



National parks best practices: Lessons from a century's worth of national parks management

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ABSTRACT

While the importance of ecological conservation and encouraging public recreation in national parks is widely recognized, challenges to achieving these goals persist. With over a century of national park management experience, the institutional knowledge of national park systems in Australia, Canada, New Zealand, and the United States can offer a valuable insight into management best practices. Twelve open-ended semistructured interviews with national park experts representing the four systems revealed valuable lessons learned in major facets of national park management. Overall, our results suggest that effective and sustainable national park management requires federally-based organizational framework with deference to local institutions at park-level, stakeholder inclusion in park management decision-making, public engagement encouraged by information-sharing and education, clarity on boundaries to improve relations with adjacent land owners, and prioritizing improved indigenous relations. Interviews highlighted that better park governance is rooted in education to raise awareness of the importance of national parks and park systems to the public. Tourism and climate change were widely anticipated to increasingly pose challenges to park management, underscoring a shared urgency to address these issues.

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1. Introduction

The world is rapidly losing biodiversity through the degradation of ecosystems directly linked to land use change, direct exploitation of organisms, climate change, pollution, and invasion of alien species (IPBES, 2019). Protected areas are a key approach to global ecological conservation efforts and recognized as the most important way to protect species in their natural habitats (Chape, Harrison, Spalding, & Lysenko, 2005; Leverington, Costa, Pavese, Lisle, & Hockings, 2010; Watson et al., 2015). In 2010, the Convention on Biological Diversity (CBD) adopted the Aichi Biodiversity Targets to address the global loss of biodiversity through achieving specific national objectives by 2020 (CBD, 2010). Through these national commitments, both protected area coverage and protected area management effectiveness was expected to increase by 2020 (Aichi Target 11 [1]). However, a recent study estimates about half of the participating countries had little or no progress toward their coverage commitments, and about 86% of countries demonstrated little or no progress towards protected area management effectiveness (Buchanan, Butchart, Chandler, & Gregory, 2020). In response, the CBD is encouraging renewed national commitments through the preparation of a Post-2020 Biodiversity Framework (CBD, 2018). The recent COVID-19 global public health crisis has highlighted the importance of protected areas in both mitigating disease spread and addressing increased related challenges to human wellness. This global pandemic has been attributed, in part, to the loss of biodiversity in ecosystems (Platto, Zhou, Wang, Wang, & Carafoli, 2021).

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Human physical and mental wellness under the limiting restrictions of COVID-19 has been positively correlated with access to outdoor natural landscapes (Slater, Christiana, & Gustat, 2020). Furthermore, the economic implications of COVID-19 are expected to negatively impact support for protected areas (Sandbrook & Gomez-Baggethun, 2020). Given the increasing importance of biodiversity and ecosystem conservation, the effective management of protected areas is becoming increasingly essential (Bruner, Gullison, Rice, & da Fonseca, 2001; Watson et al., 2015).

With a growing global concern for ecosystem degradation coupled with a developing public interest in the recreational value of natural landscapes, national parks are widely regarded as the ultimate opportunity to support tourism while preserving ecosystem integrity. Yellowstone National Park is the first protected area to have been designated a national park (MacKintosh, 1985). Yellowstone was established in 1872 in the United States, and has served as a framework ultimately adopted by countries across the globe. Since Yellowstone's establishment, the United States and other countries now have over a century's worth of experience in national park management. Australia introduced its first national park in 1879 (Royal National Park), followed by Canada in 1885 (Banff National Park), and New Zealand in 1887 (Tongariro National Park). These four countries each have over 100 years of national park management, from which lessons can be learned on management best practices. The International Union for the Conservation of Nature (IUCN) has established a classification for several types of protected areas, including National Parks. Classified under IUCN Category II, the two primary objectives of national parks are to protect natural biodiversity along with its underlying ecological structure and supporting environmental processes and to promote education and recreation (IUCN, 2019). They now comprise approximately 26% of the total protected areas worldwide (UNEP-WCMC, 2019).

