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PRAGMATIST ECOLOGICAL ECONOMICS: FOCUSING ON HUMAN-NATURE RELATIONSHIPS AND SOCIAL- ECOLOGICAL SYSTEMS

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PRAGMATIST ECOLOGICAL ECONOMICS: FOCUSING ON HUMAN-NATURE
RELATIONSHIPS AND SOCIAL-ECOLOGICAL SYSTEMS

By

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Dissertation

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Abstract:

I propose pragmatist philosophy as a companion for ecological economics, a research tradition with a focus on addressing sustainability issues and integrating ecological principles, economics, and the broader social sciences. Ecological economics laudable goals include balancing competing values, tradeoffs, and insights for more equitable decision-making. However, the field is built upon somewhat tenuous philosophical and theoretical foundations, which has resulted in a muddled body of literature, concerns about relativistic science, and questions about the future viability of the field. To address such concerns, I propose and articulate pragmatist ecological economics. Generally, joining pragmatism and ecological economics provides established beliefs about: the nature of reality with a contextual ontology; the way we learn via Dewey's experience model; the way to assess knowledge based upon deliberative democracy and 'wary assessment' and; a clear purpose to communicate, understand, and facilitate social learning about the human-nature relationship. Specific recommendations include a core subject matter (a comprehensive understanding of human-nature relationships), integration of normative sustainability, and a focus on better processes and methods that synthesize across big ideas (e.g., relationship to place research, ecosystem services). I stress that all approaches to understanding the human-nature relationship provide different, *partial* understandings. Consequently, I demonstrate a 'research menu' framework by weighing into a methodological debate between Q- and R-methodology. Finally, I propose that a social-ecological systems perspective and a pragmatist ecological economics are compatible, as the former can help the latter better achieve its applied goals by orienting the understanding of the human-nature relationships within the larger system.

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1. INTRODUCTION

The conservation sciences or, in the case of this dissertation, the slightly more specific conservation *social* sciences, are unique. First, the broad field includes researchers from a variety of areas of academic study and, as a result, there is no single unified disciplinary foundation. For instance, research taking place within the W. A. Franke College of Forestry and Conservation (FCFC) at the University of Montana ranges widely, from studies of predator-prey dynamics, to “optimal” forest rotation strategies, to the meaning of wilderness solitude and unconfined recreation, and the nuances of the Public Trust Doctrine. While each of these study areas may take place within a slightly more specific department, such as the Department of Society and Conservation at the FCFC, a prerequisite disciplinary foundation is still lacking. For example, unlike research taking place in an economics department, where research methods and basic underlying theory and scientific beliefs are established, generally accepted, and conveyed to students in a like manner, such topics in the conservation sciences are often taught with broad brush strokes (e.g., qualitative research methods, quantitative research methods, general research paradigms).

Second, while the approach to research in the conservation sciences is diverse and without unification, the general purpose for research is agreed upon, in a *very* general sense. That is, *conservation* science is meant to create robust knowledge for, perhaps, conservation outcomes, sustainability, or better natural resource management, planning, and stewardship (the meaning or avenue to such outcomes is an open question and depends on one’s perspective). It is arguable as to whether ‘basic’ science, or science for the sake of knowledge creation, can be clearly distinguished from ‘applied’ science, or science for some purpose, within the context of the conservation sciences.

A consequence of these two, somewhat unique, facets of the conservation sciences is that few scientific beliefs and practices are implied, other than a commitment to science, knowledge, and perhaps understanding. Thus, a situation is created where each individual researcher needs to articulate such beliefs and practices from foundational philosophy to on-the-ground practice and application. In pursuit of a Doctor of *Philosophy*, this dissertation aims for such an articulation. In order to set up this articulation, this introduction includes a discussion of a motivation and general context, the specific research problem, general approach and conclusions, an overview of relevant research that I have engaged in (which will serve as an example for discussions herein), and an outline of the dissertation layout.

1.1. Motivation: Complex environmental problems and holistic approaches

A significant amount of effort in the conservation sciences is focused on addressing ‘complex social-ecological problems’. This particular term appears to be the most prevalent in the literature, and it captures ideas such as ‘wicked problems’ ([Rittel & Webber, 1973](#)). Wicked problems are characterized by scientific uncertainty and the inability to fully understand all the relevant information, multiple formulations of both problems and solutions predicated upon deep differences in values (thus resisting clear and agreed upon solutions), and interrelated social and ecological systems whereby implemented solutions have irreversible effects that span multiple spatial and temporal scales ([Allen & Gould, 1986](#); [Balint et al., 2011](#); [Davies et al., 2015](#); [Norton, 2012](#); [Rittel & Webber, 1973](#); [Xiang, 2013](#)). Examples of complex social-ecological

problems include major challenges facing humankind such as global climate and land-use change, and widespread environmental degradation accelerated in the age of Anthropocene¹.

The complex environmental problem motivating this dissertation is planning and management of natural resources at a regional level, with a specific focus on decision-making related to administration of multiple-use public land. This task is considered to be complex, in part, because it is an ongoing iterative process without a ‘stopping rule’ that signals completion. An understanding of success of management and planning approaches is based not on clear objective criteria but on the elusive consensus of diverse stakeholders ([Allen & Gould, 1986](#); [Balint et al., 2011](#); [Lachapelle et al., 2003](#)). The Forest Planning Rule of 2012 is the guiding document for developing plans for USFS administered land, and the inherent complexity of the task is reflected in the explicit requirement that natural resource stewardship on public forests “contributes to ecological, social, and economic sustainability...and the sustainable use of public lands to support vibrant communities” ([U.S. Department of Agriculture Forest Service, 2012:21173](#)). Considering both diverse aspects of sustainability and of nearby communities highlights a temporal scale reaching some distance into the future and a spatial scale extending beyond the administrative boundaries of public land to a larger social-ecological system (SES). Administering multiple-use public land for current and future generations, within the context of the forest and its onsite users as well as surrounding communities, reinforces the complexity of the task. That is, multiple formulations related to the ‘right way’ to plan and manage natural

¹ The ‘Anthropocene’ is a term increasingly used within the scientific community, which refers to the time period roughly marked by the start of the industrial revolution. Within this relatively short period (when compared to geological timelines), the activities of humankind have essentially influenced every natural system on earth. That is, there is nothing that is free from human influence and, as a result, ecological “degradation” has increased dramatically. Perhaps the most obvious form of ecological degradation is the loss of biological diversity associated with a rapid species extinction relative to other epochs.

resources are likely to exist and, given the nature of the resource (i.e., publicly owned), there should be no single privileged perspective.

To address complex social-ecological problems, where solutions can be thought of as indeterminate (not singly defined) ([Xiang, 2013](#)), ‘holistic’ approaches are commonly suggested. Examples of contexts where holistic approaches are recommended include landscape and urban planning ([Xiang, 2013](#)), social-ecological vulnerability assessment ([Adger, 2006](#); [Armatas et al., 2017a](#); [Schröter et al., 2005](#)), ecosystem service valuation and assessment ([Armatas et al., 2018](#); [Deal et al., 2017](#)), adaptive governance ([Chaffin et al., 2014](#)), and water governance ([Pahl-Wostl, 2015](#)). While the meaning of ‘holistic’ is fairly specific and thoroughly discussed and debated in the philosophy of science literature², its meaning within the conservation sciences appears to be more general and, in many cases, synonymous with ‘integrated’. For example, according to [Caracelli and Greene \(1997\)](#), within the context of mixed-methods research, a holistic approach involves the integration of methods throughout a study with the goal of presenting a single integrated explanation of results. [Hardy and Patterson \(2012\)](#) use ‘holistic’ and ‘integrated’ interchangeably in describing the approach to research and knowledge production within complex systems science and indigenous approaches to understanding. In the conservation sciences literature, ‘holistic’ is sometimes used to describe the research process (methodological approach), while other times it qualifies a type of understanding or decision-making style. For instance, [Xiang \(2013:2, emphasis original\)](#) suggested that complex problems require “a holistic

² According to [Zahle and Collin \(2014:1-2\)](#), the “individualism-holism” debate is centered around two issues: (1) the nature of social phenomena and, “as part of this, their relationship to individuals” and; (2) the extent to which “social scientific explanations [should] focus on individuals and social phenomena respectively.” According to [Greene and Caracelli \(2003\)](#) this long-running debate, or ‘historical dualism’, is considered by many to be incommensurable and, as a result, unlikely to be reconciled. Fundamentally, questions such as when integration or holism has occurred, or what is needed to be integrated and, hence, holistic are likely unanswerable, as these questions require consensus on *who* decides, as well as *how* they decide.

and process oriented approach that is by nature *adaptive, participatory, and transdisciplinary*.” As a systems scientist, [Pahl-Wostl \(2015:viii, emphasis added\)](#) noted that she tries to “*integrate different perspectives to achieve a holistic understanding of governance systems and their dynamics*. In adopting such a broad understanding, seemingly incompatible theories may start to look complementary rather than contradictory.” [Chaffin et al. \(2014:9\)](#) explained that adaptive governance is “born from the social will to *manage SESs holistically* for either increased resistance to undesirable change or the ability to transform a system to a more desirable state.”

There are several research traditions that focus on addressing complex social-ecological problems with holistic approaches, including (but not limited to) ecological economics, human ecology, sustainability science, conservation psychology, and conservation biology. This dissertation is focused on ecological economics (EE) and its potential role in addressing complex social-ecological problems with holistic approaches; however, the other fields are mentioned because they share a common goal and common challenges. These commonalities (listed below), and the fact that each field exists, imply that addressing complex social-ecological problems is a team effort where each field can offer something different in the quest for a holistic approach and a holistic understanding of the problem. The broad, interrelated commonalities are:

1. Addressing the challenge of transdisciplinary research ([Funtowicz & Ravetz, 1993](#); [Howarth, 2008](#); [Lélé & Norgaard, 2005](#); [Thompson Klein, 2004](#)), defined broadly herein as scientific inquiry that includes not only experts and the formally trained, but also policy-makers, practitioners and the general public.
2. Grappling with the difficulty of interdisciplinary research, where calls for methodological pluralism (e.g., [Armatas et al., 2018](#); [Florin & Mathieu, 2015](#); [Miller et al., 2008](#); [Minteer, 2012](#)) introduce well-documented challenges, including

- overcoming disciplinary hierarchies and power dynamics, disparate (or poorly defined) ontological and epistemological assumptions across disciplines, and the difficulty of co-producing knowledge in the shadow of the dominant paradigm of descriptive-analytical knowledge production ([Gardner, 2013](#); [Talwar et al., 2011](#); [Wiek et al., 2012](#)).
3. The broad belief that complex social-ecological problems require consideration of natural and social systems as interrelated units (i.e. SESs). Frameworks for understanding SESs acknowledge the complexity of most environmental problems and the inadequacy of a single discipline for providing solutions, the interrelation between natural and social systems, and the evolution of such interrelated systems across time and space ([Adger, 2006](#); [Ostrom, 2009](#); [van Riper, 2014](#)). Such systems may be considered to be ‘open’, which suggests some level of influence between the specific system of interest and outside systems. According to [Norton \(2012\)](#), complex social-ecological problems are situated within open systems and, as a result, there is a need for contextual analysis and acceptance that all models are supplemental.
 4. A ‘problem-oriented’ motivation for scientific inquiry which, according to [Pahl-Wostl \(2015:viii\)](#), “supports integration and openness” in the form of interdisciplinary thinking. At the same time, it has been suggested that the “emphasis on problem solving in the context of application to socially identified priorities tends to erode the independence of academic researchers and, consequently, weakens their defense against external influences. As a result, scientific agenda tends to grow from political developments rather than from scientific findings.” ([Shi, 2004:25](#))

These broad commonalities, particularly as they relate to complex environmental problems and holistic approaches, serve as the context and motivation for this dissertation, but they do not constitute the specific focus of this dissertation. The specific focus is on the philosophy and theory underlying holistic approaches to address complex environmental problems. As discussed next, this area of the conservation sciences is in need of attention. While the discussion herein centers around ecological economics, the discussions below likely apply to other research traditions (e.g., conservation biology) facing similar challenges.

1.2. Research problem: A lack of scientific identity

Ecological economics (EE), a transdisciplinary and interdisciplinary field broadly focused on issues of sustainability, has ambitious goals with a commitment to engage in problem-oriented science that directly addresses on-the-ground issues. According to [Howarth \(2008:469\)](#), EE should strive to understand the “interplay between economic and ecological systems with the goal of informing decisions that balance competing values and the insights offered by a variety of intellectual traditions.” [Erickson \(2015:ix\)](#) suggested that EE should “ground the study and application of economics within the biophysical realities of a finite world and the moral obligations of a just society.” The meaning of justice or equity within the context of EE appears to mainly refer to both distributional justice (i.e., equity and fairness in the distribution of, and access to, natural resources) and procedural equity (i.e., equity and fairness related to participation in the decision-making process) ([Marques et al., 2015](#); [Siciliano & Urban, 2017](#)).

Despite the promise and appeal of EE, the field has developed in a way that has led to ambiguity, both in terms of its subject matter and its methodology. With regard to the former, [Røpke \(2005:274\)](#) noted that “it is a difficult, if not impossible task to identify the main topics and research programmes of ecological economics...the field could be said to cover almost anything with a faint relation to the environment.” [Spash \(2015:32\)](#) asserted that the body of literature in EE is “amorphous.” Regarding methodology, it has been argued that there is relatively little focus on the philosophical and theoretical foundations of EE, which impedes progress in the field and calls into question the scientific integrity of research conducted within its purview ([Baumgärtner et al., 2008](#); [Puller & Smith, 2017](#); [Spash, 2013](#)). [Anderson and M'Gonigle \(2012\)](#) questioned the future of EE given, in part, its incoherence. That is, a lack of clarity about the field's foundations have led to “a situation of ambivalences and contradictions” ([Puller & Smith, 2017:19](#)) and a “precarious and epistemologically confused position” ([Spash, 2012:37](#)).

The general sentiment of these critiques is that progress and coherence of EE, and ultimately its relevance, depends on more scholarship related to its scientific foundations. Such discussions can both lead to a stronger disciplinary identity, and criteria for sorting good science from bad science. In other words, a graduate student interested in applying an ecological economic approach to a problem such as national forest planning in the United States should, for example, have foundational philosophical and theoretical frameworks to choose from which are clear and useful for guiding research. While foundational philosophical commitments (often labeled axiomatic research paradigms) are not necessarily discipline specific (and thus a student could choose any foundation), a characteristic of a well-formed and cohesive discipline is one which has examples of non-discipline specific paradigms paired with discipline-specific stances

in a way that yields a cohesive general methodology. For example, consider the hermeneutic approach to understanding the experiences of tourists and outdoor recreationists ([Patterson & Williams, 2002](#)), the phenomenological approach to understanding how health practitioners assess patients with emotional problems or mental disorders ([Davidsen, 2013](#)), or the application of positivism to study economics and law ([Hovenkamp, 1990](#); [Katz, 1996](#)). At this stage within EE, options for adopting such frameworks are very limited (see, for example, those advocating critical realism for perhaps the most comprehensive example ([Puller & Smith, 2017](#); [Spash, 2015](#))).

Related to this issue, the relatively limited amount of literature on the scientific foundations of EE is itself in need of organization and greater clarity. In other words, the literature related to the philosophy and theory underpinning EE does not, in general, build upon itself in a productive manner. For instance, several paradigms have been suggested, including critical realism ([Puller & Smith, 2017](#); [Spash, 2015](#)), some form of social constructivism ([Baumgärtner et al., 2008](#); [Goeminne, 2011](#); [Tacconi, 1998](#)), and the phenomenological (or interpretivist) approach ([Ramos-Martin, 2003](#)). But, how these different approaches relate to one another is generally unclear; despite these paradigms often being placed beside one another in research-paradigm typologies. Other philosophical perspectives, which fit oddly within the context of more traditional scientific paradigms, such as American pragmatism in the form articulated by [Bromley \(2008\)](#) and post-normal science ([Funtowicz & Ravetz, 1993](#); [Munda, 1997](#)) have also been recommended for EE, and their position on the landscape is perhaps less clear.

It is worth emphasizing that I am not suggesting that philosophy of science discussions in EE should amount to a “theirs is wrong and ours is right” type discussion; instead, consistent

with peer-reviewed scholarship in general, there is a need for more charitable critical assessment and productive dialogue. This is not to say that critical assessment is non-existent. For instance, [Spash \(2015\)](#) is critical of particular attempts to establish a paradigm for EE. Referencing [Baumgärtner et al. \(2008\)](#), who argue generally for a social constructivist position, [Spash \(2015:33\)](#) stated: “their discussion still claims an epistemological plurality to support plurality in the use of methods. Besides being unnecessary, there is a problem in proposing multiple epistemologies without any synthesis. This is the simple impossibility of simultaneously holding two (or more?) contradictory ways of understanding the meaning of knowledge.” As another example, [Puller and Smith \(2017:19\)](#) are critical of the pluralist approach of [Söderbaum \(2008\)](#), when they stated: “his presentation of neoclassical economics as one narrative amongst many is a constructivist interpretation that does not respect the essence of positivism.”

However, these criticisms, the root of which are directed at the idea of methodological pluralism, are difficult to interpret. While unstructured pluralism (a relativistic ‘anything goes’ approach) is clearly disavowed, there is a lack of clarity about what form of methodological pluralism is appropriate. For instance, [Spash \(2012:40-41, 45, emphasis added\)](#) is a critic of *unstructured* methodological pluralism (i.e., relativism) and makes an explicit case against it, but in the same paper he is clear that “all pluralism” should not be discarded; he suggested a ‘methodological position’ of EE as “*structured* methodological pluralism [which] requires working across fields of knowledge with those who share *a common ontology and epistemology*.” How is this call for structured methodological pluralism with common ontologies and epistemologies to be interpreted exactly? In this context, ‘structured’ methodological pluralism refers mainly to the work of [Dow \(2004\)](#), who essentially suggests a middle ground between a singular approach and relativism; but there is still a lack of clarity regarding what this

middle ground is, and how different paradigmatic assumptions should (or should not) be reconciled. While [Dow \(2004\)](#) does introduce and discuss Thomas Kuhn's idea of a paradigm shift (along with his view on paradigm commensurability), this view is only one 'worldview' among many (a point discussed further below).

In sum, there are two issues regarding discussions of the scientific foundations of EE. The first issue is the limited scholarship on the philosophical underpinnings of EE which can yield insight for applying EE in practice. This is the primary issue addressed by this dissertation. The second issue is that discussions regarding the philosophical underpinnings in EE are lacking a common framework for building a productive dialogue. That is, these discussions in EE do not have a way to clearly position one's stance within the context of philosophy of science discussions. In other words, embracing a particular paradigm and some form of methodological pluralism may become more understandable, and thus promote productive dialogue, with a framework that moves beyond the research paradigm to lower-level research in practice, and higher-level scientific worldview. This second issue is addressed in Section 2 below, and it provides a framework for the discussion that follows throughout the dissertation.

1.3. Major conclusions: Pragmatist philosophy, and a focus on human-nature relationships and social-ecological systems

To address the gap in the literature with regard to scientific foundations for EE, a pragmatist philosophy is adopted and discussed. There are several connections between pragmatism and EE, which suggest the general appropriateness of the former underpinning the latter. Directly, several have noted the potential compatibility of pragmatism and EE (e.g.,

[Bromley, 2008](#); [Nahser, 2014](#); [Norton, 2005, 2011b](#)). Several indirect connections can also be found. For example, institutional economics generally claims pragmatism as its philosophical basis ([Stickers, 2015](#); [Webb, 2007](#)). Institutional economics focuses on how social institutions (e.g., cultural norms) and social relations are linked to economic behavior ([Hodgson, 2001](#)), and practitioners adopting this economic perspective were early contributors to ecological economics. Furthermore, institutional economists had long been grappling with ideas about methodological pluralism, systems thinking, and equity and distribution ([Røpke, 2005](#)). [Hodgson \(1997\)](#) does not explicitly reference EE, but a discussion relating (mostly institutional) economics with addressing complex environmental problems sounds much like a pragmatist inspired EE (as defined in this dissertation).

Another indirect connection between EE and pragmatism is through Aldo Leopold. There is the connection between Leopold and pragmatism, as evidenced by the debate between two well-known environmental philosophers about whether Leopold was a pragmatist ([Callicott et al., 2009, 2011](#); [Norton, 1996a, 2011a](#)). Leopold then, if one reads him through a pragmatist lens, can link pragmatism and EE. First, Leopold lobbied for the hiring of a professor in ‘ecological economics’ at the University of Wisconsin in 1947. Also, Leopold was among the most prominent to articulate ideas fundamental to contemporary ecological economics, such as better aligning economic activity with ecological principles and embracing a cautionary and ethical management approach ([Lin, 2013, 2014](#)). The connection between Leopold, Pragmatism, and EE can be gleaned throughout much of Bryan Norton’s work (even if it is not explicitly stated), and [Nahser \(2014\)](#) explicitly connects the three in a short, very general article. Given these connections, one could argue for pragmatism as an underpinning of EE based upon this historical path through institutional economics and Aldo Leopold.

A third connection between EE and pragmatism is within the context of mixed-methods research, which has focused significantly on interdisciplinary and transdisciplinary methodology. Pragmatism has been advocated as a leading candidate for the philosophical underpinning for such research ([Biddle & Schafft, 2014](#); [Johnson & Onwuegbuzie, 2004](#); [Leech, 2005](#); [Morgan, 2007](#)). However, a general critique leveled at EE inquiry is a lack of strong theoretical foundations, and the potential for the employment of multiple methodologies that have conflicting, incommensurable philosophical assumptions; and a pragmatist philosophy is considered a viable foundation for methodological synthesis ([Frankel Pratt, 2016](#); [Hands, 2001](#)).

Clearly, given these connections between pragmatism and EE, the basic premise of this dissertation is not its unique contribution. The unique contribution is making the connection between pragmatism and EE official via thorough synthesis of the two scholarly arenas. The more thorough treatment is given to pragmatism, because the primary intention of this work is to bring pragmatist ideas to ecological economists, and perhaps other conservation social science disciplines that are hybrid in nature (i.e., those sharing the commonalities outlined above). Through this synthesis of these two scholarly arenas, a *pragmatist* EE is articulated and discussed. Two primary conclusions are then reached from this synthesis, which is that a pragmatist EE should: (1) focus on human-nature relationships and; (2) embrace a social-ecological systems perspective. These conclusions are briefly discussed to prime the reader.

1.3.1. Human-nature relationships

It is suggested that a pragmatist EE should focus on understanding human-nature relationships, but it needs to be stressed that the meaning of human-nature relationships in this

dissertation is more broadly conceptualized than other definitions of human-nature relationships. For instance, [van Riper et al. \(2019:71\)](#) defined human-nature relationships as “psychologically stable worldviews about the complex relationships that form between people and places.” These authors reference the ‘New Ecological Paradigm’ (NEP) as the longest-running and most well-known measurement of such worldviews ([Dunlap et al., 2000](#)). Among many critiques of NEP, [Flint et al. \(2013\)](#) viewed NEP as an overly simplistic view of the complex relationships. New typologies have been suggested.

The review of the human-nature relationship ‘concept’ by [Flint et al. \(2013\)](#) highlights the broad range of discussions (and terminology) surrounding the topic. Indeed, they found several literature domains related to human-nature relationship concepts, including values, attitudes, and worldviews literature, as well as religious traditions and those of environmental philosophy and environmental ethics. In their review, [Flint et al. \(2013\)](#) suggested three main dimensions of human-nature relationships that generally capture the existing typologies derived through empirical research: (1) positionality, which captures the perceived appropriate role of humans in nature; (2) character of bond, which captures not only why people think nature is important, but also whether people perceive there to be an existing bond with nature (i.e., ‘connectedness/apathy’) and; (3) understanding of nature, which includes notions about the fragility and/or resilience of nature.

Often, human-nature relationships are conceptualized in terms of positionality, or the appropriate role of humans, which include ideas such as humans relating to nature as ‘master’, ‘steward’, ‘partner’, or ‘participant’ ([van den Born, 2008](#); [van den Born et al., 2001](#)). However, thinking of the human-nature relationship in terms of worldviews, or perhaps as “attitudes toward nature” ([Bauer et al., 2009:2911](#)), regarding the appropriate role of humans within the

context of the natural world does not capture the entire human-nature relationship discussion, as reflected by [Flint et al. \(2013\)](#). Even within the relatively narrow context of protected area management, it has been suggested that the term relationship is “quite nebulous” ([Dvorak et al., 2013:1519](#)). It is a broad conceptualization of the human-nature relationship, as conveyed by [Flint et al. \(2013\)](#), that is embraced herein.

As an example of this broad conceptualization, consider [Flint et al. \(2013:215\)](#), whose aim was partly to discuss whether the ecosystem services concept could be identified as a “specific type” of human-nature relationship. Ecosystem services are often defined as the goods and services provided to people by nature ([de Groot et al., 2002](#)), and it is a concept that has been adopted widely in the conservation sciences as a framing for conserving ‘nature for people’ ([Mace, 2014](#)). Ultimately, [Flint et al. \(2013\)](#) were reluctant to include the ecosystem services concept as a type of human-nature relationship. They concluded that the ecosystem services concept “dominating contemporary environmental management policy and practice may only cover a narrow segment of the broad human-nature relationship spectrum” ([Flint et al., 2013:215](#)), namely the instrumental and humans separate from nature segment.

A pragmatist EE agrees with this assessment, though two additional points could be made. First, ecosystem services does not constitute a ‘type’ of relationship, but instead it is a *part or element* of the human-nature relationship. Similarly, attachment to place is a part of the human-nature relationship. The belief that humans should protect nature for its intrinsic value, or the belief that humans should dominate over nature, are also parts of the human-nature relationship. It is not likely that a single typology will neatly capture all these complex parts, but understanding and communicating the human-nature relationship as holistically as possible is the goal of a pragmatist EE. The second point, with a focus on the importance of language, is that a

pragmatist EE would conceptualize the human-nature relationship less as a clearly defined entity lying on a spectrum, and more of a conglomerate of parts, which will vary across (and within) people depending on the context. The importance of context is stressed through this dissertation, and in the case of the human-nature relationship it is consistent with the thinking of [Flint et al. \(2013\)](#).

