
Send submissions in electronic format to http://mstracker.com/submit1.php?jc=her. Please see instructions to authors on inside back cover.

© Society for Human Ecology
Information for contributors to Human Ecology Review

Human Ecology Review is a semi-annual journal that publishes peer-reviewed interdisciplinary research on all aspects of human–environment interactions (Research in Human Ecology). The journal also publishes essays, discussion papers, dialogue, and commentary on special topics relevant to human ecology (Human Ecology Forum), book reviews (Contemporary Human Ecology), and letters, announcements, and other items of interest (Human Ecology Bulletin). As of volume 20(2) Human Ecology Review will also publish an occasional paper series in Philosophy of Human Ecology and Social–Environmental Sustainability.

Author instructions
Send submissions, following the guidelines below, to mstracker.com/submit1.php?jc=her

Title page, abstract and authorship
When you access the Human Ecology Review manuscript submission portal at mstracker.com/submit1.php?jc=her you will be presented with a manuscript submission form. You will be instructed to enter the title of your manuscript, an abstract, and your and any co-authors names and contact details. The abstract should be 150 words or fewer and include four to six keywords. The abstract information will be used when soliciting for reviewers and should not contain any author identification.

Reviewers
Please use the manuscript submission form’s cover letter section to provide the names and contact information of three suggested reviewers for your manuscript.

Manuscript
The manuscript should not exceed 6,500 words. Do not include author information. Please limit references to 50 or fewer.

The manuscript should be in the form of a single Word document file that includes tables and figures rather than sending multiple files. It should be in 12 point font, line spacing 1.5. The entire manuscript should be free of underlining or boldface type; use italics only for emphasis and in references (see below). Headings and subheadings should be flush left, sentence capitalization.

Style followed is that of the Publication Manual of the American Psychological Association (APA style; www.apastyle.org). The dictionary used is Merriam-Webster.

Footnotes
Footnotes, not endnotes, should be used.

Tables and figures
Tables should be clear and concise and able to stand alone, that is, complete headings and table notes should be used to clarify entries. Figures may be in color, but authors should be mindful of loss of resolution or clarity if figures are printed in black and white. All tables and figures must be referred to in the text. Authors must obtain copyright permission to reproduce any material that is not their own.

Although figures should be embedded in the original submitted paper, if your manuscript is accepted you will be required to provide professional quality, high resolution (at least 300 dpi) images in separate files.

References
References should conform to APA style. See below; also see www.apastyle.org
The list of references should be arranged alphabetically by author. Multiple citations by the same author(s) should be listed by name.

Citation of references in the text should follow the format Henry (1998) or (Henry & Wright, 1997) or (Henry et al., 1996, pp. 22–24) or (Henry, 1995, 1998; Wright, 1994). In-text citations should be in alphabetical order, in the same order in which they appear in the reference list. Papers with three or more authors should use et al. This is an exception to APA style.

Sample references

Information for subscribers
Human Ecology Review is published by ANU Press
The Australian National University
Canberra ACT 0200, Australia
Email: anupress@anu.edu.au
This title is available online at press.anu.edu.au
ISSN 1074-4827 (print)
ISSN 2204-0919 (online)
Printed by Griffin Press
Cover and page layout by ANU Press
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation Science Policies Versus Scientific Practice: Evidence from a Mexican Biosphere Reserve</td>
<td>3</td>
</tr>
<tr>
<td>Gabriela Alonso-Yañez and Conny Davidsen</td>
<td></td>
</tr>
<tr>
<td>Human Ecology as Philosophy</td>
<td>31</td>
</tr>
<tr>
<td>Carleton B. Christensen</td>
<td></td>
</tr>
<tr>
<td>Use of Cultivated and Harvested Edible Plants by Caiçaras—What can Ethnobotany Add to Food Security Discussions?</td>
<td>51</td>
</tr>
<tr>
<td>Mariana Giraldi and Natalia Hanazaki</td>
<td></td>
</tr>
<tr>
<td>Community-Based Water Systems: Preserving Livelihood, Ecology, and Community</td>
<td>75</td>
</tr>
<tr>
<td>David S. Henkel</td>
<td></td>
</tr>
<tr>
<td>Qualitative Indicators of Social Resilience in Small-Scale Fishing Communities: An Emphasis on Perceptions and Practice</td>
<td>97</td>
</tr>
<tr>
<td>Teresa R. Johnson, Anna M. Henry, and Cameron Thompson</td>
<td></td>
</tr>
<tr>
<td>Place Matters: An Investigation of Farmers’ Attachment to Their Land</td>
<td>117</td>
</tr>
<tr>
<td>Courtney E. Quinn and Angela C. Halfacre</td>
<td></td>
</tr>
<tr>
<td>Environmental Identity and Community Support for the Preservation of Open Space</td>
<td>133</td>
</tr>
<tr>
<td>Janet K. Swim, Stephanie J. Zawadzki, Jessica L. Cundiff, and Bruce Lord</td>
<td></td>
</tr>
<tr>
<td>Visualizing Stakeholder Perspectives for Reflection and Dialogue on Scale Dynamics in Social–Ecological Systems</td>
<td>157</td>
</tr>
</tbody>
</table>
BOOK REVIEWS

The Sixth Extinction: An Unnatural History, by Elizabeth Kolbert
Reviewed by Jordan Fox Besek

Energy and Electricity in Industrial Nations: The Sociology and Technology of Energy, by Allan Mazur
Reviewed by Richard York

Defensive Environmentalists and the Dynamics of Global Reform, by Thomas K. Rudel
Reviewed by Thomas J. Burns

Contributors to this issue

On the Cover
College of the Atlantic's historic Seaside Garden. Image courtesy of the College of the Atlantic Archives.
RESEARCH AND THEORY IN HUMAN ECOLOGY
Conservation Science Policies Versus Scientific Practice: Evidence from a Mexican Biosphere Reserve

Gabriela Alonso-Yañez
Werklund School of Education
University of Calgary, Canada

Conny Davidsen
Geography Department
University of Calgary, Canada

Abstract

This paper interrogates the activities, perspectives, and positions of scientists conducting research in Sierra de Huautla Biosphere Reserve, Mexico. Biosphere reserve conservation models are specifically designed for a sustainable integration of social and natural environments, a mandate that relies on both natural and social scientific research to improve conservation of nature and human well-being. Seen through the analytical lens of a social worlds/arenas framework, integrative scientific research in this particular case proves to be challenging in practice and fraught with paradoxes and contradictions. The findings suggest that academic and institutional factors (funding, publication avenues, and scholarly status) force, or at least strongly invite, scientists to pursue academic research agendas which, in fact, may conflict with or override the researchers’ own commitments to meaningful conservation research work and interventions. This case highlights structural concerns over biosphere reserve–specific governance issues in Mexico, and integrative human–environment scientific practice in conservation in general.

Keywords: biosphere reserves, conservation, environment and development, interdisciplinary research, local benefit, politics of science, situational analysis

Introduction

The biosphere reserve was conceived by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as an integrative conservation model to reconcile the needs of human and natural environments. From its beginnings, the biosphere reserve model represented a special conservation approach where ecological protection is integrated with the needs of the local

1 Corresponding author: galonsoy@ucalgary.ca.
population, based on sustainable human–environment interfaces within the designated park boundaries (Halffter & Ezcurra, 1989; UNESCO, 2013). The idea was explicitly based on a threefold set of complementary functions (Halffter, 2011): (1) conservation, (2) development (or social integration), and (3) research. The third function even describes the reserves as “living laboratories for testing out and demonstrating integrated management of land, water and biodiversity” (UNESCO, 2013). Under these three functions, conservation is implemented through tiered land-use designations within the protected area that allow for different levels of resource use for the local populations. Social integration and development includes formal and informal partnerships with a range of interested organizations, research institutions, communities, and individuals (Halffter, 2011; Stairs, 2007; Gomez-Pompa & Dirzo, 1995).

The idea of integrating human needs with environmental protection, embedded in continuous scientific efforts, has earned the biosphere reserve conservation model considerable enthusiasm, support, and advocacy across Latin American conservationists over the past decades (Halffter, 2011; Halffter & Ezcurra, 1989). Mexico in particular prioritized the establishment of what has been called the “Mexican modality” of biosphere reserves (Halffter & Ezcurra, 1989; Santana-Castellón, 2013; Stairs, 2007). To add local emphasis, the national policy required that the biosphere reserve was fully embedded in, supported, and desired by the local level (Halffter & Ezcurra, 1989, p. 194). An important feature of the Mexican modality was “to give the [biosphere] reserves administrative independence by commissioning their management to research institutions that respond to the higher (state and federal) authorities of the country” (Halffter & Ezcurra, 1989, p. 195). The Mexican biosphere reserves were to be brought up by an alliance between university conservationists and local communities. As biocultural approaches to the conservation of land, biosphere reserves were planned as spaces that directly linked management and scientific research to develop adaptive management strategies and places where legitimate stakeholder participation platforms were provided in reserve management. Moreover, biosphere reserves were to be places where environmental outreach and community education programs exist as multidirectional communication mechanisms. The Mexican modality of biosphere reserves was a policy later adopted by international nongovernmental organizations, such as UNESCO’s Man and the Biosphere Programme, due to its promising scientific practice link (Halffter & Ezcurra, 1989; Santana-Castellón, 2013).

Given that scientific research is one of the biosphere reserve mandates, particularly significant in the Mexican modality, this article seeks to provide further insight into the realities of scientific practice at the conservation research–practice interface. It focuses on examining how the integrative goal of the biosphere reserve model—namely, conducting interdisciplinary research—
is pursued by a particular group of scientists at a biosphere reserve research center. Our study examines the types of research in which the scientists of the center engage; their perspectives regarding the goals of conservation initiatives; their perspectives on the institutional conditions of the research center; and the limitations and pressures that influence their priorities and behaviors regarding conservation research and practice. Our research attempts to understand science in conservation and highlights the specific non-conformity between the expectations of conservation advocates and the problematic realities of conservationists (particularly scientists) on the ground.

Challenges for the Mexican model

Mexican biosphere reserves, especially those associated with a research institute or laboratory, have been praised for their contributions to the production of knowledge on biodiversity in tropical ecosystems (Castillo & Toledo, 2000; Halffter, 2011; Martínez et. al., 2006). However, little is known about the extent to which biosphere reserves have fulfilled the commitment to address interdisciplinary research and promote locally relevant socio-environmental solutions. Several analyses on Mexico’s biosphere conservation over the past decade suggest that Mexican biosphere reserves have come to exhibit a systemic failure of social integration and research (Contreras-Hernández, 1991; Durand & Jiménez, 2010; Gerritsen, 2002; Halffter, 2011). For instance, Young’s work in El Vizcaíno (1999) reported that local communities had no choice but to participate in pre-planned conservation projects designed by governmental and academic actors. The initial establishment and subsequent management of the biosphere reserve not only failed to address broad social problems within the region, but also criminalized the livelihoods of some of Mexico’s most impoverished land dwellers. Similarly, the work of Gerritsen in Sierra de Manantlán (2002) and of Contreras-Hernández in El Cielo (1991) describes how these biosphere reserves were planned by outside researchers and the rules and park zones designated by state governments. Both reserves were and continue to be managed without prior consultation with local residents. For the most part, no effort was made to enhance the residents’ participation in managing the biosphere reserve. Equally troubling is the poor record of Mexican biosphere reserves in conducting research to improve the social conditions of biosphere reserve inhabitants. Several studies conducted in Mexican biosphere reserves have lamented the conditions of local inhabitants and indigenous groups involved in conservation strategies (Durand & Jiménez, 2010; Gerritsen, 2002; Young, 1999). While research is a central objective and explicit mandate of biosphere reserves, most of the research by management-partner institutions has been found to reinforce a traditional and narrow biological focus (Figueroa & Durand, 2011; Halffter, 2011; Urquiza-Haas, 2009).
Despite the growing findings on a problematic gap between the integrative mandates of biosphere reserves—including a gap between conservation research and practice—only recently did scholars raise the question that it may have something to do with failures in the underlying practices and experiences of conservation research itself (Campbell, 2010; Durand & Vázquez, 2011; Sievanen et al., 2012). For example, the fact that professionally, academics are essentially evaluated on their research performance—that is, their publication record and how this metric impacts their performance and diverts researchers from the ultimate goal of conservation biology—is just recently being studied (Arlettaz et al., 2010; Chapron & Arlettaz, 2008).

A rare and interesting study by Castillo & Toledo (2000), for example, about the involvement of scientific researchers in applied conservation in Mexico found that only a small number of projects contributed to the larger development of applied ecology research in Mexico, and that the institutional research focus was often influenced not by such goals but by the structures of academic rewards.

Over the past 16 years, the Mexican government has actively promoted the strengthening of natural science–based research to inform conservation strategies in natural protected areas (Halffter, 2011). As a result, biosphere reserves have become a cornerstone of Mexico’s conservation policy. They are one of its most widely used policy instruments for land-use protection and boast the second-largest number of biosphere reserves (41 in total) in the world, covering nearly 6.5 percent of the country (Comisión Nacional de Áreas Naturales Protegidas, 2012).

Over time, Mexico’s environmental administration and proud leadership on biosphere reserves somewhat cemented itself into a mindset that the presence of scientific efforts would guarantee conservation success (Blauert & Dietz, 2004; Simonian, 1995; Stairs, 2007). The government incorporated a large number of natural scientists into its staff in order to increase the natural science dimensions of conservation research. However, the hiring wave of natural scientists has been found to de-emphasize the social and political aspects of integrative conservation—regardless of the critical decision-making, agenda setting, and management of protected areas in ways that often resonate beyond government policy-making (Durand & Lazos, 2008; Durand & Vázquez, 2011; Halffter, 2011; Stairs, 2007). In particular, the Mexican modality granted considerable management authority of the biosphere reserves to the research institutions, largely outside the reach of local authorities and reporting directly to the state and federal authorities that decreed the biosphere reserves (Halffter & Ezcurra, 1989).

More than two decades into its conservation science policy efforts, the Mexican government has now conducted systematic reviews of the protected-
area system and, in 2009, released a comprehensive, state-of-the-art, national review of its biodiversity conservation system (Koleff & Urquiza-Hass 2011; Urquiza-Haas, 2009). The large-scale government review centered on assessing the ecological effectiveness of the Mexican network of national protected areas and concluded, for example, that 11 ecosystems are underprotected within the system, addressing questions of conservation effectiveness and representation (Bezaury-Creel & Gutiérrez-Carbonell, 2009; Dirzo et al., 2009; Halffter, 2011). The review paid less attention to the network’s performance in terms of social involvement and interdisciplinary and cross-discipline research performance.

While there is abundant research on conservation challenges and failures of integrative conservation models, most research reports challenges and failures in relation to local communities, government staff members or nongovernment agencies. There is a lack of work focused on the work of conservation scientists in practice. Natural resource management policies continue to emphasize the idea that the science behind conservation efforts can guarantee successful conservation efforts as if it were removed from the political and social environment around it. This assumption permeates conservation narratives of most international lending institutions, government offices, and nongovernmental organizations involved in natural resource management planning and development initiatives. Therefore, we feel it is our role as scientists to continue to seek ways to identify and unveil the very complex sociopolitical processes at stake in conservation science practice.

The Sierra de Huautla case study

Sierra de Huautla first became a protected area of the State of Morelos in 1998, then a biosphere reserve in 2006 as part of the international UNESCO Man and the Biosphere Reserve Programme (UNESCO, 2013). The area’s upgrade into an internationally recognized biosphere reserve came at a time when Mexico’s biodiversity conservation agenda had developed a strong political momentum, embedded in a considerable scientific support network from government agencies and academia (García-Frapolli et al., 2009; Stairs, 2007). The upgrade was also influenced by a collaborative effort between researchers at the Autonomous University of the State of Morelos and Rancho Santa Ana Botanic Garden of Claremont, United States, who were advocating for its creation because of its ecological significance. Sierra de Huautla’s endemic forest vegetation—tropical dry forest—had become recognized as one of the most threatened in the country, forming part of a dominant tropical ecosystem of the neotropics that reaches from Mexico’s northern Pacific coast to the state of Chiapas (Noble & Dirzo, 1997).

Sierra de Huautla Biosphere Reserve is the home of 31 communities across six counties and is co-governed by the National Commission of Natural Protected
Human Ecology Review, Volume 20, Number 2, 2014

Areas, as the legal administrative authority for the area, and a local research center that was founded at the time of the creation of the reserve, specifically mandated with the monitoring of the biological and social conditions of the reserve. Linking area-specific conservation research centers with natural protected areas had become a favorable and strategic instrument often chosen for new protected areas, reflecting the Mexican modality of local embeddedness and the country’s conservation commitment to a stronger research–practice link (Blauert & Dietz, 2004; García Frapolli et al., 2009; Simonian, 1995; Stairs, 2007). As such, the area’s research center provides a relatively typical setting with regard to the time, political context, and location of a biosphere reserve center as it reflects common research–practice links in Mexico’s biosphere conservation practice.

The Sierra de Huautla research center is run as a division of the Autonomous University of the State of Morelos on the main campus in Cuernavaca City. Called “the Mexican capital of knowledge” (Academia de Ciencias de Morelos, 2012), Cuernavaca boosts the largest number of scientific research centers in the country and is conveniently located just outside (60 kilometers) Mexico City’s diverse research infrastructure. At the time of our study, the research center was subdivided into three departments: two conducting research in natural aspects of the reserve—Evolutionary Ecology, and Taxonomy and Systematics—and one conducting research into the social aspects of the reserve—Resource and Environmental Management and Environmental Education. Scientists who were members of the Evolutionary Ecology department focused their research on the evolutionary histories of species and the interactions between them, while scientists in the Taxonomy and Systematics department focused on the identification and classification of organisms. Scientists working in the Resource and Environmental Management and Environmental Education department studied the integration of human and natural environments.

Methodology and research design

The purpose of our study—examining the work and scientific practice of researchers in Sierra de Huautla Biosphere Reserve—directs the methods of data gathering and analysis to be within the realm of qualitative inquiry. Our research focused on ground-level qualitative work, the activities of conservation scientists. We relied on situational analysis (Clarke, 2005) to collect and interpret textual, interview-derived, and field-derived data.

Within situational analysis methodology, the central analytical perspective we used in the study is the social worlds/arenas (SWA) analysis, embedded in a political ecology perspective. The SWA framework for analysis has proven to be useful in the analysis of scientific work from a sociological perspective
Conservation Science Policies versus Scientific Practice: Evidence from a Mexican Biosphere Reserve

(Clarke, 1991; Fujimura, 1987; Gerson, 1983; Tuunainen, 2005), and it has particularly been linked to science and technology research that examines the ways through which the production of science and technology become interlaced with social norms and hierarchies (Jasanoff, 2004), such as the work of scientists in conservation projects that ultimately affect the way conservation science is decided upon and practiced in society. The perspectives of scientists and their commitment to conservation priorities actively shape their work and also affect the way they organize their work, individually and collectively. The SWA approach is deeply rooted in the long tradition of examining scientific practice, disciplinary fields, and scientific production groups with particular focus on locally, historically, and institutionally situated interactions among scientific disciplines, specialties, and research traditions composed by individuals and collectives (Clarke & Star, 2007; Fujimura, 1987; Tuunainen, 2005).

The SWA framework defines social worlds as “groups with shared commitments to certain activities, sharing resources of many kinds to achieve their goals, and building shared ideologies about how to go about building their business” (Clarke, 1991, p. 131). Examples of different social worlds could be groups of educators, students, and administrators that coexist in an educational institution, embracing different ideologies over their work and expressing them through different professional activities, languages, and modes of relation (den Outer et al., 2013). Similarly, the different collective groups that have a stake in conservation practice, such as ecologists, taxonomists, and ethnobotanists who are members of various scientific disciplines, specialties, and research traditions, are examples of a social world. Social worlds are composed of individual agents who also bring personal agendas and commitments to action (Clarke, 2005).

The SWA framework was selected for this analysis due to the way in which it allows a consideration of larger sociopolitical issues as constituents of conservation practice. As such, this approach also follows longstanding calls from political ecology researchers to put more emphasis on “the politics involved in the processes of conservation and the social and material struggles to which they give rise” (Büscher, 2013, p. 3).

Our analytical focus on the underlying scientific and social practices in conservation science follows recent political ecology perspectives in that it seeks to analyze the ways in which environmental projects seek legitimization by “portraying [themselves] as being outside of politics,” as Büscher (2010, p. 29) has put it. Our work builds on an extensive body of political ecology research that has traditionally highlighted the inherently political nature of human–environment processes, and outlined the political forces within conservation; for example, in social conflicts over forest resources, protected areas, agricultural regimes, and productive regions (see Baker et al., 2012; Brockington et al., 2006;
Brockington & Schmidt-Soltau, 2004; Bryant & Bailey, 1997; Büscher, 2013; Lane, 2003; Le Billon, 2001). We attempt to contribute to the emerging political ecology research that has, together with the science and technology literature, helped uncover the political character of conservation science—in other words, the politics behind the scientific practice upon which environmental policies and conservation are built (Cairns, 2011; Forsyth, 2008; Forsyth & Sikor, 2013; Kellert et al., 2000; Vayda & Walters, 1999).

Data collection at the Sierra de Huautla Biosphere Research Center

The data were collected over a period of two years (2010–2012) at Sierra de Huautla Biosphere Reserve through on-site fieldwork, in-depth interviews, and analysis of scientific texts. Members of the research center in the data collection period comprised 20 early-career scientists (around 35–45 years old) holding a master’s degree or a PhD. At the outset of our project we contacted all 20 scientists working in the center, but only eight agreed to be interviewed. During the recruitment process of participants for the study we found that many researchers we approached did not consider themselves eligible or relevant for the study because their research was not related to, or even carried out in, Sierra de Huautla.

Seven interviews were conducted in person at the scientists’ offices and one interview was conducted over the phone. The background information of the interviewees is summarized in Table 1.
The interviews first addressed the participants’ conservation perspectives. We explicitly solicited their views on the work of six prominent conservation scholars well known by all interviewees. Three scholars were offered as examples of rigorous “protectionist, natural science–based” approaches (John Terborgh, Kent Redford, Daniel Janzen) within conservation literature, and three were used as proponents of “people-oriented” approaches whose work advocates for the inclusion of a social dimension in conservation research and practice (Victor Toledo, Julia Fraga, Janice Alcorn). We asked the eight interviewees to identify
the scholars from the list whose work they considered important, inspiring, and/or similar to their own work in the biosphere reserve. We also asked them to describe their views on the value of nature vis-a-vis humans and their ethical arguments for conservation. The interview then asked about the participant’s personal and professional background in the biosphere reserve, followed by questions about their collaborations, intellectual synergies, and professional relationships in order to determine the participant’s priorities and agendas.

The in-depth analysis of interviews then informed further data collection (Clarke, 2005; Glaser & Strauss, 1967) that included university-related institutional management, academic employment conditions, research policy documents, and the researchers’ own research articles. We used Google Scholar search engine to track down the types of research programs and lists of published works for each individual scientist, including those presented in the center’s reports. We searched specifically for information regarding the research site; for instance, whether the research was conducted in Sierra de Huautla Biosphere Reserve and whether the research was published in English or Spanish. We also reviewed three current government evaluations concerning the National System of Researchers in order to have a full account of the origins of the program and the current performance of conservation scientists in Mexico.

The purpose of gathering more data was in response to our interest in comparing the information given by interviewees (e.g., research activities versus products relevant for Sierra de Huautla Biosphere Reserve). This data-gathering technique attempts to trace the researchers’ “vocabularies of motive” (Clarke, 2005 p. 22). The purpose of this sampling strategy was to directly explore the relationship between verbalizations (actual answers/statements) and the motives (normative cultural/contextual regulations) that framed those answers. In other words, we were seeking to account for what scientists “said they were doing” and “what scientists were actually doing.”

All interview data were organized into transcribed and translated segments of 3–5 minutes for a qualitative data analysis aided by the computer software NVivo. Following Clarke’s (2005) situational analysis methods, we carried out initial open coding and produced over 34 codes for each interview. We compared the codes in order to identify similarities and differences, and to develop larger themes (Clarke, 2005; Corbin & Strauss, 1990).

**Analysis: Challenges to integrative conservation research**

The data outlined three major areas of focus or concern: first, an asymmetry between the amount of natural science and social science research that is
conducted in Sierra de Huautla Biosphere Reserve; second, we identified barriers to locally relevant research because of counter-directed institutional incentives; and third, both these problems are inclined to grow further given the social and political context of the research center.

Balance between natural and social science research

In contrast to the declared goals of integrated research particular to the biosphere reserve model and emphasized since the creation of this particular research center in Sierra de Huautla, there is a strong emphasis on natural sciences in the center’s composition of scientists, resources, and programs. Out of 20 researchers employed at the research center, only two were associated with social sciences. Over 90 percent of the center’s funding and resources was allocated to natural science research, while the social science department held about 9 percent of annual budgetary funds. Collaborations of the research center were held mainly with other academic units that were dedicated to the natural sciences; for example, with the Institute of Biotechnology, and Institute of Biological Sciences.

The clear natural–social science asymmetry observed in the annual report documents in terms of funding, resources, and number of staff trained in the social sciences working within the research center was also reflected in the composition of academic researchers recruited for this study (Table 1).

The in-depth interviews with each of the participating researchers explored their perspectives as outlined in the methods section above. The conservation-related beliefs were situated between protectionist and people-oriented as counter-directed positions for reference, complemented by interviewee responses about the value of nature vis-a-vis humans, the ethical arguments for conservation, and the type of research collaborations scientists described as priority for their work (number of projects carried out in collaboration with social scientists). Although some heterogeneity of perspectives and views was evident, statements from interviews showed a clear position of scientists on core issues and a tendency to prioritize natural science–based research and the need to concentrate efforts on protecting the natural state of the ecosystem. The participants’ science-related beliefs were categorized based on their descriptions regarding the type of research they considered more effective and relevant for conservation projects.

The researchers who endorsed a protectionist approach for conservation (Table 2) argued that the conservation and maintenance of biological processes should be prioritized in conservation projects and that one way to do so was to “follow the scientific method” to understand and intervene in the conservation of Sierra de Huautla Biosphere Reserve. The five participants who expressed
protectionist views also emphasized the singular importance of natural science research for the planning of conservation projects, as opposed to a move toward an integration of the contribution provided by local knowledge. They would refer to the need to “educate” local community inhabitants and to “test” their views about biophysical events rather than recognizing the contributions of local knowledge toward integrative conservation management and goals.

Table 2. Conservation priorities: Conservation- and science-related beliefs of researchers

<table>
<thead>
<tr>
<th>Conservation position</th>
<th>Protectionist approach</th>
<th>People-oriented approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1, P2, P3, P4, P6</td>
<td>Nature has intrinsic value. Practices of local inhabitants cause environmental degradation.</td>
<td>P5, P7, P8 Inhabitants should be the ones setting the terms for conservation measures as they inhabit the area.</td>
</tr>
<tr>
<td>P5, P7, P8</td>
<td>There should be a balance between social and natural science research to inform comprehensive projects.</td>
<td></td>
</tr>
</tbody>
</table>

Note: P = participant (see Table 1).

“So the thing here is that: for us [scientists] the most important part is the environment, not the humans, and for them [local inhabitants] is the opposite” (P3).

Local knowledge provided by community inhabitants can be the basis for further scientific knowledge. The thing is that local knowledge does not have any scientific basis. It can become the base for developing science. This rustic, rudimentary, non-scientific knowledge that people have about their environment can be, probably, tested and thus prove to be “strictly real” and used for conservation decisions. (P4)

The current director of the research center concentrated his efforts on supporting the natural science units and referred to the need to adjust to the organization requirements set by the university academic regulatory frameworks, as he explained:

As the research center’s director, I need to coordinate what is done collectively in this institution. I have to be sure that the work is good and that we comply with the perspectives and academic regulations of the whole university. My function within the center is to make sure we have a good organizational performance and resources to achieve the mission of the center which is related to maintaining the biodiversity and the biological conditions in the BR. (P4) [emphasis added]
Most participants emphasized in one way or another that the overall goal of conservation was to allow biological processes of adaptation and evolution to continue without interference. Some of these participants identified specific types of biological research they considered should be prioritized, such as research concerning genetic traits or long-term assessment of biodiversity features. For the five participants who held a protectionist view, the work of social scientists was not regarded as a valuable priority in itself but as a supplementary or optional contribution to conservation. Some participants even expressed open mistrust towards conservation projects that were directed by social scientists, as the following example illustrates:

> These people have good intentions and, ostensibly, would know how to manage conservation, but they really do not know anything. They are not experts, they are anthropologists or sociologists and so they do not know anything about conservation. Nothing! They are fake conservationists. (P1)

The three scientists who were more aligned with a people-oriented approach to conservation were actively participating in research projects that involved social scientists in the center, such as the development of community needs assessments and the design of educational materials for local communities. One of them stressed, however, that while he had collaborated in multidisciplinary teams earlier in his career as a student, currently he did not see a conducive environment in the research center for interdisciplinary research with peers from other academic backgrounds:

> Nowadays we are focused on laboratory research and work that does not involve local communities because it is easier. Here in the research center I have worked more in the laboratory than in the field because working with people is complicated and there are no projects held collaboratively. (P5)

Another of the participants supporting a people-oriented approach described how difficult it was for her to “convince” other researchers of the importance of an integrative approach to conservation and biodiversity management:

> This is an everyday effort, from a small chat in the hallway to a serious discussion in an academic committee. I have to stand up for my work in the face of other collaborators who, even now, believe that integrating local people in conservation is not a priority. My work is not considered “scientifically” relevant within the center. (P8)
Local relevance and engagement in the biosphere reserve

Another finding of our study was that even within the amount of biological research carried out in the center, there was a lack of connection and engagement with local conservation activities, their planning, and management of priorities and goals in the biosphere reserve. As mentioned in the methods section, even the mere recruitment process of participants for this study revealed a lack of local identification of many scientists at the research center. Moreover, scientists interviewed made continuous reference to a divide between science and action and the challenge to pursue research that had a concrete impact on conservation practice for Sierra de Huautla Biosphere Reserve.

You have to choose between working on theory or practice when you do conservation. My students ask me many times: what is the importance or relevance of our work about insects? My answer is that we need to do this part of the work and then maybe, perhaps later with our information, someone else will come and make the link with practical uses of the information for conservation. We cannot do everything. (P3)

Linking research outcomes with conservation in the same time scale is not necessary. I am sure that if we list one new species we are not conserving. Basic biological research is good; however, alongside research activity, we need to find ways to carry out other activities that help conserve the place in the short term. I can tell you now that all the scientific production developed by the research scientists have not impacted in any way the conservation of the area. (P2)

We reviewed the research center’s annual reports 2008–2011, as well as other information on the center’s ongoing research activities. In order to enrich the data, we searched Google Scholar for publications in natural sciences for the years 2008–2012 that contained the name of the Sierra de Huautla Biosphere Reserve. Our analysis of the ongoing research activities of scientists was based on the following criteria: (1) whether the research projects (published by scientists from the center) were conducted in the biosphere reserve or concerned life forms particular to this site, (2) the number of cross-disciplinary studies, and (3) studies of loss of native vegetation and wildlife.

The research center reported production of 39 scientific articles in a two-year period, of which only 12 were conducted in the biosphere reserve or concerned ecological matters specific to the reserve. The Google Scholar search retrieved 343 articles, 22 of which were authored by researchers of the center. While the natural science–based research contribution of the center was globally significant in terms of generalized biological knowledge production (assessed
based on their abstract claims and academic quotations), references to the local context or relevance of the conducted research for Sierra de Huautla were nearly non-existent. Similarly, the research center’s annual reports presented its scientific production based solely on scholarly contributions in relation to the impact factor of the scientific journal in which articles were published, missing descriptions of any conservation-related impact, local relevance, embedded research or community activities in the biosphere reserve.

Our analysis of the interview data regarding scientist’s positions (Clarke & Friese, 2007) offers insights as to why scientists did not prioritize locally relevant research within the biosphere reserve. We also examined researchers’ statements regarding their internal and external incentives and limitations at the research center as these affect their scientific work in principle or in practice. Figure 1 summarizes the reported information of interviewees regarding the priority they assigned to the publication of articles over locally relevant research pertaining to the biosphere reserve (vertical axis) and the priority they assigned to conducting research in the biosphere reserve (horizontal axis).

![Figure 1. Positions of scientists’ research priorities](image)

Most scientists (P2, P3, P4, P5, and P6) identified a clear priority on publishing articles in high-ranked journals over a local engagement in research that would be pertinent to the biosphere reserve. They argued that research on the local biological and ecological processes specifically embedded in the local ecosystem of Sierra de Huautla was discouraged by their work environment, while generalizable biological research output was encouraged and favored.

**Both trends continue: Natural/social science research and local conservation engagement**

Across all participants, our data indicate a clear and pragmatic encouragement of the center’s institutional system and the researchers’ social worlds toward
foundational biological research, growing further away from locally embedded projects and toward short-term generalizable ecological research that offers a larger audience and publication access to higher ranked journals. As the researchers explained, locally specific conservation research such as forest and landscape restoration projects, local monitoring needs and practices, population sizes, or local species biodiversity require scientists to engage in long-term research projects over more years than laboratory research and cannot guarantee that they would result in publishable products. Those researchers who depended on frequent academic assessments in order to renew their employment contracts stressed this issue:

Nowadays, being a researcher means publishing. You need to have products that are relevant for the broader field. If your products are not globally significant, you will probably not publish in a high-ranked journal. You can publish, but then your research results have only local impacts. The impact factor is low because it is local. It seems that if the results are locally relevant, nobody will read that. And then you fail to comply with the university’s evaluation requirements. The institution is the one that sets the requirements. You need to publish in journals with a high impact factor. You have to decide where you want to play. (P5)

The five interviewees who strongly prioritized publishing articles (Figure 1) further elaborated that their main incentive for collaborative research projects was to boost their scholarly output, not the development of new research activities that could potentially be relevant for the area.

Realistically, our objective is to contribute to listings of entomological species. We contribute to generate information about insects at a national level. We mostly collaborate with researchers and museums outside Mexico. For instance, Museum of Los Angeles, University of Kansas, and we assure quality research products. (P2)

Moreover, interviewees indicated that initiatives and efforts toward multidisciplinary approaches were typically marginalized in the research center in terms of resource support, infrastructure, and opportunities for larger collaborations. One interviewee explicitly blames the high competition between integrated and non-integrated conservation research perspectives in academic practice:

The team of TAs [technical assistants], RAs [research assistants], and myself are outnumbered by those researchers who focus their work on exclusive biological-oriented research. This is reflected in the impact of our work that is not visible in the overall performance of the center. (P8)
The participants were recruited from different organizational levels and sub-units of the research center, from administration (director) at the center of authority to research staff at the periphery. They have different access to decision-making and agenda setting regarding the strategic priorities, research management, and resource administration of the center. The direct interviews and triangulation indicate that those scientists who are involved in multidisciplinary work hold less influential roles in the research center, which potentially reproduces a further marginalization of multidisciplinary or transdisciplinary approaches among the competition over resources, influence, and priorities in the center.

Despite that fact that descriptions of projects for education and biodiversity were lacking in the biosphere reserve center’s report, evidence of such activity was found elsewhere. For instance, earlier documents and references indicated that the research center used to run a series of public outreach projects for education and biodiversity awareness (Dorado et al., 2002). Various projects tried to increase social ties with the local communities in the biosphere reserve and increase local environmental awareness of the general public. For instance, research center staff developed educational resources, posters, leaflets, and banners about animal and plant species that were used for public outreach in local communities and schools to create awareness of the region’s biodiversity. These projects were designed collaboratively between research center staff and members of the local community (Reyes Morales & Dorantes Flores, 2007). The research center even ran two radio shows and a TV show for biodiversity-related outreach in partnership with the state university and the state government office of communication, offering local news and environmental education programming. However, the 2010–2012 annual reports that we reviewed did not make any reference to these outreach activities. The 2008–2009 annual reports referred only vaguely to the participation of the center’s scientists in public outreach formats, interviews, and radio shows.

Many interview participants recalled that these outreach efforts struggled due to lacking academic recognition and increasing marginalization at the center, which led to their discontinuation although they had once been the core objectives of the center. The interviewees stated that the center’s evaluation and reward mechanisms systemically favored foundational biological research and its scientific publication in high-ranked journals over the broader academic activities that served public engagement and the center’s local integration mandate. This marginalization was further enforced by the purely scientific assessment criteria of the university system they were part of, and on which they relied to renew their academic positions. As a result, the pressure to publish and deliver scientific products—measurable only through academic publications—added to the increasing disconnect between social and biological conservation activities in biosphere reserve.
Some excerpts from participants’ statements are reproduced below.

Around the year of 2000, the biology honors program at UNAM [Autonomous University of the State of Morelos] was changed and most biologists currently working in Mexico come from this university. The new program clearly encouraged more work in the laboratory in fields like molecular ecology and, in general, fields that are mostly lab-focused. The work in the lab is much easier; you get your material, you study that material and that’s it. I do not have to worry about asking for permits or going to collect, I just work with those collections and I can publish a lot. (P5)

Nowadays, it is only me developing teaching materials because here, most researchers are not contributing to develop outreach projects. I believe that these programs are important because they are conservation strategies that really impact the public. But currently, researchers are more interested in their own personal agendas, which I respect. It is the system that asks you to do that and you have to choose. (P1)

The recent history of the research center itself shows how the re-orientation toward foundational biological research has become reinforced through new administrative changes. As several interviewees (P1, P2, P3, P7) describe, the center’s 2008 appointment of a new director coincided with a shift of research focus away from social research toward a stronger biological and ecological emphasis. The public records of the research center indicate that two years after the new director’s appointment, the center’s original name “Center for Environmental Education and Research of Sierra de Huautla” was changed to “Center for Research in Biodiversity and Conservation” to re-label the center’s research content and activities away from a local focus on the biosphere reserve to a more general biological scope (Gallardo, 2010; González, 2010).

