permanent residents. With 83% of Waiheke Island's 9200 hectares privately owned it is important to educate and inspire the community to get involved. There have been many volunteers involved in controlling rats on the island for the past decade.

One of the participants explains, "We have had many volunteer contributions to the programme, with the local retirement home building 700 traps, Waiheke High School selling trap kit sets to fundraise for their compost system...so many people want to be involved." The community is now not only engaged in the program, but also in biodiversity outcome indicators - the return of native birds not previously seen on the island. *"We ran a photo competition to see who could photograph the first kākāriki on the island and they are now spotted frequently. There is generally a strong connection to the land/environment for people who live on the island, and knowing that they are making a difference to future generations is really motivating."*

More information on Te Korowai o Waiheke can be found at <https://tekorowaiowaiheke.org/>

features direct quotes, intentionally chosen to reflect the collective discussion and the values underpinning it.

In locating invasive species management, the framing and history were necessary, and particularly viewing history through Te Ao Māori (Māori worldview) and Te Taiao (and the natural world). They explained, *The Ngahere (the forest) is a breathing living being and the child of our ancestors. The ngahere is our life source; it provides warmth, clothing, food, and shelter. With the introduction of a possum, it started to take away these important things, the mauri (essence - life force) out of the ngahere. So we are trying to put it in a state of the original forest. It's spiritual and a way of life - we believe Te Taiao.*

The group emphasised a key component of their program is about power, in particular the power of being an Iwi-led, they explain, *we have control in*

this environment to apply Mātauranga (knowledge or wisdom). They went onto elaborate Mātauranga, a lived science, our Mātauranga has been derived from generations of observations, noting things, and then doing things and seeing the response. That's our science. Ours is a lived science - not a paper-based science.

Listening to the discussion about this way of knowing, it became clear that a practical, lived experience passed through generations is invaluable, and it made me ponder how this intersects with Western science.. They went on to explain, *There is a saying, Te ao hurihuri; the world is always turning. We need to evolve too. While our ancient knowledge is valued, we must evolve with technology and western science. Drawing on this lived science, the group spoke about the importance the intersection of western science, We have to observe things and bring them back and discuss the observations, taking our*



Meeting with leaders of the Korehāhā Whakahau project.

knowledge and ‘muddle’ it with western knowledge and produce something new. We use western technology, such as data collection of pests in the field. That paints part of the picture. Then from our perspective, we are painting a perspective of doing as Iwi. When we can amalgamate them, we can start to see patterns. The values we hold as Ngāti Awa are what ultimately helps us navigate western science and Mātauranga. What do our values say when we get to an impasse or difficult point? Before you know it, we get clarity on the direction. They provide us with guidance. From a spiritual point of view - all our ancestors have given us that guidance.

When we discussed their engagement strategy and tactics for the program, they outlined how engagement is a process not only of education, but also of healing in the project. *There is a landscape of generations of hurt, mistrust, and systemic dismantling of our collective belief system. Some people are less understanding of where we come from and become defensive. It would be easy to go hammer and tongs at them. However, we need an engagement approach that is collaborative and collective. It would be much more*

efficient to bowl in and say your way is the wrong way, and our way is the right way. But look what happened to us. Rather, we are reversing it. Land that was taken from us, and we are going back in there and working with those landholders. We are often met with mistrust - are they (Iwi) coming back to take the land? Why are they trying to engage with us? But we need to make it work to get our ngahere back to what it was. It takes courage.

Given the project’s success, they were asked to work with another organisation to help them engage with Māori. In considering this, they considered how best to honour and reflect engagement on their terms. So, they offered to convene a Wānanga⁸. They explained, *This wasn’t about box-ticking engagement - it was the genuine and appropriate... an invitation to invite others to sit down - come and feel it. Come and lets us take care of you and have strong conversations in a safe space... When we sit in our value system enabled us to have this conversation - we have to be truthful - due north - everything has to have integrity.*

In finishing the conversation, the group asked to convey a message to whanau

⁸ Wānanga is a Māori term that refers to a traditional form of higher learning, knowledge transmission, and deep inquiry. It involves a gathering or session where knowledge is shared, explored, and discussed in a collaborative way. Wānanga encompasses a holistic approach to learning, incorporating not only intellectual understanding but also spiritual, cultural, and experiential elements.



Taurikura Anamata wānanga, Whakatāne

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Taurikura Anamata Wānanga

To learn more about the power of coming together, I would encourage you to see and feel the power in this short video which, in under 5 minutes, provides a moving account of the wānanga convened by Korehāhā Whakahau, bringing people together to build relationships and work across difference.

- The video can be found here - https://www.youtube.com/watch?v=5lpa_DWgMEw

(family) - Australia's first nations people, acknowledging we feel we are much further along than Australia, but we are still in a place of struggle. We look at our whanau (family) across Tasman and we are with you. We are working to get our Mana back to where it was. We understand.

A social movement program for the eradication of predators

Another landscape scale project is run in Wellington - I think their recent impact report tells their story, "Ehara taku toa i te toa takitahi engari he toa takitini - Our strength does not come from ourselves alone, our strength derives from the many." Their project leader brings a sense of passion and human-centric nature to his work as he explains to me that the program is about eradicating rats from the peninsula.

We really are running a social movement program that allows the eradication of predators to occur, this required to be betterment of the community to be involved, trust is essential - he explains, holding a local map of the area he is

working with. I love that idea - it speaks to the importance that this is, first and foremost, a human issue. I smile. He goes on, "it's the way it has to because you can't march into communities and say we are going to do this for you, and this is good for cause...well, they just say, nah. I am good thanks."

An essential part of their project work has been engaging all parts of the community in control efforts. The strength of the local partnership programs has been the depth of engagement that has occurred. "Trust. It's about the relationships we have to build, and in the first six months, that is what we did. We built relationships, talked to people, and finding out what's important." Central to this project was getting the whole community on board because their project officers needed to access the private property and lay down bait traps, one every 25 metres.

One of the challenges to engagement is acknowledging different socio-demographics and meeting people where they are at. One of the project

engagements is explained to me, “we rocked up at the door with our two-page brochure on what we are trying to protect... and some people are like, that’s choice... But I need to put food on the table.” After speaking to the families, they found that removing the rights in the ceiling was important as it disrupted their sleep. Sitting down, talking to, and understanding the problem through different perspectives increased participation. The investment upfront in engagement and the project has been able to clock up some impressive achievements - no rats pictures since October 2022, and local bird populations are soaring.



Predator Free Trust

Predator Free Trust, distinct from Predator Free 2050, is another important organisation in the Predator Free movement. Predator Free Trust is a not-for-profit organisation dedicated to eradicating predators from the country. The trust is staffed by a small team focusing on public education, community engagement, and social mobilisation to combat predators. As a non-profit organisation, it has the advantage of being adaptable and able to communicate messages that the government may not be able to convey.



The Predator Free Trust website (<https://predatorfreenz.org/>) provides some great examples of practical information for communities wanting to get involved in predator control and also a shop, selling bait stations, traps and other merchandise. One of my favourites here is their New Zealand Native Bird Poster - beautiful illustrations and also some practical classifications used to communicate how endangered species are.

Also, its worth checking out is their communications through their Instagram page (@predatorfreenz)

With a mission to eliminate introduced predators and restore native biodiversity, Predator Free Trust engages communities, landowners, and volunteers in implementing innovative predator control methods. Through trapping, bait stations, and strategic toxin application, they have successfully protected and revived threatened species, including kiwi birds. The trust’s collaborative approach, strong partnerships, and public awareness campaigns have garnered widespread support and participation. With a focus on community engagement and effective strategies, the Predator Free Trust exemplifies a successful model for achieving ambitious conservation goals and preserving New Zealand’s unique ecosystem.

Making conservation everyone’s business

A theme which I heard many times during my interviews in New Zealand, and with the trust was the importance of making conservation more inclusive. This is an area that the Trust is passionate about, their Chief Executive explains, *I mean it’s just mainstreaming of conservation, right? It’s taking it out of the preserve of hardcore greenies and saying actually this*



Checking a bait station in a community-led program in Wellington.

is something we all need to care about... How do you make it accessible to everyone rather than just the super passionate..... You know, it's like how do you make it that people can integrate into their everyday lives and feel like they are part of it and they've got an important role to play?

Similar sentiments were expressed to me during a local community project to control the rat population in a socio-demographically diverse peri-urban area. The project leader highlighted the changing demographic of the community and the difficulties in encouraging young people from various ethnic backgrounds to identify as conservationists. With great passion, he elaborated on the challenges faced, *Like most countries, conservation is an affluent thing, right? I believe that conservation belongs to the people... It doesn't belong to a government agency to define it, but the people..... It's green leafy suburbs associated with rich neighbourhoods, essentially. Yeah. And we had to go knock on these doors and this particular neighbourhood, which has really high cultural diversity, really high socioeconomic deprivation, schools, gang houses, things like that. And so you knock on the doors of these people with social housing.....*

He then articulated how the socio-economic challenges lead to innovative

practice (see here for an inspiring example with “Rat Man”, an ex-convict turned local hero, another example of storytelling, but also what is possible when we focus on the human dimensions of invasive species control.

Upon hearing these stories, I conducted my own research and uncovered a concerning pattern in community involvement in ecological projects, particularly predator eradication. The research by Hart et al. (2022) indicates that participation tends to be skewed towards white ethnic groups, individuals with higher education and wealth, and those who are middle-aged or older. Dr Shanahan’s research in Wellington suggests a link between economic advantage and engagement in ecological initiatives (Shanahan, 2020). These findings prompted me to reflect on the situation in Australia and wonder what our disparity rates are like. This realisation underscores the importance of inclusivity and highlights the need for social justice to be an integral aspect of programs involved in managing invasive species. Yet, such notions often need to be spoken about or considered when we design policies and programs.

Nested governance and facilitating institutions

After considering the New Zealand experience and examining the



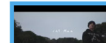
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If you have spare 17 minutes and want to hear an inspiring story of how rats have impacted locals and community leadership in this short documentary on the “Rat Man” illustrates the power of relationships in supporting in his local community - <https://vimeo.com/377680665>

various components of the Predator Free movement, it becomes evident that effective governance entails a collaborative approach involving national and local government, community participation, crown entities, and non-profit organisations. This form of nested governance supports a movement relying on a distributive form of leadership, where responsibilities are shared across the system.

The Department of Conservation’s leader, a systems thinker, expressed his views on the matter, *In this case we also have to develop the whole bloody system. So what’s the system for predator-free, how do we deliver it and then how do we look after it? We need to make sure it stays active and working.*

When examining this from a systemic perspective, it becomes evident that the government evolved from simply developing programs to manage invasive species. Instead, the government has taken on the responsibility of facilitating collaboration between various groups and supporting them in implementing their unique solutions. Additionally, in a system where multiple organisations are involved in different projects, there appears to be redundancy or what can be referred to as

systems resilience, as long as others are available to provide support.

Aside from the behaviours of those wanting to co-operative on this work, what I feel allows these different organisations to come together with a sense of hope, the stories they tell under the banner of Predator Free New Zealand, and the role of individuals and communities within that story.

2.3 Synthesis

When reflecting on the New Zealand experience, several key insights emerge from the Predator Free program, which goes beyond being a national initiative to remove predators. It has evolved into a social movement that brings collective change and engages multiple stakeholders in addressing invasive species challenges.

The program embraces a systemic approach, recognising that a coordinated effort involving various organisations and projects is essential for success. It leverages distributive leadership and nested governance, allowing different entities to contribute uniquely. Each organisation supports specific parts of the system, and each project is

tailored to address local needs and engage with the community effectively. This approach fosters diverse forms of engagement, unearth leadership potential, and encourages innovative solutions. Additionally, the program leverages broader system levers, such as funding local businesses to develop creative solutions. Government and other stakeholders play a supportive and stewarding role, sharing power with those most affected by the invasive species problem.

Storytelling is a powerful tool used at various levels within the Predator Free program. These stories go beyond merely narrating the removal of pests; they also build emotional connections and resonate with people by sharing personal and lived experiences. By incorporating diverse voices and perspectives, storytelling humanises the issue of invasive species control and inspires action. These stories help empower others, spark empathy, and foster social change. The narrative weaves together the efforts of communities, researchers, and practitioners, creating a compelling and united call to action.

Although not often associated with programs focused on invasive species, inclusion and justice play a crucial role in the Predator Free initiative. These principles are instrumental in fostering greater human-human interdependency and reinforcing the interdependency between humans and nature. By promoting justice and inclusion, the program ensures that all stakeholders, including marginalised communities, are heard and included in decision-making processes. Recognising the broader social and environmental implications, Predator Free aims to create a more equitable and sustainable future where the well-being of people and the natural environment are intertwined.