There is already a fairly substantial body of work pertaining to research on national parks, as well as park management. For example, Agee and Johnson (1988) compiled a comprehensive book outlining strategies for ecosystem management in parks, and Eagles and McCool (2002) have explored methods of managing for tourism in national parks. Many studies have also been performed to examine specific concerns or challenges in different national parks all over the world, and experiments with different management systems. These studies have focused on specific themes within specific park systems. For instance, many studies have investigated the tourism dimension of park management, including stakeholder perceptions, tourism capacity challenges, tourism development, and the quality of visitor experience (Haukeland, 2011; Schwartz, Stewart, & Backlund, 2012; Stokke & Haukeland, 2018; Wolf, Stricker, & Hagenloh, 2015). Other studies have analyzed the integration of sustainable development principles in park management (Mitchell, Wooliscroft, & Highman, 2013), the implication of varying population dynamics (Dressler, 2006), climate change adaption (Jacobs, Louise, Polly, Vandenberg, & Batten, 2018), and the implications of science-based management approaches (Lindenmayer, MacGregor, Dexter, Fortescue, & Cochrane, 2014). These studies have narrow scope, choosing to focus on particular physical or managerial features of particular national parks. For instance, studies have analyzed the management of specific water bodies within national parks (Rogers & Biggs, 1999) and the effectiveness of a specific environmental management plan (Taru, Chingombe, & Mukwada, 2013). Many of these papers use case studies of a single park within a park system to comment on broad topics, including development and biodiversity protection tradeoffs (Juutinen et al., 2011), the evolution of a country's park management model (Ly & Xiao, 2016), the practicality of a specific approach to conservation management (Van der Merwe, Bezuidenhout, & Bradshaw, 2015), and the connection between visitor motivation attitudes toward management restriction (Gunersen, Mehmetoglu, Vistad, & Andersen, 2015). Another earlier study has compared park management, however the study surveyed managers at the park-level, leaving out those managing the central national park system itself (Machlis, Tichnell, & Eidsvik, 1985). Major issues identified from this piece of work include the varied nature of threats to national resources, the undocumented nature of these threats, and the prominent threats through illegal animal life removal and lack of personnel. However, as environmental issues multiply and worsen at exponential rates, resources such as these are now somewhat outdated and incomplete in the challenges they summarize. Also, more importantly, these studies are solely based on one country's, or one continent's, experience with park management. Up until now, there is little to no work done that performs a thorough and comparative review of multiple, well-established national park systems. A review of how different well-established park agencies function at both the central and park-level is necessary to identify lessons learned that can inform better practices for the countries in question, as well as countries seeking to develop their own national park systems. This is the knowledge gap we hope to fill with our study.

The research presented here focuses on the dimensions of national park management in each country, analyzing where consistencies and divergences exist for challenges and successes of national park management. While analyses of national park management exist (Bruner et al., 2001; Campbell, Kartawijaya, Yulianto, Prasetya, & Clifton, 2013; Yahnke, 1998), they are quantitative and/or focused on a single park. In this paper, we report on the best approaches to national park management, comparing lessons learned between countries and across levels of management. We draw on interview data relating to national park management, as well as related documents (including management plans and park reports), to evaluate the challenges and successes of national park management. Using this information, we then identify general lessons learned and best practices that can inform future decision-making on park establishment and administration.

2. Methodology

2.1. Data collection

This study employed qualitative research to investigate different approaches to park management. Data were collected in open-ended, semistructured interviews with National Park 'experts' (Table 1). In order to evaluate a broad range of management practices at varying levels of park management, we chose experts from both the park level and the central agency level. At the

Table 1

Interview summary statistics.

Number of respondents				
	Australia	Canada	New Zealand	The United States
Central level	1	1	1	1
Park Level	2	2	2	2
Total	12			
Number of Questions	26			
Average Interview Length	75.4 min			

park level, we chose 2 managers from two different parks selected based on their years of operation and popularity. We included the first parks in each national park system, and paired with another park with similar historical relevance and popularity. We focused on the first national parks established in each system as they represented a baseline framework of management approaches informing the other parks. We chose the second parks in each system ensuring they were also established early in the park system development and that have high visitation numbers to ensure we were investigating parks that are well-established and well-attended. As operations at the central level facilitate national cohesion on policies and practices across parks, we chose to interview one from each system. In total, we interviewed 12 experts. The experts at both the park and central levels were carefully selected based on the extent of their institutional knowledge. This was informed conversations with administrative staff who sanctioned the expert that could best represent each department and agency. The quality of the interviewee's expertise and sample size was purposive to support in-depth investigation and to yield richly-textured information. Our sample ($n=12$) was determined appropriate owing to the depth and duration of interviews, richness of data rendered, and the complexity of the analytical task (Vasileiou, Barnett, Thorpe, & Young, 2018; Young & Casey, 2019). Upon expert reference, we reviewed public records including management plans and park reports mentioned by the experts to better contextualize their responses.

The countries involved were chosen based on maintaining over 100 years of experience in national parks management. Interviews were conducted over the phone as well as in person. Interviews recorded took between 54 and 146 min (average 75.4 min). Each expert had 26 identical open-ended questions posed to them, roughly divided into the following sections: Parks System Overview, Implementation, Financial Management, Governance; and Outlook (Annex A). The 12 interviews were then transcribed.

2.2. Data analysis

Interviews were conducted for national park systems in Australia, Canada, New Zealand, and the United States. We interviewed experts at the central level of park agency management of each national park system ($n = 4$) and experts from two national parks within each park system ($n = 8$). The transcribed interviews were formatted in Microsoft Word, including headings and paragraph numbers (NVIVO, 2021; Woolf & Silver, 2017). The 12 documents were then imported into NVivo (each made into its own 'case'), and auto-coded by Question. Answers were also separated by Parks level and Federal level, and by country.