Along with the described systemic discouragement of local engagement, our interviewees noted that the erosion of applied research and local engagement at the research center was further exacerbated due to simple geographic barriers of logistics and distance. The center is based in Cuernavaca; three hours away from the biosphere reserve. Several interviewees argued that having their offices closer to the reserve would indeed make a difference in their involvement with local communities in the area. At the same time, they were reluctant to support a move of the research center closer to the biosphere’s rural environs because they feared impacts on their lifestyle and family activities. They also stressed that Cuernavaca represents an important academic hub that offers considerable resources for carrying out scientific research and collaborations in the city, thus providing a substantial incentive toward academic networks as opposed to local engagement and rural networks within the biosphere reserve. While
offering benefits to the academic networks, this arguably contributes further to the development of a somewhat buffered and mutually enforced social world of academic researchers within Cuernavaca, as opposed to a more isolated researcher whose social world may enable a more immediate engagement with the local conservation needs of Sierra de Huautla Biosphere Reserve.

**Conclusion**

Our study of Sierra de Huautla Biosphere Reserve in Mexico illustrates a considerable disconnect between the integrative human–environment conservation ideals that biosphere reserves were initially envisioned to follow, and the scientific practice encountered today in a biosphere research center that makes a distinction between academic career success on one hand and meaningful conservation research with local engagement on the other hand. Compared to the premises and needs of the integrative goals of the Mexican modality of a biosphere reserve as a conservation model, this case study reports a lack of social and multidisciplinary research concerned with the integration of natural and human dimensions of conservation in the biosphere reserve, and a lack of local relevance even within the mostly natural science–based research that is being conducted.

Researchers in Sierra de Huautla Biosphere Reserve indicate a strong prioritization of foundational biological research, embedded in a composition of scientists with protectionist ideas of conservation that put an exclusive emphasis on the contribution of natural sciences, further reinforced by the pressures of academic evaluation rigor, which encourages efficient laboratory work and high-ranked scientific publications while discouraging long-term and in-depth engagement with local conservation needs. In short, the socio-natural interface that should be guiding conservation research in the biosphere reserve is virtually absent in Sierra de Huautla’s research center.

Moreover, this case study suggests that the described disconnect may grow even further over time due to the institutional reward mechanisms and mutual enforcements within the academic social worlds of the scientists that are in place at the research center. Both create an environment for scientists that discourages academic effort toward social or multidisciplinary research, interest in the local relevance of research applications, and a deeper engagement with the conservation needs of the biosphere reserve. Our analysis highlights several reasons why this is happening—for example, because of individual pressures and incentives in their academic work environment, as well as problems within academic management and administration—which offer an in-depth case to
understand how Mexican research centers associated with specific biosphere reserves may be unable to address integrative and local aspects of their research mandates sufficiently.

The systemic context of these mechanisms at this research center raises the possibility of a structural problem in Mexico’s system of academic conservation research related to biosphere reserves and their local needs in general, which we think requires further research at the policy interface between Mexico’s conservation research and practice. This concern is consistent with recent academic studies in Latin America that report of conservation scientists who have criticized the character of academic requirements which force them to comply with regulations that are often detrimental to conservation research (Ceballos, 2004; Ceballos et al., 2009; Galindo-Leal, 2000). The lack of interaction among scientists and managers working in Mexican biosphere reserves, along with the lack of research on locally relevant species within natural protected areas, has already been identified as an urgent challenge for the future of management and conservation strategies (Castillo & Toledo, 2000; Pino-del Carpio et al., 2011). For example, it has been reported that a large amount of ecological and biological research is opportunistically published in the conservation literature, while little focus is given in comparison to policy-relevant information regarding local and regional conservation action (Fazey et al. 2005).

Reports on the performance of Mexican natural protected areas show that protection initiatives that have their own laboratory or are associated with a research institute have been considered very important contributors for the production of natural science–based knowledge (CONABIO, 2012; Halffter, 2011; Urquiza-Haas, 2009). However, the production of knowledge in itself does not necessarily improve the local conservation situation on the ground, nor does it ensure that local interests and effective local management conditions are sufficiently taken into account (Castillo & Toledo, 2000).

Our findings remind of the critical importance of alignment between the written priorities and the practical conditions of conservation efforts. This small case study of one Mexican research center is in line with similar findings across a growing body of research which suggests that what might be required is not only to increase the number of natural protected areas or strengthen natural science–based research—as is currently advocated in the Mexican environmental literature (Dirzo et al., 2009)—but, fundamentally, a critical re-examination of the culture of conservation research practice.

For example, recent integrative research on indigenous and community-conserved areas in Mexico suggests that these types of environmental initiatives have important conservation benefits (Berkes, 2009; Orozco & Berkes, 2010; Robson, 2007). These initiatives are not necessarily based on a conventional
conservation approach that could be effectively supported through multi-institutional structures, but instead require strong community organizations paired with traditional knowledge–based conservation strategies. Given the potential for biodiversity conservation offered by such alternative initiatives and the challenges of current scientific practice as described in this study, such new strategies could become considered as valuable components of future conservation planning in Mexico, rather than remain outside alternatives while conventional conservation strategies are further expanded (Robson, 2007).

With regard to the scientific environment of conservation researchers, the current conventional (“mainstream”) evaluation criteria for academic success in the Mexican scientific community (i.e., based on publications and grant income) poses challenges to local conservation relevance and engagement, and raises the question whether it could be examined for refinement or be revisited for a broader assessment of criteria (Ceballos et al., 2009; Martínez, et al. 2006). Several recent academic reviews and reports have started to question the success of this evaluation system for Mexico’s overall research science performance, particularly with respect to scientific and technological engagement in local and regional issues (Alcocer, 2010; Aupetit & Gérard, 2011; González-Maya & Cepeda, 2011; Jaso-Sanchez, 2008).

Our presented findings support the need for further research in this regard. García-Frapolli et al. (2009), for example, have argued that Mexico’s conservation policy has greatly benefited from the government’s long tradition of employing scientists, based on the argument that this valorizes scientific planning over political interests. However, we would like to add that it is also important to look at the power asymmetries, selection mechanisms, and barriers that scientists are facing when carrying out their work. As our study illustrates, the scientists’ work is embedded in a larger political realm, which is currently influenced by managerial trans-local discourses of “academic excellence,” detached from actual conservation sites to an extent that has made locally relevant science in Mexican conservation research difficult. “Publish or perish” has for too long been presented as an apolitical, “value-free” system under which scientists worldwide are operating. Our findings support the growing critique that is emerging toward the implications of this notion in conservation, and illustrate how the scientific priorities that it creates reflect an underlying political paradigm on numerous levels. This analysis of the research center managing Sierra de Huautla Biosphere Reserve offers a pressing example of how scientist norms, careers, and commitments are embedded within sociopolitical contexts and selection mechanisms, and it reminds us that they are never value-free or neutral, but inherently political.
References


Human Ecology as Philosophy

Carleton B. Christensen

School of Philosophy, Research School of Social Sciences
College of Arts & Social Sciences
The Australian National University

Abstract

This paper articulates the essentially philosophical character of human ecology. The first section argues that the often-noted concern of human ecology for both sustainability and equity is best understood as a concern to help humans implicated in problematic human–environment interactions to identify how to refashion these interactions so as to enable a more sustainable balance between the moral claims of others and their own needs and desires. Human ecology is therefore governed by a unitary practical interest in facilitating a more sustainable balance between virtue and happiness—living well in Aristotle’s sense. If this is so, then human ecology must be done, in certain phases of its practice, as philosophy. The second section then illustrates how this general conception applies to and shapes the investigation of a concrete issue—consumption—particularly in first world economies. It also shows how, given this conception of human ecology as philosophy, this issue is not just one important target of investigation alongside others but the central human ecological topic. Finally, the third section argues that human ecology, done as philosophy, also requires grounding in philosophy. Specifically, it needs a general account of what it is to be the rational animals we humans are since only this can give action-guiding content to the idea of living well without tendentiously prescribing any specific form of life. In conclusion, it is argued that the philosophical character of human ecology explains what it means to describe it as a multi-, inter-, trans-, and even adisciplinary fusion of biological and social sciences.

Keywords: consumption, critical theory, living well, philosophy, rationality, sustainability

Introduction

Since its inception as “a fusion of biological and social sciences in the early twentieth century,” (Dyball, 2010, p. 273) human ecology has been variously described as (a) multidisciplinary—in that it draws upon the insights of different disciplines—; (b) interdisciplinary—in that it integrates the insights of other disciplines into a whole greater than the sum of its parts—; and

1 Author contact: carleton.christensen@anu.edu.au.
(c) transdisciplinary—beyond all disciplines and therefore adisciplinary, hence not really a discipline at all. But what does it mean to characterize human ecology in these successively more radical terms? They are, I believe, inchoate attempts to articulate the following thesis: Human ecology must be done, in certain phases of its practice, as philosophy and indeed is crucially reliant on strictly philosophical reflection.² Only by grounding human ecology as philosophy (as discussed in Section 1) and in philosophy (as discussed in Section 3) can one see what it is to genuinely ‘fuse’ natural and social scientific disciplines in a coherent unity which explains why it has been successively characterized as multi-, inter-, trans-, and ultimately adisciplinary. Thereby human ecology is strengthened both theoretically and practically: theoretically, in that one has a clearer understanding of what, as a human ecologist, one’s task is; and practically, in that one sees how ambitious and politically relevant the task is.

Inevitably, then, much of this paper will work in the language of philosophy, with which many readers of Human Ecology Review will not be familiar. This paper is, however, envisaged as the first in a series in the course of which the philosophical dimensions and presuppositions of human ecology will be further spelled out. This will progressively make the philosophical terminology and style employed here more accessible to readers less familiar with philosophy in general.

The character of human ecology as practically interested

Let the object domain of a form of inquiry be the class of entities with which this form of inquiry is essentially concerned. An object domain is thus a class of entities in their capacity as constituted in such a way that they can occur in the kinds of relation which a particular form of theoretical inquiry essentially seeks to comprehend. Thus, physics has as its object domain a class of entities which are so constituted as to stand in distinctively physical relations, that is, causal interactions of the kind in which an entity is implicated by virtue of having physical properties. Similarly, the historiography of, say, Germany in the 19th century has as its object domain a class of entities so constituted as to stand in historical relations, specifically those pertaining to German history of the 19th century. Finally, mathematics has as its object domain a class of entities so constituted as to stand in distinctively mathematical relations.³

² Of course, in saying this, I mean much more than that human ecology should avail itself of the philosophical tradition.
³ Note that I am deliberately leaving open what physical, German-historical, and mathematical properties are. This is because I want to allow that what one understands by a physical, historical, or mathematical property may evolve.
“Human ecology is about the interrelationships between humans, their cultures and their ecosystems” (Dyball, 2010, p. 273). In other words, it investigates the complex web of causal relations which exist between human beings, their cultural and social practices, and the ecosystems in which these are embedded. We may therefore say that its object domain is the class of human–environment interactions. More precisely, it is the class of entities implicated in these interactions by virtue of having those properties or standing in those relations which shape these interactions. There is, however, a crucial difference between this object domain and those of physics, historiography, and mathematics. The object domain of physics is understood to be unified by natural laws. It is the defining task of physics to find these laws. The object domain of a particular form of historiography, for example, of Germany in the 19th century, is not unified in this sense. Nonetheless, this domain contains items which are intrinsically significant,4 that is, significant in the sense that they are understood to have made Germany and Germans what they are today. And understanding how Germany and the Germans have become what they are is something not, or at least not just, practically useful, in that it helps us to deal with Germany and Germans;5 it is interesting in its own right. So here, too, something unifies the object domain, making it a worthy object of investigation in its own right: the idea of there being a coherent story to tell about how an important country, culture, and people have emerged as what they are today.6 Finally, the object domain of any particular kind of mathematics is understood to be unified by a set of axiomatic principles constitutive of the kind of mathematical entity at issue. It is the task of any given branch of mathematics to uncover the relevant set of principles—that underlying unity definitive of an object domain which is perhaps the example par excellence of something worth knowing for its own sake.

But the object domain of human ecology is not like this. It is not presumed to possess an underlying unity, whether of natural law, narrative significance, or axiomatic principle. Rather, it is understood to be a motley affair whose unity lies in the fact that human–environment interactions have become practically problematic. In other words, the object domain of human ecology is picked out by a practical interest underpinned by concern about human–environment interactions rather than by a theoretical interest affectively underpinned by what Aristotle called wonder (thaumazein).7 In this regard, human ecology is

---

4 Obviously, not everything which happened in Germany in the 19th century is of historical interest, hence belongs to the object domain of that form of historical inquiry which is the historiography of Germany in the 19th century.
5 It is in fact arguable whether such historical knowledge is in this way ‘useful’ at all.
6 It is worth noting that something at least analogous to such narrative unity can be found in disciplines which are not so-called Geisteswissenschaften (humanities). Thus, the object domains of natural history, the evolution of the Earth, etc. are presumed to possess an at least quasi-narrative unity.
7 Wonder is to be distinguished from mere curiosity, however intellectual, because it involves awe, hence recognition of value—beauty, elegance, simplicity, or perhaps, nobility, heroism, creativity, etc. Such recognition of value can be entirely absent from curiosity, for which reason one can speak of a prurient curiosity but not of a prurient wonder.
like engineering or rather the applied science which underpins engineering; for example, research undertaken in order to determine how the reproductive system works so as then to engineer safe and effective means of contraception.

There is, however, also a crucial difference: the object domain of a particular form of applied science is any kind of causal interaction by understanding which one might potentially achieve, through the engineering of appropriate technological solutions, a specific human benefit. So the practical interest at issue here is purely prudential in the sense that it is a concern to know how certain things work for the sake of identifying, or at least enabling the identification of, effective technological means of bringing about certain results beneficial to us. By contrast, the practical interest which leads one to select human–environment interactions as one’s domain of theoretical investigation is not simply prudential—as if one were concerned merely to understand these interactions simply in order to devise better ways of protecting and maintaining ecosystems of value to us.8 This interest is also ethical: one is concerned to understand these systems in order to derive just ways of protecting and maintaining ecosystems of value to us.9 In one’s account of human–environment interactions, one is also concerned to identify their ethical implications and consequences for those morally considerable beings; in particular, for those other human beings implicated in and affected by them.

If, however, the object domain definitive of human ecology is not intrinsically unified in the sense in which those of physics, history, or mathematics are, then human ecology can no more be pursued in purely disinterested, merely theoretical fashion than can engineering or applied science. This does not mean, of course, that an individual human ecologist might not practice the trade out of mere intellectual curiosity. The point here concerns the institution or cognitive practice of human ecology, not individual human ecologists. If the institution or cognitive practice of human ecology were merely an exercise in knowledge for knowledge’s sake, then, in contrast to physics, historiography, or mathematics, it would be merely entertaining, a hobby, in the manner of, say, train-spotting. No doubt train-spotting can and perhaps does have its congresses and journals, its experts and keynote speakers. Even so, it remains a diversion. By contrast, physics seeks to know the innermost lawfulness of the physical, and this is something truly wondrous. This innermost lawfulness makes the knowledge gained by physics something worthwhile, something valuable and valued, in a way in which the knowledge gained in train-spotting is not. In this sense, then, physics is serious in a way train-spotting is not. Independently of the

8 Note that the phrase ‘of value’ allows that the value in question may not be simply prudential but, say, aesthetic.
9 Veronica Bullock has pointed out to me in conversation that the same might well be true of the science of conserving artefacts and other cultural items for exhibition.
motivations of any individual physicist, physics is a cognitive practice embedded in and sustained by the shared social conviction that what it accomplishes is valuable in and of itself. It is thus a cognitive practice essentially characterized by the normativized collective belief, hence normative expectation, that one does physics because one is intellectually curious about a presumed innermost lawfulness of the physical.

So, too, with human ecology: it is serious in a way train-spotting is not. Independently of the motivations of any individual human ecologist, it is a cognitive practice embedded in and sustained by the normativized collective belief that what it accomplishes is valuable, not in and of itself, but for practical reasons—it permits us to understand phenomena with critical prudential and ethical consequences. It is thus a cognitive practice essentially characterized by the normative expectation that one engages in human ecology because one is concerned about these prudential and ethical consequences. Evidently, if this is so, then as a rule human ecologists will pursue human ecology out of a combined prudential and ethical concern. As a rule, one cannot do human ecology disinterestedly, out of mere intellectual curiosity.

This response to one objection intimates the reply to another. One might grant that human ecology is defined by an essentially practical interest in order then to object that this practical interest might be merely prudential. It is, after all, possible that someone might naively believe that current human–environment interactions do not harm any morally considerable third party but merely threaten the individuals and societies which engage in them. Such a person would then engage in human ecology merely for prudential reasons. But as with the possibility of doing human ecology out of mere curiosity, so, too, with this one: we are discussing the institution or practice of human ecology, not the psychology of the individuals who practice it. Human ecology is a cognitive practice which is essentially structured by the normativized collective expectation that one engage in it out of a concern not just for the prudential but also for the ethical consequences of human–environment interactions. To be what counts as a good, effective human ecologist, one therefore needs as a rule this motivation and when, exceptionally, one does not, one is not doing human ecology properly.

At this point, a crucial question arises: If human ecology is constituted by a practical interest both prudential and ethical in a way in which the practical interest of applied science is not, then how do these two dimensions stand to one another? Surely they do not sit indifferently and contingently alongside one another but rather are intimately bound up with one another. In some way, they must surely form an inseparable unity. But what could this mean? Through interacting with the environment humans seek to satisfy various needs or desires. At the same time, they typically know any such interaction to stand,
like any human action, under the moral obligation that it not be undertaken in a fashion which disregards the interests of morally considerable beings potentially affected by it. So any human being, simply in virtue of standing, hence knowing him- or herself to stand, under this moral obligation confronts the task of finding some way to mediate between the prudential and the ethical, that is, to find some way in which one can satisfy need and desire while fulfilling the requirements of ethics and vice versa.

Regularly and reliably accomplishing this mediation in the conduct of one’s affairs is what Aristotle called living well.\(^\text{10}\) It follows trivially from this characterization of living well that a life lived well—the good life—is neither simply virtuous nor simply happy, but rather both at once. Relatedly, the good person is not simply someone who sacrifices desire to ethics, but rather someone who has an accurate sense of their own entitlement to desire satisfaction. Moreover, living well in this sense, that is, existing as a process of mediating ethics and desire with one another, is objective happiness—objective in the sense that all human beings, unless they are conscienceless psychopaths, would acknowledge it as the optimal way to live, even if they do not regard themselves as having the moral character required for being able to live in this manner. Evidently, living well is not happiness in the sense of feeling good, in particular, about oneself. It is thus not what these days is called well-being. Rather, it is happiness in the sense of contentment and this is a state one can be in even though one is not living in the most comfortable or commodious of conditions and even though one knows one has not achieved all one could have.\(^\text{11}\)

This conception of living well has both internal psychological and external social and biophysical implications: as a rule, if not always, human beings must be psychologically disposed to seek this mediation in the conduct of their affairs. Equally, their external situation, which comprises both the social and the natural circumstances under which they live, must be such as to permit them regularly to accomplish this mediation. This yields two further important notions: firstly, one is a good person, that is, of good moral character, insofar as one is psychologically disposed to living well. Secondly, a society is a good one insofar as it enables individuals to develop and realize good moral character. Note that this will involve not only appropriate practices of character formation and the right social relations, it will also require society to have an appropriate relation to its biophysical environment. A good society is one which enables seekers of happiness to be upright, lovers of justice happy, across psychological, social, and natural dimensions.

\(^\text{10}\) Specifically, it is what he called sôphirosynê—see Aristotle (2011/1941, 1140b12).

\(^\text{11}\) It is, for example, quite possible to be happy in this sense—content, at peace with oneself and the world—even in a hospice.
At this point, we may venture the following speculative thought: In the practical interest constitutive of human ecology the prudential and the ethical are indeed inseparably bound up with one another and they are so because this interest, properly understood, lies not just in listing the various ways in which the human–environment interaction under investigation is prudentially unwise and/or morally wrong, but rather in exploring these ways in their unity as detracting from living well. And the point of thus exploring how the human–environment interaction under investigation undermines living well is to determine how this human–environment interaction could be so rearranged that it enables, for those who engage in it, a better realization of living well.

At first sight, this might seem little more than the anodyne point that human ecology seeks, through the knowledge it provides, to contribute to so-called “win/win” solutions. There is, however, more meat to the idea than this. Firstly, from the substantive perspective of what human ecology accomplishes, it possess a hidden depth of content. It is often hard to determine just how, in the concrete circumstances, one might reorder a human–environment interaction so as to mediate as well as possible in the circumstances between ethics and desire. In particular, what often makes this so hard is that the specific desire at issue is itself dysfunctional, hence is itself what must change; there is no clever way to rearrange things which would permit desire to be satisfied without injustice. This means that human ecology is committed by its constitutive practical interest to exploring a human–environment interaction with a view to determining how the specific desires, hence underlying affective dispositions, of those engaged in the interaction might be reconfigured to make them more conducive to living well. In other words, since desires and affective dispositions are the springs of purposive behavior and action, human ecology is committed to exploring the possibilities of so-called behavioral change in quite radical fashion, up to and including the study of how, in the concrete circumstances, those involved in problematic interaction might be brought not to desire and not to feel in the manner which drives this interaction. Evidently, this points to the need for an account of what desire and affective disposition essentially are. In particular, it points to the need to investigate first whether human beings have them under their rational control, such that they can reconfigure their patterns of desire and affect in reflective fashion; and then, if this is so, under what conditions and in what way such rational control is effectively exercised.

---

12 By an affective disposition I mean a capacity to be affected in some way, either viscerally (hunger, pain or pleasure) or emotionally (grief or joy, amused or displeased, etc.). Affective dispositions in this sense make it possible to have desires: I desire to eat because I am hungry, I desire to help a certain person because I love her—or indeed perhaps because I would feel ashamed of myself if I did not help. The capacity for such complex emotions as guilt and self-respect, shame and self-esteem (which pairs are not to be confused with one another) are extremely important affective dispositions.

13 More will be said below, particularly in Section 3, about the nature of this investigation.
Secondly, also from the methodological perspective of how human ecology accomplishes what it accomplishes, this idea possesses a hidden depth of content. The constitutive practical interest of human ecology impacts upon how it individuates the human–environment interactions with which it deals. Obviously, if one is investigating a problematic human–environment interaction not simply in order to list its prudentially and ethically negative consequences but also in order to determine how it measures up as enabling those who engage in it to live well, then one cannot be investigating this interaction in isolation. Identifying something which would appropriately recognize the interests of all involved\textsuperscript{14} will clearly require one to see this interaction in both its biophysical and its socioeconomic, political, cultural, and historical context. So from the outset, the human–environment interaction under investigation is picked out as a part belonging to (perhaps larger parts of) a biophysical, socioeconomic, cultural, and historical whole—to an entire form of human life. Furthermore, since human ecology is practically and not merely theoretically interested, this form of life is either directly or indirectly our own. Australian human ecologists could, for example, be investigating Filipino fishing practices, or, in a more historical mode, the land management practices of Australian Aboriginals prior to European colonization. Either way, as human ecologists they are investigating such human–environment interactions because they believe that understanding them is relevant to understanding and better dealing with their own current human–environment interactions, understood as aspects or parts of their own current form of life.

This shows the widely acknowledged holism (Dyball, 2010, p. 1) of human ecology to have a distinctive character which distances it from its origins in ecology as a natural science and permits it to reach out to the social sciences. I have claimed that the practical interest constitutive of human ecology is not simply the sum of two concerns contingently lumped together, on the one hand, a concern to ascertain what prudentially problematic features a given human–environment interaction might have, and on the other, a concern to ascertain what its ethically problematic features might be. Rather, I have suggested that these twin concerns are but aspects or dimensions of the one deeper practical interest in ascertaining how concretely the human–environment interaction does or does not facilitate living well. And by an understanding of how concretely a particular kind of engagement with the world does and does not facilitate living well on the part of those thus engaged, I do not mean simply knowledge of certain superficially observable features of the engagement as prudentially or ethically bad. Rather, I mean a grasp of how things actually are in their character as less than they might potentially be. To understand how concretely a particular kind of engagement with the world does and does

\textsuperscript{14} This is, of course, the really substantive idea behind talk of a “win/win” solution.
not facilitate living well on the part of those engaged in it is thus to grasp what it is actually in essential relation to an unrealized potential inherent to it. Such understanding is what human ecology must aim at if it is governed by a genuinely practical interest in knowing how a human–environment interaction does or does not facilitate living well—knowing how in a sense which insinuates knowing what to concretely do in response to the impediments to living well the human ecologist discerns.

Since, however, knowledge in this strong sense of how a particular human–environment interaction impedes living well does not leap out at the investigator—it is not superficially obvious in the way in which, say, isolated moral blemishes can be—human ecology is defined by a deep and complex task. It seeks not just to list problematic features of the human–environment interaction it is investigating; it also seeks to identify practically available opportunities for developing out of this interaction something which better approximates to living well—better approximates in that it better gives all morally considerable parties their due, hence better balances ethics and desire. Accomplishing this must be a process in which, through ongoing exploration of and negotiation with the context, the investigation lets the human–environment interaction at issue appear in its character as a lesser version of something better. Evidently, a crucial resource in the development of this are the human beings engaged in or affected by the interaction—the stakeholders. Insofar as human ecology is ultimately concerned with understanding how concretely a particular human–environment interaction does and does not facilitate living well, hence must ascertain concretely how things might be better, it must draw upon the knowledge and experience of those engaged in and affected by it. It must make them, to some extent, participants in the investigation.

This immediately gives to human ecology an inherently critical character, in the sense intended by such critical theorists as Theodor Adorno, Max Horkheimer, and Herbert Marcuse. By critical theory, these thinkers meant a theoretical practice which was inherently evaluative: to engage in it was not simply to come up with claims about how things are from which one could only proceed to claims about how they might be better by importing normative and axiological premises from outside. Rather, to engage in it was to come up with claims about members of the object domain which in and of themselves entailed a certain kind of evaluation of these members. To investigate phenomena from the perspective of whether and in what ways they enable or disable living well is, as we have seen, to set oneself the task of exploring them in such a manner that they progressively reveal themselves as aspects of a form of life which would be better in such and such ways. The cognitive goal is to reveal the form of life of which these phenomena are parts not just in its actuality or positivity—what it factually is—but also and primarily in its potentiality or negativity—what
it is not but could be. Human ecology seeks ultimately to move beyond merely establishing what is problematic in a human–environment interaction in order to glimpse that potential form of life relative to which the actual one appears as less adequate by virtue of containing this human–environment interaction.

An example will make this clearer: Historians can investigate the interaction between a Roman patrician and his Greek tutor in straightforwardly positive fashion, noting, for example, that the latter is a slave whom the former can and often does treat as a mere thing to be used, whom, however, the former does and indeed must treat with deference when learning from him. But precisely for this reason we intuitively recognize that this characterization leaves something unsaid, namely, that there is something cognitively dissonant about the interaction in relation to the patrician’s behavior overall: how the patrician behaves when learning shows that the tutor is not a mere thing to be used, hence should not be a slave. Should our historians go on to articulate this, they would obviously be assessing the interaction. And their assessment would be at least ethical: these historians would be applying the general norm that something capable of teaching should never be treated simply as a means but always also as an end in itself. Crucially, they would be assuming that this norm were something acknowledged not just by them themselves but also by the patrician—implicitly acknowledged in the way the latter behaves when being taught. Just this, however, means that the historians’ primary assessment would be an ontological one: From the outset, they would have picked the patrician and his behavior out as something to which this norm applies, hence from the outset they are seeing the actual interaction as inherently pointing towards a not-yet-realized one in which those involved have received the due the character of their interaction implies—a counterfactual interaction, therefore, in which the slave would not be a slave. This would be to assess the actual interaction as (part of) an imperfect form of living well, whereby the notion of living well would serve as a standard in the ontological sense that it defines a possibility inherent in the actual interaction of which this interaction is a suboptimal realization.

The study of consumption and the critique of consumerism

I want now to illustrate how the general conception just sketched applies to and shapes the investigation of a concrete issue. I have chosen this issue because, as we shall see towards the end of this section, when human ecology is conceived as inherently philosophical in the manner described in Section 1, this issue shows itself to be not so much just one important target of investigation alongside others but, in a sense to be explained, the central human ecological topic.
It is widely acknowledged that problems of sustainability have much to do with the character, quantity, and rate of consumption, particularly in first world economies. In the literature on consumption and consumerism there are two broad traditions, each strong where the other is weak. On the one hand, there is a tradition that starts from the assumption that consumption is a process through which individuals not merely satisfy needs and desires, but also signal to others such things as status, power, identity, and/or individuality. Acknowledgment by others of the status, power, identity, or individuality thereby signaled is then construed as confirming individuals in their own sense of self, hence as a source of their self-esteem. Often, the signaling role of consumption is seen as manipulable through advertising by vested interests. When it is thus manipulated, consumption becomes consumerism, with consequences bad for consumers themselves: loss of autonomy, ‘inauthentic’ selfhood, and the absence of ‘true’ happiness. Evidently, this tradition, which reaches from Thorstein Veblen (1994/1899) through J. K. Galbraith (1958), Vance Packard (1957), and Erich Fromm (1976) to Juliet Schor (1998) and Clive Hamilton and Richard Denniss (2005), seeks not just an account of consumption but a critique of consumerism.

On the other hand, there is a tradition which proceeds ethnographically, examining diverse practices of consumption in order to determine what exactly individual consumers do when they use consumer goods and services, hence why they purchase them. This tradition ascertains that consumers frequently use consumer goods and services in such spontaneous and creative ways that no advertiser could anticipate this use. To this extent, and in contrast to what many in the first tradition maintain, the desires driving consumption cannot be literally manufactured by producers through marketing. Furthermore, no obvious sense emerges in which consumption in late modern capitalist societies is bad for consumers themselves, hence consumerist. The second tradition thus provides no basis for the kind of critique characteristic of the first. Indeed, sometimes this second tradition construes ostensibly consumerist consumption positively, as providing opportunities for creative self-expression and fantasy—see Bauman (2000, 2001) and Campbell (1987). Other representatives of the second, noncritical tradition include Daniel Miller (2001), Sophie Woodward (Miller & Woodward 2012), Richard Wilk (2001), and, in a different way, Elizabeth Shove (2003; and Shove et al. 2009).

The second tradition stands on empirically stronger ground: most forms of consumption and consumer do not correspond to the picture painted of them by the first tradition. In fact, the first tradition illicitly takes a particular form of consumption—conspicuous consumption—as representative of all consumption. Furthermore, it paints a distorted picture of conspicuous consumption. In particular, it construes the conspicuous consumer as a slave
of advertising whose desire for a product is just as much manufactured by the producer through advertising as the product itself. This “productivist” picture of consumption grossly misrepresents how advertising actually works. Yet there is a certain legitimacy to the concern of many within the first tradition to identify a sense in which contemporary consumption is consumerist, that is, bad not just for certain third parties but for consumers themselves. If it can be shown that such consumption is not truly in the interest of those who engage in it, then one will have uncovered a powerful motivation for behavioral change. This is evidently an attractive feature for those seeking more sustainable kinds, quantities, and speeds of consumption. One would like, therefore, to preserve this critical dimension of (much of) the first tradition even as one preserves the empirical accuracy of the second. A synthesis of the two traditions is needed.

Recall now the account implicit in Aristotle of the formal structure of living well: To live well is to reliably and regularly, if not necessarily always, mediate successfully between ethics and desire, such that as a rule the demands of the one are reconciled with the demands of the other. Clearly, being able to live well in this sense is a function both of one’s internal desires and general moral character and of one’s external social and natural circumstances. This provides a clue as to how one might interpret practices of consumption in late modern consumer capitalist society as “consumerist,” that is, bad for consumers themselves even though such consumers might very well enjoy the fruits of consumer society and even though they are so little manipulated by advertisers that they display a relative autonomy in relation to the blandishments of marketing. For one can imagine a situation in which the totality of consumption practices becomes dysfunctional in the sense that although this totality might provide a vast choice of high-quality, low-cost opportunities for consumption, the practices of production and distribution needed to sustain this totality involve such speed, change, labor intensity, temporal fragmentation, and social isolation that the capacity for living well is impaired. One needs, for example, to go somewhere and would prefer to use public transport, perhaps because it is environmentally friendlier, hence ethically better, and moreover gives one the chance to read, hence is prudentially better. Unfortunately, one has so much to do, and the public transport system is so inconvenient that one has no choice but to make the short-term rational but long-term irrational decision of traveling by car. Evidently, if such suboptimality is a feature of practical decision-making across many different contexts and individuals, then the capacity of individuals collectively to steer the totality of consumption and production practices will be undermined. The political life of this totality can then only be maintained as a comforting illusion.

There thus lies in this situation of dissonance a possible collective motive for the reorganization of the spheres of consumption and production: less choice of
low-cost, high-quality goods and services in favor of more time for the kind of reflectiveness, the social and political engagement, and indeed the overall inner composure which fully rational decision-making, hence living well, requires. Those interested in less choice of low-cost, high-quality goods and services for environmental reasons can therefore exploit this collective dissonance in an argument to the effect that in reality, however advantageous and pleasurable current practices of consumption may be in the short term, in the longer term the kind of lifestyle, and in particular workstyle, they embody is not really worthwhile because it tends to rob us of crucial dimensions of living well: reflectiveness, social and political engagement, and inner composure. Much contemporary consumption is indeed consumerist in the sense desired and the demonstration that it is so is a powerful argument for social change. The harder we have to work in order to maintain such consumption the more powerful this argument will become.

Two important points follow from this sketch of how to provide an account of consumption that is critical without empirical distortion. Firstly, it requires one to investigate consumption in its relation to production, that is, to practices of work. It discloses the dimension of work as something one needs to investigate in order to understand the quality of life in consumer capitalist society and in so doing it reveals this dimension as a possible source of motives for social change, in particular, change towards a less consumerist, hence more sustainable, organization of work and play. All sorts of notions now become targets of critical scrutiny, in particular those associated with the kind of work increasingly demanded by the consumer society, for example, productivity or efficiency, performance, excellence, flexibility, and similar notions. These can now be investigated for the potentially dehumanizing consequences which take the gloss off the bounty of consumer goods and services.

Secondly, the appeal to the notion of living well as the key to a genuinely critical but empirically accurate account of consumer capitalist consumption insinuates the centrality of the issue of consumption for human ecology. Human ecology is an investigation of human–environment interactions motivated by a concern to determine how these can be reorganized along lines that secure sustainability while facilitating living well. But all human–environment interactions are ultimately undertaken because they serve some kind of (end-)consumption, whether the particular interaction at issue be food supply or rest and recreation. So by its very nature human ecology considers human–environment interactions as a unity of production and consumption—more precisely, as a sequence

15 In Meister Eckhart’s sense of the term—what he calls Gelassenheit, which has connotations not just of self-composure but of self-surrender, that is, the capacity to put on hold one’s own preoccupation and concern with oneself in order to be able to see how things really are, hence what really matters. Self-surrender in this sense is clearly an essential feature of fully rational decision-making.
of acts of production enabling acts of (end-)consumption. Practices of (end-)consumption are therefore not just contingently a matter for human ecological empirical investigation.  

**Philosophical foundations in an ontology of self**

The claim that human ecology seeks knowledge useful for transforming human–environment interactions in the direction of sustainable living well would be little more than a slogan had one no principled, theoretical means for determining what it meant, in the specific circumstances under investigation, for rational animals such as we are to live well. One would be forced to rely on pre-philosophical intuitions about what concretely realized, from case to case, the formal structure of living well and such reliance would run the risk of tendentiously favoring certain concrete forms of life and culture over others. Thus, precisely in order to make the notion of living well concrete enough to guide action yet not so concrete as to become a tendentious imposition, human ecology requires a certain kind of philosophical grounding. Specifically, it needs an account of rational animality itself, an account which would identify certain concrete features of which it argued that all forms of living well must exhibit them. Appeal to such features could then guide practical political engagement without fear of tendentiousness.

Now under the plausible assumption that self-conscious subjectivity and rationality requires animality—that is, embodiment in the sense of a capacity both for bodily action and for affective response (feeling, sentiment, emotion, hence vulnerability)—a philosophical account of rational animality would be nothing less than a strictly philosophical ontology of the self, its subjectivity, and its rationality. The goal of this ontology would be twofold. Firstly, it would seek to elaborate and justify the claim implicit in Section 2 that reflectiveness, social and political engagement, and inner composure are the conditions under which the defining capacity of creatures capable of living well, namely reason, is optimally exercised, hence are essential features of living well. Evidently, these features prescribe no concrete form of life. Yet they are not so abstract as to permit no inference to operationalizable guidelines for the development of

---

16 Nor is it surprising that human ecologists, when they seek to identify what current human–environment interactions lack, should so readily turn to notions of enoughness (*Genügsamkeit*), sufficiency and the like.

17 Demonstrating this assumption would indeed be a principal task for such an ontology of self.

18 It follows trivially from the characterization of the formal structure of living well given here that one can only live well if one is capable of ethical judgement and deliberation. For this reason, as Aristotle points out, only rational animals can live well. Of course, as he also points out, animals not capable of self-consciousness and rationality, for example, oxen, can lead pleasurable, pain-free lives. But they cannot be happy in Aristotle’s sophisticated sense.
political programs and policies. Thus, secondly, on the basis of its neither too abstract nor too concrete understanding of living well, the envisaged ontology of self, subjectivity, and rationality would seek to justify both the avoidance of complexity and tight coupling, and the need for the slow and for a non-hubristic precautionary stance towards social and environmental intervention. For these it would show to be the collective “mindset” required for creating and maintaining the social relations and psychological dispositions which encourage reflectiveness, social and political engagement, and inner composure.

Implicit in these two interrelated goals is an important specific task required of the envisaged ontology. In Section 1 it was pointed out how, on the conception of it sketched there, human ecology was committed to exploring the possibilities of potentially quite radical behavioral change, up to and including the identification of how those involved in problematic interaction might be brought not to desire and not to feel in the manner driving this interaction. Now everyday, pre-theoretical experience already testifies that the desires and affectivities of distinctively self-conscious, at least moderately rational subjects are not brute, unchangeable facts of animal constitution, such that nothing can ever change them. Equally, however, it suggests that such desires and affectivities are not simply artifacts of external, hence purely externally manipulable conditions, for example, the socioeconomic, technologically mediated practices of consumption in which one participates. In some sense, then, changing them in a more sustainable direction requires intervening to change the internal psychological constitution of the subject itself. But what kind of intervention? Some kind of engineering intervention, such as brainwashing or the administration of drugs? Quite apart from its dubious morality, any such psychoengineering is unlikely to be effective.

