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Leveraging Digital Interventions to Build Public Support for Bold Policy Change Aimed at Conserving Biodiversity

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ABSTRACT

Bold policy change is urgently needed to overcome the current biodiversity crisis. A significant concern in conservation research is that for such policy to be successfully implemented, broad and enduring support from political decision-makers and the wider public is required. Here we consider ways to facilitate this support by leveraging digital interventions aimed at raising awareness. We explore the current landscape of digital conservation interventions through the lens of two variables: audience and politicization. Four unique types of digital interventions emerge, each with potential to raise awareness for policy change: niche educational, broad educational, focused and political, and broad and political. We propose that digital conservation interventions aimed at changing the political attitudes of specific groups and reaching broad audiences are currently underutilized. We finish by sharing examples from conservation and other disciplines that can serve as inspiration to assist in filling these gaps.

1 | Introduction

Biodiversity loss threatens all species, including humans, and ecosystems around the world (IPBES 2019). Human activities and their resource dependencies are drivers of biodiversity loss. For example, a consequence of the global food system is that it causes large-scale deforestation while mineral commodities for industrial processes drive land-cover change, pollution, and air quality degradation (IPBES 2022). Despite conservation action achieving some victories (Bolam et al. 2021), the fight to prevent species extinctions and population declines is being lost (Ritchie et al. 2022). Predictions indicate that the adverse patterns observed in the natural world will extend beyond 2050 (IPBES 2019). This has left many environmental scientists feeling frustrated by the inadequate societal response (Pihkala 2020). There is a need for conservation science to find innovative ways to make an impact on preserving biodiversity.

While changes in the activities of individuals can help (NPS 2022), system-level changes are required to improve our response to the biodiversity crisis at the scale required (Leiserowitz 2019). Attempts at system-level change through conventional policy solutions aimed at limiting the activities of humans have largely failed (IPBES 2019; Schmitz 2019). Only transformative alterations across economic, social, political, and technological factors will have the required impact for meaningful change (IPBES 2019). International frameworks and advisory bodies have laid out the consequences, drivers, goals, and targets for how to conserve, restore, and sustainably use nature (CBD 2022; IPBES 2019). Despite these pathways, the

Summary

In the face of a global biodiversity crisis, delivering effective conservation policies requires more than scientific research—it demands widespread public and political support. This article examines how digital technologies can help raise awareness for bold policy change aimed at conservation. By analyzing digital interventions through the lens of audience size and politicization, researchers identified four distinct types of strategies. The study highlights that approaches targeting specific and broad groups while aiming to influence political perspectives are currently underutilized. The authors suggest that more strategic digital interventions could be crucial in building the broad-based support necessary to drive meaningful policy changes to protect our planet's biological diversity. Drawing inspiration from successful approaches in conservation and other fields, the research offers inspiration for more effective digital communication of conservation challenges.

- **Practitioner points**
  - Policy changes that can address the biodiversity crisis require broad and enduring support from both political decision-makers and the public to be successful.
  - Digital conservation interventions can be categorized into four types based on audience reach (low/high) and politicization level (low/high), with focused political and broad political approaches being significantly under-utilized.
  - Conservation practitioners should prioritize digital interventions that target specific political groups and reach broad audiences to build the necessary support for bold policy change.

many signatory countries still show insufficient commitment to implementing the ambitious policy agenda required to meet conservation goals (CBD 2020).

