Taylor & Francis
Taylor & Francis Group

Australasian Journal of Environmental Management

ISSN: 1448-6563 (Print) 2159-5356 (Online) Journal homepage: https://www.tandfonline.com/loi/tjem20

Best practices: social research methods to inform biological conservation

Sharifa G. Crandall, Jennifer L. Ohayon, Luz A. de Wit, J.E. Hammond, Kate L. Melanson, Monica M. Moritsch, Rob Davenport, Diana Ruiz, Bradford Keitt, Nick D. Holmes, Heath G. Packard, Jeffrey Bury, Gregory S. Gilbert & Ingrid M. Parker

To cite this article: Sharifa G. Crandall, Jennifer L. Ohayon, Luz A. de Wit, J.E. Hammond, Kate L. Melanson, Monica M. Moritsch, Rob Davenport, Diana Ruiz, Bradford Keitt, Nick D. Holmes, Heath G. Packard, Jeffrey Bury, Gregory S. Gilbert & Ingrid M. Parker (2018) Best practices: social research methods to inform biological conservation, Australasian Journal of Environmental Management, 25:1, 6-23, DOI: 10.1080/14486563.2017.1420499

To link to this article: https://doi.org/10.1080/14486563.2017.1420499

AUSTRALASIAN JOURNAL OF ENVIRONMENTAL MANAGEMENT, 2018
VOL. 25, NO. 1, 6–23
https://doi.org/10.1080/14486563.2017.1420499

Taylor & Francis
Taylor & Francis Group

Best practices: social research methods to inform biological conservation

Sharifa G. Crandall[a], Jennifer L. Ohayon[b], Luz A. de Wit[b], J.E. Hammond[b], Kate L. Melanson[b], Monica M. Moritsch[b], Rob Davenport[b], Diana Ruiz[b], Bradford Keitt[c], Nick D. Holmes[c], Heath G. Packard[c], Jeffrey Bury[b], Gregory S. Gilbert[b] and Ingrid M. Parker[b]

[a]California State University, Monterey Bay, Seaside, USA; [b]University of California, Santa Cruz, USA; [c]Island Conservation, Santa Cruz, USA

ABSTRACT

Social factors play a critical role in almost every conservation problem. There is a pressing need for conservation researchers and practitioners to understand both the ecological and human dimensions of their systems in order for projects to be successful. At the same time, many conservation professionals come from a natural science background with little training in or limited access to social research methodologies. The purpose of this article is to review the principal methods of social science field research relevant for biological conservation: archival research, key informant interviews, oral histories, surveys, focus groups, participant observation, discourse analysis and participatory research. Our goal is to provide a scaffold of knowledge for those unfamiliar with these methods, outlining each approach and providing examples of how they have been applied to conservation problems. We emphasise social research designed to advance conservation objectives, particularly in the case of the conservation of biodiversity on islands internationally, where high endemism and risk of extinction combine with diverse human needs, values and belief systems. Based on the literature reviewed, we contribute a timeline suggesting when to implement these social methodologies during conservation efforts on inhabited islands.

KEYWORDS

Sociology; social research; methodology; conservation; biodiversity; islands

Introduction

Conservation actions play out within linked ecological and social systems. Recognition of the importance of social factors in conservation is now widespread (de Snoo et al. 2013; Mascia et al. 2003; Newing et al. 2011; Sandbrook et al. 2013). Even so, because of the high level of biological knowledge that is needed to plan the recovery of even a single species, conservation practitioners focused on understanding the ecology of a system may inadvertently overlook or underestimate the importance of the human populations and institutions influencing the system. Even when the importance of the social aspects of conservation is obvious and acknowledged, it can be difficult to discern how to engage these dimensions effectively.

CONTACT Sharifa G. Crandall scrandall@csumb.edu

Conservation researchers and practitioners with a background in natural science may have little specialised training in social science research methodologies (Muir & Schwartz 2009; Newing 2010). There is a need to access this type of training along with an entry into the literature of social science for those who are unfamiliar with its specialised terminology and conventions. Some recent volumes have been published to help fill this gap (Bennett & Roth 2015; Newing et al. 2011). These works together provide a comprehensive and detailed reference for research and analysis across a wide range of social science disciplines, reaching beyond what we offer here. Our specific objective is to offer a primer of the social research methods suitable for conservation researchers and practitioners. Sandbrook et al. (2013) distinguish between social research on conservation and research for conservation, both of which have much to offer the field of conservation science. Here, our focus is social research for conservation, which emphases advancing the goal of conserving biodiversity effectively. In that light, we put the eight methods into context and provide examples in order to show when and why each approach might be useful to understand opportunities for conservation action and roadblocks to achieving conservation goals. Moreover, many applied social science research projects use a multi-method approach and we suggest when the eight methods might be used together.

In this review, the focus on islands is not arbitrary. Although islands make up less than five per cent of the land area on Earth, they support an estimated 20 per cent of all plant and vertebrate species on the planet (Kier et al. 2009), along with a high degree of associated marine biodiversity (Allen & Werner 2002; Roberts et al. 2002). At the same time, 95 per cent of historical extinctions of birds and mammals have been on islands (Loehle & Eschenbach 2012), and today islands support 40 per cent of the world's critically endangered species (Ricketts et al. 2005). The challenge of working effectively with a diverse array of stakeholders and governance structures is common to any international conservation organisation, while removing invasive species from inhabited islands, for example, presents particular challenges (Glen et al. 2013; Tershy et al. 2012; Island Conservation 2017). There is a clear need to conserve island biota while simultaneously understanding the role of humans on island systems historically and today. The focus here is on how practitioners can more effectively assess the social acceptability and feasibility of conservation actions through social science research. Conservation on islands is our particular lens, but the methods, as well as the examples we choose, are broadly applicable to any conservation enterprise.

The approaches discussed here will contribute most effectively to the conservation decision-making process by incorporating socio-ecological data collection into a larger investigative framework of inquiry. As recent discussions focused on social research and conservation biology illustrate, successful interdisciplinary methodological approaches need to integrate multiple systems of knowledge in order to avoid research outcomes that are incommensurable; what has been referred to as the 'two cultures problem' (Adams 2007; Agrawal & Ostrom 2006; Brosius 2006; Nyanga 2012; Sandbrook et al. 2013). Several key elements are common to effective interdisciplinary research frameworks (Figure 1).