For this reason, it was also claimed in Section 1 that human ecology presupposes human beings to have, at least to some sufficient degree, their desires and affectivities under their rational control, such that they can themselves rationally reconfigure their patterns of desire and affect. Human ecology therefore presupposes an account of how this can be so. The envisaged ontology of self and subjectivity must include an ontology of desire and affect which shows first that, as distinctively self-conscious subjects, human beings do have such rational control; and second, in a manner in which our everyday, pre-theoretical experience cannot show, under what conditions and in what ways human beings can exercise this rational control. This ontology would thus describe the nature and extent of the capacity to rationally reconfigure patterns of desire and affective response in the light of the knowledge human ecology provides as to the unsustainability of, for example, current practices of consumption and the hints it gives as to more sustainable alternatives which,

19 Shove (2003) seems rather inclined to this view.
once habituated to them, we would find to be forms of living at least as well, if not better. What mechanisms of social and psychological compensation must be in place in order for the transition to new, more sustainable forms of desire and affectivity to be so tolerable—which is not to say painless—that one can reliably expect individuals to embark upon it? Evidently, the ontology envisaged here constitutes the distinctively philosophical component of and contribution to a theory of behavioral change. Such a theory would clearly be of importance to the practicing human ecologist since, as already pointed out, patterns of desire and affect play a crucial causal role in currently unsustainable human–environment interactions. Human ecology must therefore seek to understand these patterns as well, and to do so with a view to suggesting how they, too, might be changed for the better.

Finally, implicit in the conception of human ecology sketched here lies a decisive metatask for this strictly philosophical account of self and subjectivity. Everything said thus far entails that human ecology understands not just itself but also the humans it investigates as governed by a distinctive practical interest in living well. More precisely, it entails that human beings are, in their capacity as rational animals, essentially oriented towards living well: This is what it is for us to be most fully or optimally as the rational animals we are. The essential character of this orientation explains why all normal, nonpsychopathic human beings would acknowledge living well as the optimal way to live for rational animals even though they themselves may believe they do not have the moral character to do so. It also explains the truth of the claim that most people are not affectively indifferent to right and wrong: most could not be psychopaths but would prefer to do the right thing and will do so provided the costs are not too high. In other words, most people will not ruthlessly seek their own advantage at all cost but will sooner make some sacrifice, however small, in order to do the right thing. Claims such as these create space for something desperately needed in these times of growing eco-despair and -resignation: faith in the capacity of human beings to deal effectively with such enormous crises as the environmental one. Given this, it becomes imperative to ground, as an essential structure of self and subjectivity, that orientation towards living well which entails the truth of these claims.

20 For an example of a powerful manifestation of this, see http://dark-mountain.net/about/manifesto/. Admittedly, just how despairing the Dark Mountain Project really is remains unclear—this because it remains chronically unclear about just what it is rejecting: environmental or ecopolitics, no matter how radical, or merely the light-green panglossian and technocratic politics of government and business.
Conclusion

Claims that human ecology is multi-, inter-, trans-, and even adisciplinary are not just unclear, they are disconcerting. For if human ecology is all these things, and in particular the latter two, then how can it be anything coherent at all? Is it not rather, as its opponents in academia might allege, a mere hotchpotch of investigations into human–environment interactions which try to be both natural and social science without succeeding at either? Evidently, these worries and allegations presuppose that the notion of discipline has a fairly specific sense. In particular, the notion cannot be understood so broadly that any cognitive practice will count as a discipline since human ecology is obviously a cognitive practice, with its own conventions, congresses, journals, professional networks, and the like. What, then, is a discipline? Surely it is a cognitive practice with an inherently recursive character: a discipline possesses a stable body of agreed-upon results from which current practitioners can and must proceed as an accepted basis for further research, whereby they generate further agreed-upon results from which subsequent practitioners can and must proceed, who in turn generate further agreed-upon results ... and so on, ad infinitum.

No doubt all cognitive practices conventionally regarded as disciplines only approximate to this ideal. And no doubt some practices approach it better than others. Certainly, different types of discipline approach it in very different ways—for example, English literature as opposed to molecular biology. Human ecology, however, has surely not approached it very much at all. But if human ecology is inherently philosophical, both in the sense that in some phases of its activity it is philosophy and in the sense that it is directly reliant on a strictly philosophical account of self and subjectivity, then one should neither be surprised nor disturbed by this fact. For philosophy only is what it is, and does what it does, by resisting normalization as a recursively structured discipline. This obviously does not mean that it is not a genuinely cognitive practice with a crucial role to play in human culture and advancement. In fact, precisely in its non-normalisability, philosophy is that essential complement to disciplinarity without which the totality of cognitive practice would not be able to radically recast itself—precisely into new disciplines very different from existing ones. Seen in this light, human ecology becomes the distinctively philosophical appropriation of the results of whatever disciplines, techniques, and indeed pre-theoretical, everyday knowledge are needed for providing human society not just with the knowledge but also with the conceptual flexibility it needs in order to generate a creative practical response to the most serious crises human beings have ever confronted.
The task then becomes that of applying this conception of human ecology as philosophy to specific issues—centrally, of course, to the critical study of consumption but also to many other issues. One such further issue would be the critical study of production, that is, work and its potentially alienated forms in late modern capitalist society. Another would be the conceptual analysis of key concepts used in characterizing human–environment interactions, for example, the urban, the rural, the natural, and the wild, which could be deepened to include reflection on such fundamental ontological categories as those of biophysical limit, system, and causation. Of highly topical political relevance would be the analysis of the legitimacy and limits of growing social tendencies to eco-resignation, as illustrated by the Dark Mountain Project. Last but not least, there is the critical investigation of mainstream understandings of what problems of sustainability are and how to solve them—more bluntly put, of technocratic thinking. These all represent new and exciting issues for members of the human ecology community to work on into the future.

References


21 See footnote 20.


Use of Cultivated and Harvested Edible Plants by Caiçaras—What Can Ethnobotany Add to Food Security Discussions?

Mariana Giraldi
Federal University of Santa Catarina, Brazil

Natalia Hanazaki
Federal University of Santa Catarina, Brazil

Abstract

Human populations along the Brazilian coast have undergone transformations in their livelihoods and recent changes have affected local food security. Caiçaras, traditional inhabitants of the coastal Atlantic Forest, have experienced processes of urbanization, intensification of tourism, and nature conservation, which have influenced their relationships with biodiversity. Within this context, the objective of this research was to analyze livelihoods and food security of the Caiçaras based on a case study in southeastern Brazil, emphasizing the use of food plants that are cultivated and harvested within protected areas. Using an integrative approach of human ecology and ethnobotany, methods included free listing, 24-hour recall, and food storage analysis. The results indicate that food security requires a complementarity between food- and income-generating activities in the studied communities. From all food items consumed by the families interviewed, 8 to 12 percent were local plants; specifically, fruits and spices available in homegardens.

Keywords: Atlantic Forest, diet, human ecology, livelihoods, protected areas

Introduction

Historically, humans have established social and environmental relationships in order to conduct their ways of life. Such relationships have undergone changes, in part influenced by natural phenomena, as well as by human actions (Mahdi et al., 2009; Ramakrishnan, 2001). According to Ramakrishnan (2001), livelihoods in recent decades have been marked by intensified environmental impacts, such as pollution, ecosystem degradation, and loss of biodiversity. In certain
situations, the combination of these impacts, including political, economic, and cultural aspects, have led to extreme poverty and food insecurity (DFID, 1999; FAO, 2009; Hesselberg & Yaro, 2006).

Food security is defined as the access to secure, constant, and sufficient food for ingestion in the human diet (Maxwell & Smith, 1992). Proper nutrition is a human right and when this is not attained, the situation is marked by malnutrition and hunger (CONSEA, 2009). On a global scale, one billion individuals endured the margins of food security in 2009, primarily in developing countries (FAO, 2009). In the same year, around 30 percent of Brazilian households demonstrated some degree of food insecurity, with a higher proportion in rural areas (IBGE, 2010).

Due to its importance in ethical and economic terms, the issue of food security has been a recurrent discussion in many nations and part of political agreements (CONSEA, 2009; MDG, 2010; ONU, 2012). However, despite the efforts to guarantee food security for the future, FAO (2009) predicts difficulties that humans will experience by 2050. For example, production of food plant resources will be affected by climate change and availability of arable land, and water for irrigation will be scarce. In addition, there is the issue of deforestation and biodiversity loss (Ramakrishnan, 2001). Given this situation, FAO (2009) and the National Policy on Food and Nutritional Security in Brazil (CONSEA, 2009) recommend the intensification of family farming as a way to enhance local food sovereignty. Thus, the production of food plants in households (in small homegardens and crop fields), coupled with the harvesting of plants in forest remnants, is extremely important for food security (Kinupp & Barros, 2010; Pimentel et al., 1997; Valadão et al., 2006).

The investigation of livelihoods, including subsistence activities and eating patterns, helps to clarify risks, benefits, and trends for food security. In Brazil, investigations aimed at understanding the relationships between human populations and natural resources they use have been conducted, for example, along the southeastern coast. Caiçaras, mixed descendants of Amerindians, Europeans, and Africans, are among the inhabitants of this region, and are historically characterized by the practices of fishing activities, small-scale farming, hunting, and extraction of plant resources in the Atlantic Forest (Diegues, 2002). Recently, the southeastern coast has been undergoing an intense process of urbanization and intensification of tourism, contrasting with nature conservation policies. Together, these factors have led local people to increase their participation in commerce-related activities and even to migrate to urban centers (Adams, 2000). Reflecting on this scenario, new relationships have been established between the Caiçaras and natural resources, involving changes in food acquisition and eating habits (Hanazaki & Begossi, 2000, 2003; Hanazaki et al., 2009, 2013, 2007; MacCord & Begossi, 2006).
In the field of ethnobotany, Borges and Peixoto (2009), Cavechia et al. (2014), Hanazaki et al. (2000), Miranda and Hanazaki (2008), Peroni et al. (2008), and Rossato et al. (1999) have investigated the relationships between Caiçaras and plants. With the exception of Cavechia et al. (2014) and Peroni et al. (2008), who studied agrobiodiversity, other research consisted of general ethnobotanical surveys characterized by recording the richness of known and used plants, usually considering the categories medicinal, food, manufacturing, and ornamental. There is minimal research focused on the relationships between Caiçaras and their cultivated and harvested edible plants.

In identifying this gap, our study aimed to analyze livelihoods and food security in two Caiçara communities of Paraty, state of Rio de Janeiro, with a focus on the acquisition and consumption of local plants. We analyzed subsistence activities that generate food and money, and the richness of food plants cultivated and harvested, as well as the habitats where they were obtained. Furthermore, we verified the proportion of local plant resources within families’ diets, contrasting the diet composition between summer and winter.

**Methods**

**Study area**

The municipality of Paraty, located on the coast of Rio de Janeiro, southeastern Brazil, has an area of 925 square kilometers and a population of 37,533, of which 26 percent lives in rural areas (IBGE, 2011). Founded in the mid-sixteenth century, Paraty was characterized by fishing activities and small-scale agriculture, but the past three decades have been marked by tourism and urban development (Adams, 2000; Diegues, 2002). In addition to the urban areas, the city has five protected areas in its territory (Mosaico Bocaina, 2011). Such strategies have contributed to the protection of biological diversity in fragments of the Atlantic Forest, a heavily exploited biome whose remnants represent between 7.91 percent (SOS Mata Atlântica, 2009) and 16 percent (Ribeiro et al., 2009) of the original cover. The establishment of protected areas brought restrictions to land use and occupation by Caiçaras residing within them, who partly depend on natural resources for subsistence. Among the Caiçara communities that fall into this situation are Ponta Negra and Araújo Island, which are the focus of this study.

Ponta Negra (23°20’50” S and 44°36’25” W) is located within two juxtaposed protected areas: the Environmental Protection Area of Cairuçu (Decree No. 89.242 of December 27, 1983) and Juatinga Ecological Reserve (State Law No. 89.242, de 27 de dezembro de 1983. Retrieved from http://www.icmbio.gov.br/brasil/RJ/area-de-protecao-ambiental-de-cairucu/downloads/decreto-no-89–242-de-27-de-dezembro-de-1983.)
1859 of October 1, 1991). The latter is more restrictive and its categorization in the Brazilian system of protected areas is currently under discussion. Access to the village is possible by land and sea. The distance from the center of Paraty to the neighborhood of Laranjeiras is 35 kilometers by road, from where one can take trails through the woods (2–3 hour walk) or small motorboats (20–30 minutes) towards Ponta Negra. Sea transport costs about US$8 (about R$15 in April 2012) per trip. Ponta Negra inhabitants and visitors must embark through a private condominium located between the street and the seafront, which implies some restrictions. The community consists of approximately 48 households, and families generally buy food in the center of Paraty on a monthly basis. At the same time they complement their diet with local resources. Ponta Negra is in the midst of very dense vegetation, with some crop fields and functioning cassava flour mills. There is no public lighting system, sewage system, or water treatment.

Araújo Island (23°09’38” S and 44°41’41” W) is also located within the Cairuçu Environmental Protection Area; however, vegetation density and the presence of crop fields are less prominent than in Ponta Negra. It is 11 kilometers by road from the center of Paraty to the community of Praia Grande, from which one must travel by boat to the island (5–10 minutes). The cost of the shuttle is about US$0.8 per trip, favoring daily transportation. The community consists of about 118 households, with no sewage system or water treatment. Unlike Ponta Negra, Araújo Island has public lighting and a small market, which facilitates the purchase and storage of food.

Both communities have elementary schools from 1st to 4th grades, community association groups, and government healthcare services.

The choice of Paraty as a study site was due to its inclusion in the project “Community-based resource management and food security in coastal Brazil,” a research partnership between universities in Brazil and Canada. The project proposal, under a human ecology focus, was to investigate changes in livelihoods in coastal southeastern Brazil and discuss the Caiçara food security. Contributing to this theme, and from an ethnobotanical perspective, we selected the two communities based on the following criteria: difficult access to the urban center of Paraty; a high number of fishermen in the community; and representativeness of edible plants in crop fields, woodlands, and homegardens (this latter based on Hanazaki et al. 2013).

Data collection

Due to the fact that this research⁴ was included within a larger project, some steps were completed in collaboration with other researchers. In January 2010 a diagnostic trip was made to Paraty and in June–July 2010 a collective effort was made to obtain socioeconomic data from participating communities (see Hanazaki et al., 2013). The number of households visited followed a sampling error of 10 percent of the total number of households estimated (Barbetta, 2002). The sampling was probabilistic, in which homes were visited by areas, aimed at a more heterogeneous sample (Albuquerque, Lucena, & Alencar, 2010; Dufour & Teufel, 1995). The Laboratory of Human Ecology and Ethnobotany at the Federal University of Santa Catarina made available socioeconomic information for Ponta Negra and Araújo Island.

We used semi-structured interviews to collect ethnobotanical data, including free listing, 24-hour recall, and food storage analysis, (Albuquerque, Lucena, & Neto, 2010; Dufour & Teufel, 1995), and to obtain additional socioeconomic information about family income and food expenditure in the month prior to the visit. Following Murrieta et al. (1999), family unit was seen as the spatial domain of the residence and its current occupants. It is worth noting that, whenever possible, informants were the chief or head of the household, also allowing the participation of other household members.

The informants were asked to free list local names of known edible plants, and then to indicate which of them were consumed in the residence during the past year. Furthermore, respondents indicated the sites where plants mentioned were obtained. Food consumed in the last 24 hours by members of the family unit was accessed through the 24-hour recall method. Food storage analysis allowed for the recording of food present in the residence at the time of the visits. The 24-hour recall and food storage analysis were conducted in February and July 2011 to verify and compare diet composition. Questions related to income and monthly expenditure on food were also repeated. February represented summer, which is the high season for tourism and intense fishing activity. July represented winter, which is a low season for tourism and little fishing activity (Hanazaki & Begossi, 2000).

Plants recorded in the free lists were photographed and collected during guided tours with key informants in crop fields, homegardens, trails, and woodlands (Albuquerque, Lucena, & Neto, 2010). We identified the cited plants in situ.

---

⁴ This study was approved by the Brazilian National Ethics Committee for Research (authorization FR-391341). Free and informed consent was obtained with all visited households, according to Resolution CNS 196/96 (Brasil, 2002). Additionally, since both communities are inside a federal protected area, the collection and transfer of plant materials were authorized by the Chico Mendes Institute for Biodiversity Conservation (authorization number 26930–1).
and ex situ with the aid of botanical literature (Lorenzi, 2010; Lorenzi et al., 2006; Reis, 2006) and consulting specialists. The taxonomy followed the APG II system (Lorenzi & Souza, 2008) and scientific nomenclature was verified by querying the TROPICOS online database. Herbarium specimens were incorporated into the Dárdano de Andrade Lima Herbarium at the Agronomic Institute of Pernambuco (vouchers 86608 to 86618), and into the Vasconcelos Sobrinho Herbarium at the Federal Rural University of Pernambuco (vouchers 50914 to 50925).

Data analysis

Heterogeneity of the sample according to different socioeconomic profiles was verified through a cluster analysis by unweighted pair group method with arithmetic mean using simple matching similarity coefficient (Valentin, 2000) and the software MVSP 3.1 (Kovach, 2005). We used the following variables (obtained from the socioeconomic databases): number of individuals per household, presence of fishermen and/or farmers in the household, food shortages in the past year, and perceptions of diet quality and quality of life (details in Hanazaki et al., 2013).

Activities related to food and income generation were recorded for frequency of citations, per family and per individual, respectively. Data on the number of persons per household, age group, monthly income, and amount spent on food were analyzed by descriptive statistics, taking average values for normal samples and the median for non-normal samples (Vieira, 1991). Normality (p > 0.05) was verified through the Shapiro-Wilk and Lilliefors tests, using the software BioEstat 5.0 (Ayres et al., 2007).

Food plants mentioned in the free lists were analyzed for richness (Peroni et al., 2010), where the local names, in a proposed emic classification, considered responses at the folk generic (e.g., banana) and the folk specific (e.g., banana-prata) levels (Mourão & Montenegro, 2006). Descriptive statistics were also used to determine the most-cited plants. Initially, local names were tabulated per community, separately considering categories of “knowledge” and “use in the past year.” For the samples that did not have a normal distribution of citations the median was used as a central point (Vieira, 1991). Food plants were considered the most frequent when they were located above the third quartile (representing the 25 percent most cited in both categories and in both communities). For sites where plants mentioned were obtained, analysis was done considering the frequency of the habitat indicated by informants.

5 http://www.tropicos.org/.
From the 24-hour recall information it was possible to account for the contribution of edible plants in the *Caçara* diet, as well as the frequency of citations. In addition, the proportion of “fruits,” “spices,” “roots and tubers,” “vegetables” and “others” in the diet of the families studied was verified. The group “others” included stems, seeds, and palm hearts.

A chi-square test ($\chi^2$) was done using the software BioEstat 5.0 (Ayres et al., 2007) in order to identify significant differences ($p \leq 0.05$) (Albuquerque, Medeiros, & Almeida, 2010) in diet composition between summer and winter. To evaluate these differences only households visited in both seasons were considered. Researchers grouped food items registered in the 24-hour recall and food storage analysis into “purchased food,” “local food of animal origin,” and “local food of plant origin.”

**Results**

We visited 21 homes in Ponta Negra and 43 in Araújo Island in February and revisited 16 and 40 homes in July, respectively. This research could not be conducted for all intended households due to six refusals, seven families absent at the time of visits, and four canceled interviews. The sample comprised two socioeconomic profiles in each community (groups A, B, C, and D) (Table 1), indicating the existence of distinct intrapopulation profiles.

**Table 1. Study design and stratification of the samples in Ponta Negra and Araújo Island, Paraty, Brazil**

<table>
<thead>
<tr>
<th>Community</th>
<th>Ponta Negra</th>
<th>Araújo Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated number of family units in the community</td>
<td>48</td>
<td>118</td>
</tr>
<tr>
<td>Number of family units in the databases</td>
<td>32*</td>
<td>54**</td>
</tr>
<tr>
<td>Sample stratification</td>
<td>A, B, C, D</td>
<td></td>
</tr>
<tr>
<td>Number of family units visited per grouping</td>
<td>7, 14, 11, 32</td>
<td></td>
</tr>
<tr>
<td>Number of family units revisited per grouping</td>
<td>4, 12, 11, 29</td>
<td></td>
</tr>
</tbody>
</table>

* Three interviews were excluded because they represented the same family unit.

** One interview was excluded at the request of the informant.

The population sampled in Ponta Negra corresponded to 94 individuals (43 females and 51 males) in 21 households. The age of subjects ($n = 90$) ranged from 6 months to 77 years old, with the median from age 9 to 39 years. Each household had on average 4.5 people, ranging from 1 to 10. Median monthly household income was US$319 in the summer ($n = 19$) and US$387 in the winter ($n = 12$). Median monthly expenditure on food was US$186 in the summer ($n = 17$) and US$228 in the winter ($n = 14$). Accordingly, about 58 percent of monthly income was directed to the purchase of food items in both seasons. All
households reported fishing practices and homegardening as food-generating activities (Figure 1). Extraction of plant resources (81 percent), agriculture (47 percent), and foraging of marine animals in the coastal zone (43 percent) were also noted as important sources of energy and nutrients. Hunting (33 percent) and livestock (28 percent) were less important.

At Araújo Island, the studied population comprised 162 individuals (83 females and 79 males) in 43 households. Their ages ranged from one month to 83 years old, with a median age between 14 and 51 years (n = 159). The average household was composed of four people, with the median between one and nine. Median monthly family income was US$542 in the summer (n = 35) and US$577 in the winter (n = 34). Median expenditure on food was US$346 in the summer (n = 36) and US$287 in the winter (n = 33). Around 64 percent and 50 percent of monthly income was spent on the purchase of foods in summer and winter, respectively. Similarly to Ponta Negra, fishing and homegardening were the predominant food-generating practices (Figure 1). Extraction of plant resources (60 percent) and foraging of marine animals on shore (53 percent) were also mentioned, and to a lesser extent livestock (25 percent), hunting (14 percent), and agriculture (11 percent).

![Figure 1. Activities related to local food production according to the households interviewed at Ponta Negra (n = 21) and Araújo Island (n = 43), Paraty, Brazil](image-url)
Cultivated and harvested edible plants

Altogether, 134 names of food plants cultivated and harvested were mentioned. Thirty of those were exclusive to Ponta Negra, while 27 were exclusive to Araújo Island. Seventy-seven were mentioned in both communities. Thus, the shared botanical knowledge on food plants corresponded to about half of all citations (57.5 percent).

The most-cited plants shared by both communities are listed in Table 2 and those exclusive to each community are listed in Table 3.

Table 2. Number of edible plants most cited at Ponta Negra and Araújo Island in Paraty, Brazil (percentage frequency of citations in parentheses)

<table>
<thead>
<tr>
<th>Family</th>
<th>Scientific name</th>
<th>Local name (English name)</th>
<th>Ponta Negra</th>
<th>Araújo Island</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Known</td>
<td>Used in the past year</td>
</tr>
<tr>
<td>Apiaceae</td>
<td><em>Eryngium foetidum</em> L.</td>
<td>Coentro (Coriander)</td>
<td>18 (85)</td>
<td>18 (85)</td>
</tr>
<tr>
<td>Araceae</td>
<td><em>Xanthosoma sagittifolium</em> (L.) Schott</td>
<td>Taioba (Taro)</td>
<td>8 (38)</td>
<td>8 (38)</td>
</tr>
<tr>
<td>Arecales</td>
<td><em>Cocos nucifera</em> L.</td>
<td>Coco-da-Bahia (Coconut)</td>
<td>9 (42)</td>
<td>8 (38)</td>
</tr>
<tr>
<td>Caricaceae</td>
<td><em>Carica papaya</em> L.</td>
<td>Mamão (Papaya)</td>
<td>8 (38)</td>
<td>8 (38)</td>
</tr>
<tr>
<td>Euphorbiaceae</td>
<td><em>Manihot esculenta</em> Crantz</td>
<td>Aipim (Cassava)</td>
<td>16 (76)</td>
<td>16 (76)</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td><em>Ocimum americanum</em> L. / O. campechianum Mill.</td>
<td>Alfavaca (Basil)</td>
<td>10 (47)</td>
<td>10 (47)</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td><em>Ocimum basilicum</em> L.</td>
<td>Manjeriço (Basil)</td>
<td>14 (66)</td>
<td>13 (61)</td>
</tr>
<tr>
<td>Lauraceae</td>
<td><em>Persea americana</em> Mill.</td>
<td>Abacate (Avocado)</td>
<td>15 (71)</td>
<td>12 (57)</td>
</tr>
<tr>
<td>Moraceae</td>
<td><em>Artocarpus heterophyllus</em> Lam.</td>
<td>Jaca (Jackfruit)</td>
<td>19 (90)</td>
<td>19 (90)</td>
</tr>
<tr>
<td>Musaceae</td>
<td><em>Musa</em> Section <em>Musa</em></td>
<td>Banana-nanica (Banana)</td>
<td>13 (61)</td>
<td>13 (61)</td>
</tr>
<tr>
<td>Musaceae</td>
<td><em>Musa</em> Section <em>Musa</em></td>
<td>Banana-prata (Banana)</td>
<td>12 (57)</td>
<td>12 (57)</td>
</tr>
<tr>
<td>Myrtaceae</td>
<td><em>Psidium guajava</em> L.</td>
<td>Goiaba (Guava)</td>
<td>15 (71)</td>
<td>15 (71)</td>
</tr>
</tbody>
</table>
Other plants cited in both communities: Allium fistulosum L. (cebolinha); Anacardium occidentale L. (caju); Ananas comosus L. (Merr.) (abacaxi); Annona glabra L. [Rollinia mucosa (Jaccq.) Baill. (condessa); Attalea humilis Mart. (coco-pindoba); Artocarpus altilis (Parkinson) Fosberg (fruta-pão); Averrhoa carambola L. (arambola); Bixa orellana L. (urucum); Citrus aurantiifolia (Christm.) Swingle (laranja-lima); Citrus aurantium L. (laranja-pocan); Citrus sp1. (laranja-da-china); Citrus spp. (laranja); Coffea arabica L. (café); Colocasia esculenta (L.) Schott (inhame); Cucumis sativus L. (pepino); Cucurbita moschata Duchesne (abóbora-redonda); Cucurbita pepo L. (abóbora); Cucurbita sp1. (abóbora-comprida); Dioscorea alata L. (ará); Eriobotrya japonica (Thunb.) Lindl. (ameixa-amarela); Eugenia cf. brasiliensis Lam. (grumixama); Eugenia uniflora L. (pitanga); Euterpe edulis Mart. (palmito); Inga cf. ingoides (Rich.) Willd.) (ingá); Ipomoea batatas (L.) Lam. (batata-doce); Lactuca sativa L. (alface); Laurus nobilis L. (louro); Malpighia emarginata DC. (acerola); Mangifera indica L. (manga); Manihot esculenta Crantz (mandioca); Morus nigra L. (amora); Musa Seccion Musa (banana-da-terra, banana-maçã, banana-ouro, banana-preta and banana-São-Tomé); Musa spp. (banana); Myrciaria sp. (jabuticaba); Passiflora sp. (maracujá-do-mato); Petroselinum crispum (Mill.) Fuss (salada); Phaseolus vulgaris L. (feijão-preto); Plectranthus cf. amboinicus (Lour.) Spreng. (hortelã-de-galinha); Plinia edulis (Vell.) Sobral (cambucá); Psidium cattleianum Sabine (araçá); Saccharum officinarum L. (canã, cana-caiana, cana-preta and cana-sapo); Sechium edule (Jacq.) Sw. (chuchu); Solanum lycopersicum L. (tomate); Solanum tuberosum L. (batata-branca); Syzygium jambos Duthie (jambo-branco); Syzygium malaccense (L.) Merr. & L.M. Perry (jambo-vermelho); Theobroma cacao L. (cacaou) undetermined (melão) and Zea mays L. (milho).

Table 3. Edible plants mentioned in only one of the communities—Ponta Negra or Araújo Island, Paraty, Brazil

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Ponta Negra</th>
<th>Araújo Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abuta sp.</td>
<td>Abuta</td>
<td>Abelmoschus esculentus (L.) Moench</td>
</tr>
<tr>
<td>Astrocaryum aculeatissimum (Schott) Burret</td>
<td>Coco-preto</td>
<td>Allium cepa L.</td>
</tr>
<tr>
<td>cf. Attalea dubia (Mart.) Burret</td>
<td>Coco-indaiá</td>
<td>Annona muricata L.</td>
</tr>
<tr>
<td>cf. Syagrus pseudococos (Raddi) Glassman</td>
<td>Coco-pati</td>
<td>Capsicum baccatum L.</td>
</tr>
<tr>
<td>Brassica oleracea L.</td>
<td>Repolho</td>
<td>Capsicum chinense Jacq.</td>
</tr>
</tbody>
</table>

60
<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Local name</th>
<th>Scientific name</th>
<th>Local name</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Cajanus cajan</em> (L.) Huth</td>
<td>Feijão-guandu</td>
<td><em>Capsicum</em> sp.</td>
<td>Pimenta-pomaria</td>
</tr>
<tr>
<td><em>Chorisia cf. speciosa</em> A. St-Hil.</td>
<td>Paina</td>
<td><em>Citrus latifolia</em> (Tanaka ex Yu. Tanaka)</td>
<td>Limão-legítimo</td>
</tr>
<tr>
<td><em>Cordia superba</em> Cham.</td>
<td>Baba-de-boi</td>
<td><em>Citrus</em> sp2</td>
<td>Laranja-da-terra</td>
</tr>
<tr>
<td><em>Coriandrum sativum</em> L.</td>
<td>Coentrosalsa</td>
<td><em>Daucus carota</em> L.</td>
<td>Cenoura</td>
</tr>
<tr>
<td><em>Cymbopogon citratus</em> (DC.) Stapf</td>
<td>Erva-cidreira</td>
<td><em>Mentha</em> sp.</td>
<td>Hortelã</td>
</tr>
<tr>
<td><em>Dioscorea</em> sp1</td>
<td>Cará-branco</td>
<td><em>Miconia albicans</em> (Sw.) Steud.</td>
<td>Pixirica 1</td>
</tr>
<tr>
<td><em>Dioscorea</em> sp2</td>
<td>Cará-coco</td>
<td><em>Miconia prasina</em> (Sw.) DC.</td>
<td>Pixirica 2</td>
</tr>
<tr>
<td><em>Dioscorea</em> sp3</td>
<td>Cará-roxo</td>
<td><em>Musa</em> sp11</td>
<td>Banana-São-José</td>
</tr>
<tr>
<td><em>Eruca sativa</em> Mill.</td>
<td>Rúcula</td>
<td>Non identified 4</td>
<td>Agrião</td>
</tr>
<tr>
<td><em>Garcinia gardneriana</em> (Planch. &amp; Triana) Zappi</td>
<td>Bacupari</td>
<td>Non identified 5</td>
<td>Orvalho</td>
</tr>
<tr>
<td><em>Musa</em> sp1</td>
<td>Banana-cravo</td>
<td><em>Pouteria caimito</em> (Ruiz &amp; Pav.) Radlk.</td>
<td>Abiu</td>
</tr>
<tr>
<td><em>Musa</em> sp5</td>
<td>Banana-nanicona</td>
<td><em>Saccharum</em> sp1</td>
<td>Cana-amarela</td>
</tr>
<tr>
<td><em>Musa</em> sp8</td>
<td>Banana-prata-veaca</td>
<td><em>Saccharum</em> sp4</td>
<td>Cana-cinza</td>
</tr>
<tr>
<td><em>Musa</em> sp10</td>
<td>Banana-sacriviaca</td>
<td><em>Saccharum</em> sp5</td>
<td>Cana-listrada</td>
</tr>
<tr>
<td>Non identified 1</td>
<td>Maminha-de-sapo</td>
<td><em>Saccharum</em> sp6</td>
<td>Cana-paca</td>
</tr>
<tr>
<td>Non identified 2</td>
<td>Mandacaru</td>
<td><em>Saccharum</em> sp8</td>
<td>Cana-rosa</td>
</tr>
<tr>
<td>Non identified 3</td>
<td>Maria-peidorreira</td>
<td><em>Saccharum</em> sp9</td>
<td>Cana-roxa</td>
</tr>
<tr>
<td><em>Pausandra morisiana</em> (Casar.) Radlk.</td>
<td>Baquá</td>
<td><em>Solanum gilo</em> Raddi</td>
<td>Jiló</td>
</tr>
<tr>
<td><em>Phaseolus cf. lanatus</em> Benth.</td>
<td>Feijão-magalô</td>
<td><em>Syagrus romanzoffiana</em> (Cham.) Glassman</td>
<td>Coquinho</td>
</tr>
<tr>
<td><em>Psidium guineense</em> Sw.</td>
<td>Araçá-goiaba</td>
<td><em>Vigna</em> sp.</td>
<td>Feijão-de-corda</td>
</tr>
<tr>
<td><em>Saccharum</em> sp2</td>
<td>Cana-sete-metros</td>
<td><em>Zingiber officinale</em> Roscoe</td>
<td>Gengibre</td>
</tr>
<tr>
<td><em>Solanum melongena</em> L.</td>
<td>Berinjela</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Spondias purpurea</em> L.</td>
<td>Ciriguela</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Virola bicuhyba</em> (Schott ex Spreng.) Warb</td>
<td>Bacúbixaba</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Regarding the plants cited in only one community (Table 3), we noticed that there were several species from the forest in Ponta Negra, such as the palms coco-indaiá (cf. *Attalea dubia*), coco-natal (cf. *Bactris vulgaris*), coco-pati (cf. *Syagrus pseudococos*) and coco-preto (*Astrocaryum aculeatissimum*). In Araújo Island, plants used for flavorings, such as mint (*Mentha* sp.), ginger (*Zingiber officinale*), chili pepper (*Capsicum baccatum*), cayenne pepper (*Capsicum* sp.) and red pepper (*Capsicum chinense*), were more prominent.

Homegardens were the main habitats where food plants were obtained (Figure 2), and were cited by 51 percent of Ponta Negra households and 65 percent in Araújo Island. Agriculture was an important source of food plants for Ponta Negra households, but not for those in Araújo Island. Neighbors provided 13 percent of food plants for households in Araújo Island, but were less important in Ponta Negra. Comparing Figures 1 and 2 we noticed that extractive activity was overestimated by the respondents when asked about this practice without detailing its frequency.

![Figure 2. Cultivation and harvesting places for edible plants at Ponta Negra (n = 21 households) and Araújo Island (n = 43 households), Paraty, Brazil](image)

Note: Trails correspond to the paths that connect homes. Acquisition of food plants from neighbors refers to plants located in their crop fields and homegardens.

Food items consumed in households resulted in 486 citations in Ponta Negra and 1,195 citations in Araújo Island, using the 24-hour recall methodology. In 82 percent of Ponta Negra reports, foods were purchased and the rest were locally obtained (both animals and plants). In Araújo Island, the percentage of purchased items was similar (88 percent). The contribution of local food plants in the Caiçara diet was approximately 12 percent of the total citations in Ponta Negra and 8 percent in Araújo Island, and corresponded mainly to fruits and spices (Figure 3).
Contrasts between seasons

There were no significant differences in households’ diets between summer and winter, taking into account food eaten in the 24 hours before interview and items present in households’ food storage (Table 4). For Ponta Negra there were no differences between seasons for purchased food items ($\chi^2 = 0.243; p = 0.666; df = 1$), local items of animal origin ($\chi^2 = 0.762; p = 0.5606; df = 1$), and local items of plant origin ($\chi^2 = 3.086; p = 0.1184; df = 1$). For Araújo Island there was a marginal difference for local food of animal origin ($\chi^2 = 3.429; p = 0.0956; df = 1$), but not for purchased food ($\chi^2 = 0.953; p = 0.3471; df = 1$), and local food of plant origin ($\chi^2 = 1.8; p = 0.2272; df = 1$).

Table 4. Food citations of households interviewed in Ponta Negra (n = 16) and Araújo Island (n = 40), Paraty, Brazil (considering the 24-hour recall and food storage analysis during summer and winter)

<table>
<thead>
<tr>
<th></th>
<th>Ponta Negra</th>
<th>Araújo Island</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Summer</td>
<td>Winter</td>
</tr>
<tr>
<td>Purchased food</td>
<td>254</td>
<td>271</td>
</tr>
<tr>
<td>Local food (animals)</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>Local food (plants)</td>
<td>36</td>
<td>17</td>
</tr>
</tbody>
</table>

Although there were no significant differences, during winter the income in Ponta Negra is higher, and the amount of money spent on food and the proportion of purchased items is also higher. In Araújo Island, income hardly differed
between the seasons and expenses for food and the record of items purchased were both highest in the summer. This indicates only slight differences in the households’ economic behavior between summer and winter.

For both animal and plant foods of local origin there was a reduction in the number of citations in winter. Grouping different food resources in the analysis (e.g., fruits, roots, and tubers) may have been the reason why changes were not significant. Field notes and informal conversations with residents of both communities indicate a higher consumption of fruits in summer, and of roots and tubers during winter.

**Discussion**

The livelihoods of *Caiçara* populations in Ponta Negra and Araújo Island are marked by complementarity between activities that generate food and monetary resources. Studied households show some dependence on natural resources for their subsistence, as well as the importance of income-generating activities. Some authors (see Hesselberg & Yaro, 2006; Pollock, 1975) recommend the most appropriate strategy to minimize human vulnerabilities to food insecurity is to combine activities that generate income and food resources. Pollock (1975) examined strategies for food acquisition on the Marshall Islands, Pacific Ocean, which had been under environmental, political, and economic pressures, and concluded that the purchase of food coupled with its acquisition directly from the environment provided the best combination to ensure adequate nutrition. In a study in rural Ghana, Hesselberg & Yaro (2006) also concluded that the diversification of subsistence activities made contributions to local food security.