This brief discussion of the human-nature relationship, as conceptualized in a pragmatist EE, likely raises more questions than answers, and the discussion does not fully return to the human-nature relationship until Section 5.2. However, this overview of a major theme in this dissertation can serve as a reminder as one reads about ideas such as Dewey's model of experience, important pragmatist goals (e.g., understanding, communication, and social learning), Bryan Norton's normative sustainability, the lack of consensus and the diversity of thought on theories of welfare, and the challenging task of understanding and potentially integrating different approaches to science. Regarding this last point, in addition to the stated goal of EE and other research traditions focused on research *application*, the second primary conclusions of this dissertation is the need for a social-ecological systems perspective (which by its very nature focuses on linkages between different bodies of knowledge).

1.3.2. Social-ecological systems perspective

Chapter seven discusses social-ecological systems in detail, but the idea is integral throughout the entire dissertation. The primary conclusion is social-ecological systems (SES) research can help to position the understanding of human-nature relationships yielded from a pragmatist EE within the SES at large. Generally, this conclusion is motivated by the common

roots, basic assumptions, and goals of ecological economics and SES research. It is argued, first and foremost, that SES research, and the accompanying frameworks, represent heuristics or conceptual maps, not definitive models. This follows from the articulation of a pragmatist EE in chapter five. It is also argued that SES research can help a pragmatist EE acknowledge the missing knowledge gaps necessary for addressing complex environmental problems. Similar to the discussion above on human-nature relationships, this brief discussion is meant to impress the importance of SES research in the reader's mind because, even though the full discussion does not come until chapter seven, complex social-ecological systems are commonly mentioned throughout the dissertation.

More generally, the idea that both human-nature relationships and the overarching SESs are so complex that even robust collaboration between various disciplines will only yield 'tentative truths' is inherent in this dissertation. The meaning of 'tentative truths' will become clear through the discussion of pragmatist philosophy and a pragmatist EE, but underlying this idea are the need for public debate and deliberation about both scientific knowledge and the potential tactics for addressing complex environmental problems. EE, when focusing on understanding and communicating human-nature relationships and complex SESs requires humility; indeed, it requires a pragmatist approach.

1.4. An overview of research to be used for discussion

At a basic and individual level, this dissertation is motivated by the desire to clearly articulate and understand the research that I have been engaged in for the past eight years. To this end, the theoretical and philosophical insights developed throughout this dissertation are often

related back to completed research, whether to reinforce a point made, or to highlight limitations and/or potential missteps. While details of this past research are conveyed at strategic places (e.g., the Gila National Forest study in chapter 6), it is worth providing an overview of relevant research here for context and background.

Starting in 2011, a collaboration between the University of Montana and the Aldo Leopold Wilderness Research Institute formed to develop a process to understand the social-ecological vulnerability of a broad range of stakeholders. This research collaboration took place (or is currently taking place) in three separate locations, though these applications have the same general goal of informing United States Forest Service planning and management through a comprehensive understanding of the linkages between the environment and human well-being and the drivers of change threatening such well-being.

The collaboration started on the Shoshone National Forest in Wyoming with a goal to complement an ecological assessment of biophysical resources by [Rice et al. \(2012\)](#), which found that water-related ecological components were particularly vulnerable to climate change on the Forest. Specifically, to complement this understanding, a social assessment was completed to identify a broad range of water benefits (i.e., ecosystem services) likely to be influenced by changing natural conditions, which included an exploration of stakeholder perspectives regarding the importance of identified ecosystem services and the perceived threats to these important benefits ([Armatas, 2013](#)). The study applied Q-methodology (discussed at length in this dissertation); a rank ordering method where respondent's opinions are analyzed using factor analysis, resulting in the distillation of individual viewpoints (96 in [Armatas \(2013\)](#)) into typified viewpoints (four in [Armatas \(2013\)](#)).

With the original intention to integrate this social assessment with an economic assessment focused on providing non-market values for a limited number of highly relevant ecosystem services, additional theoretical work was completed. This work resulted in two peer-reviewed publications: (1) how Q-methodology, a structured and formal social science method, could benefit the design phase of stated preference surveys, an economic approach to non-market valuation that primarily employs some combination of focus groups and expert interviews ([Armatas et al., 2014](#)) and; (2) the benefit, and role, of Q-methodology for completing a holistic social-ecological vulnerability assessment ([Armatas et al., 2017a](#)).

In June 2015, the economic assessment commenced with a choice modelling study, which is a non-market valuation method that asks respondents to weigh alternative scenarios about the state of the environment and allows for statistical derivation of monetary values related to several attributes. For that study, the attributes were water-based ecosystem services derived from the Shoshone National Forest, and a full analysis of the data, and integration of the ecological, social, and economic assessment were combined and articulated in [Armatas et al. \(2018\)](#).

In addition to this work on the Shoshone National Forest, the social assessment approach using Q-methodology was replicated, with slight alterations, on the Gila National Forest. This effort had two purposes: (1) support the forest plan revision process and; (2) articulate how the process implemented on the Shoshone National Forest and the Gila National Forest constitutes a ‘social vulnerability protocol’ that can potentially be implemented within other forest planning efforts. A ‘social vulnerability protocol’ was developed for federal land managers and planners, and published as a general technical report ([Armatas et al., In Press](#)).

Finally, there is an ongoing study taking place on the Flathead Wild and Scenic River system, which will implement the social vulnerability protocol within the specific decision context of comprehensive river management planning ([Armatas et al., 2019](#)). Data collection for this study will take place in late summer 2019. This brief review of my research history is presented for two reasons. First, the discussions throughout this dissertation are commonly related back to research on the Shoshone National Forest, Gila National Forest, and/or the Flathead Wild and Scenic River system, so there is a need to generally introduce this research to the reader.

Secondly, and perhaps most importantly, all of this research (in addition to other relevant scholarship such as the synthesis focused on articulating the benefits of understanding traditional phenological knowledge for supporting adaptive management ([Armatas et al., 2016](#))), constitutes conservation social science intended to support “public land management and planning decision-making”. In the case of the three research studies highlighted above (Shoshone, Gila, and Flathead), it has been often stated that an “ecological economics” approach was being applied. The use of scare quotes with regard to both the application of informing management and planning and the ecological economic approach indicates a level of dissatisfaction; indeed, such phrases feel like platitudes more often than not. There is a personal desire, and I argue conservation science need, to add depth to these statements. The goal is to better understand how the research reviewed above supports management, or how it constitutes an EE approach.

1.5. Dissertation outline

In order to facilitate the discussion of the scientific foundations of EE, as well as SES research, a framework for assessing science is presented in chapter two. Chapter three reviews ecological economics, with a specific focus on the challenges facing the field of research. A thorough review of pragmatist philosophy and environmental pragmatism constitutes chapter four. In chapter five, a pragmatist EE is proposed within the context of the established scientific assessment framework. As an example of how a pragmatist EE operates in practice, a methodological debate (i.e., R-methodology versus Q-methodology) is presented and discussed in chapter six. Chapter seven includes a synthesis of ideas from EE and SES research with the intention of improving the application of research, as well as highlighting how interdisciplinary research can potentially be improved through a better understanding of what different fields of research can provide. Finally, chapter eight reviews the primary conclusions and possible future areas of research.

2. A SCIENTIFIC MACROSTRUCTURE: WORLDVIEWS, PARADIGMS, AND RESEARCH PROGRAMS

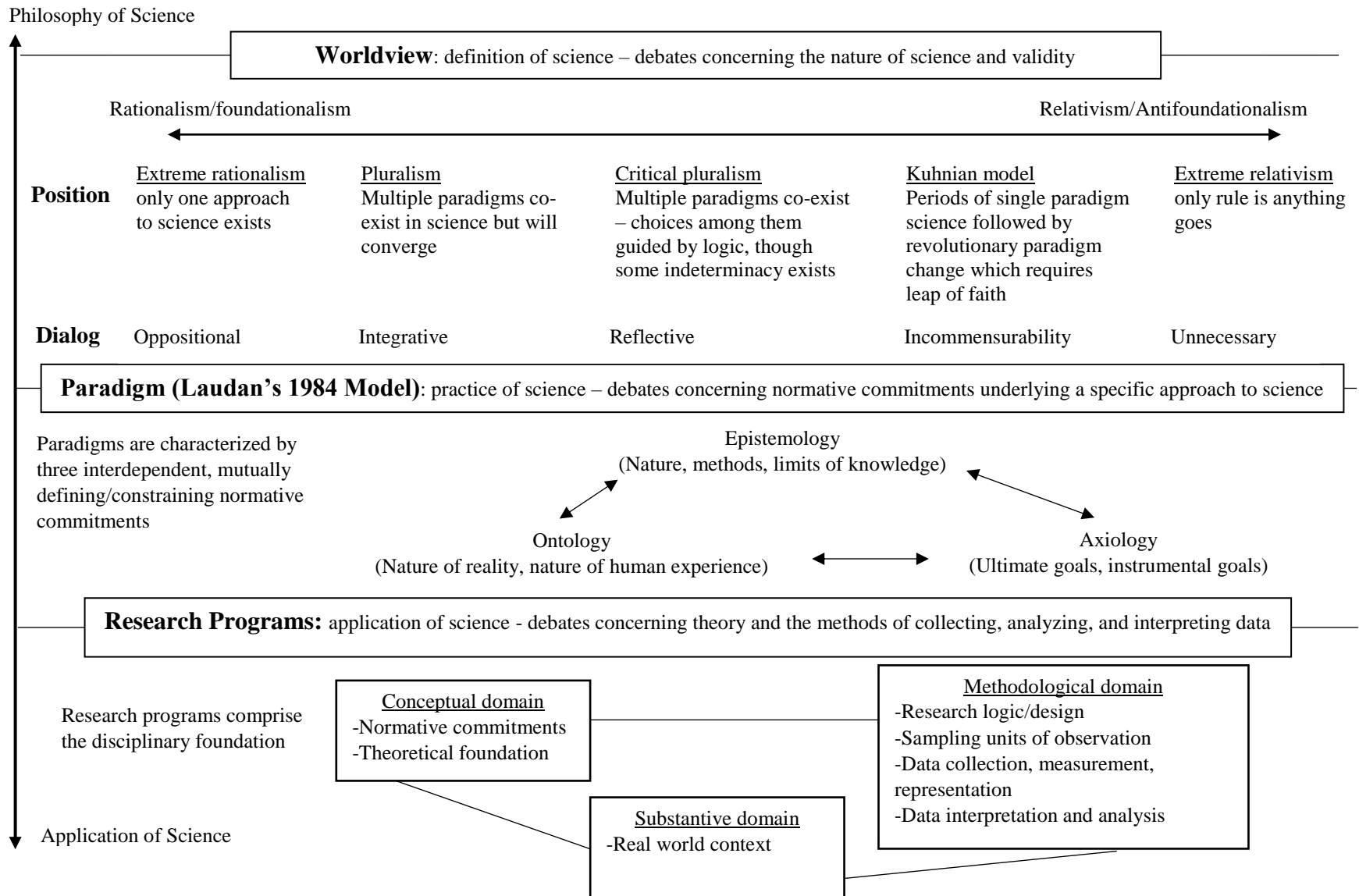
Science has been broadly defined as a “systematic set of empirical activities for constructing, representing, and analyzing knowledge about phenomena being studied”, which are guided by normative philosophical commitments ([Patterson & Williams, 1998:284](#)). Assessing scientific practice, from the foundational philosophy to on-the-ground practice, is often done by considering the scientific ‘macrostructure’, which is the standard unit of analysis applied by philosophers of science since its conceptualization by Thomas Kuhn ([Anderson, 1986b](#)). While there is no standard approach to characterizing the macrostructure of scientific practice ([Patterson & Williams, 2005](#)), the framework developed by [Patterson and Williams \(1998\)](#) is adopted herein as a *starting point* (amendments to the ‘worldview’ level are suggested).

This framework, which is illustrated in Figure 2.1, is multi-layered with three different levels. Worldviews are the broadest level, which inform paradigms which, in turn, are “linked” to research programs ([Patterson & Williams, 2005:363](#)). The framework may be particularly helpful for addressing the limitations of EE previously discussed, because it explicitly distinguishes a ‘worldview’ from a ‘paradigm’. These two terms, and ‘paradigm’ in particular, have been used in various ways within discussions of scientific foundations³. In order to prevent confusion on this issue, [Patterson and Williams \(1998\)](#) consider ‘worldviews’ as the broadest beliefs of a researcher within a research tradition, and ‘paradigms’ as those ideas related

³ In his seminal work, *The Structure of Scientific Revolutions*, Thomas [Kuhn \(1970:175\)](#) defined a scientific paradigm, in its broadest sense, as “the entire constellation of beliefs, values, techniques, and so on shared by the members of a given community.” A paradigm in this sense, according to [Masterman \(1970\)](#), is synonymous with a ‘metaphysical world view.’ The first edition of Kuhn’s book (*i.e.*, [Kuhn, 1962](#)) used the term ‘paradigm’ in at least 21 different ways ([Masterman, 1970](#)); a point that was criticized as ambiguous and inconsistent, resulting in greater specificity of the meaning of ‘paradigm’ in Kuhn’s second edition.

specifically to ontology, epistemology, and axiology. This conceptualization of a paradigm is consistent with what [Morgan \(2007\)](#) called ‘paradigms as epistemological stances’; this usage has been suggested as the most dominant within the social sciences. The importance of distinguishing worldviews from paradigms is emphasized below in the review of scientific foundations of EE, but it is necessary to first describe the framework in Figure 2.1.

Figure 2.1. Framework for mapping scientific foundations (adapted from [Patterson and Williams \(1998, 2005\)](#))



2.1. Worldviews

The first level in the framework developed by [Patterson and Williams \(1998\)](#) is the worldview. This is the broadest and most general level, which pertains to the basic ‘rules’ of science. The worldview level is rarely engaged by the typical researcher, as most prefer to “apply the rules of science defined by someone else” and, in addition, this level is only a basic starting point (on its own it is inadequate for describing a researcher tradition); “worldviews tend to be somewhat nebulous and hard to pin down” ([Patterson & Williams, 1998:287](#)). Nonetheless, understanding researcher worldviews is important, because it is where basic beliefs, which often go unstated, are established. For science today, discussions of worldviews are increasingly important at a time when science is trending towards integration (as is the case in EE). Because without understanding different researcher worldviews, it is challenging to effectively communicate and perform research that is integrated, or at the very least mutually informing and supporting.

Below, slight amendments to worldviews as defined in Figure 2.1 are suggested to better capture the issues related to EE; the original conceptualization of worldviews ([Patterson & Williams, 1998, 2005](#)) is provided, with slight amendments to follow.

2.1.1. Worldviews: focusing on science versus other knowledge, how science changes, and the interaction between different scientific approaches

Worldviews are conceptualized on a continuum from rationalism/foundationalism to relativism/antifoundationalism. This continuum is characterized in two ways. First, there are the worldviews related to what constitutes science and, relatedly, how science changes over time. The perspectives on the rationalism end of the spectrum are commonly labeled ‘positivism’, and

the general sentiment on this extreme end is that there is a single, universal set of rules for distinguishing science from non-science ([Chalmers, 2013](#); [Patterson & Williams, 1998](#)). Those occupying this end of the spectrum are not suggesting that there are multiple approaches to science where those practicing different types “stay in their lane”. Instead, they are suggesting that a single type of science exists to address all types of questions. Of course, those types of questions would vary across disciplines but, again, a single type of science would be used. [Patterson and Williams \(1998:287\)](#) cited [Calder and Tybout \(1987\)](#) as an example of the extreme rationalist worldview, who suggested that knowledge yielded by the interpretivist research paradigm can be “provocative and entertaining reading...but must stand apart from science.” A belief in a single approach to science is the impetus for defining and refining rules and methods of scientific practice within rationalist research traditions ([Patterson & Williams, 1998](#)). On the rationalist end, scientific practice has strict rules for determining that which is valid and that which is not.

This contrasts with the relativist/antifoundationalism perspective, where there is no universal set of rules for judging science. Instead, this end of the spectrum holds that “criteria for judging science are dependent on the values or goals of the scientific community evaluating them” ([Patterson & Williams, 1998:285](#)). The relativist perspective tends to focus on addressing the problem without adhering to a rigid methodology. Indeed, the extreme end of the relativist spectrum is most famously the territory of Paul Feyerabend who, in his seminal work *Against Method*, called for an ‘anything goes’ approach to science (i.e., ‘epistemological anarchism’) ([Feyerabend, 1975](#)). The goal of the less-extreme antifoundationalists is to develop ‘exemplars’, or general methodological guides ([Patterson & Williams, 1998](#)).

In the middle of the spectrum, there are worldviews that acknowledge a plurality of approaches to science, but with caveats regarding how science will change over time. For instance, the ‘pluralism’ worldview acknowledges multiple approaches to science with the associated idea that eventually these multiple approaches will converge. Alternatively, the ‘Kuhnian model’ worldview considers a situation where multiple approaches to science exist, but only one approach is in operation at a single time.

According to [Patterson and Williams \(2005:371\)](#), a second way of characterizing worldviews is according to the ‘dialog’, or the “form and nature of response different world view positions adopt in regard to questions of legitimacy, validity and diversity arising from across-paradigm differences.” In other words, the dialog position can help to define beliefs about the interaction between different approaches to science. This interaction is particularly important within the context of EE considering its focus on interdisciplinary and transdisciplinary research. The ‘dialog’ aspect of Figure 2.1 may be the least intuitive, at least when framed as a spectrum, because on the extreme rationalist end there is the ‘oppositional’ belief, which considers different approaches to science as competing. That is, science is monolithic, and choosing to do it a particular way represents, by virtue of that choice, a disavowing of other approaches. Intuitively, one might assume that the polar opposite of this dialog is ‘integrative’; that is, the opposite worldview of a monolithic and competing science is one where a plurality of approaches to science interact until the point of convergence.

Instead, the integrative perspective is adjacent to the oppositional perspective, because a plurality of approaches interacting to the point of convergence still yields, in essence, a single approach and truth. Following this logic, the right end of the spectrum is defined by the ‘unnecessary’ perspective, or the belief that different approaches to science need not interact

because scientific knowledge cannot be distinguished from other types of knowledge. In other words, as opposed to the rationalist ‘dialog’ where a single approach to science exists, the extreme relativist ‘dialog’ is one where there are an unlimited number of approaches to science or, alternatively, no approaches to science if one makes no distinction between scientific knowledge and other forms of knowledge. A consequence of this worldview is that there is no need for dialog between approaches (a dialog is ‘unnecessary’).

2.1.2. Worldviews: focusing on paradigm dialogs and integration

Given the general focus of the conservation sciences on increasing collaborative efforts and gaining insight from multiple perspectives, slight amendments to the worldviews idea are proposed to focus more on paradigm dialogs, and general views related to how different approaches to science can be integrated. As a result, a scientific macrostructure that operates on the assumption that there are *multiple* legitimate ways to practice science is assumed. Operating on this assumption, worldviews are conceptualized on a spectrum from separate/distinct to blended/unified. This change is motivated by the desire to understand and articulate the nature of science being pursued in EE (an interdisciplinary and transdisciplinary field). In addition, amending worldviews in this way does not eliminate the ideas implicit in Figure 2.1. The implicit ideas (e.g., rules of scientific inquiry, a priori/foundational knowledge) are still captured by the normative paradigmatic assumptions in the second ‘paradigm’ level.

To populate the new proposed spectrum, incorporating contributions from mixed methods research may be appropriate, which is an area of study that has put forth significant effort in understanding different perspectives related to the relationship between different

approaches to science. For instance, Table 2.1 was developed by [Greene \(2008\)](#) for the purposes of debating whether mixed-methods research is a distinct methodology.

Table 2.1. Mixing Methods and Mixing Paradigms

What is the character of traditional paradigms?	What most importantly guides practical inquiry decisions?	Mixed methods ‘paradigm stance’
The assumptions of different traditional paradigms are fundamentally <i>incommensurable</i> . Each paradigm represents a coherent whole, which must be respected and preserved	Paradigmatic assumptions	PURIST STANCE – Because the assumptions of different paradigms are incompatible, it is not possible to mix paradigms in the same study
The assumptions of traditional paradigms are not fundamentally incompatible, rather different in important ways. These differences are valuable and should be preserved to maintain methodological integrity while expanding the scope of the study.	Paradigmatic assumptions, as well as context and theory	COMPLEMENTARY STRENGTHS STANCE – Because the assumptions of different paradigms are importantly different, methods implemented within different paradigms should be kept separate from one another.
The assumptions of different traditional paradigms are different in important ways and remain valuable, but paradigms themselves are historical and social constructions and so are not inviolate or sacrosanct.	Paradigmatic assumptions, as well as context and theory	DIALECTIC STANCE – Engaging dialogically with paradigm differences can generatively yield new insights and understandings.
Historical philosophical incommensurabilities among paradigms are reconcilable through new, emergent paradigms, such as pragmatism, scientific realism, or transformation-emancipation.	The assumptions and stances of new paradigms that actively promote the mixing of methods, along with context and theory.	ALTERNATIVE PARADIGM STANCE
The assumptions of various traditional paradigms are logically independent and therefore can be mixed and matched in varied combinations.	The practical characteristics and demands of the inquiry <i>context and problem</i> at hand. Paradigms help us think better but do not themselves guide practice.	A-PARADIGMATIC STANCE
The assumptions of various traditional or emergent paradigms may well be embedded in or intertwined with substantive theories.	The <i>substantive issues and conceptual theories</i> relevant to the study being conducted. Paradigms help us think better but do not themselves guide practice.	SUBSTANTIVE THEORY STANCE

Source: Adapted from [Greene \(2008\)](#)

While Figure 2.2 does not depart drastically from Figure 2.1, the slight shift in focus is important. By removing the Kuhnian model worldview, the focus is shifted from how science *changes and evolves* to how it is *practiced*. The former is descriptive, while the latter is normative. Furthermore, removing the Kuhnian worldview avoids the debate as to whether Kuhn considered paradigm shifts to occur as the result of some relativistic ‘leap of faith’. While this is a popular interpretation of Kuhn’s work, it has been challenged variously within philosophy of science discussions ([Godfrey-Smith, 2003](#)).

As previously stated, the small changes in Figure 2.2 also shifts discussion away from the dichotomy between one approach to science and an infinite number of approaches. While the extreme positivism versus extreme relativism debate is historically entrenched, it could be argued that it is an unproductive dichotomy (and perhaps even currently irrelevant). While some may hold that there is only one way to do science, such adherents are unlikely to be interested in EE specifically, or the conservation social sciences more generally. However, the ‘oppositional’ descriptor in Figure 2.2 is retained, as the belief that different approaches to science are incompatible is certainly possible, perhaps even common. Removing the extreme relativist position is likely warranted within *science* discussions, as it reflects a debate regarding the nature of *knowledge* more broadly. Indeed, an extreme relativist position is one which seems to deny the existence of ‘science’, or a “*systematic set of empirical activities for constructing, representing, and analyzing knowledge about phenomena being studied*” ([Patterson & Williams, 1998:284, emphasis added](#)).

Even though the extreme relativist position as advocated by Feyerabend does not expressly reject science (only particular, dogmatic styles of science), it does not have a mechanism for rejecting or eliminating ideas. Furthermore, it posits that scientists need not

follow a method of any kind, but instead should follow their subjective wishes ([Chalmers, 2013](#); [Godfrey-Smith, 2003](#)). While the extreme relativist position is both articulated within the context of scientific discussions, and includes some worthwhile ideas for the purposes of science (e.g., pluralism and creativity of method), disavowing *systematic* approaches appears antithetical to science and, therefore, may not be a scientific worldview per se. Also, the worthwhile ideas suggested by Feyerabend and others can be incorporated into a pluralistic worldview without adhering to a position of epistemological anarchy (a point discussed further below).

Finally, the inclusion of extreme relativism as a worldview, at least within the context of EE discussions, has resulted in unproductive, straw-dog arguments where those advocating for methodological pluralism are often branded Feyerabend-type anarchists by default (in contemporary discussions of methodology in EE, I cannot find an example of someone taking an extreme relativist worldview). Broadly, this is a long-standing problem, according to [Patterson and Williams \(2005:362-363\)](#), characterizing the nature of research traditions “has always been a difficult task, subject to pitfalls such as creating straw men caricatures (in cases where authors characterize traditions they do not subscribe to) or of reifying a set of rules that do not truly describe how a specific epistemological tradition really works.”

In short, the different worldviews outlined above illustrate the different ideas related to foundational science issues. These general issues are the subject of much debate within the context of what are often labeled the ‘paradigm wars’. A history of this broad debate is beyond the scope of this work (see [Denzin \(2010\)](#) for a concise overview). But, particular issues within this debate are inherent (yet rarely discussed) within the context of EE discussions about what underpins practice within the research tradition. For instance, the ‘incompatibility thesis’ states that “compatibility between quantitative and qualitative methods is impossible due to the

incompatibility of the paradigms that underlie the methods” ([Teddle & Tashakkori, 2003:18-19](#)). The different stances listed in Table 2.1 imply different opinions about this thesis.

Those adopting an ‘a-paradigmatic stance’ are not likely to give the incompatibility thesis much thought, as they find questions regarding the link between epistemology and methods “distracting and unnecessary”; whereas those with the ‘alternative paradigm’ worldview reject the forced choices set-up by the incompatibility thesis between, for instance, a subjective/objective epistemology ([Teddle & Tashakkori, 2003:18](#)). While few researchers today strictly adhere to the incompatibility thesis, it is still influential to those adopting popular paradigm stances such as the ‘complementary strengths’ stance ([Teddle & Tashakkori, 2003](#)).