Delivering ambitious and robust policy requires broad support (Eyler et al. 2012; Rai 2020). Connecting the wider public and political decision-makers with the biodiversity crisis has become an important task for the conservation movement (Arponen and Salomaa 2023; Rose et al. 2018). While engagement requires a baseline cognitive understanding of the problem, research has demonstrated the role of cognitive factors such as knowledge or awareness in generating policy support (Borg et al. 2024; Loyau and Schmeller 2017). Recognizing these challenges, specific targets to enhance communication, education, and awareness have been articulated in Section K of the Kunming-Montreal Global Biodiversity Framework, and in the Unified Classification of Conservation Actions Needed identified by the International Union for Nature Conservation (CBD 2022; IUCN 2012). Furthermore, Arponen and Salomaa (2023) found that raising awareness strategies have the greatest potential to leverage systemic transformative change for conservation. Raising awareness sets the stage for problem recognition and solution seeking behavior (Goldberg et al. 2021; Raile et al. 2014), which are key foundations for obtaining the support required for policy action, referred to as public and political will (PPW). Elevating these foundations may foster policy support and create windows of opportunity for policy change (Borg et al. 2024; Carpenter and Konisky 2019; DiSalvo 2012; Kingdon 1995).

Here, we describe how digital interventions can contribute to building public support for bold solutions to biodiversity decline. Digital spaces have become inseparable from our daily lives and political spheres (Vromen 2018), with time spent online by young people doubling in the last decade (Ofcom 2017). Other scientific disciplines like public health and climatology have achieved results by leveraging digital interventions (Iyamu et al. 2022; West and Michie 2016). For example, researchers successfully influenced the understanding Republicans had on climate change in the United States (Goldberg et al. 2021). In this context, we first outline the current landscape of digital conservation interventions. Next, we employ a framework to underscore four unique types of digital interventions and discuss their potential in raising awareness for policy change. We conclude with examples of interventions that can serve as inspiration and offer a perspective on how gaps in the landscape of digital conservation interventions might be filled.

2 | Digital Conservation Interventions

2.1 | The Landscape of Digital Conservation Interventions

A "digital conservation intervention" involves the employment of public-facing digital technologies in addressing conservation challenges. Such interventions vary widely in their goals, with common examples being changing human behavior or attitudes, facilitating wildlife monitoring, or engaging citizens to participate in conservation activities (Sandbrook et al. 2015; West and Michie 2016; Wienert et al. 2022). An intervention can involve a one-off interaction, or it can be ongoing and require relationship building. Digital conservation interventions can be designed and managed by government, nongovernment, or commercial organizations, or by partnerships between them. Their commonality is a conservation-focused aim that is achieved through a design for human interaction with digital technology.

When considering raising awareness for policy change, this diverse landscape can be classified across two broad variables: the intended *audience* for the intervention and the *politicization* of the intervention. These two variables were chosen as they indicate two important features regarding the intention for digital conservation interventions: How many people are you trying to reach? and Why are you aiming to share your science?

Audience relates to the number of people the digital intervention aims to reach (Figure 1A). On one end of the spectrum, digital interventions can target a small, specific audience. For instance, gamification of environmental education for primary school-aged students through the Questagame platform (Buchanan et al. 2018) epitomizes this type (Figure 1B). At the other end of the spectrum, a digital intervention can seek to engage a broad audience. An example is a widely accessible and