Hanazaki et al. (2013) evaluated the diversity of subsistence activities in 350 households within seven *Caiçara* communities in the municipality of Paraty, including Ponta Negra and Araújo Island, and found that the greater the diversification of activities, the greater the flexibility the families had in dealing with economic and environmental crises. This consequently improved the chances of creating a framework for food security. Depending on the kinds of activities performed by households, communities could be generalists or specialists, the latter being more susceptible to food insecurity. Ponta Negra was considered a generalist community by presenting a diverse range of subsistence activities (mainly food-generating practices), while Araújo Island was classified as a specialist community, with a concentration of paid activities focused on fishing (Hanazaki et al., 2013). However, it appears that food security, in terms of access to store-bought food, poses advantages for the Araújo Island community. Percentages of self-employment and salaried jobs, as well as government aid, were similar between Ponta Negra and Araújo Island. Nevertheless, the monthly income generated in Araújo Island was higher than in Ponta Negra. Greater
chances of employment and better-paying jobs for Araújo Island residents are possibly related to easier access to the urban center of Paraty. In two Caiçara communities in the southern coast of São Paulo, the monthly income was higher where there were more paid job opportunities (Hanazaki et al., 2007).

Despite financial advantages of one community over the other, in general, there are economic difficulties in both locations. Considering that a food basket (consisting of food with a calculated daily energy requirement of 1,200 kilocalories per person) in the state of Rio de Janeiro between February and July 2011 cost about US$133 per month (DIEESE, 2012), the income of the studied families (consisting of about four members) is not conducive to food security. Additionally, about a quarter of the family income comes from government support. This further emphasizes the importance of using natural resources.

With respect to unpaid work, Ponta Negra households showed a closer relationship with the use of flora and fauna than in Araújo Island, probably due to a greater degree of geographic isolation. Reyes-García et al. (2005) showed that human groups inhabiting remote areas, as opposed to urban centers, are more dependent on natural resources. If food security is understood in terms of diversification of unpaid work and thus local access to food resources, the families of Ponta Negra, at first glance, are in a better situation than the families of Araújo Island. However, a more realistic picture of local food security should jointly consider information on the role of subsistence activities, both paid and unpaid. From this point of view, both communities have advantages and disadvantages. In the case of Ponta Negra, since monetary resources were scarcer, the use of biodiversity resources gains an even more important role in minimizing vulnerability to food insecurity.

Another important aspect related to food access refers to social relations among neighbors and relatives. In some cases, households rely on their neighbors and relatives to obtain food plants. Cavechia et al. (2014) mapped social networks related to the donation and purchase of bitter and sweet manioc varieties among small farmers from Paraty and Imbituba (south Brazil), showing exchange practices between farmers within the community and with neighboring communities, and concluded that these social networks also contribute to the conservation of agrobiodiversity. Similarly, it can be said that the social relationships and networks occurring in Ponta Negra and Araújo Island benefit their food safety.

Food security or vulnerability are expected to affect the members of a given community in different ways (Dufour & Teufel, 1995). For example, Hesselberg & Yaro (2006) identified intrapopulation variations in rural populations in northern Ghana and categorized families by the degree of vulnerability to food insecurity using criteria such as per capita income and the number of meals
during periods of food scarcity. In the studied Caiçara communities, there was intrapopulation variation on the socioeconomic profile of households in both sites, implying that food security is not reflected equally in all households visited.

Factors such as easy access to urban centers (Reyes-García et al., 2005), modernization (Furusawa, 2009), migration of human populations (Nguyen, 2003), and availability of natural resources (Ladio & Lozada, 2004) influence local botanical knowledge. The proportion of edible plants known in Ponta Negra (both in absolute numbers and as a function of the number of interviews) was higher than that in Araújo Island, a result that can be related to the fact that Ponta Negra has a greater availability of natural environmental resources.

Borges and Peixoto (2009) conducted an ethnobotanical survey in a community near Ponta Negra, also located within the Juatinga Ecological Reserve, and found that 56.4 percent of the total citations of known plants were from the forest. According to Pimentel et al. (1997), forests are an important source of food and income generation for humans who live within or near these areas. The consumption of wild plants contributes to the diversification of diet, since species rarely marketed are incorporated into the menu of local people and can make valuable nutritional contributions (Della et al., 2006; Kinupp & Barros, 2010). Citation frequency for wild plants was lower on Araújo Island, and was found to be mainly in anthropic areas such as trails and homegardens.

Additionally, family farming is disappearing with greater intensity on Araújo Island, and some research has indicated that this practice is gradually disappearing in Caiçara livelihoods at large (Adams, 2000; Borges & Peixoto, 2009; Hanazaki et al., 2007). Crop field plants reported in Ponta Negra and Araújo Island, such as manioc varieties, have been mentioned in other studies as important caloric sources (Borges & Peixoto, 2009; Hanazaki et al., 2007, 2000; Miranda & Hanazaki, 2008; Peroni et al., 2008; Rossato et al., 1999). Other plants cultivated in crop fields that are also important sources of carbohydrates for families at Ponta Negra and Araújo Island were sweet potato, taro, yam, and potato varieties. Furthermore, these roots and tubers have the advantage of being stored in the soil for long periods of time and consumed in situations of economic difficulties.

Homegardens play an important role in providing plant foods. These habitats are widely recognized as havens for the conservation of biological diversity, as well as food stocks especially important in times of food insecurity (Buchmann, 2009; Valadão et al., 2006). Homegardens are very versatile and can even persist under urbanization processes (Gandolfo et al., 2010). Given the changes in livelihoods of the Caiçaras, homegardens seem to be the areas of food production more suited to this new reality. In Araújo Island, the importance of homegardens
seems to be greater than in Ponta Negra, since plant extraction and agriculture no longer contribute as much to the local livelihoods. Overall, the richness found in Caiçara homegardens and in other regions of Brazil (see Gandolfo et al., 2010; Valadão et al., 2006) is characterized by the presence of fruit trees, vegetables, and seasonings, such as oranges, lemons, guava, passion fruit, avocado, papaya, chayote, squash, basil, and peppers. Homegardens at Araújo Island had higher numbers for spice citations than Ponta Negra, perhaps due to smaller gardens, where growing small plants is a priority or the only possibility.

Changes in the ways of obtaining food items have implications for Caiçara consumption patterns (MacCord & Begossi, 2006). Results regarding the food intake of families in Ponta Negra and Araújo Island show that diet depends in large part on income-generating activities, since most items consumed were purchased. In the Amazon, Silva & Begossi (2009) considered that in the past 30 years the decline of traditional subsistence activities and the expansion of urban areas were important changes affecting local diets. They compared the diet between urban and rural areas and found that the consumption of purchased food was higher in urban (65) than in rural areas (31), showing that where there is greater diversity of practices aimed at plant extraction and domestic food production, a higher proportion of natural resources are incorporated in the diet (Silva & Begossi, 2009).

The most-consumed local plants by Caiçara households were fruits. According to the Brazilian food pyramid proposed by Philippi et al. (1999), in a daily diet intake of 1,600 kilocalories the proportion of fruit should be 15.7 percent of the total food consumed. Apparently only a small fraction of the Caiçara diet consisted of locally obtained fruits. However, these results may have been underestimated by the limitations of the 24-hour recall approach. Recording wild and cultivated fruits by this method is complex, influenced by the forgetfulness of informants, fruiting period, preferences, and taboos (Dufour & Teufel, 1995; Hanazaki & Begossi, 2003).

Finally, critical periods of food insecurity were not identified in this research. As noted by Hanazaki and Begossi (2000) in a Caiçara community in São Paulo, as tourism activities increased during summer, monthly income also increased. Additionally, intensification of fishing activities tends to increase the income for fishermen’s families. On this basis, it was expected that the monthly income of families in Ponta Negra and Araújo Island would be higher in summer and lower in winter. However, changes were minimal, leading to the conclusion that variations in food intake at Ponta Negra and Araújo Island between the two seasons seem to be related to the availability of certain environmental resources and not to economic fluctuations.
The results of this study contribute to deepen the discussions related to food security and dependence of food resources locally obtained, especially in rural communities facing changes in their livelihoods. Acquisition and consumption of local edible plants by Caiçara families studied is a way to reduce vulnerability to food insecurity. Without the possibility of harvesting and growing plants, food security of the Caiçara would be related to the purchase of food items, and our research shows that it would not be possible for these communities to obtain an adequate diet based only on self-employment, paid jobs, and government aid. Also, the effects of seasonality in the production of local food items may become confounded with seasonal effects on income from sources such as tourism and other livelihood activities less related to natural resources. Furthermore, food-generating activities enhance food sovereignty, and contribute to biodiversity conservation and the maintenance of cultural aspects of Caiçara livelihoods.

Acknowldgments

We thank the participants in the study for their responses and for making this research possible. Thanks to N. P. Lunelli, L. A. Cavechia, and A. L. A. A. Assis for helping during fieldwork; to those who assisted in plant identification (A. B. Junqueira, C. P. Simionato, J. F. A. Baumgratz, L. Z. O. Campos, M. L. Del Rei Souza, M. O. O. Cano, N. Peroni, R. C. Martins, R. M. Begnini, and R. L. Barbieri); to CNPq for masters scholarship granted to M. Giraldi and research productivity grant awarded to N. Hanazaki; to the UFRPE Graduate Program in Botany for helping with fieldwork costs; to the International Development Research Center for the funding of the Community-Based Resource Management and Food Security in Coastal Brazil project; and to the Applied Ethnobotany Laboratory (UFRPE) and the Human Ecology and Ethnobotany Laboratory (UFSC) for institutional support. This paper is contribution number 14 supported by CAPES/PNADB through the project Knowledge, Use and Conservation of Plant Biodiversity in Atlantic Forest and Caatinga (UFSC/UFRPE/UFRGS).

References


Use of Cultivated and Harvested Edible Plants by Caïcara


Community-Based Water Systems: Preserving Livelihood, Ecology, and Community

David S. Henkel
Professor Emeritus of Planning
University of New Mexico, United States

Abstract

In the high desert region of the southwestern United States, historical Spanish colonial and native Pueblo settlements long relied upon community-based water collection and distribution systems for irrigation and domestic use.

This paper adopts a community-based planning approach to examine the ways in which the community water and irrigation systems—the acequias—today contribute to the maintenance of the cultural landscape and ecological balance in the face of development pressures on traditional land use and natural resources. The formal authority of the acequias—associations of irrigators maintaining and operating irrigation channels—as political subdivisions of the state provide a means for coordinated regional resource planning in concert with state and local government, although challenged by powerful economic and political interests.

Keywords: community identity, irrigation, rural infrastructure, water rights

Introduction

In the precolonial period, the goal of human settlement in the southwestern desert region of the United States was survival, with success dependent on adaptation to the limits of natural systems largely through cooperative social mechanisms. The limiting resource was water.

The political economy under the crown of Spain in New Mexico (1585–1821) emphasized protection of wealth-producing lands in central Mexico by settling the northern frontier as a buffer against incursions from French and particularly American interests. Success depended upon colonists holding territory for the crown. Although some surplus wealth was derived from the settlements, their
primary purpose was defense. Social solidarity was based upon mutual aid for subsistence agricultural production and for defense. The limiting resource was water for irrigation and household use.

During the brief Mexican period (1821–1848), state authority was distant but the political economy was based on early mercantilism. The Mexican state recognized the threat posed by the westward expansion of the young United States. Policy aims were to neutralize the external pressure and solidify occupation through the Indo-Hispano presence.

During both the Spanish and Mexican periods, successful settlement patterns depended upon observing the limits of the natural system, adaptation to adverse climatic and political conditions, the development of mutual aid mechanisms for labor and defense, and concentration on subsistence production of primary resources. Human settlements depended on a production system that respected the carrying capacity of the land. Customary practices governing water rights evolved at the local level, though theoretically subject to Spanish and Mexican governance principles (Simmons, 1969).

With the conquest of New Mexico in the US–Mexican war (1846–1848), new principles of political economy were introduced to the region. The political purpose was to establish dominion and solidify the national territory; the economic purpose was production of surplus wealth. Initially the relationship between human settlements and their natural surroundings was affirmed by treaty, and the early territorial period saw the wholesale adoption of customary practice associated with water by the new authorities. Gradually, however, Anglo-American law insisted upon documentary proof of title, acceptance of fee-simple property ownership and the severability of water rights from irrigated land, and standardized regulatory practices. These militated against those earlier flexible arrangements whose purpose was the survival of communities rather than optimization of resources to benefit the few (Tyler, 1995).

Context and key issues

The fifth-largest of the 50 United States, New Mexico comprises six life zones from desert to tundra, and is characterized by extreme aridity that limits most human settlements to a half dozen river valleys and the drainages that feed into them. The predominance of upper Chihuahuan and upper Sonoran desert in riparian areas is fed by 20–30 millimeters annual precipitation, with variability due to El Niño and La Niña Southern Oscillation, in addition to long-term cycles of drought currently exacerbated by anthropogenic causes.

---

2 ‘Fee simple’ refers to complete ownership of real property without restrictions—it comes from common law and is distinguished from lands granted by the crown, which could have been subsequently encumbered.
The region’s earliest inhabitants arrived about 15,000 B.C.E., succeeded by settlers from Mexico in the late 16th century, and subsequently by immigrants from the United States in the 19th century. The United States wrested the territory from the Republic of Mexico in 1848, along with Texas, Arizona, and large portions of California, Nevada, Utah, and Colorado—in sum, about 50 percent of Mexico’s national territory.

The population of slightly more than 2 million is principally concentrated along the Rio Grande and the Pecos and San Juan rivers. New Mexico is a “minority majority” state, with several major living language traditions (indigenous Puebloan and Athapaskan, Mexican Spanish, English) and political control in the hands of no one group. It is the only one of the United States in which a language other than English has formal standing in courts of law.

Economic resources have historically been largely agricultural, along with timber, mineral products, and more recently fossil fuels and uranium. Industrial production is slight and is concentrated in two of the larger cities, Albuquerque and Las Cruces.

A recurrent theme in New Mexico’s history has been the preservation of cultural identity in the face of powerful forces from the outside—first the Spanish empire and its successor Mexican republic, and then the hegemonic forces of the young United States, with local inhabitants struggling to maintain social cohesion as newcomers occupied territory already in use. The ecology of the region has constrained the range of economic strategies available, contributing to the intensity of the social dynamics and requiring a high degree of adaptability in political, social, and economic forms.

**The *acequia* culture**

The New Mexican irrigation ditch systems and the associations of irrigators who maintain and use them are both referred to by the Spanish term *acequia*, an adoption of the Arabic *as-sāqiya* (Figure 1). Before the penetration of Spanish and Mexican immigrants in the late 16th century, the indigenous people of the region had utilized local irrigation practices and attendant social organization (Dunbar-Ortiz, 2007). The addition of Iberian technology brought by settlers under Spain joined with and extended the earlier practices (Rivera & Glick, 2002).
Both the indigenous and European systems recognized the need for social cooperation in *acequia* construction and maintenance, along with regulating mutual access during the times of water shortage that were not infrequent. Both systems fostered protection of the water from contamination, and recognized the ecological role of irrigation in maintaining soil moisture, promoting the biological health of the riparian habitat, and strengthening vegetation cover (Ebright, 2001; Meyer, 1984; Van Ness, 1987).

Local interests were served by improved conditions for human survival and natural resilience. The means to these ends rested in a set of social and technological practices that addressed the entire natural system. The practices evolved over time based upon keen observation, repetition, and modification in this water commons transmitted across generations, and reinforced by religious political institutions. Thus emerged the concept of an *acequia* culture (Ostrom, 1990; Rivera, 1998) (Figure 2).
Figure 2. Distribution of *acequia* systems in New Mexico

Dependent variables: Functionality, mutuality, legitimacy

*Acequia* culture is characterized by the dynamic interrelationship of three elements: the functionality of the water delivery system, the mutuality required within and between local social groups for management of the community ditches, and the legitimacy of the conditions under which water is appropriated and distributed.

Functionality includes provision of water (diversion from the main drainage), effective irrigation (allocation), and ecological health (ecosystem services and return flow). Mutuality comprises management of the water resources, joint performance of ditch maintenance, shared water allocation during times of scarcity, and reinforcement of the social fabric by exchange of labor. Legitimacy is defined by formal agreement over the allocation of water, honoring relative seniority (prior rights), and acknowledging law and custom as foundational principles.

The contours of functionality, mutuality, and legitimacy have varied with local practice under changing environmental conditions, from drought to surplus. They have also changed due to the nature of external state authority and the motives for territorial control in different historical periods.

Independent variables: State policy and legal instruments

The three dependent variables were affected by the intended purposes served by the system, varying with the dominant sociopolitical arrangements. Indigenous societies and local groups of incoming settlers were primarily concerned with survival, and their social organization, technology, subsistence economy, and decision-making practices were directed to that purpose. The concerns of the Spanish crown and its successor Mexican republic were those of dominion and of using the settled northern borderlands to protect an economically more valuable heartland to the south, with a modest return on agricultural products and raw materials. The Anglo-American influence directed itself to surplus production and commerce.

Similarly, the indigenous and settler regulation of access to water for domestic use, irrigation, and watering of livestock relied more upon locally evolved customary practices than on codified legal forms—notwithstanding the promulgation of formal requirements of settlement and land use practices by the Spanish crown and the Mexican state. The shift to formal civil law as the guiding principle for allocation and use of water occurred when New Mexico became a territory of the United States under the terms of the 1848 treaty of Guadalupe Hidalgo concluding the US–Mexico War.
Intervening variables

There are two classes of intervening variables external to the *acequia* production system: those creating increased demands for available water, and those affecting rates of consumption.

The historical variability in climate conditions has affected the density and distribution of populations, through effects on the carrying capacity of the local habitat (Cook et al., 2009; Phillips et al., 2011). Current recognition of climate change (IPCC, 2007) suggests new magnitudes in the near future.

The number of people inhabiting the region has likewise affected the water resources available for human settlements, and has stimulated the competition for water during periods of drought. Furthermore, since the beginning of the Anglo-American occupation of the region there has been a steady population shift from rural to urban areas creating more intense demand of water for residential, commercial, and industrial uses.

The legal obligation to deliver specified volumes of water to downstream users under formal compacts with neighboring states and the Republic of Mexico—even during times of drought—is a third factor affecting availability of water to the local natural systems and human environments.

Consequently, the economic strategies of the local inhabitants have also shifted over time from subsistence agriculture to natural resource extraction, to commercial production of value-added goods. These changes have altered the scale of demand for water, and have been accompanied by important changes in technology that have increased the speed and volume of groundwater extraction in addition to the ease of planting, harvesting, mining, and logging. The modern market economy has opened up employment options available to local people, contributing to the relocation of rural populations to urban areas.

The *acequia* landscape: Indigenous, Spanish, and Mexican

The *acequia* culture has evolved against a somewhat constant (except for drought cycles) physical backdrop but a more dynamic social context.

Tree ring data has demonstrated drought cycles occurring with periodic intensity over the previous 800 years (Cook et al., 2009). This has been accompanied by dislocation of populations and intense restrictions on agricultural production. Thus inhabitants of the region have had to adapt to severe changes, only partly alleviated by complex, pre-industrial irrigation technologies and social mobilization strategies for joint labor to construct and maintain the irrigation works. From earliest times, the social institutions with authority for organizing
labor and allocating and distributing water have been based on very localized customary arrangements that persisted until the unitary state became dominant with the imposition of Anglo-American legal principles in the middle of the 19th century. Even then, local custom has continued to play a major part in the organization and operations of *acequia* associations, including their resistance to strict adherence to seniority of rights in times of water scarcity (Dunbar-Ortiz, 2007; Ebright, 2001).

Water rights under Spain and Mexico were rights of use rather than of property. This perspective allowed water resources critical to the survival of human settlements to be shared during times of scarcity, allowing all to survive. Senior and junior rights during the Spanish colonial period distinguished between standing access and access to ‘surplus’ irrigation rights. The goal was survival of the entire group (Rivera & Glick, 2002; Greenleaf, 1972; Meyer, 1984; Simmons, 1972).

Traditional irrigation systems provided for livelihood, social solidarity, and environmental health. Water carried in community irrigation ditches supplied households, livestock, croplands, and eventually small grain mills (Brown and Rivera, 2000; Rivera, 1998).

**The impact of Anglo-American law**

The indigenous, Spanish, and Mexican cultures stressed balanced relationships between water users. The focal point was on survival and the perpetuation of social relationships between water users. In doing so, customary usage addressed the natural as well as the human environment. Anglo-American principles, and their concomitant values embedded in civil law, were more concerned with the human aspects of water rights and the impact on nature. Eventually, this was reinforced by a sense that water was to be treated as a commodity or property right, with monetized values determining its worth. Under this assumption, the value of water rights was to be defined by the marketplace.

The legal code imposed by the occupying military authorities preceded laws passed by the territorial legislature. It adopted the legal principles governing water rights from the Spanish and Mexican periods and integrated them into regulations governing their use in the newly acquired territories. In 1851 and 1852 the territorial legislature passed laws governing water rights and water use based upon the preceding practices of the Spanish and Mexican periods. While other statutes were crafted, up until the beginning of the 20th century most of the water law in New Mexico was based upon these historical antecedents.
Federal law and jurisprudence

Although Spanish practice had included the concept of priority right, it was balanced by the practice of sharing water during times of scarcity. That is, even those with senior rights yielded allocation of water so that all users could survive. With the advance of Anglo-European legal principles, a more absolute practice was introduced: in times of scarcity, a “priority call” could exclude the holders of junior water rights completely. Although the Office of the State Engineer has been consistently reluctant to make such a “priority call,” the legal possibility still exists—leaving the holders of junior water rights in an uncertain position.

Under laws introduced since statehood in 1912, holders of water rights can lose them if they do not use them in a four-year period. Although forfeiture is rare, it is a constant concern for those who for whatever reason are unable to irrigate or to put the water rights to which they are entitled to beneficial use. Water rights that are not used over a substantial period of time can be considered abandoned and subject to reallocation to other applicants. The principle here is that water is such a precious resource that lack of use is considered wasteful and therefore a reason to reassign those rights to users who would put them to use and better serve the public welfare.

Another concept introduced under Anglo-American law was that water rights could be severed from the land to which they had been assigned for purposes of irrigation. Originally, water rights “followed” the land. It was not conceivable to early settlers that water rights could be treated otherwise. But in the commercial frame of reference of Anglo-American practice, water rights could be seen as commodities, therefore subject to sale. Thus, a market for water rights was created and continues to exert pressure on the historical connection between water and land. For older holders of water rights, the value of those rights can constitute the equivalent of a pension to carry them through old age. Similarly, possessors of water rights who do not have adequate financial capital can find the increasingly greater cash value to be irresistible in paying for education, home construction, or the acquisition of inputs for productive purposes (Clark, 1987; Van Ness, 1987).

At the regional level, it was recognized from the early 20th century that the planned allocation of surface water resources of the major river systems of the Southwest were necessary for the continuance of settlements and agricultural production. Consequently, interstate compacts and international treaties were devised in order that the water could be distributed in an orderly fashion throughout the region. These included the Colorado River Compact (1922); the Rio Grande Compact (1938); the 1944 treaty between the United States and Mexico governing use of water from the Rio Grande, and the Colorado and
Tijuana rivers; the Pecos River Compact (1948); and the Canadian River Compact (1971). In 1983, the United States and Mexico concluded the La Paz Agreement that addressed the quality of the water delivered from the United States to Mexico under the terms of the 1944 treaty. All of these interstate compacts and international agreements overrode the authority of local water policy in New Mexico, requiring the delivery of water downstream as a primary concern.

Unfortunately, the calculations used to determine the volume of water to be delivered downstream were based upon precipitation data derived from abnormally moist periods, leading to irrigation shortfalls during times of drought. The compacts required the states to make up the deficits of water not delivered in any given year, and exerted pressure on the distribution of water within each state. Thus the local authorities in New Mexico were required to deliver water downstream even when it threatened to seriously impair local irrigators. This is an issue of scale: the compacts are regional; the stress upon local irrigators is local. It is at the mid-scale of local government that we look for a solution to this quandary.

While the interstate compacts and international treaties demanded a quantum of water delivered annually, this was based upon an assumption about availability and end use. Furthermore, it had been discovered in the 1930s that the hydrologic functions of surface water and groundwater are interrelated, so that excessive withdrawals of groundwater to offset shortfalls in surface water effectively reduce surface flows, placing stress on the riparian zone and a reduction in its biodiversity and productivity (Phillips et al., 2011). The passage of the National Environmental Policy Act in 1969, and subsequent federal legislation such as the Clean Water Act (1972) and the Endangered Species Act (1973), introduced a broader series of concerns that did not mesh well with the engineering solutions. The need to provide habitat for the Rio Grande silvery minnow (*Hybognathus amarus*) introduced new design complexities based upon nonmonetary values (Porter & Massong, 2004). More recently, agricultural researchers have determined that numerous ecosystem services derive from water flow in *acequias* (Rivera, 1998). As federal government agencies begin to clarify the means of determining environmental values, the administration of water law promises to become more nuanced.

Future populations in the region will require potable water resources produced by healthy and dynamic watersheds (Brown & Rivera, 2000). Rural irrigation communities protect common pool resources; their management of natural resources plays a critical role in the survival of hydrologic systems providing for non-agricultural purposes, including urban and industrial uses, and the provision of ecosystem services. The persistence of these systems requires the protection of the relationship between land and water (Fernald et al., 2007; Ortiz et al., 2007; Van Ness, 1987).
New Mexico: Law and regulation

The passage of legislation following the acquisition of New Mexico by the United States falls into two categories: territorial law and state statute. The territorial legislation began in 1851 and 1852, as noted above, with the incorporation of traditional practice into law. As noted by Clark (1987), water law remained fundamentally unchanged until the end of the territorial period, with two important exceptions.

In 1907 the territorial legislature passed a comprehensive water code referred to as the “Acequia Act” that has served as the framework of state water policy, law, and regulation since that time. As Fort et al. (2012) note, “Although lawmakers intended to protect the community acequias and other traditional institutions, after 1907 the Anglo sociocultural framework increasingly dominated water policy.” This law centralized the administration of water through the creation of the office of what was to become the State Engineer. The law also provided for the severance of water rights from irrigated land, with transfer to other locations and uses.

Following admission to statehood in 1912, a substantial amount of activity occurred around water allocation within a regulatory framework, as well as periodic amendments to the 1907 water code. A number of statutes address fundamental distinctions such as between surface water and groundwater, and between regulatory administrative authorities, primarily the Office of the State Engineer and the Interstate Stream Commission, who oversee management of the state’s streams and groundwater and delivery to downstream users respectively.

In 1987 the state of New Mexico initiated statewide water planning. Goals were to develop an “inventory of quantity and quality of water resources, population projections and other demands under a range of conditions, edit determination of how those demands might be met under existing rights, supplies, agreements, and court decrees” (Fort et al., 2012).

The State Water Plan Act of 2003 called on the Interstate Stream Commission to initiate regional water planning to cover all of the declared basins within the state. The State Water Plan that resulted established objectives for water use and allocation in a general fashion, and was updated in 2008 and 2009 in the face of diminishing snowpack and a future of attenuated water supply.

In north-central New Mexico, the area with the most numerous and vibrant acequia communities, four regional water plans were completed between 2003 and 2008, all of which called for protection of the acequia systems and landscape (Figure 3).
Figure 3. Distribution of *acequia* systems in the Taos Valley

New Mexico statute assigns authority for the subdivision of property to municipal (Chapter 3) and county (Chapter 47) governments. The Office of the State Engineer reviews requests from county commissions to evaluate county-level subdivision proposals to assure they comply with the New Mexico Subdivision Act (1978 as amended) and County Subdivision Regulations (1978 as amended), to ensure that adequate water rights are available to support the development.

Water law is administered by the state of New Mexico; local land use is generally administered at the county and municipal levels. This represents a lack of articulation between two different levels of government that can become problematic when water use, land use, maintenance of habitat, and environmental services are in tension (Fort et al., 2011, 2012). It also poses difficulty when rural areas are subject to development pressures and encroachment by non-rural land uses.

The origin of the state statutes governing community ditch associations is rooted in the custom and tradition of Spanish and Mexican practices governing water rights. Early formal aspects of acequia custom provided for diversion of waters, a water allocation system, and provisions for return flow (Brown & Rivera, 2000). Within these key elements, there was a great deal of local variation because the purpose was a practical resolution of local conditions governing the allocation of water during scarce times rather than uniformity of practice. Nonetheless, the authority for decision-making was grounded in the state, initially the Spanish crown and subsequently the Republic of Mexico. The Anglo-American civil legal structure increasingly demanded uniformity of practice, and it is by conformity to formal regulations that local acequia associations acquire the status of political subdivisions of the state.

While acequia associations were recognized as corporate bodies in 1895, statute law increasingly standardized governance and decision-making procedures for them in the 20th century, beginning with the 1907 New Mexico water code (Fort et al., 2012). Subsequent amendments to the 1907 law have expanded the authority of recognized acequia associations—which the Office of the State Engineer assumes to number around 800—including a right to appeal decisions by the state engineer; to acquire and transfer water rights and to protect rights so acquired against loss for non-use; to enter into contracts for the construction, repair, and maintenance of physical irrigation infrastructure; and to exercise the right of refusal for the transfer of water rights from their jurisdiction and to protest the transfer of rights elsewhere if it is deemed that this would negatively affect the hydrological function of the acequia and its attendant water rights.

4 Section 72-7-1, New Mexico Subdivision Act (NMSA) 1978 as amended (1971); Section 73-3-55.1 NMSA 1978; Section 73-2-21.1 NMSA 1978; and Section 73-2-21 (E) NMSA 1978 and/or Section 73-3-4.1 NMSA 1978.
It is the last of these amendments that offers the clearest current means for collaboration between the acequia associations and municipal and county governments for the protection of habitat, identity, and water rights. The law passed in 2003 allows acequia associations to intervene in proposed water transfers if their by-laws have been amended to include the statute language authorizing them to do so.5

Contemporary acequia culture and rural regional planning

Acequia associations are responsible for repair and maintenance of the hydraulic works, access to the ditches for cleaning and release of water from the main ditch into lateral ditches, supervising the allocation and distribution of water, and ensuring the obligatory dues payments and proper irrigation behavior of parciantes (irrigators).

Counties are in a position to mitigate competing land uses through zoning ordinances or through community planning. The traditional acequia communities can strengthen and even reestablish their historical function through collaboration with local governments’ regulatory authority over land use, and can open the possibility of comprehensive water planning by regional authorities. Given that there are about 800 such acequia systems throughout the drainages of New Mexico, their vitality represents a key element in rural infrastructure (Fort et al., 2011; Rivera, 1998).

Land use

As land use regulation is primarily the province of county planning authorities, there is no necessary relationship between the assignment of purpose to real property and rights to irrigation water. However, counties have it within their powers to protect elements of land use that are considered of high social and ecological value; this can include the viability of acequia culture and management. Consequently, some counties have taken steps through their land use planning and zoning processes to protect acequia systems.

---

5 The Office of the State Engineer currently has routine communication with 500 of the 800 acequia associations in the state, and officials informally estimate that as many as 95 percent of those 500 have adopted enabling language into their by-laws (personal communication, May 14, 2013). Others consider 95 percent to be an exaggerated level, but acknowledge the increasing numbers of acequia associations adopting such language.
Subdivision ordinances and zoning

In 2002, the Rio Arriba Board of County Commissioners adopted the Rio Arriba Agricultural Protection and Enhancement Ordinance, in recognition of the threat posed by rampant division of land for development. Before this time, state statutes had restricted such ‘lot splits’ to four from a single property over the course of two years. But legislative reforms did not address the concentration of dwellings, wells, and wastewater treatment on the divided parcels; potential threats to irrigation ditches that had served the previously undivided property; or the removal of agricultural land itself from that use.

In passing the ordinance, the county commission aimed to “protect and enhance the agricultural lands, the acequia systems, and the ground and surface water resources of Rio Arriba County by establishing criteria for review and approval of land use zoning, subdivisions, or division of land, located within irrigated agricultural lands” (Rio Arriba County, 2002). The ordinance addressed clustering of residential sites; conservation of irrigated agricultural land and water resources; contamination of groundwater and surface water from seepage; and protection of historical settlement patterns and visual amenities in service of general public health, safety, and welfare.

What had stimulated this action was that, because residential sites had historically been developed upslope from the irrigation ditches which themselves fed irrigated land farther downslope by gravity flow, the uncoordinated division of private property for non-agricultural purposes rendered prime productive land widely inaccessible for irrigation and morcellated it into less useful sizes.

The ordinance was a countywide approach to manage otherwise unplanned and unconstrained land uses that undercut custom, culture, and function of irrigated agricultural communities.

Community planning

In 2002, the Santa Fe County Commission adopted an ordinance affirming the community-level planning for traditional and contemporary communities “…to create a process whereby community members and the County jointly learn and document how development and growth both impact and can be directed to benefit individual communities throughout the county, within the context of and according to the principles of the County Growth Management Plan” (Santa Fe County, 2002). This ordinance allowed for local community purposes and values to define planning for the settlement in question. It distinguished between the needs and dispositions of the residents of historical communities, and those of more recent residents of contemporary subdivisions.
Subsequently, the county addressed a needed revision of comprehensive land use planning by adoption in 2010 of the Santa Fe County Sustainable Growth Management Plan. This plan recognized the importance of protecting *acequia* systems and related water resources as a means of extending local agricultural production, irrigation water resources, and environmental services (Santa Fe County, 2010).

The principles in the updated 2010 plan, combined with the 2002 ordinance, opened the way for county planning staff to bridge land use and water rights issues. In each community participating in an updated planning effort, there was an opportunity for local *acequia* associations to raise key issues related to physical access, preservation, and functionality of the historical irrigation ditch systems. In some communities, the ditches were no longer in operation; in others, the irrigation issues were so contentious that local communities did not wish them to be included in local plans. In others, however, where ditches and ditch associations were still vibrant and supported local irrigation, they were considered a necessary element of the formal community plan that would be officially recognized by the Board of County Commissioners. Where local communities affirm the importance of *acequias* as part of the local infrastructure, the *acequias* are mapped into the local land use plan and the access of a buffer zone included as a living element to be considered in future development deliberations. When the community plans are approved by the county commission, they are considered to amend the county land use plan itself.

This critical juncture between land use planning and the viability of *acequia* systems opens the groundwork for a more formalized approach to land use designation at the county level. Under this arrangement, *acequia* landscapes can be defined through a “land typology zoning” that emphasizes the importance of these traditional and ecologically critical systems, perhaps by offering incentives for their preservation as well as other protections for their continued use.6

Environmental challenges

As Fernald et al. (2007), Ortiz et al. (2007), Rivera (1998), and Van Ness (1987) have all observed, the *acequia* systems play an important role in preserving ecosystem health by recharging shallow groundwater systems and extending riparian habitat. Coupled with a concern for the purity of water resources embodied in the National Environmental Policy Act, the Clean Water Act, and the Endangered Species Act, state and local governments have acted to protect *acequia* systems from contamination. A recent (2013) case is the adoption of an ordinance by Mora County in north-central New Mexico forbidding hydraulic fracturing (“fracking”) for recovery of shale gas. Mora County Commission

---

6 S. Ijadi, Santa Fe County Senior Planner, personal communication, April 15 and May 8, 2013.
Chairman, John Olivas, is quoted as explaining the motive for the ordinance in several ways, including that “Our acequias and our irrigation canals are dry, so the whole idea is resource protection” (Montoya Bryan, 2013).

The contemporary *acequia* system and rural regional planning

Functionality

Several studies in the past decade have affirmed the important role of *acequia* systems in providing ecosystem services. Among the possible benefits identified are “diluting agricultural chemicals or septic tank leachate in shallow groundwater, providing groundwater recharge to shallow wells, and providing delayed return flow to the stream thus maintaining in-stream flow after peak runoff periods” (Fernald & Guldan 2006) and “sustain[ing] riparian vegetation along the main ditch and side ditches” (Fernald et al., 2007). Tarlock (2000) argues that federal legislation protecting water quality might lead to a reconnection of water rights and land property rights on a watershed basis. Roybal (2012) has developed a method for measuring the functionality of *acequias*, including hydrologic, agronomic, and social parameters. Miller (2013) has demonstrated how the continued operation of historical *acequia* systems has actually expanded the riparian zone in one case by as much as 10 percent since 1965, to the benefit of density and diversity of vegetation and habitat types.

Mutuality

The social fabric that bound these irrigation communities together has been challenged by the changing political economy of the region since 1945:

In the decades after World War II, population growth, social mobility and technology exposed young people in the formerly isolated villages of northern New Mexico to a popular culture that offered alternatives to the hard work of farming. Market forces gave a new, monetary meaning to the concept of water rights. These factors have influenced norms and altered *parciantes’* understanding of the arrangements that determined their relationship to the *acequia* institution. (Brown & Rivera, 2000, p. 26)

However, recent analysis of *acequia* systems suggests that despite the fact that irrigated agriculture in northern New Mexico is no longer the mainstay of the domestic economy, people continue to uphold the importance of *acequias*
through active participation in maintenance and operation of the ditch systems for social and economic purposes—part of a mixed economic strategy combining crop and livestock production with wage labor (Roybal, 2012).

**Legitimacy**

State and federal law affirm the standing of *acequia* associations as corporate bodies and political subdivisions by defining their structure, upholding their decision-making authority, and providing grants and loans for them to carry out their work (Lovato, 1974; NMAA, 2010). The large body of statutes governing water rights, use, and administration has also increasingly formalized and strengthened their purposes and authority over time.

State regulatory authority has created the function of acequia liaison in the Office of the State Engineer to act as interface between the *acequia* associations and the Acequia Construction Program. The state legislature created the New Mexico Acequia Commission in 1993 “… to advise the governor, the New Mexico Interstate Stream Commission and the U.S. Army Corps of Engineers on what criteria should be used to determine priorities for rehabilitating *acequias* under a … federal funding program.” The purpose of regional water planning has been to rationalize a diverse and varied set of practices in the interest of predicting existing supply, measuring it against presumed future demand, and honoring commitments to provide water downstream under the obligations of the interstate compacts.

