

Fostering Natural World Engagements: Design Lessons and Issues from the *My Naturewatch Training Program*

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Introduction

The training program's purpose is to foster relationships with backdoor wildlife using "design for active engagement" and open design. We report our findings from using a design-led approach with community organizations to identify the opportunities and issues of designing active engagement for practitioners concerned with defining sustainable working methods. This article guides readers through the context, design work, and the wider scope and application of the research.

Environmental sustainability is the key challenge of the twenty-first century. According to *The State of Nature Report*, which combines expertise from more than 50 organizations, 53% of species declined between 2002 and 2013, and "7% of urban species [are] threatened with extinction from Great Britain."¹ As wildlife faces a crucial challenge, a design space emerges to engage audiences who are unaware of their effects on surrounding wildlife or ecological systems.

In the past 20 years, environmental issues have had more media coverage, alongside "enhanced environmental legislation."² Although national parks encourage public engagement, these "protected areas are not playgrounds"; says Buckley, wildlife "parks are assets for tourism, but they are not tourist assets."³ Thus, we should not exploit natural resources and constantly be aware of our footfall or increasing traffic to locations that benefits tourism.

In addition, human interactions with and experiences in nature are shrinking. Cox and Gaston state that in "recent decades, daily contact of people with nature has declined"; they note stark differences between the frequency of nature experiences that contemporary children have (e.g., climbing trees) compared with their parents.⁴ To address the issue, they suggest that "[resource] provisioning can avert the extinction of experience, benefiting people and wildlife."⁵ The goal is to create impact through interaction: We must "re-connect youth [with] natural environment(s), transitioning [them] into ecologically responsible citizens."⁶ *Noticing Nature* highlights the following statistics:

- 1 Daniel Eaton Hayhow, Fiona Stanbury, Mark Burns, Andrew Kirby, Will Bailey, Neil Beckmann, Bjorn Bedford, Jacob Boersch-Supan, Philipp Coomber, and Fraser Dennis, *State of Nature 2016* (London: The State of Nature Partnership, 2016).
- 2 Law Commission, *Reforming the Law: Wildlife, law regulating wildlife* (United Kingdom: Ministry of Justice, 2012).
- 3 Ralf Buckley, "Parks and Tourism," *PLoS Biology* 7, no. 6 (2009): e1000143. doi.org/10.1371/journal.pbio.1000143.
- 4 Daniel Cox and Kevin Gaston, "Human-Nature Interactions and the Consequences and Drivers of Provisioning Wildlife," *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences* 373, no. 1745 (March 2018). doi.org/10.1098/rstb.2017.0092.
- 5 Ibid.
- 6 Giuliano Reis, Jeff Scott, and Mira Freiman, "Environmental Education: Nurturing a Relationship with Everything, Everywhere," in *International Perspectives on the Theory and Practice of Environmental Education: A Reader*, ed. Giuliano Reis and Jeff Scott (London: Springer, 2018), 1–15.

- 7 Miles Richardson, *Noticing Nature Report 2020* (England: National Trust, 2020).
- 8 Julia Torquati, Mary M. Gabriel, Julie Jones-Branch, and Jennifer Leeper-Miller, "A Natural Way to Nurture Children's Development and Learning," *Young Children* 65, no. 6 (2010): 98–104, 99.
- 9 Kieren Topp, Michael Thai, and Deanne H. Hryciw, "The Role of Entertainment in Engagement with Climate Change," *Environmental Education Research* (2019): 1–10.
- 10 NERC, "Valuing Nature," <https://nerc.ukri.org/research/funded/programmes/valuingnature/> (accessed March 25, 2019).
- 11 Kay Haw and Karen Hornigold, eds., *Wood Wise: Nature Inspires Education* (Grantham, Lincolnshire, UK: Woodland Trust, Autumn 2017).
- 12 See, e.g., Stephen Moss, *Natural Childhood* (London: National Trust London, 2012); K. McEwan et al., "Shmapped: Development of an App to Record and Promote the Well-Being Benefits of Noticing Urban Nature," *Translational Behavioral Medicine* 10, 3 (2019): 723–33; R. Lumber et al., *Nature Connections 2016 Conference Report: Implications for Research and Practice* (Derby: University of Derby, 2017); Nancy Bockstael et al., "On Measuring Economic Values for Nature," (2000); Jeanne Brown and Candace Kaye, "Where Do the Children Play?: An Investigation of the Intersection of Nature, Early Childhood Education and Play," *Early Child Development and Care* 187, no. 5-6 (2017): 102–41; and M. C. Muñoz, "How Can We All Help Conserve Nature?" <https://kids.frontiersin.org/article/10.3389/frym.2019.00084> (accessed June 21, 2019).
- 13 Guillaume Chapron, Yaffa Epstein, and José Vicente López-Bao, "A Rights Revolution for Nature," *Science* 363, no. 6434 (2019): 1392–93.
- 14 Ralf Seppelt and Graeme S. Cumming, "Humanity's Distance to Nature: Time for Environmental Austerity?" *Landscape Ecology* 31 (2016): 1645–51.
- 15 Robert Macfarlane and Jackie Morris, *The Lost Words* (London: House of Anansi Press Incorporated, 2018), 72.
- 16 Fiona Harvey, "Twitter Storm: Noise Pollution Creates Havoc for Birds, Study Shows Human Activities Could

Children's nature connections: 83% infrequently/never smelled wildflowers, 77% infrequently/never listened to birdsong. Adults' nature connections: 79% infrequently/never smelled wildflowers, 62% either infrequently/never listened to birdsong.⁷

We believe that "nature connectedness" should become embedded in our lives. Engagement in nature "inspire[s] enthusiasm for learning [because] there is no substitute for hands-on, child-initiated inquiry about the natural world."⁸ In addition, entertainment has a role in addressing climate change in that "edutainment for communicating science to the public is exceptionally powerful."⁹ Nature's value is exponential, complex, and intertwined. Natural system degradation occurs "because ecosystem services have no 'immediate' market value; hence, wider societal value(s) is frequently underestimated in decision-making."¹⁰