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Chapter 3

South Africa



3.1 Background

Like its colonial antipodean counterparts, South Africa faces significant issues with invasive species. Large areas of the country are marked by invading tree species, including wattles, pines, mesquite, and eucalyptus. Among these, over 200 Australian eucalypt species were introduced to South Africa for forestry growth trials, but they are now causing considerable disruption to the landscape (Le Maitre, 2016). When discussing invasive species in South Africa, the focus often centres around their detrimental effects on water resources, which can have far-reaching consequences for local communities and biodiversity.

Although South Africa is a relatively small land mass compared to Australia, I was often reminded of its abundant biodiversity in my interviews. Despite occupying only 2% of the land mass, South Africa boasts 10% of the world's biodiversity, which is unique and stunning. Whether it is the Proteas, one of the oldest flowering plants (which I also learned has the Fibonacci sequence), or the sheer mechanics of a giraffe, South Africa's biodiversity is genuinely remarkable.

The Convention on Biological Diversity (CBD) warns that invasive species are a key driver of biodiversity loss in South Africa. One of the most problematic is the Eucalyptus. Similarly, the invasive *Prosopis* tree has become a significant problem in South Africa's arid and semi-arid regions, consuming large amounts of water and out-competing native vegetation (Food and Agriculture Organization, 2021). Other challenges include the Black Wattle (*Acacia mearnsii*) and the Hakea (*Hakea sericea*), which have significantly impacted South Africa's biodiversity. These invasive species threaten the survival of many endemic species, such as the Table Mountain Ghost Frog and the Clanwilliam Cedar (South African National Biodiversity Institute, 2021).

The reporting of the Cape Town drought in South Africa in 2018 and the role of invasive species first piqued my interest in understanding the challenges of invasive species. Their well-known deep taproot system of Eucalyptus, which can extract water deep underground, suited to its native home in Australia, has devastated water security, compaction, and nutrition recycling in South Africa (Albaugh et al. 2013). Additionally, while talking to Birdlife South Africa, I was disheartened to learn their research where *Prosopis* had homogenised the landscape, reducing understorey and, with it, the native bird assemblage plummeting (Dean et al. 2002), and the challenges that Kruger Park - a UNESCO designated Biosphere Reserve was confronting invasive plants and animals.

South Africa boasts notable figures regarding invasive species management - from government, civic leadership, non-profit organisations, academia, and biological control expertise, mainly through their renowned Working for Water Programme. However, as with any country, there remain ongoing challenges and opportunities in invasive species management. One key challenge is balancing social, economic, and ecological priorities while maintaining effectiveness in management strategies (van Wilgen et al., 2022).

3.2 Insights

The following insights have been gained from the interviews and meetings with key stakeholders across South Africa. I thank Guy Preston for his assistance in organising my agenda and schedule. Notable conversations were held with the World Wildlife Trust, Birdlife South Africa, Department of Forestry, Fisheries, South African National Parks, South African National Biodiversity Institute, Endangered Wildlife Trust, and other civic and government leaders.



Outeniqua Alien Invasive Plant Clearing Project



This short video from World Wildlife Fund will give you a feel of the impact of invasive species on water, the intersection with climate change, and its impacts on the South African landscape, how they approach the issue through a collective lens - and involving some interesting funders.

The video can be viewed here;

<https://www.youtube.com/watch?v=TXET2fJuLd8>

While not intended to be a comprehensive assessment of invasive species in South Africa, this analysis seeks to provide a deeper understanding of the context of invasive species, explore the reasons and methods behind successful stakeholder collaboration, and unpack key factors contributing to their success.

Working for Water Program

As I was flying into Cape Town, staring outside my window at the seemingly sparse landscape below, little did I know that I was overlooking fynbos. Later that morning, during my visit to the World Wildlife Fund, I discovered the ecological significance of this unique ecosystem. Fynbos is home to a diverse array of plant species, many of which are endemic to the region, making it one of the world's most biodiverse floral kingdoms. Its role in regulating water flow and quality is vital, as the roots act like natural sponges, preventing erosion and aiding groundwater recharge. Unfortunately, invasive species such as Wattles, Eucalyptus, and Prosopis seriously threaten this delicate balance.

The Working for Water Program, a keystone initiative in South Africa established as a public works program to address water conservation in South Africa. With thirsty invasive species being a key driver, the program focused on their removal.

The program had its political origins in 1995, the beginning of a new administration under the leadership of Nelson Mandela: Kadar Asmal, former Minister of Water Affairs & Forestry. With a strong commitment to social justice and working with senior administration, the Working for Water program was born. The program was launched in 1994 in a *“politically inspired context”*, the new government's determination to make a difference and create opportunities. As one participant explained, *“We are employed to employee - reciprocity not just to the land, but the relationships and understanding the needs is a critical component for me of invasive species.”* In talking to people about the origins of the program, the social justice lens seemed to be the critical in developing the program - as one interview succinctly

described it, *its about doing things doing things for the right.*

Several important factors made the Working for Water program such a success. These included;

- Firstly, the program benefited from a lack of rigid bureaucracy, which allowed for efficient progress and a focus on cost-effectiveness.
- The leadership played a crucial role in modelling positive behaviours and embodying a spirit of servitude. One program manager said, “It’s about living what we preach.”
- Thinking about local situations and underlying local needs when developing programs, and then looking at local-level innovation (i.e. more than invasive species control, such as how we can turn this into a market opportunity).

Understanding local context

During the interviews, understanding the impact of invasive species on local livelihoods emerged as a crucial driver for conservation efforts—one example of this approach exploring market opportunities for value-added industries utilising by-products from invasive species.

During one of the interviews, I observed a local business pouring a concrete slab for a patio. The scene was filled with trucks, mixers containing various aggregates, and workers on wheelbarrows, all donning ‘Working for Water’ t-shirts. The interviewee explained that the company’s owner was a former employee of the Working for Water program who had taken the initiative to start a construction company. This company produced mixed cement using eucalyptus chips, which were by-products of tree removal. The resulting cement product offered a more affordable and ecologically sound alternative with



Working for Water

The Working for Water program in South Africa is a compelling case study in environmental and social justice initiatives. Inspired by the political vision of Nelson Mandela’s government, the program was established in 1995 to address the country’s invasive plant problem while simultaneously creating employment opportunities for marginalised communities. The program successfully cleared vast tracts of invasive vegetation by mobilising thousands of workers, often from impoverished backgrounds, restoring native ecosystems, and mitigating water scarcity. This integrated approach protected biodiversity and empowered individuals, alleviating poverty and fostering a sense of ownership and stewardship over the land. The Working for Water program exemplifies how environmental initiatives can intersect with social justice objectives to achieve sustainable and equitable outcomes.

strong thermal properties. This success story demonstrated how a program focused on invasive species management could foster economic opportunities, foster leadership and support local businesses.

Furthermore, I heard other inspiring stories of utilising invasive species by-products to create essential items for the community. For instance, by-products were used to build school desks and coffins, addressing critical needs during the peak of deaths caused by the AIDS pandemic. These initiatives showcased the potential of incorporating invasive species management into sustainable development practices that benefit both the environment and local communities.

By exploring value-added industries and creative uses for invasive species by-products, the Working for Water program addresses invasives and contributes to local economic growth and resilience.

Such efforts demonstrate the power of integrating conservation with livelihood opportunities, creating a win-win situation for environmental protection and community development.

An example of innovative solutions comes to light in the case of pit latrines, which often pose health risks, especially for children in rural areas who may accidentally fall in and drown. However, a new program is taking shape to address this pressing issue. This initiative involves utilising by-products from *Prosopis*, a woody weed species, to construct toilet blocks equipped with new flushing systems. By repurposing invasive plant materials, this project improves sanitation in rural communities and creates economic opportunities for local disabled young adults.

While these local projects are impressive, it is essential to delve into the underlying



Becoming an Enviropreneur in the Invasive Plant Biomass Economy

For those seeking entrepreneurial opportunities in the realm of biomass produced from invasive species, there exists a valuable resource that promotes such possibilities. The document titled "Invasive Plant Biomass Economy: Entrepreneurial Opportunities" provides insightful guidance and information to potential enviropreneurs interested in tapping into this emerging market.

This resource, available at https://www.dffe.gov.za/sites/default/files/docs/publications/inasiveplantbiomasseconomy_entrepreneur.pdf, serves as a comprehensive guide for individuals interested in venturing into the innovative field of invasive plant biomass. As invasive plant species pose significant ecological challenges, there is a growing interest in harnessing their biomass as a sustainable resource.



Flying into Kruger Park following heavy rains

reasons for their development. Upon reflection, a few ideas emerge when considering these examples, my personal experiences, and conceptual framing (Section 1.4). Firstly, investing in people networks not only facilitates environmental change, such as weed removal but also enables the exploration of other local approaches to address the issue. Secondly, programs led solely by government departments with a specific mandate of removing invasive species may fail to foster networks and tap into the innovation and ideas within local communities. The theory of change, explaining how interventions are expected to lead to specific development changes, must align with the realities on the ground.

To support these ideas' emergence and implementation, programs must recognise the importance of investing in capacity and being flexible to adapt to local conditions. Programs can flourish into various offshoots by allowing space for emergent ideas and innovative solutions. This requires courage and a willingness to step beyond established ways of framing the issue.

The program's founder discusses how the broader political environment also supported wider social outcomes, "When

we would take Carter (their Minister) and show them the invasives and talk about all the technical issues around it and biocontrol agents or whatever. The eyes would start glazing over, but if we're talking about a single headed household there, a person now was able to put food on the table and his or her life story and you know that they know the fridge was something that people really aspired to as an example. But you know, getting their kid into school, their own education things, those sort of human touch things".

Probing more on considering the importance of local-level context and broader outcomes, I probed a little deeper into leadership - he aptly summarised, "It's a sustainability thing right here. Whatever you do, make sure it works and make sure it's actually really needed."

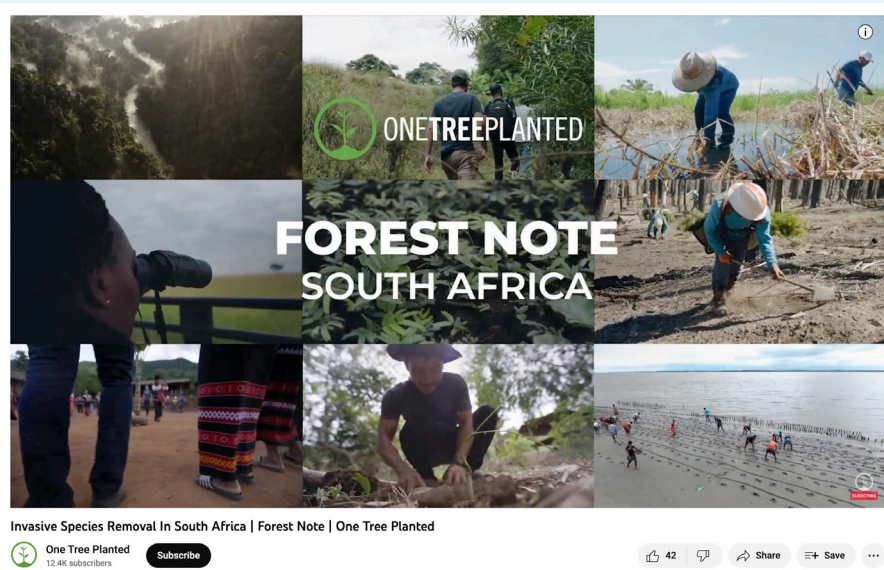
Sitting alongside a cohort of vibrant government leaders in Pretoria, the administrative hub of South Africa, they expand on their role of continuing engagement in invasive species and Working for Water "I mean highlighting that the issue of invasive species management is a collective responsibility for all that is involved." When pressed on why they are undertaking engagement, they expressed two aspects. Firstly, they

explained, “So it’s generally accepted that human beings are at the centre of much environmental change that we see particularly undesirable environmental changes. Yeah so that’s the reason why you see that you know it’s almost a no brainer that in all that we do {engage community}. They then went on to explain, “Secondly, which I think is one of your key questions around community-led responses is that if you look at the financial situation in South Africa, we can’t afford for the government to just pour all of its money and just do things on its own. So we need everybody to be involved, and that’s where you get to the state whereby we think communities can participate so that we can reduce the number of resources required.”

The second argument around cost-effectiveness is one I am familiar with in Australia. There is an acknowledgment that the government alone cannot resolve the problem, which can often be an unstated driver for community engagement.

Although I understand this, their first point is more critical in framing. Pointing to the notion that the issue is one of human-nature nexus, this should drive the framing of community engagement. Jumping to the argument on cost-effectiveness, we risk losing sight of the fact that it is fundamentally about people, which could lead to a fundamental distrust of engagement processes and not address the fundamental issue of the human-natural aspects of the challenge.