2.2. Paradigms

The second level of the scientific macrostructure framework is the ‘paradigm’, which is the dimension of a research tradition where the normative philosophical commitments or assumptions underpinning actual research are established ([Patterson & Williams, 2005](#)). All science is underpinned by basic philosophical assumptions (whether one is cognizant of them or not). As noted by [Patterson and Williams \(1998:284\)](#), “when you practice science in a particular way, you are ‘buying into’ something; specifically, a set of normative philosophical commitments.” Theoretically, there is a substantive link between paradigms and research programs ([Patterson & Williams, 2005](#)); however, explicit discussions of these assumptions are fairly uncommon in most research. As noted by [Phillips \(1996\)](#), philosophical assumptions are typically not discussed unless one is in the position of defending methodological choices.

The relatively small amount of scholarship focused on paradigmatic assumptions has been acknowledged both within EE specifically ([Baumgärtner et al., 2008](#); [Puller & Smith, 2017](#);

[Spash, 2012, 2013, 2015](#)), and natural resource management more broadly ([Patterson & Williams, 1998](#)). One could argue that such scholarship within these contexts is not a pressing issue, as empirical research, while limited, has shown that paradigmatic assumptions have a small influence on the practice of research ([Greene, 2008](#)). A pragmatist EE rejects this potential argument, but it is worth mentioning nonetheless.

As depicted in Figure 2.1, the framework adopts Laudan's model ([Laudan, 1984](#)) where the different types of normative commitments are interrelated, mutually defining and constraining. These assumptions are categorized as ontological, epistemological, and axiological, and the basics of these different types of assumptions are briefly discussed. However, it should be noted that the different assumptions represent individual, extensive fields of study in philosophy of knowledge and science and, in the case of axiological assumptions, ethics. In other words, the overview of these ideas is *cursory*.

Ontological assumptions refer to ideas and opinions about what exists in the world, including the nature of reality, human experience, and social beings. This concept is sometimes mapped from realism to relativism, or objectivist to constructivist. An extreme realist would suggest that one reality exists, where the social and natural world are both concrete, and phenomena can be observed and explained in terms of accuracy. Whereas, an extreme relativist would suggest that multiple realities exist (perhaps one reality for each person), where phenomena become reality through the mind and its processes ([Evely et al., 2008](#); [Moon & Blackman, 2014](#); [Morgan & Smircich, 1980](#)).

With regard to human nature, or the nature of social beings, [Patterson and Williams \(1998\)](#) distinguished between information-based models and meaning-based models, where the former includes a conceptualization of humans as being rational, analytic, and goal-driven where

humans process information that is available to them. The standard ‘rational actor’ model in economics is an information-based model. Meaning-based models view social beings as actively engaged in constructing meaning through experience. Using slightly different language, [Hudson and Ozanne \(1988\)](#) conceptualized social beings as deterministic and reactive under the positivist perspective, and voluntaristic and proactive under the interpretive perspective. [Morgan and Smircich \(1980\)](#) conceptualized social-being ontology as humans as ‘transcendental beings’, ‘social actors’, ‘information processors’, ‘adaptive agents’, and ‘responding mechanisms’.

[Babbie \(2010\)](#) defined epistemology as the “science of knowing,” which is concerned with aspects of validity and what constitutes a claim to ‘truth’. [Hudson and Ozanne \(1988\)](#) characterized epistemology as views related to how knowledge is acquired and generated, what is knowable, who can know, the issue of causality, and the relationship between the researcher and the subject. Epistemology is often illustrated along an objective-subjective continuum, where a strong ‘objectivist’ (positivist) approach considers knowledge to be singular in that one truth exists that can be verified with observation and empirical evidence that is both generalizable and independent of social thought; whereas a strong ‘subjectivist’ (sometimes used synonymously with ‘constructivist’ or ‘interpretivist’) approach considers a world that is inherently influenced by one’s experience and, as a result, multiple legitimate truth claims exist ([Durning, 1999](#); [Moon & Blackman, 2014](#)).

The positivists “seek context-free generalizations”, or “abstract laws that ideally can be applied to an infinitely large number of phenomena, people, settings, and times”; whereas the interpretivists “seek to determine motives, meanings, reasons, and other subjective experiences that are time- and context-bound” ([Hudson & Ozanne, 1988:511](#)). The subjectivist approach does not focus on finding general laws, particularly in the social sciences, as they are either thought to

be non-existent or beyond humans' ability to comprehend. Naturally, the differences in belief regarding what type of knowledge can be generated has implications for the types of questions asked, and the general path toward knowledge. For instance, some have distinguished the linear process of the positivists from the hermeneutic circle of the interpretivists, where the former yield a final answer (often in the form of a law) and the latter may express the understanding at the moment, which is subject to iterative revision ([Hudson & Ozanne, 1988](#); [Patterson & Williams, 1998](#)).

Regarding issues of causality, which is interrelated with the knowledge generated, positivists focus on identifying causal linkages based upon the belief, for example, that human behavior can be explained, at least in part, by a preceding causal event. Interpretivists “view the world as being so complex and changing that it is impossible to distinguish a cause from an effect” ([Hudson & Ozanne, 1988:512](#)). Views on causality partly underpin the “individualism-holism” debate which, according to [Zahle and Collin \(2014:1-2\)](#), is centered around two issues: (1) the nature of social phenomena and, “as part of this, their relationship to individuals” and; (2) the extent to which “social scientific explanations [should] focus on individuals and social phenomena respectively.” The positivist perspective operates on the assumption that causal linkages between an independent and dependent variable on an individual level can be aggregated to explain or predict social phenomena more broadly, whereas an interpretivist would likely adhere to a ‘holism’ argument, which holds that aggregating individual cases does not yield an explanation of the whole. According to [Greene and Caracelli \(2003\)](#) this long-running debate, or ‘historical dualism’, is considered by many to be incommensurable and, as a result, unlikely to be reconciled. This issue of aggregation, as well as issues of causality are discussed toward the end of chapter five and throughout chapter six.

Epistemological assumptions also encompass views related to the role of the researcher relative to the phenomenon observed, and the positivist viewpoint is one where the researcher is detached and separate from the subject in a way that prevents the researcher from influencing the results; that is, the researcher is an objective observer of phenomena ([Hudson & Ozanne, 1988](#); [Patterson & Williams, 1998](#)). The alternative, interpretivist perspective is what [Patterson and Williams \(1998:288\)](#) called the “fusion of horizons”, where the observer is entwined with the observed phenomena and, therefore, active in coproducing knowledge as opposed to simply describing it. Adherents to this viewpoint do not consider the researcher to have a privileged vantage point ([Hudson & Ozanne, 1988](#)). The call for greater ‘reflexivity’ and ‘positionality’ in research, which appears to be relatively common in the conservation social science literature, is a call for greater attention to be paid to this particular assumption.

The third set of assumptions that comprise a research paradigm are axiological, which refer to commitments related to the goals and objectives of research, as well as the ethical considerations and value commitments of the researcher. [Patterson and Williams \(1998\)](#) categorized axiological commitments in terms of ‘terminal goals’ and ‘instrumental goals’, where the former refer to the primary aims of science (e.g., prediction, explanation, description, understanding, communication) and the latter refer to the criteria by which research is evaluated (e.g., generalizability, persuasiveness, insightfulness). Positivists are usually associated with an axiology focused on prediction, and interpretivists are associated with a goal to understand ([Hudson & Ozanne, 1988](#)). Additionally, references to value-free or value-laden knowledge implicitly refer to an axiological perspective, where the former suggests that scientific research is free from influence of human values (and thus neutral) and the latter is under the direct influence of human values ([Gonzalez, 2013](#)). Axiology is sometimes not explicitly included within

discussions of inquiry, because it traditionally departs from questions of truth to questions of value.

Some may still argue today that science need not be concerned with axiology, based upon a worldview that it is chiefly concerned with questions of how the world *is* (as opposed to ethical questions regarding how the world *ought* to be). However, and particularly within the *conservation* social sciences, there is an increased focus on addressing questions of value in conjunction with questions of truth. For instance, EE is a problem-oriented science with the dual aim of creating knowledge for action or, as articulated by [Baumgärtner et al. \(2008:385\)](#), a cognitive interest (“understand and explain then world as it is”) and an action interest (“manage the world based on an idea of how it ought to be”).

Within the scientific macrostructure framework presented above, combining ontological, epistemological, and axiological assumptions comprises a research paradigm. There are many paradigm typologies, which reflects that lack of consensus regarding the exact composition of various paradigms. [Moon and Blackman \(2014\)](#) identified and discussed nine paradigms: positivism, post-positivism, structuralism, social constructivism, interpretivism (which subsumes hermeneutics, phenomenology, and symbolic interactionism), critical theory (which subsumes emancipatory, advocacy or participatory, and feminism), post-structuralism, post-modernism, and pragmatism. [Lincoln et al. \(2011\)](#) identified and discussed five paradigms: positivism, postpositivism, critical theory et al., constructivism, and participatory. [Evely et al. \(2008\)](#) discussed seven paradigms: extreme positivism, structural realism, critical realism, transcendental realism, hermeneutics, nominalism, and extreme subjectivism. [Crotty \(1998\)](#) identified five paradigms. As discussed by [Patton \(2002\)](#), there are many more paradigm typologies, and some are more parsimonious than others; there are typologies with as few as two

paradigms and as many as 27. Regardless of how a particular paradigm is conceptualized, or which one is chosen by a researcher, the various commitments defining each paradigm are meant to guide the practice of research on the ground. In other words, research programs should be underpinned by research paradigms.

2.3. Research programs

Generally, the research program level is where researchers are most active and comfortable, and [Patterson and Williams \(1998\)](#) identified three domains that comprise a ‘research program’ within a scientific discipline: (1) the conceptual domain, which includes normative commitments (e.g., ontological and epistemological assumptions) and theoretical foundations (e.g., specific core concepts such as utility maximization in economics); (2) the methodological domain, where issues, for example, related to research design, sampling preferences, and data analysis and interpretation are considered and; (3) the substantive domain, which includes real-world issues and the application of research.

Worldviews and paradigms are generally not specific to disciplines, as a researcher could hold a ‘complementary strengths’ worldview and apply a post-positivism paradigm to their work within the context of any discipline. Research programs, on the other hand, are discipline specific⁴, because this level is where normative commitments are paired with specific theories, conceptual models, constructs, and specific methodologies for generating empirical data; it is

⁴ It is worth mentioning that this is only true to the extent that disciplines are communities of scientists. As journals, conferences, and departments increasingly cross disciplinary boundaries, this may become less evident.

also the level where science is applied to real-world or managerial problems ([Patterson & Williams, 1998](#)).

Unlike paradigms, which can be classified and discussed in terms of the same characteristics (e.g., epistemology), research programs are not “composed of independent, mutually exclusive categories with distinct boundaries”, as the “diversity of phenomena dealt with is so broad and varied” ([Patterson & Williams, 1998:290](#)). While the phenomena studied at the research program level vary significantly, it may be possible to find common ground within the theoretical foundation of the conceptual domain component. Elements of this theoretical foundation are what [Greene \(2008:8\)](#) referred to as ‘stances’, or the “conceptual perspectives related to the core constructs and theoretical dispositions” of a discipline. Similarly, these beliefs are considered as roughly equivalent to the term ‘concepts’ defined by [Baumgärtner et al. \(2008:388\)](#): “an intellectual figure – a norm, a notion or a mechanism – that is part of the basic construction of the world by a scientific community”. For example, a core stance of economics in general would be that given budgetary considerations, a consumer will purchase the ‘best’ bundle of goods, as it relates to the concepts of preferences and utility ([Varian, 2014](#)).

Even though [Patterson and Williams \(1998\)](#) stressed that research programs can be challenging to clearly distinguish because of the broad range of phenomena studied, when considering a broad range of research programs within a discipline, one should begin to understand what types of phenomena are being studied. [Patton \(2002:80\)](#) related this to foundational or ‘burning’ questions of a discipline (e.g., sociology focuses on “what holds society or social groups together” or “what keeps them from falling apart”). Within the context of natural resource management social science, [Patterson and Williams \(1998\)](#) provided examples of research programs that focused on why people engage in recreation experiences and

what landscapes people prefer. These burning questions of natural resource management social science highlight, in part, an axiological goal to improve natural resource management. Often burning questions of different disciplines are considered to be obvious, which is perhaps why they are not explicitly addressed within Figure 2.1. However, as discussed below, the burning questions of EE are not always clear and, therefore, burning questions are considered as another element of research programs.

A final point about research programs was made by [Greene \(2006:94\)](#): they gain “credibility and persuasiveness when all of these domains [(i.e., worldviews, paradigms, and researcher programs)] act in concert with one another, when their interlocking connections are smooth and well oiled, when the overall presentation is strong, coherent, well articulated and thus persuasive.” This is an imperative for EE, and part of proposing a pragmatist EE, and thus a significant point of this dissertation, is to achieve some level of coherence. The macrostructure framework may facilitate this coherence, which is now applied to briefly review scientific progress and debate within EE.

3. ECOLOGICAL ECONOMICS: A RESEARCH TRADITION WITHOUT COHESION

Ecological economics (EE) is a research tradition focused on understanding, broadly, the interaction between humans and nature for the purpose of making more sustainable decisions, with an explicit focus on the diverse range of competing values, and the biophysical limits of the planet. EE officially formed in the late 1980s ([Røpke, 2005](#)), but there is little agreement, and relatively little scholarship regarding the research tradition as a well-oiled, single entity. In other words, well-articulated EE research programs, which trace on-the-ground practice up through the scientific macrostructure are limited. To be clear, there is a significant amount of scholarship focused on the theoretical foundations or conceptual ideas of EE. This scholarship is the result of thirty years of collective thinking, and roots of core ideas extending further back into a variety of disciplines (i.e., systems ecology, multiple strands of economics, energy studies stemming from physics and engineering, and general systems theory) ([Røpke, 2004, 2005](#)). [Franco \(2018\)](#) traced some EE ideas back to the 1880s.

This diverse range of disciplinary expertise was coupled with an enthusiasm for applying a more integrated type of science to address complex/wicked environmental problems. These problems were increasingly alarming to policy and science communities, and singular disciplinary approaches were considered inadequate⁵. The coupling of interdisciplinary research and an interest in complex environmental problems resulted in progress toward better defining the substantive domain in Figure 2.1. For instance, there is general agreement that the application of research within EE should address sustainability issues. While full clarity and agreement on

⁵ Ropke (2005) outlined the various synergies relevant to the formation of and development of EE, which primarily took place in the late 1980 and early 1990s and focused on sustainability and transdisciplinary research in the wake of the Brundtland Report, including the emergence of the Beijer Institute, which is also known for work in resilience and social-ecological systems.

what sustainability means is a challenge given the variety of definitions and perspectives on the notoriously elusive concept, EE has been referred to as the ‘science and management of sustainability’ ([Costanza, 1991b](#)), and one primary ‘approach to the concept of sustainability’ ([Quental et al., 2011](#)).

Despite progress in particular areas of research programs within EE, the research tradition lacks cohesion. While there are several examples where a comprehensive treatment is provided (e.g., [Costanza, 1991b](#); [Daly & Farley, 2004](#); [Faber et al., 1996](#); [Martínez-Alier & Muradian, 2015](#); [Spash, 2017a](#); [Tacconi, 2000](#)), there are very few examples where all three domains of the research program (including epistemology, ontology, and axiology) are clearly defined *and* the various interrelationships between the research programs, paradigms, and worldviews are discussed. That is, it is rare to find accounts that explicitly describe a worldview, paradigm, and research program to be applied within EE. This is partly because, as outlined in the introduction, there is a lack of literature within EE related to the normative commitments that are established at the worldview and paradigm level. Prior to outlining pragmatist philosophy as one option to improve the cohesion of EE, the progress of EE as a field is briefly reviewed.

3.1. Worldviews: A debate about methodological pluralism and the need for more nuance

One could argue that discussions related to worldviews within EE are both foundational and prevalent. Indeed, as the then newly minted Editor-in-Chief of the journal *Ecological Economics*, [Howarth \(2008:469\)](#) suggested that EE is defined “by a set of concrete problems rather than a particular epistemology or methodology.” This statement implies a worldview where multiple approaches to science not only exist, but are necessary and required for research within EE. Richard Howarth was not breaking new ground with this statement, but reinforcing

the widespread call for methodological pluralism within EE that accompanied the field from the start (e.g., [Costanza, 1991a](#); [Gowdy & Erickson, 2005](#); [Norgaard, 1989](#); [Tacconi, 1998](#)).

As [Norgaard \(1989\)](#) noted when EE was in its nascent stage, the research tradition will be most useful if it maintains the “breadth of the methodological base of economics and ecology and reaches out to the methodologies of other disciplines as well.” Most seem to agree that methodological pluralism is beneficial in principle, as it represents the belief that “certain knowledge about reality is not in general possible” ([Dow, 2004:283](#)). Therefore, there is the need for multiple ways of knowing to understand complex social-ecological systems (SESs), particularly when the subject matter involves situations where law-like behavior and definitive theories are not likely to be found ([Dow, 2004](#)). EE, and particularly its social science focused efforts, addresses such subject matter.

While these discussions clearly suggest that an extreme rationalist worldview (Figure 2.1) does not align with EE, there are rarely additional details offered regarding what worldview should be embraced. To be clear, many criticize the calls for methodological pluralism as dangerous by suggesting that without additional details as to what methodological pluralism means, the research tradition is embracing a default position of Feyerabend-style relativism. For instance, [Spash \(2015:33\)](#) stated: “the conundrum for methodological pluralists is that they must either indiscriminately accept everything, and so lose any meaning for the concept of knowledge, or accept some grounds for rejecting ideas and approaches which they find strongly objectionable.” In other words, it has been argued that embracing methodological pluralism is impeding the realization of the fields promising goals ([Anderson & M'Gonigle, 2012](#)), and leading to a situation where sorting good knowledge from bad knowledge is not possible ([Baumgärtner et al., 2008](#); [Spash, 2012, 2015](#)). There is a concern that unstructured pluralism

could result in an ‘anything goes’ approach where a science is practiced on a tenuous theoretical foundation ([Dow, 2007](#); [Spash, 2015](#)).

Narrowing the potentially appropriate worldviews to somewhere in the middle of the spectrum between extreme rationalism and extreme relativism represents the majority of work within EE. For instance, as briefly outlined above, Clive Spash, who is perhaps the most active scholar within the context of discussions on normative commitments of EE, eschews *unstructured* methodological pluralism but embraces *structured* methodological pluralism for interdisciplinary research in cases when epistemological and ontological commitments are shared ([Spash, 2012](#)).

Given the caveat that methodological pluralism is acceptable when ontology and epistemology align, then it seems that Spash is positioned near a ‘complementary strengths stance’ in Table 2.1, or somewhere on the left side of the spectrum illustrated in Figure 2.2. Without explicit acknowledgement of his stance, or explicit rejection of stances other than extreme relativism, it is difficult to know exactly where [Spash \(2012\)](#) is positioned or what types of middle-ground methodological pluralism are being rejected. It seems the ‘unstructured’ pluralism, as explained by [Dow \(2004\)](#) or embraced by Spash, is not specific enough. Furthermore, without a more nuanced discussion of worldviews, it is challenging to understand if those criticizing methodological pluralism have greater concern with blending (or not blending) paradigms (i.e., an issue with particular dialogs), or with the relationship between paradigms and research in practice. In other words, by rejecting particular forms of methodological pluralism, is one rejecting an ‘alternative paradigm’ worldview or an ‘a-paradigmatic’ worldview?

3.2. Paradigms: Several mentioned, but few linked to research programs

Those advocating for a critical realism paradigm ([Puller & Smith, 2017](#); [Spash, 2015](#)) perhaps provide the most thorough discussion regarding both the various associated normative commitments, and the implications for adopting such a paradigm for research within EE. For instance, [Puller and Smith \(2017\)](#) highlighted past research that is both guided by critical realism and relevant to EE (which include discussions of approaches to interdisciplinary research, cost-benefit analysis as an unrealistic planning tool, and the limits to growth).

Other contributions to the paradigm discussion within EE were listed in the introduction, so they are not restated here. Instead it is worth noting that there is relatively little discussion that explicitly links the advocated or selected paradigm with an EE research program. For instance, [Baumgärtner et al. \(2008:390\)](#) articulated their normative commitments related to epistemology, noting that knowledge is the result of “the interplay between human intellect and empirical experience.” However, the implications of this commitment within the context of an EE specific study is only articulated at a very general level. For example, the authors stated that these epistemological assumptions, in part, support their use of ‘generic modeling’, which abstractly represents the system under study in a way that “can potentially be generalized to a large class of systems [while], at the same time, [retaining] enough structure to be actually applicable to realistic systems” ([Baumgärtner et al., 2008:389](#)). While this suggestion implies that exemplars are the goal (i.e., a model that may be generalizable to a limited extent), it is difficult to clearly understand how this is achieved without specific examples.

To be sure, clearly demonstrating the link between normative commitments and research practice is a challenge (and the ‘a-paradigmatic’ stance sees it as unnecessary); nonetheless, such attempts could benefit the field of EE. It is worth noting that this challenge is not unique to EE,

as mixed methods research more generally is grappling with a similar issue. For instance, pragmatist philosophy (herein advocated as a foundation for a worldview and paradigm in EE) is increasingly popular as a potential way forward within mixed methods, as it aims to move beyond⁶ historical philosophical incommensurabilities. But, [Greene \(2008\)](#) suggested that there is a need to move past describing the philosophical position to providing specifics of how pragmatism may actually influence research in practice. A similar argument is made for EE; that is, simply suggesting a paradigm as an underpinning to a research program in EE without specific examples of the implications of such normative commitments is inadequate.

3.3. Research programs: well-developed generalities, relatively few specifics

As a research tradition, EE lacks a strong and clear identity ([Faber, 2008](#); [Røpke, 2005](#)). Part of this lack of identity is due to the lack of organization and specificity related to its subject matter ([Faber, 2008](#); [Røpke, 2005](#); [Spash, 2012](#)). The lack of specific research topics, or ‘burning questions’, likely stems from a very broad definition of what is studied in EE. For instance, [Spash \(2015\)](#) stated that the objects of study are the interaction between society, economy and nature. Others narrowed the subject matter to the interaction between economy and nature (e.g., [Baumgärtner et al., 2008](#); [Costanza, 1989](#); [Proops, 1989](#)), though caveats are often attached. For instance, [Costanza \(1989:1, emphasis added\)](#), described the subject matter as the “relationship between ecosystems and economic systems in the *broadest sense*.” The journal, *Ecological Economics*, “emphasizes critical work that draws on and integrates elements of ecological

⁶ As will be discussed at length in chapter 4, particular normative assumptions of pragmatism facilitate this moving beyond, such as experience as the foundation of its epistemology and an axiology focused on communication and understanding.

science, economics, and the analysis of values, behaviors, cultural practices, institutional structures, and societal dynamics” ([Elsevier, 2019:paragraph 1](#)).

This broad and general study area and diversity of disciplinary interest in EE yields, unsurprisingly, a research tradition that lacks a singular (or even several) burning question(s). As [Røpke \(2005:285\)](#) suggested, EE could be said to cover any topic with even a slight relation to the environment; in other words, “the field is programmatically open, pluralistic and transdisciplinary, so virtually unrelated contributions can appear as parts of the field. The core beliefs provide a framework for research, but they give little specific guidance.”

Core beliefs in this context (also referred to as ‘stances’ and ‘concepts’ above) refers to the theoretical foundation of the ‘conceptual domain’. There may be some disagreement surrounding the various core beliefs, but surveying the literature within EE yields an abundance of scholarship on core beliefs (e.g., [Castro e Silva & Teixeira, 2011](#); [Costanza, 1991a](#); [Gowdy & Erickson, 2005](#); [Munda, 1997](#); [Nadeau, 2015](#); [Özkaynak et al., 2012](#); [Proops, 1989](#)). After two decades of debate and discussion in the field, core beliefs on conceptual issues started to emerge. [Gowdy and Erickson \(2005\)](#), in the *Cambridge Journal of Economics*, published a paper entitled “The approach to ecological economics”. Table 3.1 illustrates the stance on several main conceptual issues in ecological economics in comparison to neoclassical welfare economics. The intent is not to review each and every belief discussed by [Gowdy and Erickson \(2005\)](#), but instead to emphasize that even though particular elements of many research programs in EE are well developed (i.e., general theoretical beliefs), practitioners generally lack specifics about how these beliefs influence both the methodological domain and the substantive domain.

Table 3.1. Key core beliefs of ecological economics

Conceptual issue	Neoclassical welfare economics	Ecological economic alternative
Value Monism	Reduce value to commensurable monetary units; utility function.	Separate value into incommensurable categories; multi-criteria assessment
The Rational Actor	Individual consumers and firms at the center of analysis	Analyze humans as social actors, consumers versus citizens
Marginal Analysis	Comparative statics of marginal change.	Recognizes discontinuous change and total effects
Evolutionary Change	Evolution as constrained optimization, survival of the fittest view of market outcomes, individual based selection	Importance of contingency, historical accidents, path dependency, consider altruism and group selection as well as selfishness.
Uncertainty	Reduce uncertainty to risk. Market outcome focus to decision-making	Precautionary principle to deal with pure uncertainty. Process-oriented, co-evolutionary focus to decision-making.
Decision Criteria	Efficiency as the sole criterion, usually based on potential Pareto improvements.	Equity, stability, resilience of environmental and social systems.
Production Process	Theory of allocation of fixed resources; production function.	Production as a biophysical process, thermodynamics; extended IO approach, joint production of goods and polluting wastes.
Discounting	Straight-line discounting of future costs and benefits.	Recognizes the difference between individual and social valuation of the future; hyperbolic discounting.

Source: [Gowdy and Erickson \(2005:213\)](#)

That is, the core beliefs in the neoclassical welfare economics column have been developed and refined in a way over time that is tightly knit and gives practitioners guidance. For example, the decision rules associated with potential Pareto improvements are fairly definitive. The same cannot be said of the ecological economic alternative. How one can make a decision based on equity, stability, and resilience of environmental and social systems (with economic systems

nested within the latter) is an open question which has multiple answers. This is a direct acknowledgement of complex environmental problems.