According to the Woodland Trust, "nature encourage[s] physical activity, enhance[s] social interactions, helping us connect to green spaces, improving health and well-being. For children specifically, outdoor play is important for emotional, physical and social development."¹¹ Research on natural engagements have considered a wide range of aspects and benefits, including nature's health service and community benefits, wellbeing, connectedness, economics, play, and emotion.¹² In addition, the (non-human) rights of nature "provide an efficient way to protect the environment, benefiting all"; such protection offers value, whether seen in isolation (i.e., for nature's sake) or solely for human benefit.¹³ Society's leaders, individuals, and institutions need to "act quickly to redirect effort[s] being devoted to the commodification of nature, back towards instilling a love for nature in people. [Our] withdrawal from natural environments, sourcing food and other goods, has allowed people to forget the realities of ecosystem change."¹⁴ The "western world need[s] to change behaviour and consumption patterns to create an environmentally sustainable society."¹⁵ Furthermore, we need to bring our "natural relationship"—our relationship with nature—into balance because "even human noise pollution impacts bird behaviours."¹⁶ As this example shows, complex combinations of disengagement from nature hold unknown costs. Research indicates that we "find it hard to love what we cannot give a name to, and what we do not love we will not save."¹⁷

Contextual Culmination

The contextual climate challenge, accessible design tools, digital technologies, public response, all unify, creating a discursive design space for "active engagement." This space has complexities, nuances, and requires collaborative and expert approaches. Nature

- Be Affecting Reproduction and Even Normal Social Behaviour," https://www.theguardian.com/environment/2019/jun/20/twitter-storm-noise-pollution-creates-havoc-for-birds-study-shows?CMP=tw_t_a-environment_b_gdneco (accessed June 20, 2019).
- 17 Robert Macfarlane and Jackie Morris, *The Lost Words*, 85.
- 18 BBC, "Garden watch," <https://www.bbc.co.uk/programmes/articles/4gjThGt61ndDfXqcWLD4rqn/gardenwatch-our-biggest-citizen-science-project-yet> (accessed October 2, 2019).
- 19 Jem Bendell, "Because It's Not a Drill: Technologies for Deep Adaptation to Climate Chaos" (2019).
- 20 Norman Maclean, *A Less Green and Pleasant Land: Our Threatened Wildlife* (London: Cambridge University Press, 2015), 54.
- 21 Ryan Lumber, Anne Hunt, Miles Richardson, and Caroline Harvey, "Nature Connections 2016 Conference Report: Implications for Research and Practice," (2017).
- 22 Rachael White, "Connecting Children and Teenagers with Local Nature," Connecting Children and Teenagers with Local Nature (July 28, 2019).
- 23 Paul Barkham, "How to Rewild Your Garden: Ditch Chemicals and Decorate the Concrete," <https://www.theguardian.com/environment/2018/may/30/how-to-rewild-your-garden-ditch-chemicals-and-decorate-the-concrete> (accessed October 2, 2019).
- 24 Sara Aminzadeh, "A Moral Imperative: The Human Rights Implications of Climate Change," *Hastings International and Comparative Law Review* 30 (2006): 231.
- 25 Eric Von Hippel, *Democratizing Innovation* (Boston: The MIT Press, 2005), 15.
- 26 Emily Campbell, *RSA Design & Society. You Know More Than You Think You Do: Design as Resourcefulness & Self-reliance* (London: RSA Projects, 2009).
- 27 Turilif Vilbrandt, Evan Malone, Hod Lipson, and Alexander Pasko, "Universal Desktop Fabrication," in *Heterogeneous Objects Modelling and Applications: Collection of Papers on Foundations and Practice* (Springer, Berlin, Heidelberg, 2008), 259–84.
- 28 Maria Menendez-Blanco and Pernille Bjørn, "Makerspaces on Social Media:

experts from BBC SpringWatch assert that "saving wildlife starts in your back garden."¹⁸ In 2019 "The Extinction Rebellion" united generations to take a stand as "Life on Earth is in crisis: scientists agree we have entered a period of abrupt climate breakdown."¹⁹ Biologists "call [current times] the sixth great biological extinction,... [resulting from] the increase in human population and the consequent increasing demand for food, natural resources and industrial expansion."²⁰ Reports highlight a reduction in teenage nature connectedness while pointing to the necessity of lifelong relationship engagements.²¹ Thus, Green Member of Parliament (MP) Lucas, at the *Connecting Teenagers with Nature* Conference, stated that "naturalist skills are being lost when we need them most."²² Compounding issues, with our nature disconnection and busy lives, has led to "biodiversity loss in our gardens," engagement(s) that must start at home.²³ *Climate Action to Protect Human Health* raises "nature's interdependencies with human health."²⁴

Open design (OD) enables the re-appropriation of design content and distributed manufacturing; it opens design opportunities to schools, non-governmental organizations (NGOs), and financially restricted organizations. OD evolves design and manufacturing values in that, "rather than one producer's being responsible for objects' fabrication, it is decentralized to the end users' control."²⁵ Through design decentralization, users (not just professionals) can actively engage in design stages. Thus, OD "turns user[s] into designer[s] and provides the control of the [metaphorical] pen"²⁶; it gives users "the ability to fabricate concepts for personal use, distribute globally, or manufacture locally."²⁷ Social media use is contributing to the global proliferation of makerspaces and OD, according to Menendez-Blanco and Bjørn: "Prior to entering the physical door of a makerspace, social media presence serve[s] as the 'front door' for Open Design activities," they note.²⁸

OD outputs can exceed a designs' original use. For example, Public Laboratory's balloon mapping (*publiclab.org*), originally was designed to map the BP Deepwater Horizon oil spill; now, the design is used internationally to catalog deforestation and other concerns. To further illustrate the value of OD's flexibility, this article examines how OD, nature engagement, social broadcasts, and community production were used in combination to define and undertake the My Naturewatch (MNW) project.