The combined strategies of zoning, community planning, and environmental protection at the local government level, along with regional water planning initiatives at the state level, are serving to complement state statutes governing water resources policy that have empowered *acequia* associations to intervene in proposed transfers of water rights, maintain access to irrigation ditches, acquire *acequia* water rights directly, and administer grants for the improvement of the *acequias*.

**Conclusion**

This convergence of *acequia*, local, state, and federal government actions, although not part of an intentionally unified strategy, nonetheless offers potentially powerful instruments to protect this historical, holistic approach to sustainable land and water use. But the broader state and federal legal contexts only constitute a shell within which daily aspects of land use and the provision of water are carried out. If land use and water rights decisions were left to...
state authorities, they would likely align with dominant regional economic and political interests. Because of the direct and persistent engagement of local communities, water rights and their distribution serve those broader-than-monetary beneficial uses and continue to support the vitality of historical irrigation communities. This demonstrates how traditional knowledge based on experience along with citizen activism can influence the means by which public policy is implemented to the benefit of historical communities.

This is not to suggest that defense of traditional water rights and irrigation practices alone will sustain traditional land use. There are powerful economic pressures to transfer water rights and sell agriculturally productive land in an area that has been land rich and cash poor. But the marriage of traditional water rights and water management with land use regulation through zoning ordinances and the prospect of regulated land classification are important tools to reattach water to land in the interest of watershed health. The benefit is not only to local communities but to the broader needs for water for consumers downstream in a given drainage, and ultimately in other states.

Regional planning needs to consider physical infrastructure as one of its charter ingredients, and provision of potable water for irrigation and non-agricultural consumption is a requisite element of that infrastructure. The ability to preserve hydrological, economic, and social functions through the public–private cooperation between *acequia* communities and local governments offers an important step forward.

**References**


Qualitative Indicators of Social Resilience in Small-Scale Fishing Communities: An Emphasis on Perceptions and Practice

Teresa R. Johnson
School of Marine Sciences
University of Maine, United States

Anna M. Henry
Northeast Fisheries Science Center
Maine, United States

Cameron Thompson
University of Maine, United States

Abstract

This paper reports on ethnographic research aimed at understanding what resilience means to those living within fishery-dependent communities. We draw on semi-structured and oral history interviews, focus groups, and household and business interviews in four Maine fishing communities to examine the reflections of fishermen and other community members on the past, present, and future of their communities, including the threats they face and how they are able to respond to them. Based on our analysis, we identify broad qualitative indicators of resilience: survival, social identity, diversification, getting by, and optimism. The indicators of resilience that we identify are difficult to fully understand using secondary data and, therefore, we argue that understanding them also requires an ethnographic research approach that focuses on the practices of fishermen and the context in which those fishermen live.

Keywords: adaptation, adaptive capacity, fishing communities, qualitative indicators, quantitative indicators, resilience, vulnerability

1 Corresponding author: teresa.johnson@maine.edu.
Introduction

Research methods and theories of vulnerability span over 30 years and multiple disciplines (Adger, 2006; Smit & Wandel, 2006). However, a robust theory of vulnerability has yet to be developed in the social sciences (Davidson, 2010; Kasperson et al., 2001), and global vulnerability assessments remain a research frontier (Schröter et al., 2005). Vulnerability refers generally to the “differential susceptibility to loss from a given insult” (Kasperson et al. 2001, p. 24) and arises from diverse sources, including social relations, technology, biophysical conditions, economic relations, and demography, and therefore we should expect systematic patterns related to vulnerability (Dow, 1992). There is wide agreement that vulnerability has three components: exposure, sensitivity, and adaptive capacity (Adger, 2000; Gallopin, 2006). Exposure refers to the degree, duration, or extent to which a system is in contact with a threat, perturbation, hazard, or stress. Sensitivity is the degree to which the system will be affected if exposed. Adaptive capacity, or resilience, is the ability of the system to endure or recover from exposure to a threat and can also include responses in anticipation of a threat. We focus here on the last component—adaptive capacity or resilience—and follow Adger (2000, p. 347), who, cautioning against transferring the concept of ecological resilience directly to social systems, offers the following definition of social resilience: “the ability of groups or communities to cope with external stresses and disturbances as a result of social, political, and environmental change.” Maclean et al. (2013) recently identified six attributes of social resilience through an analysis of six case studies research. Although understanding of the topic is increasing (Berkes & Ross, 2012), questions remain regarding the social aspects of resilience (Davidson, 2010; Maclean et al., 2013).

Turner et al. (2003) argue that comprehensive vulnerability assessments are unrealistic, and that the differential or variable nature of vulnerability to location calls for place-based research. Similarly, Smit and Wandel (2006) recommend community-based vulnerability assessments that do not specify a priori determinants of resilience. We sought to incorporate these insights into our approach by identifying components or indicators of resilience within communities themselves. Our approach was to explore community members’ assessments of their vulnerability and resilience as reflected in their perceptions of the threats they face and how they respond to them. This follows a “people ecology” approach (McCay, 1978) that directs research towards understanding the threats faced by people and how they respond to them, recognizing that responsive units may be individuals, organizations, communities, regions, and other entities. We also recognize that social resilience does not need to be viewed as opposed to or a component of vulnerability, but can be thought of as building strengths and protective factors that help individuals and communities (Maclean et al., 2013).
Qualitative Indicators of Social Resilience in Small-scale Fishing Communities

Several recent studies have examined vulnerability and resilience in fishing communities (Clay & Olson, 2008), often in response to legal mandates requiring fishery managers to consider vulnerability and resilience as part of social impact assessments and, to the extent practicable, minimize the potential impacts of fishery regulations on fishing-dependent communities (Clay, 2007; Jacob et al., 2001; Jacob et al., 2010). For example, Jepson & Jacob (2007), working in the gulf coast of the United States, identified social indicators using secondary data to measure vulnerability of fishing communities. More recently, Jacob et al. (2010) developed quantitative indicators using secondary data to measure vulnerability of gulf coast fishing communities, and social scientists have expanded this work to the northeast United States (Colburn & Jepson, 2012). These quantitative indicator approaches are a valuable starting point for social impact analysis as they provide low-cost and rapid assessment capability; however, ground-truthing data through qualitative research is still important (Jacob et al., 2010).

Qualitative studies of vulnerability and resilience have also identified components or indicators of resilience. In the northeast United States, Tuler et al. (2008) examined resilience using a useful set of qualitative “driving forces of vulnerability” based on the literature that included demographic, individual decision-making, institutional, economic, sociocultural, technological, and environmental conditions. Marshall & Marshall (2007), in assessing social resilience to institutional or policy change in northern Australian fishing communities, used quantitative survey data to identify four qualitative components of resilience: (1) perception of risk in approaching change, (2) ability to plan, learn, and organize, (3) perception of the ability to cope with change, and (4) level of interest in adapting to change.

There have been many approaches to studying vulnerability, and these various methodologies reflect that more work is needed in figuring out how best to assess vulnerability. Our study began with fishermen’s perceptions of their resilience as a starting point for understanding resilience.2 We sought to understand what it means to those living within small-scale fishing communities to be resilient. We believe the indicators of resilience that we identify are difficult to fully capture in secondary data and, therefore, we argue that understanding them requires ethnographic research that focuses on the practices of fishermen and the context in which those fishermen live.

---

2 Following the convention and preference of those in our study area, we use the term fishermen to include male and female members of the fishing industry.
Methods

Our findings are based on ethnographic research conducted from September 2010 to June 2012 in four Maine, United States, fishing communities: Eastport, Lubec, Rockland, and Port Clyde (Figure 1). We draw from 18 semi-structured (Bernard, 2005) and 26 oral history interviews (Colburn & Clay, 2012; Ritchie, 2003), as well as three focus groups with fishermen and other community members, 37 household surveys, 29 interviews with local businesses, and numerous site visits and informal interviews. Many of those interviewed have transitioned to fishing part-time, or seasonally, with non-fishing related jobs filling the void, yet their identity is firmly rooted in fishing. Although all data from these communities inform our analysis, we draw primarily from the oral history and semi-structured interviews and focus groups. We conducted interviews with current and former fishermen and other community members in order to assess the major threats and changes affecting fishing communities over time, and individual and collective responses to those changes. Maine Sea Grant Marine Extension staff and other community leaders assisted in the initial selection of key informants, which was followed by snowball sampling (Bernard, 2005) to identify additional informants and ensure representation of the diverse fisheries in our study area. Interviews ranged from 1 to 2 hours in length, and were audio-recorded for preservation, sharing (with permission), and analysis. All oral history interviews and six of the semi-structured interviews were transcribed verbatim. For the remaining semi-structured interviews, we took detailed notes from the audio files following the interview guide.

We used QSR International’s NVivo 9 qualitative data analysis software to analyze all data collected in this project. Following a modified grounded theory approach (Glaser & Strauss, 1967; Strauss & Corbin, 1990), data analysis occurred through the coding and re-coding of the data, followed by additional research necessary to better understand the themes that emerged in the analysis. To ensure consistency in coding across the research team, intercoder reliability assessment was conducted using the NVivo software (Thompson et al., 2004). This served in part to reduce bias associated with single interpretations of data. Following the analysis, we selected quotations from the interviews to illustrate the themes. Focus groups and follow-up discussions served to ground-truth our findings. In this paper, we focus on the themes that emerged in the analysis related to perceptions of resilience as expressed through reflections of fishermen and other community members on the past, present, and future conditions in their communities.
Study area and context

This research took place in four Maine fishing communities. Eastport and Lubec are found in the eastern edge of the state adjacent to Canada within Cobscook Bay, while Rockland and Port Clyde are in the mid-coast region, within and near Penobscot Bay (Figure 1). Eastport and Lubec are isolated and rural with high poverty rates; Port Clyde is relatively isolated and rural with low poverty; and Rockland is more urbanized with high rates of poverty. All four communities have experienced significant social and ecological change in past decades (Table 1). Port Clyde has long experienced an in-migration of wealthy, retired individuals; this has led to higher incomes and property values compared to the other communities. Rockland is the service center for the region, but has experienced significant restructuring with a shift away from natural resource and manufacturing industries to tourism and amenities. The older, wealthier individuals driving these changes tend to live outside of the city, while the population residing in Rockland is supported by lower paying service sector jobs. Corresponding with the loss of opportunities in fishing and other traditional industries, Eastport and Lubec have seen substantial out-migration.
of young individuals. Recently there has been an in-migration of relatively wealthy individuals to these communities, and while incomes and house values are rising they lag far behind that of Port Clyde. Eastport, however, is experiencing an economic resurgence through interest in tourism and the arts, but not necessarily in the fishing sector.

Table 1. Population, age, income, unemployment, poverty and housing statistics for the study communities and the state of Maine

<table>
<thead>
<tr>
<th></th>
<th>Lubec</th>
<th>Eastport</th>
<th>Rockland</th>
<th>Port Clyde</th>
<th>Maine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population in 2010</td>
<td>1,359</td>
<td>1,331</td>
<td>7,297</td>
<td>2,591</td>
<td>1,328,000</td>
</tr>
<tr>
<td>Population change since 1960 (%)</td>
<td>–37</td>
<td>–48</td>
<td>–17</td>
<td>+63</td>
<td>+37</td>
</tr>
<tr>
<td>Population change since 2000 (%)</td>
<td>–17.7</td>
<td>–18.8</td>
<td>–4.1</td>
<td>+0.43</td>
<td>+4.2</td>
</tr>
<tr>
<td>Median age</td>
<td>54</td>
<td>54.5</td>
<td>43.5</td>
<td>51.7</td>
<td>42.7</td>
</tr>
<tr>
<td>Median income</td>
<td>$27,292</td>
<td>$30,600</td>
<td>$29,592</td>
<td>$39,777</td>
<td>$46,993</td>
</tr>
<tr>
<td>Individuals unemployed (%)</td>
<td>8.8</td>
<td>7.2</td>
<td>5.7</td>
<td>8.6</td>
<td>6.5</td>
</tr>
<tr>
<td>Families in poverty (%)</td>
<td>11.1</td>
<td>12.4</td>
<td>12.3</td>
<td>9.4</td>
<td>8.4</td>
</tr>
<tr>
<td>Houses less than $100,000 (%)</td>
<td>49.2</td>
<td>49.8</td>
<td>19.5</td>
<td>7.9</td>
<td>21.7</td>
</tr>
</tbody>
</table>

Source: US Census.

Most notably, fishermen in these communities were once diversified; access to groundfish, lobsters, herring, clams, shrimp, scallops, urchins, and other species allowed individuals to respond to annual and seasonal shifts in markets and resource abundance (Brewer, 2011; Hall-Arber et al., 2001). Today, Maine’s commercial fishing industry is now highly dependent on a single species: over 80 percent of the value of Maine’s fish and seafood landings is from lobster (Steneck et al., 2011). These communities are significantly vulnerable should the lobster resource decline or policies be implemented that otherwise significantly limit the harvest in this fishery (Steneck et al., 2011). Regulations limiting access to key fisheries and stock depletion have reduced opportunities in many of the fisheries and the fishermen left in these communities are aging (Hall-Arber et al., 2001).

Results

To understand social resilience in these communities, we report themes from our analysis on the perceptions of resilience as expressed in interviews. For the most part, we do not distinguish between the four study communities, as the themes that emerged in the analysis were similar across communities despite
different social, economic, historical, and environmental conditions. In a few cases, differences did exist and we note them in our presentation of the results. Some of the themes are overlapping and/or related to each other and we note this in our discussion. We use quotes from interviewees to illustrate the themes that emerged in the analysis.

Survival

The most frequent expression of what resilience means is simply “still fishing” despite having faced numerous threats over the years; that is, they have survived. As an example, one fisherman explained that they have “withstood quite a bit of it now with fishing regulations and some of the idiosyncrasies of it.” Similarly, another fisherman explained they are resilient, “Because we’ve had … stuff come down on us, and we’re still here.” The “here” part is important for most whom we interviewed; it’s not just that they have survived so that they can go fishing, as some fishermen continue to fish in other parts of the region, but the issue for many is holding on to the tradition of fishing in the community to which they are attached. As indicated in the following quote, not everyone survives:

Well, they have had a lot of changes over the years, the price of fuel going up astronomically, the price of bait going up astronomically, but not the price of their catch going up astronomically, and they’re still in business. Some have been weeded out, but others have survived.

The community member below similarly identifies survival as an indicator of resilience, as well as optimism in the future as a secondary indicator. The quote also captures the tenuousness of their survival; they have survived, but that does not mean they will continue to do so.

I think the fact that [fishing is] still here is an indication of that. I can’t speak specifically for some of the challenges they may be facing right now, but the fact that you are seeing some investments in lobstering, onshore lobstering facilities whether that’s processing or just storage, I don’t know, but that to me would indicate optimism about the future.

Diversification

The next theme is diversification; fishermen often referred to being diversified as enabling resilience, or they talk about diversifying as a strategy to be resilient. This theme has two related dimensions: diversification within and outside of fishing.

As noted, fishermen in Maine have long pursued diverse fishing strategies, and this is particularly true in eastern Maine. One Lubec fisherman described how
he holds multiple licenses, and harvests less-profitable shellfish when other fisheries are shut down. As he explains it, “When stocks have gone down, I mean being from Washington County, I have to do what [I] can to survive.” The quote suggests that this is something natural to fishermen “from Washington County” possibly due to the few economic opportunities in the area. In this way, it suggests that resilience in the form of diversification is part of their social identity, a theme described later.

The quote below further suggests that creativity is an underlying trait among fishermen that enables diversification.

We’re fairly creative … We’ll find something else to fish for … periwinkles—they’ve been big in the last seven or eight years; now the seaweed industry. We’ve never really had—well, for so many years we really had no industry, so we’ve had to get creative to make a living if you want to stay here [in Lubec]. And yeah, so [we’re] very resilient, very creative.

This link between creativity and diversification appeared to be widespread among the fishermen we interviewed. As one fisherman explained, resilience is because fishermen “want to make a decent living and so they put their thinking caps on,” to “figure [out] a way to survive … what I call evolving.”

The following quote expresses the willingness to “do whatever it takes,” which may be within or outside of fishing.

Now I’ve never went behind [in my payments]. I’ve never been behind on anything in my life. I always seem to think that there’s plenty of stuff to do and there’s plenty of money to be made if you just want to get out there and do it. You’ve just kind of got to set your ego aside and get in there and do whatever it takes. Today, my thing is I do everything that nobody else wants to do.

The fisherman below explains how it came to be that fishermen are “still here.” A driver for this is having investments in the fishery (e.g., boat payments) that require them to “try new things” or “diversify” in order to survive. In this case, the fisherman is planning to put a new kind of twine in his net to help address bycatch and rising fuel costs, another example of fishermen’s creativity and innovation.

You gotta make the payments, so you just try different things. Keep trying new things. Like this twine that I’m putting in my net. That’s going to help … Just diversify, like I did. What other choice do we have?
Similarly, the fisherman below describes diversification as a resilience strategy, but uses the language of adaptation instead. Again, we see innovation in fishing technology as important to resilience:

Yes, I think they’ve had to adapt to both the changes in the stocks, with declines, and adapt to new types of fisheries and grab the new type of gear to catch—they develop their own types of scallop drags. I think they have been very resilient.

Fishermen most often talk about needing to survive new regulations; the implication is that if they can’t respond appropriately, they will go out of business:

I’ve had to adapt and change my way of how I fish as a business … It’s a survival thing … I’ve adapted all these regulations, all these years. I’ve tried to make regulations work in my favor where I can stay in business.

This fisherman is talking about following new regulations, but while doing so adapting his behavior in ways to minimize the impact of the change on his business. Changes made in response to new regulations could fall under more substantive changes or “adaptations,” or they might involve coping. For example, a coping response to catch limit per trip might be to fish closer to shore to make more frequent, but shorter trips with the end result being that they catch the same amount of fish over the season. An example of a more substantive adaptation might be investing in new technology or a larger boat to pursue a new fishery. Some fishermen, however, report having little choice but to live with new regulations, suggesting they may be less resilient. Fishermen often state that they hope effort controls are temporary, while acknowledging that regulations rarely are relaxed.

The fisherman below also indicates that diversification is key to resilience, but that it is becoming more and more difficult due to regulations, perhaps suggesting fishermen are reaching a threshold in their ability to adapt. He indicates that this has led to them having to “fight,” suggesting it is different than what they have done before to survive.

We’re survivors. We continue to maintain … yes. But that resilience is becoming harder to obtain and harder to achieve with all of the new laws and regulations that come down because some of the avenues that we’ve gone into to be resilient are being taken away from us every day. We have a new problem now. We’re fighting. We’re fightin’ for our lives to be able to continue.

The threshold that is implied above refers to a reduction in their ability to be diversified. As indicated below, this is a significant concern for fishermen dependent on the lobster fishery.
So your lobster stocks collapse [hypothetically] … from a shell disease [then] this town’s [in big trouble] because we’re not diverse enough to handle something like that and probably in the ‘90s when it was diverse, it was scallopers, draggers, lobstermen, all of the above, and everybody made a living doing a little bit of everything, but now it’s basically all their eggs are in lobstering except for a scattering few.

This is less of an issue in Eastport and Lubec because fishermen there are generally more diverse and few rely solely on lobster compared to the mid-coast region.

Another perspective of resilience relating to “diversification” is having a “back up plan” to get by during difficult times. This may mean diversifying in response to a problem, but it also includes being ready to diversify in anticipation of problems. Again, the temporal dimension becomes important. Diversification can still involve fishermen’s skills and expertise as captains and fishermen, such as diving for aquaculture companies, running whale watching tours, and working for the shipping industry.

Also important are jobs that fishermen turn to outside of the fishing sector, such as driving trucks or construction work. One fisherman estimated that during the summer at least 50 percent of the commercial fishermen in Eastport work part-time outside of fishing. When asked if fishermen in his community were resilient, one fisherman from Eastport explained that fishermen resist change, but most have other jobs to fall back on.

I mean nobody wants it. If we have to, we will … All the fishermen that fish always have something else to fall back on. I mean some of the guys cut wood, some of them have other jobs.

At a higher scale, non-fishing community members are also creating alternative economic opportunities. This diversification in the communities is reflected in how those outside of the fishing industry often talk about resilience in the community. In Rockland, for example, we heard resilience described as new economic opportunities that come with tourism—one community member explained, “Without a doubt the community is resilient, you see what it’s evolved from and to in the last 20 years, and its dramatic differences. Main Street is thriving.” Indeed, in Rockland this transition is most visible in its efforts to promote the arts and tourism. In Lubec, a town official explained, “We are probably one of the most resilient former fishing communities because of our talented workforce and tourism. The strengths are in the diversity of our community” (emphasis added). In both Lubec and Eastport, tourism is being promoted and there are positive signs of economic development, although less so than in Rockland. Eastport and Lubec are also promoting new industries, such
as tidal and wind power. The implications of economic diversification outside of fishing, and the gentrification that they may stimulate, is uncertain: Will these changes help or hinder the fishermen in the community? Will changes further threaten fishermen’s access to the waterfront? Does the resilience of the community come at the expense of fishermen? These are important questions to understanding resilience in these communities. For some, these changes are welcome; for others, there is great concern that fishermen will be marginalized even further in the community. This is reflected in their belief in their ability to survive and optimism about the future.

Getting by

In contrast to adapting for “survival,” such as through a diversified fishing portfolio, resilience is also expressed when fishermen describe responding to threats or change as simply “getting by,” or making small changes to get through difficult times. When they talk about getting by, fishermen often refer to “tightening up your belt” or “knuckling down” during hard times. According to one respondent, fishermen “have been inconvenienced many times and lived through hardship many times.” Another fisherman explained, “When times get tough, [fishermen] just knuckle down … and watch their expenses. You always hope for a good year.”

The need for this kind of resilience is driven by volatile fuel costs and prices in the fishery, as well as more global economic downturns and recessions. Also part of “getting by,” some fishermen are flexible and able to respond quickly to change. This has been described as being practical; one fisherman explained: “I mean almost on a daily basis you’re adapting to one thing or another.”

Some strategies are temporary responses to short-term conditions, and once the crisis is over, they return to their normal activities. But strategies for “getting by” could lead to long-term innovations and creativity, such as new fishing strategies and technologies (such as the new twine described earlier).

Another example of “getting by” is increasing reliance on income and support from family members, particularly spouses. Fishermen we interviewed acknowledged the vital contributions from their spouses that helped them “get by.” Examples of important and direct contributions to the fishing business include bookkeeping, submitting necessary paperwork such as permit applications and landings data, maintaining fishing gear, and representing fishermen at fishery management meetings. In addition, spouses also provide key support through non-fishing employment that offers supplemental income and, often more importantly, health benefits.
Social identity

Several fishermen indicated fishing is part of their social identity and this keeps them resilient, preventing them from giving up during hard times. As an example, one fisherman explained, “Because the ones that fish, that’s what they want to do. It’s in their blood and they do it. Doesn’t matter if it’s a bad year or a good year, no, they’re gonna do it.”

Most importantly, their history and dependence on fishing drives their resilience, defined broadly as “finding a way to keep fishing going in the community” or being “a tradition” that persists. This is described by one fisherman:

Tradition, just the fishing tradition, people are entrenched in the fishery, resilient. People of this community—there’s a lot of heritage so people are always gonna want to go fishing—find a way to go fishing.

Some fishermen spoke about how the broader community helps fishermen, providing them with some resilience to “bounce back” after difficult times. For example, one community member explained when asked if the community was resilient:

Yeah, I suppose. I mean. They always bounce back ... I know one time, they have a supper to raise money for somebody ... It’s a small community, they all kind of stick together.

In many of our interviews with fishermen, we heard echoes of Princen’s (2005) “logic of sufficiency” expressed. For example, when asked how fishermen in the community were doing, one fisherman responded, “I wouldn’t say very well, but we’re getting by.”

Indeed, “getting by” here refers to the quality of life; they are not doing great, but not too bad either, and that is OK. It is clear that this “getting by” attitude is part of their social identity. As one fisherman explained, “We have seen bad times before, will see them again. If you don’t expect as much because of upbringing and work you’ve had, then you don’t need as much.” In other words, they are happy doing “not great” because they are satisfied that their needs are met with what they have.

Similarly, in addition to having jobs to fall back on, some fishermen indicate resilience also comes from “saving for a rainy day.” In other words, “it goes in cycles,” so they do not spend beyond their means in anticipation of bad years. Not all fishermen do this well, however, and this is viewed as contributing to some of the financial problems in the industry.

I think it’s resilient. I think most of the financial problems—a lot of them fall back on individuals, on how they live ... You know, we lived
close to what we made … Whereas, now, they’ve got to have bigger, faster boats. They’ve got to have snowmobiles, and I think the business end of it maybe—has [been] forgotten a little bit … I think that’s like a lot of the young people growing up with different visions of how you get by.

The same fisherman told a story of an old captain who told him that he “wouldn’t get rich fishing,” but that he “wouldn’t starve to death” either; the point he was making to us is that for him (and his fellow fishermen), getting by is enough.

This theme also suggests that resilience transcends the actions and decisions of individual fishermen, and the role of the larger community should not be ignored. In some cases, like Port Clyde, Eastport, and Lubec, the “broader community” includes non-governmental organizations (NGOs) that provide organizational and financial support for fishermen to respond to change. In Port Clyde, an NGO was instrumental in providing adaptive capacity for fishermen, helping them develop a new marketing brand, a community-supported fishery, a groundfish sector, and a permit bank (the latter two enables their participation in the region’s catch share program). We also see this in the Cobscook Bay communities where a local NGO has provided fishermen with organizational support and has facilitated dialogue in the community that has enabled fishermen to respond to past threats. The NGO is also working with fishermen to improve marketing of their fish products.

**Optimism**

As indicated earlier, optimism appears to be another indicator of resilience, seen as investment in the future. On the other hand, lack of optimism (little or no investment in the future) suggests a loss of resilience, and generally a lack of overall well-being. This is expressed when we asked people to reflect on the future of their communities. The lack of optimism was most pronounced in stories of drugs and alcoholism. Many fishermen lamented these difficult times, as expressed in the following quote.

> I saw whole families break up. I saw people lose everything they had. I saw people get divorced. Some people killed themselves. People turned into drug addicts, they turned to drugs because they couldn’t pay for boats, wharfage, insurance, truck payments, house payments, college loans.

One fisherman also made a connection between lack of optimism and resilience. When asked if the fishing community was resilient, he explained, “probably not as resilient as they could be without different socioeconomic difficulties.” And when asked what socioeconomic difficulties were preventing resilience for these fishermen, he explained further:
Probably drug abuse and alcoholism and those kinds of things ... Well, I think it’s a problem everywhere really when you ... dip into the lower income levels ... you tend to lose your hope and your faith in the process and in the future and stuff. You dip into that ... A lot of it is just plain lack of hope really.

**Discussion**

Recent studies examining vulnerability and resilience in fishing communities have focused on quantitative indicators of secondary data (Colburn & Jepson, 2012; Jepson & Jacob, 2007) or analyses of survey data (Marshall & Marshall, 2007; Pollnac & Poggie, 2008), and significant effort has been done to develop a robust set of indicators for measuring well-being of fishermen (Pollnac & Poggie, 1988, 2008; Smith & Clay, 2010). These approaches offer potentially low-cost and rapid social impact assessment capability. Our research took a qualitative approach to understanding what it means to those living within fishery-dependent communities to be resilient through reflections of fishermen and others on the past, present, and future of their communities, including the threats they face and how they are able to respond to them. Based on our analysis, we identify five broad “qualitative indicators” of resilience: survival, social identity, diversification, getting by, and optimism.

The fishermen in our study, as elsewhere, continue to face dynamic social and environmental threats that they must be willing and able to respond to if they are to survive. In our interviews, a key indicator of resilience is simply that fishermen are “still fishing” or “being survivors,” and that fishing remains part of the community. This qualitative indicator could be quantified, for example, by asking a simple question: Is there fishing going on in the community, yes or no? However, whether there are enough fishermen “still fishing” or they are fishing enough would be more difficult to quantify and would likely differ for each community. Some communities with a longer or more established history and culture of fishing might require a higher level of fishing activities to occur than a community where fishing is only a small part of the overall economy of the area. This latter aspect relates to the next theme, social identity.

Interviews point to fishermen’s social identity as fishermen as a key indicator of resilience, and secondarily that this social identity compels them to respond to survive, whether it be coping or adapting. In many cases their identity as fishermen push them to make the necessary changes to adapt to new social and environmental conditions; they want to survive so that they can still be fishermen. Without this identity, fishing is just a job, and people who have viewed it in that way have already rationally decided to leave fishing due to the cumulative difficulties; that is, they have lost their willingness to endure...
the hardships. At a higher scale, our findings also suggest that the community’s identity as a fishing community creates resilience. Fishermen receive support for adaptation from the broader community, such as through charity dinners and relief funds. In Port Clyde, the broader community has embraced the fishermen’s local marketing initiative; without their willingness to pay more for fresh, local fish, fishermen would not benefit from the program during low-volume harvests. Related to social identity, fishermen also want to see a future for their community that includes fishermen; and many currently do not because there are few opportunities for new fishermen to enter the fishery. This may contribute to the loss of social identity, and subsequent loss of fishermen’s resilience. Rather than through secondary data, social identity could be measured in a rapid assessment that would require visits to fishing communities. For example, a researcher might follow a scale for measuring the “level of industry attachment” as described by Marshall and Marshall (2007).

Our research also suggests that once a threshold of impacts or vulnerability is reached, fishermen and the broader community begin to lose hope and optimism about the future. This qualitative indicator, pessimism (or lack of optimism or hope) about the future, reflects individuals’ ability to respond to problems, or invest in the future. During difficult times, some fishermen turn to drugs and alcohol (sometimes they recover, but not always). In our research, this appeared more pronounced in remote, isolated areas. We theorize that the cumulative effect of losing optimism can impact the social identity of the community, further impacting its resilience and fishermen’s ability to “survive.” Optimism might be analogous to job satisfaction and well-being, and therefore could be quantified using established well-being and job satisfaction measures (Gatewood & McCay, 1990; Pollnac & Poggie, 1988, 2008). Optimism also could be measured through surveys using statements like those identified by Marshall & Marshall (2007), such as, “I am more likely to adapt to change compared to other fishers I know,” or, “If there are any more changes I will not survive much longer.” This too would require visits to the fishing communities, rather than collection of data through censuses or other secondary data sources.

A key strategy includes activities we termed “getting by,” which is similar to “coping” (McCay et al., 2011) because it involves very low levels of response. It refers to the short-term efforts made only during hard times—“tightening belts”—such as using less bait, minimizing fuel expenses by driving boats more slowly, or putting off maintenance and repair—or even non-fishing expenses, like eating out less. In this case, fishermen return to normal activities once the crisis is over. These practices and strategies are important components of fishermen’s resilience, but would be difficult to measure through secondary data.
collected every 5–10 years or through a structured survey. We could imagine using checklists as part of rapid assessments that could try to capture some of these “getting by” strategies.

Diversification emerged as an important indicator of resilience. McCay (1978) describes diversification as a strategy that allows individuals to “cope with problems.” It involves “spreading of the risk” and includes activities within or outside of fishing like diversifying their gear, investing in other fisheries, and occupational pluralism—that is, drawing on non-fishery occupations and government welfare for subsistence (McCay, 1978). Fishermen can adopt diversified strategies in anticipation of threats and the need to respond. These may stem from, for example, social memory or expectations that fish stocks are cyclical or inherited local ecological knowledge of stock fluctuations about good years and bad years. In this way, fishermen’s resilience is from being proactive and expecting change, and is tied to their identity of being creative. Alternatively, some fishermen may only diversify when something goes wrong—an unexpected stock collapse, loss of a market due to global forces, or emergency fishery regulations, for example. These may call for short-term or long-term diversification. In this case, diversification is reactive, in response to change. Diversification could be measured through types of permits used (and/or available) or landings, but interviews and participant observation with fishermen would be ideal ways to gather data on fishing practices and the extent that fishermen diversify, including under what conditions they diversify and how they do this, as well as the consequences of their diversification.

Finally, our research highlights the importance of broader institutional forces intervening to enable and even promote diversification efforts as critical. For some communities, institutional support from the private or public sector is needed to maintain or enhance resilience when facing particular threats. While we can readily document the presence or absence of such NGOs and community-support institutions, additional field research would be needed to understand how these groups interact with local fishermen and the ways in which they aid or hinder their resilience.

In conclusion, we recognize that many of the qualitative indicators that we have identified could be quantified or measured in some way and overlap with those already identified in the literature. Survival could be quantified simply as the presence or absence of fishing (e.g., through fish landings or numbers of active fishing vessels). Diversification could be quantified by simply counting numbers of licenses available and utilized. And optimism could be measured through existing well-being indicators. However, we argue that it is also critical to understand the practices that fishermen pursue to “survive” or simply “get by.” We believe it is insufficient to know the information provided by secondary data such as how many licenses a fisherman owns and whether they
use them or not. We also want to know which licenses they have, which licenses they would like to have, and when and how they use them in relation to each other. Understanding individual practices would be difficult, if not impossible, to capture with secondary data alone. Furthermore, only through qualitative studies can we capture how a fishermen’s individual perspective on their identity influences resilience. Thus, we propose that along with the important work being done to develop quantitative social indicators of vulnerability and resilience using secondary data, ethnographic research and fieldwork in fishing communities is also needed to pursue and document qualitative indicators that capture the complexities of fishermen’s behaviors, their practices, responses, and perceptions of change.

Acknowledgments

This research was supported by grants from Maine Sea Grant, the Maine Agriculture and Forest Experiment Station, and Maine’s Sustainability Solutions Initiative. The authors would like to thank all of those who were interviewed and otherwise contributed to this research. Chris Bartlett of the Maine Sea Grant and the University of Maine Cooperative Extension provided valuable support and assistance with interviews, focus groups, and other outreach efforts. The Cobscook Bay Resource Center and the Cobscook Bay Fishermen’s Association helped identify participants in Eastport and Lubec.

References


Place Matters: An Investigation of Farmers’ Attachment to Their Land

Courtney E. Quinn¹
Furman University, South Carolina, United States

Angela C. Halfacre
Furman University, South Carolina, United States

Abstract

Place attachment research can shed light on how farmers form relationships with their land and therefore have implications for landscape management and food systems. Unknown is how farmers develop place attachment. In this qualitative study, we examine psychological and physical experiences as antecedents to place attachment using attachment theory. Following 29 semi-structured interviews with 34 respondents in Upcountry South Carolina, we examined farmers’ security-seeking and exploration behaviors. Farmers receive security through feelings of peace and safety while on their farm and provide economic security to their families and environmental security to their land. Farmers’ exploring behaviors include trying to be more innovative in sustainable management of their land. This research helps elucidate how farmers develop attachment. It has implications for how farmers manage their resources as well as understanding the environmental, social, and economic impacts of these decisions and land conservation in the American south.

Keywords: conservation, farmer perceptions, farms, place attachment, sustainable agriculture

Introduction

In her extensive review of place attachment research, Lewicka (2011) asks, is place still important? Given the rapid pace of globalization, homogenization of landscapes, and virtualization of spaces and relationships, places with distinct character are disappearing (Giddens, 1991). Yet despite apparent changes, researchers have shown that places continue to hold special meaning (Comstock et al., 2010; Lewicka, 2010). Research has demonstrated peoples’ place attachment to nature. Most recently, researchers have revealed attachment to areas where human and natural systems intersect, in particular fisheries (Urquhart & Acott, 2013) and farms (Hildenbrand & Hennon, 2005). Considering recent trends and

¹ Corresponding author: courtney.quinn@furman.edu.
dynamics of local food movements, farms have become potentially important places for community building and conservation. Most importantly, farmers’ connection and level of attachment with their land may affect their lives and livelihoods as well as the consumers they serve.

Farmers’ place attachment

Attachment to place is multifaceted, and includes physical (Stedman, 2003) and social (Hidalgo & Hernandez, 2001) dimensions. This is particularly true for farmers, who live, work, recreate, and socialize on their farm. Land is more than a place to grow crops; farms are locations with history, symbolic meaning, and repositories of emotion. Although literature is light, researchers have demonstrated farmers often have deep embedded place attachment (Dominy, 2001; Gray, 1998; Hildenbrand & Hennon, 2005; Kuehne, 2013). Place attachment is important due to its impact on how farmers view, and ultimately treat, their land. Encouraging place attachment may well assist in the best management of resources and promoting human well-being.

While the embedded relationship between farmers and their land has been documented, the mechanisms that facilitate such bonds are less understood (Burton, 2004). Gray (1998) proposed that attachment is attributable to the “genetic metaphor;” farmers believe their abilities are a part of them, just as sheep are bred for living on hillsides. Burton (2004) suggests a mechanism based on interlacing family identity through the expression of self in the land. Families often give a name to their farm, which in turn gives the family an identity. Although Burton’s claim is important to identity research, his work assumes that only farmers on the same land for generations can have a strong attachment to their farm. Cheshire et al. (2013) found that farmers often remain attached to family farm property even when they engage in agribusiness elsewhere or have sold the family farm.

Our research starts with the assumption that farmers are attached to their land, and seeks to examine how farmers develop their attachments, regardless of land tenure or residence length. We ask, ‘What is happening on farms that creates in farmers such a deep place attachment to their land?’ What actions are occurring; the specific cognitive, emotional, and physical events that lead to attachment?’ By examining the mechanisms of place attachment and not merely its predictors, we elaborate upon the “how” of place attachment.

The process of place attachment

Understanding the process of place attachment has had limited study. Low (1992) proposed that social relations occurring in a place are the most important component opposed to a relationship with the land itself. Most research has
echoed this sentiment, claiming that the meaning of a place is formed solely through social interactions (Kyle & Chick, 2007). This view was contested by Stedman (2003), who noted the importance of physical places in place attachment. People can become attached to the meaning they give to a physical space, be it a mountain or a farm. Despite this debate over the importance of social versus physical aspects of place attachment and an extensive body of research demonstrating place attachment in both built and natural systems, we lack a broadly applicable explanation of the processes by which attachments form (Lewicka, 2011; Morgan, 2010; Williams & Vaske, 2003).