Social science research methodologies to inform conservation

Following classic texts used for teaching and implementing social science methodology (Bernard 2006; Creswell 2009; Howell 1990; Robson 2011), we identified eight principal

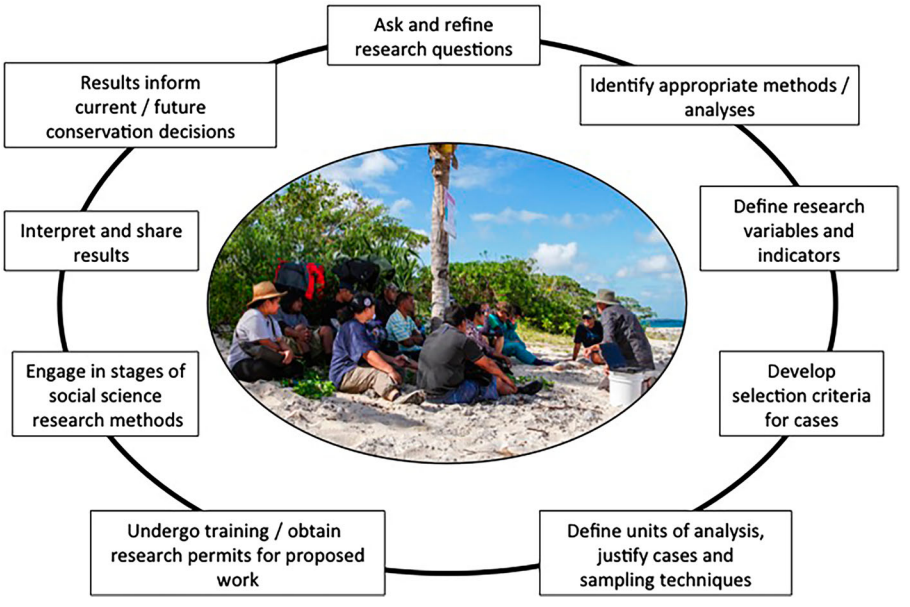

Figure 1. Key elements involved in conducting social science research for biological conservation. Visualization shows how conservation organizations can construct a social science research framework. These elements inform an iterative learning process and are not necessarily linear. Rather, elements may inform others throughout the entire research investigation. Note that engaging in the various methodological stages of social research is the focus of this review.

methods for field research in social science that can be incorporated into biological conservation research design and practice: archival research, key informant interviews, oral histories, surveys, focus groups, participant observation, discourse analysis and participatory research. For each approach, we first define it and describe how it is used, and provide information on its strengths and limitations. We review best practices for conservation researchers and practitioners for implementation and offer international examples of how the method has been used in a conservation context in island systems. Finally, based on our review of peer-reviewed examples that have successfully implemented social approaches into conservation, we contribute an example of a timeline suggesting when to incorporate these eight social approaches into conservation efforts.

Archival research

Archival research involves searching for and extracting information from original sources, such as stored records kept by governments, universities or other institutions (Bernard 2006). These data can provide context for a conservation project. This method can be most useful at the earliest stages of working in a project area. Archives such as newspaper articles and newsletters can be used to understand important events, discourses and societal processes surrounding important decisions. Records of public meetings or local agreements with other outside organisations such as private companies, international aid organisations or other non-profits may provide insight into local attitudes towards

working with conservation groups. This past contact may have a critical influence on the way people react to proposed collaborations and can contribute to the ultimate success of a conservation project. Archival records may also lead to a helpful contact with a researcher who has inside information about working in the project area (Bernard 2006; Brettell 1998).

One of the greatest advantages of archival research for conservation practitioners is the ability to develop an understanding for the potential opportunities and obstacles at a project site before arriving on the ground. Another benefit is gaining some information before engaging in the ethical and logistical aspects of interacting directly with people on site (Bernard 2006). Many archives are now available through the Internet. Finding archival data that do not exist on virtual repositories may be difficult at first and may require researching national and international physical archives, as well as pinpointing sources of local records such as town meeting minutes, newsletters and photographic archives that can be accessed later through key informant interviews.

Engaging in this methodology can help put biological conservation efforts into a social and historical context. For instance, archival research can provide critical information about when the extinction of a species occurred, the circumstances surrounding it, or information on past management actions. The Database of Island Invasive Species Eradications incorporates information from a range of sources and can be used to study the management of invasive species on islands worldwide (DIISE Island Conservation 2017). When compiled, these data shed insight into why some conservation efforts fail while others succeed, and could be instrumental in directing future efforts (Russell and Holmes 2015). Archival sources may also provide critical biological information, such as species lists, phenology data or historical distribution or abundance of species; these data may be used to estimate past and future impacts of invasive species on native island fauna (McCreless et al. 2016). Natural history field notes provide important information about environmental change, such as those archived by the Museum of Vertebrate Zoology at University of California, Berkeley (MVZ UCB) (MVZ UC Berkeley 2017). Moritz et al. (2008) investigated the impact of climate change on small mammals as part of the Grinnell re-survey at the MVZ UCB. Biological responses to global climate change were documented by comparing modern plant phenology with phenological observations recorded in Massachusetts in 1852 by Henry David Thoreau and in Wisconsin in 1935 by Aldo Leopold (Ellwood et al. 2013).

Key informant interviews

Key informants are members of a community or institution who are knowledgeable about the topic of interest, usually through experience, and these individuals are willing to share their experiences and expertise (Bernard 2006). They can be community leaders and council members or simply experts in a relevant job or role such as experienced farmers, landowners or resource managers (Giampaoli & Bliss 2011; Suárez et al. 2012). These individuals possess concentrated, in-depth knowledge about a few topics rather than superficial knowledge of many topics, although they often understand the different practices of the community as a whole in addition to their personal practices. These informants may possess traditional knowledge or traditional ecological knowledge (Anderson 2005). Key informants can play a central role in conservation efforts. Whereas other

methods such as archival research and surveys that identify what resources and practices exist and how people value different resources, or the perceived consequences of losing these resources, key informant interviews can provide an in-depth perspective of why people perform these practices as well as the reasoning behind their perceptions (Reyes-Garcia et al. 2013).

Choosing key informants carefully is vital for a successful conservation project (Suárez et al. 2012). Key informants should cover the diversity of opinions in a community and include individuals who may or may not share a manager's outcome vision, to avoid sampling bias. Establishing status and rapport, both frequently and visibly, is especially important for working with individuals, so as not to compromise other relationships within the community (Russell & Harshbarger 2003). Before choosing key informants, passive observation of community dynamics can help identify individuals who are truly representative of demographic groups and their standing in the community. Socially excluded individuals may not be able to describe the community dynamics as accurately as a well-integrated individual; however, an outsider's perspective provides valuable information as well. To evaluate the expertise or skills of key informants in their roles, researchers may observe individuals at work and look for signs of expertise. Alternatively, they may administer a more formal, quantitative questionnaire with yes–no and true–false questions appropriate to each profession in order to score their knowledge (Bernard 2006). A good approach is to ask each informant at the end of the interview, 'Who else should I talk to?' and 'Who would agree or disagree with your views on this topic?' This helps outline a broader network of key informants to interview to obtain a fuller view of the issues. The 'snowball technique', asking people to connect the researcher to one or two more other individuals, can be especially useful when members of the community are hard to find (e.g. few individuals over large areas or when locating those that belong to particular groups, including 'outsiders') (Bernard 2006; Robson 2011).