My Naturewatch Project

The MNW project is a collaboration between Interaction Research Studio, Goldsmiths, and The Royal College of Art (RCA) Design Products program. Goldsmiths led in the project's development by engaging the BBC and designing the cameras and instructional materials. The RCA team developed camera designs for a series of

public engagement workshops that targeted wildlife charities, schools, and cultural institutions, and in which agents were trained to teach their peers and communities about the cameras. Goldsmith's design of the MNW camera is described as follows:

[An] inexpensive wildlife camera designed for people to make themselves, as a way of promoting engagement with nature and digital making. We aligned its development to the interests of the BBC's Natural History Unit as part of an orchestrated engagement strategy, featuring the camera on a SpringWatch broadcast, also involving our project website and outreach to social media. Over 3,500 NW Cameras have been constructed [at the time of the writing] using instructions and software from a website and commercially available components.²⁹

SpringWatch featured the MNW project, allowing the project to reach an audience of 1 million viewers; in the course of the program, presenter Chris Packham commented that "it's fantastic" and "we can all be involved with this, [it] is brilliant."³⁰

Design for Active Engagement

Design for active engagement (DAE) is an emerging discipline, taking design beyond an interest in products and services to foster impactful, positive audience engagement. Our DAE perspective integrates "co-constructive processes of trial and action."³¹ Ezio Manzini, in his *Politics of the Everyday*, states that designers should provide "infrastructure[s] for project centred democracy."³² He further suggests the need for design experts to "build... a collective design intelligence" that produces a design capability among participants, thus providing and expanding design agency.³³ Creating tools and processes to enable others is foundational to the training scheme. Design for inclusion and access removes barriers (e.g., related to finances, age, or gender) and encompasses design adaptation. Research engaging with DAE expands designers' perspectives beyond a product focus, as we use design interventions to engender "changing/evolving behaviour."³⁴

Our work engages in DAE in natural world interactions. In this case, we see engagement as shifting beyond consequence mitigation and designing for action. For example, forest schools "contribute... to learning skills that encourage... children to work on outdoor activities"; the children's outdoor work comprises designed engagements.³⁵ Researchers often misclassify this type of engagement as "research in the wild"; however, "in the wild" misrepresents the engagement because the research actually "evaluates prototypes as they are really used within people's lives."³⁶

Shaping Access to Open Design,"

Human-Computer Interaction 34, no. 5-6.

- 29 William Gaver, Andy Boucher, Michail Vanis, Andy Sheen, Dean Brown, Liliana Ovalle, Naho Matsuda, Amina Abbas-Nazari, and Robert Phillips, "My Nature-watch Camera: Disseminating Practice Research with a Cheap and Easy DIY Design," in *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, ACM, 2019), 302.
- 30 "Filming Wildlife in Your Garden, The My Naturewatch Camera," SpringWatch (television broadcast), produced by R. Edwards, BBC, June 11, 2018, <https://www.bbc.co.uk/blogs/natureuk/entries/f549f921-fe05-406a-8ba8-49d6911b51f7>.
- 31 Ilpo Koskinen et al., *Research Through Practice: From the Lab, Field, and Showroom* (China: Elsevier, 2011).
- 32 Ezio Manzini, *Politics of the Everyday* (London: Bloomsbury Visual Arts, 2019).
- 33 Ezio Manzini, "Strategic Design for Sustainability: Towards a New Mix of Products and Services," in *Proceedings of the First International Symposium on Environmentally Conscious Design and Inverse Manufacturing* (1999), 434-37.
- 34 Debra Lilley, "Designing for Behavioural Change: Reducing the Social Impacts of Product Use Through Design" (PhD diss., Loughborough University, 2007).
- 35 "Study Reveals How Forest Schools Can Benefit Children's Development," Loughborough University, <https://www.lboro.ac.uk/media-centre/press-releases/2017/october/study-reveals-forest-school-benefits> (accessed July 2019).
- 36 Alan Chamberlain Andy Crabtree, Tom Rodden, Matt Jones, and Yvonne Rogers, "Research in the Wild: Understanding 'In the Wild' Approaches to Design and Development," in *Proceedings of the Designing Interactive Systems Conference* (New York, NY: ACM, 2012), 795-96.

Systematic sustainable development is fantastic, but empowering individuals distributes citizens' capabilities, uniting research in the wild and sustainability. We acknowledge that "sustainable development goes beyond individuals," targeting engagements with communities is more successful.³⁷ *Access to Nature* stresses how nature engagements "increase communities' ownership of natural places, establishing strong partnerships between communities, voluntary organizations, local authorities and others."³⁸ Meanwhile, Heller and Vienne advocate for human-centered design as the means to "develop... solutions based on interaction with actual individuals, [as] user-centred design relates to consumers."³⁹ Both perspectives are crucial. To achieve DAE, we must design for humans, animals, and communities—going beyond traditional, compartmentalized perspectives. Progressing "nature" should "appeal to people's hearts rather than their wallets."⁴⁰ We propose that designing for and with "things" can proactively engage communities, informing behaviors. In addition, research in the social sciences has argued that researchers should work directly with "the people they study."⁴¹ DAE does just that. Our research included and engaged diverse groups in "environmental stewardship [to] achieve social-ecological relationships yielding outputs for future generations."⁴²

Method

The training objective of the NW project was to foster relationships (external to the researchers) by encouraging wider participation, removing participation barriers, and building expertise. Using an open call, we recruited organizations through a "multi-modal recruitment strategy" that involved social media and internet-mediated methods.⁴³ The call, through which we sought to remove biases, include wide demographics, and use non-design terminology, defined our intended organizational size, scope, research intentions, capacity, and geographic location. Respondents included members of local wildlife organizations and rewilding projects, schoolteachers, wildlife photographers, and more. Participants were selected based on perceived impact, involvement with underprivileged/minority groups, potential to scale, and areas beyond the researchers' comprehension (i.e., outside our means, finding new opportunities for what we are doing). Participating organizations included the Durrell Wildlife Trust (Knepp Estate), the Countryside Education Trust, the Wildlife Trusts, and others.

The project work culminated in a "blended learning" experience, uniting wildlife and technology for cross-curricular activities.⁴⁴ The curricula were informed by lessons from a wide range of curriculum design ideas and objectives, including from public engagement, previous NW workshops, Fixperts Fixcamp, design