Each question was then analyzed using a quantitative thematic analysis approach. Thematic analysis (TA) is defined as the "method of identifying, analyzing and reporting patterns of meaning ('themes') within qualitative data (Clarke & Braun, 2017). Using TA, initial codes were generated by picking out significant comments or pieces of information from each expert's answer. These were put into an Excel spreadsheet in a single column (Bree & Gallagher, 2016; Meyer & Avery, 2009). These comments were then analyzed to assign main thematic areas (Bree & Gallagher, 2016; Nowell, Norris, White, & Moules, 2017). Similar responses (e.g. sharing words or phrases, expressing similar sentiments (Crocker, Besterman-Dahan, Himmelgreen, & Castañeda, 2014) were then categorized into these themes, and frequencies were recorded (including the proportion of federal level expert comments and parks level). Some questions required multiple rounds of analysis, combining similar themes or separating one theme into two if small but critical differences were observed. This method of TA—allowing themes to emerge from within the data itself and coding the comments according to these, as opposed to leading, predetermined questions—ensured no observer bias or preferential coding (a benefit also noted in Charmaz, 1990, and Crocker et al., 2014).

Once these main themes, and their associated frequencies, were collected, the results were used to answer related questions (for each interview question) as well as inform meaningful trends in the data that would help to answer the research question.

A shortcoming of this method was the use of primarily one researcher analyzing the data, as opposed to having multiple researchers triangulating and processing the data using identical methods. Also, as with many methods of qualitative analysis, researcher bias is high as analysis depends on interpreting language. However, using a coding framework continues to receive more and more credibility as a qualitative analysis tool (Nowell et al., 2017).

3. Results & discussion

The major themes that emerged from the content analysis of the semistructured interviews are described below, organized by research sections of the questionnaire. The findings are illustrated with direct quotations from participating national park experts.

3.1. Park system overview

3.1.1. Organizational structure

The first part of the questionnaire asks each expert to contemplate the main guiding principles and operational policies for establishment of their national parks system. The top 4 principles are listed in [Box 1](#), in order of frequency (in brackets).

In terms of organizational structure and dominant agency, the countries selected for this study run their parks services, by a noticeable majority, under federal level agencies. The only country that places the majority of their national parks under State supervision is Australia—though one expert did comment that “[they] still do work closely with the feds, especially on overlap[ping] areas of management].” In Australia’s State system, ‘Branch Directors’ have a high degree of decision-making power, and State offices in Australia also have authority over protected area designations other than national parks. It was noted by one parks level expert that a downside to this structure is that “sometimes States become too polarized without a central federal forum”.

Canada, the United States, and New Zealand experts all clearly describe their parks as being under federal authority (with Canada appearing to be the most centralized, based on interview data). No disadvantages were mentioned by experts, and there was one notable quote from a United States expert, commenting that “[because of centralized federal system], everyone understands that shared federal purpose of national parks”. It was also noted across answers that because of belonging to a federal umbrella, cooperation was accessible laterally across all agencies who work on general environmental issues. In terms of the degree of collaboration that occurs, all countries had at least one expert mention collaborations between direct park management groups or staff and other parties. The most common collaborations mentioned were other government agencies (Environment, Marine, Tourism/Business), non-government organizations (NGOs), and Indigenous groups.

For experts in the United States and New Zealand, collaborations were dictated by unit/region directors. One notable quote from a United States expert: “Lots of collaboration, especially on the landscape level, because it is understood that no unit is big enough on its own for biodiversity”. However, it was noted by some experts that a significant proportion of collaboration is only utilized ‘when needed’ due to ‘shared’ concerns—such as cross-boundary issues—and that these types of collaborations can be challenging, and time-consuming.

It is clear that most experts considered the protection of natural areas to be a priority, followed by stakeholder support and recreational opportunities ([Box 2](#).) Despite the need to systematically integrate the varied needs of multiple stakeholders, the only formal integrated management frameworks were mentioned by United States experts. In the United States, committees, specifically joint management committees, have been formed in the past for specific issues that concern more than one agency. These committees would sometimes even demand the construction of an integrated management plan. For example, a joint management committee was formed for recovery of grizzly bears in Yellowstone National Park.

3.2. Implementation

3.2.1. Establishment of a New Park

The stakeholders recognized by experts varied ([Box 3](#).) and the importance of gaining stakeholder engagement and commitment was evident across all interviews. The major theme that arose from the data related to stakeholders and their involvement in establishment or management of national parks was that ‘part of park planning is commitment to consult’ with all groups related to park decision-making. Some countries have incorporated ‘obligation to consult’ into their National Park Acts, often taking the form of round tables inviting local indigenous groups and public representatives. Multiple experts expressed an understanding that resources and/or biodiversity extend across broad landscapes, and as such, park management plans take collaboration into account as a key aspect of effective management. Experts from Canada, the United States, and New Zealand stated that any changes or updates to park management plans require consultation with stakeholders.

*Notably, outliers in the answers also mentioned local tourism groups (including industry) as an important stakeholder.

Regarding the establishment of parks or changing park boundaries, the majority of the experts stated that the boundaries of their parks have had little to no change since their establishment. However, two key themes arose from our data. First, that any additional land added to national parks was almost exclusively purchased by government agencies at market value. Some

Box 1

Question 2: The 4 principles in experts’ answers are listed below. It was noted that 3 and 4 were more heavily represented in federal expert answers, and 1 and 2 in parks level experts.