Another example of considering local context, and differing values was through programs in NGO’s, addressing both the ecological and social aspects with community. This was being done through considering ecological outcomes, water security needs and local communities. Prior to investing, programs would look to find the intersection of invasive species and threatened species, such as frogs, lizards, tortoises, insects, dragonflies, and butterflies, which require specific habitat



Repurposing invasive species in rehabilitation

This brief video, lasting less than two minutes, offers a captivating visual of Eucalyptus trees amidst the South African landscape. It also highlights a compelling narrative on rehabilitation efforts, with a particular focus on how biomass from invasive species is being utilized in this process.

The clips can be viewed at <https://www.youtube.com/watch?v=IZRqxxv6haYc>

types. Also considering into this mix was water security impacts being caused by endemic species. One of the program managers describes their work with an NGO which achieves both, “So those are the priority rainfall areas and that gives some sort of prioritisation in terms of where you should focus. And then there’s an overlay that goes over there that shows you where the alien invasive plants are within each of those water rainfall zones. So basically those colourful blobs make up 50% of the water supply for the country. So 10% of the land surface area provides 50% of the water. So that gives a very clear indication of where you should go in terms of securing water.

Drawing on this data, they then discussed how they then negotiate with the local communities, understanding their formal structures, local level politics and power, and being upfront about the project and how they can work together. In reflecting on these intersections, the conversation drifted to climate change, “the problem with climate change and we’re seeing a big time in South Africa is that it’s not so much that some areas are getting dry or some areas are getting wetter, it’s that all the areas are getting more rain all of a sudden and then no rain for a while and then all of a sudden it’s just making it more erratic and more extreme. Its having big impacts on the people.

Leaving this conversation left me contemplating the wider ecological systems in which invasive species occur - the confluence of issues such as climate change, food and water security. They cannot be separated into neat issues. They intersect and are influenced by each

other. Our organisations need to respond accordingly, with institutional architecture that considers the whole and the local, drawing on the technical and local experience.

Public spaces for education awareness

During my stay, I had the privilege of residing in Kirstenbosch Gardens, situated at the eastern base of Table Mountain. Apart from being home to a vast collection of rare and endangered plants, the gardens are also significant for their role in cultural events and education. One noteworthy educational initiative is the “Weed Exchange” program, established in 2006 to educate individuals about the weeds exported worldwide, particularly to Australia. Notable examples include the *Agapanthus* and *Watsonia* plants (both in my garden). Each plant is accompanied by a series of interpretive storyboards that explain the reasons for their success and the factors that fuelled their introduction. This initiative serves to raise public awareness about the issue of invasive species in South Africa and beyond.

Looking at this garden of ‘weeds’ and thinking about the one million visitors also expected, like me, that year to view the Kirstenbosch Gardens and the ‘weed exchange’ made me reflect on the important role public spaces can have on education. How places, such as zoos and botanical gardens, significantly preserve endangered species and can also promote public awareness and education of threats. In front of me was a practical example of this.



Leading from the middle, grounded in humility and passion

A recurring theme in the South African context pertains to leadership. The interviews showed a palpable sense of pride and devotion towards the country, its people, and its landscape. Despite its intangibility, this sentiment was challenging to articulate. In fact, in all the countries I studied, when I probed individuals about why they undertake their work, the interviews became emotional as they reflected on the significance of their efforts for their communities and future generations, and some, the importance of democratic institutions.

In South Africa, the foundation of the work was built on a strong sense of optimism emanating from the new political administration. Hearing the interviews, it felt like this hope enabled people to confront challenges with resilience and creativity. Reflecting on these stories prompted me to contemplate the various leadership forms that underpin these initiatives' success. Notably, the expression of passion is a crucial component of effective leadership. While it is challenging to summarise these encounters, this sub-text was evident in almost every conversation I had.

One leader of a large NGO reflected on why he undertakes his work *....it's altruism Mike that's what it is. You know. It's caring more about others than yourself. And you know, and as I said earlier, I didn't want to ever be put on a pedestal.... {we} must think what legacy one wants to leave....* He then went on to discuss how he viewed his leadership not as being the expert but as bringing people together and supporting them for their best work, imbued by a deep passion for his role in conservation and a belief that things can be better.

A former government official reflects on his tenure as an executive leader and the measures he implemented to elicit optimal performance from his team. *"I mean all of us. The extra miles we went through. Extraordinary. I would probably average 100 hours a week for 25 years..... Yeah, just driven by what we were trying to do and driven by things that don't work and then having to try to find ways of making*

the work." This form of passion and commitment can be seen in the people involved in the program - a dogmatic commitment to success.

Finally, there was one conversation that spoke to the history of leadership in South Africa, of the backs of many great leaders, *"I mean Nelson Mandela,Gandhi, you know, Archbishop Desmond Tutu. Individuals can make a difference*

Reflecting on the theme of leadership through the interviews, it was critical in effecting positive change. One that highlights the need for creating an environment that empowers others to lead and prioritises the needs of marginalised communities. One of the challenges is that invasive species may not be a community priority. However, such leadership requires a commitment to authorising and supporting others while ensuring that the voices of those often overlooked are heard. Ultimately, it is through such leadership that we can create a more equitable approach to addressing invasive species.

A must: Community, conservation and invasive species

Flying into Skukuza, Kruger Park, I was immediately greeted by the vast expanse of the veld as I landed at the airport. A unique journey awaited me: I had to be ferried through the bush and cross over what was once an old railway line, now transformed into a luxurious hotel, to reach the camp. This detour was necessitated by unprecedented rains that had led to flooding in the park, vividly illustrating the tangible impacts of climate change. This experience prompted me to ponder how we can better equip our communities to not only respond to climate change but also to its multifaceted impacts, especially considering the deep uncertainty and interconnected nature of ecological challenges like invasive species.

As I sat with the Kruger Park team in a meeting room with a view of roaming wildlife - arguably the best office backdrop in the world - we delved into the challenges and insights they face in managing invasive species. It's no surprise that Kruger, with its diverse ecosystems, contends with a variety of invasive species.

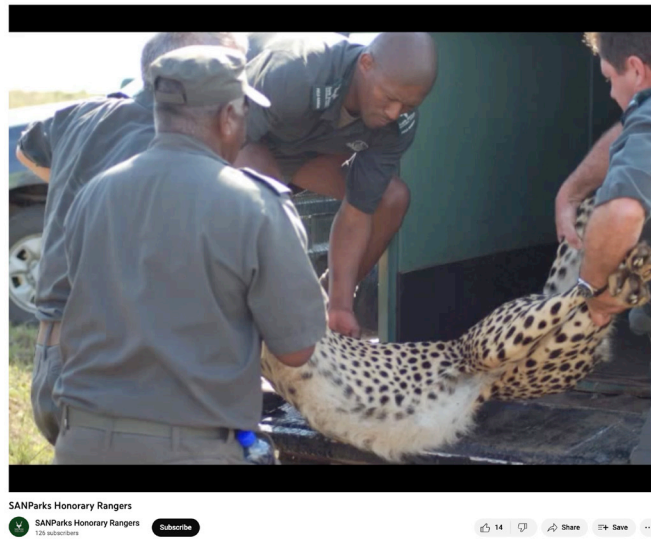


Their experiences and strategies provided a rich context for understanding the complexities of ecological management in a changing world.

Not surprisingly, Kruger has a range of invasive species, including parthenium weed, water hyacinth, Lantana, shot-hole borer beetle, Indian mynas, freshwater crayfish, tilapia, silver carp, and Tarebia snail. The spread of these species poses various ecological challenges, such as potential ecosystem changes, disruption of natural habitats, and negative effects on native flora and fauna. As one of Africa's largest protected areas, the park's vast size and limited resources pose obstacles to effective invasive species control.

We had a wide-ranging conversation on invasive species, and some of the key themes from the interview included

- **Navigating Public Perception and Politics:** Managing invasive species encounters varying opinions, with some groups opposing control methods due to animal welfare concerns. The influence of lobby groups, NGOs, and animal rights activists adds complexity to decision-making and hampers the implementation of effective control strategies. Striking a balance between conservation efforts and animal welfare considerations becomes crucial to gain public support and facilitate successful invasive species management.
- **The Power of Community Engagement:** Kruger National Park actively engages with local communities through community forums to address invasive species and conservation-related issues. While some forums have resulted in fruitful collaborations, others face challenges due to local politics and conflicting priorities. Understanding the needs and aspirations of neighbouring communities is vital in fostering a mutual understanding of the park's conservation objectives and building strong partnerships.
- **Shifting Towards a Community-Centric Mindset:** Historically, community engagement was seen as a peripheral program to appease neighbouring communities. However, there is growing recognition that conservation and tourism thrive on the support and cooperation of local communities. Placing community engagement at the forefront of conservation efforts can lead to sustainable, mutually beneficial outcomes. It is essential to empower communities and involve them as active participants in conservation initiatives.
- **Mitigating Risks of Protests and Unrest:** The high unemployment rate in the region and the perception of Kruger National Park as a potential source of jobs and contracts (for the removal of invasive species) create the risk of protests and unrest. Addressing community needs and



The Honorary Rangers Program

The Honorary Rangers program run by SANS Park is a notable case study in conservation volunteerism, including invasive species control and public awareness. Established in 1978, the program recruits and trains dedicated volunteers who contribute their time, skills, and resources to support conservation efforts across national parks and reserves - of which invasive species removal is a key activities. You can find out more about the program by visiting, <https://www.sanparksvolunteers.org/>

providing meaningful opportunities for employment can help mitigate these risks and foster positive relations. Building trust and transparency between the park management and local communities can contribute to a more harmonious relationship and cooperative approach towards invasive species management.

- Understanding the Bigger Picture: The discussion revolves around whether the teams working on conservation projects understand the larger conservation goals and the link between their efforts and the local community. It is essential to communicate the broader conservation objectives to ensure everyone involved understands the purpose and impact of their work. This awareness can enhance motivation and foster a sense of ownership among conservation teams and communities alike.

On reflection and reviewing my notes, the interview with the team at Kruger National Park has been an eye-opening experience, shedding light on the multifaceted nature of invasive species management on vast tracks of land. Their challenges faced by the park are vast and complex, however, they are committed. It made me think about how we can and should better engage our communities in Australia in conservation efforts on public land.

Also, the interview underscored the interconnectedness of ecological challenges, such as invasive species, with broader environmental and social issues. Engaging in transparent communication (which is often hard) building trust, and acknowledging the diverse perspectives are vital steps towards fostering a harmonious relationship between conservation teams and local communities.



The Cape of Good Hope, South Africa

Networks as platforms

Although often overlooked in evaluating invasive species programs, the impact they create through the networks and ideas generated is significant. Originally intended as a public works program, Working for Water, resulted in the development of capacity, knowledge, and innovative ideas within the networks involved. These ideas have inspired a series of other successful programs, such as Working for Wetlands, which focuses on erosion control, and Working for Fire, which provides fire awareness and education training to marginalised communities. As a result, these programs have created work opportunities for approximately 70,000 previously unemployed individuals, now actively engaged in environmental work.

In my experience working in government, I have realised that engaging with communities should not be approached with a predetermined and limited focus. Communities are dynamic entities, constantly evolving with new issues and ideas. Thus, effective engagement should recognise these broader influences and establish networks and platforms that can be leveraged to address future community challenges. Local community leaders often come up with innovative and interesting management ideas that may be outside current government policies or programmes. Sometimes, this may

require changes in laws or regulations. The best government leaders show flexibility and a willingness to modify policies that aren't working well. This approach helps develop trust within the community and strengthens engagement.

3.3 Synthesis

Although my time in South Africa was too short for my liking, it provided me with valuable insights, particularly regarding the Working for Water program and its remarkable success in addressing invasive species, social justice, and community capacity. Upon reflection, I believe several factors are responsible for the program's effectiveness.

Firstly, the absence of rigid bureaucracy allowed for efficient progress and a focus on cost-effectiveness. Moreover, the program's strong leadership played a crucial role, with program managers exemplifying positive behaviours and embracing a spirit of servitude. Their commitment to social justice and close collaboration with the local community were fundamental in developing the program, fostering trust, and understanding the specific needs of the region.

A highlight of the program was its innovative approach to repurposing invasive species by-products for economic opportunities. For example, utilising materials like eucalyptus chips to produce mixed cement not only cleared invasive plants but also contributed to local economic growth and sustainability.

Another crucial insight from the chapter is the importance of engaging local communities in conservation efforts. By understanding the impact of invasive species on local livelihoods and involving community members in decision-making processes, successful outcomes were achieved. The program's founder emphasised the need to invest in capacity-building and adaptability to local conditions, encouraging a sense of ownership and stewardship over the land.

Moreover, public spaces played a vital role in raising awareness about invasive species. Initiatives like the "Weed Exchange" program at Kirstenbosch Gardens served to educate the public about the issue and its impact, creating a platform for community involvement.