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- 37 Julius Grund and Antje Brock, "Why We Should Empty Pandora's Box to Create a Sustainable Future: Hope, Sustainability and Its Implications for Education," *Sustainability* 11, no. 3 (2019): 893.
- 38 Natural England (2014), *Access To Nature: Inspiring People To Engage With Their Natural Environment*, <http://Publications.naturalengland.org.uk/category>, No. A2N. England: Icarus, Enabling Positive Change.
- 39 Steven Heller, Veronique Vienne, *Citizen Designer: Perspectives on Design Responsibility* (New York: Skyhorse Publishing Inc, 2003).
- 40 Douglas J. McCauley, "Selling Out on Nature," *Nature* 443, no. 7107 (2006): 27.
- 41 Kalonji Nzinga, David N. Rapp, Christopher Leatherwood, Matthew Easterday, Leoandra Onnie Rogers, Natalie Gallagher, and Douglas L. Medin, "Should Social Scientists be Distanced from or Engaged with the People They Study?" in *Proceedings of the National Academy of Sciences of the United States of America* 115, no. 45 (2018): 11435–41.
- 42 Kai Chan, Patricia Balvanera, Karina Benessaiah, Mollie Chapman, Sandra Díaz, Erik Gómez-Baggethun, and Rachelle Gould, "Opinion: Why Protect Nature? Rethinking Values and the Environment," in *Proceedings of the National Academy of Sciences of the United States of America* 113, no. 6 (2016): 1462–65.
- 43 Cliona McRobert, Jonathan Hill, Tim Smale, Elaine Hay, and Danielle Van der Windt, "A Multi-Modal Recruitment Strategy Using Social Media and Internet-Mediated Methods to Recruit a Multidisciplinary, International Sample of Clinicians to an Online Research Study," *PLoS One* 13, no. 7 (2018): e0200184.
- 44 Leo Havemann, Elizabeth Charles, Sarah Sherman, Scott Rodgers, and Joana Barros, "A Multitude of Modes: Considering 'Blended Learning' in Context" in CDE RIDE conference, March 15, 2019, London.



Figure 1 (left) and Figure 2 (right)
Build sessions with participants; photos by
James McCauley.

45 See, e.g., B. Irene Grimberg et al., "Facilitating Scientific Engagement Through a Science-Art Festival," *International Journal of Science Education*, Part B, 9, no. 2 (2019): 114–27; Luigi Bobbio, "Designing Effective Public Participation," *Policy and Society* 38, no. 1 (2019): 41–57; R. Phillips et al., "Design and Deploying Tools to 'Actively Engaging Nature': The My Naturewatch Project as an Agent for Engagement," *Computer Human Interaction* (2019); Dan Newman, *From the Front of the Room: Notes on Facilitation for Experienced Practitioners* (Rome: Matter Group, 2015); Mitchel Resnick, and Ken Robinson, *Lifelong Kindergarten: Cultivating Creativity through Projects, Passion, Peers, and Play* (MIT press, 2017); Stephen Sterling, *Sustainable Education: Re-Visioning Learning and Change, Schumacher Briefings* (Schumacher UK, CREATE Environment Centre, 2001).

46 Robert Phillips, Jesse Blum, Michael Brown, and Sharon Baurley, "Testing a Grassroots Citizen Science Venture Using Open Design, the Bee Lab Project," in *CHI'14 Extended Abstracts on Human Factors in Computing Systems* (New York: ACM, 2014), 1951–56. doi.org/10.1145/2559206.2581134.

47 Urbano Reviglio, "Serendipity as an Emerging Design Principle of the Infosphere: Challenges and Opportunities," *Ethics and Information Technology* 21, no. 2 (2019a): 151–66, 153.

facilitation, lifelong learning, and sustainable education.⁴⁵ We created "project advocates" as spokespeople (within organizations), and these advocates shared material in their broader networks.⁴⁶ Project advocates enabled serendipity—"conceived as an emerging design process"—and encouraged inquiry beyond the researcher's original comprehension.⁴⁷ The training gave participants permission to explore Resnick's wisdom in *Lifelong Kindergarten*: focusing not on delivering instruction but instead on supporting a creative learning process.⁴⁸

Participants learned and raised questions about all processes, gaining confidence as their learning continued. On arrival, the technology use and nature engagement of participants were benchmarked through questionnaires. The training was inclusive, so that a range of familiarity and comfort—both with technology and nature—was apparent in participants. Our focus on inclusion meant that group members worked together, attending to the diversity and the needs of less familiar participants. Research has demonstrated that as groups build together, members empower each other,⁴⁹ and that "group making" re-enforces social sustainability and leads to broader exploration as members influence one another.⁵⁰ Through the training, we encouraged participants to experiment, giving permission to see beyond the value of the resources provided and to overcome any fear of breaking them. Clary acknowledges that the "protection of one's self-interest is key to motivation" and remains a challenge⁵¹; however, communities' "self-interest" also can be and was designed into the My MNW project.

Participants were given "MNW resource packs" containing five unassembled cameras, leaflets, and instructions. Online resources included teaching materials, images, films, and design files. Each camera component was explained before beginning the step-by-step group assembly. The workshop followed methodologies



Figure 3 (left)
Camouflage created by participants; photo by James McCauley.



Figure 4 (right)
Immediate “in workshop” deployment and test on RCA campus; photo by James McCauley.

akin to “experience prototyping”⁵²; thus, every participant constructed and experienced the cameras. We added “casing camouflaging,” helping participants include public audiences as it only required limited skills. This provided “permission for ownership” and creativity, enabling people to have more authorship, in the process.⁵³ (See Figures 1 and 2.)

After finishing the construction of their cameras, participants placed them (in ethically approved locations) around The Royal College of Art (see Figures 3 and 4). Talks from the MNW project team and from Fixcamp shared “design curricula” resources, including approaches, prior workshops, films, and grass roots initiatives. Groups were then guided by staff through the process of developing task sheets, in which they thought through the ongoing deployment of the MNW project and debugged any challenges. The task sheets covered recruitment, press, health and safety, ethics, objectives, self-defined success, and MNW support; thus, participants were able to strategize activities and leave the session with a clear, attainable plan.

Transferable Reflections

After the workshops, we captured the following operational reflections that parties could apply in future activities related to the project:

- *Instructional design.* Flexibility is needed to suit different audiences, needs, and requirements.
- *Off-the-shelf hardware feedback.* “Positive assembly” feedback at interim assembly stages would help minimize participants’ questions about whether their assembly is correct and working.
- *Routine.* Technologies need to be effectively aligned in users’ existing routines (e.g., exercise, commuting, or other daily activities).

48 Mitchel Resnick, *Lifelong Kindergarten*, 46.

49 E. Gil Clary and Mark Snyder, “The Motivations to Volunteer: Theoretical and Practical Considerations,” *Current Directions in Psychological Science* 8, no. 5 (1999): 156–59.

50 Basak Kalkanci, Morvarid Rahmani, and L. Beril Toktay, “Social Sustainability in Emerging Economies: The Role of ‘Inclusive Innovation,’” *Georgia Tech Scheller College of Business Research Paper no. 18-24*, <http://dx.doi.org/10.2139/ssrn.3192623> (2018).

51 E. Gil Clary and Mark Snyder, “The Motivations to Volunteer,” 156–59.

52 Marion Buchenau and Jane Fulton Suri, “Experience Prototyping,” in *Proceedings of the 3rd Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques* (2000), 424–33.