Additionally the lack of an established area of concern beyond the interaction of humans and nature is impeding progress in EE. Without a set of concise burning questions, or a set of goals related to what aspect(s) of *sustainability* can be addressed by EE, it is challenging to understand its potential contributions. This potentially impedes interdisciplinary research, as the role of the ecological economist is difficult to articulate. To be clear, some have attempted to outline the primary topics or burning questions in EE. For instance, [Røpke \(2005\)](#) listed three main research programs: (1) identity formation (a great deal of which included distinguishing EE from environmental and resource economics, as done in Table 3.1); (2) issues of scale and the resilience approach and; (3) valuation and decision-making. [Castro e Silva and Teixeira \(2011\)](#), through a ‘bibliometric’ analysis of literature within EE, listed ten topic areas: (1) theory building; (2) methodological issues; (3) values; (4) policies, governance, and institutions; (5) technical change and the environment; (6) trade and the environment; (7) global environmental issues; (8) production, consumption and sustainability; (9) biodiversity conservation and; (10) valuation. These topic areas are consistent with social-ecological systems research, a topic returned to in detail in chapter seven.

While these topic areas are more specific than the interaction between nature, the economy, and society, they are still quite broad. Furthermore, research in EE has pursued these broad topics in a way that may or may not distinguish itself from environmental and resource economics. Regarding issues of scale, global environmental issues, and sustainability, one could argue that EE has progress in a way that distinguishes itself from the more traditional economic approach through an articulation of how a macro-economic system can better realize the

biophysical realities of our planet. The conventional economic worldview is one that fosters a strong commitment to boundless economic growth without much consideration of social and environmental context – this worldview has led, in part, to pressure on natural resources and environmental degradation ([Lin, 2013](#)). While some would argue this is an outdated ‘conventional economic worldview’ adopted by few economists at this point, it has galvanized many around further discussion of a macro-level ecological economy, which is usually discussed as a theoretical endpoint where human economic activities are reorganized in a way that is more in line with ecological principles (e.g., [Janda & Lehun, 2015](#); [Lin, 2014](#)).

This underpins the ‘pre-analytic vision’ in EE that asserts there is a need to better link economic systems and a biophysical reality; a need that requires explicit attention to issues of scale. That is, “the embeddedness of the economy in nature and the related idea that the human economy can be said to take up more or less ‘space’ in relation to the closed system of the earth. The larger the scale of the economy becomes, the greater the risk of destroying the conditions for human life on earth in the long run” ([Røpke, 2005:275](#)). To this end, several topics have been developed or further explored within EE, including de-growth, low-growth and the steady state economy ([Daly, 1974, 1996](#); [Martínez-Alier et al., 2010](#); [Paech, 2017](#); [Victor & Jackson, 2015](#)), alternative measures to well-being beyond the conventional gross domestic product (GDP) ([Boyd & Banzhaf, 2007](#); [Daly & Farley, 2004](#)), and framing economic growth within the ‘coevolutionary paradigm’ ([Kallis & Norgaard, 2010](#); [Norgaard, 1994](#)). The practical avenues to such a theoretical endpoint are not well established, but EE has at least progressed in developing a vision of this endpoint.

The broad topics of valuation, values, and decision-making are perhaps less distinguishable from the more traditional approaches of environmental and resource economics.

According to [Plumecocq \(2014\)](#), who completed a discourse analysis of several journals relevant to EE, the field of EE has increased its focus on ‘ecosystem services methods and debates’ over time and, partly as a result, the fields of EE and environmental and resource economics have become *less* distinct (despite an express interest of EE to be something different than environmental economics). For instance, the significant amount of research focused on improving and applying valuation methods such as stated preference approaches are mostly situated within a standard economic framework (e.g., [Armatas et al., 2014](#); [Blamey et al., 2000](#); [Fischer & Hanley, 2007](#); [Kontogianni et al., 2012](#)). This is not to say that EE contributions related to valuation, which expressly depart from economic frameworks, have not been made. For example, [Spash et al. \(2009:962\)](#) used the theory of planned behavior to gain a better understanding of what motivated willingness to pay (WTP). [Kumar and Kumar \(2008\)](#) applied a ‘psycho-cultural’ perspective to improve interdisciplinary collaboration and cooperation in the valuation of ecosystem services and, similarly, [van Riper et al. \(2017\)](#) focused on incorporating socio-cultural phenomena into ecosystem service valuation. [Spash \(2007\)](#) applied deliberative monetary valuation as a way to combine economic and political processes in valuation. [Armatas et al. \(2018\)](#) combined Q-methodology and choice modeling to provide a social and economic perspective on the importance of ecosystem services, which ensured that a broad range of perspectives could express their opinions.

The primary point to be gleaned from this section on research programs is two-fold. First, ecological economists can better articulate how the core beliefs of the research tradition, such as in Table 3.1, are to be realized in practice. Second, ecological economists need to better articulate what their ‘burning questions’ are. This requires further grappling with the fundamental question of how EE is different from the more traditional approaches of

environmental and natural resource economics, the latter of which have, for example, ways to accommodate 'difficult to value' aspects of the environment such as existence and bequest values. In other words, simply accounting for non-use values, for instance, does not seem to constitute an EE approach. Can more traditional environmental and natural resource economic approaches be considered EE if they are accompanied by an understanding of drivers of changes affecting the provision of environmental benefits, costs accrued to society resulting from human and natural change, or the social, political and cultural barriers to receiving particular benefits? If one answers yes to this question, then it seems to flow naturally into another: when is one not practicing EE anymore, and doing something different such as political ecology?

Pragmatist philosophy can help to add cohesion to research in EE by better linking the scientific macrostructure. While pragmatist philosophy may partly address the need for greater specificity in terms of burning questions and subject matter, a social-ecological systems framework is also a potentially important contributor to the need for greater specificity (as discussed in chapter 7).

4. PRAGMATISM AND A DIVERSE COLLECTION OF IDEAS

Pragmatism is a philosophical tradition, which is often labeled ‘American Pragmatism’ due to its origin in the United States. It is distinct from a more colloquial use of the term ‘pragmatist’ or ‘pragmatism’, which may also be associated with America, as [Westbrook \(2005:ix\)](#) explained:

In ordinary speech, a ‘pragmatist’ is someone (often a politician) who is willing to settle for a glass half empty when standing on principle threatens to achieve less. Pragmatists are concerned above all about practical results; they have a “can do” attitude and are impatient with those of the “should do” disposition who never seem to get anything done. Americans are often said to be a particularly pragmatic people, and many Americans pride themselves on a sensibility others are inclined to label shallowly opportunistic.

This distinction between the philosophical tradition and the colloquial use of the term is generally made because it can, and has, created confusion ([Ralston, 2011](#); [Webb, 2007, 2012](#)).

That is, colloquial uses of ‘pragmatism’ are confused as stances of pragmatism philosophy. For instance, in a textbook describing qualitative research and methods within a section entitled “pragmatism”, [Patton \(2002:135-137\)](#) suggested that, in practice, one does not need to consider theory and the normative commitments of various research paradigms. In this context, the meaning of ‘pragmatism’ is colloquial (as no reference to the philosophical tradition is made).

Similarly, within the context of EE, [Spash \(2013\)](#) negatively described one main camp within the field ‘new environmental pragmatists’. This camp was characterized as environmental scientists chiefly concerned with influencing policy and management, who market the importance of nature through commodification and valuation; while at the same time sacrificing theoretical rigor, especially in the social sciences, in the pursuit of solving practical problems within the current world hegemony. [Spash \(2012, 2013\)](#) is clear to stress that he is referring to the

colloquial use and not the philosophical tradition; nonetheless, the conflation between the two uses of the term ‘pragmatism’ does occur.

Despite the attempts to distinguish the different uses of the term, some have suggested language used within the philosophical tradition can be misleading. For instance, [Crotty \(1998:62\)](#) characterized criticism of pragmatism both as misguided based on “a simplistic and distorted reading”, and warranted given a “rhetoric” that is easily misinterpreted due to its simplicity and ambiguity. This assessment seems fair because, on one hand, a thorough reading of pragmatist philosophy highlights several commitments that belie an expedient approach (see, for example, the discussion by [Minteer \(2012:26-28\)](#) with regard to pragmatist commitment to the method of inquiry and democracy). On the other hand, cursory survey papers (there are many) can correctly describe pragmatism and, at the same time, give an impression that pragmatist philosophy advocates for an ‘anything goes’, rigor-less approach to science. For example, in their ‘guide to understanding social science research for natural scientists’, [Moon and Blackman \(2014:1175\)](#) suggested that pragmatism applies all necessary approaches to understand the research problem without committing to a particular philosophical position, is a perspective that seeks a “compromise” between empiricism and rationalism, judges the value of knowledge “with respect to how well it serves human purpose”, and can be applied for “any or all” research purposes. Although this description is potentially valid, without additional detail of the more nuanced aspects of pragmatist philosophy, and how it may be different from other perspectives driving research, one could certainly draw a conclusion that pragmatist philosophy and pragmatism in the common-language sense are synonymous.

Pragmatist *philosophy* (henceforth the only meaning of the term ‘pragmatism’ or ‘pragmatist’) is commonly traced to the thinking and writing of three people: Charles Sanders

Peirce, William James, and John Dewey (George Herbert Mead is sometimes mentioned as a fourth – and [Ralston \(2011\)](#) added Jane Addams as a fifth). It is frequently noted that these pragmatist originators were quite different in their thinking, which is partly why the exact nature of what pragmatism ‘is’ has been thoroughly discussed to no certain conclusion. This point was belabored in the early days of pragmatism when, in 1908, Arthur Lovejoy argued for thirteen pragmatisms, which “are separate not merely in the sense of being discriminable, but in the sense of being logically independent, so that you may without inconsistency accept any one and reject all the others, or refute one and leave the philosophical standing of the others unimpugned” ([Lovejoy, 1963:2](#)). As noted by [Hands \(2001\)](#), William James originally articulated six different pragmatist approaches. The ‘what is pragmatism’ question is perhaps even more noticeable today, which is reflected by: (1) various distinctions within the pragmatist community, such as between ‘classical pragmatists’ and ‘neo-pragmatists’ ([Putnam & Putnam, 2017](#)) and, further, ‘neo-pragmatists’ and ‘paleo-pragmatists’ ([Minteer, 2012](#); [Ralston, 2011](#); [Westbrook, 1993](#)) and; (2) a common caveat accompanying summaries of the pragmatist landscape stressing the “spectrum of meanings...multiple permutations...novel versions” ([Ralston, 2011:77](#)), and/or the past and present “philosophical heterogeneity” ([Minteer, 2012:8](#)).

In some cases, the various meanings of pragmatism is explicitly identified as a challenge. For example, [Proctor \(1998\)](#) outlined potential insights that pragmatism could provide within the context of the relativist debate regarding the social construction of nature, but these contributions were, according to the author, somewhat obscured by the myriad meanings of pragmatism. In other cases, the lack of a settled understanding appears to create freedom to suggest new directions and applications. [Koopman \(2009:1\)](#) justified his book, *Pragmatism as Transition*, not as “yet another in a long line of books in which the author attempts to state what pragmatism is”,

but as a novel conception of pragmatism based on previously stated, though little explored, pragmatist ideas.

This characteristic of pragmatist philosophy is acknowledged for several reasons. First, it underscores the broad nature of pragmatist philosophy and highlights why a concise and authoritative overview is a potentially intractable task. Second, it signals to the reader that the pragmatism presented herein is not only partial, but also potentially different from pragmatisms presented elsewhere. Third, it stresses the need to be specific about the conceptualization applied herein with regard to how it relates to the various threads within the pragmatist literature.

For this dissertation, pragmatism is, first and foremost, a philosophical perspective that can serve as a philosophy of science. Pragmatism applied as a philosophy of science is common, though its framing as such is inconsistent (a point clarified below). However, as previously suggested, pragmatism is quite broad and, as a result, it has been discussed as something more than a philosophy of science. This lack of limits is reflected in a variety of pragmatist discussions, such as pragmatism as social theory (that is, a general idea related to how societies function) ([Frankel Pratt, 2016](#); [Joas, 1993](#)). Or, more broadly, pragmatism as a ‘Way of Life’ ([Putnam & Putnam, 2017](#)) or a “complete philosophical ‘Weltanschauung’, a plenary and exhaustive view of the world” ([Long, 2002:39](#)). The wide scope of interest within pragmatist philosophy is likely due to the varied interests of the founders. As [Webb \(2007:1070\)](#) noted, “Peirce focuses upon scientific, logical and mathematical inquiry while Dewey uses scientific inquiry as a resource for inquiry into practical problems of society and individuals.”

Within the context of EE and the macro-science framework provided above, interpreting pragmatism as a philosophy of science *and* something more is relevant because it highlights the potential that pragmatism may not only inform the worldview and paradigm levels, but also

facets of research programs such as burning questions and methodology. In other words, pragmatist philosophers have focused on the more universal⁷ paradigmatic assumptions (e.g., epistemology) and, in addition, they have articulated specific stances and methodological characteristics that align with, or potentially address weaknesses related to, EE. For example, if considering environmental pragmatism as a methodology ([Light & Katz, 1996](#)), an environmental ethic ([Rosenthal & Buchholz, 1996](#)), a method of conflict management ([Varner et al., 1996](#)), and/or an approach to sustainable adaptive management ([Norton, 2003, 2005, 2015](#)), then the discussion necessarily departs from general philosophy of science issues such as reality and inquiry to specific subject areas. Some of these subject areas, such as environmental values, complex social-ecological systems, and intergenerational equity are highly relevant to EE.

The pragmatism that can help guide research within EE is, broadly, summarized by [Ralston \(2011\)](#) as a “sophisticated way of thinking about knowledge, existence and social-political affairs.” This type of pragmatism is characterized by [Ralston \(2011\)](#) as ‘paleo-pragmatism’, and it is roughly represents the pragmatism embraced herein. This is the type of pragmatism discussed and accepted by [Minteer \(2012\)](#), who is perhaps fairly categorized as an environmental pragmatist. While *environmental* pragmatism, and those contributing to it (e.g., Bryan Norton, Ben Minteer, Andrew Light), form a significant portion of the pragmatist ideas discussed below, the focus is on pragmatism more broadly. As Bryan Norton recently stated, the core of his diverse body of work (which includes ideas related to sustainability, adaptive management, environmental values, and social-ecological systems) is, more broadly, “pragmatism” as a “forward looking philosophy” ([Meine, 2018:289](#)).

⁷ ‘Universal’ in that one can apply pragmatist philosophy of science to a variety of subjects, from international relations ([Frankel Pratt, 2016](#); [Ralston, 2011](#)) to community health research ([Andrew & Halcomb, 2007](#)).

4.1. Pragmatism as a philosophy of science: A worldview and a paradigm

A review of the pragmatist literature highlights several different conceptualizations of pragmatism as a philosophy of science. It has been placed beside other research paradigms (as defined above) such as positivism, constructivism, and interpretivism (e.g., [Moon & Blackman, 2014](#)). It has been discussed primarily in the context of its *influence* on such paradigms (e.g., [Crotty \(1998\)](#) discussed its influence on ‘symbolic interactionism’; [Lovejoy \(1963\)](#) identified one of thirteen pragmatisms as ‘pragmatism as interactionism’), and framed as being fundamentally different than such ‘metaphysical’ paradigms ([Denzin, 2010](#); [Morgan, 2007, 2014](#)). Somewhat differently still, [Norton \(2005:519-578\)](#) provided a historical overview of pragmatism and concluded that it is most appropriate to think of pragmatism as encompassing a revised version of positivism.

These various different framings of pragmatism as a philosophy of science, as well as its status as an emergent paradigm with an ‘alternative paradigm’ stance (Table 2.1), suggest it does not neatly fit with the more traditional research paradigms. This ill fit is implied, or in some cases explicitly stated (e.g., [Haack, 2009](#)), in the numerous accounts of pragmatism which start by describing the philosophy as one that rejects traditional philosophical dualisms (e.g., realism/relativism, free will/determinism, facts/values, individualism/holism). From the beginning, Dewey promoted pragmatism as a different kind of philosophy ([Morgan, 2014](#)), and more recent scholarship has focused on conveying the difference of pragmatism from other more traditional research paradigms as it relates to perceived relationship between ontology, epistemology, methodology, and methods ([Denzin, 2010](#); [Morgan, 2007, 2014](#)). As suggested by [Morgan \(2007\)](#), pragmatism may seem out of place within the context of other paradigms because it does not necessarily adhere to the same structure (specifically, pragmatism does not

prioritize ontology in its quest for knowledge). This relationship between the different paradigmatic normative commitments reflects part of the pragmatist worldview.

That is, pragmatism does not adhere to the common framework for knowledge production provided in many research methods discussions (e.g., [Crotty, 1998](#); [Lincoln et al., 2011](#)), where a pyramid-like structure is presented with ontology forming the base which supports the epistemology tier, which supports the methodology tier which, in turn, supports the methods tier. As [Morgan \(2007:58\)](#) noted, this framework is often presented with ontology, epistemology, and methodology being weighted equally (at least in a nominal sense where one is not more important than another), while at the same time the sequential orientation “led to an emphasis on metaphysical questions about the nature of reality and the possibility of truth because these ‘higher order’ assumptions imposed limits on every aspect of their system.” This orientation, and the fact that comparisons between different paradigms were often rooted in ontological issues, is what led [Morgan \(2007\)](#) to dub these more traditional paradigms ‘metaphysical’. The macrostructure framework developed by [Patterson and Williams \(1998\)](#) is adopted partly because it adhered to Laudan’s paradigm model, which explicitly posits that the different types of normative commitments (i.e., ontology, epistemology, and axiology) are mutually defining and constraining, as opposed to hierarchical.

In addition to the view that ontology is not necessarily foundational to the construction of a research paradigm (discussed further below), the pragmatist worldview adopts the perspective that traditional philosophical dualisms (e.g., realism versus relativism) are reconcilable, usually through some middle ground. For instance, [Haack \(2009\)](#) proposed an ‘intermediate theory’ of epistemology by rejecting the traditional dualism between foundationalism and coherentism. This dualism is not elaborated upon, though [Steup \(2018\)](#) provides a quality introduction.

However, the primary point is that the pragmatist worldview is a middle ground where multiple approaches to science exist in a beneficial way and paradigmatic differences can be reconciled. On the spectrum illustrated in Figure 2.2, the pragmatist worldview to science could be positioned near the ‘blended/unified’ end of the spectrum, but it is important to note that this position is likely considered a theoretical endpoint. That is, over an infinite amount of time, a plurality of approaches may converge toward a singular scientific approach and, consequently, a unitary truth. The starting point, on the other hand, is somewhere between pluralism and critical pluralism (Figure 2.1). As [Minteer \(2006:6\)](#) noted, pragmatism is known “for its acceptance, if not hearty embrace, of the condition of pluralism; i.e., that individuals are differently situated and are shaped to a significant degree by dissimilar traditions and experiences. Any claim to a universal or singular ‘good’ is thus illusory.” While this ‘pluralism’ refers mainly to the belief that there is no single ethical norm, plurality in scientific approaches is also embraced by pragmatists.

Discussing the implications of the incorporation of different approaches to science, and perhaps even convergence toward a single methodology, for the purpose of practical research is critical. Prior to that discussion in chapter five, pragmatism is presented as a paradigm by discussing the normative commitments related to ontology, epistemology, and axiology.

4.1.1. Pragmatist ontology: Disagreements and questions of relevance

Unsurprisingly, pragmatist literature on ontology is diverse. There is disagreement related to the realism versus relativism debate. The founding pragmatists were split on the issue, and this split continues today. Charles Peirce was a realist, though of a unique kind ([Haack, 1977](#)). Peirce believed in the existence of universal laws and the associated causality, which existed outside the

human mind; however, human conceptions of this reality is “purely mental in its composition” ([Skagestad, 1983:269](#)). According to Peirce, over time a community of inquirers could arrive at a single, unitary truth ([Norton, 2005](#)). William James did not subscribe to this belief, and took a more pluralistic approach ([Norton, 2005](#)). Some have suggested that James took an essentially agnostic view toward metaphysics as a whole ([Morgan, 2007](#)). The continuance of this disagreement today is perhaps most evident in the ‘neopragmatist’ camp, which is often said to include Richard Rorty and has been distinguished from others by its proximity to relativism and subjectivism ([Minteer, 2012](#); [Norton, 2005](#)). The ontological position of the ‘paleo-pragmatists’, on the other hand, tends toward realism, though this is still a middle of the spectrum realism.

This middle-of-the-spectrum position is appropriate given that pragmatism is generally focused on transcending typical philosophical dualisms, which are unlikely to yield consensus conclusions and may impede effective inquiry ([Johnson & Onwuegbuzie, 2004](#); [Ralston, 2011](#)). According to [Norton \(2005:63\)](#), pragmatism is “not relativistic—it expects to arrive at a justifiable decision in a particular situation—so it is better thought of as contextual.” On the other end of the spectrum, pragmatism is definitely not strictly realist in that it strongly rejects ‘foundationalism’, or the idea that knowledge is grounded in basic beliefs about a certain reality ([Minteer, 2012](#)). Pragmatists generally deny that the human mind is a mirror image of nature ([Bromley, 2015](#)). [Anderson \(2011\)](#) suggested that pragmatists do not believe in an absolute truth at a given time but, instead, a temporary belief that would inevitably change.

[Norton \(2005\)](#) suggested ‘limited realism’ as a pragmatist *epistemology*, but it is discussed here as it captures what could be perceived as ontological assumptions and it highlights what is meant by ‘contextual’. Furthermore, it touches on antifoundationalism and the

importance of language, which are two key pragmatist commitments ([Minteer, 2012](#)). [Norton \(2005:109\)](#) stated:

Limited realism accepts the fact that no substantive knowledge of the external world is knowable a priori; we must construct our system of beliefs without benefit of prior principles to guide us [(i.e., antifoundationalism)]. It also accepts the apparently unavoidable conclusion that our varied linguistic forms, designed to function in many different situations, yield no common underlying structure for all experience [(i.e., importance of language)]. The categories we find in this world are of our own making; they are not given in reality independent of us. For these reasons realism must be limited. But it remains realism in the most important sense. It retains a method of selection based in reality, not in our wishes, dreams, or imaginations.

Thinking of reality within pragmatism as ‘contextual’ is perhaps more clear in light of this stance, as our experiences, social commitments, opinions about what is important, and general viewpoints are diverse and, inevitably, shaped at least in part by different circumstances. As discussed in the next section on epistemology, pragmatist views on the meaning of ‘experience’ represent a view of social beings that aligns with the interpretive approach and meanings-based models (i.e., social beings are proactive learners that engage with, and derive meaning from, their natural and cultural environment); however, this does not imply an ontology where humans are “arbitrary creators who simply make up a ‘world’” (i.e., a ‘wholesale constructivist’ approach) ([Anderson, 2011:11](#)). Instead, human beings are natural interpreters of our natural and cultural environment, which belies *certain* knowledge about reality without denying the existence of such reality ([Anderson, 2011](#)). As [Bromley \(2015:10\)](#) explained, “there are, to be sure, objects and events ‘out there’ in the world, but there are no universal and objectively ‘true’ descriptions of the objects and events in that world.” [Hildebrand \(2018\)](#) asserted that John Dewey took an ontological position that was realist, naturalist, non-reductive, emergentist, and process-oriented. This position is one where our place in some objective reality cannot be

divorced from our observations of that reality and, therefore, for all intents and purposes, reality is ‘limited’.

This middle-ground ontological position may be unsatisfactory to some. However, pragmatists commonly consider a final and settled position as generally unimportant. As [Lohse \(2016\)](#) suggested, there are two prominent views regarding the relevance of ontological investigations within the context of social science: (1) the ‘ontology first’ viewpoint, which holds that questions of reality are mostly neglected and are in need of sorting out prior to methodology and theory and; (2) the ‘leave ontology behind’ viewpoint, which holds that these abstract discussions have received plenty of attention and are not all that important for fruitful social science anyway. While some pragmatists have focused on the benefit of ontology as being somewhere in the middle (e.g., [Frankel Pratt, 2016](#); [Lohse, 2016](#)), the general sentiment that ontology is not of paramount importance is evident in a variety of pragmatist thinking. As pointed out by [Frankel Pratt \(2016:512\)](#), the pragmatist school has made an effort to collapse ontology and epistemology, which is likely due to the common perception among pragmatists that “fundamental ontological questions of social theory, such as the nature of action, experience, agency, structure, or mind, are too abstract and do not need to be answered anyway to permit fruitful inquiry.”

The agnostic view of William James toward metaphysics is one example, as mentioned above, but many others appear to agree. For instance, [Morgan \(2007\)](#) focused on methodology, epistemology, and methods when discussing research underpinned by pragmatism (essentially removing ontology as an essential element). As pointed out by [Norton \(2005:572\)](#), the democratic pragmatic epistemology for social inquiry, which is centered on bottom-up approaches where diverse interests and communities are engaged, is an open-ended process

whereby “progress is measured by the plausibility of the stories we tell about our common interests,” and this process is important regardless of whether “it is viewed as having a single, ideal endpoint.” The book which is being quoted here ([i.e., Norton, 2005](#)) has been described as being grounded in ‘pragmatist epistemology’ and not in metaphysics (which subsumes ontology) ([Hickman, 2007](#); [Norton, 2007](#)).

One’s opinion on whether ontology (and some coherent position with regard to it) is a fundamental element of social scientific inquiry clearly has implications for how a pragmatist approach is received, because it is likely fair to suggest that pragmatism has made greater progress in issues related to epistemology and methodology. For instance, within EE, one criticism of the philosophical foundation provided by [Baumgärtner et al. \(2008\)](#) was that it appeared to commit an ‘epistemic fallacy’ ([Spash, 2012, 2015](#)); that is, effectively merging ontology and epistemology, or claiming means to describe reality (i.e., epistemology) without defining reality (i.e., ontology) ([Spash, 2015](#)). Whether a pragmatist approach is vulnerable to such critiques is perhaps an open question, and one’s opinion is likely contingent upon their worldview. It will become clear in the next chapter that this potential weakness of pragmatism is not considered a fatal flaw for a pragmatist EE, and it should also be noted that there are particular ontological positions in pragmatism that are quite clear, such as the social nature of human beings (as elaborated upon below).