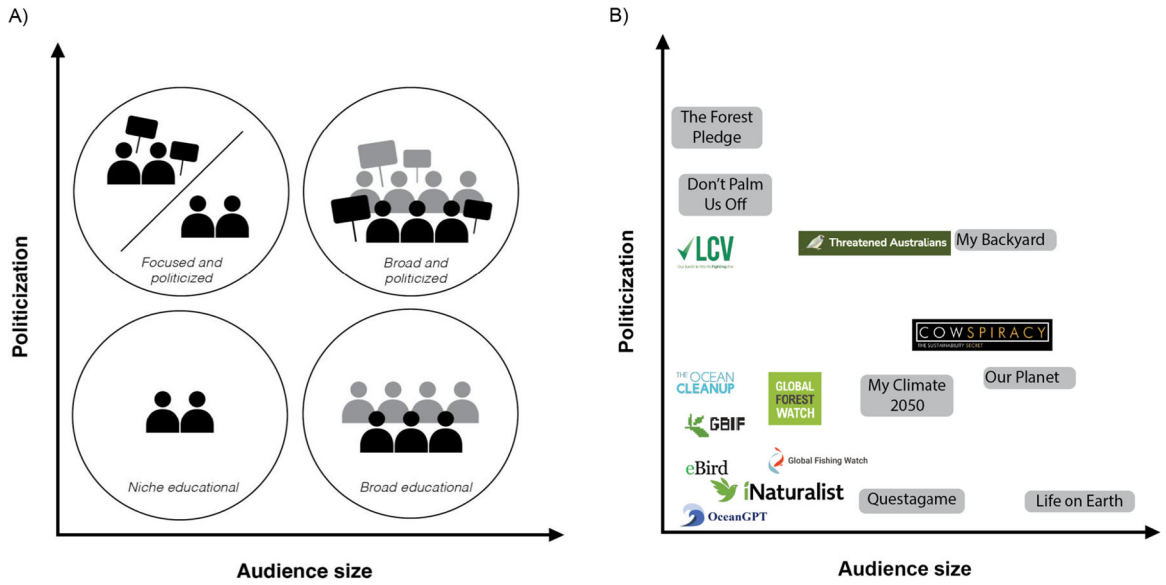

FIGURE 1 | The relation between politicization and audience size. (A) Diagrams representing the dominant combination of both variables within that quadrant of the digital conservation landscape. From bottom left, clockwise: niche educational; focused and political; broad and political; broad educational. The combination of high politicization and low audience size (upper left) has two compartments to represent that digital interventions can focus on either politically *activating* or *deactivating* a specific public based on whether they are supporting or blocking a particular policy change. (B) A scatterplot of logos and labels showcasing where current digital interventions are positioned along these variables. Where logos are unavailable, labels have been used. Descriptions of each of these interventions and why we believe they fit where they do on the axis are found in Table S1.

ideally, ungated documentary such as productions from the BBC or National Geographic (Figure 1B). Importantly, audience size is related to the size of the problem being addressed. Local issues such as habitat destruction in a specific location will have fewer stakeholders, which in most cases is likely to lead to a smaller audience. In some cases, local issues may still draw political impetus from an audience that extends beyond stakeholders. National and international issues (e.g., climate change) have more stakeholders and larger audiences are both more likely and more necessary.

The second variable, which we label politicization, relates to the intention behind the intervention. There is a continuum around intentions with an "educational" aim of sharing robust science at one end and science-informed "political change" at the other (Figure 1A). Some digital interventions eschew any overt attempt to encourage political change and prefer to "stick to the science"; they are anchored in scientifically validated knowledge and do not attempt to extend beyond educational goals. These may support political change by providing evidence for input into political decision-making. Resources such as the Atlas of Living Australia or campaigns to promote the actions of individuals such as to reduce fossil fuel emissions by riding bicycles to work reflect this type (Figure 1B). In contrast, other digital interventions are motivated by, and explicitly aim to encourage political change, striving to influence the decisions of government or other social institutions. A case of this type of intervention is a digital petition from the United States' League of Conservation Voters that urged President Biden to safeguard the Grand Canyon (Figure 1B). Politicization is crucial for gauging how effective an intervention is likely to be in influencing policy change.

Specific and broad audiences can each be targeted for either educational or political change purposes. As a result, these two variables can be used as axes in constructing a matrix of digital conservation interventions (Figure 1A). Using this matrix, we can identify four distinct types of digital conservation intervention: (1) niche educational; (2) broad educational; (3) focused and political; and (4) broad and political (Figure 1A). While each possess unique contributions, when we consider them in the context of raising awareness for policy change the differences we will explore pose considerations of resource use and opportunity costs (West and Michie 2016).