53 Kim P. Corfman et al., “Values, Utility, and Ownership: Modelling the Relationships,” *Journal of Retailing* 67, no. 2 (1991): 184.

- *Exploration of participants' motivations.* Different audiences have distinctive means and motivations to actively engage.
- *Technological troubleshooting.* Problem diagnosis should enable both technical and non-technical individuals to communicate and appropriately align terminologies at a distance, without frustration.
- *Redistributing finances.* Finances need to allow for community-led schemes while also maintaining effective project oversight.
- *Avoiding exclusion.* We need new means of informing audiences outside traditional digital communities, being mindful of individuals' financial and time commitments.
- *Organizations.* We must balance volunteers' agency with needs to maintain oversight.

Results

Advocates ran 15 sessions, referred to as Organiser Workshops (OW), that included a range of populations, from senior pensioners to teenagers, technology novices to experts, and families to MPs to broadcasters. Settings included schools, museums, cinemas, conservation projects, animal hospitals, cultural institutions, NGOs, and more. For example, NGO participants included:

- 1) *Adur River Trust.* Independent charity creating a new waterway. Used NW toolkits to offer a lending scheme for families and schools, thus increasing participation and establishing a "camera library."
- 2) *Suffolk Wildlife Trust.* As a result of offering the NW toolkits, the Trust gained new volunteers, engaged new families in collaborating with a local wildlife hospital, and was presented in parliament by a local MP.
- 3) *The Durrell Trust.* Part of the Knepp rewilding estate, the trust re-introduces storks to the UK. The Trust used the NW toolkit to log and tag flighted birds, gaining wildlife traffic insights. The toolkit cost enabled the Trust to give volunteers who were feeding the storks NW kits, which increased the catalogue of stork sightings.

Six months after the training, we invited participating organizations to a celebration event, hosted at the London Design Museum. Attendees included Wildlife Trusts, Durrell Wildlife Conservation Trust, Ouse and Adur Rivers Trust, The Conservation Volunteers, Spitalfields City Farm, Westmeads Community Infant School, Heathlands Reunited, Urban Growth Learning Gardens, Wildlife

Wonder, The Countryside Education Trust, and Froglife. Although a six-month timeline certainly is concentrated, the results even in that timeframe were notable and impactful. Organizations presented their My NW project experiences, methodologies, and results. Design Museum senior staff stated that the My NW project transformed their sustainable vision:

It opened up new thinking in the Learning Department on how the museum can collaborate with HEIs on practice-led design research, demonstrating the crucial role for museums to play in introducing contemporary design issues and technologies to audiences. (Design Museum Learning Producer)

The celebration event gave a space for participants to share experiences. The event included a focus group, and participants also were interviewed individually, thus “avoiding the Hawthorn effect” of negatively influencing peers.⁵⁴ The training scheme’s success affected organizations’ digital presence, enhanced their community connections, and created new charity audiences. The scheme aligned volunteer motivations, helped organizations foster communities, and affected future engagement strategies. Thematic review was used to analyze the interview data, highlighting issues and repeatable elements. Such themes and elements included connected community, fostering project freedom, engagement, mutual concordance, and building ecological citizenship. We discuss each of these in turn.

Connected Community

Voluntary motivation is based on altruism and selflessness, according to Bang and Ross.⁵⁵ Meanwhile, engagement with (natural world) citizen-led activities is inspired by various motivations, including personal interests, “desire to learn, spend time in nature, meet like-minded people, and volunteer for causes.”⁵⁶ These aspects are indicative of the My NW project’s capacity to foster complimentary motivations. Advocate participants talked extensively about the project’s “audience motivation,” which was supported by skills learning, a trial-and-error approach, granting agency over use, and the value in social connectedness. One participant’s comment illustrates the connection developed between two participants who rarely collaborated:

Oh Dad, give it to me.” [The dad] had been trying, and she [his daughter] got it working; then he absolutely ran with it. Putting it out every day, he said, when interviewed, “Do you know what? I’ve been looking forward every single day to coming home and seeing what’s on the camera. (OW participant)

54 Jan Chipchase, *The Field Study Handbook* (San Francisco: Field Institute, 2018).

55 Hyejin Bang and Stephen D Ross., “Volunteer Motivation and Satisfaction,” *Journal of Venue and Event Management* 1, no. 1 (2009): 61–77.

56 Gitte Kragh, “The Motivations of Volunteers in Citizen Science,” *Environmental SCIENTIST* 25, no. 2 (2016): 32–35.

Connections were fostered among immediate audiences and external parties. We have highlighted the value of these social connection in previous work⁵⁷; they are an imperative in the NW project:

Going to see my grandma and seeing the excitement on her face when she sees a photo of a robin brought us together. It's amazing a camera can do that. It's like these cameras are connecting people through the medium of nature, as well as connecting people to nature. People do feel more connected to nature, and this had an impact that we could see. (OW participant)

Understandings of “community” can be ambiguous; under one definition, relevant to the MNW project, “communities are simply groups of people who keep coming together over what they care about, building collaborative acts.”⁵⁸ Researcher-led workshops focused on collaboration, delivering them using a flattened hierarchy to grow people’s confidence and autonomy. This approach ultimately fostered shared communal experiences and successes that prevailed beyond the structured workshops. One workshop organizer stated that “I [conducted the workshop] as a peer-learning sort of activity.... I was like, I’m going to need your help to figure this out again.” The organizer developed the tone, delivery, and content to ensure that everyone felt included and heard. The participants then “felt so excited, because you’d made it together; you spoke to other people, and you’d gotten those ideas. You’d made connections.” Thus, the work leveraged relationships to help people build confidence and grow from the collaborative experience.

Another connection that was valued by participants included “inter-generational making.” One volunteer participant stated that “I wanted to explore with my grandchildren. They got so much out of it.... It’s something all grandparents should do.”

Fostering Project Freedom

The MNW project gave participants agency by leading with a serendipitous agenda set by the participating organizations. Reviglio examines serendipity as a design principle and states that allowing for serendipity is “a process that can proliferate media by users.”⁵⁹ Hollbrook finds that “researchers love serendipity; [but] they do not understand it. Serendipity is not blind luck. Serendipity is sagacity regarding opportunity.”⁶⁰ Organizers can cultivate project freedom by engaging diverse audiences and creating open-ended interactions.