1. Public access/recreation (7)
2. Protection of natural resources/ecological integrity (6)
3. Education and involvement of public (5)
4. Policies derived from federal Acts of some kind, or management plans (4)

Box 2

Question 3: The top factors to be considered when establishing a new park are listed below. The two most common (1 and 2) were evenly split between the two levels of experts.

1. Identify aspects that need protection and provide sufficient prioritization and area (6)
2. Representation (6)
3. Public support (4)
4. Clear communication and support from partners (indigenous) (4)
5. Government system support/approval (3)
6. Recreational opportunities (3)

Box 3

Question 6: Who are the stakeholders involved in establishing national parks, and what is their involvement? (From highest to lowest frequency)

- Public citizens/lobby groups (12)
- Local government (11)
- State or provincial governments (9)
- Local indigenous groups (8)
- NGOs (7)

land purchases are prompted by pressures of lobbying NGOs or groups. The only country that mentioned land being added via donation was the United States. There were no comments that implied any forced acquisition of land.

It was also apparent from the experts' comments that establishing or adding new land to a national park is widely perceived as a lengthy, consultation-heavy process—one expert cited negotiations can take up to a decade. Changing the boundaries of national parks has the potential to impact a variety of stakeholders; consulting and then coming to agreements with all the various groups involved requires patience and diligence.

One of the common tactics to 'stay informed' with developments in the availability of land was the presence of rangers along the park boundaries. Some parks commented that their rangers have friendly relationships with the park's 'neighbors', and communicate regularly, meaning they become quickly aware of any land around the park that may become open for purchase.

Ranger patrols also fulfill some of the management needed for the boundaries between surrounding landscapes and national park land. No park in our data had clearly defined 'buffer zones' around parks—at most, some cited legislation in surrounding areas that dictate certain activities, such as a minimum distance to a national park where you may light a fire. Interestingly, some experts commented that a benefit to having other national parks nearby was helping to keep boundary issues to a minimum.

By far the most common issue emerging from this section of the interviews was 'engaging with park neighbors'. Maintaining clear boundaries and managing for effects that cross park boundaries requires communication with citizens surrounding the park—one expert commented: "it is a PR [Public Relations] issue". Some experts expressed concern and even frustration over the lack of sympathy or cooperation that can come from surrounding neighbors who share differing perspectives. Many biodiversity concerns also require increased connectivity across the landscape, including off parkland. A commonly recognized challenge throughout the interviews was building collaborative relationships with the general public around the park. However, experts also demonstrated a shared understanding of how vital these collaborations are to effective management.

Interestingly, one expert also shared that "boundaries in general can be debatable because of badly written treaties with indigenous people".

3.2.2. Indigenous communities

In terms of displacement, every country except New Zealand had at least one expert who acknowledged that indigenous people had been displaced from park land upon establishment of national parks. However, every country also had at least one expert mention at minimum existing formal recognition of or even agreement regarding indigenous land claims located in their NPs. All countries cited allowance for 'use of park resources for cultural use' as the major proponent of the presence of indigenous peoples in national parks. Australia and New Zealand both appear to have even more progressive legislation; Joint Management

Boards exist for some national parks in Australia, and treaties in New Zealand automatically designate indigenous leaders as members of the conservation boards—“no decision is made without them”.

The answers from almost every interview related to indigenous communities were notably shorter, possibly exemplifying a lack of benefit sharing across the board between national parks and indigenous peoples—though this may also simply signify the sensitive nature of this topic, and a hesitancy to address it publicly. 3 parks level experts expressed similar opinions communicating the idea that “it is a case by case issue”, and “there is no one size fits all solution”. However, a few major themes did come from the answers that were provided. Most notably, the main method of benefit sharing with indigenous peoples seems to be tourism benefits—whether it be indigenous groups operating a tourism business, or their local businesses outside of park boundaries benefiting from increased visitation due to the park's presence. The second most cited benefit for indigenous peoples were employment practices and hiring standards, which in some countries ensure job openings for indigenous peoples belonging to groups with acknowledged land claims within park boundaries. Both Australian and United States experts described employment standards in place to secure a certain proportion of available jobs for local indigenous people. Lastly, a significant shared benefit seems to be the legal allowance of park resources for traditional, cultural use (as mentioned above).

3.3. Financial management

3.3.1. Economic activities

Every country had at least one expert definitively state that no extraction of natural resources is allowed within park boundaries. It seems that, currently, any extraction activities are more of an issue in other designations (‘protected’ land patches that have a lesser degree of protection). Extraction in these areas can sometimes affect national park land by proximity.

The bigger economic activity issue for parks appears to be the development of facilities and visitor infrastructure. Maintaining park integrity while accommodating for visitors (the numbers of which are increasing every year) appears to be the main development challenge. Managing for this issue most commonly involved returning to management plans for guidance, as well as using other existing land designations to trade off with development industries, and ‘push’ facilities and degradation outside park boundaries.