2.2 | Niche Educational Interventions

A widely used form of digital intervention aims for a limited audience while focusing on specific educational outcomes (Figure 1). These interventions include those which collect and disseminate scientific information such as iNaturalist or the Global Biodiversity Information Facility (Lin Hunter et al. 2023; Whitelaw and Smaill 2021). For example, iNaturalist has a primary goal of connecting people with nature, while aiming to generate scientifically valuable data, and has risen to be one of the most globally successful with 1.4 million users (Mesaglio and Callaghan 2021). These interventions have helped specific groups and individuals become increasingly aware of the importance of monitoring biodiversity (Allf et al. 2022; Andrachuk et al. 2019; Joly et al. 2018). Yet, their design of monitoring or sharing biodiversity information means their reach is often limited, which may lead to failure in creating broad awareness as only a small audience is motivated to engage with the activities they offer. Typically funded or managed by not-for-profits, universities, and sometimes governments,

these interventions are incentivized to avoid entering political conversations (Driscoll et al. 2021; Hamilton 2004).

2.3 | Broad Educational Interventions

Digital interventions targeting broad audiences while avoiding political content often take the form of information campaigns and documentaries such as those from the BBC's Natural History Unit involving Sir David Attenborough (Figure 1). Scaling up from niche to more broad audiences does increase the outreach but may be still limited as it may not directly translate into pro-environmental behavior (Balmford et al. 2017, 2021; Klöckner 2015, 165; Kollmuss and Agyeman 2002; Liu et al. 2020). This is because inundating people with information on environmental issues may lead to them blocking out the messages, known as "environmental numbness" (Gifford 2011). We note that in recent years, documentaries have increasingly altered their strategy from educational entertainment to ecological or social impact entertainment with increases in environmentalist rhetoric (Zemanek 2022). Notable examples include Our Planet, Cowspiracy and Before the Flood where the need for action is emphasized, albeit they are either largely vague (Zemanek 2022) or focused on individualism. However, evaluating the effectiveness of these broad educational interventions in fostering policy change remains to be done (Dunn et al. 2020; Pabian et al. 2020).

2.4 | Focused and Politicized Interventions

Collective action problems such as biodiversity loss require people to act in a coordinated fashion to achieve intended goals (Roser-Renouf 2016). People form "issue publics," a subset of the population dedicated to a specific issue (Krosnick 1990; Raile et al. 2014). A highly organized issue public can wield political power beyond their numbers that may enable or block change (Leiserowitz 2019). These can be considered keystone roles. An example are transnational organizations in marine ecosystems wielding disproportionate influence over seafood production (Folke et al. 2019; Österblom et al. 2015). While increasing broad awareness is desirable for the potential to overpower these keystone actors, targeted interventions may be more suited to achieving specific policy change in these circumstances. A digital intervention that targets actors who are slowing or preventing change by shifting political attitudes or by making the enablers more powerful by helping them become more politically organized is one with a focused scope (Figure 1A). Threat chains offer a means to map and explicitly target the most influential actors in policy change contexts (Balmford et al. 2021; Williams et al. 2020). For example, United States elected Republicans are crucial for achieving robust climate policy; thus, increasing their understanding of the reality and risks of climate change is critical for robust climate policy (Goldberg et al. 2021).

Conservation has a dedicated "issue public" in the memberships of eNGOs, who if encouraged to intensify their collective power through digital conservation interventions, may wield influence beyond their numbers (Han and Barnett-Loro 2018). A salient example of this approach is in how the National Rifle Association mobilized gun club members in America to have outsized control over prohibiting firearm control policies (Han and Barnett-Loro 2018; Raile et al. 2014). In these keystone actor situations, these types of intervention may be the most effective and economical. Our assessment shows there is significant space for more conservation interventions of this type.

2.5 | Broad and Politicized Interventions

Interventions that intend to engage diverse and broad audiences in politically relevant ways are poised to be impactful for raising awareness for policy change (Figure 1). By recognizing that the political process is intrinsically contentious, these interventions broadly focus on empowering existing actors and providing opportunities for others to join the spaces of confrontation (DiSalvo 2012). Broad and politicized interventions explain the central challenge faced by conservation alongside actions that enable people to express their preferences. This is because there needs to be physical, social, psychological opportunities for individuals to realize their values and intentions (Michie et al. 2011). For example, the Threatened Australians and My Backyard projects provide constituencies with local threatened species information and palatable explanations alongside easy-to-take public sphere activism actions and as such, is an attempt at deploying this type of intervention (Kelly et al. 2022). Despite their potential for high impact in raising awareness for policy change, this type remains largely underexplored in the landscape of digital interventions.