To investigate beyond the social and physical aspects of place attachment, researchers are adding other dimensions, including “process.” Scannell and Gifford (2010) introduced a tripartate framework of people–place–process to offer a more holistic research approach that involves social interactions and physical place, as well as how attachment develops. In this paper, by focusing on “process” we explore the phenomenon of farmers developing place attachment. We utilize attachment theory of security exploration, a proposed mechanism of place attachment development (Lewicka 2011), to investigate ways farmers develop and maintain attachment to a farm property (Figure 1).

![Figure 1. Proposed study mechanisms for development of place attachment](image)
Attachment theory was originally proposed to explain the emotional bonds formed between an infant and caregiver (Bowlby, 1969). One proposed model of attachment development is an iterative cycle between exploration and security behaviors (Morgan, 2010). Researchers have more recently applied the idea of security and exploration to attachment with a particular place. Place attachment results from the association between the positive effect experienced when feeling secure and the sense of adventure and mastery resulting from exploratory behavior (Lichtenberg, 1989). While Lichtenberg claimed that strong place bonds are only possible when children remain in one place for the duration of their childhood, others note that place attachment can occur when settings are instilled with meanings that create or enhance an emotional tie, regardless of a person’s age (Cuba & Hummon, 1993). Several studies have proposed that a primary role of place attachment is to provide a sense of security (Chatterjee, 2005; Fried, 2000). Interestingly, however, attachment theory of security and exploration has not been explored in adults’ place attachment. This rich theory may provide insight into how place attachment occurs in adults.

Study area

The Upcountry of South Carolina comprises 10 counties in the uppermost region of the state. The area lies adjacent to the stretch of the Appalachians known as the Blue Ridge Mountains. The land was originally forested but has experienced heavy soil erosion due to extensive pasture and crop production (Carbone & Hidore, 2008). From 1790 to the end of the Civil War in 1865, cotton production was the most important economic activity in the American south and continued to play a role in the agricultural economy of the Piedmont region through the 1940s.

At present, farming remains South Carolina’s second-largest industry, contributing US$36 billion in annual revenue and sustaining 460,000 jobs. Since 1960, however, the number of farms across the state has declined from 86,000 to 24,000.² The rising costs of labor, fuel, pesticides, and fertilizer, as well as packing fees and out-of-state competition, are leading many farmers to sell much of their property to developers and/or leave the business altogether (Halfacre, 2012).

The United States Department of Agriculture (USDA, 2007) reports over 8,000 farms in Upcountry South Carolina, coming close to a million acres in farmland. Yet the average farm size remains small at 120 acres. Although there are a high number of farms, 81 percent report less than US$10,000 per year in the value of farm sales and 66 percent of farm operators maintain their primary source of income off-farm (USDA, 2007). Many of these small farmers supply the

increased demand for local food. There is a growing trend of consumers actively seeking local farm products in South Carolina. Consumers can choose from farmers markets, roadside stands, community supported agriculture programs where customers pay a fee and receive a box of fresh produce weekly from a farmer, or purchase local foods at small and larger grocery stores. One indicator of burgeoning interest in local food in this region is the presence of *Edible Upcountry*—a quarterly periodical that has expanded from 10,000 to 17,000 distributions in less than three years.

**Methods**

This empirical phenomenological study seeks to understand the lived experiences of farmers in relation to their land. Phenomenology seeks to describe the meaning, or universal essence, a group of people assign to their lived experiences of a specific phenomenon with descriptions of “what” is experienced as well as “how” it is experienced while researchers set aside their personal understandings to concentrate on the experience of participants (Creswell, 2013; Moustakas, 1994). We performed a regional case study to explore the nuances of farmer perceptions and shed light on dynamics not previously studied (Yin, 2014). To explore our research question—what is the process that farmers engage in to develop place attachment?—we draw on data from 29 semi-structured interviews with 34 farmers, collected in winter 2012–2013. The goal of the interviews was to converse with farmers regarding their history, experiences, and perceptions on farming. An interview protocol was developed including questions about farming history, challenges and joys, production practices, and conservation views and behaviors. Participants were identified through purposeful typical case sampling and snowball sampling (Miles & Huberman, 1994; Patton, 2002) techniques. Purposeful typical case sampling is conducted with the cooperation of key informants who can identify who and what are typical cases (Patton, 2002). Snowball sampling is a preferred method of recruiting research participants when the goal of research is to examine a lived experience, and not to test a series of predetermined hypotheses of a representative sample to allow for extrapolation to the whole (Biernacki & Waldorf, 1981). It is recommended to conduct between 5 and 25 interviews for a phenomenological study (Polkinghorne, 1989). Through this process we accessed a wide array of farm types found in the Piedmont, including small organic produce farms, orchardists, small poultry and livestock farms, and large conventional produce operations.

The goal of the interviews was to generate a dialogue to elucidate farmers’ knowledge and experiences regarding their attachment to their farm. Our purpose was to investigate the richness of experiences as well as meanings
farmers attribute to their land. Semi-structured interviews were conducted as conversations, with open-ended questions to allow interviewees to express themselves freely. Two researchers were present for each interview, which occurred most often on the interviewees’ farm. Interviews lasted between one and two hours. Researchers were encouraged to explore topics in-depth by asking follow-up questions. At the end of each interview, demographic profiles were collected. All interviews were audio recorded and later transcribed. Using RQDA qualitative analysis software (Huang, 2012), we first highlighted significant statements of textural and structural description using quotes under the *a priori* codes of (1) security and (2) exploration (Creswell, 2013; Moustakas, 1994). Next, we developed clusters of meaning from the significant statements into themes regarding attachment theory (Moustakas, 1994). The evidence presented below draws from answers elicited through structured questions or indirectly through continuing conversations.

**Results**

Twenty-nine farms were included in our interviews, with 34 farmers participating. Our sample comprised 25 men and 9 women. The average age for men was 56, with a range from 35 to 82. The average age for women participants was 53, with a range from 28 to 65. Twenty-four respondents own their land and four lease. One farmer is a manager for a university farm who neither owns nor leases the land. We collected data on farm size, main production ventures (Table 1), and land tenure, and categorized farms according to the work relationships of the primary farm operator(s), although farms could be categorized under more than one area (Table 2). Most farms were small in geographic scale, ranging from less than 2 acres to 30 acres. Two farms, one solely produce and one produce/livestock, were roughly 300 acres. One farmer leases land throughout the Upcountry and employs farm laborers on 2,500 discontinuous acres.

**Table 1. Main production ventures**

<table>
<thead>
<tr>
<th>Farm products</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>21</td>
</tr>
<tr>
<td>Orchards or berries</td>
<td>5</td>
</tr>
<tr>
<td>Dairy</td>
<td>1</td>
</tr>
<tr>
<td>Meat production</td>
<td>5</td>
</tr>
<tr>
<td>Goat (meat or dairy)</td>
<td>4</td>
</tr>
</tbody>
</table>
Almost all of our farmer participants expressed a deep attachment to their farm. The one exception was a farmer who rents patches of land in various places and grows conventional produce for wholesale. However, it should be noted that renting, as opposed to owning, land did not preclude farmers in our study from developing strong place attachment. When asked what their land means to them, many farmers had immediate strong and emotional reactions. Farmer responses often had a poignant note, comparing their land to a member of their family or the place where they feel spiritually fulfilled.

Security as a driver of attachment

The relationship farmers have with their land is complex. From our analysis, three primary themes emerged regarding place attachment development and security. First, interviewees reported they receive security from their land through a sense of safety or peace. Second, farmers reported they provide security to their land by acting as stewards. And third, farmers reported they are seeking security by creating a thriving economic business and leaving a family legacy.

Farmers reported receiving security from their land. In light of attachment theory, a farmer represents the infant seeking security and the farm serves as caregiver. Farmers discussed the spiritual sense of peace and calm they find on their land. "It means way too much to me. I mean it sustains me, there’s no doubt about it, um, it’s truly my haven, it is a place where I can feel safe.” The farm is a place that, despite hard physical work, farmers find time to relax and enjoy life. Several farmers discussed the therapeutic nature of working on their farms—perceiving their work as “feeding their soul.” In addition, farm spaces contain a spiritual security for some. “I’m not very much of a religious person but from a spiritual perspective, this is where I’m happiest.”

Some farmers described times when they received security from their farm during physical and medical hardships. Three farmers discussed how their farm helped them recuperate from a medical situation. “After my stroke I was paralyzed on the left side. My rehab was [my farm] out there. I could walk
around, I took a stool at first. The first year I took a stool with me and I’d sit down … and next thing you knew I could actually walk 12 feet. And now I can—I have gotten a lot of strength back.”

Second, farmers see themselves as providing security to their land, as caretakers or stewards. “It’s my baby … my second baby.” In this sense, within attachment theory the farmer acts as the caregiver and the farm serves as the infant. Farmers engage in activities to improve and care for the land and animals such as building soil, invasive plant removal, water redistribution, sustainable agricultural practices (few or no pesticides, organic certification, free-range animals), and fence building. Some farmers consciously limit the physical size of their farm to be able to have a deeper understanding of their operation. “And we are standing here, and you can see it all. You can kind of wrap your arms around it in some sense that you can’t get in a bigger place.”

Farmers also provide security to their livestock on a day-to-day basis as well as during intense difficult situations such as birthing, death, or extreme weather. These experiences have had significant impact on our research participants, encouraging a strong sense of attachment to the animals themselves as well as the wholeness of farm life. Many farmers became emotional during our conversations when they discussed assisting in birthing baby animals or tending to animals during extreme weather. These memories and experiences clearly carried strong positive associations for farmers. “A couple of years ago I was out in the sleet rotating them [cattle], and I was out in the sleet moving electric wire to move the cows and I thought ‘I love these animals’ (gasps) I can’t believe I thought that!”

Interestingly, we found a third relationship between farmers and their land that is not neatly explained by attachment theory. Farmers discussed that they are seeking economic security, which may or may not be their current reality, and to leave a family legacy. In this relationship, farmers are using the land to create a secure place and a living for their family. This supports previous research showing the importance of the relationship between economic dependence and sense of place for farmers (Crossa et al., 2011). Farmers work to create a secure financial living by engaging in production practices and economic ventures that will provide a stable income to ensure that the farm property will continue to be farmed in the future. In this relationship, the farm does not give security as a peaceful or spiritual place. Farming can be an economically unstable business, so the farmer must create his or her own security. Farmers discussed the importance of considering the farm as a business. “My sustainability is I have a threshold of this much money. I need to make this much money to survive in the farming business. If I don’t make that much money, it doesn’t matter how many tomatoes I grew, I can’t make a living at that. And you have to make a living of this.”
In addition, many farmers want to leave a legacy for their family. “I look at it as the future and the future of my family. So I look at it that way, I’m building up this land, taking care of this property. Making as many improvements as I can possibly do so that when they have it on their own it’s not so tough as it was for me.” Farmers want their children to feel the same sense of security that they do on farm property, even if their children are not currently living on the land or a daily part of farm work. “My goal has always been, I want my kids to always think of this as home. I want them wherever they choose to go in life, I want them to be able to come back to think of it, to preserve it.”

To create and preserve a secure farm setting, farmers engage in practices and projects that will, hopefully, provide a more stable environment, such as water redistribution. “I want to be able to control the movement of water; that’s the biggest thing because without water you cannot have life.” Farmers also diversify produce and livestock operations for security. “One of the things you have to do with small farming, you have to diversify.” In addition, farmers have expanded the use of their land to include non-production ventures such as agritourism to ensure a more stable income. “Weddings hosted at the farm have been a significant source of income.”

**Exploration as a driver of attachment**

Although security is perhaps the ultimate goal of a farmer providing for their family, the role of farm as a place to explore was mentioned by almost every interviewee. Farmers’ exploration includes mechanical fixes for old farm equipment, personal recreation, nature observation, and new production ventures including value-added products like goat-milk soap to heritage breed poultry to hundreds of apple or peach varieties. Farmers also experiment with new and different technologies such as online decision-making tools and energy sources such as windmills.

For farmers, security and exploration are connected as they hope their experiments will lead to greater economic or environmental security. However, farmers discussed how the process of trying new things is an innate part of who they are. For our farmers, exploring is a constant; a mindset and a part of their personality and identity. “You’ve got to be ready to research and experiment. You’ve got to always be thinking, ‘what if I did this’, and running scenarios all the time. You can’t just sit and try and do one crop and expect you’re going to make it. You got to continually look at markets and potentialities of what you could be doing, not just what you’re doing now.”

Many farmers have a deep need to try new things and solve problems, and being a farmer was an outlet for that desire. For 19 of our interviewees, farming is a second career. They left careers in areas such as marketing, design, or
construction. For a few it is a twilight career after retirement from business or academia. Most of our interviewees use production methods that combine historical methods (pesticide free) with modern science (soil testing, no-till, integrated pest management, etc.). Farmers relish relearning old techniques as well as devising novel systems. “Well that’s where this new generation of farmers, that generation that was probably operating on passed down information is pretty much gone now, and in their places you have people who are trying to learn, trying to develop back into the process of studying different things.” Farming is seen as a grand exploration and farmers appreciate the freedom to explore. “Each year you get a little better and your plants get a little better, more vigorous and healthy and you have crisis and you have failures and it gets more enjoyable, even the failures you see that as a learning opportunity.”

Farmers use their land for personal and family recreation. Engaging in activities other than farm chores appears significant for forming a strong bond with the land. Fishing, hunting, horseback riding, target practice, family birthday parties, camping, hiking, nature photography, star gazing, mountain biking, paddling, and four-wheel driving are all activities farmers partake in on their land. “It’s a life! Yeah, you know, on weekends I’ll grab my daughter and we’ll ride around, take a look at what’s going on in the garden. Doing this and that, that’s fun to me.” Farmers also use their land for quiet reflection and meditation. “I’ve got my quiet spot on the very back side of the farm where I go and sit and think and do my work. Nobody can find me.”

Interestingly, some farmers see their work as recreation itself. Many find it fun and enjoyable. “Sunday afternoon is the time to go check the cows. Now that’s sort of work, it’s taking care of what we have, but it’s also fun, you know, and to me, recreation is something that’s fun.” Another farmer stated, “Oddly enough, the labor on the land, in many cases is recreation. You know, it’s really relaxing to just go out there and prune vines, it’s really relaxing to go out there and take the hoe and weed rows and hill beans and things of that nature. You’re accomplishing something but it’s also relaxing, I don’t have to go to the gym to work out, I just go out to the backyard, and do that.”

Farmers take a keen interest in the wild flora and fauna on their property. “I teach my granddaughter to identify birds and flowers. I used to take my little Sierra Club Wildflower book with me.” Many farmers can identify wild plant species, birds, and mammals. They spend time watching the life cycles of wild creatures. These observations occur while engaged in everyday activities and recreation. “It’s observation based as you go about your daily thing. The other morning I came out and there was a flock of 12 wild turkeys just out in pasture. And I could see ’em and they’re just doing their thing.” Place attachment is formed through experiences that are both mundane and extraordinary from spending time with family to bird watching and exploring the natural history
of the farm to connecting to nature in a spiritual manner when seeing particular wildlife or changes to the land. “I’ve got Henry my hawk, I call him my hawk, his territory is staked out around the farm. I get out on my tractor and start mowing grass, in the summertime he’ll come off the trees and just sit there and fly right beside me.”

**Discussion**

Our results align with previous studies showing that farmers can develop a deep connection with their land and animals. Here we move beyond descriptions of place attachment to investigate the process by which farmers develop their attachment to place. Though the attachment theory of childhood development is not a perfect analogy to explain the phenomenon of farmers developing place attachment to their farm, it did provide a valuable starting point. Through receiving, giving, and seeking security farmers act as both a caregiver to their land and one who receives care.

In receiving security from their land, farmers develop a deep place attachment. The farm provides a sense of peace and sometimes even helps farmers through difficult personal journeys. These results demonstrate the importance of place in development of place attachment, in that the relationship that is the impetus for attachment is between a person and their land and not merely the person-to-person interactions occurring there.

In providing security to their land, farmers are considering much more than economics. This security is a holistic consideration of the long-term well-being of the farm as a system, as well as day-to-day ethical consideration of welfare through healthy and happy animals. Farmers regard their role as caretakers to be a calling that provides purpose to their lives, more than a paycheck. Their role is to leave the land better than when they found it so that whoever uses it next will find a well cared for and ecologically healthy space. This larger purpose of farming connects farmers with land, animals, community, and the future in ways that help to create deep place attachment.

In finding the economic consideration of seeking security as a separate issue for farmers, we see a distinction between the ecological security of the farm itself and security of immediate home economics and a family legacy. The economic considerations of farm life were important to our farmers; they recognize that without this consideration they will not be farmers for long, but our farmers are not willing to sacrifice their role as providers of long-term ecological security and day-to-day ethical animal care for short-term economic profit.

Exploration was also found to be important to farmers’ development of place attachment. The farmers in our study highly valued exploration experiences.
We found that farmers like to have new and novel problems to solve, and enjoy recreation and observing nature to explore the world on their farm property. For our farmers, the process of exploration is an innate part of their self-identity. Our participants were drawn to the life of a farmer, where daily problems lead to exploration opportunities to fix an old tractor, try a new crop rotation, or observe and learn about the pests attacking a plant. These things are seen as exciting adventures and opportunities to learn. When a challenge is successfully met, our farmers’ self-identity is strengthened and a deeper relationship forms with the land that offered that opportunity.

When farmers recreate on their land, they have positive experiences with either surrounding nature and/or family and friends. These bonding experiences strengthen place attachment with the farm. Therefore, farmers bond with their land over both work and play. In addition, farmers spend a great deal of time observing daily rhythms of their crops and animals as well as surrounding natural flora and fauna. Bonding with the land through a special wild animal or in finding rare native flora creates attachment to the place in which this discovery occurred.

These findings are noteworthy as they depart from those of most place attachment studies that look at behaviors that result from place attachment, not behaviors that contribute to the development of place attachment. A better understanding of how place attachment develops will provide a deeper understanding of the relationship between a farmer and a farm. This research is a starting point for investigating the roles of various relationships that exist within a food system, between people and land as well as between farmers and consumers. Our data show development of place attachment, at least for farmers, is not necessarily dependent upon time in a location or childhood memories, but rather from specific experiences. We found new farmers (on their land for less than five years) reported a deep place attachment similar to farmers who have been on the same land for 20 years or more. Even farmers who lease their land reported a strong attachment to place. Our results can lend support to practitioners, extension agents, and advocates working to aid beginning farmers by demonstrating that experiences can alter perceptions. In addition, attachment to place opens doors for specific extension and outreach to have greater impact.

Our finding that security—exploration is an important mechanism for farmers’ development of place attachment by no means precludes other variables and mechanisms from playing an important role in the process. As very little work has been conducted on the process of place attachment, numerous avenues exist to explore this topic further. Other methods of investigation could add to our understanding of the process, including observations, quantitative questionnaires, and work with new farmers to gauge and record their experiences of developing place attachment. Research should also examine what economic
or environmental benefits, if any, occur when farmers are attached to their land. How does place attachment influence behaviors including conservation, legacy planning, and production practices?

Future research should also examine place attachment developed by consumers who frequent particular farms and have a relationship with farmers. Important future research questions include: Can consumers develop place attachment with a farm? What process do consumers engage in to become attached to a farm? How can farmers promote such an attachment between consumers and their farm or consumers and themselves? What economic, social, and ecological benefits would a farm incur with a customer base that has a strong place attachment to their farm?

Through a more nuanced understanding of the process of place attachment, there will be more opportunities to promote farming and stewardship. The average age of farmers in the United States is now 57 and the fastest growing group of farm operators is those 65 years and older. Many local communities are attempting to foster new farmers to meet their desires for local farming and knowledge of where their food comes from. Place attachment may play an important role in encouraging younger generations to engage in this livelihood, and could also be key in affecting how sustainably all farmers manage their land. Place attachment provides a sense of connectivity and security for farmers. This connectivity to place can encourage a sense of community, individual well-being, and preservation of cultural heritage. A better understanding of how farmers develop place attachment can provide important insights about how place bonds are formed and how a robust and sustainable local food community is built.

Acknowledgments

The authors would like to thank Furman’s David E. Shi Center for Sustainability, Carolinas Food and Farming Student–Faculty Research Initiative, funded by The Duke Endowment. We greatly appreciate the time and willingness of our respondents to participate in this study.

References


Kuehne, G. (2013). My decision to sell the family farm. Agriculture and Human Values, 30(2), 201–213.


Environmental Identity and Community Support for the Preservation of Open Space

Janet K. Swim, Stephanie J. Zawadzki, Jessica L. Cundiff, and Bruce Lord
The Pennsylvania State University, United States

Abstract

The preservation of open space, preserved or minimally developed stretches of land, is a pressing issue facing many United States’ communities. This paper examines one United States township’s attempts to preserve open space. Most residents surveyed (96 percent) approved of preserving open space, and most homeowners (73 percent) were willing to pay increased property taxes for preservation. Strong identification with nature and the township were associated with willingness to pay higher taxes. Respondents also rated the importance of qualities afforded by preserving open space. Valuing qualities of open spaces related to preserving its present state (e.g., preserving ecology and historical places) and following already established plans mediated relations between residents’ identification with nature and the township and their willingness to pay to preserve open space. Qualities that increase human access to the space (e.g., recreation and accessibility) did not show the same mediational relations. These results suggest that psychological identification with nature and the community play important roles in pro-environmental support. Both the practical and theoretical contributions of this research are discussed.

Keywords: applied research, environmental identity, open space, place identity, willingness to pay

Introduction

Open spaces are important for protecting the natural environment, for preserving a community’s natural and social history, and for their psychologically restorative qualities. These spaces include undeveloped lands such as national parks or natural geological features in the form of special rock formations or waterfalls; moderately developed areas, such as agricultural lands and recreation areas in the form of parks and golf courses; and connections between spaces provided by walking and bicycle paths (Backlund et al., 2004; McDonald et al., 2010; USDA,

1 Corresponding author: jswim@psu.edu.
Open spaces can be privately or publicly owned and can be classified as either potentially developable or permanently protected from development (Irwin, 2002). Permanent preservation of open space allows it to remain in an undeveloped or relatively underdeveloped state. Preservation protects the ecosystems’ land, water, flora, and fauna from destructive development, benefiting both the natural environment and community residents.

This paper reports on a rural Pennsylvania township’s efforts to preserve open space and, in particular, the community members’ support for preserving open space. Practically, the paper reports survey data about the qualities of space that residents deemed most important, their willingness to pay to preserve the space, and the use of the results by the community. Theoretically, the paper addresses the role of residents’ environmental identity in support for preservation of open space and whether this relation can be explained by the qualities of open space residents deem important. We conclude with a discussion of the implications for community action research and practice and citizen participation in local government efforts to preserve their environments.

**Qualities of open space**

There is a long history of preserving open space in the United States, spanning the colonial period to the present day (Cordell et al., 1990; Jensen & Guthrie 2006; Moore & Driver 2005). Yet, open space is being threatened by population growth and distribution, and large-scale development that typically accompanies growth. Rural areas with increases in population are particularly prone to disproportionately large development because of the tendency toward low density and spatially sprawled development in these areas (USDA, 2006).

Rural areas are geographically close to natural resources, which means that the loss of open spaces in rural areas can be especially ecologically problematic (Geoghagen, 2002). For example, land development near forests makes forest management more difficult. Such development threatens water quality and wildlife habitats by fragmenting wildlife movement. Development in rural areas also increases threats to local biodiversity, reduces public recreation options, and reduces local economic resources, such as produce from local farms and timber from forests. In response to these threats, communities across the United States are attempting to preserve open space within their communities (Geoghagen, 2002; Kline, 2006; USDA, 2006).

Open spaces vary in their physical qualities (Backlund et al., 2004; McDonald et al., 2010; USDA, 2006). They vary in their level of development and their levels of human involvement in maintenance. Some open spaces are protected nature preserves. Others are areas that require more maintenance and are more
specifically about addressing human needs, such as agricultural land for food and occupations, or pleasures, such as golf courses for recreation. Thus, open spaces afford different types of benefits to humans both in terms of direct use of the land and in terms of preserving biological diversity and ecological health.

Understanding what a community perceives to be important about open space is important for predicting whether or not the community will support local policies to protect these spaces (Banzhaf et al., 2010; Irwin, 2002). Some spaces may be valued because they provide residents with opportunities for recreation. Other spaces may be valued because of the particular historical value provided to the community, such as places where civil war battles were fought, where memorials are located, or places where early settlers lived. Still other spaces may be valued because of their benefit to the local natural environment.

Past research demonstrates that ecological benefits of preserving open space are often preferred over benefits to human consumption. Over recent decades, there has been a shift in environmental attitudes from prioritizing economic growth and human domination over nature to believing that nature is fragile and growth should be limited to protect nature (Brulle, 2008; Dunlap & VanLiere, 1978). Consistent with this greater focus on ecological preservation, research demonstrates protecting open spaces that promote resources and wildlife health (e.g., lakes and ponds) is more highly valued than open spaces that are designed for human use (e.g., golf courses; Backlund et al., 2004).

Economic data also indicate preferences for preserving less-developed open spaces. In order to quantify the value individuals attach to open spaces, researchers typically estimate the perceived economic value of the space by asking respondents how much they would be willing to pay for preservation of an open space (Geohagen, 2002; Irwin, 2002). Researchers may also estimate the value of an open space by examining property values near the space and examining whether property values are best explained by proximity to the space. Measuring the economic value of permanently preserved open spaces has shown that proximity to permanent and less-developed open space increases private property values (Geohagen, 2002). Proximity to both agricultural and forested lands that are kept permanently undeveloped are associated with higher property values when compared to open spaces that are available for possible development (Irwin, 2002).

**Environmental identity**

Environmental identity represents the extent an individual's self-concept includes a connection to the natural world (Clayton & Opotow, 2003; Devine-Wright & Clayton, 2010; Schultz et al. 2004). There are several different types of
identity. One type of identity is reflected in feeling connected to nature. Greater connection to nature is associated with greater concern about animals such as support for animal rights (Schultz & Tabanico, 2007), protecting species in the wild, and caring for animals in zoos (Clayton et al., 2011). It is also associated with many pro-environmental attitudes and actions, such as seeking contact with preserved natural spaces, support for environmental movements and causes, recycling, and buying sustainable products (Tam, 2013).

Given these pro-environmental associations with environmental identity, connection to nature would logically be associated with a desire to preserve open space and greater importance placed on qualities afforded by preserving open space. For example, those who are more connected to nature are more likely to participate in outdoor recreation (Wolsko & Lindberg, 2013). This association suggests that those who are more environmentally identified would perceive recreational opportunities afforded by preserving open space as more important than those who are less environmentally identified. However, the type of outdoor reaction matters (Wolsko & Lindberg, 2013). Those who are more connected to nature are more likely to engage in activities such as walking one’s dog outdoors, jogging outdoors, hiking, cross-country skiing, snowshoeing, canoeing, kayaking, and rafting. In contrast, they are less likely to engage in motorized outdoor reaction (riding an all-terrain vehicle, off-road motorcycle, or snowmobile, for example). This difference is consistent with connections to nature being associated with a desire to preserve nature. Thus, the qualities of open space that individuals most closely identified with or connected to nature would rate as most important would be those associated with preserving the open spaces, particularly for the protection of ecosystems or preventing development.

People can also be connected to specific natural locations, sometimes called place identity (Devine-Wright & Clayton, 2010; Proshansky et al., 1983). They form emotional and cognitive bonds to a specific place, allowing that space to become a part of the person's identity (Devine-Wright & Clayton, 2010; Stedman, 2002). This place identity has been shown to predict civic engagement against development of open, scenic spaces (Devine-Wright & Howe, 2010) as well as general pro-environmental behavior (Scannell & Gifford, 2010). However, when it comes to legislating land-use change, place identity does not always predict the same outcomes as connection to nature. In their survey of nearly 1,000 residents near Italian national parks, Bonaiuto et al. (2002) found that positive attitudes toward permanent nature preserves were found predominantly among residents with relatively low place identity and who lived farther away from the national parks. People who lived nearest the parks tended to be most concerned with local economic and pragmatic benefits from the spaces.
Present research

Description of the site

The federally implemented Housing Act of 1961 combined the planning of transportation systems with the planning of recreation trails to encourage state governments to set forth specific policies for establishing park, forest, and other recreation and historic trails (16 U.S.C. § 1247, 2011). Consistent with this Act, the Pennsylvania Open Space Lands Act 153 of 1996 allowed local governments to acquire land for preservation of open space (32 P.S. § 5001). Located in rural central Pennsylvania next to a state forest, the open space present in Harris Township is predominantly agricultural land with little built development. Developed neighborhoods are small, somewhat scattered, and separated by stretches of open, privately owned farmland. Many of the farms are family owned and operated, and so the scale of the agricultural practices is predominantly small. There is a very small downtown area that is approximately six blocks long and three blocks wide with an immediately surrounding community.

In recent years, Harris Township has experienced a 4.3 percent (%) population increase in a county that has experienced some of the largest growth in Pennsylvania (13.4% increase; Brown et al., 2012). In Harris Township, the population growth is visible in the conversion of farmlands to low density housing developments. As a result, the character of the development of agricultural open spaces is under consideration by the township and efforts to designate areas of permanently preserved open space have become a concern for residents and township leaders. To address local concerns about the rapidly declining availability of open space, community members formed an ad hoc open space committee with the goal to set procedures for identifying open spaces that can be preserved to benefit the local community and natural environment.

Establishment of the Open Space Committee

Preservation of open spaces depends upon community action and support. Community leaders must formulate plans and communicate those plans to community members, who in turn must be willing to support the mechanisms (e.g., increased taxes) for purchasing the land. In order to achieve the goal of purchasing and preserving open spaces in Harris Township, concerned community leaders began by forming an open space committee. Consistent with open space often being historically associated with recreation opportunities, the process started with the Parks and Recreation Advisory Committee.

A survey conducted by the Parks and Recreation Advisory Committee revealed that many residents were interested in more trails in the township and preserving open space. As a result, the Open Space Committee was established by the
The committee was charged with studying all aspects of open space preservation, including identifying types of lands to preserve and ways to fund preservation efforts. The committee began by establishing a vision and mission statement for open space in their township. The committee reviewed local community laws and gathered information from other townships that had established mechanisms for preserving space in their communities. Under the lead of the first and last author, the Open Space Committee decided to conduct the present survey of community members to answer specific questions needed to plan an open space policy for the township. To assist with data collection, the survey was administered by students in a university course on conservation psychology.

Content of survey

With input from the Open Space Committee, the psychology class designed a survey to provide both practical and theoretical contributions to understanding why people do or do not support the preservation of open space. Practically, the survey results contributed to the efforts of the committee to learn about the extent to which their community supported the preservation of open space and understand the reasons for that support. Determining the extent to which community members supported increased taxes to acquire open spaces informed the committee’s decisions regarding the mechanisms for preserving open spaces. Evaluation of the qualities of open space provided the basis for establishing what type of open space properties the township would pursue purchasing should landowners decide at some point to sell their property. Committee discussion referencing other open space plans in the area and state, the prior survey mentioned above, and personal experiences in the community resulted in seven qualities of open space to be included on the survey: (1) preserving ecosystems, (2) preventing likely development (e.g., within the next 5 years), (3) preserving historic places, (4) improving the ability for people to obtain access to open space, (5) providing recreational opportunities, (6) providing connections between different locations in the community (e.g., bike paths), and (7) following development plans laid out by the local government.

Theoretically, we predicted that stronger environmental identity, in terms of connection to nature and the township, would be associated with greater support for preserving open spaces. We predicted these associations because
preserving open space would help protect and preserve the current state of the township and its natural surroundings and help build stronger community ties. Additionally, we predicted that both types of environmental identity would be associated with placing greater importance on the qualities afforded by open space. We predicted that those qualities most closely related to preserving ecology and the current state of the community (e.g., preservation of ecology and preventing development) would be more strongly related to environmental identity than those qualities related to facilitating human use of the space (accessibility, recreation, connectivity). Lastly, we predicted that these qualities, especially those related to preserving the ecology and current state of the community, would mediate the relation between both types of environmental identity and support for preserving open spaces.

**Method**

**Respondents**

Of 720 randomly selected households who were sent the survey, 390 (54%) completed the survey, 237 (34%) did not respond and the research team was unable to contact them, 76 (11%) refused to complete the survey, and 6 (1%) were unable to complete the survey because they did not speak English. The response rate from each neighborhood in the township ranged from 47% to 60%.

Similar numbers of women and men responded (51% female, 47% male, and 2% did not indicate their gender or indicated that a man and a woman completed the form together). Respondents ranged in age from 18 to 96 with a mean age of 54. The number of years each respondent had lived in the township ranged from less than 1 year to 76 years, with a mean of 19 years. With regard to home ownership, 83% owned their home whereas 15% rented. Finally, 35% of the households surveyed had children living at their home.

**Procedure**

Households were chosen by stratifying 2,028 addresses, provided by the township’s manager, into 23 neighborhoods and then randomly selecting 40% of households from each neighborhood. After removing businesses and vacant lots, 720 households were mailed a packet of materials including an introductory letter from the chair of the township’s Board of Supervisors and an information letter from the professor of the class involved in collecting the survey data (this paper’s lead author). In order to randomize respondents within households, the survey began by asking that the household member with the next birthday complete the survey. The packet also included a consent form and a copy of the survey.
The information letter described the various modes by which respondents could choose to complete the survey and when to expect interviewers to be arriving at their doors. Respondents had the option of: (1) completing the survey on their own and returning it to the township office, mailing it to the researcher, or handing it to the student from the Pennsylvania State University Conservation Psychology class who would come to their residence, (2) completing the survey in person with an interviewer, or (3) completing a web version of the survey. Four days after the packets were mailed, students began visiting households who had not submitted their survey either through the mail or online. If the survey was already completed or the respondent declined to complete the survey, students did not return to the residence. If the students were unable to contact residents, students returned up to eight additional times until someone either answered the door or it was determined for other reasons not to return (e.g., the residence appeared unoccupied). Of the 390 respondents who completed the survey, 38% returned it to the township, less than 1% mailed it to the research supervisor, 15% gave a completed version of the survey to the interviewer, 21% completed the survey in person with the interviewer, and 25% completed the survey online.

Survey instrument

Definition of open space

Respondents were first provided a definition of open space, as developed by the Open Space Committee. They were informed that the township considered open space as “a parcel of land that is predominantly undeveloped. The space can be public or private and can be small or large. Preservation of the space allows it to remain in its current state and enhancement of the space allows it to be adapted for common use.” To understand the community’s perceptions of open space, respondents were then asked to provide their own definition of open space in an open-ended question.

Qualities of open space

Next, respondents were asked to rate the importance of seven different qualities of open space on a five-point scale (1 = not at all important, 5 = very important). The qualities were presented in the following order: (1) Preserves Historic Places (e.g., historic events/people, historic buildings); (2) Preserves Ecosystems (e.g., protects drinking water, sensitive soils, wildlife habitats, special waterways, agricultural lands, rock or forest features); (3) Provides Accessibility (e.g., from neighborhoods to open space); (4) Provides Connectivity (e.g., from one open space to another, such as one bike path to another or to other types of open space); (5) Provides Recreation; (6) Prevents Likely Development (e.g., within
the next 5 years); and (7) Is Consistent with Township or Regional Plans. As noted above, the qualities were chosen based on the committee’s previously conducted survey and deliberation among the committee members.

Respondents also chose which three of the seven qualities they felt were the most important qualities of open space. The top-rated qualities were preserving ecosystems, preserving historic places, and preventing likely development. The one to three rankings correlated with one to five importance ratings of each of these three top-ranked qualities, $r(318) = .33, p < .001$, $r(193) = .30, p < .001$, $r(194) = .31, p < .001$, respectively. We only present results for the ratings because respondents selected their top three qualities and, therefore, did not rank all qualities. This ranking procedure limited the ability to differentiate among the least important qualities. Respondents were also given the opportunity to indicate additional qualities they thought should be considered.

Support for open space

Respondents were asked whether or not they supported preserving open space. The prompt provided read, “In your opinion, should Harris Township preserve open space?” with a “Yes” or “No” response option.

Willingness to pay for open space

Next, respondents were asked whether they owned or rented their property. If they owned their own home, they were asked to indicate their preferred options for property taxes, should a tax be the means selected for purchasing open space. The different tax response options (in mills) were: 0 (no increase), 0.5, 0.7, 1.0, and 1.5 mills. To help respondents understand what these tax options would mean for both individuals and the township, each tax option (in mills) was presented with the amount of tax (in dollars) that the average property owner would pay with different tax rates (the average property value in the township was provided for comparison to their own property value), and the amount of anticipated revenue that the tax rate would provide to the township (in dollars). In addition, they were provided the options of “Don’t know” and “Does not apply to me.”

Social–psychological variables

There is currently no consensus on how to best measure environmental identity, but one common approach is to ask how connected the person is to nature or to particular places (Devine-Wright & Clayton, 2010; Schultz, 2001). Following the logic of Schultz’s (2001) single-item measure of “Inclusion of Nature in the Self,” respondents separately rated the extent to which they felt connected to the township and to nature on 5-point scales (1 = not at all connected, 5 = very connected). Connection to Harris Township was used to measure place identity.
Respondents also rated their connection to animals because open spaces may provide residents with unique spaces to bond with their domesticated pets independent of their sense of connection to wildlife (e.g., walk one’s dog). Because of the greater theoretical rationale for including a measure of connection to nature, we chose to use this measure over connection to animals. Connection to nature and to animals were highly correlated, $r(370) = 0.60$, $p < 0.001$, so results for both measures were similar.

**Demographic information**

Finally, respondents completed the demographic questions described in the Respondents section, above. They also indicated the neighborhood where they lived.