One OW participant articulated the freedom in open-ended interaction design: Whether “it’s a family course with [Wildlife Trust] or a charity, each year, we’re now scheduling a My Nature-watch get-together. So, everybody who comes to anything will be

57 Robert Phillips, Rosie Anderson, Amina Abbas-Nazari, William Gaver, and Andy Boucher, “Urban & Suburban Nature Interactions,’ Impacts and Serendipitous Narratives of the My Naturewatch Project,” in *Proceedings of the Design Society: DESIGN Conference*, vol. 1, 2109–18. (Cambridge University Press, 2020).

58 Bailey Richardson, *Get Together: How to Build a Community with Your People* (San Francisco: Stripe Press, 2019), 13.

59 Urbano Reviglio, “Serendipity as an Emerging Design Principle of the Info-sphere: Challenges and Opportunities,” *Ethics and Information Technology* 21, no. 2 (2019): 151–66.

60 J. Britt Hollbrook, “Designing Responsible Research and Innovation to Encourage Serendipity Could Enhance the Broader Societal Impacts of Research,” *Journal of Responsible Innovation* 6, no. 1 (2019): 84–90.

invited.” To further illustrate, workshop organizers designed and cultivated loan schemes, synchronized garden watches, technology build workshops, team-building activities, and goals of monitoring for specific species. The MNW project cameras helped people to share what they had seen while also remaining accessible to all through social media; “these cameras and the images are fantastic for social media, a great avenue to spread your message. It’s made us realize how important a social-media strategy is,” noted one OW participant. In addition, common objectives tied participants together: “Yes, you know you’ve got a common goal. You’re trying to see what’s around, and collect stuff for afterward,” commented one OW participant. These common goals provided the courage and freedom to move comfortably through the unknown; as a result, people were able to “break free from dominant behaviors, moving outside the rules of the game.”⁶¹

Both freedom and agency were crucial in the OW workshops—not just for the participating humans but also in relation to the technologies. Neither “humans nor artefacts possess agency prior to their interaction; agency comes into being when the two are combined.”⁶² The combination of open technology, people, context, and shared content fostered a form of “DIY citizenship.” According to Ratter and Boler, DIY citizens “create individuality through a process of choosing a higher purpose, or [they] make to encourage others”; agency, then, is both received and given.⁶³ One OW participant shared that he “hadn’t actually known that there was a fox coming in his garden, and suddenly he’s got these images of a beautiful young fox in the garden.” Participants saw the NW project intervention as a process that empowered them through making; said one participant, “these cameras are connecting people to other people through the medium of nature, as well as connecting people to nature.” Finally, a great bond was formed between technology, communities, and nature, and the bonds created shared experiences. The project’s goal to “bring them all together, connect nature lovers within the local community” was achieved, noted one grateful OW participant.

Engagement

The participating organizations hosted making workshops and cultivated site visits among participants involved in their community. Thus, as organizations provided feedback, they gained an important opportunity to establish relationships with participants and engage new volunteers—something they were unable to do before. Participants commented, “We had a look in the garden, and I was like, Well, there’s a reason we’re not getting anything. It’s because you’ve got a piece of grass and a big fence. Actually, that led to more conversations then about how they could make their garden more wildlife friendly and things.”

61 Ezio Manzini, *Politics of the Everyday*, 20.

62 Katinka Waelbers, “From Assigning to Designing Technological Agency,” *Human Studies* 32, no. 2 (2009): 241–50.

63 Matt Ratto and Megan Boler, *DIY Citizenship: Critical Making and Social Media* (Cambridge, MA: MIT Press, 2014).

OW sessions were run with larger groups, supporting collaborative learning. Many larger groups trained their (in-house) teams and included people within a social activity that transformed the barrier to entry. One OW participant commented that “We did it together, it was a really fun, a good bonding experience, we all sat down with some tea and cake. By the end, we had all of the lights coming on correctly and people were like, Oh!....” A workshop participant from Wildlife Trusts commented that “we’re building up a good picture of hedgehog [locations], allow[ing] us to devote time and energy to areas; it’s a really valuable tool to gather data on where hedgehogs are.”

Mutual Concordance

We see “mutual concordance” as an agreement to which participants committed, involving ethics and an open agenda. Participating organizations were already highly motivated, so the nature of individual participants’ commitment required intentional shaping. As Cornwall states, “self-mobilisation” describes people taking “the initiative” independently of external organizations, retaining resource control.”⁶⁴ Noted one OW participant, “most of the time, you like people to figure it out because then they feel like they’ve accomplished something.” In discussing and identifying participant motivation, we observed that “persistence” and the “reward” of getting images were important aspects. Thus, both the research team and the workshop organizers sought to manage expectations. For example, if participants believed the technologies would deliver “perfection,” they were informed that “you won’t necessarily get brilliant photos every time; it’s about sticking with it and building up a picture.” These MNW interactions required people to complete them, giving participants editorial agency. One organizational participant stated that “get[ting] people to start self-recording and start figuring out what they got from the experience” was the ideal. The closest analogy in terms of the goals of the MNW project is Citizen Science; both seek to leverage social license, trust, and engagement. Achieving “social license for conservation requires engagement with communities [by] promoting dialogue and cooperation.”⁶⁵ The challenge is in building inclusive systems that address the needs of organizations, individuals, and volunteers. One exemplar for creating mutual benefits—an initiative in Rural France—was “the French post office [strategy] joining challenges; the growing number of elderly people living alone; and dwindling letter-writing in the digital era.”⁶⁶ Another exemplar is Detroit SOUP, a micro-granting feast supporting Detroit-based projects. Attendees at the event give a \$5 donation and receive soup and a vote. They hear presentations from individuals who share their ideas about art, urban agriculture, or

64 Andrea Cornwall, “Unpacking ‘Participation’: Models, Meanings and Practices,” *Community Development Journal* 43, no. 3 (2008): 269–83.

65 Rachel Kelly, Aysha Fleming, Gretta T. Pecl, Anett Richter, and Aletta Bonn, “Social License through Citizen Science” *Ecology and Society* 24, no. 1 (2019).