4.1.2. Pragmatist epistemology: Experience creates knowledge, democratic process confirms it (at least for the moment)

Pragmatist knowledge claims are developed and verified through repetitive observation and experimentation related to diverse human experience, at both the individual and community

level ([Minteer, 2012](#); [Norton, 2005](#)). The notion that experience is central to creating knowledge is perhaps the most basic epistemological commitment, and it is why ‘empiricism’ is generally listed as foundational to pragmatist philosophy. The empiricism embraced by pragmatists is, however, different from classical empiricism (particularly the British version) ([Hildebrand, 2011](#); [Webb, 2007](#)). Earlier British empiricists, such as John Locke and David Hume, reduced experience to a mechanistic occurrence whereby ‘sense data’ is recorded through perceptual senses, and then processed through thoughts or ideas; the result is “intelligence by way of an elaborate process of associative learning” ([Hildebrand, 2018:11](#)). The pragmatist view of ‘experience’ is different. Even though the version presented below is gleaned from, and mostly credited to, the writings of John Dewey, it is important to note that Dewey built upon earlier thinkers such as Charles Peirce and William James as he articulated a reformed version of classical empiricism ([Anderson, 2011](#); [Hildebrand, 2018](#); [Hildebrand, 2011](#)). Particularly, Dewey built upon the ideas of William James’ ‘radical empiricism’ ([Hildebrand, 2011](#)).

Dewey’s version of ‘experience’ was borne out of his interest in psychology and, specifically, his fundamental disagreement with common psychological theories related to how humans experience the world. According to [Dewey \(1930, cited by Hildebrand \(2018:10\)\)](#), psychology could provide insight into deep philosophical questions, and perhaps facilitate the overcoming of “longstanding divisions (between subject and object, matter and spirit, etc.) [by showing] how human experiences —physical, psychical, practical, and imaginative —were all integrated in one, dynamic person.” This holistic view of human psychology eschewed the more standard atomistic and reductionist approaches. Dewey was particularly critical of the reflex arc concept ([Dewey, 1896](#)), which characterized humans as:

A passive organism encountering external stimuli causing a sensory and motor response; for example, a child sees a candle (stimulus), grasps it (response), burns her hand (stimulus), and pulls her hand back (response). This, it argued, makes explicit the event's basic stimuli and responses, replete with connections satisfactorily describable in mechanistic and physiological terms – and *all without recourse to mysterious and unobservable entities*" ([Hildebrand, 2018:13](#), [emphasis added](#)).

Dewey thought that this atomized and mechanistic view of psychology could never account for the diversity of lived meanings in the sociocultural environment; a belief which resulted in a reconstruction of psychological stances on various components of human conduct (e.g., instincts/impulses, perception/sensation, acts/habits), and informed his “lifelong contention that mind, contrary to long tradition, is not fundamentally subjective and isolated, but social and interactive, made through natural and cultural environments” ([Hildebrand, 2018:11](#)).

What resulted from a more holistic view of human learning and behavior, in part, is a pragmatist conceptualization of experience that is part ‘realist’ epistemology in that the things and events (i.e., the physical world) that one’s senses interact with are integral to human perception. However, human learning and behavior is also partly anti-realist (or constructivist) through “a partnership of perception with background belief, in the sense that our *beliefs about* what we see, hear etc., are affected not only by what we see and hear, but also by already-embedded beliefs about how things are” ([Haack, 2009:157](#), [emphasis original](#)). Returning to the example of the child with the candle, learning (or lack of learning) are not only shaped by the physical environment where the event takes place, but also by the child’s past experiences, and her level of involvement in the experience ([Hickman, 2009](#)). Elaborating on these ideas, [Dewey \(1933, 1938\)](#) sketched the inquiry and learning process in five steps. Dewey’s five steps are summarized from [Hickman \(2009\)](#) and [Hildebrand \(2018\)](#):

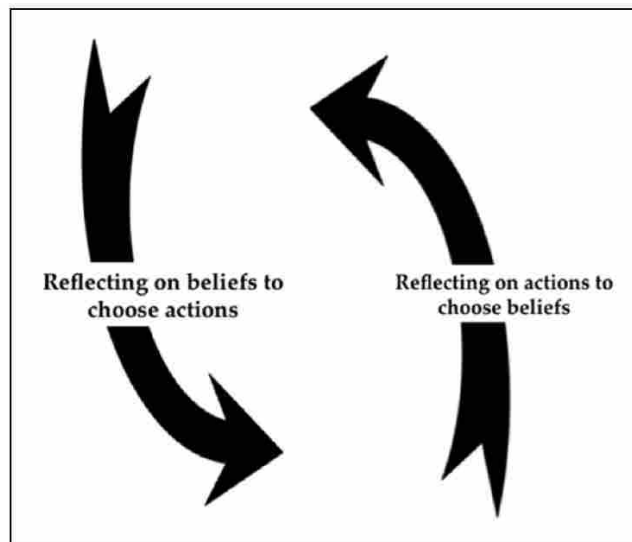
1. An emotional response or feeling that something is different or new within the context of a typical experience (e.g., a child wandering through an otherwise familiar room to find a burning candle);
2. A formulation of the problem (which is a divergence from the typical assumption that problem identification precedes experience), where a new situation calls for exploration and application of an intellectual response (e.g., the child tries to make the situation 'more stable' by applying lessons learned from past experiences);
3. Hypothesis construction, where past theoretical understanding and current perceptions weigh the possible consequences of various actions (e.g., child uses past familiar exploration methods by reaching for the candle);
4. Testing and experimentation, where one 'reasons through' the implications of actions and, potentially, finds contradictions thus necessitating a return to the problem identification or hypothesis construction phase (e.g., the child grasps the candle based on previous exploration attempts in other situations which, this time, results in a burned finger);
5. Application and evaluation, where inquiry is ended with a decision as to whether an 'indeterminate situation' has been converted into a 'determinate one' (e.g., if the burn is sufficient to prevent further exploration, then the effect of the flame on the child's finger is learned; if the burn is insufficient to prevent further exploration, then the experiment starts over again until a lesson is learned).

While Dewey was clear to stress that this sketch of how people think and learn is both a simplified schematic (in reality, the phases are likely not as discrete or linear) and an exemplar (i.e., not 'everybody' thinks this way), it outlines a view of experience that is "processual,

transactional, socially mediated, and not categorically prefigured as ‘rational’ or ‘emotional’” ([Hildebrand, 2018:28](#)).

This view of learning can perhaps clarify what is meant when it is suggested that pragmatism emphasizes epistemology over ontology, because the nature of social beings is such that experience yields beliefs which, in turn, yield action. [Morgan \(2014\)](#) illustrated this with a simple diagram (Figure 4.1).

Figure 4.1. Dewey’s model of experience



Source: [Morgan \(2014\)](#)

Interpreting this figure can be facilitated with the following from [Fesmire \(2003:28\)](#): “classical pragmatism situates reason within the broad context of the whole person in action. It replaces beliefs-as-intellectual-abstractions with beliefs-as-tendencies-to-act, pure reason with practical inquiry, and objectivist rationality with imaginative situational intelligence.”

With this view of experience, Dewey was attempting to resolve the tension between two perspectives of the world (i.e., one that is biological, functional, and material, or one that is

inherently creative and spiritual). This dichotomy was overcome, like many others, with a conclusion that the world is both, and that humans are actively engaged in diverse circumstances for diverse purposes: “in a phrase, there is no psychology without social psychology, no possible inquiry into pure, biological instincts (or any other “natural” powers) which does not also consider both the social and environmental context of the phenomena studied and the inquiry’s own context” ([Hildebrand, 2018:15](#)). The interactive nature of humans within diverse environments is why pragmatist experience is seen as transactional, where “each learner is a living organism with her own history, needs, desires, and, perhaps most importantly, her own interests” ([Hickman, 2009:9](#)).

The nature of experience in pragmatism highlights three other ‘positive’ characterizations of Dewey’s account of experience: (1) experience as ‘experimental’; (2) experience as ‘primary’ versus ‘secondary’ and; (3) experience as ‘methodological’ ([Hildebrand, 2018](#)). Experience is ‘experimental’ because through interaction with one’s environment, there is the *potential opportunity* to learn and understand how various actions may or may not be significant for controlling future events ([Hildebrand, 2018](#)). ‘Potential opportunity’ is emphasized because it has been noted that, unlike other versions of empiricism, Dewey’s version does not assume that all experiences must somehow influence what can be known ([Hildebrand, 2011](#)). For Dewey, knowledge is a subset of experience ([Webb, 2007](#)). This distinguishing characteristic of experience within pragmatism reflects Dewey’s position that there are two types of experience.

The first type, ‘primary’ (also referred to as ‘had’, ‘felt’, or ‘direct’) experiences, are the most common. Indeed, primary experiences start and end all inquiry. They include those experiences that are barely reflected upon, regulated, or prepared for; these relatively unquestioned types of experiences are habitual ([Hildebrand, 2018](#); [Hildebrand, 2011](#); [Morgan,](#)

[2014](#)). The second type, ‘known’ experiences (also referred to as ‘reflective’, ‘secondary’, or ‘indirect’ experiences), are abstractions away from primary experiences in purposeful and selective ways, whereby something in the primary experience triggers the need for more thoughtful reflection ([Hildebrand, 2018](#); [Miettinen, 2000](#)). In other words, the majority of human existence is comprised of habits, or ‘primary’ experiences, but in the face of problem situations, ‘secondary’ experiences arise. This is why problem definition is the second phase of learning within Dewey’s model, and why theory is considered to be an intermediate phase of inquiry. As [Hildebrand \(2018:30\)](#) explained, “as we live our lives, we confront problems which invoke the need for inquiry and, often, there is a need to devise a tool of explanation and amelioration. Theory is that tool, generated by these encounters; it does not come first.” Reflective thought is a process of adaptation striving towards stability, where “discordances in experience” arise from the failure of applying past actions in the context of an ever changing environment ([Fesmire, 2003:30](#)).

Prior to continuing with the pragmatist view of experience, it is worth interjecting a brief discussion on abductive reasoning or logic. This reasoning represents the initial stage of deriving a belief, and it connects to the natural inclination to explain our experiences for the purpose of ameliorating problems. Typically, only two types of reasoning are distinguished: inductive and deductive. Inductive reasoning is ‘bottom-up’ (i.e., deriving theories and descriptions from observations), and deductive reasoning is ‘top-down’ (i.e., testing hypotheses with observations). Abductive reasoning was a third form of logic distinguished by Peirce as the process of formulating an explanatory hypothesis in the event of an interrupted habitual experience ([Misak, 2004b](#)). While similar to induction in that it starts with observations, abduction was distinguished more as a preliminary step of developing a number of potential hypotheses; Peirce considered it

to be a ‘bolder’ and more ‘perilous’ step than induction ([Anderson, 1986a](#)). Induction is the final “evidencing process” ([Anderson, 1986a:151](#)), it is when some generalized theory or description is added to our system of beliefs ([Misak, 2004b](#)). While it could be assumed that those employing inductive reasoning are considering multiple possible explanations for some occurrence, articulating abduction as its own process is consistent with the pragmatist focus on transparency regarding the knowledge production process (this relates to ‘wary assessment’ discussed below), as well as the need to explain and describe events.

Returning to Dewey, primary and secondary experiences are distinguished to: (1) make a ‘phenomenological’ observation that we engage and cope with a world that is not always meaningful or understood (sometimes experiences are simply experienced; not used to derive knowledge for the prediction and control of circumstances – however, the lack of understanding does not make the experiences “less *real*”) and; (2) stress that experience is a ‘method’, whereby knowledge creation should always start from a point that is devoid of theoretical presuppositions ([Hildebrand, 2018:30, emphasis original](#)).

With regard to the first point, it is important to stress that human interaction with the world may be both misunderstood due to the limited ability of our senses *and* difficult to articulate or grasp. This latter point is due to the pragmatist view that the perceptual state is loose in a way; it includes states “phenomenologically indistinguishable from those caused, in a normal way, by sensory interactions with the world” ([Haack, 2009:158](#)). Déjà vu is perhaps a good example of a phenomenologically indistinguishable experience. When discussing Charles Peirce’s stance on experience, [Misak \(2004a:155\)](#) explained that experience goes far beyond what our ears, eyes, nose, and skin report: “Peirce takes anything that is compelling, surprising,

brute, or impinging to be an experience, regardless of what causes us to feel compelled and regardless of whether we can identify the source of the compulsion.”

Another important point regarding experience is the pragmatist commitment to ‘anti-foundationalism’, or the belief that there is no certain knowledge serving as the foundation of inquiry. [Webb \(2007\)](#) suggested that pragmatism is better thought of as *a*-foundational and [Haack \(2009\)](#) coined ‘foundherentism’, as opposed to *anti*-foundational. Because, again, pragmatists are focused on moving beyond entrenched philosophical dualisms. Some might consider anti-foundationalism as synonymous with ‘coherentism’, which is typically presented as opposite foundationalism (see [Steup \(2018\)](#) for an introduction to these ideas). Regardless of chosen terminology, the primary point remains that pragmatism, unlike other modern philosophies, does not begin with theoretical starting points or presuppositions⁸.

Closely related to the rejection of epistemological foundationalism is the embrace of ‘fallibilism’, or the idea that humans will inevitably ‘get it wrong’ and that there are no immutable beliefs. As [Webb \(2007:1069, emphasis original\)](#) explained, “beliefs well warranted by previous inquiry provide the means of furthering other inquiries. This does *not* mean that well-warranted beliefs are themselves permanently exempt from future critical scrutiny.” The

⁸ At this juncture, it may be worth noting that, as [Miettinen \(2000:54\)](#) pointed out, Dewey’s (and others) model of experiential learning does inherently assume that an individual has “an innate capacity to grow and learn”, which constitutes an ontological assumption about the nature of social beings within pragmatism. As an aside, the assumption nicely highlights how, under the research paradigm conceptualization applied herein, the normative commitments are mutually defining and restricting. But, more importantly, it seems to add some level of ambiguity to the exact meaning of *a*-foundational. While the starting point in pragmatism is “experience as actually encountered” ([Webb, 2007:1069](#)), it does seem that there is a foundational assumption related to the nature of social beings as social, learning entities. Does this represent a contradiction within pragmatism? While this question may have been addressed in the literature, it is not resolved at this time. A similar potential flaw in pragmatist logic is with regard to the basic premise that democratic debate and deliberation are assumed as unquestionably positive axiological goals. In this instance, there is at least one targeted response (see [Minteer \(2012:22-25\)](#)).

empiricism of pragmatism results in a critical, radical, and dynamic model of theorizing, where previous interpretations and judgments are constantly scrutinized by new experiences ([Dewey, 1925](#); [Hildebrand, 2018](#)). This does not mean that there is no knowledge outside the human mind, but instead (applying the popular analogy of Charles Peirce) that knowledge is like a cable made up of individual strands (i.e., beliefs) where the breakage of one strand does not necessarily weaken the cable as a whole ([Peirce, 1868 \[1955\]](#); [Webb, 2007](#)). This signals the idea of a tentative truth, which does not commit with certainty or a capital “T” truth.

Peirce held that fallibilism was not about doubting all beliefs about which error is conceivable, but as doubt arises through experience there will be a need to revisit individual beliefs in a piece-meal fashion ([Misak, 2004a](#)). As nicely articulated by [Friedrichs and Kratochwil \(2009:714\)](#), pragmatist epistemology generally means that “instead of relying on false promises, we will learn to act on reasonable bets.” Knowledge is inherently tentative, and pragmatist epistemology implies open-mindedness and humility; confidence is good, as in any pursuit, but one should always acknowledge the possibility of needing to revise knowledge, as well as personal beliefs.

Given the pragmatist stance that all knowledge is derived through experience, specifically those secondary experiences when some problem triggers an inquiry, two big issues remain for the purposes of this dissertation. First, is whether there is a difference between scientific knowledge and other knowledge, and second is the process by which knowledge is accepted (or not accepted) as ‘true’, or tentatively true in the case of pragmatism. Regarding the difference between scientific knowledge and non-scientific knowledge, following [Dewey \(1910 \[2008\]\)](#), [Morgan \(2014:1047\)](#) pointed out that similar to thinking about inquiry as a specific type of experience in pragmatism, research as a scientific approach is “simply a form of inquiry that is

performed more carefully and more self-consciously than most other responses to problematic situations”. However, there is no sharp distinction between everyday life and research. Perhaps the former can be thought of as self-consciously logical and the latter as carefully systematic. [Webb \(2007\)](#) noted that neither scientific knowledge nor common sense knowledge is privileged (either or both may be important within the context of a particular inquiry). It follows then that the process of assessing common sense knowledge and scientific knowledge is generally the same, though one would expect the assessment of scientific knowledge to be more rigorous somehow (peer-review within scientific communities, with their respective assessment criteria, represents that more rigorous process).

The process for assessing knowledge claims is fundamentally democratic. Pragmatism holds that “community experience” ([Norton, 2007:305](#)) or “public critical discussion” ([Bernstein, 1989:9](#)) are the arbiters of good and bad knowledge. The process of assessing knowledge claims is repetitive and, according to [Hildebrand \(2011:47, emphasis original\)](#), both epistemic and existential:

Verifying truths happens because of how one *lives* – their habits of regular interaction with others, their encouragement and rewards to those who criticize them. If I wish to know if my theory is true, I must coax others to *try out* what I have undergone so I can learn what *they* find. The most important route, in other words, to justifying belief runs *through* the experiences of others.

When assessing knowledge claims, there is a need to return to the primary experiences that gave rise to inquiries and, subsequently, one needs to be wary and critical of the process and steps employed to develop knowledge and conclude that an indeterminate situation is now a determinate one. This is because, as [Dewey \(1925 \[1981\]:386\)](#) stated, “all intellectual terms are the products of discrimination and classification”.

Therefore, one must “go back to the primitive situations of life that antecede and generate these reflective interpretations, so that we re-live former processes of interpretation in a wary manner.” This wary assessment, as explained by [Hildebrand \(2011\)](#), requires understanding both the immediate elements of the experience (i.e., the interaction with the real world) as well as the background information influencing one’s experience. In other words, all experiences are undergone with some pre-conceptions, and when a secondary/reflective experience is engaged, there is some level of selective emphasis. Explaining Dewey’s stance, [Hildebrand \(2011:47-48, emphasis added\)](#) stated:

Selective emphasis is an ingredient in any encounter. The difference between healthy and unhealthy empiricist methods lies in the degree to which selections and choices are *overt and avowed* by the experimenter...a good scientist enacts habits of transparency and disclosure as she urges others to conduct experiments which, she hopes, will ratify her choices and confirm her findings.

Truth, as noted by [Hildebrand \(2018:43\)](#), “does not stand outside experience, but is an experienced relation, particularly one which is socially shared.” These guidelines for assessing the quality of knowledge are very general, indeed, the process essentially describes peer-review within scientific communities. However, it is this general nature of assessing knowledge combined with the belief in the diversity of human experience that accommodates another fundamental commitment of pragmatism—pluralism.

While the pragmatist community is somewhat divided in their interpretation of John Dewey’s writing regarding the connection between scientific inquiry and democracy, [Minteer \(2012\)](#) argued that Dewey’s pragmatism considered the two to be intimately connected. Minteer pointed, in part, to the clear articulation made by [Gouinlock \(1990:267, emphasis added\)](#), who suggested that democracy and science are ‘fused’ through similar foundations:

the norms of science are incorporated into those of democracy...the nature of their combination can perhaps best be suggested by thinking of them as a union of certain moral and intellectual virtues...the virtues include a willingness to question, investigate, and learn; a determination to search for clarity in discourse and evidence in argument. There is also a *readiness to hear and respect the views of others, to consider alternatives thoroughly and impartially*, and to communicate in a like manner in return...these virtues embrace novelty, innovation, growth, *regard for concern for others*, and scientific discipline...these might be viewed as the virtues of the experimental inquirer, but they are also virtues in the process of collective moral deliberation. What makes democratic behavior more than free speech and counting votes is that the participants use scientific intelligence in determining the nature of their situation and in formulating plans of action, and they are not stuck on foregone conclusion.

The embrace of pluralism in pragmatism, whether it be a plurality of ethical stances and values or a plurality of approaches to scientific inquiry, stems partly from the normative commitment that science and democracy should be closely related. Inherent in this commitment is the belief that most complex social problems are the result of varied and conflicting viewpoints.

Conflicting viewpoints are not necessarily a negative, at least in the view of William James, who thought that competing perspectives could be complementary: “each may compensate for something concealed by the other” ([Fesmire, 2003:48](#)). While this commitment to pluralism may appear to be relativistic, its adherence to community deliberation to sort good knowledge from bad knowledge should yield some level of consensus. In other words, pragmatists do not suggest that all ideas are equally valid, even though full consensus may not be found, one would expect that a manageable number of warranted beliefs would emerge through public debate and deliberation.

Reinforcing the basic point that the pragmatist founders were, themselves, split on a variety of issues, it is worth noting that Peirce, a more strict adherent to an objectivist/realist worldview, was less enthusiastic about pluralism than Dewey and James ([Misak, 2005](#)). Peirce believed that the goal of all inquiry (e.g., mathematics, ethics, chemistry) was focused on finding

a single 'right' answer to questions, but he acknowledged that such answers may not exist within the context of particular questions (most notably those concerning ethics) ([Misak, 2005](#)). Peirce considered truth to be a particular kind of opinion, which would persist if inquiry was carried on to an ultimate conclusion. However, such conclusions are never actually reached as they are at some infinite point in the future, but the iterative building of knowledge through generations did constitute a particular type of reality or "objective idealism" ([Skagestad, 1983:269](#)). Other pragmatists such as Dewey hold that "when we look to the practice of inquiry to get a fix on the concept of truth, we find only solidarity or the practice of arriving at beliefs which are warranted for our community" ([Misak, 2005:130](#)).

While there is clearly a tension between these two positions, a few points are worth stressing. First, a core pragmatist idea that does seem to be in consensus is that: (1) disagreement and pluralism is productive in that it leads to learning and an *improvement* of beliefs ([Misak, 2005](#)) and; (2) even if one adopts Peirce's position, a single correct answer is often only a theoretical endpoint to be reached after an infinite amount of inquiry and democratic debate. The second point, which follows from the first, is that warranted beliefs or assertions are tentative, as ongoing experiences and learning will iteratively update beliefs. The third point, which is particularly salient for the discussion herein related to EE, is that pragmatists were aiming for a very general philosophy for addressing any type of inquiry and, therefore, the type of question being addressed will inevitably influence whether there are a plurality of truths. For instance, it seems reasonable to suggest that there is a single right answer regarding the earth's circumference, but multiple right answers to the question of how humans are supported by national forests.

The final element of pragmatist epistemology to be discussed is, as [Minteer \(2012:10\)](#) phrased it, a commitment to a “linguistic emphasis on community.” This commitment refers to the importance of language for understanding diverse experiences and, consequently, knowledge. Following the writings of Rudolph Carnap, [Norton \(2005:563\)](#) stressed the pragmatist stance that languages are tools for describing and classifying our experiences, and because “linguistic choices” shape the world and our understanding of it, language should be “understood functionally, in terms of human purposes and goals.” [Norton \(2005\)](#) added that a ‘truly’ pragmatic approach is one that “pays attention to the uses of language in real, communicative situations”, and places “much more emphasis on the use of language for purposes other than to describe the world; more attention would be given to language that evokes attitudes, persuades others, enters into commitments, and builds trust.” This focus on language, pluralism, and democratic debate starts to blur the line between how we come to know what we know (i.e., epistemology) and the goals or reasons for pursuing scientific knowledge (i.e., axiology). The latter set of normative commitments is where I turn now.

4.1.3. Pragmatist axiology: Communication, social-learning, and addressing the myriad practical problems of life

Pragmatism focused on reorienting philosophy away from abstract concerns towards human experience ([Morgan, 2014](#)), but for what purpose? The terminal goals, ultimate purpose, or end in itself of pragmatism is not easily categorized. This is evident in [Moon and Blackman \(2014\)](#), who stated that the application of pragmatism is ‘any or all’; as opposed to positivism, for instance, which had a listed terminal goal of ‘prediction’. While this categorization of pragmatism is not particularly enlightening, it is reasonable. As [Westbrook \(1993\)](#) pointed out,

William James said that pragmatism “stands for no particular results. It has no dogmas, and no doctrines save its method...innumerable chambers open out of it.” This ‘method’ refers to the pluralistic approach of creating knowledge through experience which, so formulated, does not necessarily represent a path toward a single purpose such as prediction, understanding, emancipation, or deconstruction. The pragmatic approach is one focused on solving the myriad problems that are encountered through diverse experiences, and solving may require explanation, prediction, understanding, and/or deconstruction. This focus on problem solving has led to pragmatism being described as a research paradigm focused on simply doing ‘what works’, which is a crude summary that, according to [Morgan \(2014\)](#), has been a perennial problem for pragmatists. This crude summary suggests a pragmatist credo of ‘the ends justify the means’, but [Morgan \(2007\)](#) and many others assert this is a mischaracterization.

This mischaracterization essentially equates pragmatism with crude instrumentalism, where the latter is usually defined as a view that scientific theories “are neither true nor false, but function as tools or calculating devices for organizing and systematizing observations in an economical fashion” ([Skagestad, 1983:263](#)). While pragmatists are generally interested in using knowledge to address practical problems and real-world issues, most would likely reject the expedience implied in this definition of instrumentalism. The mischaracterization of pragmatism is partly the result of cursory summaries such as that provided by [Moon and Blackman \(2014\)](#); however, I suggest such summaries are implicitly referring to Peirce’s ‘pragmatic maxim’, or some interpretation of it. The ‘pragmatic maxim’, while not labeled as such originally, is as follows: “consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of those effects is the whole of our conception of the object” ([Peirce, 1878:293](#)). This wordy and confusing statement underlies the

fundamental pragmatist principle related to the connection between theory and practice, and many have interpreted and discussed this statement or some iteration of it.