Our analysis (Figure 1B) shows digital conservation interventions that present a range of stimuli, information, and user experiences. However, there is an apparent gap in the top right-hand corner of this figure that represents broad and politicized interventions, of which there are few. Given the importance of policy change for conservation efforts, politicized digital interventions present as an underutilized way of supporting policy change more directly.

3 | Filling Current Gaps in Conservation Digital Interventions

In conceptualizing the current landscape of digital conservation interventions, we undertook a search for existing interventions (Figure 1B). Here, we highlight key examples from conservation and other disciplines that can serve to inspire and instruct conservation in filling these gaps.

Turning the vast amounts of data collected by scientists and community scientists into interactive knowledge products has the potential to facilitate raising awareness for policy change. *Global Forest Watch* is an excellent example of this kind of digital intervention, which makes complex data on global forest changes accessible and useful for institutions and organizations focused on crafting effective forest policies (Curtis et al. 2018). Another knowledge product is *Global Fishing Watch* which creates and publicly shares knowledge about human activity at sea to enable fair and sustainable use of our ocean. Existing and

future platforms can use this knowledge product approach to capture engagement that then can be converted into attitudes and behaviors that encourage policy change.

Beyond conservation, lessons can be learnt from other fields. For example, the public health sector has recognized the ability for digital technologies to assist in solving challenges faced by the field such as helping change physical activity levels (Wienert et al. 2022). While the challenges typically tackled by digital public health faces are different to the gaps around awareness and political attitudes for policy change, the field has theory and practices that are useful for conservation inspiration (Iyamu et al. 2022). For example, the *Niggle* app sought to assist young people in their wellbeing and recovery for mental health (Stoyanov et al. 2021). The app provides an example of a co-design process which aimed to provide an effective, innovative, theoretically sound, accessible, and engaging digital intervention (Stoyanov et al. 2021). It is an example targeted toward a specific group of actors—though quite broad in its targeting—with a specific aim to change awareness and attitudes.

The practice of conservation marketing is established among conservation organizations which have used digital interventions such as advertisements to engage, educate, and motivate audiences (Ryan et al. 2020). Ryan et al. (2020) examined 28 studies of empirical evaluations of conservation marketing initiatives to uncover their effectiveness. The *Don't Palm Us Off* zoo conservation campaign, a high-quality evaluation examined by the researchers, used digital components to achieve significant increases in palm oil awareness among other conservation behaviors (Pearson et al. 2014). Another campaign that exerted substantial influence through a series of videos was *Greenpeace's* challenge to a Lego-Shell partnership, part of their broader efforts to halt Arctic oil exploration (Miller 2014). This is a case study in video strategies to affect or motivate audiences using what Miller (2014) has called a "post-modern pastiche." The impact evaluations and media strategies of these campaigns can serve to inform future digital conservation interventions designs.

In cases where raising broad awareness is impractical, such as when actors who hold oversized influence are involved, targeted advertising campaigns prove to be a powerful tool. Recognizing the importance of bipartisan support for robust and lasting climate policy, climate change researchers conducted an online advertising campaign aimed specifically at influencing Republican views in the United States (Goldberg et al. 2021). The researchers used strategies such as persuasive messaging that aligned with conservative moral values and found that the campaign shifted the treatment group's understanding of climate change's existence, causes, and impacts by several percentage points (Goldberg et al. 2021). Observing the characteristics of these advertising campaigns in conjunction with the existing knowledge base on conservation messaging may help in the design of future digital conservation interventions focused on policy change (Goldberg et al. 2020; Kusmanoff et al. 2020).