66 Angelique Chrisafis, Care Package: The French Postal Workers Helping Lonely Older People (2018), <https://www.theguardian.com/world/2018/nov/23/care-package-french-postal-workers-helping-lonely-older-people> (accessed December 3, 2020).

technology, for example. “The attendees eat, talk, and vote on projects that benefit the city. Winners go home with the raised finances to execute their project.”⁶⁷

The mutual benefit of MNW is embedded as participants and organizations prosper, providing a lasting legacy. Engagement in the MNW project transformed participants and their approach in working with the public:

We’ve always been looking at how we incorporate technology with nature. To engage certain audiences, especially teenagers, we get them by using what they know best. Then, when they witness that, “Oh, I’ve got a fox,” it engages them, making them feel part of something. (OW participant)

The participants then think about how and why they come to an NGO’s events; in addition to nature, they also come for the community, the common goal, and meeting other like-minded people. The activities thus uncovered hidden needs of the organizations’ volunteers: “It’s really important to remember the benefits for volunteers; we know a huge subsection of them are engaging because they like nature, but they really also need social interactions,” noted one organizational participant. The collective outputs—cameras, images, wildlife views, social interactions, nature connectedness, impacts, scientific value(s), wildlife monitoring, etc.—made apparent the importance of mutual benefit to all parties within this construct; “[participants] could see all the data of their surrounding area. They also could say ‘I’m providing input and I’m doing science,’ and they were getting a bit of a pat on the back from themselves.” (OW participant)

Wider Issues: Ecological Citizenship

Overarching projects that rely on volunteer workforces often fail over time because they require combinations of curation, communication, and integral resources. The NW project work highlighted the importance of establishing cooperatives that provided these skills and of establishing mechanisms that do not rely on people’s kindness. Wanting to contribute to bigger causes is one such mechanism, as one organizational workshop participant noted: “I think if you couple the idea of these workshops or bringing people in to build a camera with a cause, like, ‘Help us track the hedgehogs in Trumpington.’ Comments like, ‘Oh, I’ve got a fox,’ or ‘I’ve got this,’ show that it just engages them, and it makes them feel part of something.” Researchers should design this ownership and embed it as from the first day, slowly stepping back and handing over projects over time.

67 <https://detroit soup.com/about/> (accessed March 13, 2020). Detroit SOUP’s mission is to promote community-based development through crowdfunding, creativity, collaboration, democracy, trust, and fun.

To this end, we reframed “nature citizenship” to be designed into the project to nurture our planet (i.e., participants as Earth Guardians). For example, ecological citizenship could be represented by “donations” for nature-based volunteering activities, thus contributing to the common good that is, by promoting activism through collective designed perspectives. Sites of special scientific interest (SSSi) are at risk as a result of fly tipping, pollution, invasive species, and effects of climate change. Of the 4,126 current SSSIs, “47% have not been examined in the last six years, according to environment department data.”⁶⁸ Promoting ecological citizenship offers a corrective by advocating for the following:

...Transcending consumerism, undertaking challenges, intervening in cultural habits, enacting sustainable change, and empowering resilience. We define “ecological citizenship” as proposals deployed within public communities, positively informing our actions toward sustainable ambitions, beyond our individual personal needs.⁶⁹

One exemplar of ecological citizenship is the Mounted City of London police, when they were ordered to help trample in wildflower seeds at the Barbican. Grazing animals play an essential role in maintaining traditional wildflower meadows because their hooves create dips and furrows that help push seeds into the soil and create microhabitats; that is, their actions benefit wider parties.⁷⁰ Ecological citizenship also involves proposals, embedded in communities, that inform our actions toward sustainable goals. For example, deploying camera traps is “an attractive tool because [they] provide a low-cost, non-invasive survey method that (due to the physical absence of an observer) reduces disturbance and does not require the capture and handling of studied animals.”⁷¹ Meanwhile, the bigger challenge is motivation over time. The inability of participants to capture images over time—not because of NW project technical issues with the camera, but because wildlife visits were lacking—were a negative factor. Initially, NW project citizens were motivated by their own intrinsic interests in community studies. However, “for continuing contributions, other factors are necessary to motivate them: feedback about their contribution, acknowledgement by scientists and peers, a sense of belonging to a community, and more.”⁷²

Coordinated mass interactions present common issues and problems in the design and execution of citizen science projects—problems that are site-specific or that include sample collection. At scale, small interactions and choices (i.e., dropping a piece of litter) can have exponential effects. The number of climbers on Mount Everest offers one example. Since 2015, Tibet officials have required all climbers to remove rubbish; they must retrieve at least 8kg of rubbish and are fined \$100 for every kilogram below 8kg.⁷³ Consider another example: As a regional issue, bird watching apps replicate

- 68 Emma Howard, “Nearly Half of England’s ‘Most Important Wildlife Sites’ at Risk After Not Being Monitored for Years,” <https://unearthed.greenpeace.org/2018/09/07/half-england-sssi-sites-not-monitored/> (accessed March 10, 2020).
- 69 Robert Phillips, Rosie Anderson, Amina Abbas-Nazari, William Gaver, and Andy Boucher. “‘Interactions,’ Impacts and Serendipitous Narratives of the My Naturewatch Project,” in *Proceedings of the Design Society: DESIGN Conference*, vol. 1, 2109–18, 2121 Cambridge University Press, 2020. Urban & Suburban Nature Interactions.
- 70 Phoebe Weston, “Call the Cavalry! Horses Ride to Rescue of an Inner-City Garden,” <https://www.theguardian.com/environment/2020/dec/28/call-the-cavalry-horses-ride-to-rescue-of-an-inner-city-garden-aoe> (accessed April 1, 2021).
- 71 Scott Newey et al., “Limitations of Recreational Camera Traps for Wildlife Management and Conservation Research: A Practitioner’s Perspective,” *Ambio* 44, no. 4 (2015): 624–35.
- 72 Dana Rotman, Jen Hammock, Jenny Preece, Carol Boston, Derek Hansen, Anne Bowser, and Yurong He, “Does Motivation in Citizen Science Change with Time and Culture?” in *Proceedings of the Companion Publication of the 17th ACM Conference on Computer-Supported Cooperative Work and Social Computing* (New York: ACM, 2014), 229–32.
- 73 Lily Kuo and Peter Beaumont, “Mount Everest Climber Numbers Face Major Cut as China Starts Clean-Up. Number of People Scaling North Side to Be Reduced By a Third and Season Shortened,” <https://www.theguardian.com/world/2019/jan/21/mount-everest-climbers-face-major-clampdown-as-china-begins-cleanup> (accessed March 9, 2020).

bird calls for bird watchers who wish to photograph them. However, “repeatedly playing birdsong recordings to encourage a bird [i.e., to see it or photograph it] can divert territorial birds from important duties, such as feeding their young. People should never use playback to attract a species during its breeding season.”⁷⁴ At scale, these actions can have a dramatic impact.