The pragmatic maxim was presented and interpreted differently by the classical pragmatists. For instance, Charles Peirce considered it to be a logical principal that could be proven mathematically, and William James viewed it less concretely as a ‘philosophical attitude’ ([Hookway, 2012](#)). However, there was general agreement that the pragmatic maxim was meant to facilitate making one's ideas clear by focusing on the differences, or practical implications, of accepting concepts and propositions as true ([Legg & Hookway, 2019](#)). Peirce, as a chemist and physicist, typically provided examples from the physical sciences, and this maxim was explained, in one instance, using force. [Skagestad \(1983:276, emphasis original\)](#) conveyed Peirce’s stance: “*If we know all the effects of force, we know fully what force is; but we never do know all the effects of force, or of anything else. A scientist understands a term like ‘force’ as referring to the totality of its experimental consequences, and he knows the meaning of the term to the extent that he knows its experimental consequences.*” This description of Peirce’s stance highlights two points. First, there is an epistemological assumption embedded in this description whereby the search for a unitary and complete truth is never complete. As highlighted above, Peirce believed that infinite inquiry (though impossible) would, in the end, reach such a truth.

The second point is that while there was general agreement that the pragmatic maxim could provide guidance about clarifying ideas and knowledge, the classical pragmatists were generally focused on different ends ([Hookway, 2012](#)). Peirce used the pragmatic maxim to help explain abstract scientific concepts. According to [Skagestad \(1983\)](#), this was to encourage the continued investigation and discovery of beliefs about such concepts through novel experimental techniques. Using Peirce’s analogy, the multi-stranded cable that represents our understanding of

the physical concept of force is never complete, and it can be made stronger through future work. Peirce was searching for generalizations and universal laws through empirical means. He did not necessarily adhere to the belief, often assigned to pragmatists, that the “justification of science lies in its tendency to increase social happiness, or to strengthen social stability” ([Skagestad, 1983:265](#)). In other words, with his realist leanings, Peirce likely had a view where facts and values were mostly separate. On the other hand, James and Dewey, with backgrounds more focused on social issues, seemed to extend the pragmatist maxim to include not only scientific inquiry, but also human conduct more generally.

[Hookway \(2012:3, emphasis added\)](#) explained the pragmatist maxim in broader terms: “we clarify a proposition by showing how its truth would make a difference to what it is rational for us to do. Of course, what it would be rational to do, given the truth of this proposition, will depend upon aspects of the *context*.” Others have done similarly; [Biddle and Schafft \(2014:327\)](#) implicitly reference the pragmatic maxim when they suggested that pragmatism has a “highly contextualized axiology that recursively asks what practical difference one action makes versus another.” [Bromley \(2015:13, emphasis original\)](#) summarized the principle as: “the meaning of an object *to us* is nothing but the sum of its perceived effects *on (for) us*.” In essence, the maxim suggests that “planning and monitoring our activities requires information about what would occur if were to act in various ways...it is characteristic of philosophy and science to embody reflective, systematic thought” ([Hookway, 2012:190](#)). While these explanations of the pragmatic maxim appear to extend beyond Peirce’s original context, it is important to note that crude instrumentalism is not being advocated.

The meaning of this maxim, based on the above explanations, may still lack clarity. First, what is meant by ‘context’ and, second, how does adhering to this pragmatic maxim guide our

actions as individuals and researchers (i.e., what are the implications for axiology)? The following excerpt from [Hookway \(2012:10, emphasis original\)](#) is among the most clear and accessible I have read:

Let us allow that the ‘desires and circumstances’ constitute the *contexts* in which we can act...We might then consider *possible* contexts in which our desires are different or our circumstances are different. In that case, we may decide to try to change features of our context rather than simply doing what it is best to do given the desires we have and the circumstances in which we find ourselves. Indeed we might hold that what it is rational for us to do should not be determined by the *desires* we happen to have; instead we should be guided by our understanding of what desires we *ought* to have or by our conception of the good...Our use of the pragmatist maxim in guiding our inquiries and other actions is inseparable from our reflections about what it [*sic*] is reasonable. A full understanding of the pragmatist maxim probably requires an understanding of our cognitive contexts, of the sorts of information we should take account of in reflecting about the consequences of our actions in different possible circumstances.

There are a number of important elements within this quote. First, specificity is added to the meaning of ‘context’ or ‘contextual’; that is, our actions take place within the context of varying desires and circumstances. Second, rationality is two-sided in that desires are pursued both based upon axiological (evaluative) concerns of what is appropriate, as well as instrumental (cognitive) concerns about the most effective path to achieving such desires ([Rescher, 2000](#)). If beliefs drive actions (and vice versa), then the pragmatist maxim guides us toward systematic reflective thought of both means and ends. As [Rescher \(2000:170\)](#) noted, “at many junctures, life confronts us with alternative directions in which to proceed. And only through the evaluation of such alternatives can we effect a sensible (rationally appropriate and acceptable) choice among them.” However, ‘rationally appropriate’ extends well beyond that which is ‘preferred’ in the neoclassical economic sense; there is a need to consider the reasons for ones preferences and desires ([Rescher, 2000](#)).

The third point is that pragmatism should not be interpreted as a philosophical system that values practice over thought. While [Dewey \(1929\)](#) identified, *at the time*, a major problem resulting from the prioritization of ‘pure’ science over practice or applied science, [Putnam \(2010:36\)](#) suggested that given the current prioritization of applied science over pure science (at least based upon the metric of government investment), Dewey would likely have “adjusted his rhetoric to emphasize the importance of pure science.” One important point to be gleaned from Dewey, and pragmatism more generally, is that practice and results are not prioritized over thought (i.e., pragmatism is not meant to justify expediency) but, instead, that theory and practice are so interrelated that considering facts and values in isolation does not make sense ([Putnam, 2010](#)).

[Biddle and Schafft \(2014\)](#) do not explicitly suggest that pragmatist axiology is insufficient, but they do assert that most researchers claiming pragmatism as a paradigm do not adequately articulate axiological assumptions and, furthermore, imply that those claiming pragmatism adhere to a belief that theoretical assumptions and values are not relevant to the practical outcomes of research. It seems that a nuanced understanding of pragmatism, and honoring its commitment to a wary assessment of knowledge suggests the opposite. [Bernstein \(2010:157\)](#) pointed out that Hilary Putnam, a prolific (and more contemporary) pragmatist, discussed at length the interrelationship between facts and values; accordingly, there is no way to make sense of scientific knowledge and its associated concepts “unless we understand that they are values and involve normative judgments; they cannot be analyzed or reduced to what is ‘merely’ factual...values and norms are indispensable for an analysis and assessment of knowledge claims.”

The final point regarding the above block quote is that ‘our conception of good’, or our reflection about ‘the consequences of our actions in different possible circumstances’ is not merely an individual activity. Instead, our individual experiences are inherently social, as they take place in varied socio-cultural contexts. Making ideas *clear*, whether in the scientific realm or the political realm (or any other realm), implies conversation between people for the purpose of learning and improving our beliefs. Therefore, *if* one was forced to select a single, ultimate axiological goal of pragmatism, it would probably be communication and social learning. In the face of challenging problems, particularly those plaguing the public, [Dewey \(1927:155, emphasis added\)](#) suggested that the solution is “perfecting of the means and ways of *communication of meanings* so that genuinely shared interest in the consequences of *interdependent activities* may inform desire and effort and thereby direct action.” According to [Norton \(2007\)](#), pragmatism has the purpose of getting to cooperative action and accelerated learning.

To this end, [Bromley \(2006, 2015\)](#) distinguished between ‘warranted assertions/beliefs’ and ‘valuable assertions/beliefs’. The former constitutes knowledge claims developed, tested, debated and, ultimately, accepted within a scientific community. The latter are those accepted scientific beliefs that are likely to resonate and motivate action within the context of some problem. As [Bromley \(2015:15\)](#) stated, “even if a class of warranted assertions exists and serves to define the best scientific evidence of particular events or phenomena, individuals in society are under no obligation to stop what they are doing and fall in line behind the prevailing scientific consensus.” In other words, the acceptance of scientific knowledge within a disciplinary community is a partial accomplishment within the context of addressing a practical problem; the other critical element is communicating such knowledge to a broader audience in a way that is both understandable and persuasive (in that it induces action). If one is reading this

through a conservation social science lens, then climate change is likely on the mind as a relevant example. A more generally applicable example is implicit in the current measles outbreak in the United States; that is, science has yielded a warranted belief related to vaccinations, though this belief is clearly not valuable to all members of the general populous.

While the axiological commitment of pragmatism could be summarized as communication for the purpose of facilitating social learning and addressing problematic situations, it does not commit to what decision or action is best for solving some problem (indeed, a ‘best’ solution does not exist, as per wicked problems). Nor does it commit to what is the most pressing problem to be addressed. Indeed, [Norton \(2015:149\)](#) stated the following when it comes to weighing knowledge created by economists and environmental ethicists within the context of sustainability issues:

Methods of economists and environmental ethicists function, within an open-ended discourse, provide reasons to favor some actions or policies over others in specific situations. Their role should not be to provide universal, top-down value that determines the shape of evaluative discourse; instead, it is to contribute to reasons and arguments within the discourse that may prove convincing to participants who are considering and reconsidering competing values...so these theories will not be given the role of directly deciding what is rational policy substantively; their role will rather be to encourage deeper thinking about values among citizens and to support a reflective mood of deliberation within a community.

The main message here is likely the impetus for a criticism of pragmatism which, ironically, is the opposite of the ‘ends justify the means’ criticism. As [Rescher \(2000:175\)](#) highlighted: “a common complaint against pragmatism is that it is an instrumentalistic philosophy that cares only for means and not ends.”

Even though most pragmatists would reject this criticism, it is nonetheless worth a reply because it reinforces two important points. First, while pragmatism stands for no particular

results, it does not advocate arbitrary ends ([Rescher, 2000](#); [Westbrook, 1993](#)). Quite the contrary, pragmatism is focused on a democratic process whereby all positions, at least to the greatest extent practicable, can be articulated in a systematic way, and the wary assessment of how knowledge claims are arrived at is paramount to a nuanced pragmatic approach that embraces open-mindedness and humility. Second, it is correct that pragmatist axiology does not explicitly privilege specific groups in all situations (e.g., women, impoverished people), but its focus on communicating a plurality of viewpoints and meanings for the purpose of solving public problems does imply an axiology meant to support the underserved and underrepresented. While this may sound anarchistic in that all viewpoints are, from the start, equally considerable, deliberative democracy is theoretically meant to minimize those unsubstantiated and unconvincing arguments.

The pragmatist belief that underrepresented viewpoints can be supported (and that the most popular viewpoint does not necessarily reign supreme) is reflected in Dewey's conception of 'democracy'. Dewey did not view democracy simply as a form of government whereby the "sovereign is the multitude of individuals", this "numerical aggregation" conception of democracy where the majority rules implied that individuals were non-social units. This did not align with Dewey's view of democracy as an "ethical way of life" ([Bernstein, 2010:74-75](#)). For Dewey, the democratic ideal was one that fostered empathy through an understanding of viewpoints different from one's own, and this meant that in the face of conflict there would be the willingness to question and revise one's own opinions as opposed to entrenched partisanship ([Bernstein, 2010](#); [Fesmire, 2003](#)). The pragmatist's view of democracy opposes the type of ragged individualism that would result in one opposing taxes for schools because they have no children; such a perspective fails to comprehend the situation whereby our actions and

experiences are interrelated ([Fesmire, 2003](#)). This view of democracy and, consequently, decision-making, whereby the majority *does not necessarily* rule is an important underpinning to a pragmatist EE, which suggests that all levels of the human-nature relationship need to be understood (requiring a multitude of ‘research menu’ approaches). Chapter five discusses these ideas and points in detail.

Even though pragmatist axiology is focused on the social (or collective) good, [Biddle and Schafft \(2014\)](#) are justified in their criticism of the lack of specifics with regard to what and how such social good is pursued. Indeed, inclusivity, in general, was one element Dewey suggested for a plan focused on improving the social good, but the specifics of what inclusivity meant were lacking ([Bernstein, 2010](#)). Pragmatist philosophy, as outlined above, is *general* in that it could be applied within a variety of contexts. Pragmatist philosophy broadly, for instance, does not specifically focus on public problems related to the environment, healthcare, or the economy. This is not to say that those adhering to the general principles of pragmatism have not applied such principles in specific situations. One needs to focus on these specific situations to better understand, for instance, what is meant by inclusivity.

4.2. Pragmatist research programs: A focus on general methodological principles and the varied relationships between humans and the environment

Discussing pragmatist research programs is potentially awkward, because research programs are defined by three domains (i.e., conceptual, methodological, and substantive), and the literature reviewed below does not necessarily fit this framework perfectly (as clarified in a moment). The ultimate goal of this dissertation is to articulate the implications of adopting pragmatism for research in EE; that is, how the worldview and normative commitments of

pragmatism can inform: (1) basic theoretical foundations (e.g., the adopted meaning of ‘sustainability’, details regarding people as citizens as opposed to consumers, and making decisions based on equity, stability, and resilience—in other words, many of the elements of Table 3.1); (2) methodology (e.g., what specific methods might be most appropriate, how can one interpret non-market values of ecosystem services, how should ‘representativeness’ be considered, and what is the purpose (or lack thereof) of cost-benefit analysis) and; (3) managerial decisions and real-world problems through EE research (e.g., how can the results of an EE study be applied, how should they be communicated to decision-makers and the public).

It seems the natural first question would be to ask how pragmatism has been applied in other contexts. That is, where and how are the pragmatist ideas, as outlined above, being discussed and used? It turns out that pragmatism has been discussed in a variety of contexts, and there are several that generally represent research programs; however, these discussions may only be partially relevant to the goals of this paper. On the other hand, there are discussions that are pertinent, but do not perfectly constitute research programs as defined herein.

Regarding research programs that may only be partially relevant, I mean the application of pragmatism for supporting research in other disciplines. For instance, pragmatism has been advocated as a philosophical underpinning for research in numerous fields, including international relations ([Frankel Pratt, 2016](#); [Friedrichs & Kratochwil, 2009](#); [Ralston, 2011](#)), community health research ([Andrew & Halcomb, 2007](#)), human resources ([Korte & Mercurio, 2017](#)) and, more generally and perhaps most prominently, mixed methods research ([Biddle & Schafft, 2014](#); [Johnson & Onwuegbuzie, 2004](#); [Leech, 2005](#); [Morgan, 2007](#)). There may be *methodological* insights from such scholarship that can apply to EE, but the subject-matter specifics of human resources research, for example, is not all that relevant to our discussion here.

Based on this rationale, the first goal of this section is to briefly review potential methodological insights from such scholarship without wading into the specific theories or real-world domains of these disciplines.

Regarding discussions that are awkwardly framed as research programs (as defined herein), pragmatist philosophy has motivated an extensive discussion within environmental philosophy and ethics, and such discussions can potentially yield insights for EE both by informing *general theoretical principles* and approaches to applying EE research to *practical problems*. Pragmatist discussions within environmental philosophy and ethics, broadly known as environmental pragmatism, does not yield significant insight into methodological issues beyond what is implied by adopting the normative commitments outlined in Section 4.1. This is not to say that the works of philosophers and ethicists is purely speculative; indeed, environmental pragmatists have applied and discussed empirical research, and a principle goal of environmental pragmatism was to move away from the standard argumentative and theoretical philosophical approach to a “more applied empirical and integrative approach to normative debates” to influence policy and political processes such as planning ([Minteer, 2012:11](#)). Notwithstanding this non-traditional philosophical approach, it is likely fair to suggest that most of this work focuses less on specific methodological issues (e.g., sampling approaches, specific statistical approaches) and more on, for example, highlighting the benefit of adopting value pluralism ([e.g., Minteer & Manning, 1999](#)) and the application of different viewpoints for on-the-ground decision making (e.g., [Meine, 2018](#); [Norton, 2015](#)). Therefore, the second goal of this section is to review environmental pragmatism with specific focus on insights that are relevant to EE in terms of theoretical foundations and problem-solving.

4.2.1. Applications of pragmatism for informing research methodology

A full review of how pragmatism has informed research methodology, across all disciplines, is well beyond the scope of this dissertation. [Greene \(2008\)](#) asserted that there is a need to move beyond describing the philosophical position of pragmatism to providing specifics of how it may actually influence research in practice. Generally, it seems as though this call has not been fully answered. While there are several examples of different disciplines advocating pragmatism as a methodological guide, there are very few examples of how pragmatism actually influenced research practice. One of the most explicit examples of how pragmatism specifically influenced research practice is provided by [Friedrichs \(2008\)](#) and [Friedrichs and Kratochwil \(2009\)](#); both sources discuss the same study (the earlier work is a book and the latter work is a condensed journal article). While much of their work articulates general methodological principles, they did provide specific instances where a pragmatic approach led to dropping statistical findings, and they stressed that findings were not interpreted in the light of existing theories until the final stages of research (thus honoring the exploratory nature of abductive reasoning). Beyond these few specifics, most research provides general methodological implications of adopting pragmatism as an underpinning.

Prior to commencing, it is worth noting that the lack of specific examples of how pragmatism influences research practice is likely partly the result of the general pragmatist hesitation to provide definitive directives. Indeed, pragmatism generally resists pre-ordained action whereby given some situation, *A*, one should proceed with action, *B*. This belief is implicit in a-foundationalism, abductive reasoning, the importance of context, and the pragmatic maxim; the general goal is to consider a variety of potential situations and actions, and then apply deliberation to understand the best way forward, *for the time being*. Nonetheless, if one is

advocating pragmatism for underpinning research, *and* research decisions are made with pragmatist normative commitments in mind, then there is likely a benefit in articulating the process of making such decisions.

The benefit is both for other researchers who may be grappling with similar decisions, and over time it may be possible to establish contexts that are similar enough to warrant claims of quasi-generalizability (the idea of transferability discussed below). Additionally, articulating specific research practice decisions based on pragmatism allows the research community to provide feedback and deliberate about the validity of such decisions. Finally, it seems that if one is to claim pragmatism as an underpinning to research, then full transparency about research decision-making is required to allow for Dewey's 'wary assessment' of such knowledge.

A look at the literature relating pragmatism to methodology, whether within the context of international relations or community health research, highlights several implications for research practice that could be applied broadly. For instance, a near universal suggestion is that pragmatism can provide methodological flexibility; as [Ralston \(2011:92\)](#) noted that pragmatism must remain "open-textured" to build a multi-faceted "tool-kit for the sake of resolving specific problems before the inquirer." While 'flexibility' is appealing, it is both generally uninformative and again easily labeled as 'anything goes'. Despite this limitation, I proceed with a brief review of generalities, because joining such basic principles with specific examples within EE could yield substantive guidance for EE methodologists.

Within the context of international relations research, [Friedrichs and Kratochwil \(2009\)](#) outlined a 'pragmatic research strategy' based on abductive reasoning, which included several basic principles. One principle was to state publicly the purpose of the research, including the researchers personal motivation. This highlights an axiology where reflexivity, or acknowledging

the positionality and the influence of the researcher in relation to the knowledge produced, is given a high priority. This suggests an acknowledgement of the tenuous nature of the fact/value divide ([Johnson & Onwuegbuzie, 2004](#); [Morgan, 2007](#)), and it also implicitly refers to a transparent methodology, which may foster collaborative efforts with other researchers even when philosophical orientation is different ([Leech, 2005](#)). Another basic principle for pragmatic methodology is the focus more on ‘orientation’ as opposed to causal theorizing; this entails abductive reasoning with the goal of articulating many explanations for some phenomena, and then iteratively working between inductive methods and deductive methods to, perhaps, find some causal link ([Friedrichs & Kratochwil, 2009](#); [Morgan, 2007](#)). Definitive causal links or generalized conclusions are perhaps secondary axiological goals, as the abductive process is likely to lead to new insights that are valuable scientific contributions.

[Morgan \(2007\)](#) suggested that the results of research underpinned by pragmatism should strive for ‘transferability’ as opposed to complete generality or context-dependence. Essentially, this is a middle ground where results might not apply in all cases, nor are they completely unique; patterns are the goal perhaps, not laws. To this end, “we need to investigate the factors that affect whether the knowledge we gain can be transferred to other settings” ([Morgan, 2007](#)). In chapter five, this idea of transferability is revisited when discussing ‘exemplars’.

Another general implication for methodology is that formal tools, such as statistical methods, can be used to simplify the complexity of phenomena that may be too cognitively burdensome to understand, which implies that intuitive tools such as cross-tabulations may be preferable to inferential techniques such as regression ([Friedrichs & Kratochwil, 2009](#)). Inferential techniques are generally considered to be heuristics. For instance, the associations between dependent and independent variables, particularly if causality is implied, would be

viewed with caution. This extends to the concepts of multi-criteria analysis and cost-benefit analysis: “the use of formal methods for decision analysis is justified so long as they are viewed and used as decision support resources and not as decision-making tools” ([Sarkar, 2018:225](#)).

[Minteer and Manning \(1999\)](#) stressed that a pragmatist approach is pluralistic in its embrace of many worldviews, and it is committed to developing theoretical and applied frameworks that can incorporate a diversity of ethical and moral positions into decision-making. This could be interpreted as a general methodological guideline, but it basically extends the normative commitments of pluralism and democratic deliberation to decision-making frameworks.

4.2.2. Environmental pragmatism: the implications of value and ethical pluralism

The major goal of environmental pragmatism is to expand the horizons of environmental ethics and philosophy beyond the traditional project of articulating a non-anthropocentric basis for all environmental value (i.e., nature is intrinsically valuable and thus worth protecting irrespective of its value for human purposes). According to [Minteer \(2012:18\)](#), ardent advocates of the non-anthropocentric view such as Holmes Ralston and Baird Callicott create "a kind of binary, all-or-nothing contest, one between a correct or 'appropriate' nature-centered worldview and an incorrect, consumptive anthropocentrism." Even though Ralston and Callicott are ardent non-anthropocentric philosophers, it is suggested that the idea that “an anthropocentric value framework is ethically and ontologically defective and thus must be replaced by a nonanthropocentric one is a widely held view in the field” ([Minteer, 2012:19](#)).

The stated reason for expanding beyond a single non-anthropocentric stance, or any morally singular stance for that matter, was to create room for debate and, ultimately, bring environmental ethics and philosophy discussions into the realm of public policy. Environmental pragmatists are generally motivated by an environmental philosophy that has been ineffective, or non-existent, within the context of environmental policy discussions and decision-making ([Light & Katz, 1996](#); [Minteer, 2012](#)). While the non-anthropocentric argument is important for helping the general public deliberate about how environmental decisions are made, it cannot be the only stance given the variety of contexts within which environmental decisions are made. As Bryan Norton, who is fairly categorized as an environmental pragmatist, recently stated in an interview:

After I joined the Environmental Economics Advisory Committee of the EPA, for example, I would have been laughed out of the room if I had started in saying, ‘Oh, you don’t need to worry about these supply and demand curves. Nature has intrinsic value.’ Well, it wouldn’t have worked. So I had to figure out ways of contributing in contexts where philosophers and environmental ethicists had seldom tread. ([Meine, 2018:280](#))

Norton was somewhat unique in the environmental philosophy and ethics world because: (1) he had a philosophy of science background and a public policy perspective and; (2) he thought since humans are making the environmental decisions, then it was more important to see the world from a human perspective ([Meine, 2018](#)). This was not necessarily a popular perspective in the environmental ethics and philosophy field ([Meine, 2018](#); [Minteer, 2012](#)). But, the pragmatist beliefs driving Norton and others, including both that humans should be allowed to have and express a plurality of values and that the pragmatic method can help us understand and revise those beliefs, underscores a desire to solve practical environmental problems with the support of systematic and empirical scientific approaches. To this end, environmental pragmatists have discussed, adopted, and/or developed several concepts or ideas that could be potentially beneficial to research within EE, including a well-developed stance on ‘sustainability’, a nuanced

stance on anthropocentrism, and a general method for decision-making (i.e., heuristic proceduralism). These concepts are reviewed in turn.

4.2.3. Normative sustainability: expanding the dimensions of welfare

The concept of sustainability is notoriously challenging, as there is no consensus on what it means nor how it can be achieved; beyond it being “about the future and our concern toward it” ([Norton, 2010:534](#)). Figure 4.2 illustrates different definitions of sustainability across different disciplines. To complicate matters, the definition of strong sustainability within an economic framework is not agreed upon. There are several permutations of strong sustainability, as thoroughly discussed by [Neumayer \(2013\)](#). Therefore, while there may be some level of agreement within EE for a strong-economic sustainability, there is not universal agreement as to what this entails.

The intention is not to review all these different definitions of sustainability in detail, but to highlight the basic differences between the four columns and to review ‘normative sustainability’ as the working definition for environmental pragmatists. The primary difference between the four sustainability definitions is represented by the thick middle line between weak, welfare-counting sustainability and strong, stuff-counting sustainability. According to [Norton \(2015\)](#), a welfare-counting conceptualization of sustainability, whether within mainstream economics or EE, commits to representing any good or bad in terms of countable impacts on human welfare. Of course, this characterization (which posits EE as a welfare counting approach) presents EE as a clearly defined research tradition (this work contends otherwise).