Related to the answers for the previous question, the major need of national parks regarding tourism appears to be visitor management. Some key phrases used by experts in their answers were “managing for impact”, “education”, “better infrastructure and permits”, and “planning [for visitor management] right in the start”. For all interviewees, licensing is a major tactic for restricting the environmental impact of tourism. Steps for conscientious licensing involves investigating carrying capacity of ecosystems, thorough screenings of company mandates and purposes, and also incorporating ‘social license’ in decisions (public input).

Multiple experts also mentioned zoning as a framework to mitigate the impacts of tourism—essentially using specific areas of park land for specific degrees of impact or degradation. Experts from Canada, New Zealand and the United States also commented that in some cases, tourism licenses are granted in exchange for a ‘trade-off’—for example, some areas previously being degraded will be closed for recovery to offset future environmental impacts of the activity.

3.3.2. Financing

Funding concerns were raised by parks managers in New Zealand and Australia, who are experiencing an increasing “pressure to do more with less”. As well, experts from most countries commented that besides a basic lack of funding in national parks, managers also “have to compete” for funding that is available.

The majority of funding that is available for national parks seems to come from government funding (tax dollars). One expert from Australia observed that funding is “a black box thing, where you wonder where the money comes from and where it goes”. However, for some countries park fees are, or will become, a source of income for park budgets—for some, with the aim of augmenting the lack of government funding. New Zealand, whose parks are known to be almost free, plans on introducing an international park use fees, to mitigate the impacts of increased international visitation while delivering on their national park mandate to provide access to these natural areas to residents of New Zealand. In Canada, only the larger parks such as Banff claimed that park fees could almost exclusively sustain the park. An expert from the United States also mentioned that philanthropic funding also occurs in the United States. While park-based fees allows for less dependence on central government funding, it can also leave park support vulnerable to external shocks that directly affect income from visitors. For instance, parks relying heavily on financing through nature-based tourism suffered tremendously when visitation plummeted due to COVID-19 restrictions (Smith et al., 2021).

3.4. Governance

3.4.1. Land use planning

Land use planning in national parks, according to the interviewees, comes down mainly to zoning in order to designate areas for visitor recreation and restricted areas for protection/restoration. Experts commented that zoning decisions were most commonly dictated by the degree or purpose of use, Federal guidelines, and park management plans. For example, some areas are restricted to vehicles and only accessible on foot, or for certain sizes of groups. A Canadian expert also proudly pointed out that Canada was “kind of a blueprint for IUCN zoning”. Concerns regarding land use planning within park boundaries were mostly related to the challenge of balancing visitor experience while maintaining ecological integrity, by reducing pressure on park

resources. One method mentioned by an Australian expert was allowing environmental ‘hardening’ (e.g. tanks and sewage presence) in areas that are already at risk because they are popular with visitors.

3.4.2. Governance and local communities

Every country cited at least once the critical importance of public cooperation and support in managing a national park. Public approval and public input were by far the most important aspect of a governance system in the opinion of the interviewees, as well as wide, visible representation in the community (“staff are affiliated on the ground”). Partnerships and collaborations were seen by most experts as vastly useful and required in top-down (State-led governance) as well as bottom-up (community-led governance) approaches to management. The most common approach to gaining public support across the experts’ answers were: 1) tourism and visitation benefitting local businesses as a by-product of the park’s presence, and 2) inviting public input into park management.

Another common tactic to gain public ‘buy-in’ (or willingness to support) was education—including signage around the parks, ‘fire talks’ (park-based education venue), and school visits and tours.

Another observation regarding collaboration, echoed by multiple experts, advised using partnerships to designate as much land as possible into any degree of protection, and then working together to build up more strict protection over time.

3.4.3. Law enforcement

In every country, rangers were granted either firearms or the ability to use legal power to enforce laws within the park (e.g. fines), and most parks encourage their staff to educate visitors and explain rules and policies in parks. The most common legality issues cited by experts were visitor ignorance, closely followed by ‘organized’ illegal activity (some individuals, but also corporate—such as illegal dumping of waste). The dominant prevention technique across all four park systems was education of the public regarding the consequences of actions or activities.

In terms of poaching threat, Australia and Canada both had experts who cited it as ‘minimal’, or ‘a non-issue’. However, every country described police presence or at least a relationship with police as a safeguard against illegal poaching in park areas. Rangers were also assigned monitoring routes to patrol for poaching and other illegal activities. The most common strategy to prevent poaching was education, as well as licensed poaching at certain times of the year. One interesting comment from an Australian interviewee voiced that a significant amount of poaching involves invasive and feral species, and these occurrences may not always be punished.

3.4.4. Wildlife management

Every country (except Australia – whose focus was on culling programs to resolve wildlife-livestock conflict) mentions monitoring and mitigation actions related to wildlife well-being undertaken in national parks. Every country had at least one expert mention that visitors feeding or approaching wildlife is the main cause of human-wildlife conflict in their national parks (with only Australia mentioning existing crop or livestock conflicts). Other issues arise from visitor ‘ignorance’; e.g., leaving garbage out, safety around animals, etc. The main responses to human-wildlife conflict were education of the public, tracking of threatened or troublesome species, as well as editing ranger routes to allow them to check on major interaction hotspots.