The training program was successful because we worked with leading experts and organizations who independently advised participants. Thus, we avoided issues like “baiting,” which is the practice of priming spaces with food to encourage animal interactions. The practice encourages vermin, changes the ecological species balance, and has a wide range of other negative effects, including causing unclean environments, increasing financial costs, causing differential behavioral responses, biasing of population parameters, creation of false environments, and poisoning feed.⁷⁵ In the NW project, participants shared an awareness, according to one participant, that people can overfeed animals, making them dependent on one or two gardens.

Wider Issues: Strategic Opportunities

A design strategy is a plan or a series of maneuvers for obtaining specific result(s). Strategic design for sustainability is “the development of an integrated system of products, services, and communication [that is] coherent with the medium and long-term perspective of sustainability [and that is] economically feasible.”⁷⁶ For the MNW project, three aspects of the strategic design plan were crucial:

- 1) *Technology that evolves.* The DIY nature of the project enabled the design team and participants to develop together. For example, one organizational participant noted that participants valued access to such evolutions: “So if a newer version [of the camera] comes out, I could technically have that?”
- 2) *Beyond volunteering.* The project documented a model, beyond conventional volunteering economies, in which our participants called themselves custodians, rather than volunteers. The project also led to new means for communication between OW staff and their site visitors. Referring to the MNW camera, workshop organizers stated, “The kits are working. We’ve tested it. [organizers colleagues] even talked to visitors, which they rarely do.”
- 3) *Alternate dissemination.* The NW project yielded large volumes of social media activity and encouraged live conversations at a distance. We fostered the use of new approaches and new technologies to engage a teenage audience. And we revisited our insights, looking for wider opportunities and further defining the issues and challenges in encouraging public “nature engagements.”

74 BBC, Birdsong phone apps “harmful” to birds, say Dorset experts (2013), <https://www.bbc.co.uk/news/uk-england-dorset-22863383> (accessed March 9, 2020).

75 See, e.g., Royal Horticultural Society, “Invasive Non-Native Plants,” <https://www.rhs.org.uk/advice/profile?pid=530> (accessed June 8, 2020); B. D. du Preez et al., “To Bait or Not to Bait: A Comparison of Camera-Trapping Methods for Estimating Leopard Panthera Pardus Density,” *Biological Conservation* 176 (2014): 153–61; P. Meek, et al., “Recommended Guiding Principles for Reporting on Camera Trapping Research,” *Biodiversity and Conservation* 23, no. 9 (2014): 2321–43; D. G. Rocha et al., “Baiting for Carnivores Might Negatively Affect Capture Rates of Prey Species in Camera-Trap Studies,” *Journal of Zoology* 300, no. 3 (2016): 205–12; D. Holinda et al., “Effects of Scent Lure on Camera Trap Detections Vary Across Mammalian Predator and Prey Species,” *PLoS One* 15, no. 5 (2020): e0229055; and A. L. Towerton et al., “Detecting Pest and Prey Responses to Fox Control Across the Landscape Using Remote Cameras,” *Wildlife Research* 38, no. 3 (2011): 208–20.

76 Ezio Manzini, *Politics of the Everyday*, 1.

Wider Issues: Amateurs and Strategic Planning

The discovery of new species by amateurs has been common throughout history, asserts Numer. Publications identifying “new species come out today three times more frequently than earlier decades. Internationally, many efforts are driven by amateurs.”⁷⁷ Instances are fueled by resources like iNaturalist, which is a social network for those who are interested in wildlife. Amateurs can upload their photos of, for example, moths or birds to the app; the app then posts the location, and “amateurs and expert naturalists help identify the species.”⁷⁸ At times, amateur access can be polarizing because initiating people’s engagement can present challenges. Interested parties can have widely varying perspectives on issues such as nature conservation, invasive species, human interactions, native species, and control measures.⁷⁹ The NW project used the term “content creation” for the project-built opportunity, instead of referring to data and scientific databases as we sought to address the wider issue of how to design user-led rigor into an amateur process while also maintaining participants’ agency.

To bring change, incorporating and sustaining individual participants’ agency must be held in tension with a larger communal goal. Society-centered design (societycentered.design) articulates this view. It advocates for new values by placing society as a central focus. One of its values—redistributing the power of technology—is described this way: “Design must seek to redistribute that power [of technology] for *citizen empowerment and equity*.” In the NW project, the bigger issue was that we still needed to design processes to validate and support citizen empowerment in lay users’ engagement with technology—and to foster engagement with the natural world (i.e., not by replacing nature with a screen or sanitizing nature beyond recognition). How the NW project’s design balanced this tension required intentionality. Participants more accustomed to technology than to engaging with nature expressed some concern. One OW participant described a fear that “I’m going to end up with a picture of something I really don’t want to see... You don’t want to see any horrible images.” “Engaged” projects like NW must ethically prepare for how they can be used and what people might see, without sanitizing or downplaying nature’s realities.

Conclusion

The successes and failures of designing for “active engagement”—that is, in our communicating and our designing objectives—relied on the participants’ network, time resources, and passion for charitable cause(s). We saw that “mutual benefits” require further exploration in active engagement, outside the realm of charitable causes.

77 R. Numer, *Amateur Naturalists Are Discovering All Kinds of New Insect Species* (2013), <https://www.smithsonianmag.com/smart-news/amateur-naturalists-are-discovering-all-kinds-of-new-insect-species-20573477/> (accessed March 10, 2020).

78 R. Kelly et al., “Social License Through Citizen Science,” *Ecology and Society* 24, no. 1 (2019) DOI: 10.1101/266692, pp.3.

79 For example, on invasive species, see Sarah Lowe, Michael Browne, Souyad Boudjelas, and Maj De Poorter, “100 of the World’s Worst Invasive Alien Species: A Selection from the *Global Invasive Species Database*,” 12 (Auckland: Invasive Species Specialist Group, 2000).

The design team encouraged serendipitous occurrences, and one success of the project was in allowing agents to dictate how the NW kits were deployed. Thus, we balanced giving enough structure and also providing permission for people to adapt the kits' use. Repeatable MNW project elements included open designs, off-the-shelf components, adaptable objectives, and mutually motivating (user and organization), mutually benefiting economic and social media content.

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