Throughout my experiences, the significance of leadership and passion emerged as recurring themes. Effective leaders were deeply committed to their role in conservation and empowered others to contribute actively. These insights offer valuable lessons for addressing invasive species challenges and underscore the importance of community engagement, creative solutions, and holistic thinking in conservation efforts. South Africa's successful initiatives can serve as a guiding inspiration for similar endeavours worldwide, fostering sustainable and equitable outcomes for both the environment and local communities.

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Chapter 4

Scotland



4.1 Background

Travelling through Scotland's landscape I was captivated by its beauty - walking across moors, heaths and standing by lochs and streams (looking at beaver dams), I felt a deep sense of awe. Leaving the southern hemisphere late summer and coming to the beginning of winter may have also shocked my physical sense too. Not as visual as large eucalyptus stands in South Africa, Scotland is battling with a less visible, mobile set of invasive species. They do also have invasive plants. Yet, the challenges and impacts are significant. The cost of controlling and eradicating invasive species in Scotland is estimated to be in the millions of pounds (Scottish Natural Heritage, 2021). For example, the cost of managing Japanese knotweed in the UK is estimated to be around £1.5 billion (BBC News, 2021).

The grey squirrel (*Sciurus carolinensis*) is a notable invasive species in Scotland - and one which was hard to spot⁹. The grey squirrel was introduced from North America in the late 19th century and has since become a major threat to the survival of the native red squirrel (*Sciurus vulgaris*). The grey squirrel has displaced the red squirrel through competition and the transmission of squirrel pox, a virus that is deadly to red squirrels but not to greys. This is a significant concern as Scotland is home to 75% of the UK's remaining red squirrel population.

Like many now problematic invasive species, American mink (*Neovison vison*) were introduced into Scotland for the fur framing industry - however, some minks escaped or were thought to have been intentionally released from fur farms, and establishing wild populations, Mink were described to me as, "a voracious and effective predator" in Scotland, impacting

on water voles (a riverside native mammal to Scotland) and one of the most threaten native mammals¹⁰. The point was effectively conveyed by the images of mink with blood around their mouths.

Managing mink is challenging due to their ability to rapidly colonise new territories, even in low population densities. They can travel long distances to find new breeding grounds, making it crucial to coordinate control efforts at a large scale. Further, as they hunt at night, they are not always visible to humans. Without proper coordination, controlling their populations is pointless as they will quickly recolonise the area. This sounds like an all-familiar story of rabbits in the Australian landscape, except that their population levels appear to be much higher. Also similar to mobile species, they can be elusive to the human eye, which often means that their impacts may be less visible to humans compared to a plant species.

On the plant front, there are several species causing major damage include [rhododendron](#) (*Rhododendron ponticum*), [Japanese knotweed](#) (*Fallopia japonica*), [giant hogweed](#) (*Heracleum mantegazzianum*) and [Himalayan balsam](#) (*Impatiens glandulifera*). These species have all had a significant impact on Scotland's native biodiversity, particularly along waterways.

Although considered native, rewilding efforts with the wild cat (Eurasian lynx) and beaver can be problematic, generating controversy between different user groups, such as Giles, farmers, and environmentalists. Further, animal welfare concerns are present - particularly in managing adult mink when they are feeding their young during certain periods.

⁹ This is not due to its abundance, rather that it is mobile and I am sure being cooler, they were not as inclined to head out.

¹⁰ <https://www.nature.scot/plants-animals-and-fungi/mammals/land-mammals/water-voles#:~:text=The%20water%20vole%2C%20or%20'water,those%20in%20England%20and%20Wales.>



Checking mink traps in Scotland

This strikes me as tricky, as protecting the welfare concerns of mink, but conversely, mink as predatory animals of native birds. Similar to concerns around the use of chemical and off-site impacts, increasing concerns around animal welfare will be another important driver for invasive species management, and a potential community to engage into the future.

Even with these challenges, there are some impressive programs bringing people together to address invasive species head-on. The Scottish Invasive Species Initiative, funded through the Heritage Lottery Fund and other partners, provides an important model to bring community and government together to raise awareness and undertake on-ground practical measures to address species - such as trapping and removing mink, and targeting giant hogweed and Japanese knotweed.

4.2 Insights

These insights have been gained through the various interviews and meetings I had, and I am grateful to Callum Sinclair for helping to organise the itinerary and connecting practitioners on the ground, through Nature Scot, the Scottish Invasive Species Initiative, and Saving Scotland's Red Squirrels. This section of insights on Scotland is not intended to be a comprehensive state of invasive

species. Rather, it is to outline what I heard through the conversions and meeting, and particularly exploring why and how programs have brought together different stakeholders to address invasive species, and to unpack insights and factors which have made this successful.

Scottish Invasive Species Initiative - bringing people together

When talking about invasive species management in Scotland, the Scottish Invasive Species Initiative (SISI) is a key starting point. Led by NatureScot, the government department responsible for conserving Scotland's natural heritage, the Initiative is a collaborative project that works with local organisations and volunteers to control invasive species. "What I found particularly interesting about the initiative was its funding through the National Lottery Heritage Fund. This highlights a crucial point: given the impacts that invasive species have on public good, exploring diverse funding sources beyond traditional government programs is essential. This approach is critical, as grants and government programs often have limited lifespans, typically spanning only a few years. Finding innovative funding solutions is vital to sustain community-led programs over decades, ensuring a more enduring impact in managing invasive species.

The SISI plays a vital role in facilitating collaboration and coordination among different groups to address invasive species management. Although it is housed within NatureScot, the program has its own unique branding, which no doubt assists with its positioning with the community to bring the different players together.

Despite being a small team, they are able to have a greater impact by strategically positioning themselves in areas where they collaborate with volunteers, community groups, schools, and work closely with local fisheries trusts and other boards. This approach of coordinating and facilitating was described to me as “*allowing us to maximise our impact.*” Reflecting on this point, and as you will read about the impact, spoke to their philosophical position on leadership - focusing outwards, rather than inwards. Working with and through a network allows the program to have significant and broad impact. This is evident in their control program with over 400 individual sites across Scotland under management, many with multiple species. This requires up to 470 plus volunteers a year.

A key challenge in terms of the sustainability of their program revolves around ensuring the transfer of responsibilities to land managers and landowners of invasive species control. This is a problem shared also with Australia, under the guise of shared responsibility.

Sitting down for a PowerPoint presentation near Balmoral Castle, with participants beaming in via Zoom from across Scotland, the team outlined their three-phased approach to invasive species management. The strategy includes:

1. Prioritising initial site control using contractors and staff, supplemented by volunteers and land managers.
2. As the infestation declines and becomes more manageable, shift the focus to those we have supported through training, equipment loans, and joint efforts.
3. Preparing ‘voluntary management agreements’ for land managers and owners to outline future control needs and establish agreed responsibilities.

Following this strategy overview, they presented a slide titled ‘Key to Success:

People, Communities, and Volunteers’, featuring images of individuals of various ages engaged in invasive species work across diverse landscapes.

Invasive species and ‘black holes’

Invasive species projects can become black holes, if you are going to move the dial and make progress, you’ve got to involve people

One recurring theme that emerged from the interviews was the difficulty of investing in invasive species control, often referred to as ‘black hole investments’. These conversations highlighted the challenge of demonstrating the impact of such programs, especially to funders who seek accountability for their investments. To this last point, one potential advantage of having external investment is helping people think through how we measure success, and its complexity.

One of the challenges we face in evaluating invasive species is the complexity and dynamism of the systems involved, both biological and socio-political. The biological aspect is characterised by uncertainty and unpredictability, such as the rapid dispersal of invasive species across a landscape through various pathways. Ostrom’s work helps us understand this as mobility, growth, and replacement rates.

Some of the areas of complexity the program was working through and how to demonstrate change and address ‘black hole investment’ include;



Scottish Invasive Species Initiative website (<https://www.invasivespecies.scot/>) provides information about invasive species, case studies, opportunities for people to get involved, and learning and training opportunities from school kids to angler groups.

- Failure to coordinate control efforts between neighbouring properties or along risk pathways. For example, if one property downstream successfully manages a large infestation of Knotweed, but fails to address the root cause upstream, the plant will continue to spread and cause ongoing infestation.
- If work is not continued over time, large infestations can be significantly reduced within one year (see photo). However, if the remaining infestation is not addressed in the subsequent years, the problem will simply return.
- Collecting a substantial amount of data, such as the quantity of weed removed, is crucial. Equally important is monitoring the transformation of the land, for example, from a river infested with weeds to a river that can now be utilised for other activities such as fishing or picnics.
- Short term investment: if one chooses to invest in short-term weed removal without considering the importance of maintaining relationships with those responsible for ongoing work, it may not yield long-term benefits.

Having metrics such as the number of species removed or the hectares affected by invasive species is not sufficient on its own. While these measurements provide some insight, they fail to capture the long-term impacts and the dynamic nature of invasive species control. It's crucial to recognise that simply quantifying removals, like in the case of deer control, doesn't necessarily equate to ecosystem benefits or improved societal conditions. Independent measures are needed to truly evaluate success. For instance, the effectiveness of a control programme isn't just about the quantity of species removed, but also about understanding the subsequent ecological and social benefits, such as reduced conflicts or ecosystem recovery.

Some of the challenges the program has been working through is building awareness of the problem, developing capability of people to control the works, and securing ongoing commitment from land managers to continue the effort. At the nub it was explained to me that *it {managing invasive} is a collective effort, and that sort of coordinating function is really key to projects in Scotland*. Yet, as raised, for collective effort to work you

lots of people engaged, as explained to me, *"We are a partnership project, we can only work with the land managers that give you approval... if we have someone in the middle {that won't participate} then we have a real conundrum, and {it raises questions} on whether we should still invest in that site.... You are almost appealing to people's collective and social responsibility..* This talks to the human dimensions of the issue, and if progress is to be made, the need to bring people into the process. As one participant described, *it's about equity... if you don't make that ask of them (landholders), they get free lunch forever...I don't think that's a sustainable model or a sustainable end point.*

When I reflect on this conversation and my experiences in Australia, I often feel that the coordinating and facilitating role is frequently undervalued, and under estimated in the impact it can have. I am unsure of the reasons behind this, but when I examine the Scottish Invasive Species Initiative and my experiences back home, I believe that the facilitating role - when focused on bringing people together, brings about the most significant return on investment, especially if we consider the legacy this can have over time.

Noting the previous point on equity and ensuring people aren't 'getting a free lunch' the program has been using Voluntary Property Management Plans to help formalise agreement with land managers to help secure greater social and collective responsibility. Initial work is done to help reduce the infestation, and train local people in the management process, investing in their capability. Drawing from this, property management plans are then developed, as explained to me *"Where we like putting documents {Voluntary Property Management Plans} in front of those landowners to say, here is what we have invested in your land, here is how the problem has shrunk. This site is smaller size. Here's an estimate of the time required to maintain the management will finish the job, and we want you to do it.*

These planning tools aim to establish expectations and norms among actors in the system. They not only focus on delivering ecological outcomes in the education of a specific invasive species but also contribute to social outcomes such as equity.



Hedribean Mink Control

During my visit, I heard from the leader of the Hedribean Mink Project, which is focused on eradicating minks from the Outer Hebrides. These islands, located off the Scottish coast, are home to a diverse ecosystem.

Launched in 2015, the initiative involves a collaboration between local landowners, conservation organisations, and volunteers. It employs a combination of trapping, monitoring, and public engagement activities. Through targeted mink removal, the project has successfully reduced mink numbers and safeguarded native species like water voles and ground-nesting birds. The project's success can be attributed to the strong community involvement, adaptive management, effective trapping methods, and ongoing monitoring to ensure the long-term preservation of the Hedribean Valley's biodiversity.

If scholars are interested in learning more about the project and island eradication, they can find a paper 'Large scale eradication of non-native invasive American mink (*Neovison vison*) from the Outer Hebrides of Scotland' [here](#).

Fostering volunteers networks and social sustainability

As outlined, ensuring ecological sustainability involves effectively managing invasive species by understanding their spread over time and determining possible outcomes, such as eradication or asset protection. Additionally, social sustainability is crucial in engaging land managers who bear the responsibility of controlling invasives and fostering volunteer networks.

Working alongside professionals, volunteer networks make a critical contribution to the control of invasive species in Scotland - this includes reporting sightings of invasive

plants, or minks, being involved in trapping animals, working alongside qualified staff in the on ground control of weeds, squirrels and habitat restoration. Driving between field sites, we were riffing on the volunteers in their program, *"Volunteers don't come for free and also, I think we've got to figure out why they're there. Their motivations are many, but almost right the way through it. They want to feel part of something and if that's something they perceive as abandoning them and walked away then they've not got that same loyalty again.*

This final point regarding the critical support needed for volunteers highlights a potential risk in community-led initiatives. When leadership is heavily reliant on just



Delivering a seminar at the University of Aberdeen

a few individuals, the entire program can become vulnerable. As noted, losing a local project champion or leader can cause rapid disintegration. This is a significant challenge in volunteer-led programs, where burnout is common. Even passionate individuals can only sustain their efforts for so long before life's other commitments take precedence. This reality underscores the need for broader support structures to ensure the longevity and resilience of such programs.