Working closely with well-respected key informants can also help researchers understand the power dynamics driving decisions and may help gain community support for conservation projects such as invasive species eradication efforts. In particular, indigenous peoples or historically disadvantaged or sensitive groups may put more trust in members of their own community than in outsiders. Key informants who approve or disapprove of certain conservation goals or projects can help bridge perspectives. These individuals can advocate for a particular conservation effort, especially if researchers and community members equally acknowledge local values such as protection and preservation of cultural or food resources beyond biodiversity conservation or ecological restoration.

For example, near São Francisco do Sul Island in Brazil, scientists worked with local fishers to map the distribution of the Goliath grouper (*Epinephelus itajara*), whose populations are threatened from overfishing (Gerhardinger et al. 2009). The goal of the project was to understand species habitat-use in order to develop adaptive co-management regimes. The authors used traditional knowledge from key informants to map where fish are located, in combination with studies where scientists worked closely with these fishing communities to understand the abundance, migration and behaviour of marine resources. The results from such studies can facilitate the creation of a marine-protected area and allow a better understanding of the practices and needs of local fishers in order improve environmental management goals (Gerhardinger et al. 2009).

Oral histories

Oral history is defined as in-depth biographical interviewing about life stories, experiences and eyewitness accounts (Ritchie 2011; Yow 2005). This approach is often used to interview indigenous groups or historically disadvantaged individuals whose voices are excluded from written documentation or the decision-making processes (Hamilton 1987; Sarkar 2012). Oral history can be applied to a range of conservation biology problems, from assessing cultural response to conservation actions, to understanding the environmental history of a region (Chazdon et al. 2009). Oral histories can play a role in conservation projects both directly, by giving voice to local experience and documenting the opinions of key actors, and indirectly, by enriching personal connections between conservation practitioners and local peoples.

Oral history supplements written documents and provides diverse perspectives as to how individuals relate to social life and major events (Hamilton 1987; Sarkar 2012). This approach is often combined with methods from fields such as critical anthropology, literary criticism, qualitative sociology, cultural studies, linguistics and psychology (Sarkar 2012). Prior to an interview, researchers should prepare an outline of questions to guide the interview (Baylor 2014, Leavy 2011). The goal of the interview should be an honest personal account, free of stereotypes or leading statements and should avoid misrepresentation. During the interview, it is important for the interviewer to respect the interviewee's boundaries while also going beyond superficial answers. Best practices for collecting oral history include preserving an audio or video recording of the interview (Leavy 2011). Interviewers must always ask permission of the interviewee to record their conversation and should indicate in a clear manner what will be done with the recorded conversation and whether the interviewee's identity will remain anonymous (usually the case), especially when discussing sensitive issues. After the interview, the interviewer should document their methods, transcribe the interview including coding or changing names to protect the interviewee, store the recordings and honour any interviewer–interviewee agreements, such as anonymity or how and with whom the investigator plans to share the oral history (Baylor 2014; Leavy 2011).

Oral histories are most commonly used in conservation to help understand ecological history and human resource use and management. For instance, collecting oral histories could be incorporated into initial habitat and community assessments, detailing the local environmental history of a site. In the case where a species removal or other conservation intervention is planned, oral histories can help clarify local perceptions of native and introduced species and assess community support for management plans. In Papua New Guinea, researchers used oral histories to understand both historical management of coral reefs and the social importance of the reefs to the local community (Cinner et al. 2005). Ahu Islanders use traditional knowledge and management to restrict fishing within their communities in certain areas of a common coral reef lagoon. By combining oral history data from islanders together with fish biomass data obtained from underwater visual censuses, the study found that there was no significant harvesting effect on the fish stocks. The authors attribute their findings to the perceived legitimacy of traditional fishing restrictions that encourage sustainable fish harvest.

Oral history provides an invaluable opportunity to cultivate positive relationships with local populations and allows articulation of community values into conservation plans;

this can facilitate local acceptance and participation in management plans. For instance, researchers in the Kanyapella Basin, Australia employed oral history to incorporate public suggestions into the dialogue of wetland restoration (Robertson and McGee 2003). Oral histories of local inhabitants on flooding frequency and accounts of past flora and fauna allowed for reconstruction of the ecological landscape to provide guidance for restoration efforts. These data were combined with various historical documents to create a more robust historical ecological view of the management area in question. Moreover, local landowners felt that by contributing their oral histories, they were part of the wetland rehabilitation project (Robertson and McGee 2003).

Surveys

Surveys are systematically structured interviews designed to collect information from respondents in a form that can be analysed using summary or analytical statistics (Bernard 2011). Surveys are useful tools in conservation efforts: they can inform policy and management decisions by providing data about people's perceptions, level of knowledge, values and attitudes towards environmental issues and concerns (Schultz et al. 2005). Surveys can help identify differences and conflicts of interest between different stakeholders (Streever et al. 1998; Turner et al. 2000) and can also be used to help structure research efforts to be more useful for managers (Matzek et al. 2014).

Data can be collected through four main methods: (1) personal interview (face-to-face), (2) self-administered questionnaire where the interviewer is absent, (3) telephone interviews and (4) online surveys, each with its own caveats (Bernard 2011). White et al. (2005) review the use of surveys in ecological research and make useful recommendations for best practices. These practices include explaining the rationale for targeting certain human populations for social research and conducting pilot-studies to help hone the surveys before moving to wider implementation.

Conservation practitioners can design surveys to illuminate the cultural, social and economic values that local inhabitants place on endangered endemic species, on invasive species, as well as the inhabitants' perceptions and support of conservation efforts (Sharp et al. 2011). In the west-central Philippines, effective conservation and management of coral reef ecosystems necessitate an involvement of the local fishing villagers that depend on the ocean for their sustenance and livelihood (Aldon et al. 2011). In order to understand local fishing activities, Filipino cultural norms and use of natural and cultural resources, researchers conducted household surveys to quantify local demographics and socio-economic data, resource use and perceptions of marine resource degradation. The authors found that most fishers perceived a high state of marine degradation and were willing to support conservation and management efforts to curtail overfishing to both improve coastal health and their fishing livelihoods (Aldon et al. 2011). In another study from Zakynthos Island in the Ionian Sea, a survey was used to assess whether seabird by-catch poses a threat to bird populations in this region of the Mediterranean (Karris et al. 2013). By collaborating with the Zaykynkos Fishery Department, the researchers used a questionnaire with closed and open-ended questions to interview licenced fishers in the area. The authors learned which bird species are accidently caught during fishing expeditions, the type of equipment most responsible (commercial

longline) for seabird by-catch, and they conducted a spatio-temporal analysis to better understand when and where this problem occurs (Karris et al. 2013).