Games also offer a potent alternative (Tan and Nurul-Asna 2023). Although they are typically used to help identify solutions to problems, games encourage the player to immerse through deep engagement, increasing the likelihood of persuading and creating lasting changes in attitudes (Goldberg et al. 2020; McGonigal 2011; Sandbrook et al. 2015). For example, *World Without Oil* engaged players to consider a possible near-future world with an oil shortage, and then to propose solutions (Fjællingsdal and Klöckner 2022). *Fate of the World* puts players in charge of maintaining ecosystem balance and resource demands. Although it included no explicit attempt to introduce people to conservation issues, the 2016 game *Pokémon Go* combined virtual nature and real environment to capture 21 million users in its first week and has featured in the Playing for the Planet Alliance (Dorward et al. 2017; Patterson and Barratt 2019). Dorward et al. (2017) suggest a number of ways the game could be adapted to increase conservation impact. Relevant here is how a digital experience was able to capture such a large acquisition of users and the potential for this mass being focused on a conservation challenge such as policy change (Meurk et al. 2020; Sandbrook et al. 2015). A similar level of interactivity can be achieved through other means. Documentaries such as *Do Not Track* offer interactive, personalized narratives that drive active engagement by blending the product, user perception, and the author's perspective (Vázquez-Herrero and López-García 2019). These interactive avenues serve as compelling examples of how digital interventions can aim for enduring change.

The effectiveness of a digital conservation intervention depends upon conservation practitioners matching the right intervention type to the right context. Practitioners should use a portfolio approach to prioritize niche politicized interventions for generating targeted support, while using broad politicized interventions to build broad support for policy change. The choice of which to use will likely depend on whether the context involves keystone actors with outsized influence (favoring focused approaches) or requires broad coalition building (favoring broad politicized approaches).

4 | Conclusion

Broad and enduring support is essential for policy changes that can effectively curb and reverse the ongoing and increasingly dire biodiversity crisis. We examined the current landscape of digital conservation interventions and their orientation toward a desired audience and political intentions by drawing on a conceptual framework (Figure 1A). We have demonstrated that there are a wide variety of digital interventions emerging within the conservation sector, yet there remains a gap, with few digital interventions aiming for politicized awareness among a broad audience (Figure 1B). Few interventions aim at changing the political attitudes of specific groups. This is significant, given that the conservation community needs to increase the political power of the existing eNGO membership (Han and Barnett-Loro 2018), change the political attitudes of the proponents of antienvironmental policy (Goldberg et al. 2021), while also inducting more of the population into the movement by raising broad awareness (CBD 2022; IUCN 2012). There is a role for digital interventions in these efforts, where any intervention can benefit from the wealth of knowledge already accumulated in disciplines like the behavioral sciences (Balmford et al. 2021; Kusmanoff et al. 2020; Nielsen et al. 2021), public health (Iyamu et al. 2022), and climatology (Goldberg et al. 2020). It is

important to pause here and acknowledge the caveats of digital solutions. The pitfalls of "solutionism" and "clicktivism" driven by rapid technological advances and the ease of digital expression caution us to recognize technology's limitations in achieving conservation objectives like awareness for policy change. Digital interventions act as one component of a broader solution, not a panacea. Digital conservation interventions that aim at a broad audience, in coordination with in-person or digital person-to-person initiatives (Goldberg et al. 2020; Santarossa et al. 2018), present as an underutilized and highly useful approach for fostering bold biodiversity policy change.

Author Contributions

Gareth S. Kindler: conceptualization, methodology, data curation, investigation, validation, formal analysis, funding acquisition, visualization, project administration, resources, writing – original draft, writing – review and editing. **Nick Kelly:** conceptualization, methodology, investigation, validation, supervision, funding acquisition, visualization, writing – review and editing, resources, project administration. **James E. M. Watson:** conceptualization, investigation, funding acquisition, methodology, validation, visualization, writing – review and editing, supervision, resources, project administration.

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Ethics Statement

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data sets generated in by this article are available as supporting materials.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.