Post COVID-19 more effort has concentrated on building up a volunteer network, and appointing a volunteer officer, who has been helping to build a volunteer network through putting up posters in the village hall, knocking on doors of land managers, and using social media, and newsletters. The Scottish Invasive Species website has a specific section dedicated to volunteering opportunities ([click here](#)). Individuals can explore various practical volunteering options. These opportunities range from monitoring mink traps and reporting on different species to participating in habitat restoration projects. One aspect that stands out about this website is the pragmatic focus, and ease which people can be involved, making the entry costs low.

Walking through a local estate and looking for grey squirrels, their project leader explains to me the effort being invested in building their volunteer networks, We

spent a lot of money over the last seven years or so building volunteer networks to deliver grey squirrel control... we tried to step away from a lot of these and various groups no longer went on.

The volunteer network has played a crucial role in the program by collaborating closely with local Squirrel Project Officers, who are paid professionals responsible for trapping and ethically dispatching squirrels. These officers work alongside the volunteers to enhance their technical skills - such as running their own trap lines. She goes on to explain, *"You know, one of the things is to try and develop that sort of volunteer network and build those capacities by the provision of training and equipment and support and mentoring and all these things which are nice things to do, essential things to do.* One of the challenges is the lack of consistency in control methods, especially when the responsibility is solely placed on community volunteers.

One mechanism the team have used is a Community Hub through the Saving Scotland's Red Squirrels Program which supports volunteers by directing them to community groups, to enrol in volunteering, report sightings and technical resources (see box). Having paid staff was important in some areas due to the different capacities of volunteers, particularly in terms of the welfare implications of dispatching squirrels and



More information can be found on Saving Scotland's Red Squirrel website here, <https://scottishsquirrels.org.uk/> It provides good example of community reporting on sightings, and some well presented information on the program and what the community can do. The website also contains the Community Hub, and example of material to support volunteers.

running trap lines. *We're not going to find that that model is something that allows us to walk away. There are areas where we can, you know we've got groups that have really grown into that role and want to take that role and have the capacity to do it.* However, this may create some inequities of having paid and volunteers, which would need to be considered.

Invasive species as a conservation game

Based on my experience, I have noticed that some invasive species programs tend to focus solely on managing a specific target species. And this myopic focus can failure to account for the wider social, economic and ecological outcomes. This may also reflected some of siloed thinking in terms of evaluation of programs (see previous section on black hole investment). However, the Red Squirrel Program stands out as an example of a program that takes a different approach. Instead of solely concentrating on the negative aspects of controlling grey squirrels, the program's objective is to conserve red squirrels (predated upon by the greys) This objective may not be fully understood by everyone, and some individuals concerned about animal welfare, may feel uncomfortable if the program emphasises the need to kill grey squirrels. Nevertheless, the program has made significant efforts in building relationships and helping people understand that conservation sometimes involves the removal of certain species.

The Red Squirrel Program is an initiative dedicated to conserving and protecting the iconic red squirrel species in Scotland. Launched in 2009, the program is led by the Scottish Wildlife Trust (another key organisation in invasive species control) in partnership with various organisations and local communities. The primary objective is to combat the threat posed by invasive non-native grey squirrels, which outcompete and displace the red squirrels. The program employs a range of strategies, including extensive monitoring, habitat management, and the creation of buffer zones to prevent grey squirrel encroachment. Additionally, targeted grey squirrel control measures are implemented to reduce their population and allow red squirrels to thrive. The program has seen encouraging results, with red squirrel populations stabilising and expanding in certain regions. Ongoing community engagement and public awareness campaigns are crucial in garnering support and encouraging active participation in red squirrel conservation efforts.

Working with others to build their capability

Standing by the River Tay we are looking at a site which was previously infested by Japanese Knotweed (see picture below). The picturesque place features a village on one side, with a stone bridge connecting it to the town centre there is a charming local pub that looks incredibly inviting.

The project officer explains how they were able to work with the local Anglers Association, who leased one side of the river, and National Trust Scotland (NTS) how leased the other side. *"They hadn't been dealing with the problem because they didn't know how, and then eventually it got too difficult to deal with."* The species can be controlled manually, or chemically, through stem injections. The project officer goes on, *"both members of NTS and the Angling Association, were given training and pesticide application and in the first year it was a mix of our staff, members of both of those groups and volunteers that came and that helped to get all under control."*

Through bringing people together, the program has been able to support learning about the invasive species, provided

encouragement with locals who can see the infestation reduce over time, and importantly build local capability and relationships. She continues “*Since members of those organisations have trained they can then take care of the clean up work, yeah. However, with NTS and we’ve had a bit of an issue with them in that all of the staff we’ve tuned up have under contract. At the moment we are having to keep an eye on this.*”

Related too, but in addition to the capacity problem is the notion of what was actually possible - being able to demonstrate that through some investment up front, a lot can be achieved with this particular species, and also the importance of continuing to follow up over time to eradicate the species. This helps generate realistic expectations with the community, and also helps to demonstrate that follow-up effort is needed (see below).

Reflecting on this situation, I find it challenging to fully grasp the complexity of managing invasive species. It’s easy to look at a picture of Japanese knotweed and a clean river bank and assume that the problem has been solved. However, this simplistic view fails to consider the capacity that has been built and the time it took to establish the necessary relationships to achieve this outcome.

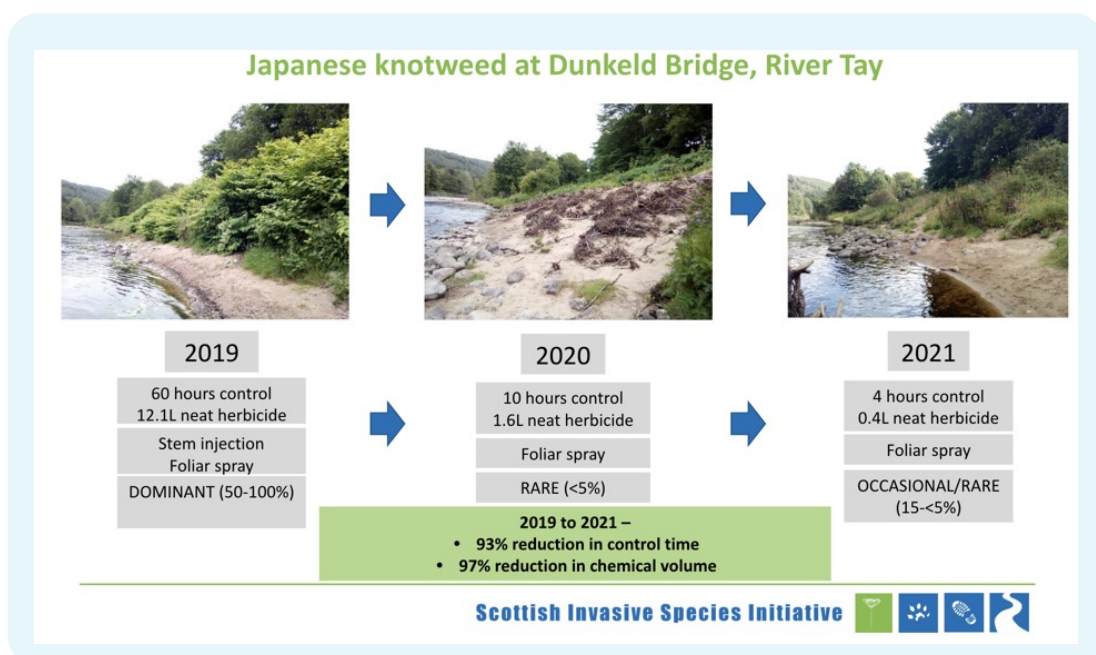
The Scottish Invasive Species Initiative has played a crucial leadership role in

addressing this issue. Their program has demonstrated the importance of building relationships and developing the necessary skills and expertise to effectively manage invasive species. It is essential to convey these complexities to the public and stakeholders, and to have evaluation metrics and frameworks that accurately capture the progress made.

Additionally, there are structural barriers that can hinder participation and subsequent restoration efforts. Limited financial resources and a lack of technical expertise can prevent individuals and groups from actively participating in invasive species management. Addressing these barriers is crucial to ensure that everyone can contribute to the restoration of affected areas.

Conflict resolution & ‘soft skills’ *Negotiating between the beaver and others*

Although not an introduced species, the re-introduction of beaver into parts of the Scottish landscape has been problematic. Walking across a farmers paddock to a small stream with growing beaver dam, the local project officer describes the beaver as “*a determined critter, his up there with the honey badger.*” Staring down into the beaver dam, which has recently caused flooding after a significant rain fall event causing some significant angst between landholders. She goes on describe their



determination, *“If you put a notch in the top of his dam (beaver dam) he will just want to fix it up.”* Looking around I can see how this beaver family handiwork, with recently planted trees (<2 years old) across the riparian zone, had been gnawed down and dragged to re-construct the beaver dam.

“There (is) definitely a group of farmers in this district that will never be totally happy (with the reintroduction of beaver) and I get it.” Staring at the dam you can see a ‘flow device’ that has been installed, taking water from the bottom of the dam into the creek.

The management of beavers is an interesting example because it generates various types of politics among different actors in the landscape. For example, fishing guides, known as Gillies, may have specific concerns about beaver dams and their impact on salmon runs and fish populations. The presence of newly gnawed trees in riparian zones also raises concerns about erosion and stream quality, as well as the potential for carbon sequestration. Additionally, there are actors who strongly believe in the rewilding cause. Although beavers are not considered invasive species, their case highlights how non-native species can create different political dynamics among actors within a system. It also demonstrates that environmental goals can sometimes conflict with each other. Therefore, it is crucial to have individuals who can bring these actors together, help them negotiate their differences, and accept competing outcomes. This will require people in government institutions to possess skills in building rapport and facilitating collaboration across diverse perspectives. There will likely be no definitive solutions and probably no consensus, but rather a reluctant acceptance. In the future, the importance of these ‘soft skills’ will continue to grow, especially when it comes to rewilding efforts, managing invasive species, and addressing sustainability issues on a broader scale.

Alien detectives - Education and awareness

Another really impressive part of the program in Scotland is the work they are doing in engaging young people in education and awareness through their

Alien Detectives Program. Through this program, SISI aims to educate and involve young individuals in the world of alien species detection and management.

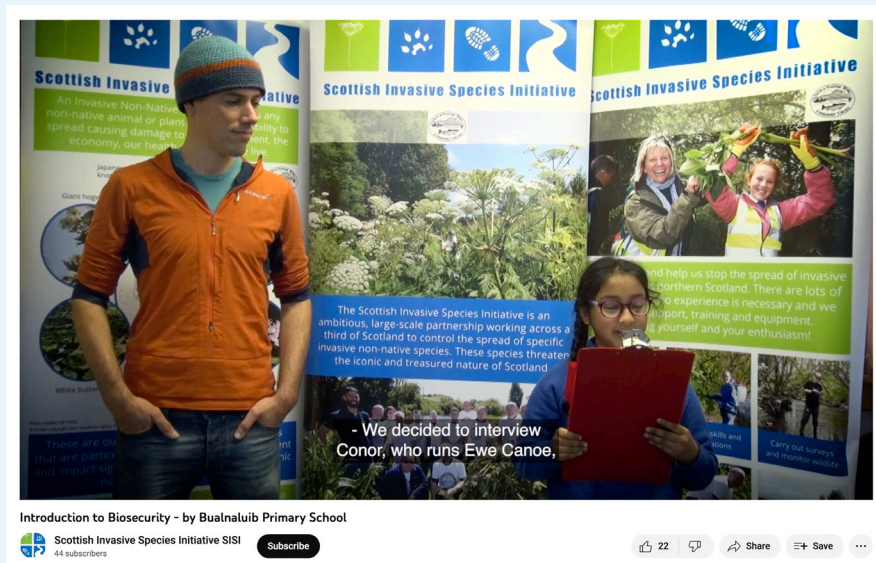
The program conducts interactive workshops and training sessions in schools, community centres, and youth organisations across Scotland. These sessions are designed to educate young people about the concept of invasive species, including the potential risks. The workshops utilise creative and hands-on activities to spark curiosity, critical thinking, and a sense of environmental responsibility among the participants. To encourage active participation, SISI involves young people in fieldwork and data collection exercises. Equipped with basic detection tools and guidance from experts, young detectives explore various habitats, monitoring for signs of potential alien species. This hands-on experience allows them to apply their knowledge and contribute to real-world scientific research.

A part of their program I found really inspiring was their film project. The program manager explains to me how difficult it has been when covid to deliver the work. Students are teamed up with a professional filmmaker, where they decide what film is going to be made, write their own story boards and tell their stories on invasive species and the impact on their environment.