Figure 4.2. A conceptual geography of sustainability definitions

	Weak Sustainability	(Strong) Economic Sustainability	Strong Sustainability	Normative Sustainability
Home Discipline	Mainstream economics	Ecological economics	Systems ecology	Policy science / environmental ethics
Paradigm	Welfare economics	Welfare economics + natural capital designations	Complex dynamic systems theory/adaptive management	Complex dynamic systems theory/adaptive management
Definition	Maintenance of undifferentiated capital	Weak sustainability + maintenance of natural capital	Weak sustainability + maintenance of resilience	Weak sustainability + maintenance of options
Key Concepts	Non-declining wealth	Maintaining natural capital	Maintaining resilient ecosystems	Integrity of place; community involvement
Key Advocates	Solow	Pearce and Barbier	Holling, Lee	Leopold, Norton
	Weak sustainability – welfare counters ←		→ Strong sustainability – stuff counters	

Source: ([Norton, 2005:314](#))

Nonetheless, this characterization is consistent with an EE that would “encompass neoclassical economic theory with its emphasis on an efficient *allocation* of resources, but superimpose on this the criterion for just inter-generational *distribution* and an optimal *scale* of the macroeconomy” ([Neumayer, 2013:28-29, emphasis original](#)). On the right-hand half of Figure 4.2, stuff-counting sustainability is that which protects “goods, features, and other aspects of physically described systems that must be protected for the future” ([Norton, 2015:80](#)). The ‘physical’ aspects of the system are distinguished because, as discussed further below, normative

sustainability focuses on the various opportunities that may be associated with such physical aspects of the system.

The basic review of ‘normative sustainability’ provided herein presents the following: (1) a general definition of normative sustainability; (2) the primary difference between counting welfare and counting stuff, and the meaning of ‘goods, features, and other aspects of physically describable systems’ and; (3) the definition of a ‘community’ and considerations of varying spatial and temporal scales. Before commencing, it should be noted that this review of normative sustainability is not exhaustive, as its main architect (i.e., Bryan Norton) has put forth monumental effort articulating normative sustainability and how it both differs from other types of sustainability and can inform decision making ([Norton, 2003](#), [2005](#), [2015](#); [Norton & Toman, 1997](#)).

4.2.3.1. General definition of normative sustainability

[Norton \(2005:363\)](#) defined normative sustainability as “a relationship between generations such that the earlier generations fulfill their individual wants and needs so as not to destroy, or close off, important and valued options for future generations.” Normative sustainability was conceptualized over two decades, and it represents an ambitious attempt to create an integrated concept of sustainable systems that incorporates key ideas of economists and ecologists into “an overarching system capable of both describing and evaluating policies proposed to support sustainability” ([Norton, 2015:81](#)). Following pragmatism, normative sustainability is focused on informing action and addressing practical problems; Norton was specifically focused on adaptive management. As such, sustainability is defined from the

viewpoint of the environmental manager who is “reacting to problems as they arise, must rely on everyday observation, consultation, and common sense, although he or she may consult the more precise models of disciplinary scientists from time to time” (Norton, 2005:357).

The general nature of this definition, and the need to fill in the specifics (i.e., decide what is valued and important), partly emphasizes the normative (not just descriptive) aspect of this particular sustainability conceptualization. As Norton (2015:102, *emphasis added*) explained, “a normative definition differs from a descriptive one, such as Solow’s definition, in giving *evolving community values a central role in specifying sustainability* for that community...different communities will emphasize different features of special value.” Solow’s definition (and others) is ‘descriptive’ because it dictates, a priori, what should be measured (i.e., all relevant forms of capital (Neumayer, 2013)). Whereas normative sustainability holds that “choosing what to sustain is prior to choosing how to measure its sustenance” (Norton, 2005:364). As expressed in Figure 4.2, normative sustainability does not specify ‘welfare’ as that which should be sustained necessarily. To make Norton’s distinction between welfare-counting and stuff-counting clear, there is a need to clarify (or attempt to) what is meant by welfare.

4.2.3.2. Expanding the meaning of welfare and the meaning of ‘stuff’

Generally, a theory of welfare has been considered in terms of three levels: the conceptual level, the sources level, and the indicators level (Binder, 2010; Sumner, 2006). The conceptual level specifies the nature of welfare, “giving a formal account of what constitutes *individual* well-being and *social* welfare. At this level, it is specified what makes a life go well and under what conditions this takes place” (Binder, 2010:22, *emphasis added*). Notice that human well-

being indicates the welfare of an individual, and social welfare indicates some aggregate or collective measure. The second level specifies the sources of well-being, and while an exhaustive list may not be possible the sources of well-being should follow from the conceptual level. The final, indicator level, is the “most practice-oriented layer, where concrete measures for the sources of well-being are proposed” ([Binder, 2010](#)).

Norton disavows a welfare-counting approach to sustainability, which is referring to the theory of welfare within economics. Over time, the meaning of welfare in economics has changed as the field has evolved ([Scarantino, 2009](#)), but generally individual welfare has been thought of either in terms of hedonism or as preference satisfaction ([Binder, 2010](#)). The hedonism view of welfare would equate the presence of pleasure and the absence of pain as a state that maximizes welfare; however, this view is somewhat outdated in economics, as the view that welfare equates to the satisfaction of preferences is generally accepted ([Binder, 2010](#); [Hausman & McPherson, 1994](#); [Sumner, 2006](#)). This view parallels the idea that the economic concept of ‘utility’ is, contemporaneously, viewed only as a way to describe or represent preferences, as opposed to it being equated with pleasure or happiness ([Varian, 2014](#)). Both views of welfare are considered ‘subjective’ theories, as the individual is the judge of their own desires and there is not specification of what these desires may be because they are assumed to be wide ranging. Additionally, the preference satisfaction view is thought of as ‘state-of-the-world’ theories, because they detail which states of the world fulfil certain desires ([Binder, 2010](#)).

So what exactly are the deficiencies of counting welfare in Norton’s view? Generally, the issue with welfare counting is that economic valuation treats all environmental goods as measurable using the same indicator, thus providing a “*comprehensive* treatment of

environmental values” ([Norton, 2005:166, emphasis original](#)). Even though valuation of environmental goods and services has developed beyond simply asking open ended willingness-to-pay questions (e.g., choice modeling makes WTP less explicit in some cases), it is fair to characterize economic welfare as singular (as [Binder \(2010\)](#) does) in that it does generally represent preference satisfaction through indicators such as WTP or income. Consider the following definition of sustainability (or sustainable development), which is generally accepted within an economic framework (regardless of whether it is considered strong or weak economic sustainability): some action is sustainable if “it does not decrease the capacity to provide non-declining *per capita utility* for infinity” ([Neumayer, 2013:8, emphasis added](#)).

The issues with a comprehensive treatment of environmental values refers to the idea that, in principle, one can gain a total economic valuation of the environment by accounting for both use and non-use values. This principle stems in part from the unspecified nature of welfare beyond preference satisfaction. Welfare, as represented by the satisfaction of preferences, is “materially empty since it does not say anything about what might be the cause of this welfare gain” ([Binder, 2010:33](#)). For instance, one could prefer that a plot of national forest be logged instead of protected for recreation use for any number of reasons and, while this preference would imply a higher utility for logging, it says nothing about motives. As [Carson et al. \(2001:177\)](#) noted, economic theory is clear in that motives, or reasons for taking action in some situation, are “essentially irrelevant” and “it is utility whatever its sources that matters for total value.” That is, the welfare gained through the satisfaction of the logging preference does not necessarily imply some individual gain *per se*, as the ideas of bequest values and existence values are meant to convey. As [Arrow \(1951:17, emphasis added\)](#) emphasized long ago, economic theory assumes that individuals have preferences for the ordering of social states,

which are partly defined by the bundle of goods within each state; however, it is not assumed that “an individual’s attitude toward different social states is determined exclusively by the commodity bundles which *accrue to his lot* under each.”

Even though Norton understands that this comprehensive treatment of environmental values may be possible in principle, there is enough evidence to suggest that it does not hold in practice. He cites a first-hand account of a debate regarding the validity of a contingent valuation study, but one does not need to look far to find accounts questioning and testing the capacity of economic approaches to comprehensively account for environmental values (particularly non-use values) (e.g., [Chee, 2004](#); [Kumar & Kumar, 2008](#); [Langlois, 1998](#); [Venn & Quiggin, 2007](#)). [Norton \(2005, 2015\)](#) is clear that the application of economics within environmental decision-making is important and potentially needed (depending on the decision context), but at the same time he stresses that it can only provide a partial understanding of complex environmental issues. The same critique is essentially leveled at all singular approaches, including at ardent supporters of non-anthropocentrism.

This is where normative sustainability, with its focus on ‘stuff’, broadens its scope. Fundamentally, stuff-counting sustainability needs to make a broad range of values explicit. Before clarifying this statement, it is worth noting that the concept of ‘values’ is notoriously opaque, as can be gleaned from even a superficial reading of natural resource social science literature. It is not a new problem either, as works often belabor the point that values is an ambiguous idea (e.g., [Brown, 1984](#); [Dewey, 1939](#)). [Hechter \(1992\)](#) even entitled an article: *Should Values Be Written out of the Social Scientist's Lexicon?* Nonetheless, discussing pragmatism, and Norton’s stuff-counting sustainability makes it nearly impossible to avoid the

term. Therefore, I proceed with caution for this section, but later discuss how pragmatism and EE could help to clarify the convoluted values concept.

Environmental pragmatists generally call for value pluralism, and the term ‘values’ is prevalent in both books focused on articulating a clear vision of normative sustainability (i.e., [Norton, 2005, 2015](#)). In trying to distinguish stuff-counting sustainability from welfare-counting sustainability, it seems that Norton makes two substantive distinctions. First, there are a plurality of values that should be debated and discussed when a community is grappling with a complex environmental problem and deciding on a sustainable approach going forward. If the theory of welfare framework is applied to Figure 4.2, then Norton (consistent with pragmatism) is suggesting that individual well-being and social welfare will require more specificity than just preference satisfaction and the aggregation of such preferences. While he acknowledges that one cannot exhaustively catalog all possible values that may broadly define well-being, he suggested four broad categories that might be important to discussions about how to live sustainably: (1) community-procedural values; (2) weak-sustainability (economic) values; (3) risk-avoidance values and; (4) community-identity values ([Norton, 2005](#)).

Procedural values, acknowledged as a potentially odd fit within the context of environmental problem solving, represent the contribution of discourse ethics by emphasizing that agreeing on a process for cooperative solutions is, in and of itself, a contribution to sustainable living. In other words, while process values do not imply the substance about what is valued, a fair and open process of establishing such values gives rise to sustainability commitments ([Norton, 2005](#)). Economic values refer to discussions of sustaining wealth. Each community, in essence, has to decide if maintaining the accumulated wealth of a society is an essential sustainability commitment. Measuring this wealth is an important topic, and it includes

discussions of enumerating both market and non-market goods and services, as well as when it is appropriate (or inappropriate) to apply non-market valuation techniques such as contingent valuation. Risk-avoidance values refer to the magnitude of influence that risk analyses should have in making decisions concerning environmental problems; the environmental protection agency (EPA) emphasizes this framework. Lastly, community-identity values are those that emerge on a community scale, which “are developed and passed from generation to generation, creating cohesiveness within human communities but also binding individuals and communities to their natural habitat” ([Norton, 2005:371](#)). These values stem from virtue ethics and “express a sense of the good life”, as [Norton \(2005:371-372\)](#) briefly elaborated:

I have chosen to adopt the terminology of layered obligations, wherein a “thin” theory of justice includes obligations to treat other individuals with respect and “thick” obligations are obligations accepted as part of defining and living a good life in a community with shared values. Thin obligations originate in universal aspects of the moral situation, whereas thick obligations are culture-bound and relative to particular situations.

It should be noted that within the context of environmental decision-making, the concepts of community and attachment to place are well-established and discussed in the conservation social sciences literature.

The main point is that these four value categories are among those that may change, or be more or less influential within a variety of community settings (i.e., “different communities will emphasize different features of *special value*” ([Norton, 2015:102, emphasis added](#))). Stuff-counting sustainability is meant to *make explicit*, through debate and discussion, the basic ground rules and content of what it means to live sustainably. Continuing with the welfare-theory framework above, what are the sources of well-being in normative sustainability? It appears to be the ‘goods, features, and other aspects of physically described systems that must be protected for the future’, as well as the ‘opportunities’ afforded by such features. [Norton \(2015:104,](#)

[emphasis added](#)) slightly amended the definition of normative sustainability in his most recent book: “for a given generation to live sustainably means that that generation fulfills its needs and desires so as not to destroy important and valued *opportunities* for future generations.”

An opportunity is defined as “a possible action or policy that could be chosen, given the environment at hand” ([Norton, 2015:103](#)). The second element of this definition related to the ‘environment at hand’ stresses, somewhat obviously, the need to connect possible opportunities (choices or actions) to physical characteristics of the environment. The contrary concept to opportunities is ‘constraints’, which acknowledges that humans are generally adapting and operating within the reality of their physical system (e.g., a flat desert ecosystem constrains one’s ability to downhill ski). [Norton \(2015:104\)](#) follows his schematic definition of normative sustainability with:

The definition leaves a role for communities to democratically decide what activities are valued deeply enough to sacrifice to protect them for future generations—what *should* be saved. One should not forget that this approach, which leaves action, choice, and policies unspecified, as variables, is insufficient as a definition of sustainability for any community. To actually instantiate this definition, it is necessary for a community to engage in a process by which opportunities are associated with the community’s deepest and most inspirational values. The task will be to describe a process by which a community, through democratic means and through participation in deliberation and negotiation, might define for itself what sustainability means to their community.

One way to facilitate this process is by adopting Amartya Sen’s ‘capability approach’, which views welfare in terms of ‘functionings’ and ‘capabilities’. Functionings are roughly divided into ‘beings’ (being happy, being nourished, being educated) and ‘doings’ (travelling, voting, eating meat, providing for one’s family), and capabilities are the freedoms or opportunities to realize the desired functionings ([Binder, 2010](#); [Robeyns, 2016](#)). As [Robeyns](#)

[\(2016:8, emphasis added\)](#) explains: “while travelling is a functioning, the real opportunity to travel is the corresponding capability. The distinction between functionings and capabilities is between the realized and the effectively possible, in other words, between achievements, on the one hand, and freedoms or *valuable opportunities* from which one can choose, on the other.” Sen’s approach considers a person’s (or community’s) well-being to be constituted by a combination of a variety of valuable opportunities ([Robeyns, 2016](#)).

A full articulation of Sen’s approach is beyond the scope of this paper, but it is important to stress that it arose in direct contrast to the unidimensional approaches of preference-satisfaction and hedonism welfare (see, for example, [Binder \(2010\)](#), [Sumner \(2006\)](#), and [Robeyns \(2016\)](#)). Sen’s approach, aside from motivating Norton’s use of the term ‘opportunity’, is a formal framework intended to incorporate a variety of underlying values beyond utility (i.e., it is multidimensional), and it incorporates different discourse ‘spaces’ to facilitate the overcoming of obstacles related to different technical languages and disciplinary assumptions ([Binder, 2010](#); [Norton, 2015](#)).

4.2.3.3. Defining a community

The final element to be discussed with regard to normative sustainability is the broad definition of community, and how varying spatial-temporal contexts can be integrated. Community is context dependent, but it can be generally understood as a “group with a shared identity” which, in some cases, are connected in important ways with a “physical area and the natural characteristics of that area” ([Norton, 2015:103](#)). Drawing boundaries around a community, whether social or ecological, can be a challenge, and clearly those who are (or are

not) part of the debate regarding a sustainable path will influence the chosen definition of sustainability. Norton's pragmatist approach draws insights from complex systems theory and ecology to better manage such a challenge. Specifically, to operationalize normative sustainability over space and time, which is critical for any sustainability definition, Norton integrates ideas from hierarchy theory (HT).

Briefly, HT posits that smaller subsystems in a set of nested systems change more rapidly than the systems they compose. [Norton \(2005:230\)](#) suggested it is "useful to perceive human choosers as embedded in a hierarchical system and to see that the human values delivered by that system emerge on different scales of space and time. Once values are so sorted, it may be possible to associate these variables with natural dynamics essential to their continuation." Table 4.1 illustrates roughly how different human concerns may relate to different times scales.

Table 4.1. Correlation of human concerns and natural systems dynamics on different temporal scales

Temporal horizon of concern	Time scales	Temporal dynamics in nature
Individual and economic	0-5 years	Human economies
Community intergenerational bequests	Up to 200 years	Ecological dynamics and interaction of species in communities
Species survival and our genetic successors	Indefinite time	Global physical systems

Source: [Norton \(2005:231\)](#)

The relationship between HT and Aldo Leopold's 'thinking like a mountain' simile is prevalent in Norton's writing ([Norton, 1996b](#), [2005](#), [2015](#)). The simile referenced by Norton is in Leopold's *A Sand County Almanac* published in 1949, and it tells the story of culling predator

populations for the short-term benefit of hunting game, and the unforeseen consequences in the long-term (namely starving game, erosion and other environmental damage from unnaturally large game populations). [Leopold \(1966:140-141\)](#) ended the essay with:

The cowman who cleans his range of wolves does not realize that he is taking over the wolf's job of trimming the herd to fit the range. He has not learned to think like a mountain. Hence we have dustbowls, and rivers washing the future into the sea...perhaps this is behind Thoreau's dictum: In wildness is the salvation of the world. Perhaps this is the hidden meaning in the howl of the world, long known among mountains, but seldom perceived among men.

The central point is that the long-term perspective of the mountain results in different thinking than does the short-term perspective of humans. A focus on human concerns over different time scales is attractive, according to [Norton \(2005:220\)](#), because “this separation of values onto different scales reduces direct competition between them, since different dynamics will be associated with their production.”

At this time, a full articulation of how HT fits into normative sustainability is not required, but its reliance on systems theory, the integration of diverse human values, and the modeling of natural resource management at a broad range of time scales supports the underlying case being made in this dissertation (i.e., that pragmatism is a suitable philosophy for driving research in EE). The quick review is also helpful as considering human values over different time scales is central to the environmental pragmatist view on anthropocentrism.

4.2.4. Administrative anthropocentrism and anthropocentric holism

Intrinsic value is the idea that the environment, or its constituents such as individual animals or large ecosystems have value irrespective of *instrumental* human interests. Without fully wading into the depths of the intrinsic value debate, environmental pragmatists view

intrinsic value as among a spectrum of values that include both instrumental (e.g., timber, recreation) and non-instrumental (e.g., spirituality, beauty, intrinsic) values ([Minteer, 2012](#); [Norton, 2005, 2015](#); [Weston, 1996](#)). Environmental pragmatism can be considered ‘subjectivist’ in that humans are doing the valuing, but that is not to say that it is crudely anthropocentric in a subject-centered, only human-beings-have-value kind of way ([Weston, 1996](#)). Humans have to prioritize and take action based upon a plurality of *human* values, among which intrinsic value is included. That is, humans can value intrinsic value (above and beyond any human benefits gain from that valuing). Humans recognize and act upon intrinsic value, *regardless* of human benefit.

[Norton \(2015:267\)](#) dubbed this idea ‘administrative anthropocentrism’, which “is the recognition that, when there is conflict among values held by persons or groups, the resolution of such conflicts, if achieved, will be a resolution by human beings.” The implication of this is that no value, such as the preservation of endangered species based upon intrinsic value arguments, is automatically deemed of highest importance. Any value, based upon community discussions, can be deemed the most important. In the case of endangered species, the intrinsic value of species is reflected as very important in the United States through the passage the Endangered Species Act (albeit to the chagrin of some). In a nuanced discussion of intrinsic values and pragmatism, including the ideas of John Dewey, [Minteer \(2012:63-64\)](#) reflected: “Norton seems to be making a careful distinction between ontological accounts of intrinsic value (which he rejects) and an anthropocentric accommodation of pragmatic noninstrumental value (which he accepts).” While Norton is accommodating such values, though there is some skepticism of the long-term impact of intrinsic value arguments within environmental discourse ([Minteer, 2012](#)), which is reflected above in the anecdote about the EPA advisory committee.

The idea of anthropocentric holism connects humans as the deliberators of a plurality of values across different time scales. How anthropocentric holism relates to other types of anthropocentrism is reflected in Figure 4.3. The difference between non-anthropocentric individualists and non-anthropocentric holists is commonly referred to as a biocentric view and ecocentric view, respectively ([Minteer, 2012](#)). By connecting different human concerns and values across time, partly through the incorporation of HT, [Norton \(2005\)](#) suggested that both humans and ecosystems can be valued; thus, the ‘anthropocentric holists’ moniker.

Figure 4.3. Two intersecting distinctions in environmental ethics

	A	B
	Anthropocentrism	Nonanthropocentrism
I Individualism	Anthropocentric individualists <i>Traditional ethics and mainstream economics</i>	Nonanthropocentric individualists <i>Animal liberationists e.g., Singer, Sagoff</i>
II Holism	Anthropocentric holists <i>e.g., Leopold and Norton</i>	Nonanthropocentric holists <i>e.g., Callicott</i>

Source: Adapted from [Norton \(2005:216\)](#)

His claiming of Leopold in this camp is one part of his argument that Aldo Leopold was a pragmatist at heart, which is a debate that he has primarily had with Baird Callicott over the years ([Callicott et al., 2009, 2011](#); [Norton, 1996a, 2011a](#)). Claiming Leopold as anything but a

non-anthropocentric adherent is a dissent from the majority opinion in environmental ethics and philosophy ([Minteer, 2003](#)). This brief review of anthropocentrism in environmental pragmatism was merely meant to introduce the topic for the purpose of this paper (i.e., not provide an exhaustive review). I now turn to the idea of decision-making as it pertains to environmental pragmatism.

4.2.5. Decision-making: A process approach toward social learning

It should not surprise the reader that, given the discussion above, the *path* toward decision-making is the focus of environmental pragmatism; that is, there is no specific decision criteria in the way that economics, for instance, applies cost-benefit analysis or net present value. It may also not surprise the reader that many of the ideas in this section have been articulated by Bryan Norton. While good scholarship should draw from a diversity of sources, I echo [Brister \(2018\)](#), who noted: “Norton’s account of environmental decision-making is a rich one, drawing on Dewey’s theory of inquiry, Jürgen Habermas’s theory of deliberative democracy, and the adaptive management of C. S. Holling and natural resource managers.”

When confronted with complex environmental problems, environmental pragmatists eschew ‘substantive rationality’ as it “attempts to identify one correct answer by computation or by some algorithm, and it attempts to determine what is substantively rational by considering and measuring all outcomes against stated objectives” ([Norton, 2015:57](#)). Instead, procedural rationality, which focuses on the process employed given the problem at hand, is the approach of choice for making decisions. This aligns with the paradigmatic assumptions of pragmatism outlined above and, furthermore, it aligns with the natural resource planning literature that has generally called for a ‘transactive’ approach whereby expert opinion is complemented with

public engagement and transparent deliberation ([Borrie et al., 1998](#); [McCool et al., 2007](#); [Nilsen & Tayler, 1997](#)).

Procedural rationality can be thought of in terms of ‘pure proceduralism’ or ‘constrained proceduralism’. The former does not attempt to assess the appropriateness of the outcome but simply accepts the decision made as the best one based upon the process in place; whereas the latter has a constrained decision space, where a limited number of options are established (perhaps due to an existing legislative policy) and then the process is implemented to choose the best outcome ([Norton, 2015](#)). Basic procedural rationality as a foundation, whether pure or constrained, is potentially open to the ‘means justify the ends’ critique of pragmatism outlined in the axiology section above (Section 4.1.3). This is perhaps why [Norton \(2015\)](#) introduced ‘heuristic proceduralism’, which focuses first and foremost on identifying different processes that may be appropriate for establishing outcomes. While this may be implied in procedural rationalism more broadly, the focus of environmental pragmatists, consistent with Dewey’s focus on integrating scientific methods into democratic procedures, is to identify appropriate processes that tend to “encourage agreement and cooperative behavior within a deliberative process” ([Norton, 2015:116-117](#)).

[Norton \(2015:119-171\)](#) described a general method for heuristic proceduralism at length and, consistent with this section more generally, I will not go into great depth. The essence of Norton’s general method is to identify specific ways (e.g., scenario building) to envision different future possibilities or development paths whereby different social values, and indicators for such values, are discussed. There is a need to resist ‘chunking’, which refers to the breaking apart of nature into chunks of objects that have value. Economists do this when they consider forest stocks, for example, or the availability of cubic board feet, and environmental, non-

anthropocentric ethicists do this when they assign value to individual organisms, species, and ecosystems. It is suggested that these evaluative methods are beneficial for making short-term decisions, but if intergenerational sustainability is the goal then there is a need to approach SESs with an open-ended, systems based understanding.

Combining the ideas of hierarchy theory and the need to understand social values with a plurality of approaches provides context for different decision tools (e.g., cost-benefit analysis, multi-criteria analysis), which are associated with different spatial and temporal time scales.

[Norton \(2015\)](#) ended the description of his general method with:

Adaptive managers, ideally, would not, when faced with a problem of placing values on changes in natural systems, go to the economics department or the philosophy department to find a consultant to do a study at long distance. Rather, they should invite those practitioners—or local practitioners with similar skills—into the public process. If studies of attitudes and values become necessary in the ideal adaptive process, evaluation of possible development paths should be initiated by members of the management team. Alternatively, evaluators with special abilities may be brought onto the management team. The point here is that both adaptive science and evaluation of change is best done within the conflict-ridden context in which problems are faced, because each problem faced is unique.

Norton's general method, while informative, should be considered an ideal, because in practice executing what is suggested here is potentially full of obstacles. [Brister \(2018\)](#) noted that there is potentially valid skepticism that the type of process described is attainable within the context of complex environmental problems.

Within the context of natural resource planning, the need for transactive planning is well-established, as are its basic elements, including social interaction among stakeholders, opportunities for mutual learning among citizens and planners, debate and discussion regarding tradeoffs between values, and the forming of partnerships for implementing agreed upon management actions ([Friedmann, 1973](#); [Hudson et al., 1979](#); [Krumpe & Stokes, 1993](#)).

These ideas parallel those of Norton. However, how such an approach can be implemented in practice is less established, and it is recognized as a significant challenge to a variety of planning processes. For instance, the cost of public engagement may be considered an ‘extra’ cost of planning, public facilitation expertise may be limited, and it can sometimes be difficult to clearly articulate to the public what their exact role is to be ([McCool et al., 2007](#)). One suggestion is that ecological economists should focus on developing methods that can be implemented within the public deliberation process, which are both scientifically robust and potentially capable of facilitating social learning through an understanding of diverse public perspectives about relationships between humans and the environment.