Focus groups

Focus groups are moderated discussions using pre-formulated semi-structured or open-ended questions that are used to ascertain how small groups (under 10–12 people) feel about a particular issue or product (Bernard 2006; Krueger and Casey 2008). Group members may disagree with each other or may agree on certain issues or topics during the discussion. Focus groups create dynamic discussions where participants' responses build on one another and can provide richly nuanced information. Focus groups may uncover reasons for resistance to conservation actions that may not arise comfortably during one-on-one questioning by an outside researcher. Hence, focus groups can help conservation practitioners who engage in projects that directly affect the values or livelihoods of many different groups and stakeholders, whereas individual surveys or interviews may not cover the full spectrum of social perspectives and responses to a proposed action (Cabuy et al. 2012). Typically two to three researchers conduct a focus group, where one person is the moderator and the others silently record by hand or digital tape recorder what is being said, who says what, who dominates the conversation, and who remains silent (Bernard & Ryan 2010; Krueger & Casey 2008). The transcript from the discussion is analysed by coding, identifying patterns in the opinions voiced in the group (Krueger & Casey 2008).

Focus groups are a useful social research method because people with similar interests and values can be assembled for an in-depth discussion. They allow an opportunity for the community members selected to participate to discuss their concerns and fears with one another and the researcher, as well as articulate their preferences for certain outcomes after conservation actions are implemented, especially if economic development or alterations in resource use patterns are necessary for conservation success (Philip & MacMillan 2005). On Efate Island in Vanuatu, focus groups were conducted to understand community-based fishing rules and the traditional management of marine resources as well as how conservation groups working with these villages have influenced traditional fishing practices (Léopold et al. 2013). With the assistance of local leaders, researchers visited seven villages and conducted eight to nine focus groups per village with three to six people at a time. The authors found that marine reserves rules were effective and enforced within these communities. Certain fishing regulations were perceived as overly complex and imposed by conservation groups; these were not helpful for community-based marine resource management. Instead, traditional rules and restrictions proved more effective than national rules in the long-term (Léopold et al. 2013).

Participant observation

Participant observation is a method widely used within anthropology and sociology that involves studying actions and behaviours through a combination of direct observation, participation in group activities and informal interviews or conversations with research subjects (Bernard 2006; Puri 2011). Conservation researchers and practitioners can benefit from using this approach to learn who is involved in decision-making, in order

to receive approval for conservation and management actions, to gain permission and access to visit private or protected areas, and to earn public support for the organisation's presence. Participant observation can elucidate key community needs and values with respect to target conservation goals (Puri 2011).

Common settings for participant observation include meetings and workshops, workplaces or other institutional settings and observing people in their daily lives. Some participant observation research, such as traditional anthropological field research, takes place over several years while other participant observation studies can be condensed into a few months. Typically, the observer is immersed in the daily happenings of a community. Most data collected are qualitative, such as field notes, photographs, or video or audio recordings (Bernard 2006). Participant observation can also help researchers cross-validate information gained through other avenues, such as discrepancies between what people say and what they do. It can also assist in the development of survey or interview questions. It is thus both a method in itself and a precursor to employing other methods. Participant observation can be included with multiple methods to cross-validate data or to contrast how individuals or groups act in different settings. For example, Hagerman et al. (2010) combined interviews and participant observation data to argue that scientists would discuss controversial topics to address biodiversity loss in the face of climate change in private settings (e.g. one-one-one interviews), but would avoid these topics in public venues (e.g. sessions of an international meeting).

Participant observation research can play a key role in conservation science. Attending scheduled community events and public meetings, as well as organising workshops and inviting key informants, may help conservation groups connect with local individuals and groups when initiating a project (Stern 2008, Sorice et al. 2006) and to identify key community players, needs and values (Puri 2011). In order to understand the relationship between Neotropical otters (*Lontra longicaudis*) and fishers off the coast of the São Paulo state in Brazil, de Castro et al. (2014) used participant observation and informal interviewing techniques. The fishers shared traditional knowledge on the diet and behaviour of the otter, which contributed to a better understanding of the basic ecology of this elusive species (de Castro et al. 2014). The authors also found that although otters compete directly with fishers for fish resources, many fishers were willing to try different alternatives to deter otters from their traps, rather than resorting to killing otters.

Discourse analysis

Discourse analysis is a method used by a variety of social science disciplines that focuses on written, vocal or communicative events and how meaning is constructed and power functions in a society (Bernard & Ryan 2010; Fairclough 1995). Drawing from linguistic theory, this method analyses conversational grammar and sentence structure, language content, as well as the structure, flow, and meaning of entire conversations in both oral and written discourse. This method can also be used to analyse controversial issues in the media including social media (Fairclough 1995). Discourse analysis can be used in conservation science to understand how different stakeholders frame their arguments, how people convey environmental values in their language conventions, and where trust and power lie in local relationships.

There are many specific approaches that fall under the umbrella of discourse analysis. These include language use analysis, critical discourse analysis and conversation analysis (Bernard & Ryan 2010). Language analysis can elucidate meaning in a conversation by looking at the words or phrases that are used in bilingual or multi-cultural situations (e.g. code switching, Fairclough 1995). Critical discourse analysis is used for understanding the semantics and flow of conversations around social or political issues. Here, by examining the discourse, power dynamics emerge to help elucidate perceptions and opinions that may be heavily weighted toward a few people or a certain gender or ethnic group (Wodak & Reisig 2001). Moreover, Chapin (2004) underscores, albeit informally, a shift in the conservation discourse from the use of 'indigenous' peoples to 'marginalised' or 'impoverished', which he argues takes away from the dignity, value and power of native peoples as stakeholders in the conservation dialogue and process. Conversation analysis finds patterns in transcripts of speech. Researchers may identify who speaks, how many times they contribute to the conversation and when different people contribute. The content of what is said, or is not said, can be evaluated.

Discourse analysis can help conservation researchers understand the beliefs of local inhabitants and how they interact with other stakeholders who oppose or support conservation projects. Organisational document analysis or transcripts of community meetings can be used to: (1) understand how various stakeholders and interest groups frame their arguments so that conservation researchers might engage them, (2) understand local language conventions that convey how people value certain aspects of their environment that an organisation has not previously addressed, and (3) identify local language conventions that convey who local organisations may see as inside versus outside their group, and therefore where trust and power lie, which could be useful for organisations to build and gain the trust of stakeholders (Bernard 2006).