Based on my experience in Victoria we found that younger people have often been left out of the development of policies and programs in invasive species. Programs like the Alien Detectives play an important role by cultivating a sense of ownership and responsibility for the environment, fostering long-term stewardship among the youth. Further, they help bridge the gap between research and engagement - showing young people that you don't have to be a scientist to make a difference - but also hopefully it can inspire future scientists too.

The Cairngorms: Balancing Conservation and Recreation

Nestled in the heart of the Scottish Highlands, the Cairngorms National Park presents a captivating case study in sustainable land management. Spanning over 4,500 square kilometers, the park's



A short film: Introduction to Biosecurity by Bualnaluib. An inspiring example of young people telling the biosecurity story through the lens of a superhero - <https://youtu.be/ELGMhz2tnAQ>

rugged terrain, ancient woodlands, and pristine lochs harbor a delicate ecosystem and centuries of cultural heritage.

Conservation efforts have been a focal point, with local communities, conservationists, and policymakers collaborating to preserve biodiversity. The reintroduction of native species like the Eurasian beaver and the capercaillie grouse stands as testament to this commitment. However, this idyllic landscape also attracts outdoor enthusiasts seeking adventure.

Striking a balance between conservation and recreation has become a cornerstone challenge. Managed paths and eco-friendly accommodations aim to mitigate the impact of the park's half a million annual visitors. Yet, the delicate alpine habitats remain vulnerable.

Innovative solutions are emerging, such as the implementation of a Cairngorms Connect project, aiming to restore vital peatlands and expand habitats. This initiative embodies the park's ethos of collaborative conservation.

The Cairngorms' story illustrates the complex interplay between preserving natural beauty, cultural heritage, and economic vitality. As the park continues to

evolve, the lessons learned here resonate globally: sustainable stewardship requires foresight, cooperation, and a commitment to safeguarding nature's treasures for generations to come.

4.3 Synthesis

In reflecting on the Scottish Invasive Species Initiative and similar programs, their accomplishments stand out, especially given their comparatively small size and resources relative to countries like Australia. The cornerstone of their success lies in their adept human-centric approach. Passionate staff prioritize engagements with diverse stakeholders: volunteers, paid personnel, and the youth. This ethos stems from a deep-seated leadership philosophy championing inclusivity, reciprocity, and capacity building as long-term solutions to invasive species challenges. Moreover, by reducing entry costs, they've made volunteering more accessible, boosting participation. Continuing to support volunteers is important and requires on-going investment.

Contrastingly, many in governmental roles, including myself, sometimes perceive community engagement as a mere buffer for budget constraints, an

arguably flawed viewpoint. The Scottish model, emphasising collaborative actions with communities, is not just inspiring but essential for tackling invasive species pervading our landscapes. Beyond mere species control, these initiatives foster social capital and advance rehabilitation, outcomes that are intrinsically valuable.

The notion of 'black hole investment' prompted introspection on the need for comprehensive evaluation frameworks, particularly those that integrate socio-political dimensions. Current metrics tend to oversimplify program impact, often quantifying success as the number of species eradicated from specific land areas. Simplistic theories of change, like disseminating a brochure to induce behavioral shifts, are prevalent but can be reductive. While these metrics may be popular, they often fail to capture the intricate nature of human behaviour and cognition.

Take, for example, the reduction of Japanese knotweed in a designated area. If we only assess the plant's decline at a given time, we overlook the reasons behind such a reduction and the agents of that change. Was it merely a contractor's efforts or active community involvement? Will the community maintain control, monitor for new infestations, and promote local awareness about curbing invasive species? Will they reintroduce native species to once-infested areas? Understanding local incentives and feedback is vital. How do we account for generational shifts, especially the younger voices envisioning landscapes free from invasives? Comprehensive

evaluation frameworks, factoring in these intricacies, are imperative, especially with endemic species where a definitive endpoint might not be evident. Such frameworks, taking into account broader socio-political contexts and sustainability, can more accurately represent a program's true impact.

This aspect becomes particularly crucial when tackling widely established species, where a clear end goal might not be evident. Considering the broader socio-political context, the long-term sustainability of control efforts, and the imperative of collective action is essential. The issue of scale is pivotal. While sufficient resources – both human and financial – can yield noticeable impacts in small areas, the real challenge lies in assessing the impact across larger regions or even at a national level. It's vital to develop programs that can be effectively scaled up, harnessing the power of collective action to ensure that our efforts translate into meaningful, widespread change.

4.4 References

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Chapter 5

United States
of America



5.1 Background

Coming into the north-eastern part of the USA, I was not only struck by places like New York City, but moving upstate, the beauty of their forests, and sitting on the doorsteps of the Adirondack, one of the first and oldest Forest Preserves, and the Finger Lakes region. Looking at the pristine beauty scared me of how much is at stake through invasive species, with the presence of some serious offenders like the Emerald Ash Borer (*Agrilus planipennis*), the Hemlock Woolly Adelgid (*Adelges tsugae*), and the Spotted Lanternfly (*Lycorma delicatula*).

The Emerald Ash Borer, for example, is a beetle that was first discovered in the US in 2002 - thought to be imported on a wooden pallet from southeast Asia and has since spread rapidly throughout the country, including in New York State. The beetle infests and kills ash trees, significantly losing forest cover and wildlife habitat in affected areas (New York State Department of Environmental Conservation, 2021). The Hemlock Woolly Adelgid, on the other hand, are small aphid-like insects that feed on the sap of hemlock trees, causing significant damage to hemlock forests in the eastern US, including in New York State (USDA Forest Service, 2022). The Spotted Lanternfly, a recent invader in the state, feeds on the sap of trees and has the potential to cause significant damage to orchards, vineyards, and other agricultural crops.

These invasive species, directly and indirectly, impact forest ecosystems, including altering forest composition and structure, disrupting nutrient cycling, and reducing biodiversity. These impacts also have knock-on effects - such as climate change, as forests are critical in carbon storage and sequestration. For example, the loss of ash trees due to the emerald ash borer infestation has reduced carbon sequestration (Dale et al., 2015).

Although not introduced, deer have also been problematic in different parts of the community. When in large numbers, over browsing can alter forest understory vegetation, reduce plant diversity, and impact wildlife habitat (New York State Department of Environmental Conservation, 2021); encroachment into peri-urban areas can cause angst, and their presence along motorways can pose a serious risk. Additionally, there is the significant risk of associated tick-borne diseases such as Lyme disease, Ehrlichiosis, and Babesiosis. These diseases add another layer of complexity to the management of deer populations and highlight the need for comprehensive strategies that address both ecological and public health concerns.

Managing invasive species in New York State is a complex and ongoing challenge, requiring collaboration among various stakeholders, including government agencies, conservation organisations, and landowners. One unique and important aspect about the USA coming in as an outsider was their extension system¹¹ - the cooperative extension services. Established in 1914; the cooperative extension service serves as a crucial bridge between public land grant universities and government entities. These services are vital in disseminating research-based knowledge to the public, such as on invasive species and biosecurity. By forming a collaborative partnership, universities and government agencies collaborate to provide educational programs and resources to diverse populations nationwide. These educators collaborate with government agencies, non-profit organisations, and industry partners to address specific regional needs and challenges.

¹¹ An overview of the Co-operative Extension program can be found here, <https://www.usda.gov/topics/rural/cooperative-research-and-extension-services>



Uninvited: The Spread of Invasive Species



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Uninvited: The Spread of Invasive Species

Uninvited is the most well-produced documentary on invasive species. To gain a deeper understanding of invasive species issues and the captivating landscapes of the region, I invite you to watch a short film titled “Uninvited” (approximately 50 minutes).

<https://www.youtube.com/watch?v=NKh8Lc31rm8>

This documentary showcases the stunning beauty of New York State while shedding light on the challenges of invasive species. Through this film, you will hear from experts and leaders who provide valuable insights into the impact of invasive species on the region’s ecosystems and communities. “Uninvited” takes you on a journey that unveils the ecological significance of the landscapes.

5.2 Insights

The United States, both geographically and socio-politically, encompasses a vast expanse of opportunities for exploration. During my visit, however, I had the privilege to concentrate my attention on the northeastern region, specifically around New York and Pennsylvania – and their inspiring winter-touched landscapes.

My insights stem from a series of interviews and interactions with participants from government and academia. While this exploration was not intended to be an exhaustive analysis, it proved to be a thought-provoking and inspiring final phase of my trip, offering glimpses into the diverse scholarship and practices embraced in this corner of the world. I am

grateful to Dr Paul Curtis, Mitchell O’Neill, and Caroline Marschner for their invaluable assistance in organising my itinerary and coordinating the enriching experiences.

iMapInvasives - good data for good decisions

Making my way from New York to Albany, I visited a cohort of experts working on invasive species as part of the New York Natural Heritage Program. What struck me with this group was their deep expertise and a real sense of passion and urgency for their work.

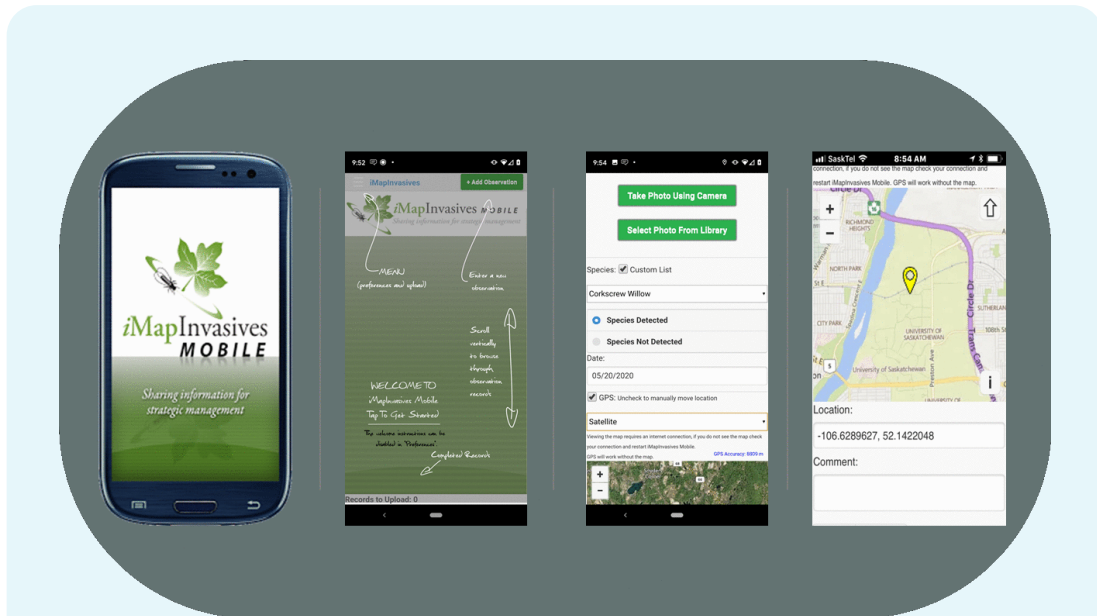
The iMap team (<https://www.nyimainvasives.org/>), part of the New York Heritage Program, are playing a critical role in bringing data to invasive species management, or as they

explained, *knowing that every agency has its spreadsheet, and there was a very intentional effort {to bring it together}.*

The online tool allows users to report sightings of invasive species and view distribution data. In the interview, they explain that the data input can be

from experienced biologists with more advanced knowledge who want to focus on a particular pest, trained volunteers or just your local citizen who wants to report something.

In another interview, a group of extension staff explained to meet, help in developing



Resources for some inspiration - check out this story map

Story mapping is a powerful tool that allows us to tell engaging narratives while harnessing the potential of spatial data. One inspiring example is the story map that highlights the impact of iMapInvasives in sharing invasive species data. This interactive platform lets stakeholders access and visualise crucial information about invasive species and their distribution, enabling better-informed decision-making and effective management strategies.

The iMapInvasives story map (<https://storymaps.arcgis.com/stories/4ea4876c3a2d4a16b9cbdf3ff8ffe4d3>) showcases how spatial data plays a pivotal role in understanding the spread of invasive species. Through interactive maps, images, and informative text, the story map takes us on a journey to explore the distribution and impacts of invasive species across various regions.

One of the most significant advantages of iMapInvasives is its collaborative approach. The platform encourages data sharing and crowdsourcing, allowing scientists, conservationists, and the general public to contribute vital information about invasive species sightings and occurrences. This shared data fosters a deeper understanding of invasive species' ecological and economic impacts and facilitates coordinated efforts in managing and controlling them.

Moreover, integrating spatial data in the story map enhances our ability to visualise patterns and trends related to invasive species. The interactive maps provide valuable insights into the spatial distribution of invasive species, helping stakeholders identify high-risk areas and prioritise management actions effectively.