Ecological restoration was one of the top themes that emerged from this section of the interview, almost exclusively by Canadian and American experts, including the use of fire to rejuvenate landscapes. However, the two most significantly prominent themes were 1) species reintroduction and 2) relocation (mainly of threatened species). Some examples of these programs include Australia’s Koala relocation program, New Zealand’s Kiwi and other bird species rehabilitation programs, Canada’s Caribou conservation programs, and The U.S.’ plant nursery initiatives. The removal of invasive species was also a top 3 theme, though not present in Australia.

3.5. Outlook

3.5.1. Anticipated challenges

Box 4 lists the top challenges named by experts for establishing and managing parks and biodiversity. As shown, impacts of increased visitation was significantly the top concern. Notably, one expert commented that:

“Everyone is putting their hand up is saying tourism is our biggest challenge. We have a ministry of tourism. So I’m hoping that they put their hand up and say oh, we’ll take care of this, you go back to looking after the land. Because you know we’re getting sidetracked a bit”.

As discussed above, national parks in each of the four systems function to achieve two main objectives: ecological conservation and public recreation. It was made clear through the interviews that, in each country, the latter objective is being met, perhaps at the cost of the former objective.

Before even being brought up in the interview questionnaire, four experts (2 from Australia, 2 from the United States) cited climate change as the biggest emerging challenge for parks (Q21). Across experts’ answers, the main threat from climate change (Q22) is species extinction, and a majority of comments cited actions already in place for climate change adaptation. However, most experts share the perception that their respective countries have in some way acknowledged the need for climate change adaptation, or may even have an established body that is focused on climate change adaptation on a general national level. Canada is the only country with a published, comprehensive climate change adaptation plan for national parks themselves (Parks Canada Agency, 2020).

Box 4

Question 21: The top challenges listed by experts are below, as well as their frequency:

- Impacts of visitation/increasing visitation (12)
- Loss of species and biodiversity (8)
- Social license (ongoing approval within the local community and other stakeholders) or political changes (5)
- Invasive species (5)
- Climate change (and any associated effect on natural patterns) (4)
- Funding (2)

Also, the changing climate impacts on ecosystems raised concerns with some experts who worry that shifting climate will mean migration of mass ecosystems out of park boundaries. These concerns were exacerbated by the unpredictability of how these “webs of inter-connectivity will be affected”. Education and awareness were mentioned as tools available to national park staff to mitigate climate change on the park level—with the aim of increasing public support for conservation of land and resources. Notably, 4 comments (all from Parks level staff) conveyed the opinion that climate change ‘solutions’ are not part of the Parks job—that is a federal level mission, whereas parks should focus on adaptation.

The top theme of successes or achievements was ‘increased social buy-in and education’. This theme encompasses increasing awareness about the current state of the environment, threats to the natural landscape, and what can be done (individually and in parks). Improvement of people management was also mentioned as an achievement in a couple parks. Intermediate successes from this question were: 1) increased land protection, and 2) biodiversity recovery and monitoring.

There were notable specific examples of achievements from each country. Australia’s top successes mentioned by included using social media for public educations, awareness, and important notices. Canada’s experts mentioned a continually transforming relationship with indigenous peoples, as well as healthy grizzly and wolf populations. Experts in New Zealand described bird species restoration and recovery, while those from the United States described achievements in native fish conservation and restoration.

3.5.2. Lessons learned

The dominant means of improvement across experts’ answers was updated management plans. Throughout all the associated answers, ‘updated’ mostly refers to ensuring that management plans take into account contemporary issues like climate change, increasing visitation, and common challenges specific to the park in question. Intermediate themes that emerged were increased collaboration, especially with local communities and the public, and funding from charging for uses of the park beyond ‘viewing’ (e.g. activities or experiences).

Almost tied for frequency, two themes emerged from the answers to Question 25 (key lessons learned). First, that public support is key to success. For example, some experts claimed that instilling a sense of national pride in parks helped to solidify appreciation for parks in the general public. The second theme of this question showcased the appreciation across interviewees for the importance of collaboration. Some experts pointed out that there is a difference between “just talking” to stakeholders, and “actually engaging—implement some of the things they ask for to ensure long term, thoughtful engagement”.

Both these themes had high frequency across countries on the federal and parks level. Other prominent lessons included strong, enduring legislation and governmental support; a balance of science and open-mindedness, as well as blending different models. Notable quotes from this section of the interviews included “The last thing you want to do is love your park to death!”, “Protected areas are publicly owned—you need support!”, and “if they’re not looking beyond park boundaries and working externally with their communities, their tribes and their neighbours, other agencies, they’re really missing the boat”.

Though the nature of Question 26 is very individualistic, and answers covered a broad range, there was one common theme and a few notable quotes from the interviews. The most common idea in the collection of answers communicated the impact of collaboration in park management—e.g., “collaboration!”, “exchange and sister parks can work!”, “we’re always here!”. There were also a handful of comments, some of which were repeated by multiple experts, which covered a more diverse range of topics, including that the park purpose may change over time; marine conservation is important as well, and shares similarities; well trained staff/be adaptable; the questionnaire did not inquire about international agreements/commitments; funding is key; and parks have additional cultural importance.