**Results**

**Conceptualizations of and support for open space**

Respondents’ definitions of open space were coded to identify the different themes emphasized in the responses. Overall, the open-response definitions coincided with the definition provided by the Open Space Committee and noted on the survey. Specifically, 17% explicitly agreed with the definition, 34% defined open space as open or undeveloped land (e.g., “a parcel of undeveloped land”), 20% focused on nature (e.g., “Space where there is protected natural habitat”), 15% focused on recreation (e.g., “A parcel of land that is used for recreational purposes and is developed for that use”), and 7% focused on public use in their definitions (e.g., “a place that the town could use together”). An additional 21% gave specific examples of types of open space (e.g., “farmland,” “fields, no house,” “pasture land or woods—unused space”) and 2% mentioned specific locations in the township. Finally, an “other” category (8%) emerged, including general comments such as stating how open space can “benefit the community,” can be “animal friendly,” or the statements could not be coded. There were a few (2%) who disagreed with some aspect of the definition, mostly in terms of preferring to exclude private land from the definition. Twenty percent of respondents left the answer blank. Statements could fall into more than one category, hence the percentages reported above add up to more than 100%.

An overwhelming majority of respondents (96% +/− 2%, 95% CI) indicated they support the township preserving open space.² Most respondents (n = 293;
75% of the sample and 91% of homeowners) answered the question asking about a tax preference value, should a conservation fund be established. Paying property taxes did not apply to renters so they were not asked to provide a tax preference value (n = 69). An additional 28 respondents indicated that they did not know what tax option to select. Of the remaining 293 respondents, most (73%, n = 216) were in favor of some amount of tax increase in order to preserve open space (Figure 1). The most popular option was the lowest tax increase rate provided on the survey (0.5 mills). However, it is worth noting that 42% of respondents supported paying more than this amount.

![Figure 1. Percentage of respondents in favor of different tax rate increases](image)

Note: Figure represents data only from respondents who selected a tax option (75% of sample; 91% of homeowners).

**Qualities of open space**

A repeated-measures ANOVA and subsequent simple effects tests revealed that the quality of open space most valued was preserving ecosystems, followed by preventing likely development and preserving historic places, $F(6, 2148) = 73.87, p < 0.001$ (see Table 1). Respondents were given an option to list additional qualities that should be considered. The majority of respondents chose not to respond (67%). Of those who did, most identified ideas noted in the qualities already listed, with 14% specifically elaborating on these qualities. Some (4%) respondents made reference to other qualities not specifically mentioned in the ratings (e.g., preserving agricultural lands, education, and open space, including explicit statements of support (e.g., “We enthusiastically support all efforts to preserve the open space that makes this an enjoyable and healthy community to live in.”) and specific requests concerning the preservation of open space (e.g., “I would like to see a bike path to [the mountain]”).
costs). Other respondents indicated they supported the development (e.g., “We need consistent development”) and maintenance of open space (e.g., “Make it look nice”) (5%). The remaining comments discussed open space without any specific reference to the qualities of open space (11%).

A principle component analysis with varimax rotation and Kaiser normalization was used to determine the underlying structure associated with the importance placed upon the different qualities afforded by preserving open space. An examination of the scree plot and Eigen values greater than one revealed a two-factor structure. The first factor accounted for 41% of the variance and reflected functional features of open space for human use (i.e., providing connectivity from one open space to another, providing accessibility from neighborhoods to open space, and providing recreation; all factor loadings for these three values > 0.76 and factor loadings for the other four qualities < .31). The second factor accounted for 16% of the variance and reflected reasons to maintain the current state of the ecology and community (i.e., preservation of historic places, preservation of ecosystems, prevention of likely development, and consistency with township or regional plans; all factor loading values for these four qualities > 0.56 and factor loadings for the other three qualities < .21). In order to include these measures in our mediation analyses reported below, we averaged responses to these ratings to form a measure of perceived importance of functional qualities of open space (Cronbach’s α = 0.74) and importance of preserving the current state of the community (Cronbach’s α = 0.64). Reliability for the latter measure was not improved by removing any of the four items.
Table 1. Correlations between social–psychological/demographic variables and ratings of the importance of open space qualities and support for taxes

<table>
<thead>
<tr>
<th>Identity</th>
<th>Mean (standard deviation)</th>
<th>Identify with nature</th>
<th>Identify with township</th>
<th>Years in township</th>
<th>Age</th>
<th>Home ownership</th>
<th>Gender</th>
<th>Children at home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness to pay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support for increased taxes (^4)</td>
<td>.73 (.44)</td>
<td>.22***</td>
<td>.22***</td>
<td>-.19***</td>
<td>-.06</td>
<td>na</td>
<td>-.01</td>
<td>-.01</td>
</tr>
<tr>
<td>Amount of increased taxes (^5)</td>
<td>.58 (.47)</td>
<td>.30***</td>
<td>.23***</td>
<td>-.22**</td>
<td>-.07</td>
<td>na</td>
<td>.02</td>
<td>-.00</td>
</tr>
<tr>
<td>Importance of qualities (^6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preserves ecosystems</td>
<td>4.53* (.78)</td>
<td>.38***</td>
<td>.21***</td>
<td>-.12*</td>
<td>.05</td>
<td>.05</td>
<td>-.10*</td>
<td>-.01</td>
</tr>
<tr>
<td>Prevents development</td>
<td>4.07* (1.08)</td>
<td>.31***</td>
<td>.27***</td>
<td>-.01</td>
<td>.08</td>
<td>-.05</td>
<td>-.07</td>
<td>.05</td>
</tr>
<tr>
<td>Preserves historic places</td>
<td>3.97* (.93)</td>
<td>.13**</td>
<td>.29***</td>
<td>.01</td>
<td>.03</td>
<td>.06</td>
<td>-.10</td>
<td>.02</td>
</tr>
<tr>
<td>Provides accessibility</td>
<td>3.69* (.98)</td>
<td>.20***</td>
<td>.09</td>
<td>-.12*</td>
<td>-.07</td>
<td>.08</td>
<td>-.13*</td>
<td>-.04</td>
</tr>
<tr>
<td>Provides recreation</td>
<td>3.60* (.98)</td>
<td>.03</td>
<td>.00</td>
<td>-.11*</td>
<td>-.12*</td>
<td>.17**</td>
<td>-.05</td>
<td>-.14**</td>
</tr>
<tr>
<td>Provides connectivity</td>
<td>3.50a (1.08)</td>
<td>.24***</td>
<td>.05</td>
<td>-.18***</td>
<td>-.06</td>
<td>.12*</td>
<td>-.15**</td>
<td>.01</td>
</tr>
<tr>
<td>Is consistent with plans</td>
<td>3.50a (1.07)</td>
<td>.15**</td>
<td>.23**</td>
<td>.09</td>
<td>.20**</td>
<td>-.03</td>
<td>-.09</td>
<td>.14**</td>
</tr>
</tbody>
</table>

Note: Means with different letters are statistically different from each other at \(p < .05\); correlations with asterisks are significant: * \(p < .05\), ** \(p < .01\), and *** \(p < .001\).

1 Home owner coded as 1; renter coded as 2
2 Male coded as 1; female coded as 0
3 0 = have children at home; 1 = no children at home. Having preschool children was associated with less interest in preventing development; having elementary children at home is associated with preferring recreation; having children older than high school is associated with preferring accessibility. While having preschool, elementary, and middle school children at home is associated with rating regional and township plans lower, having children older than high school at home is related to rating these plans higher.
4 0 = no support; 1 = support
5 1 = 0 mills, 2 = 0.5 mills, 3 = 0.7 mills, 4 = 1.0 mills, 5 = 1.5 mills
6 Ratings range from 1 (not at all) to 5 (very important)
Individual differences

Consistent with predictions, stronger identification with nature (i.e., environmental identity) and the township (i.e., place identity) were associated with more support for preserving open space and the importance of most of the qualities associated with open space (Table 1). We did not examine associations with stated support for preserving open spaces because there was a ceiling effect on this variable with nearly all supporting it, as reported above. Both types of identity were associated with the qualities that reflected a desire to preserve the current state of the community. Identification with nature was also associated with providing accessibility and connectivity.

Although length of years in the township was positively correlated with connection to the township, $r(271) = .37, p < .001$, the longer residents lived in the township, the less support they had for taxes. Notably, as illustrated in Figure 2, even with the diminished support for taxes, the majority supported taxes regardless of length of residence. No other demographic characteristics were related to support for taxes. Several demographic variables, on the other hand, such as renting a home, being female, and having children living at home, predicted valuing open space for functional use (providing accessibility, recreation, and connectivity).

![Figure 2. Percentage of respondents supporting taxes by quartile split of number of years living in the township](image)

**Mediation model**

We examined whether the importance given to maintaining the current qualities of the ecology and community and the importance of functional qualities of open space mediated the relation between identification with nature and willingness
to pay for open space and the relation between identification with the township and willingness to pay for open space. We tested a parallel mediation model using Hayes’s (2013) PROCESS macro with 1,000 bootstraps. Parallel mediation means that we tested both mediators in the same model, which allowed us to compare the relative strength of the two mediators. We conducted separate analyses for the two predictor variables of place and environmental identity.

Rated importance of qualities that preserved the current state of the community mediated the effect of identification with nature and identification with the township on willingness to pay for open space via a property tax increase, while functional qualities did not mediate these relations (Figures 3 and 4). That is, the more connected residents were to nature and the township, the more they rated qualities that preserved the current state of the community as being important. In turn, these qualities predicted willingness to pay for open space. In contrast, although identification with nature and the township was associated with rating functional qualities as being important, in these models functional qualities were not associated with willingness to pay for open space via property taxes. Thus, the relation between environmental and place identity and greater willingness to pay for open spaces can be explained by the greater importance identified individuals placed on maintaining the current state of the community.

![Figure 3. Mediation tests of the relation between identification with nature and willingness to pay taxes for open space](image)

Note: * $p < 0.05$, *** $p < 0.001$

---

3 We used the two measures created from the factor analyses on rated importance of qualities associated with preserving open space rather than the seven separate qualities because collinearity between importance ratings could interfere with our ability to identify the strongest mediators.
Discussion

With near unanimity, residents supported preserving open space in their local community. The majority were willing to back this support by an increase in taxes. Residents rated all the qualities afforded by preserving open space as being important. The top three qualities were all related to preservation: preserving ecology, preserving historic places, and preventing development. The other qualities could be understood as ways to facilitate human use of open spaces (recreation, accessibility, connectivity, and following township plans). The prioritization could reflect the increased cultural concern for preserving and caring for the environment over utilization of the environment (Brulle, 2008; Dunlap & VanLiere, 1978). However, preserving historic places is not directly about preserving the environment. Further, factor analyses indicated that the least valued attribute, following township plans, was more strongly associated with the three types of preservation. In contrast then, these preferences may have reflected a status quo bias rooted in loss aversion—a preference to minimize losses over acquiring gains (Kahneman et al., 1982; Kahneman & Tversky, 1984; Samuelson & Zeckhauser, 1988).

As predicted, the more residents identified with nature (i.e., environmental identity) and their township (i.e., place identity), the more they were willing to pay more for preserving open space. This is consistent with other research that
Environmental Identity and Community Support for the Preservation of Open Space

indicates that communities who are generally more ecologically concerned tend to cite the environment as a strong reason for supporting policies that preserve open spaces (Banzahf et al., 2010). These two types of identity were also related to being more likely to perceive qualities afforded by preserving open space as important, especially those qualities related to preserving the current state of the community. However, identification with nature was also related to the perceived importance of increased accessibility to open spaces from, for instance, neighborhoods, and better connectivity to open spaces such as via bike paths. This may be because greater connection with nature is associated with participating in outdoor activities, such as hiking (Wolsko & Lindberg, 2013). Mediation analyses indicated that greater identification with nature and the township was related to support for preserving open space because these types of identification are associated with valuing the qualities that allow the community to preserve its current state over qualities that increase the functional use of the space.

Only one demographic characteristic was associated with support for preserving open space. One might expect that length of residency would result in greater support for open space because those with longer residency have more connections to the community and associations with place identity. However, those who lived in the township longer were less supportive of property taxes. The negative relation with residency could be a function of longer time residents being older, $r(359) = .26, p < .001$. Older residents are more likely to be on fixed incomes, which could make property taxes more of a burden for them. This difficulty was mentioned by several people in open-ended comments to the survey. However, age was not associated with support for property taxes. Alternatively, the negative relation could be a function of differences in political persuasion; longer time residents may have been more politically conservative and less supportive of taxes in general. Yet it is important to note that even among long-term residents (i.e., living in the community for more than 27 years) more people supported taxes than did not (see Figure 2).

Utilization of survey results by the Open Space Committee

The results of the survey were presented to the township’s Board of Supervisors and the community through various methods of communication. The presentation to the Board of Supervisors was also open to the community. Further, community members were invited to attend a meeting in the local community building to learn about the activities of the Open Space Committee, including the survey results. Several neighborhood meetings were also held to go over the work done by the committee.
Echoing the voice of the vast majority of survey respondents (96%), the committee confidently recommended that the township’s Board of Supervisors support the preservation of open space. The committee also recommended an income tax increase to fund the preservation of open space. Results from the survey suggested that a large majority of homeowners (67%) were willing to pay increased property taxes to help fund the preservation of open space. At the same time, a few home owners—particularly those with fixed incomes—were strongly opposed to increased taxes. As a result, the Open Space Committee recommended an increase in income tax rather than property tax, an option the committee was unaware was legally possible at the time of the construction of the survey.

In addition, the results of the survey informed the specific content of the open space policy developed by the committee. For example, respondents tended to rate qualities that reflected ecological reasons (preserving ecosystems and preventing likely development) and maintenance of the character of the area (e.g., historic places) as important to very important, and they tended to rate qualities that reflected the functional use of open space (accessibility, recreation, and connectivity) as moderately important to important. These ratings were used—according to the open space policy—to evaluate and weight the desirability of property, should it become available to the township for purchase.

An interesting unintended consequence of conducting the survey was that it raised awareness among residents about the Open Space Committee’s activities, furthering citizen participation. The survey results became a discussion among other township committees. There were also reports of discussions about the survey and open space among residents’ informal conversations. Thus, the survey itself was not only a central part of the planning process but it became an educational and agenda-setting tool as well. Community surveys could serve as an important tool for getting specific issues on the political agenda within a community.

**Limitations**

The survey is limited in its ability to fully account for willingness to support preservation of open space. Not only was the survey intended to be relatively short (fitting on one page of paper) for the convenience of respondents, the committee also decided to not ask questions that would have been useful to more fully understand support, and potentially rule out, factors confounding with identity. For instance, the committee decided to exclude questions about income, political persuasion, and tendency to vote in elections.

There are both strengths and weaknesses of two of the authors’ adopting dual roles of researcher and member of the Open Space Committee. The presence of
the authors on the committee allowed them to fully understand the discussions and needs of the committee and have these discussions and needs reflected in the content of the survey and to be able to interpret the results in a manner that was most useful for the committee. On the other hand, concerns might be raised about the authors’ ability to remain objective in their two roles as committee member and researcher. Yet, concerns about objectivity are allayed for at least two reasons. First, the authors were not evaluating the committee’s performance but instead providing information to the committee about the township. Second, objectivity was aided by the full committee having input in the construction of the survey and the township’s Board of Supervisors reviewing and approving the survey prior to its administration.

The survey results were not predictive of the township’s vote on a referendum to raise funds for preserving open space through raising income tax by 0.6%. The referendum was narrowly defeated with less than a 1% difference between those in favor and those against it. There are a number of possible reasons for the defeat. There could be factors associated with the survey. Because the committee decided to exclude a question asking about voting tendencies, the survey was limited in its ability to identify preferences for the subsection of the community that would likely vote. Thus, the survey may have indicated the township preferences but not represented the voters’ preferences. A mismatch in the information in the survey and that on the ballot may have been important. The survey clearly defined open space and the ratings could have made reasons for support for open space salient. Neither of these types of information was present on the ballot. The committee went through much effort to educate the community about the referendum via community meetings, flyers, and information on the township’s web page. Yet, these took some effort on the part of the community to attend to this information. The mismatch in information between the survey and the ballot means that other factors could have influenced the vote that did not influence responses on the survey. Ironically, a status quo bias could have influenced voters to not support the referendum. This is ironic because it is possible that a status quo bias may have been the reason why survey respondents supported qualities of open space that would preserve the current nature of the township. Another possible factor was misinformation. Oppositional signs were posted throughout the township the day before the election which did not give the committee time to address the misinformation on the signs. Perhaps the most likely alternative factor influencing the vote was that the vote occurred during a contested national election where there was much discussion about “no new taxes.” This national tone may have influenced sufficient number of voters to reject the referendum because of the greater salience of political over ecological principles.
Conclusion

In response to local government leaders noting changing demographic and land use and a previous survey revealing citizens’ desire for more trails and preserving space, community leaders and concerned citizens volunteered for an ad hoc committee to formulate recommendations for preserving open space in their communities. The survey assessed community perceptions of and support for preserving open space, as well as investigated the role of place identity in support for preservation of open space and increased taxes as a mechanism of support therefor. The survey gave voice to the citizens of Harris Township and increased citizen participation in their local government.

Residents of the township showed a strong endorsement of the protection of ecosystems consistent with historical trends toward viewing the need to protect the environment from human infringement. The survey also validated the role of identity in understanding support for open space, a type of pro-environmental action. Attention to identity revealed a source of variation in support for property taxes dedicated to preserving open space. Those who were more connected to nature in general, and more connected to the township in particular, were more supportive of increased taxes. Both of these relations were mediated by the importance residents placed on maintaining current status of their community and community plans.

The survey results continue to contribute to the township, providing the basis for continued exploration of how to achieve open space preservation in the township. Theoretically, this study offered insight into the role of place identity and connection to nature as predictors of willingness to pay for open space, as well as some of the underlying psychological mechanisms that may be involved in community participation in preventing environmental development and degradation. Lastly, in addition to providing the results and an opportunity for the inclusion of the community voice in township decision-making, the discussions about the survey itself may have contributed to increasing community awareness about issues surrounding the preservation of open space and the natural environment more generally.

Acknowledgments

Portions of this paper were presented in a white paper for Harris Township, Pennsylvania, and are reported in Harris Township’s official Open Space Plan and the American Psychological Conference 2011 convention in Washington DC. We would like to thank Amy Farkas (the township manager) and the Harris Township staff for their assistance in conducting the survey. We would also
like to thank the members of a Pennsylvania State University Conservation Psychology class for their assistance on this project. These class members were: Katherine Angulo, Meghan Bisbey, Kara Brehm, Ross Carpenter, Efrain Castillo, Erica Cherry, Kathleen Childs, Mathew Clark, Julia Cutler, Lindsey Epley, Kristi Falco, Rebecca Gibson, Amanda Gingrich, Caitlin Gregory, Rebecca Hartman, Justin Hughes, Maryana Kagalovskaya, Jacqueline Kralik, Sarah Kretz, A-Rim Lee, Briana Lieberman, Michelle Mancini, Madeline Martinez, Feryne McSweeny, Amanda Migliaccio, Michalyn Millen, Eun Jung Moon, Stephanie Myers, Rachel Peck, Cory Peterson, Alyssa Pettinato, Stephanie Pratt, Michelle Rapp, Ansimon Rezk, Amey Rosati, Kathleen Wagner, Rebecca Ware, Edward Wickland, and Courtney Williams.

References


Visualizing Stakeholder Perspectives for Reflection and Dialogue on Scale Dynamics in Social–Ecological Systems

J. M. Vervoort¹
Environmental Change Institute
Oxford University Centre for the Environment, United Kingdom

M. A. Hoogstra
Forest and Nature Conservation Policy Group
University of Wageningen, the Netherlands

K. Kok
Soil Geography and Landscape Group
Wageningen University, the Netherlands

R. van Lammeren
Laboratory of Geo-Information Science and Remote Sensing
University of Wageningen, the Netherlands

A. K. Bregt
Laboratory of Geo-Information Science and Remote Sensing
University of Wageningen, the Netherlands

R. Janssen
Globalorange, the Netherlands

Abstract

An understanding among societal actors of how social–ecological systems interact across multiple levels and scales contributes to better governance of those systems. This paper introduces a tool, Scale Perspectives, developed to help societal actors share their perspectives on issues of social–ecological systems governance in a multilevel framework. A first version showed that participants in a local and European case study associated a diverse range of levels and time frames with the same issues, but the version was not able to capture cross-level dynamics. A second

¹ Corresponding author: joost.vervoort@eci.ox.ac.uk.
version of the tool did allow for the visualization of cross-level dynamics, and was tested in live workshops where more opportunities for individual and group reflection were offered. The tool proved useful for sharing perspectives and strategic dialogue among the participants. The results show the potential of such tools to help societal actors tackle challenges related to scale dynamics in social–ecological systems governance.

Keywords: governance, scale, social–ecological systems

Introduction

Interacting human and natural systems, or social–ecological systems (Folke, 2006), are neither predictable nor wholly chaotic, but rather evolve through an interplay of changing subsystems that interact across space and time. Therefore, spatial and temporal scales—as well as various social scales—play a key role in understanding this complexity (Cash et al., 2006). The role of scale dynamics has important implications for the governance of social–ecological systems (Ostrom, 2009).

In this paper, we use the following definitions from scale and governance research (Cash et al., 2006; Gibson et al., 2000; Vervoort, Rutting et al., 2012):

- We define a scale as a way to structure a certain dimension (such as time, space, power)—examples are the metric system as a scale for geographic space, a jurisdictional hierarchy for state governance, and the Julian calendar for time.
- We define the positions on a scale as levels, for example, individual level, community level, district level, national level.

There is evidence that sharing knowledge and coordination of action across multiple levels and scales contributes to better governance of social–ecological systems (Cash et al., 2006; Kinzig et al., 2006). According to Ostrom (2009), understanding cross-level and cross-scale dynamics in social–ecological systems from the perspectives of many actors is crucial to understanding why some systems are sustainable and why some collapse. This brings in the need to involve diverse societal actors operating at different levels and scales, as well as the need for methods to facilitate exchange between these societal actors that let them explicate multilevel and multiscale issues and identify possible solutions.

This paper introduces Scale Perspectives, a simple tool for linking societal perspectives and generating dialogue about the governance of social–ecological systems. The tool was developed because of a perceived value of making multilevel systems dynamics a direct topic to address with stakeholders (Cash et al., 2006). The first, online, version of this tool was created to elicit societal perspectives
on social–ecological systems in a space of multiple governance levels and time frames, with an initial model in mind of experts and decision-makers gathering information about societal perspectives. The application of this tool to two case studies yielded promising results but also demonstrated the limits of the first version. Based on this first analysis we extended Scale Perspectives and applied a pen and paper version in two workshops. These applications demonstrated that beyond its function to elicit societal perspectives, the tool could serve as an empowering aid for societal actors that could be used for the sharing of perspectives on scale dynamics to guide deliberation and decision-making.

The objective of this paper is to evaluate Scale Perspectives as an example of a simple tool to help the sharing of societal stakeholders’ perspectives about scale dynamics in social–ecological systems. This example serves in turn to address general challenges and opportunities around such exchanges of perspectives and their potential to guide multi-stakeholder action.

We will first discuss research on scale dynamics in social–ecological systems and the role of stakeholders’ framing of scale dynamics. Next, we will introduce the first and second versions of Scale Perspectives and the case studies to which these versions have been applied. We will then present the results from both versions. Finally, we will discuss Scale Perspectives as an example of a tool to facilitate multi-stakeholder dialogue around scale dynamics in social–ecological systems and how this type of tool may help tackle some of the challenges identified around governance of such systems across multiple levels.

**Perspectives on scale dynamics in social–ecological systems governance**

Scales and levels are human-constructed forms of classification. Different societal actors maintain different perspectives on spatial levels and time frames (Cumming et al., 2006; Scott, 1998; Wilbanks & Kates, 1999). Research and thought on human perspectives on space and time has a long history, initially in philosophers—for example, Heidegger (1962), Husserl (1964), and Kant (1965/1781). Later, psychologies of time (Zimbardo & Boyd, 1999) and space (Freundschuh & Egenhofer, 1997) were developed more extensively. In social science, social systems are seen as partly disembedded from traditional notions of space and time (Giddens, 1990; Westley et al., 2002) and moreover, according to human geographers, spatial and temporal dynamics are shaped by changing power relations (Dahl, 1989; Ostrom, 1991, 1997; Sayre, 2005).

In environmental change literature, scale dynamics in biophysical systems have been a topic of research for many years (Holland, 1998; Holling, 1986; Klar, 1969; Kok et al., 2001; Levin, 1992). However, ideas about the role of societal
perspectives on space and time have also long been part of environmental change research—the Limits to Growth report by Meadows et al. (1972) posited that humans have a limited interest in and capacity for action when considering a geographic extent beyond their local communities and over long time periods. Participants in research by Boniecki (1980), Hoogstra and Schanz (2009), and Simons et al. (2004) showed a lack of engagement with events on a temporal extent beyond 10–15 years. In contrast to this spatial and temporal “myopia,” a “hyperopia” has been found linked to both scales in terms of problem recognition (Gifford et al., 2009; Uzzell, 2000): the longer term future was seen as more problematic than the shorter term by participants in these studies, and global concerns were seen as more problematic than local issues. Other psychological research has dealt with personal views of temporal and geographic scale related to environmental change concerns (Gifford et al., 2009; Lima & Castro, 2005; Uzzell, 2000), but this research has not been operationalized to provide direct input for a participatory social–ecological systems governance context.

In the domain of social–ecological systems research, scale and level dynamics have played a key role (Holling et al., 2002; Levin, 1999). Cash et al. (2006) summarize the challenges of cross-level and cross-scale governance as (1) the challenge of ignorance among actors of how systems are linked to or behave at other levels and scales; (2) mismatches between levels of governance and levels where issues play out; and (3) different societal actors holding a plurality of perspectives on which scales and levels should be focused on (for instance, attempting to frame problems as either exclusively global or local), and diverse interests on what needs to happen. Kok and Veldkamp (2011) link these practical challenges to challenges of theory development by emphasizing the need to involve nonscientist actors in theory development around scale. Considering these challenges, there is a role for tools that can help societal actors and the scientists among them identify and overcome ignorance of system dynamics at other levels and scales, allow for dialogue between perspectives on scale dynamics, and help resolve mismatches and enable better governance of social–ecological systems.

**Scale Perspectives**

Scale Perspectives represents a simple, visual way of dealing with stakeholders’ perspectives on the relevant levels on scales of jurisdictional space and of time, for their most pressing social–ecological change issues. The tool was developed because of an assertion based on the scaling and governance literature that the challenges of ignorance, a plurality of stakeholder perspectives, and the resulting scale mismatches could be overcome through facilitating direct attention to scale aspects of social–ecological systems governance.
Scale Perspectives uses a direct visual mode of representation to capture an integrated view of the spatial and temporal levels where issues are relevant according to stakeholders. This direct use of a framing of stakeholder perspectives by time and space is distinct from participatory systems modeling approaches where these dimensions play a role but are not the main focus (Voinov & Bousquet, 2010).

Scale Perspectives pre-frames spatial and temporal scales for users. This means that the tool does not allow full freedom for users to outline some of the many different scales that are possible to make their perspectives on social–ecological systems governance explicit (Cash et al., 2006). As part of the same research project that resulted in this paper, an approach (Scale Repertoire) that does allow for the capturing of a diversity of scales has been applied and reported in Vervoort, Rutting et al. (2012). However, this approach depended on long, in-depth visually facilitated interviews that produced highly individual results, limited in direct comparability to each other. The Scale Perspectives tool, by contrast, limits users in their subjective framing of scales but thereby aims to produce results faster and in a format that allows for sharing, comparison, and dialogue between societal actors.

Scale Perspectives was developed and used in two versions, with version 2 expanding the flexibility of user inputs possible in version 1. We will describe each version and its case studies first, and then present and discuss results from both versions.

**Scale Perspectives version 1**

Figure 1 shows an example of Scale Perspectives version 1. This version was used online in two case studies, both further described below. The first version of this tool was developed from the notion that it would be valuable for experts guiding decision-makers to be able to elicit and analyze societal perspectives on scale dynamics.
Figure 1. Scale Perspectives with an input example from a single participant. Users drag their preselected issues to levels that reflect their perspectives within fixed scales of time and space.

In Scale Perspectives version 1, participants started out by providing the social-ecological systems governance issues they are most concerned about. We chose to limit the top issues to five to keep the test accessible in terms of cognitive load (Miller, 1956). A form was first presented (before a time–space field from Figure 1 was shown) with the following question: “Which issues around environmental change and sustainability do you consider to be the most important for society to engage with?” Participants listed these issues themselves in five boxes. In the next step, users were asked to place dots representing their issues on a field framed by fixed scales of time and of different governance levels (Figure 1). Each marker on the scales represented a new governance level or time frame (with the different time frames representing levels on a temporal scale). Instead of being guided by focusing questions on specific levels, the participants were free to determine relevant levels themselves, in a fully integrated field of spatial and temporal dimensions. They were given the following instruction: “Place each of your chosen issues on the field below, which is framed by different spatial levels of jurisdiction and decision-making on the y axis, and by different time frames on the x axis. Place each issue in the combination of space and time you
think is most relevant for this issue.” The issues were placed randomly in the field, and participants were able to drag each issue to the location they thought most appropriate.

An optional comment box was made available for participants to describe the reasoning behind their placement of chosen social–ecological systems governance issues. Additionally, participants were asked to provide demographic information about themselves.

**Version 1 case studies**

Scale Perspectives version 1 was applied with 63 participants in two case studies. These two case studies were selected to represent different contexts and different geographic scales. In each case, the choice of case study was made because of the role Scale Perspectives could play in a larger process for each case. One case study focused on local and regional sustainable development communities, such as local groups of volunteers, citizens involved in local government projects, social entrepreneurs and others—part of a network of active groups in Oxfordshire, United Kingdom, with a demographically diverse group of participants. This network of communities and groups was chosen because of its active engagement with environmental and sustainability governance, which we assumed would ensure active participation in the use of the tool as well as benefits of insights coming out of the analysis for the network. In Oxfordshire, the Scale Perspectives tool was used as a first scoping of perspectives on the key levels of governance and time frames for top issues of sustainable development and natural resource management in the county. The results of Scale Perspectives version 1 were shared with the network and with government projects, and presented to two of the groups after they used version 2 of the tool and a scenarios exercise to inform their planning, to compare their perspectives to wider perspectives captured by the tool in the Oxfordshire network.

The second case study where Scale Perspectives version 1 was used was a European-level study with PhD researchers working in environmental science—the METIER (methods for interdisciplinary environmental research) network. In the METIER case, the outcomes of Scale Perspectives were used as an educational tool, and presented in a subsequent meeting of the network to reflect on the group’s spectrum of perspectives on social–ecological change in terms of governance levels and time frames.

Scale Perspectives version 1 was applied in these two cases because of its expected usefulness to the participants. The cases were contrasting: a highly diverse group of participants bound to a single region (Oxfordshire), and a uniform group of highly educated participants, diverse in their geographic
and cultural locations (METIER). This contrast allowed us to test whether the tool was, itself, applicable with participants across multiple levels and from multiple backgrounds.2

The Oxfordshire case study had 39 participants. Of these, 34 gave all required input. The Oxfordshire group was fairly evenly balanced on all demographic characteristics, featuring participants from nongovernmental organizations (NGOs), the private sector, government, academia and education, as well as from different education levels and age groups, with an even gender balance. In all respects, the METIER group was much more uniform, being an international network of (mainly relatively young and 75 percent male) PhD researchers connected to a series of seven courses on environmental research, with an emphasis on remote sensing, spatio-temporal model construction and geovisualization.

Scale Perspectives version 2

Scale Perspectives was used in a second set of case studies, this time in a pen and paper format in participatory workshops. These workshops focused on offering different ways to share perspectives on the future: analytic (through Scale Perspectives and Myths of Nature (Holling, 1979)) and experiential (through scenario narratives). A paper focusing on the comparison of analytic and experiential methods of eliciting and sharing stakeholder perspectives based on these case studies is published elsewhere (Vervoort, Kok et al., 2012) but does not address the use of Scale Perspectives in depth.

Partly as a result of the greater flexibility allowed by this version of Scale Perspectives being in pen and paper format, and partly because of the limits of working with specific points only in the spatial–temporal field of the Scale Perspectives tool in version 1, in version 2 participants were encouraged not to limit themselves to a single governance level or time frame for social–ecological systems governance issues. Instead, participants could use connection arrows and area demarcations to describe cross-level effects between different scales of social–ecological systems governance issues (Figure 2). The underlying model of interaction had also changed from using Scale Perspectives as a tool for gathering stakeholder perspectives and indirect analysis of these perspectives to a direct tool for sharing and exchanging scale perspectives to guide planning among societal actors. Each participant received a form where they were first asked to outline their key issues and then apply these to the Scale Perspectives field as they saw fit. Participants were allowed to elaborate on each issue and on cross-level links.

---

2 See scaleperspectives.org to learn about the future availability of an open, digital version of Scale Perspectives version 1.
Visualizing Stakeholder Perspectives on Scale Dynamics in Social–Ecological Systems

Figure 2. A digital version of a participant’s entry in Scale Perspectives version 2 from the Oxfordshire Rural Community Council workshop, done with pen and paper. In this version, participants are allowed to contribute multiple elements of an issue and potential actions related to it in the field, and draw connections between these elements.

In both workshops around 15 minutes were spent on participants’ individual inputs into the Scale Perspectives tool. Another 45 minutes were spent sharing and discussing the Scale Perspectives inputs. This was done by participants showing and explaining their inputs into the Scale Perspectives forms, which formed the basis for a visually annotated dialogue. After the workshop, individual contributions were combined in the same Scale Perspectives field and digitized based on the visual notes of the dialogue and shared with the group for feedback.

In a questionnaire after the workshop, participants were asked to describe their experiences of using the Scale Perspectives tool. They were also asked to provide demographic information about themselves.

Based on the results of the first workshop with Scale Perspectives version 2, the time scale was adjusted to allow for more detail on the medium term in the second workshop (see Figure 2).3

Version 2 case studies

Following the scoping of regional perspectives through the use of Scale Perspectives version 1, two workshops were organized with two separate sustainability-oriented groups in Oxfordshire to further explore the potential

---

3 See scaleperspectives.org for the upcoming, free digital version of Scale Perspectives version 2.
of Scale Perspectives (among other tools) for capturing and sharing societal perspectives on social–ecological systems governance. The first workshop was run with Sustainable Woodstock, a community that facilitates sustainability projects focused on the town of Woodstock. The second workshop was run with the Oxfordshire Rural Community Council (ORCC), a charity that focuses on multiple issues of sustainability (housing, environments, food, energy, and more) across Oxfordshire County. These groups were chosen because each provided a case study of societal actors actively engaged with sustainability and social–ecological systems governance, who we expected might benefit from, and participate actively in, a dialogue about scale dynamics.

The 10 Sustainable Woodstock participants were highly educated and worked in business, government, education, and in NGOs. The 11 participants in a workshop with ORCC classified themselves as working in an NGO or in government. Both workshops had 1 hour allotted to Scale Perspectives.

**Results**

**Results from Scale Perspectives version 1**

**User feedback**

Users’ reflections on Scale Perspectives version 1 were given relatively sparingly (20 percent of users) because the feedback form was voluntary. Comments were highly diverse, but several were made on the user experience (“bit confused, but good way to think!”) and the relevance of the scales (“time scales are important”). The most common observation was that the submitted issues should ideally be linked across multiple levels (“some of these will operate across ranges of time and space,” “all the issues are prevalent in global scale in the present time frame,” “the issues are of core importance and therefore should start from now on and should be ongoing in the long term”).

**Results from participants’ contributions**

Table 1 gives an overview of the inputs in main combinations of broad categories of governance levels and time frames—chosen to give an overall impression of the distribution of inputs. For the Oxfordshire group input, the highest number of overall entries, 29 percent of the total, fell in the national–global/decades–centuries spectrum. District < national and national–global were also highly populated with entries on the months < decades time spectrum. The field < district spatial scale contains the lowest number of entries; another combination of levels with low entries is the district < national spatial spectrum on the hours < months time spectrum. For the METIER group, almost half (46.1 percent) of
the entries fell within the national–global and decades–centuries range. On the same spatial level, the months < decades levels also contain a large number of entries (25.2 percent). The lower levels in Scale Perspectives received low numbers of entries.

Table 1. Scale Perspectives for both case studies as percentages of the total entries, showing general trends in three temporal and spatial categories

<table>
<thead>
<tr>
<th>Oxfordshire</th>
<th>hours &lt; months</th>
<th>months &lt; decades</th>
<th>decades–centuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>national–global</td>
<td>9.5</td>
<td>20.7</td>
<td>29.0</td>
</tr>
<tr>
<td>district &lt; national</td>
<td>1.8</td>
<td>20.1</td>
<td>8.9</td>
</tr>
<tr>
<td>field &lt; district</td>
<td>3.0</td>
<td>4.1</td>
<td>3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>METIER</th>
<th>national–global</th>
<th>months &lt; decades</th>
<th>centuries–centuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>national–global</td>
<td>4.3</td>
<td>25.2</td>
<td>46.1</td>
</tr>
<tr>
<td>district &lt; national</td>
<td>5.2</td>
<td>5.2</td>
<td>12.2</td>
</tr>
<tr>
<td>field &lt; district</td>
<td>0</td>
<td>0.9</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Figures 3 and 4 give an indication of the diversity of time frames and spatial governance levels associated with the top five most contributed issues for each group of participants. Partly different and partly similar issues come up for the two groups and, as in the overall distribution, the METIER case results show a stronger focus on the national–global spatial governance levels and the decades–centuries time frame. However, in each of the cases, multiple perspectives on each issue result in multiple combinations of spatial levels and time frames being submitted as most important.
Figure 3. The top five most-mentioned issues in Scale Perspectives results for the Oxfordshire Scale Perspectives version 1 case: 1. Transport, 2. Energy, 3. Food, 4. Climate change, 5. Environmental degradation. Each of these issues is distributed across a diversity of spatial governance levels and time frames.