Delivering a seminar at Cornell University, Ithaca

their work plan for the summer, and how community groups can use the data to develop their funding bids, and particularly to prioritise threats, *“you know, like if your species is in like the tier two or three, then you get more points towards your grant proposal than if it’s a well-established species like a Tier 4.* It also aids government agencies in responding to issues; *if a volunteer enters something you know of a particular species that’s a high priority, then state agency partners have signed up for those alerts, and they get notified; it helps the agency partners.*

The team explained how they run community training blitz programs to help communities - starting at a beginner level and then *gearing up* for people who want to get more involved in the in-depth features of the program.

iMap as a platform enables community involvement in establishing surveillance for early detection and rapid response to invasive species. One outstanding example of this approach is the Pennsylvania Natural Heritage Program, which has harnessed the power of iMapInvasives (<https://www.paimapinvasives.org/>) for community organising and engagement, effectively utilising gamification to create excitement and participation.

Through using iMapInvasives, they were able to focus on water chestnuts (*Trapa*

natans) showcasing the platform’s efficacy in addressing specific invasive species. Water chestnut is a species that is easily identifiable and, fortunately, relatively easy to eliminate when detected early. By involving the community in tracking and reporting water chestnut sightings, the Pennsylvania Natural Heritage Program has been able to respond rapidly and effectively to prevent its further spread. To read up on this approach, visit this [link](#).

Listening about their work, I was interested in why they do it - pressing this question, team reflects, *“Invasive species can be a daunting issue... they explain how easy for the community and others to feel overloaded, “it’s like, here is another invasive species, a fatigue sets in, and it is easy to get pessimistic - what do we do with all these challenges?”* iMAP provides a rallying point where it not only makes people feel good to record a species, but also it can inspire volunteer to get in work -and then also show that a species is no longer there.

Reflecting on iMapInvasives prompts me to consider the significance of data for invasive species control and the importance of data ownership and collection methods. Making the data open to the public and government has paved the way for a more inclusive and collaborative process, fostering collective responsibility among diverse stakeholders.



A reminder flying out of Los Angeles of the threatened species trade and the importance of messaging at our airports

By opening access to the data, iMapInvasives encourages greater involvement from various actors, breaking down barriers around who qualifies as an expert. This approach creates space for citizen scientists to participate in data collection actively, reporting invasive species sightings and contributing valuable information. It empowers individuals who may not have formal scientific training but possess invaluable local knowledge and observations.

The active involvement of citizen scientists brings fresh perspectives and insights to invasive species management. Programs like the Master Naturalist extension, which trains volunteers to recognize native and invasive species, play a crucial role in this process. These initiatives help create a cadre of citizen scientists, empowering many stakeholders to contribute to the collective effort in detecting and monitoring invasive species. This distributed approach to data collection not only fosters a sense of ownership and empowerment among individuals and communities but also transforms them into vital contributors in the fight against invasive species. More information about the Master Naturalist program can be found <https://blogs.cornell.edu/nymasternaturalist/contact-us/>

Furthermore, the collaboration between citizens, scientists, conservationists, and government agencies nurtures a culture of shared responsibility. It acknowledges that

invasive species management is not solely the duty of one entity but a joint endeavor that requires the combined efforts of all sectors of society. This collective approach strengthens the overall effectiveness of invasive species control strategies and increases the likelihood of success in addressing these challenges.

Human dimensions, research, and invasive species management

Cornell University has a long history of research in invasive species and is particularly interested in human dimensions. In the 1970s, Cornell researchers began to study how human behaviors affect natural resource management - they were on the cutting edge of what is now gaining greater acceptance - managing invasive species requires understanding humans too. Their scholarship has helped to bridge the gap between people and the environment significantly (provide a list of possible references), with a focus on the community engagement theory and working at the coal face with practitioners.

During my visit, I was fortunate to discuss the program's history, the scholarship, theory and practice, and the success and challenges of their work. As we sat in his office, light snow falling across campus, we could reflect on community engagement over his career. As I reviewed the transcript later, I felt it was too difficult to do justice

to this conversation, so I highlighted some points that resonated with me.

- 1. Expanding Problem Frames to better understand the human dimensions:** Human dimensions of wildlife management, or invasive species control are just as significant as ecological factors - the success of a program depends not only on technical solutions but also on engaging the community, building relationships and understanding the needs and values of different stakeholders.
- 2. It's more than the government can achieve:** Government regulation can be a blunt tool for managing invasive and/or native species (such as deer). They can fail to take into account the different impacts a species, such as deer (native), can have on different parts of the community, deer impacts are felt differently across urban (vehicle accidents) and rural areas (crop damage) versus social benefits (hunting). This can generate different sets of politics and power dynamics, and community involvement is necessary to negotiate. This will mean different perceptions around success, as different stakeholder groups have different perspectives on what constitutes success.
- 3. We need tailored approaches based on local conditions and local-level leadership.** Each community has a different socio-economic and cultural context, and having a local leader who understands the issues, has credibility, and is willing to take responsibility can be a key to success in sustaining the interest of time (as opposed to short-term inventions - see point 5). This can also be supported by co-management approaches with regulatory agencies - who can be resistant, however, in their experience, through good processes and community involvement, they can become more willing to collaborate and share decision-making power.
- 4. There is community engagement, and then there is community engagement.** Much of what many government departments frame as community engagement often engages at the surface level. Stakeholder engagement focusing on citizen participation and involvement in decision-making is a professional practice that draws upon

and moves between theory, structured processes, real-world experiences, and a suite of 'soft skills.'

- 5. Don't rush to solutions without understanding the range of possibilities, potential outcomes and associated costs.** Drawing from the above learning, we can often frame community engagement at a superficial level, which does not address the systemic causes of an issue and jumps to solutions. Investing upfront in a well-structured process, in which different perspectives are brought into the mix, where different forms of information and data can be discussed, consensus can emerge
- 6. Appeasement, consensus and consent.** There will be tension when we engage across different stakeholder groups with different interests. Sometimes as practitioners, we like to aim for consensus, but often that is not achievable. Sometimes, consent for a particular management approach may be the most feasible outcome.

Sharing and holding technical expertise in the community

Pulling up a chair in one of the offices with the extension associates, I delved deeper into the challenges surrounding forest biosecurity and its implications for forest ecology and extension work. The extension associate, who had just returned from taking samples in the forest, possesses extensive expertise in insects and diseases, having worked on Dutch Elm Disease, Fruit Fly, Emerald Ash Borer, and woolly adelgid.

Reflecting on his experience with the Emerald Ash Borer, he shared his experiences in the early days of the detection he was pressed by the need to begin to raise awareness of the seriousness of the threat; he explains, "*What I did was I created what we call what I called the Emerald dashboard task forces. And so, around the state, I engaged community people.*

These task forces were formed across the state and involved engaging community members and representatives from various government agencies and organisations responsible for managing natural resources. These meetings served as forums for discussing the issue, developing

The “Human-Wildlife Conflict Management: A Practitioner’s Guide” and the “Community-Based Deer Management: A Practitioner’s Guide”, produced by Cornell University is an exceptional example of applying scholarship and practical knowledge in the realm of wildlife management. This guide offers a fresh perspective on approaching and addressing wildlife damage, providing valuable insights for practitioners to engage stakeholders effectively.

By reframing the concept of wildlife damage, the guide encourages a more nuanced and inclusive approach to managing conflicts between humans and wildlife. It emphasises the importance of understanding various stakeholders’ diverse perspectives and interests, from local communities to conservationists and policymakers.

The guide offers practical strategies and tools that practitioners can use to navigate complex human-wildlife conflicts. By adopting a collaborative and inclusive approach, practitioners can foster meaningful dialogue and partnerships among stakeholders, leading to more effective and sustainable conflict management solutions.

What makes this guide truly remarkable is its ability to bridge the gap between scholarly research and on-the-ground practice. It brings together academic insights and real-world experiences, making it a valuable resource for those engaged in wildlife management and community engagement.

These guides can be downloaded at;

- <http://wildlifecontrol.info/wp-content/uploads/2016/04/Deer-Practitioner-Guide.pdf>
- <http://wildlifecontrol.info/wp-content/uploads/2016/04/H-W-Conflicts-Guide.pdf>

educational materials, and providing insights on how to deal with the situation and its implications.

Another extension associate later explains the importance of raising technical awareness, *“So it’s kind of a slow-moving train wreck, right? And as I think often happens with forest pests, we know it’s coming. We start talking to people, we do an early flush of education and then people don’t see anything happening for the next few years and are like whatever.”*

As the Emerald Ash Borer spread, these task forces became increasingly critical in fostering collaboration and communication among stakeholders. They provided technical information about the disease and served as platforms for stakeholders to come together, understand the impacts, and explore effective ways to respond to the invasive species challenge.

The notion of how we share and hold our expertise emerged during other

discussions with academic researchers and extension staff. This caught me off guard, and I found the notion interesting regarding how I may approach my work.

The experiences of extension agents working with communities that advocate for ‘no chemical controls for invasive species’ shed light on the importance of understanding and respecting differing perspectives. They emphasised the need to avoid dismissive approaches that can alienate individuals and hinder meaningful dialogue.

The extension agents acknowledged the historical context that has shaped these perspectives, referring to the influence of the Rachel Carson era, which promoted environmental consciousness and concern about the potential impacts of chemical use. Recognising the significance of this context, the agents highlighted the necessity of approaching conversations with empathy and respect. They understood that changing someone’s mind

requires more than scientific knowledge; it involves drawing from interpersonal skills and recognising the value of lived experiences and beliefs.

In my conversations with a forestry expert at Penn State, a similar sentiment emerged, emphasising the diverse ways expertise is held. Scientific experts may have specialised training and knowledge in their respective fields, while landowners possess an intimate understanding of their land based on their lived experiences. Instead of viewing these perspectives as exclusive or contradictory, the expert highlighted the need for a more inclusive approach that recognises the complementary nature of these different forms of expertise¹².

Creating openings for long-term management and sustainability of invasive species issues requires what the expert referred to as ‘thick’ interpersonal engagement skills. These skills involve building deep connections and understanding with stakeholders, fostering trust, and embracing the diversity of perspectives. By recognising the value of both scientific expertise and the insights derived from lived experiences, a more holistic and collaborative approach to invasive species management can be achieved.

Invasive fish and grassroots protection

Whilst in Cornell, I met with a fish ecologist whose projects focused on exploring invasive fish species and ambitious eradication efforts in waterways. Listening to his experiences in these projects, I was struck by the complexities of dealing with aquatic invasives compared to their terrestrial counterparts, largely due to the challenges posed by the invisibility of many aquatic species.

Over a cup of coffee and a warm bagel, our conversation delved into ecological and social systems - following on from a seminar I had given on systems approaches to managing rabbits. The ecologist shared an intriguing story about one of his researchers’ work on fisheries management in Thailand (see Koning et al., 2020).

Notably, the researchers could accurately discern local community interventions by studying fish richness, density, and biomass in the rivers. These indicators provided valuable insights into whether local communities were actively engaged in the management process, as opposed to relying solely on formal mechanisms.

Reflecting on this discussion, I realise that invasive species can often be viewed through environmental protection or productivity lenses, each perspective shaped by its anchor bias. However, the encounter with the fish ecologist underscored a crucial point: the significance of community institutions. This example served as empirical evidence, highlighting the central role played by community-driven initiatives in managing invasive species, transcending normative positions.

Partnership for Regional Invasive Species Management (PRISMS)

The New York Partnership for Regional Invasive Species Management (PRISMS) is a network of programs dedicated to addressing the threat of invasive species across the state. PRISMS are crucial in preventing, managing, and educating about invasive species in their regions. One of the PRISMS leads describes it to me, *“I think we’re like the circulatory system of information throughout. We don’t necessarily do all of the on-ground work, but we sort of are responsible for ensuring the things that need to be in place for successful work.”*

Comprising eight regional partnerships, PRISMS collaborates with various landowning agencies, NGOs, and local stakeholders to set priorities and develop strategies for invasive species prevention and management.

They work towards establishing effective partnerships that foster collective action in addressing the issue. Education is a key component of PRISMS’ efforts. They raise awareness about invasive species, their impacts, and methods for prevention through workshops, outreach programs,

¹² Here is a paper which provides further insight into this dilemma from a forestry perspective, Jamison, Abigail L., Theodore R. Alter, and Allyson B. Muth. “Expertise, Identity, and Relationships in Private Forestry Practice.” *Small-scale Forestry* (2023): 1-19.

and educational materials. By empowering communities and individuals with knowledge, PRISMS contribute to building a strong network of informed citizens actively engaged in invasive species management.

New York Invasives Species Research Institute

The New York Invasive Species Research Institute is a collaborative hub for scientists and researchers dedicated to understanding and addressing the challenges posed by invasive species in the state. Their mission is to connect invasive species research and practical applications to manage the impact of invasive species in New York effectively. The institute operates as a central resource that brings together experts from various fields, including universities, research institutions, and government agencies, focusing on evidence-based decision-making and interdisciplinary research.