Ruiz-Ballesteros and Brondizio (2013) evaluated the potential for community-based ecotourism on Floreana, an inhabited island in the Galápagos National Park in Ecuador. By analyzing the discourse at public meetings and in personal interviews, they considered the diversity of worldviews of different stakeholders in order to assess the risks and opportunities for developing an ecotourism industry on the island. Cairns et al. (2014) examined conservation discourses in the Galapagos Islands using the quali-quantitative (Q) method, statistically evaluating discourses from websites, non-governmental organisational documents, and local and regional governing councils. The authors also conducted informal interviews with inhabitants of Santa Cruz Island and gathered information from different stakeholders to further assess perceptions and views about local conservation efforts (Cairns et al. 2014). Their conclusions call into question consensus building as a tool for conservation on the Galápagos, and argue that a more realistic approach is to acknowledge socio-economic and environmental trade-offs to achieve sustainable management on inhabited islands.

Discourse analysis can be combined with other approaches to gain a comprehensive view of how barriers for collaboration on conservation projects may arise due to differences in local versus regional scale politics, rhetoric and agendas. A study in the Indonesian part of the island of Borneo evaluated the discourse of collaboration in a region where implementation was piloted for policies under REDD+ (Reducing Emissions from Deforestation and Forest Degradation) (Gallemore et al. 2014). The authors used records of attendance at REDD+ meetings to find 36 organisations that were involved in the

REDD+ policy network; individuals from these organisations were interviewed and they answered survey questions. Archival research was also used (e.g. newspaper articles, blogs) to find organisational activities that occurred at different geographical scales, from the local municipalities to the national level. The interview, survey and archival data were then used in a network analysis to identify discursive barriers to collaboration between different organisations involved in forest conservation on Borneo. The authors found impediments to collaboration due to differences in technical versus traditional forest management approaches that were likely to hinder implementation of strategies to curtail forest degradation in Borneo across scales (Gallemore et al. 2014). Comparative discourse analysis revealed divergent stakeholders perspectives and priorities for a wildlife hunting management plan in Australia (Nursey-Bray et al. 2010). The Hope Vale Aboriginal people prioritised cultural well-being as a management outcome whereas managers of the Great Barrier Reef World Heritage Area prioritised biodiversity outcomes.

Participatory research

Participatory research describes social science methods that emphasise involvement of the researchers within a community (Bernard 2006). There is growing interest in the conservation field in using participatory research because of its ability to address human well-being, and engage communities in environmental endeavours (Reed 2008).

Participatory research involves community members and other stakeholders in the research process. These individuals help researchers define the goals of the research and participate in the process of collecting data and then making management decisions. Participatory research can be broadly categorised into Participatory Action Research and Community-based Participatory Research (CBPR). There is much overlap between these two categories. CBPR projects in particular emphasise the incorporation of the input of community members and stakeholders at all stages of the project and decision-making processes (Dangles et al. 2010). Participatory research is currently developed and used in a wide range of applications from health to agriculture and more recently in conservation and restoration. Researchers have identified a more comprehensive list of both pros and cons of using participatory research methods in a range of fields (Newing et al. 2011).

There are challenges associated with participatory research that should be considered before the onset of a project. Participatory research involves substantial and sometimes long-term engagement with local populations. The amount of time needed for some of these methods is significant, and there may not be project staff and resources available to carry them out. A key factor is adequately identifying the stakeholders who need to be involved in the process and finding ways to engage with individuals and groups that may hold very different sets of values (Reed 2008).

Despite the challenges, heavy engagement to obtain community support for conservation actions may be the most effective or even the only way to ensure the success of certain projects. Sisk et al. (2006) demonstrated that by extensively incorporating landowners, conflict between stakeholders was resolved more quickly. The framework provided by Sisk et al. (2006) involves 'mental modeling' which actively engages stakeholders to find solutions. Pahl-Wostl (2006) expands on several types of mental models that can be helpful in identifying the priorities in the context of conservation and restoration, while

simultaneously building relationships between stakeholders and researchers. These relationships have the potential to expedite trust-building between researchers and local landowners while also decreasing the time spent resolving conflicts between stakeholders with different values.

Participatory research methods are also useful to delineate culturally and biologically important landscapes. In the case of sustainable rattan (*Calamus* spp.) harvesting on the island of Buton, Indonesia, Widayati et al. (2010) used community participatory mapping techniques to understand how this plant resource is extracted and to delineate harvesting zones within the Lambusango Forest. The authors combined hand drawn maps from rattan harvesters together with geographic information systems (GIS) to create a resource use landscape and identify the key factors driving the amount of rattan harvested. This information could prove useful to designate multiple-use areas within forest conservation areas based on local resource needs and biological conservation objectives (Widayati et al. 2010).

Collaborative projects are identified as an effective way to engage different stakeholders in the conservation decision-making process. In an effort to construct a national geospatial data clearing house for the Federated States of Micronesia, Smith et al. (2014) discuss multi-scale island terrestrial and marine biodiversity collaborative conservation through adopting community-based, participatory research methods. The authors assert that their workshops with collaborators built trust and refined the research design. Consensus was eventually reached on various decisions. The authors acknowledge that although this collaborative approach was time-consuming, because different cultural sensitivities were taken into account during the decision-making process the collaborative approach was ultimately useful and successful (Smith et al. 2014).

Discussion

There is a growing desire among conservation researchers and practitioners to include human knowledge and values in the process of conservation decision-making to improve the long-term success of projects. An understanding of the social science research methods outlined above is a good first step toward creating a more holistic assessment and management regime. It is important to prioritise socio-ecological research with funders and conservation organisations by emphasising the importance of involving island inhabitants in the conservation process in order to build an equitable, just and sustainable conservation plan. It is important to note that the research methods we describe here are not of equal utility for all projects, and will be most useful during different stages of a conservation research program and often in combination. Rarely are all eight methods used together (Figure 2).

The initial *Planning Stage* occurs prior to visiting an island or conservation project area and can help conservation biologists (researchers and practitioners) understand the unique demographic, social, cultural and political dimensions of human communities and human-dominated ecosystems prior to a site visit. Research based on archives can help identify key people both inside and outside the community and frame historical as well as current political factors that may influence a project. Planning for specific types of participatory research may begin, such as scheduling community engagement meetings (Lynch 2017). During the second stage, researchers make *Preliminary Site Visits* to the

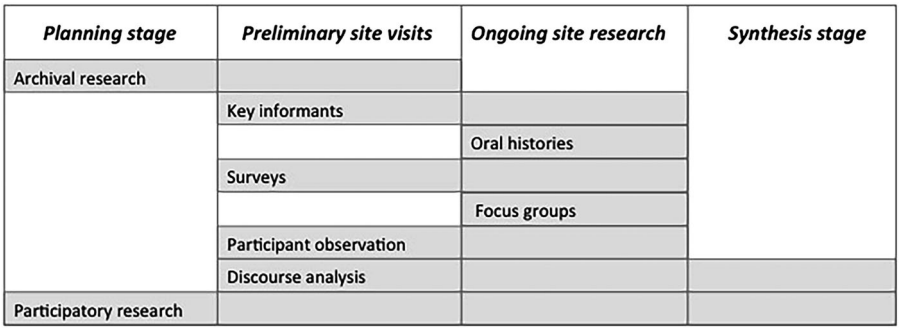

Figure 2. Social research method stages. Schematic shows a generalized sequencing of social research methods for conservation highlighting the eight social science methods discussed in this review. The length of each row suggests when each research method is most relevant with respect to four major stages of research that occur in sequence from left to right. Note that only two or three of these methods may be used at a time for a conservation project, rarely all eight.