3.6. Comparing perspective between federal and park level management

On certain topics, opinions or comments were noticeably different between park experts at the federal level and those at management level. The following are points at which federal and parks level experts’ answers appeared to be the most stratified, for each question. As federal level experts made up 1/3 of respondents, any frequencies where they made up significantly more or less of the answers in the given theme were noted.

There was less overlap in answers given to the question regarding how the establishment and management of national parks are shared between federal and State/provincial levels (Q5). Federal experts made up the majority of comments that cited

collaboration with other government agencies as highly important, especially regarding shared issues. Parks-level experts, on the other hand, overwhelmingly cited the importance of collaboration with NGOs and indigenous and local communities.

Park-level experts across the board seemed to give more importance to the locally-focused relational aspect of park management. Regarding the question concerning stakeholder involvement in national park establishment (Q6), park level experts comprised the majority of comments that named public citizens and lobby groups as important stakeholders. When asked their opinion on whether parks exclude local people from employment or livelihood access (Q10), the theme of 'legal agreement or recognition of land rights' was brought up by park-level experts. On the subject of best governance for successful national parks (Q16), park level experts highlighted themes of public buy-in/approval/input, representation that is visible to the community. Federal-level experts, on the other hand, shared the opinion that the following were the best governance systems: top-down governance, gaining more public land under any designation, and building strong legislation to support long-term management goals.

Regarding finance, park-level experts were the only group of the two that pointed to the importance of park fees to augment federally allocated park budgets (Q13). In terms of law enforcement, park-level experts across the board indicated that visitors/visitor ignorance was the biggest challenge for law enforcement, likely predicated on their relatively higher interface with the public and visitors.

The most notable difference between both levels of governance appeared in responses to the question regarding climate change (Q22). Federal level experts made up the majority of comments stating that mitigation efforts are already in place. This conflicts with park-level experts' responses that suggest there are no mitigation efforts in place, but that adaptation is the only viable option for parks. This perhaps suggests a difference in perspective of what are ideal vs practical approaches to this important challenge.

4. Conclusion and recommendations

The results of the 12 semistructured interviews of national park management reflect a general consensus on best practices for national park management across the major interview sections. Regarding organization and structure, federally-based park systems are acknowledged to facilitate collaboration between parks and other federal agencies to improve collaborative park management. Integrated approaches such as joint committees help facilitate this collaboration.

Experts all agree that stakeholder consultation is important to foster engagement and commitment in the implementation of a national park plan. Expressly including consultation processes in park management plans are key, however building these relationships takes time. Public engagement is essential for support and ensuring the longevity of park success. Clear and distinct boundaries are important to facilitate management with adjacent territories. Finally, indigenous relations are priority areas for all park systems. All countries are focused on repairing indigenous relationships with those groups that have been previously displaced. Park agencies endeavor to ensure benefits through tourism, employment and special access to park resources.

Experts agreed that the single major concern regarding financial management of park systems was increased or over-tourism. Popular approaches to mitigating this trend include park zoning to concentrate recreational activities in demarked areas, and activity licensing to manage the types and frequency of visitor activities. Financing parks largely comes from tax dollars; however, park use fees are used to augment funding if needed on a park-by-park basis.

Good governance of parks requires public buy-in, which is gained through public support and approval of parks and park systems. Education plays a crucial role in encouraging public support by raising awareness of the importance of national parks and challenges to park management. Law enforcement is fundamental to better park management, which is achieved through presence of law enforcers (rangers), as well as educating the public on appropriate behaviors. Human-wildlife conflict is largely a product of visitor 'ignorance' in these countries, and this is addressed through education, tracking species, and presence of law enforcement.

All experts agree that one of the biggest challenges to park management is managing tourism while preserving the natural landscape. Countries and parks are affected by tourism at different scales, and their mitigating approaches are site-specific, however, they broadly include education and enforced zoning for restoration. The other major challenge is climate change, and there was a strong sense that adaptation ought to be an important element to park management plans. Experts emphasized that public support and stakeholder collaboration is instrumental to park establishment and long-term administration. Both require extensive and iterative communication processes, but are paramount to successful park management.

It is clear that there has been a convergence of opinions in these park systems that have been developed in countries with different social and political systems. The management implications derived from the experts representing these 4 well-established national park systems can be applied to countries implementing relatively newer park systems. Future studies should analyze and evaluate on the application of lessons learned from well-established park systems to countries seeking to introduce or develop their own park systems.

Credit Authorship Contribution Statement

Kalifi Ferretti-Gallon: Conceptualization, Investigation, Methodology, Project Administration, Writing – Original Draft Preparation. **Emma Griggs:** Formal Analysis, Writing – Original Draft Preparation. **Anil Shrestha:** Resources, Writing – Review & Editing. **Guangyu Wang:** Supervision, Conceptualization, Writing – Review & Editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. National park project questionnaire

A.1. Park system overview

History of National Parks

- 1) Please briefly describe the history of national park development in your country, emphasizing any major challenges and subsequent policy changes to address those challenges.
- 2) What are the main guiding principles and operational policies for establishment of your national parks system?
- 3) In your view, what are the most important factors that need to be considered while establishing a new national park?