One of the key roles of the institute is to act as a boundary spanner, bridging the

gap between different forms of knowledge, including academia, practitioners, and the community. By facilitating interactions among these diverse groups, the institute helps foster mutual understanding and listening, creating opportunities for co-learning and knowledge exchange. This approach allows the research conducted by scientists to be grounded in real-world experiences and needs, addressing the practical challenges faced by managers and communities dealing with invasive species.

An illustrative example of the institute's boundary-spanning efforts is its climate change project. It was initiated in response to managers raising questions about managing invasive species in the context of climate change. By bringing together scientists, networks, and practitioners, the institute facilitated the establishment of a community of practice that co-produced knowledge, developed concise and practical summary materials, and conducted workshops and symposiums.

This collaborative effort eventually grew into an 800-strong invasive species and

Useful examples - Adirondacks PRISM website - <https://adkinvasives.com/>

The Adirondacks PRISMS (Partnership for Regional Invasive Species Management) is a valuable website hosted by the Nature Conservancy, serving as one of the eight PRISMS websites.

The website is a hub for volunteers passionate about tackling invasive species issues. It facilitates connecting individuals and communities interested in contributing to invasive species management efforts. By offering a user-friendly interface, the website encourages participation from various stakeholders, including residents, conservation enthusiasts, and researchers.

Volunteers can access a wealth of resources related to invasive species management through the Adirondacks PRISMS website. These resources are designed to empower individuals with knowledge, tools, and best practices for addressing invasive species challenges effectively. The website offers comprehensive information to support volunteers in combatting invasive species in the region, from identification guides to control methods.

Moreover, the Adirondacks PRISMS website acts as a centralised platform for sharing information and updates on the area's current state of invasive species. By providing real-time data and tracking the distribution of invasive species, the website helps raise awareness about the urgency of the issue and the need for collective action.



Meeting with colleagues at State College, Pennsylvania

climate change network, born out of a people-first approach and consideration of the human dimensions of invasive species management. The success of this project demonstrates how connecting knowledge and know-how can lead to impactful outcomes. By acting as a boundary spanner, the New York Invasive Species Research Institute plays a crucial role in connecting scientific research to on-the-ground applications, ensuring that invasive species management efforts are informed by both scientific expertise and the needs and perspectives of the people directly impacted by these invasive species.

What struck me in learning about the Institute was the type of leadership that makes it function - the ability to be a boundary spanner - to connect knowledge and know-how. This comes through bringing together people, drawing different ideas across different networks, to be a futurist in leadership - looking forward and asking new questions. It seems these are all important leadership attributes.

5.3 Synthesis

During my time in northeastern New York, the first thing that struck me was the current and future potential risks it faced. The confluence of climate change and increased trade and travel were introducing highly invasive species into these forests, posing a significant threat to the delicate ecosystem. Witnessing this, I was reminded

of the interconnectedness of our world and how human activities can have far-reaching consequences on the environment. As I explored the area, I visited a local Maple Syrup farm with a vast network of small tubes connecting thousands of trees. Curious about the impact of climate change on syrup production, I asked the manager about his concerns. Surprisingly, his main worry was not climate change, but rather the introduction of pests and diseases to the forest. This highlighted the severity of the invasive species issue in the region and how it overshadowed even the implications of climate change on their livelihood. The ecological impacts of invasive species can vary significantly. Some may have minimal effects, while others may find natural predators that keep them in check. However, certain intrusions can potentially disrupt our production and ecological systems, which we deeply depend on for our well-being. Understanding and addressing these invasive species are crucial to safeguarding the delicate balance of these ecosystems and protecting the environment for future generations.

During my visit, I was struck by the significant importance and resources dedicated to supporting networks focused on invasive species management. These networks serve as a valuable platform that combines technical expertise from universities, government agencies, and non-profit organisations. Within these collaborative spaces, experts work



Returning home - flying back into Albury

together to raise awareness, develop support programs, and share the latest research, fostering a strong and cohesive network. One aspect that stood out was the emphasis on using technology like iMap Invasives to map and track invasive species data, enabling better decision-making and management strategies. This was about good data, and collecting good data was in the remit of scientists and government agencies and the community.

Finally, I was excited to encounter a wealth of academic scholarship in the theory and practice of community engagement in invasive species and

human-wildlife conflicts. Community engagement is often discussed in various contexts, but its application in invasive species management deserves greater attention. The scholarly work and practical experiences shared with me during my visit emphasised the need for a more comprehensive understanding of community engagement strategies. By focusing on the human dimensions of invasive species management and drawing upon this rich body of scholarship, we can develop more effective and inclusive approaches to address this complex issue.

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Chapter 6

Bringing it all together

“To improve is to change, so to be perfect is to change often.

I am always ready to learn although I do not always like being taught.



Winston Churchill

“Unless someone like you cares a whole awful lot, nothing is going to get better. It's not



Dr Seuss
The Lorax

In this chapter, I take a step back to synthesise the trip and its learnings. In doing so, I draw upon the insights from each country and incorporate frameworks, some philosophy, and personal experiences to facilitate a broader sense-making process.

My main goal in undertaking the Churchill journey was to deepen my understanding on community-led approaches to managing invasive species and delve into the human aspects of this issue. I sought to understand the local challenges related to invasive species, examine the various interventions deployed, and uncover the reasons behind their choices. Additionally, I wanted to explore how stakeholders navigate tensions and the role of professional practice and leadership. Along the way, I encountered different business models and programs, such as 'enviropreneurs,' iMapper, volunteering platforms, and the use of digital media, which sparked innovative ideas for potential implementation in Australia. And importantly, I gained a deeper understanding of the intricate human dynamics involved in this complex challenge.

Despite recognising the 'wicked nature' of managing invasive species, I often found myself yearning for a perfect process or solution, only to realise that none exists. This trip has reaffirmed this for me. It is a messy problem, but what truly matters are the human dimensions. Embracing different perspectives, interests, and knowledge is crucial in addressing this issue. It involves grappling with diverse stakeholders and coming together to deliberate on the challenges. Also, we need to be careful that it is not 'just talk' but fundamentally how coming together through social learning, which cumulates in changing behaviours, and ultimately leading to environmental change.

6.1 Change is the only constant

From a macro perspective, every challenge, including that of managing invasive species, is interwoven with the fabric of societal development. As change remains the only constant, navigating complex problems requires a deeper understanding

of multifaceted systems that shape our existence.

Our ecological and socio-political systems are always changing, and they have been since the dawn of time. We oscillate between continuity and change - with some periods more so to the later and the former. When I think about this, I reflect on warning on the Anthropocene and planetary boundaries (Rockström et al, 2009), and our interdependency on ecological systems and ourselves. Flying back into Albury after trekking through global cities and landscapes, I couldn't help but feel small. As I gazed out of the porthole, I was acutely reminded of the local changes unfolding before me - the river winding its way through the hills and the brimming local dam. Two consecutive wet summers had transformed the usually yellow landscape into a vibrant green, with growth that included some invasive species like St John Wort and blackberry. Just three years ago, the same route would have revealed a landscape scarred by intense fires. This ever-changing scenery is a product of the interplay between our economic, political, social, and ecological systems, influencing the presence of invasive species. It serves as a constant reminder that we are in a state of perpetual change, despite our attempts to predict, model, and control. Systems thinking underscores the dynamic and unpredictable nature of our ecological and socio-political systems - an understanding that the Traditional Owners and Custodians of the land have long embraced (Yunkaporta, 2019).

6.2 Beyond Regulation and Expertise: Understanding the Fluidity of Systems

Our modern institutions tend to treat everything in isolation, as if they are discrete entities disconnected from one another, often overlooking the profound interdependency between humans and nature and our interconnectedness.

While government regulations are crucial, they alone cannot eradicate invasive species – it's a complex challenge that demands more than just regulatory measures. Similarly, relying solely on expert assessments and reports with government consensus won't lead to significant progress. I don't mean to disregard these efforts; they are essential in raising awareness and securing funding. However, addressing invasive species requires a holistic approach. It's an ongoing challenge that cannot be adequately tackled in isolation.

The beauty of stepping out of one's own country is to be able to see your own experiences through a different lens, and observe how different countries, regions and communities establish different rules to organise themselves. In each country, I heard the desire to be able to learn what other countries are doing – Australia is well progressed in this work? You do things differently over there? They are hard questions to answer, and in truth, think we can all learn from each other. However, there are some conceptual and analytical framings that can help us better understand the challenges.

I am going to start by stating the obvious, but I feel it needs to be said: Behavioural change concerning invasive species is hard. In fact, behavioural change, in general, is challenging. Our deeply ingrained scripts, patterns, and habits make it difficult to adopt new behaviours. Behavioural economics reveals that we are not merely rational decision-makers; cognitive biases, heuristics, and emotional factors play significant roles, which can vary depending on situational contexts (Kahneman, 2017). Furthermore, insights from social cognitive neuroscience highlight underlying processes influencing our decisions, including mental models and feedback mechanisms (Snyder, 2016; Tarvis & Aronson, 2007). Understanding institutional economics is also essential, as it reveals how formal and informal rules, norms, and institutions influence behaviour, often leading to path dependency (our past choices shape future possibilities) and inertia (Schmid, 2004). Additionally, power dynamics and risk asymmetries further shape our actions and systems (Taleb, 2018).

These different lenses can help us step back, analytically, and conceptually to start to make sense of invasive species – standing back to make sense of the messiness. I have come to better appreciate how locked in (path dependent) my thinking has become in terms of community-led approaches to invasive species management, and how that limits my future thinking. It also raises some important questions that require further exploration: Do our institutional arrangements encourage collective action or support individual interests? How does bias affect the design and development of programs? How can deep listening, deepening relationships help foster new ways of addressing invasive species? In my experience, the organisations responsible for managing invasive species often prefer technical expertise within their government departments. Given these considerations, what is the best way to come together to address this challenge?

6.3 The promise of community engagement

This is where I believe the promise of community engagement offers some important next steps to bridge the gap between theory and practice. The challenge, as I see it, is not just about invasive species, but rather how we come together to discuss and address the issue. With limitations of top-down approaches to managing invasive species, bottom-up, participatory approaches offer viable alternatives. In the heart of these approaches lies community engagement – involving those voices directly and indirectly, with a strong incentive to find the right solutions and take an active role in research, planning, and actions. Additionally, I've noticed various levels of engagement, which reminded me of Arnstein's concept of "ladders of citizen participation" (Arnstein, 1969).

Looking across different countries, I've witnessed how engagement strategies have been applied, facilitated by adaptive management and radical leadership, where the focus is on empowering others and embracing diverse ideas. "Letting go of power" and redistributing it enables

people to be part of decisions about their landscapes and future, transforming invasive species from just a technical issue to a community concern. When done well, truly listening and bringing in different voices and experiences can challenge bias, and path dependencies.

The power of storytelling has been instrumental in showcasing local voices and fostering polycentric governance – where different organisations lead – has been effective in creating platforms for ongoing learning and environmental change. This approach enhances socio-political resilience through redundancy, meaning if one organization fails, others can step in to support the cause. Thick relationships and networks provide the foundation for continued learning, growth, and environmental change over time.

During interviews, I inquired about engagement strategies, and interestingly, no one had an explicit one. However, they emphasised the importance of engagement processes. While good engagement might be intuitive, I believe that developing a community engagement strategy for invasive species could add significant value, informing the development of programs and policies. There is a wealth of knowledge and experiences within each region that, when combined with scholarship on human dimensions, engagement theories, and social change, could lead to meaningful progress. Some examples outside of invasive species management, such as Project Drawdown (<https://drawdown.org/>) and the Carbon Almanac (<https://thecarbonalmanac.org/>), offer inspiration for presenting systematic issues like climate change through collaboration with diverse contributors, countries, and change-makers.

Despite all my experiences and learnings on this trip, I still consider myself an amateur in this field. Each interaction provides me with valuable lessons, and the journey of growth and learning continues.

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The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry, no matter how small, should be recorded to ensure the integrity of the financial data. This includes not only sales and purchases but also expenses and income. The document provides a detailed list of items that should be tracked, such as inventory levels, accounts payable, and accounts receivable. It also outlines the procedures for recording these transactions, including the use of double-entry bookkeeping to ensure that the books balance.

The second part of the document focuses on the analysis of the recorded data. It explains how to calculate key financial ratios and metrics, such as the gross profit margin, operating profit, and return on investment. These calculations are essential for understanding the company's financial performance and identifying areas for improvement. The document also discusses the importance of comparing the company's performance against industry benchmarks and historical data to provide context for the results.

The final part of the document addresses the reporting requirements for the financial data. It outlines the format and content of the financial statements, including the balance sheet, income statement, and cash flow statement. It also discusses the importance of providing clear and concise explanations for any significant fluctuations in the data. The document concludes by emphasizing the need for transparency and accuracy in all financial reporting to build trust with stakeholders and ensure compliance with regulatory requirements.