island and begin interacting directly with stakeholders. Social research methods can help identify key informants, gather information and build trust by assessing local attitudes, opportunities and challenges through surveys, participant observation, participatory research, and discourse analysis. Gaining an understanding of the asymmetries of socio-political power in local decision-making may facilitate dialogue and understanding between researchers, island inhabitants and institutions. In the *Ongoing Site Research* stage, more in-depth engagement with individuals, institutions and analysis occurs, usually while researchers are still on site. More complex methods such as focus groups and oral histories can be undertaken at this stage, once the researcher already has a basic understanding of key players and socio-political drivers. In the final *Synthesis Stage* of social research, researchers synthesise findings and finish analyzing these data gathered from previous stages in order to inform future conservation and management efforts on the island. It is important at this stage to consider how to share the results of the research with the community. In addition, researchers must be cognizant of the ethical implications of their work, for example, when traditional knowledge has been misused to exclude people from access to land and resources (Anderson 2005, Lynch 2017).

Conclusions

We recognise the importance of individuals, stakeholders, communities and cultures for successful conservation efforts in a dynamic conservation environment. This article serves as a starting point to understand when and how to gather data on affected human populations, when the conservation process affects and is influenced by local peoples and institutions. Moreover, earning the trust and respect of local peoples and communities hinges on the transparency of researchers' intentions and a willingness, when necessary, to transform their approaches to address the unique socio-ecological situation of each conservation opportunity. This transformation can occur, in part, by working with local individuals and institutions to ensure congruence between the intention and mission of a conservation organisation and local stakeholders' values and needs. Socio-ecological

research is becoming more widely recognised as an integral part of effective conservation action, especially on inhabited islands. Conservation practices on inhabited islands can provide valuable opportunities for engagement and understanding – especially when engaging small, discrete island communities (Lynch 2017). We hope this review provides a useful entry into this rich and complex field.

Acknowledgements

We thank the staff at Island Conservation, particularly Wes Jolley, Erik Oberg and Aurora Alifano, for their expertise and input during our collaborative seminar that led to the development of this article. Thank you to all the participants in the seminar course for thoughtful discussions, and especially to Sarah Skikne, Flavia Stoike and Paulo Quadri for their editorial contributions. We also thank Nick Taylor and James Russell for their insightful comments and edits. Finally, we thank the Center for Tropical Research in Ecology, Agriculture, and Development (CenTREAD), the Ecology and Evolutionary Biology Department and the Environmental Studies Department at the University of California, Santa Cruz for their institutional support.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Adams, W 2007, 'Thinking like a human: social science and the two cultures problem', *Oryx*, vol. 43, pp. 275–276.

Agrawal, A & Ostrom, E 2006, 'Political science and conservation biology: a dialog of the deaf', *Conservation Biology*, vol. 20, pp. 681–682.

Aldon, MET, Fermin, AC & Agbayani, RF 2011, 'Socio-cultural context of fishers' participation in coastal resource management in Anini-y, Antique in west central Philippines', *Fisheries Research*, vol. 107, pp. 112–121.

Allen, GR & Werner, TB 2002, 'Coral reef fish assessment in the 'coral triangle' of southeastern Asia', *Environmental Biology of Fishes*, vol. 65, pp. 209–214.

Anderson, MK 2005, *Tending the wild native American knowledge and the management of California's natural resources*, University of California Press, Berkeley, USA.

Baylor University Institute for Oral History 2014, *Introduction to oral history*, viewed 25 May 2017, <http://www.baylor.edu/content/services/document.php/43912.pdf>.

Bennett, NJ & Roth, R 2015, *The conservation social sciences: what?, how?, and why?*, Canadian Wildlife Federation and Institute for Resources, Environment and Sustainability, University of British Columbia, Vancouver, Canada.

Bernard, RH 2006, *Research methods in anthropology: qualitative and quantitative methods* (4th ed.), Altamira Press, New York, USA.

Bernard, RH 2011, *Research methods in anthropology qualitative and quantitative approaches* (5th ed.), Altamira Press, Plymouth, UK.

Bernard, HR & Ryan, GW 2010, *Analyzing qualitative data: systematic approaches*, Sage, Los Angeles, USA.

Brettell, CB 1998, 'Fieldwork in the archives: methods and sources in historical anthropology', in RH Bernard (eds), *Handbook of methods in cultural anthropology*, Altamira Press, Walnut Creek, pp. 513–546.

Brosius, JP 2006, 'Common ground between anthropology and conservation biology', *Conservation Biology*, vol. 20, pp. 683–685.

Cabuy, RL, Marwa, J, Manusawai, J & Rahawarin, YY 2012, 'Non-woody plant species of Papuan Island forests, a sustainable source of food for the local communities', *Indian Journal of Traditional Knowledge*, vol. 11, pp. 586–592.

Cairns, R, Sallu, SM & Goodman, S 2014, 'Questioning calls to consensus in conservation: a Q study of conservation discourses on Galapagos', *Environmental Conservation*, vol. 41, pp. 13–26.

Chapin, M 2004, 'A challenge to conservationists', *World Watch Magazine*, vol. November/ December Issue, pp. 17–31.

Chazdon, RL, Peres, CA, Dent, D, Sheil, D, Lugo, AE, Lamb, D, Stork, NS & Miller, S 2009, 'The potential for species conservation in tropical secondary forests', *Conservation Biology*, vol. 23, 6, pp. 1406–1417.

Cinner, JE, Marnane, MJ & McClanahan, TR 2005, 'Conservation and community benefits from traditional coral reef management at Ahus Island, Papua New Guinea', *Conservation Biology*, vol. 19, no. 6, pp. 1714–1723.

Creswell, JW 2009, *Research design: qualitative, quantitative, and mixed methods approaches*, (3rd ed.), SAGE, Lincoln, USA.