Organizational Structure

- 4) What agency oversees the operation of your national park system? Please describe the organizational hierarchy of your national park system. Does the agency overseeing the national parks system collaborate with other government agencies while managing the national park system? If yes, under what circumstances does this collaboration occur?
- 5) Are the establishment and management national parks shared between federal and state/provinces levels government? If so, how are the responsibilities shared?

A.2. Implementation

Establishing New Parks

- 6) Who are the stakeholders involved in establishing national parks, and what is their involvement? Is the establishment of national parks a top down (e.g., federal government mandated) or bottom up (e.g., local community initiated) process? Please describe the procedure for planning, management, and decision-making throughout the establishment and operation of your national parks system.
- 7) While establishing a new national park, or changing the boundaries of an existing national park, how is the new land (public or private) acquired? Please describe the procedure, compensation mechanism, source of funding, and responsible agency that oversees the new acquisition.
- 8) When establishing a national park, how are surrounding landscapes adjacent to national park boundaries managed?

Cooperation with Indigenous People

- 9) While establishing a new national park, how are local or indigenous people residing in or adjacent to the national park managed? Are they displaced from the national park? If yes, please describe the procedure, compensation mechanism, if any, and responsible agency that oversees this process. Please describe the related policy and best practices to achieve the intended outcome.
If there is no displacement, are there any other alternative activities/programmes to manage local people/indigenous people residing the park? Please describe the guiding policy, best practices, and any specific examples of these alternatives to managing local people in the national park. How are the parks regulated to manage their access to natural resources to secure their livelihood within the national park?
- 10) Does the establishment of national parks threaten to exclude local people from employment or access to livelihood? How are these challenges addressed so that local people's livelihood/employment are secured? Please describe any best practices, example cases, as well as guiding policies.

A.3. Financial management

Economic Activities

- 11) Natural resource extraction, as well as economic and infrastructure development (e.g., mining, road construction, hydroelectricity, tourism facilities) are one of the biggest threats to the ecological integrity of national parks. How are these disturbances managed within your national park system? Please describe the guiding policies, best practices and example cases that address these issues.

- 12) Nature-based wildlife tourism is often a contested issue in national park management. How are the impacts of tourism and other economic activities regulated in your national park system? Please describe guiding policies, best practices, and example cases that address these issues.

Financing

- 13) Sustainable financing is always the key to the successful establishment of a national park and the implementation of its policies. How are the establishment and management of national parks financed? What is the source of funding and how is it dispersed among various related national parks programs?

A.4. Governance

Governance and Local Communities

- 14) Please describe your approach to land use planning within the national park. For example, what percentage of land within the park should be a dedicated core area (closed to the public), buffer zones for edges, and an area dedicated to developmental/recreational activities?
- 15) How do national parks share benefits with surrounding communities and/or local government? How do national parks gain public support, please share the most important strategies, policies, and example case studies (if any) that help you gain public support for the park?
- 16) What are the best governance systems for successful national park management? What kind of partnerships does the park agency have with the government, the public, and the private sectors?

Law Enforcement

- 17) How is law enforcement practiced in national parks to enforce rules and regulations, protecting the park against illegal activities? Do national parks have their own law enforcement agency? If yes, then what are their roles, responsibilities, and jurisdiction? If not, do national parks get help from other government agencies to maintain law enforcement, for instance from local police departments?
- 18) What strategies and practical actions are being carried out to reduce illegal hunting/poaching or other illegal activities in the national park? Please also describe the magnitude of this problem in your national parks.

Managing Wildlife

- 19) What is the state of human-wildlife conflict in your national parks, and how are these conflicts addressed? Please describe any related strategies, practical actions, compensation mechanisms (if any) and their source of funding. Please describe any other activities that reduce human-wildlife conflict in the national parks.
- 20) Does the park engage in restoration of habitat and wildlife through reintroduction and/or captive breeding programmes for endangered species and their rehabilitation in the park? If yes, will you please share any related policies and successful case studies occur in your national park?

A.5. Outlook

Challenges

- 21) Based on your experiences, what are the biggest and emerging challenges for establishing new parks and managing biodiversity in your country? What measures (if any) have been taken to address these challenges?
- 22) Climate change is new emerging threat for conservation national parks. How are climate change issues being addressed to achieve successful conservation? Please share with us any related policies, best practices, and example cases that address this issue.

Lessons Learned and Future Direction

- 23) What have been the biggest successes/achievements that you have experienced in your national park, thus far?
- 24) Are there any improvements that you think still need to be addressed for successful national park? How do these improvements help achieve long-term biodiversity conservation?
- 25) What are key lessons learned for the establishment of a successful national park for future development, based on your experience in your country?
- 26) Are there any other issues or concerns that have not been covered in this survey that you feel are important to consider? Please elaborate.

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