Figure 4. The top five most-mentioned issues in Scale Perspectives results for the METIER Scale Perspectives version 2 case: 1. Climate change, 2. Environmental degradation, 3. Food, 4. Economic change, 5. Public policies. Although the distribution of the top issues starts between the district/county level, this case also shows a diversity of spatial governance levels and time frames for each issue when participants’ perspectives are compared.
Results from Scale Perspectives version 2

User feedback

The application of Scale Perspectives in a live setting in the Sustainable Woodstock and ORCC cases provided more in-depth information on the perception of the value of the toolbox by participants. Table 2 summarizes participants’ responses to an open question asked directly after using the tool.

Table 2. Participants’ responses to an open question about their experience of the Scale Perspectives tool—keywords numbered by appearance in responses

<table>
<thead>
<tr>
<th></th>
<th>Positive: 14</th>
<th>Criticism: 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keywords</td>
<td>(very) interesting (3), enlightening (1), well done (1), useful (1), thought provoking (2), encourages to think about own responses (1), realization (1), challenging (1), stimulating (1), encouraged holistic/system-wide considerations (1), clarifies individual thoughts (1)</td>
<td>difficult to choose only five (1), needs more time (3)</td>
</tr>
</tbody>
</table>

Responses from participants to this question were largely positive and referred to Scale Perspectives mainly as allowing them to re-examine and understand the patterns in their and others’ perspectives through the visual structure of the tool. Users’ main criticism of Scale Perspectives in the live setting was that they needed more time to explore and discuss their entries and one participant mentioned the limitation of the instruction to focus on only five issues.

Results from participants’ contributions

Individual contributions in Scale Perspectives, combined through discussions in each workshop, are shown in Figures 5 to 10. These combined Scale Perspectives inputs were produced from the workshops to function as guiding information for each organization.

Figures 5 to 7 show combined Scale Perspectives entries from the Sustainable Woodstock case. Figure 5 summarizes participants’ entries about biodiversity and ecosystem change along with water management and air pollution. It combines participants’ perspectives on the need to manage short-term risk at a regional level while linking to other governance levels, while some longer term issues around water and ecosystems management should be focused around national and European policies linked to higher and lower levels. Air pollution was seen as a problem to be solved in a top-down fashion from the European level. Figure 6 combines resource issues around energy, food, and waste and includes equality. Challenges around these issues are seen as needing governance across multiple levels but based in a bottom-up, short-term to long-term drive for
change. Figure 7 summarizes participants’ entries and subsequent discussions to combine them that focused on social–ecological systems governance and the role of Sustainable Woodstock, linking back to the issues presented in previous figures. This was subjected to the most elaborate discussion.

Figure 5. A thematic combination of participants’ contributions in the Sustainable Woodstock workshop using Scale Perspectives version 2. Solid arrows refer to water governance and broken arrows refer to ecosystem and biodiversity degradation. The lightest arrow refers to air pollution.

Figure 6. A thematic combination of participants’ contributions in the Sustainable Woodstock workshop using Scale Perspectives version 2, focusing on energy and resource use (solid arrows), food security (broken arrow) and global equality (dash–dot arrow)
The discussion based on participants’ entries focused on the perception that local initiatives are often led by dedicated individuals who have a long-term commitment to change. Also, these initiatives are often characterized by their concrete character: something tangible is achieved. These concrete projects can serve as icons and examples to motivate other communities to take similar actions. The difficulty with “upscaled” local initiatives to the regional level and above is that these governance levels require very different strategies and that the status quo regimes that dominate these larger scales are much more inert to change. The discussion then focused on the power and limits of top-down governance, as complementary to bottom-up action, both in terms of “hard” or enforcing governance and “soft” or facilitating governance.

Sustainable Woodstock activities were seen as making a positive contribution at the local community level: woodland planting, events, efforts to change local waste, and resource use. These activities also work on the individual level—aiming at informing and changing the behavior of individual community members. Beside individual behavior change, community members might be motivated to contribute at the community level by joining in the organization of events and projects. Sustainable Woodstock was seen as contributing to the profile of Oxfordshire as a county with many sustainable development communities working on concrete projects. Furthermore, from this basis of concrete action, Sustainable Woodstock was seen as having the potential for an active voice in policies at the regional level and above.
Figures 8 to 10 show combined Scale Perspectives entries from the ORCC case. Again, these entries were combined through a discussion about different overarching subjects. The time scale was adjusted after the Sustainable Woodstock workshop to allow for more detail in the medium time frames. This is reflected in the fact that combined entries from participants are less clustered to the right side of the figures and have more space to outline relationships.

Figure 8 summarizes entries focused on resources: energy, food, water, and waste. For both food and energy, an emphasis was put on the relationship of local production and national/global use and trade. Awareness and the provision of options were seen as the most important regarding these topics. The contributions focused bottom-up action: scaling up from local success stories.

![Diagram](image)

**Figure 8.** A summary of contributions by participants in the Oxfordshire Rural Community Council workshop using Scale Perspectives version 2, on the theme of resources: energy (broken arrows), food (arrows), water (dash-dot arrow), and waste (dotted arrow)

Contributions on demographic change, housing, and transport as elements of sustainable governance (Figure 9) focused on taking care of the growing share of elderly in the population, as well as ensuring affordable housing for the new generations. On higher governance levels, there were more questions than ideas: How will the world deal with migration and demographic change on the long run? In terms of local transport, planned travel and bus schemes were proposed. On higher levels, investment in alternatives like trains and water transport was suggested. Working from home was seen as a solution that should be stimulated as well.
Similar to Sustainable Woodstock, general issues of governance were discussed at length, particularly around participants’ entries about education, community empowerment, and awareness raising (Figure 10). Specific emphasis was given to cross-level interactions in the form of investment into lobbying and organizing local initiatives together. Also, a perceived lack of cross-level understanding of sustainability governance issues (the “not in my backyard” mentality) was highlighted as a challenge to be overcome. A historical perspective was brought into the discussion: a few decades ago, participants perceived that there was more direct influence from the local and regional levels of government on the national level, and therefore the action gap between these levels was smaller. In contrast, with a decreased emphasis on regional levels of organization, this gap appeared, to the participants in the workshop, to be increasing.

To take on the scale gap, a strategy was discussed that consisted of three elements. There should be a greater focus on higher-level political presence for the ORCC and its peer organizations in the United Kingdom. Aside from the larger involvement of rural community council networks in this local-to-national communication, individual members should also be made aware of the importance of this link across scales. A clear strategic vision should be communicated on each of the local, regional, and national organizational levels. Finally, in the context of the United Kingdom government’s Big Society policy, it should be clearly communicated that the ORCC has always been doing what national politics were now trying to achieve.
Figure 10. A thematic summary of contributions by participants in the Oxfordshire Rural Community Council workshop using Scale Perspectives version 2, focusing on the council’s engagement with other partners and higher governance levels (solid arrows), education (broken arrows), and awareness raising (dash–dot arrows)

Discussion

Scale Perspectives version 1

The goal of the first version of Scale Perspectives was to collect information about participants’ perspectives within a target group and to come to general insights: to identify what governance levels and time frames participants were or were not engaged with, and to identify the diversity of scale perspectives around certain issues. In both case studies, the top five most-mentioned issues made up about half of the social–ecological change issues mentioned by the participants. This indicates that, overall, issues that were a concern to the majority of participants were identified and outlined in terms of governance levels and time frames, as well as a range of other issues.

The open character of the question used with Scale Perspectives version 1 was useful to discover the prevalence of top issues and the ways participants defined them. However, a problem of the results was that the issues identified by participants ranged from the specific to the general. We hypothesized that the more general the issue, the less embedded it would be in specific governance levels and time frames. This argued for a requirement of more specification and elaboration from the participants on their input, which contributed to the changes made in version 2.
Participating stakeholders in both cases entered diversely scaled perspectives, both in the temporal and spatial dimensions. The Oxfordshire group showed a focus on the highest spatial and temporal levels, but this preference was more extreme in the METIER group. We believe this difference reflects the difference between the case studies: the Oxfordshire group consisted of a demographically diverse group of participants, while the METIER group was made up of PhD students and researchers, mostly male and in the same age group. Also, the Oxfordshire group had a regional focus, while the METIER group was spread across Europe. Both cases indicated that several combinations of spatial and temporal levels are not considered relevant: the smallest spatial levels and shortest temporal levels are largely left empty. In Oxfordshire, the longest term for the intermediate spatial level (district < national) was also left largely empty. Temporal and spatial hyperopia may have affected the specificity of issues contributed by participants—the more global and long term the focus of the participants, the less specific their input will be.

In both cases, entries for each of the top five issues were widely spread across spatial and temporal levels. This indicates that while stakeholders agreed on many top issues, they had different perspectives on the spatial and temporal levels at which these issues were most relevant. This result can help to highlight to societal actors the prevalence of one of the three aforementioned challenges of governance across levels and scales, the “multiplicity of scale perspectives” (Cash et al., 2006). Gaps in the focus levels submitted by the participants offer clues as to what elements of the social–ecological systems are downplayed in the perspectives of stakeholders. Because of this, its outputs can help, to some degree, address another of Cash et al.’s (2006) identified scale challenges, that of “ignorance of other levels”. Scale Perspectives version 1 does not, however, offer a way in itself to use the mapping of this diversity to overcome differences between societal actors. Its inability to let participants frame environmental change issues as connected across governance levels and time frames ultimately turned out to be a significant limitation, evidenced both by the limited information provided by the participants’ contributions and their feedback on the tool. These insights contributed to the development of Scale Perspectives version 2.

Scale Perspectives version 2

The second version of Scale Perspectives was developed to overcome the limitations of the first version, specifically by lifting the limitation for participants to contribute only one marker per social–ecological systems governance issue in the scaled field provided by the tool, and instead allowing for multiple markers per issue, arrows, marked areas, and other visual indicators. After our experience with version 1, we also decided to use the new version of the tool in workshop
formats first, to get more information from users about their experience of it, and additionally to explore possibilities for sharing and dialogue based on use of the tool.

The potential of the Scale Perspectives tool as a format for sharing and combining societal perspectives on social–ecological systems governance went beyond the goal of the first version. This function, however, proved to be the main focus in the two workshops in which version 2 was used. Participants used the freedom provided by the scaled field to draw links across governance levels and time frames, connecting multiple elements of environmental change issues. Participants signified how challenges at one level (global) could begin to be tackled by bottom-up responses at the local level, supported by facilitating governments at regional, national, and European levels. Whereas some participants focused mainly on the agency of their own community or organization, others focused on the actions of higher-level actors, and these perspectives were combined. These differences in emphasis were made explicit and comparable using the Scale Perspectives tool.

In both cases, the conversation turned from an initial identification of issues and cross-level system links to what the role of the organization or community that these participants were engaging with was and could be in the greater multilevel perspective outlined by the group.

In both cases, participants used the dialogue-based Scale Perspectives contributions to strategize about engagements with new partners to ensure greater impact. Both groups thought that their focus so far had been too local and that they would benefit from leveraging higher-level institutions. These conclusions, drawn from the groups’ use of Scale Perspectives, signified a different role for the tool than was initially intended—rather than being merely a tool for the collection and secondary analysis of societal perspectives on scale dynamics, the tool could function as a direct way to empower societal actors in their participation in governance across multiple levels and time frames (Dryzek, 2009; Ostrom, 2009).

Because the tool was used as a planning tool more than anticipated in the first of the two cases where Scale Perspectives version 2 was used (with Sustainable Woodstock), in the second case (with the ORCC) the time frame was adjusted, which allowed for more medium-term information to be captured.

Overall, Scale Perspectives version 2 retained the benefits of version 1 but increased the information captured, allowed participants to focus on the multifaceted nature of social–ecological systems governance issues, and provided the additional benefit of linking challenges with solutions at different levels and
time frames. This way, Scale Perspectives version 2 allowed for information to be visualized in a way that has benefits over Cash et al.’s (2006) visualization of scale challenges:

- It addresses the ignorance of scale dynamics by allowing participants to compare their scale perspectives with those of others and see complementarities in knowledge as well as recognizing common gaps and helping to identify key issues.
- It allows societal actors to make their perspectives explicit and thereby provides the basis for a multi-stakeholder dialogue that can help combine knowledge and action and overcome differences.

The challenge of scale mismatches was addressed only implicitly. However, it was the possibility for dialogue and a combination of participants’ contributions in the workshop format that showed potential for this tool to help stakeholders act on such challenges by devising collaborative strategies.

**Potential improvements**

Scale Perspectives version 1 showed some potential to help address challenges in capturing societal perspectives around scale dynamics in social–ecological systems. Limitations identified by researchers and users informed Scale Perspectives version 2, which overcame some of these limitations. Given its potential to generate, share, and combine systems perspectives, the relative simplicity and flexibility of the tool is a benefit. However, this simplicity also comes with some drawbacks. Firstly, the scales used in the tool are preframed, and it could be argued that this limits participants in eliciting their scale perspectives in a truly subjective fashion. An alternative to Scale Perspectives that does focus on the diversity of scales, rather than just levels, that stakeholders may use to frame environmental and other governance issues is the Scale Repertoire (Vervoort, Rutting et al., 2012). This tool, however, requires a much more in-depth analysis that is dependent on facilitation. A version of Scale Perspectives that could bank on the benefits of both tools could be one where a scoping of preferred scales and levels among stakeholders is done first and Scale Perspectives participants are then invited to frame the scaled field using their own identified, rather than predefined, scales.

Another drawback of the current simplicity of Scale Perspectives is that it does not, in its present form, allow for quantitative or even semiquantitative assessment of dynamics between system elements. Other tools for capturing stakeholder perspectives on systems, such as fuzzy cognitive maps (Kok, 2009; van Vliet et al., 2010) and other participatory modeling tools (Voinov & Bousquet, 2010), do allow for a systems description that includes semiquantification of relationships and feedbacks among system elements. These models, in turn,
have no specific focus on system levels and scales. A combination of Scale Perspectives with features of fuzzy cognitive maps (such as asking users to define the strengths of relationships and feedbacks across levels) would be feasible, however.

Finally, the advantage of Scale Perspectives version 2 over version 1 has partly come from its use in workshop settings where dialogue about Scale Perspectives inputs was easily shared, discussed, and combined. Version 1, by contrast, had the benefit of being scalable due to its online format. The introduction of options for exchange, comparison, and dialogue based on different Scale Perspectives inputs is, again, feasible, but would require an enabling architecture.4

Conclusion

Scale Perspectives provides an example of how simple interactive tools could be used to help address challenges for societal actors around social–ecological systems governance across multiple system levels. Allowing participants more flexibility to indicate system dynamics across governance levels and time frames, to include solutions, and then to offer a space for the sharing, discussing, and combining of those perspectives helps to address practical scale challenges. Challenges that Scale Perspectives can help address include the identification of areas of ignorance for societal actors about system dynamics and actors at other levels, and the elicitation and sharing of different actors’ scale perspectives. The combination of scale perspectives stimulates multilevel dialogue about solutions for identified governance issues. This way, tools such as Scale Perspectives can empower societal actors to act collaboratively and strategically across system levels and scales to tackle the significant challenges of governing social–ecological systems.

---

4 See scaleperspectives.org for the upcoming, free digital version of Scale Perspectives version 2.
References


Kok, K. (2009). The potential of fuzzy cognitive maps for semi-quantitative scenario development, with an example from Brazil. *Global Environmental Change, 19*(1), 122–133.


BOOK REVIEWS
In the autumn of 2009, Johan Rockström and colleagues published a feature report in *Nature* titled “A Safe Operating Space for Humanity”. The objective of the piece was to quantify the global status of 10 key physical processes, including ocean acidification and land-use change, as well as how far each could be pushed before drastic and irreversible environmental change was set in motion. According to the report, seven of these processes have yet to breach their limits. Of the three that already have—the nitrogen cycle, biodiversity loss, and global warming—biodiversity loss is without doubt in the worst shape. Indeed, according to Rockström et al. (2009), global biodiversity loss is occurring at a rate up to 1,000 times greater than it would be without human influence.

Considering this dire state of global biodiversity, as well as the obvious fact that human social processes are squarely responsible for such a state, it is surprising that environmental sociologists and other social scientists concerned with such unacceptable degradation have yet to seriously confront the matter. Perhaps the jolt needed to take on such an academic project will come from an unlikely source—a trade book. *New Yorker* staff writer Elizabeth Kolbert’s *The Sixth Extinction*, published by Henry Holt and Co., does well to make the case that the dramatic escalation in biodiversity loss is without doubt worth our attention.

For those familiar with Kolbert’s *New Yorker* oeuvre, it should come as no surprise that *The Sixth Extinction* is a lively, well-written book. As in her *New Yorker* pieces, we join her as she restlessly hops around both history and the planet in order to examine the current fortune of a certain threatened or extinct species; the fate of which, we are rightly assured, may well serve as a harbinger of many more. For example, we visit remote Panama to learn about the unexpected near disappearance of the once-ubiquitous Panamanian yellow frog, the victim of a novel African species of chytrid fungi rapidly spreading through international
trade and leaving hosts of dead amphibians in its global wake. In a typical move, Kolbert uses the fate of this Panamanian amphibian as an opportunity to relay an important point about biodiversity loss—this time to explain how contemporary ecological changes are moving with such unprecedented alacrity that, for many species, characteristics that once helped them operate in certain ecologies are no longer useful, thus making them more vulnerable. To bolster this point she consults a whirlwind of paleontologists, veterinary pathologists, mycologists, herpetologists, various other “experts,” the marine fossil record of the past 600 million years, and even a local open-air market selling “what must be the largest selection of golden-frog figurines.” All this in little more than 15 pages. We never stay anywhere too long, however, as we are soon whisked off to an office in Paris that was once home to Georges Cuvier. There we learn about mastodons, how Cuvier introduced the concept of extinction to western science, about the scientific debates in which he was involved, and even his eating habits. From there, onward to Iceland. In total she travels to a dozen locations and introduces as many species in order to weave narratives on climate change, the extinction of the dinosaurs, invasive species, the contemporary status of bats in New England (it’s not good), ocean acidification, graptolites, and more. All to make the necessarily urgent point that human activities, now the principal driver of ecological change, have pushed biodiversity beyond the brink.

If some of these stories sound familiar, that may be for two reasons. First, over the past several years, roughly one-fifth of them have appeared in the *New Yorker* in almost the same form they are found here (while the ones that have not read as if they could have). Second, her style and, especially, the historical narratives she employs, are well worn. While not explicitly but certainly understandably, Kolbert draws heavily from previous work by the best communicators of evolutionary and scientific history; people such as Loren Eiseley (e.g., 1958), Donald Worster (e.g., 1994), Richard Lewontin (e.g., 1992), Richard Levins (e.g., 1996), Richard Leakey (e.g., Leaky & Lewin, 1995) and Steven Jay Gould (e.g., 2001). As such, for those familiar with these writers, neither the history of science she provides nor her explanation of physical processes will be new. This is especially salient for those familiar with Leakey, who less than two decades ago published a book on the same topic that even bears the same title as Kolbert’s.

This is not to say the book is redundant. For, unlike these other writers, Kolbert is not a trained scientist nor historian, but rather an accomplished journalist. She therefore provides a slightly different perspective as, instead of being told from on high how specific ecologies operate or why Darwin sided with Lyell in the catastrophism/gradualism debates, we learn as she does and share with her in the excitement of discovering novel ecological processes as well as the horror of their implications. Indeed, Kolbert is reflexive about her own naivety and does well to carefully incorporate the most current science while never coming
down too hard on either side of an open debate. She is also generally successful in capturing the historical contingency of ecological processes, and when she does relay technical information she does so in an approachable manner. Additionally, to state the obvious but still important point, Kolbert’s work is more current as many of these forebears have passed on or are in the twilight of their careers.

Though, perhaps because of this admitted naivety, essential elements of this earlier work are missing. For example, Kolbert does not possess the theoretical depth of Gould, the historical scope of Eiseley or Worster, nor the political urgency of Lewontin and Levins. She never questions how contemporary ecological knowledge is built, nor does she take an in-depth look at the social processes that are setting in motion such abrupt ecological degradation.

These key limitations demonstrate the need for a current, more robust social science of biodiversity loss. For in order to find some sort of social explanation for why we human beings are undercutting our own ability to survive, not to mention the survival of many more beings, Kolbert does not seek any cultural, political, or economic (or political–economic for that matter) origins. Instead, she unfortunately turns to an ill-defined notion of human nature for explanation. The result is that, according to The Sixth Extinction, the blame for the biodiversity crisis lies in the ostensible fact that human beings can’t help themselves but push the limits of the ecological world. It is simply in our genes to be so restless, to discover, to erase boundaries, and to destroy. Sticking to this logic, the only hope Kolbert can then find is that our better angels save ourselves from ourselves (and everything else) before it is too late.

Certainly environmental sociology and social science more broadly can develop a better explanation for the social drivers of biodiversity loss than this? We already have a host of macrohistorical explanations for coupled social and ecological change, but few have been robustly explored in terms of biodiversity loss. Even considering this book’s faults, it will hopefully inspire some of us to take on this question. Ultimately, we cannot disagree with the eloquent urgency in these pages and we should commend Kolbert for bringing such urgency to a wider audience. Let us just make sure we do more than listen, but join the conversation.

References


Energy and Electricity in Industrial Nations: The Sociology and Technology of Energy
By Allan Mazur
Oxon and New York: Routledge, 248 pp., 2013
ISBN: 978-0-415-63441-0

Reviewed by Richard York1

How nations use energy—including how much and from what sources—has serious implications for societies and the environment. Climate change and air pollution, nuclear waste and the threat of nuclear accidents like the one at Fukushima, oil spills such as those from the Deepwater Horizon and the Exxon Valdez, the contamination of groundwater and contribution to earthquakes from “fracking,” and the decimation of landscapes from mountain top removal coal mining highlight some of the consequences that stem from the energy use practices of modern societies. The complexities of the technical systems involved in extracting energy resources and distributing energy in usable forms to industries and consumers are important to understand to get a grasp on our energy challenges, but few people, including most social scientists, understand these technical aspects in detail. The political, economic, social, and cultural systems that influence how societies use energy are as complicated, if not more so, as energy technologies and understanding these systems is essential if change to energy use is to be achieved, but few engineers grasp the intricacies and subtleties of social systems.

The author of the book under review here, Allan Mazur, is that rare individual who has a strong grasp on both the social and technical aspects of energy systems, having trained as an engineer and a sociologist, and having been a leading scholar of energy, technology, and society for decades. He has produced a valuable book aimed at a non-technical audience that deftly explains both the technology and sociology of energy, which will likely improve the understanding of energy issues for most people who read it and may serve to enhance scholarship across multiple fields dealing with energy systems. The book focuses on affluent industrial nations, particularly the United States, a limitation that Mazur acknowledges. In light of the fact that energy use is rising

1 Department of Sociology, University of Oregon, United States; rfyork@uoregon.edu.
dramatically in China and India among other nations it is increasingly important to consider processes occurring outside of the wealthiest societies. Nevertheless, the focus is appropriate given that the lion’s share of global energy resources over the past two centuries has been consumed by “developed” nations.

The book has 14 chapters, divided into five sections. The first section gives an overview of the rise of energy use, particularly fossil fuels, that occurred as part of the industrial transformation that unfolded over the past two centuries and how energy use in industrial societies differs from that in preindustrial societies. This presentation includes a discussion of the many environmental problems connected with various energy resources, how energy and electricity are distributed in industrial societies, and the connection between energy use and quality of life (roughly speaking, rising energy use in poor nations is associated with improvements in some indicators of quality of life, but this link is not apparent in affluent nations).

The second section covers the major sources of energy—fossil fuels, nuclear, and renewables—explaining where they come from, how they are used, and trends in their use over the past few decades in industrial nations. The section also includes a chapter assessing the contribution of population growth to the consumption of energy (which is substantial, but its effects differ across nations and are less important for electricity consumption than they are for overall energy consumption).

Part three focuses on electricity grids, particularly the United States grid system (now based on three main grids, two of which are linked with Canada) and how it developed from the end of the nineteenth century to the present. There is also a shorter discussion of the Japanese grid system and how it was affected by the 2011 earthquake and tsunami.

Part four focuses on the social conflicts that occur over energy use, including controversies about the contribution of fossil fuels to global climate change and the environmental impacts of energy extraction. Mazur notes how controversy often stems from the divergence of what seems “rational” from a technical point of view and what seems sensible from a more human perspective. Mazur discusses disputes about the appropriate weight given to “expert” opinion, how experts differ from one another in their assessments, and how risk–benefit analyses are conducted. This section includes a chapter on media coverage of energy-related issues, particularly reporting on global warming, discussing theories aimed at explaining changing patterns in news reportage over time.

The fifth and final section focuses on proposed solutions to our energy problems and offers some guidelines for energy policy. Mazur provides an intelligent discussion of energy use in transportation and in cities, and the potential
merits and limitations of energy efficiency and policies like cap and trade. The final chapter ends with a list of 10 points under the heading “What should we do?” These aren’t so much suggestions as important matters that should be considered when making decisions about energy and include the need to consider all energy options, to recognize the virtues of renewable energy sources while not overlooking their shortcomings, and to question social institutions (corporations, governments) that work to spur energy consumption.

This is a well-written and informative book by an outstanding scholar who is unusually well qualified to analyze both the social and technical aspects of energy systems. Mazur is a hard-nosed realist who does not propose any technofixes or other magic bullets to solve our energy problems. Rather, he recognizes the many tensions, trade-offs, and limitations that exist in how societies use energy and what societies gain and lose by their energy use practices. He also recognizes that there are hard choices to be made about how to reduce energy consumption and how to produce the energy societies consume. Who makes these choices and what choices are made depend on inequalities of power; the consequences of decisions differ across people based on their social positions and across environmental systems.

The main shortcoming of the book is that, while it acknowledges the importance of political and economic power, including the role of corporations, in determining energy production and consumption practices, it does not draw on the substantial sociological literature on the political economy of the environment to any great extent. Political economists in environmental sociology have shed a great deal of light on how the dynamics of capitalist systems lead to environmental crises, and drawing on this work would have elevated the theoretical level of the book. Additionally, while he acknowledges public controversies, Mazur never seriously engages with a consideration of how social movements challenge powerful actors to bring about reform in energy policy and what potential movements have to bring about social change (and, thereby, to bring about change in energy use). Of course, there is only so much one can address in a single book, and Mazur clearly sticks to his strengths, giving authoritative information on many aspects of energy systems. Overall, this is an excellent book, fully worthy of attention from a variety of scholars as well as generally educated readers of all backgrounds.

Disclaimer: Gene Rosa, who was my adviser in graduate school, my friend, and one of my research collaborators and co-authors, was a former student of Allan Mazur, who is therefore in some sense my intellectual grandfather. Before publication, I provided Professor Mazur with some brief comments on an outline of the book reviewed here.
Defensive Environmentalists and the Dynamics of Global Reform

By Thomas K. Rudel

New York: Cambridge University Press, 262 pp., 2013

Reviewed by Thomas J. Burns

How do societies, perhaps most or even all of which are on the precipice of overshoot, come to be sustainable? This is perhaps the most important question facing humankind in the third millennium. The central question of Thomas Rudel’s book is a critical piece of this. He asks (p. 9): “How [do] defensive environmentalists interact with movement activists to build sustainable social orders?”

With that question as a through-line, Rudel builds a framework for his inquiry in the nexus of three theoretical streams. After acknowledging the importance of modernization theory from sociology, and succession theory from ecology, Rudel then points the discussion to an emerging approach focusing on the critical interplay between natural and human systems. This coupled natural and human systems, or “CNH” approach (e.g., Liu et al., 2007) seeks, inter alia, to address weaknesses in earlier theorization by acknowledging the interactive, dialectical relation between natural and social systems. Each profoundly influences the other; Rudel makes a strong case that human ecology does well to appreciate that, particularly given the complexities faced by people and societies in late modernity.

Using this theoretical framework to guide the analysis, Rudel synthesizes lessons from a wide array of empirical work. While he does focus more on smaller level case studies and meso-level analysis, he also considers work more global in nature. He compares processes and institutions from around the globe, as he builds a multi-tiered analysis. In so doing, he looks at several levels of decision making, from individual and family decisions about fertility and recycling,
to the most global of issues, such as ozone depletion and global warming. In between are meso-level decisions, such as those concerning agribusiness versus alternative agriculture, resource allocation, and energy policies.

In his thoroughgoing analysis, Rudel ties in a number of what may otherwise be mistaken for disparate and marginally relevant ideas, and shows their relevance and predictive capacity. He deftly takes a number of unexpected intellectual turns that are remarkably on point. His work is replete with examples, but a few will suffice for this review.

In applying ideas and observations from ecology to social systems, for example, Rudel sees the relevance of Romer’s rule (the insight that many evolutionary changes, such as the development of bony limbs in fish, are actually adaptations that allow the species, at least in the short run, to hold on to an older way of life) in social and ecological systems (200ff.). Many of the activities, and even ways of seeing the world, of people living in social systems and interacting with the natural environment, appear to follow such a pattern as well.

He fleshes out this idea with discussion of events from history, in which a people (Campesinos in Mexico), threatened by resource capture and ecological marginalization that they saw as posing an imminent threat to their way of life, gradually decided to fight over scarce resources. These actions were a key component of the cascading events leading to the Mexican Revolution (Womack, 1969; also see Homer-Dixon, 1999). While outcomes of the revolution may have been unexpected and novel in many ways, many of the ideas and actions precipitating it were grounded in trying to maintain older patterns.

Rudel’s analysis takes an important turn when he looks at the role of events that serve as ways of focusing attention, such as tornados or earthquakes. These focusing events, after being run through the filters of framing provided by opinion leaders (who sometimes can be, but are not necessarily, environmentalists), serve to shape subsequent discourse. The attention cycle plays a key role here, and environmental policy changes and other related actions stand their best chances of adoption and integration into the culture at certain points in that cycle (164ff.).

Typically, though, the cycle ebbs before meaningful action can be put in place, because the political process moves more slowly. What is often left is a trajectory that favors more active, connected, and monied interests who are able to counter-frame and who ride different aspects of attention cycles such as economic downturns (McCright & Dunlap, 2003). Here again, Rudel finds relevant ecological theory to shed light on these processes. The attention cycle, “social cascades,” and feedback processes follow equilibrium processes. Those processes are far from smooth, following something much more akin to
the punctuated equilibrium of ecology. Many political processes take place in a recursive set of subsystems, which behave in remarkably similar ways to punctuated equilibrium processes (True et al., 2006).

Rudel examines common human practices and culturally embedded ways of seeing the world and weaves his work in ways that show how tendencies to focus on certain aspects of problems can and do aggregate from the individual and interpersonal level to more macro levels. Large-scale ecological problems can and do result from focusing on the here and now at the expense of long-term consequences. Rudel points out that this product of long evolutionary forces made sense (and still does in some instances) historically, but is now a major contributor to environmental problems. But this tendency is not only the head of a wicked problem of the ways in which people degrade the environment. It also, Rudel shows, profoundly affects the sorts of problems people choose to engage, when they turn to environmental activism.

He is able to end on a somewhat hopeful note. Rudel points out that meaningful moves toward sustainability will necessarily occur not just locally, but more generally and on a number of levels. While environmentalists have often at best met with mixed success (for discussion, see Burns & LeMoyne, 2001), Rudel points to some hopeful signs in this regard. He looks, for example, at efforts of climate scientists to frame environmental knowledge in ways likely to resonate with existing cultural sentiments, so that people will tune into the dangers and be more likely to act in ways to help mitigate disaster. National and international nongovernmental organizations can craft strategies that include an array of interested actors, so as to bolster the chances of environmentally friendly action spanning levels of political actors, from the most local to the most global.

Thomas Rudel’s work is a scholarly tour de force. It is theoretically grounded and synthesizes a wide array of findings into a coherent whole. The book deserves a wide and serious reading, from students and scholars to policy-makers across institutional levels.

References


Contributors to this issue

Gabriela Alonso-Yañez is a post-doctoral researcher in the Environmental Policy and Governance research team in the Geography Department, University of Calgary and a sessional instructor at the Werklund School of Education. Her research interests include ground-level qualitative research, environmentalism and pedagogies of place, science and technology studies, actor network theory, and post-human political ecology.

Arnold K. Bregt is professor of Geo-information Science at Wageningen University, the Netherlands. Following more than 25 years experience in the field of geo-information science research and applications, his current areas of interest are spatial data infrastructures, human–space interactions, and spatial thinking. He is (co-)author of about 300 publications and holds an MSc and a PhD from Wageningen University.

C. B. Christensen, BA (Hons), MA, and Dr. Phil., works in German philosophy of the late 19th and early 20th centuries, with emphasis on the phenomenology of Husserl and Heidegger; and in the philosophy of technology and sustainability. He has also worked in analytical philosophy, on the history of philosophy (Descartes, Kant, Hegel, and Marx) and on critical theory.

Jessica L. Cundiff is a visiting assistant professor of psychology at Colgate University. She completed her PhD in Social Psychology and Women’s Studies from the Pennsylvania State University in 2013. Her research examines how subtle and often unintentional forms of bias are expressed and how they impact feelings and behavior in ways that contribute to social inequities.

Conny Davidsen is an assistant professor of Environmental Policy and Governance in the Geography Department, University of Calgary. Her research focuses on the global–local interfaces and political discourses of environmental conflict, including rainforest conservation, forest carbon policies, petroleum extraction, and local forest/land rights. Her Environmental Policy and Governance research group conducts projects on four continents, with emphasis on Latin America.

Mariana Giraldi has an MSc in Botany from the Universidade Federal Rural de Pernambuco, and currently is a professor with the Departamento de Metodologia do Ensino, Universidade Federal de Santa Catarina. Her research interests are human ecology, ethnobotany, and education.
Angela C. Halfacre is professor of Political Science, and Earth and Environmental Sciences (sustainability science) at Furman University, and the founding director of Furman’s David E. Shi Center for Sustainability, established in 2008. Her teaching and research focuses on understanding the perceptions, policies, and practices that characterize local and regional “conservation culture.”

Natalia Hanazaki holds a PhD in ecology from the Universidade de Campinas, and currently is a professor with the Ecology and Zoology Department, Universidade Federal de Santa Catarina, where she coordinates the Laboratory of Human Ecology and Ethnobotany. Her research interests are human ecology, ethnoecology, ethnobiology, ethnobotany, and biological conservation.

David Henkel is emeritus professor of planning at the University of New Mexico. He received his PhD in the Sociology of International Development from Cornell University (1984), and his BA and MA from the University of Pennsylvania (1969). His research and professional work on community economic mobilization, natural resources and protected areas management, and transboundary resources planning has focused on Latin America, Southeast Asia, and non-state nations of Europe.

Anna M. Henry is a social scientist contractor with Integrated Statistics, working at the Social Sciences Branch of NOAA Fisheries, Northeast Fisheries Science Center. Her co-authored publication in this issue is based on research done as a graduate student at the University of Maine, where she received an MSc in Marine Biology and an MSc in Marine Policy. She also holds a BA in Environmental Studies from Lewis and Clark College.

Marjanke Hoogstra is a researcher and lecturer at the Forest and Nature Conservation Policy group at Wageningen University, with a PhD on temporal planning perspectives in the forestry sector. Her interests are in forest management, natural resource economics, scenario planning, and decision-making under uncertainty.

Rolf Janssen is a programmer with work experience in various government and private sector contexts (startups, Fortune 500 enterprise environments). Rolf has developed online research tools for the Dutch TransForum program on agricultural innovation and for the Climate Change, Agriculture and Food Security program of the CGIAR.

Teresa R. Johnson is an associate professor in the School of Marine Sciences, University of Maine. She holds a PhD from Rutgers University, an MSc in Marine Policy from the University of Maine, and a BA from Bowdoin College. Her applied social science research focuses on understanding social–ecological change and resilience in coastal communities and the design of fisheries science and management institutions.
Kasper Kok is assistant professor of the chair group Soil Geography and Landscape at Wageningen University. His main research topics focus on developing integrated, multiscale scenarios particularly related to climate change mitigation and adaptation. His key interest is improving (multiscale) methodologies, using qualitative and semi-quantitative methods in a participatory setting, mostly dealing with state-of-the-art scenario development in Europe and Latin America.

Bruce Lord is a lecturer of statistics at the Pennsylvania State University. He has over 35 years of experience as a resource economist specializing on the impacts of public lands upon rural economies. He has made extensive use of survey research to study the economic impacts of the wood products industry and natural resource–based travel and tourism.

Courtney E. Quinn is research fellow and program manager for the David E. Shi Center for Sustainability at Furman University and teaches in the Earth and Environmental Sciences sustainability science major. Dr. Quinn specializes in the study of leadership for sustainability and is particularly interested in food and farming issues.

Janet K. Swim is a professor of psychology at the Pennsylvania State University. She completed her PhD in Social Psychology from the University of Minnesota in 1988. Her research interests include social and psychological drivers of pro-environmental beliefs and behaviors and the development of ways to facilitate change education and communication.

Cameron Thompson is a research associate for the University of Maine working out of the Bio-Oceanography lab at the Gulf of Maine Research Institute in Portland, Maine. He received an MSc in Marine Biology and an MSc in Marine Policy at the University of Maine, and a BSc in Biology from SUNY Geneseo. The graduate research for the policy degree was used for both his co-authored publication in this issue and his thesis.

Ron van Lammeren is an associate professor of Geo-information Science at Wageningen University and a state-registered landscape architect. His main research topics are geo-visualisation, spatial thinking, and geo-information-based empowerment related to participatory planning and landscape planning. He currently supervises PhD research on geo-visualisation in relation to climate change adaptation, in designing sustainable energy landscapes, and in support of local water services.
Joost Vervoort is a researcher at the Environmental Change Institute of Oxford University and scenarios officer for CGIAR’s Climate Change, Agriculture and Food Security program in Africa, Asia and Latin America. His main interests are in strategic planning and experiential learning in complex systems contexts. Joost has a PhD from Wageningen University in eliciting knowledge on social–ecological systems.

Stephanie J. Zawadzki is pursuing a dual-title doctoral degree in Psychology and Human Dimensions of Natural Resources and the Environment at the Pennsylvania State University. Her research interests include investigating human–environment systems, long-term behavioral engagement and behavior change, and program evaluation.