Dangles, O, Carpio, FC, Villares, M, Yumisaca, F, Liger, B, Rebaudo, F & Silvain, JF 2010, 'Community-based participatory research helps farmers and scientists to manage invasive pests in the Ecuadorian Andes', *Ambio*, vol. 39, no. 4, pp. 325–335.

de Castro, FR, Stutz-Reis, S, Reis, SS, Nakano-Oliveira, E & Andriolo, A 2014, 'Fishermen's perception of Neotropical otters (*Lontra longicaudis*) and their attacks on artisanal fixed fence traps: the case of Caicara communities', *Ocean & Coastal Management*, vol. 92, pp. 19–27.

de Snoo, GR, Herzon, I, Staats, H, Burton, RJF, Schindler, S, van Dijk, J, Lokhorst, AM, Bullock, JM, Lobley, M, Wrbka, T, Schwarz, G & Musters, CJM 2013, 'Towards effective nature conservation on farmland: making farmers matter', *Conservation Letters*, vol. 6, no. 1, pp. 66–72.

DIISE Island Conservation 2017, *Database of island invasive species eradications, island conservation.org*, viewed on 25 May 2017, <http://diise.islandconservation.org>.

Ellwood, ER, Temple, SA, Primack, RB, Bradley, NL, Davis, CC, Hérault B 2013, 'Record-breaking early flowering in the Eastern United States', *PLoS ONE*, vol. 8, no. 1, pp. 1–9. e53788.

Fairclough, N 1995, *Critical discourse analysis: the critical study of language*, Longman, London, UK.

Gallemore, CT, Prasti, HRD & Moeliono, M 2014, 'Discursive barriers and cross-scale forest governance in Central Kalimantan, Indonesia', *Ecology and Society*, vol. 19, no. 2, pp. 1–13.

Gerhardinger, LC, Hostim-Silva, M, Medeiros, RP, Matarezi, J, Bertoncini, AA, Freitas, MO & Ferreira, BP 2009, 'Fishers' resource mapping and goliath grouper *Epinephelus itajara* (Serranidae) conservation in Brazil', *Neotropical Ichthyology*, vol. 7, pp. 93–102.

Giampaoli, P & Bliss, JC 2011, 'Landowner perceptions of habitat protection policy and process in Oregon', *Western Journal of Applied Forestry*, vol. 26, pp. 110–118.

Glen, AS, Atkinson, R, Campbell, KJ, Hagen, E, Holmes, ND, Keitt, BS, Parkes, JP, Saunders, A, Sawyer, J, & Torres, H 2013, 'Eradicating multiple invasive species on inhabited islands: the next big step in island restoration?', *Biological Invasions*, vol. 15, pp. 2589–2603.

Hagerman, S, Satterfield, T & Dowlatabadi, H 2010, 'Climate change impacts, conservation and protected values: understanding promotion, ambivalence and resistance to policy change at the world conservation congress', *Conservation and Society*, vol. 8, no. 4, pp. 298–311.

Hamilton, CA 1987, 'Ideology and oral traditions: listening to the voices "from below"', *History in Africa*, vol. 14, pp. 67–86.

Howell, N 1990, *Surviving fieldwork*. American Anthropological Association, Washington, DC, USA.

Island Conservation 2017, viewed 25 May 2017, <http://www.islandconservation.org>.

Karris, G, Fric, J, Kitsou, Z, Kalfopoulou, J, Giokas, S, Sfenthourakis, S & Poirazidis, K 2013, 'Does by-catch pose a threat for the conservation of seabird populations in the southern Ionian Sea (eastern Mediterranean)? A questionnaire-based survey of local fisheries', *Mediterranean Marine Science*, vol. 14, no. 3, pp. 19–25.

Kier, G, Kreft, H, Lee, TM, Jetz, W, Ibisch, PL, Nowicki, C, Mutke, J & Barthlott, W 2009, 'A global assessment of endemism and species richness across island and mainland regions', *Proceedings of the National Academy of Sciences of the United States of America*, vol. 106, pp. 9322–9327.

Krueger, R & Casey, MA 2008, *Focus groups: a practical guide for applied research*, (4th ed.), Sage, Los Angeles, USA.

Leavy, P 2011, *Oral history: understanding qualitative research*, Oxford University Press, Oxford, UK.

Léopold, M, Beckensteiner, J, Kaltavara, J, Raubani, J & Caillon S 2013, 'Community-based management of near-shore fisheries in Vanuatu: what works?', *Marine Policy*, vol. 42, pp. 167–176.

Loehle, C & Eschenbach, W 2012, 'Historical bird and terrestrial mammal extinction rates and causes', *Diversity and Distributions*, vol. 18, pp. 84–91.

Lynch, AJ 2017, 'Respect, reflect, and engage – enhancing biophysical research practices with Indigenous people, their land, and culture', *Australasian Journal of Environmental Management*, vol. 24, no. 3, pp. 319–331.

Mascia, M, Brosius, JP, Dobson, TA, Forbes, BC, Horowitz, L, McKean, MA & Turner, NJ 2003, 'Conservation and the social sciences', *Conservation Biology*, vol. 17, pp. 649–650.

Matzek, V, Covino, J, Funk, JL & Saunders, M 2014, 'Closing the knowing-doing gap in invasive plant management: accessibility and interdisciplinarity of scientific research', *Conservation Letters*, vol. 7, no. 3, pp. 208–215.

McCreless, EE, Huff, DD, Croll, DA, Tershy, BR, Spatz, DR, Holmes, ND, Butchart, SHM & Wilcox, C 2016, 'Past and estimated future impact of invasive alien mammals on insular threatened vertebrate populations', *Nature Communications*, vol. 7, pp. 12488.

Moritz, C, Patton, J, Conroy, C, Parra, J, White, G & Beissinger, S 2008, 'Impact of a century of climate change on small-mammal communities in Yosemite National Park', *USA Science*, vol. 322, pp. 258–261.

Muir, MJ & Schwartz, MW 2009, 'Academic research training for a non-academic workplace: a case study of graduate student alumni who work in conservation', *Conservation Biology*, vol. 23, pp. 1357–1368.

MVZ UC Berkeley, 2017, *Museum of Vertebrate Zoology*, *University of California, Berkeley*, viewed on 25 May 2017, <http://mvz.berkeley.edu>.

Newing, H 2010, 'Interdisciplinary training in environmental conservation: definitions', progress and future directions', *Environmental Conservation*, vol. 37, pp. 410–418.

Newing, H, Eagle, CM, Puri, RK & Watson, CW 2011, *Conducting research in conservation: social science methods and practice*, Routledge, New York, USA.

Nursey-Bray, M, Marsh, H, Ross, H 2010, 'Exploring discourses in environmental decision making: an indigenous hunting case study', *Society and Natural Resources*, vol. 23, 366–382.

Nyanga, PH 2012, 'Factors influencing adoption and area under conservation agriculture: a mixed methods approach', *Sustainable Agriculture Research*, vol. 1, no. 2, pp. 27–40.

Pahl-Wostl, C 2006, 'The importance of social learning in restoring the multifunctionality of rivers and floodplains', *Ecology and Society*, vol. 11, no. 1, pp. 10.

Philip, LJ & MacMillan, DC 2005, 'Exploring values, context and perceptions in contingent valuation studies: the CV market stall technique and willingness to pay for wildlife conservation', *Journal of Environmental Planning and Management*, vol. 48, pp. 257–274.

Puri, RK 2011, 'Chapter 5: participant observation', in H Newing, CM Eagle, RK Puri, & CW Watson (eds), *Conducting research in conservation: social science methods and practice*, Routledge, New York, USA, pp. 85–97.

Reed, M 2008, 'Stakeholder participation for environmental management: a literature review', *Biological Conservation*, vol. 141, no. 10, pp. 2417–2431.

Reyes-Garcia, V, Ruiz-Mallen, I, Porter-Bolland, L, Garcia-Frapolli, E, Ellis, EA, Mendez, ME, Pritchard, DJ & Sanchez-Gonzalez, MC 2013, 'Local understandings of conservation in southeastern Mexico and their implications for community-based conservation as an alternative paradigm', *Conservation Biology*, vol. 27, pp. 856–865.

Ricketts, TH, Dinerstein, E, Boucher, T, Brooks, TM, Butchart, SHM, Hoffmann, M, Lamoreux, JF, Morrison, J, Parr, M, Pilgrim, JD, Rodrigues, ASL, Sechrest, W, Wallace, GE, Berlin, K, Bielby, J, Burgess, ND, Church, DR, Cox, N, Knox, D, Loucks, C, Luck, GW, Master, LL, Moore, R, Naidoo, R, Ridgely, R, Schatz, GE, Shire, G, Strand, H, Wettengel, W, & Wikramanayake, E 2005, 'Pinpointing and preventing imminent extinctions', *Proceedings of the National Academy of Sciences of the United States of America*, vol. 102, pp. 18497–18501.

Ritchie, DA 2011, *The Oxford handbook of oral history*, Oxford University Press, Oxford, UK.
Roberts, CM, McClean, CJ, Veron, JEN, Hawkins, JP, Allen, GR, McAllister, DE, Mittermeier, CG, Schueler, FW, Spalding, M, Wells, F, Vynne, C, & Werner, TB 2002, 'Marine biodiversity hotspots and conservation priorities for tropical reefs', *Science*, vol. 295, pp. 1280–1284.
Robertson, HA & McGee, TK 2003, 'Applying local knowledge: the contribution of oral history to wetland rehabilitation at Kanyapella Basin, Australia', *Journal of Environmental Management*, vol. 69, pp. 275–287.
Robson, C 2011, *Real world research: A resource for users of social research methods in applied settings* (3rd ed.), Wiley and Sons Ltd, West Sussex, UK.
Ruiz-Ballesteros, E & Brondizio, ES 2013, 'Building negotiated agreement: the emergence of community-based tourism in Floreana (Galápagos Islands)', *Human Organization*, vol. 72, pp. 323–335.
Russell, D & Harshbarger, L 2003, 'Chapter 12: key informants', in *Groundwork for community-based conservation: strategies for social research*, Altamira Press, Walnut Creek, USA, pp. 189–206.
Russell, JC & Holmes, ND 2015, 'Tropical island conservation: rat eradication for species recovery', *Biological Conservation*, vol. 185, pp. 1–7.
Sandbrook, C, Adams, WM, Büscher, B, & Vira, B 2013, 'Social research and biodiversity conservation', *Conservation Biology*, vol. 27, pp. 1487–1490.
Sarkar, M 2012, 'Between craft and method: meaning and inter-subjectivity in oral history analysis', *Journal of Historical Sociology*, vol. 25, no. 4, pp. 578–600.
Schultz, PW, Gouveia, VV, Cameron, LD, Tankha, G, Schmuck, P, Franěk, M 2005, 'Values and their relationship to environmental concern and conservation behavior', *Journal of Cross-Cultural Psychology*, vol. 36, no. 4, pp. 457–475.
Sharp, RL, Larson, LR & Green, GT 2011, 'Factors influencing public preferences for invasive alien species management', *Biological Conservation*, vol. 144, pp. 2097–2104.
Sisk, TD, Prather, JW, Hampton, HM, Aumack, EN, Xu, Y & Dickson, BG 2006, 'Participatory landscape analysis to guide restoration of ponderosa pine ecosystems in the American Southwest', *Landscape and Urban Planning*, vol. 78, no. 4, pp. 300–310.
Smith, WJ, Mount, J, Bennett, D & Shed, P 2014, 'Collaborative research methodologies and the construction of a national geospatial clearinghouse to conserve biodiversity in the Federated States of Micronesia', *Applied Geography*, vol. 54, pp. 198–208.
Sorice, MG, Shafer, CS & Ditton, RB 2006, 'Managing endangered species within the use-preservation paradox: the Florida manatee (*Trichechus manatus latirostris*) as a tourism attraction', *Environmental Management*, vol. 37, no. 1, pp. 69–83.
Stern, MJ 2008, 'The power of trust: toward a theory of local opposition to neighboring protected areas', *Society & Natural Resources*, vol. 21, pp. 859–875.
Streever, W, Callaghan-Perry, M, Searles, A, Stevens, T & Svoboda, P 1998, 'Public attitudes and values for wetland conservation in New South Wales, Australia', *Journal of Environmental Management*, vol. 54, no. 1, pp. 1–14.
Suárez, A, Williams-Linera, G, Trejo, C, Valdez-Hernández, JI, Cetina-Alcalá, VM & Vibrans, H 2012, 'Local knowledge helps select species for forest restoration in a tropical dry forest of central Veracruz, Mexico', *Agroforestry Systems*, vol. 85, pp. 35–55.
Tershy, BR, Croll, DA & Newton, KM 2012, 'Accomplishments and impact of the NGO, *Island Conservation*, over 15 years (1994–2009)', *Biodiversity Conservation*, vol. 21, pp. 957–965.
Turner, RK, van de Bergh, JCJM, Söderqvist, T, Barendregt, A, van der Straaten, J, Maltby, E, & van Ierland, EC 2000, 'Ecological-economic analysis of wetlands: scientific integration for management and policy', *Ecological Economics*, vol. 35, pp. 7–23.
White, PCL, Jennings, NV, Renwick, AR & Barker, NHL 2005, 'Questionnaires in ecology: a review of past use and recommendations for best practice', *Journal of Applied Ecology*, vol. 42, pp. 421–430.
Widayati, A, Jones, S & Carlisle, B 2010, 'Accessibility factors and conservation forest designation affecting rattan cane harvesting in Lambusango Forest, Buton, Indonesia', *Human Ecology*, vol. 38, pp. 731–746.

Wodak, R & Reisig, M 2001, *Discourse and discrimination, the rhetoric of racism and antisemitism*, Routledge, London, UK.
Yow, VR 2005, *Recording oral history: a guide for the humanities and social sciences*, Altamira Press, Walnut Creek, USA.