5. A PRAGMATIST ECOLOGICAL ECONOMICS: BASIC SCIENTIFIC BELIEFS, GENERAL METHODOLOGY, AND SPECIFIC PRACTICES

This section focuses on articulating how pragmatism can guide EE. In the context of this work, pragmatism constitutes a paradigm for EE within the macrostructure framework.

Therefore, this section focuses on the implications of adopting pragmatism for both the higher level worldview as well as lower level research programs. What follows are recommendations for what a pragmatist EE would look like, including guidelines, imperatives, and a variety of other considerations.

5.1. A pragmatist EE worldview: Paradigm relevance, dialog between scientific approaches, and a new dimension

A scientific worldview encompasses general beliefs related to the nature of science. The macrostructure framework above focused on beliefs regarding the importance of paradigmatic assumptions for driving research practice, as well as beliefs about how different approaches to science interact (i.e., the dialog). In this section, a pragmatist EE worldview in relation to these beliefs is described. In addition, a third ‘worldview’ dimension is discussed, which was not a focus of [Patterson and Williams \(1998\)](#), but is increasingly relevant within the context of the conservation social sciences. This is the integration of a diverse range of stakeholders into science. The general idea of transdisciplinary research is that science should not be purely expert driven, but instead it should extend the peer-community to include non-experts as well ([Lang et al., 2012](#); [Wiek, 2007](#)). The dialog element of the macrostructure framework essentially encompasses views on interdisciplinary research but, given the context of this work, it is also

important to think about beliefs related to transdisciplinary research (as challenging as this may be to define).

5.1.1. Paradigms strongly support research in practice

Following Dewey's belief in the 'wary assessment' of knowledge, all scientists should have an explicit philosophical stance driving their research whereby the process used to arrive at such knowledge is (or at least could be) described from the bottom to the top. That is, from the foundational beliefs to general methodology, specific methods, results, interpretation, and on-the-ground implications. This follows a methodological pluralism described by [Hodgson \(2001\)](#), where potentially conflicting paradigmatic assumptions can coexist in a beneficial way within disciplines and the academy at large, but within a researcher's mind assumptions should be consistent. This suggests a pragmatist EE is not 'a-paradigmatic' (Figure 2.2). Foundational assumptions of research within EE are more than 'background information', they not only influence research in practice but their understanding and connection to research practice is required to justify and defend science within the context of public deliberation. Furthermore, if the important axiological goals of communication and social learning are to be realized, then a researcher should be able to articulate even the most mundane elements of scientific inquiry, if they are considered to be of interest to other scientists and/or the general public.

5.1.2. Interdisciplinary research can lead to convergence on a unified methodology

A pragmatist EE necessarily embraces multiple approaches to science. More specifically, pragmatist EE occupies the space somewhere between pluralism and critical pluralism (Figure

2.1). Pluralism suggests that, over time, the multiple paradigms supporting science will converge toward a single set of normative assumptions and a single general methodology. Whereas critical pluralism suggests that multiple paradigms can co-exist and inform one another in valuable ways, though some indeterminacy will persist. As asserted above, EE is among the conservation social sciences and, therefore, it is unlikely that practitioners of EE believe that there is only one way to do science; at least in the sense, for instance, that a positivist approach *is* science and an interpretivist approach, while interesting, *cannot* be considered science. A pragmatist EE rejects both this stance, and the idea that anything goes and science is relativistic.

Making such an assertion, while also avoiding the more specific discussion of the middle ground is not all that enlightening. Greater specificity requires, at least, taking a position between the outdated stance that there is only one way to appraise science and the devil's-advocate stance that there is no way to appraise science. Additionally, greater specificity requires articulating what is meant by possible methodological convergence of different approaches or, alternatively, persistent indeterminacy (e.g., that ontological assumptions in positivism and constructivism renders science using these different assumptions as incompatible). The methodological-pluralism spectrum illustrated in Figure 2.2 can facilitate this greater specificity. Generally, a pragmatist EE holds that there are several systematic approaches to understanding and describing the world which yield warranted assertions (scientific beliefs), but such descriptions are only partial. If complex environmental problems are assumed to unfold within dynamic SESs, then a pragmatist EE focuses in large part on considering partial descriptions of the world to yield a *more detailed picture* of the complex system.

When trying to yield a more detailed picture, a pragmatist EE does not adopt a 'pure/oppositional' dialog, where scientific explanations of the same phenomena are competing.

Again, it believes that scientific explanations are partial. For instance, if trying to describe the importance of a national forest, an *environmental* economic approach focused on total economic valuation (an exhaustive enumeration of use and non-use values) can, even in principle, only capture part of the importance of a national forest. Similarly, a hermeneutic approach only captures part of that importance. These partial understandings may be more applicable or appropriate in particular contexts; however, complex environmental problems will often require a combination of approaches. For example, national forest planning requires a consideration of ecological, social, and economic sustainability ([U.S. Department of Agriculture Forest Service, 2012](#)), and no single method is going to provide the information needed to comprehensively inform and address this challenging task.

When several methodologies are applied to addressing the same problem, a pragmatist EE worldview would posit that over time the combination of different approaches can lead to methodological convergence and, consequently, a more comprehensive tentative truth. While this suggests that a pragmatist EE may eventually yield a single methodology, it is important to stress that methodological convergence will not happen immediately, and it may never happen fully. That is, it may never happen to the extent that disciplinary roots start to disappear (i.e., some pure interdisciplinary approach were distinguishing different disciplinary contributions is not possible). In practice, different approaches to describing the importance of a national forest likely start as multi-disciplinary research, and perhaps the endpoint (at least in a single study) is the removal of conflicting methodological beliefs (i.e., strands of the cable of truth that are no longer tenable).

For example, the aim to understand the importance of water-based ecosystem services on the Shoshone National Forest ([Armatas, 2013](#); [Armatas et al., 2014](#); [Armatas et al., 2018](#)) started

with a Q-methodology study. This methodology aligns more with a constructivist paradigm, and it provides a nuanced, qualitative understanding (in the sense that results are not generalizable) of the importance of ecosystem services. The results from this study were interpreted as beneficial for potentially helping forest planners and managers understand the tradeoffs among different ecosystem services. Additionally, the results were interpreted as beneficial for informing an economic, non-market valuation study of ecosystem services. This interpretation is detailed in [Armatas et al. \(2014\)](#), which is now best categorized as an attempt to improve non-market valuation techniques within an environmental economics framework. Issues related to protest responses and lexicographic preferences are discussed, and more valid and reliable monetary estimates are suggested as benefits. Addressing these problems using a novel method is certainly a contribution to environmental economics, but it is not interdisciplinary per se. In other words, it is multidisciplinary in that a social science approach is proposed for adding rigor to a subsequent economic approach, but the basic assumptions underpinning the different methodologies remained unchanged as presented in [Armatas et al. \(2014\)](#).

This changed when implementing the economic valuation study in practice. A second phase of this study on the Shoshone National Forest applied choice modeling, which is a non-market valuation survey that typically yields monetary estimates of environmental goods and services. Supported by the Q-methodology study, a mailback survey was performed asking respondents to tradeoff different ecosystem services, and a cost attribute was included to allow for monetary estimates. Again, this survey was designed based upon standard economic paradigmatic assumptions (e.g., rational-actor model). However, analysis, interpretation, and discussion of this study was presented in conjunction with the initial Q-methodology study as an *integrated* assessment of ecosystem services ([Armatas et al., 2018](#)). This discussion includes

several methodological decisions that reflect interdisciplinary research and a pragmatist philosophy, including the decisions to not aggregate willingness-to-pay estimates or to publish the choice modelling results on their own (i.e., reserving a partial story of national forest value until a more detailed picture was understood). These decisions are discussed in greater detail below, but the important point for this section is that different approaches to science (even with potentially conflicting underlying assumptions) led to some convergence toward a more unified methodology. In other words, the constructivist ontology of Q-methodology and sometimes espoused in EE, which questions the practice of aggregating individual characteristics (in this case WTP), influenced the interpretation and presentation of results from an economic methodology, which is based upon a more objectivist ontology without such aggregation qualms.

Of course, the extent that a plurality of approaches to science will result in a convergence to a single methodological approach is an open question. Pragmatism, as characterized by [Greene \(2008\)](#), results in convergence (Table 2.1); however, following Peirce, convergence to a unitary tentative truth (methodology in this case) may best be thought of as the result of infinite inquiry that is never actually reached.

5.1.3. A pragmatist EE worldview on transdisciplinary research

Transdisciplinary science is an ambitious and ambiguous approach whereby science integrates societal perspectives in a way that makes science more democratic while also maintaining rigor. Although there appears to be growing support for such research, not only in EE but in other emerging fields such as sustainability science ([Quental et al., 2011](#)), implementing such research in practice remains elusive. Perhaps the most fundamental question

regarding transdisciplinary research is whether it is possible. As [Söderbaum \(1999\)](#) mused in his discussion of values, ideology and politics in ecological economics, “some of us believe in transdisciplinary research, others do not.”

A pragmatist EE views transdisciplinary research as that which can engage the public with methodological processes that not only yield an understanding of the world, but also lead to communication and social learning. In other words, research should help to partially describe the world in a way that constitutes a valuable assertion, which is distinguished from warranted assertions in that it is not only supported scientifically, but relevant and interesting to the public.

As [Hands \(2001:263, emphasis added\)](#) suggested:

Pragmatic philosophy can, and for Dewey should, serve an emancipatory role within the process of social reconstruction, but in order to do so it must affect the values that individuals hold. But these values are products of the social environment, and thus in order to succeed pragmatic philosophy *must hook-up effectively with social life; the most significant hooks for pragmatic philosophy and social life are the social and moral sciences.*

This should not be interpreted as some form of manipulation, rather a call to better inject science into democratic processes. As [Norton \(2005:565\)](#) suggested, a pragmatic approach cannot “be dominated by the descriptive, snap-shot like aspects of science. The context, and the problems that constitute it, will ensure that values will be injected into the process. And the meaning given to scientific information is largely determined by its bearing upon disagreements that affect management decisions.”

While challenging, a pragmatist EE should focus on processes that engage the public and describe that which is of interest. For example, [Armatas et al. \(In Press\)](#) developed an application of Q-methodology within the context of national forest planning and management, which listed supporting decision-making and public relations as its two main contributions. The social

vulnerability protocol, as it is called, is intended as a process that managers and planners can implement themselves within the context of public engagement. The results from the process include an understanding of diverse viewpoints regarding the importance of ecosystem services and the drivers of change relevant to influencing such services. One benefit of the approach, according to [Armatas et al. \(In Press\)](#) is as follows:

The clear representation of diverse viewpoints may also help decision-makers facilitate civil discourse between members of the general public. The protocol process can facilitate such discourse because it is an individual activity, which both allows all individuals to submit their input and prevents dominant personalities from monopolizing the discussion. The fact that every individual interacts with every ecosystem service in the ranking list can also help members of the public understand benefits that may not have been previously considered. We have observed participants discussing their Q-sorts (after the exercise), genuinely intrigued by their own and others tradeoffs. The “diverse archetypes can potentially give legitimacy to viewpoints that differ from one’s own. If one is no longer skeptical about the existence of a different viewpoint, then perhaps acceptance of that different viewpoint and subsequent civil discourse can commence” ([Armatas et al., 2017b:34](#)). The protocol may foster empathy among members of the public for different perspectives.

This social vulnerability protocol highlights the benefits of understanding different stakeholder perspectives, such as helping decision-makers “understand ‘winners’ and ‘losers’ of decisions” ([Armatas et al., In Press](#)). However, first and foremost, the benefits for communication and social learning are stressed, as reflected in the above block quote. Blending descriptive information for the primary benefit of planners and managers with a process that could potentially lead to better communication and social learning is consistent with a pragmatist EE worldview. It is also consistent with [Norton \(2015\)](#), who suggested that researchers should aim to engage science in the public process.

A final point about a pragmatist EE worldview is that it is incremental. As represented by Peirce’s analogy, the quest for an ultimate truth is through the replacement of individual strands

(i.e., beliefs) of a cable. This worldview is incremental both in terms of methodological improvement and the affecting of values. This might be the biggest difference between a pragmatist EE and other EEs. For instance, the critical-realist EE being advocated by Clive Spash and others essentially calls for the abandonment of mathematical formalism (i.e., methods employing the rational-actor model and the aggregation of such preferences) and the wholesale replacement of our current economic system. [Spash \(2017c:13\)](#) considered “activism as an essential part of being a committed ecological economist”, and additionally suggested that the goal of ecological economics is “destroying a dominant rhetorical claim made when mainstream economists, neoliberals and apologists for orthodox growth and consumerism lose an argument. That is, that there are no alternatives to the existing structures and system” ([Spash, 2017b:xvii](#)). This ‘dominant rhetorical claim’ highlights the primary criticism offered by mainstream economists in challenging ecological economists. [Gowdy and Erickson \(2005\)](#) labeled it the ‘we know this already’ defense of mainstream economics, and it refers to the following basic counter argument: the shortcomings of mainstream economics and its concepts such as the rational-actor model are well known; in many cases they have been (or are actively being) addressed and are therefore no longer valid. Furthermore, a superior alternative has yet to be offered.

A pragmatist EE worldview rejects the all or nothing stance, whether that be related to an environmental ethic, methodology, or alternative (more sustainable) economic system. A pragmatist EE strives for a better incorporation of ethics and intrinsic value for the purposes of more sustainable and equitable distribution of nature’s resources, but getting there is an incremental process. In other words, I agree with [Turner and Clifton \(2009:187\)](#), who in the context of discussing the contrasting general viewpoints of Indigenous cultures and predominant western societies with regard to climate change adaptation stated: “changing the dominant

industrial paradigm to far-thinking, eco-centric, community-centric perspectives could make an enormous difference to our collective impact on the planet, including the burden of human-driven climate change.” However, changing the dominant thinking is not done through the assertion that utility-based anthropocentrism is wrong, but through incremental revision of the many beliefs that underpin the dominant industrial paradigm. This incremental approach may be unsatisfying to some, or labeled as obsequiousness. But, nonetheless, I argue it represents a pragmatist EE worldview, which may be beneficial for making progress towards resolving complex environmental problems. Furthermore, the worldview supports a more nuanced view of particular controversial topics within the literature, such as ecosystem services. This nuanced view, as well as other implications of research programs within a pragmatist EE are discussed below.

5.2. Pragmatist EE research programs: Theoretical stances, methodological considerations, and real-world decisions

Research programs involve the various debates surrounding underpinning theories and normative commitments (conceptual domain), issues of data collection, analysis, and interpretation (methodological domain) and, finally, the real-world context related to how science can accomplish its primary goals (substantive domain). The primary goal of the work herein is to better articulate how adopting pragmatism as a paradigm can influence research within EE. Specifically, what are the implications of adopting pragmatism for the conceptual, methodological, and substantive domains, whether that is within the context of informing management and decision-making, and/or facilitating social learning?

This section addresses this question for each domain in turn, but it is worth stressing that the implications detailed below are by no means exhaustive. Instead, major implications are detailed with the understanding that future research could expand and refine an understanding of how a pragmatist EE would operate at the research application level.

5.2.1. Conceptual domain: normative sustainability, a holistic individual experience, and complex social-ecological systems

The conceptual domain concerns issues related to theoretical foundations and normative commitments. This section focuses on how adopting the normative commitments of pragmatist can influence the theoretical foundations of EE. Generally, several of the distinctions between environmental economics and EE listed in Table 3.1 align with a pragmatist foundation.

Adding to the distinctions made by [Gowdy and Erickson \(2005\)](#), another implication of adopting pragmatism for research in EE would be the reliance on normative sustainability as the working definition. Instead of aiming to sustain welfare for future generations, as defined by the value of some combination of human and natural capital, adopting normative sustainability would encourage ecological economists to focus on understanding the various opportunities and constraints that are relevant to communities as they confront complex environmental problems. If normative sustainability is the theoretical foundation of a pragmatist EE, then the methodological domain will have to facilitate an understanding of the various ‘opportunities’ that are relevant to a community given the environment at hand. Opportunities, as a reminder, are policies or actions that could take place within a given natural resource context. For example, opportunities could, depending on the physical resource, include: harvesting a section of forest,

expanding protected bear habitat, building a road, going skiing, going birdwatching, quietly reflecting about the grandeur of a landscape, restoring a riparian area, floating a river, preventing a species from going extinct, being part of an agricultural community and maintaining its historical connection to homesteaders, grazing cattle, or removing a dam.

Following Sen's capabilities approach, opportunities require both a consideration of the broad range of 'beings' and 'doings' (i.e., functionings) as well as the capabilities to realize such functionings, which may or may not be constrained by the environment at hand. A pragmatist EE approach would expand these constraints to include not only the environment, but the SES more broadly. That is, there are, for instance, institutions that facilitate or constrain the realization of functionings. Sen's approach was designed to better accommodate values beyond a nebulous utility. Again, 'values' is a challenging term, but normative sustainability requires a discussion of both underlying values and opportunities.

It seems that these values mostly refer to 'held values' as articulated by [Brown \(1984\)](#), who articulated the concept of value in natural resource 'allocation'. He referenced three types of values: held values, relational values, and assigned values. Held values were discussed in the 'conceptual realm', which referred to the underlying values that influence "the basis for preference about things and states of nature which are directly at issue in resource allocation" ([Brown, 1984:232](#)). Held values were categorized into instrumental (means values) such as frugality, generosity, courage, and fairness; and terminal (end) values such as happiness, freedom, beauty, and pleasure (these are akin to Sen's 'beings'). This definition highlights the unspecified nature of preference-satisfaction welfare; economics has typically ignored the basis for preferences by collapsing everything into utility. Assigned value was discussed in the 'object realm' as the "expressed relative importance or worth of an object to an individual or group in a

given context” ([Brown, 1984:233](#)). Assigned value can be unspecified, or specified: “thus, a forest may have assigned value in general (unspecified value) and have value for specific purposes, such as educational value, recreational value, commercial value, and food value” ([Brown, 1984:234](#)). Assigned value for an object is expressed through two different modes (i.e., actions or words) on multiple scales (e.g., ordinal). Lastly, relational value referred to the bridge between held values and assigned values because, as suggested by [Brown \(1984:233\)](#), value “arises from a preference relationship between a subject and an object”; it is this unobservable value at the “feeling level” that often gives rise to an expression of assigned value. Adopting normative sustainability as a theoretical foundation in a pragmatist EE requires that multiple held values are accommodated. How these values are accommodated is a question to be addressed within the methodological domain.

Another theoretical implication of adhering to the normative commitments of pragmatism is the shift from the rational-actor model to the more fluid, and potentially ephemeral, experience model described by Dewey and other pragmatists. The former assumes preferences that are stable and pre-existing, which are expressed in a linear fashion described by [Brown \(1984\)](#). The latter assumes that humans draw on previous experience, which includes potentially existing preferences, in addition to being shaped by current experiences. The implication of an experience-based model is that surveys, or other data collection methods, can themselves have an effect on peoples’ beliefs⁹. This is a critical point, as a pragmatist EE would view data collection

⁹ The reader may be thinking that this shift also invalidates much of what economic methods strive to accomplish, such as WTP estimates from non-market valuation surveys. I disagree, but it does highlight the partial understanding that WTP estimates provide, and it represents a stance that the rational-actor *model* is over-simplified. A pragmatist EE does not reject models, as simplified representations of reality are beneficial and needed tools for addressing complex problems. Instead, a pragmatist EE strives to document the inherent limitations of all models in a clear and transparent way through wary assessment. Better defining contexts (i.e., varied social and environmental conditions) where particular models are appropriate is part and parcel with this.

efforts as a way to get people to break habitual experiences (i.e., primary experiences) and, consequently, enter a ‘secondary’ experience where deep reflective thinking is engaged (as discussed in Section 4.1.2). Secondary experiences are where beliefs are affected and social learning takes place.

The final theoretical implication of a pragmatist EE is at the macro-level. Considering the systems within which individuals are embedded, a pragmatist EE adopts a complex systems view of the world. The choices people make are shaped by their varied social and environmental contexts, and the interrelationship between smaller systems nested within larger systems posits that considering isolated elements is inadequate. For example, clear cutting a portion of a forested ecosystem has implications for species biodiversity, nearby stream turbidity, increased economic opportunities, and lost (or gained) recreational opportunities. Additionally, though, it has implications for carbon sequestration, late-season river flows (which could affect autumn spiritual ceremonies of indigenous peoples and the realization of junior water rights), timber opportunities for future generations, and perhaps the desired ‘functioning’ of some population of people to *be a good steward* of the land. While those fully immersed in the conservation social sciences today may consider these additional implications obvious, it is a cognizance that is likely due in part to an increased focus on complex SESs and interdisciplinary research.

These broad theoretical implications of adopting pragmatism for research in EE have implications for methodology, several of which are discussed below.

5.2.2. *Methodological domain—an overview*

The methodological domain, as defined in Figure 2.1, encompasses: (1) research logic/design; (2) sampling units of observation; (3) data collection, measurement, representation and; (4) data interpretation and analysis. This section discusses a general methodology for a pragmatist EE by addressing a broad range of methodological considerations. Specifically, a pragmatist EE general methodology is discussed in six parts:

1. Discussion of the overarching need for holistic approaches that fully acknowledge the complexity of that being studied (research logic);
2. Identification of a core burning question – the study of the human-nature relationship embodied by individual people (research logic/unit of analysis);
3. Review of potentially fertile areas of existing knowledge for developing a holistic understanding of the human-nature relationship (research logic and design);
4. Discussion of fundamental considerations regarding human-nature relationship investigation (data collection and measurement);
5. Reflection on an example of an approach to understand the human-nature relationship (research logic, data collection) and;
6. Proposed guidance for interpreting human-nature relationship research (representativeness, and analysis and interpretation).

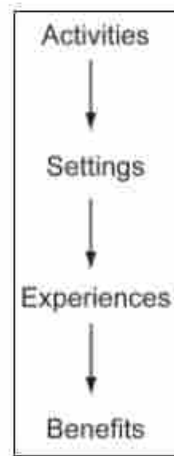
At times, discussions of these six methodological considerations are quite broad, as they represent the fundamentals of a pragmatist EE. However, in the subsequent two chapters additional detail is provided in order to add depth to the generalities discussed below.

5.2.2.1. Part one: Holistic approaches and the confrontation of complexity

As stressed in the introduction, the use of the term ‘holistic’ in the conservation sciences is prevalent. Interdisciplinary and transdisciplinary research are meant to address the complex environmental problems with holistic methodological approaches. A SES approach is meant to embrace the complexity and uncertainty associated with interrelated systems by striving for a holistic understanding. Above, Dewey’s view of experience is described as holistic. The need for acknowledging and confronting the complexity of SESs and the myriad problems that arise with holistic methodological and management approaches is often stressed. Indeed, a holistic view of science and how humans experience the world is consistent with a pragmatist EE. But, what does holistic mean within these contexts? I consider ‘holistic’ as synonymous with ‘comprehensive’, ‘integrated’, and ‘complexity-aware’, but the brief discussion below is worthwhile both because of the importance of language in pragmatism and because ‘holistic’ is commonly used in the conservation social sciences.

It may be worth starting with what ‘holistic’ is meant to oppose: overly reductionist approaches. For instance, a mainstream economic view of decision-making is quite reductionist, as people, in sequential order, consider a budget, their preferences, an invisible utility phase, and then a choice. The demand hierarchy (Figure 5.1), which underpins several recreation management frameworks, is reductionist. It conveys people’s demand for recreation with four distinct levels: (1) activities (e.g., fishing); (2) particular settings for such activities (e.g., pretty vistas with opportunities to catch fish); (3) experiences (e.g., adventure for stress relief and companionship) and; (4) benefits derived from recreation (e.g., a happy citizenry, weight loss, job opportunities).

Figure 5.1. Recreation demand hierarchy



Source: ([Driver & Brown, 1978](#); [McCool et al., 2007](#))

The reasons for reduction are likely obvious; they help humans, with their limited cognitive ability, make sense of the world. Models, as simplified representations of reality, help us to “better conceptualize, communicate about, understand and act on a forthcoming decision” ([McCool et al., 2015:304](#)). However, those calling for holistic approaches are not suggesting that modeling, or simplifying, complex phenomena should cease. Instead, there is a call for increased awareness of the dangers of simplification. For instance, the demand hierarchy, which is both historically dominant and prevalent today as the approach to recreation management, is one that shares a foundation with market-based approaches, whereby recreation experiences are assumed to be judged solely upon the associated settings, as represented by “collections of features or attributes” ([Williams et al., 1992:30](#)).

While this approach is beneficial in that it frames the management task as one of primarily ‘producing’ the right settings to meet the other demands in the hierarchy, relying upon this mechanistic, ‘commodity metaphor’ also has its limitations, including its perpetuation of the

“notion that recreation settings are theoretically interchangeable, even reproducible, given that the replacement provides a similar combination of attributes” ([Williams et al., 1992:30](#)). The notion of reproducibility and interchangeability (or substitution) has been challenged variously within the recreation arena ([Williams et al., 1992](#)), as well as the sustainability arena ([Norton, 2011b](#)).

It should be stressed that overly simplifying complex phenomena related to the importance of the environment is not only potentially a problem for EE. Indeed, the work focused on getting ‘beyond the commodity’ metaphor ([Williams, 2014a](#); [Williams et al., 1992](#)) is mostly presented from an environmental psychology perspective, which has a long history of applying consumer satisfaction research approaches to the environmental realm. Place research, which is itself a somewhat nebulous field of inquiry ([Patterson & Williams, 2005](#)), focuses on the complex relationship between people and places, and there is an ongoing debate regarding how such relationships should be assessed and discussed. [Williams \(2014a:93\)](#) referenced the risks of over-simplification in the context of place attachment research:

Taken too far, measuring attachment to separable components of place works against the holism embodied in the idea of place. For one, it reverts back to multi-attribute thinking, classic consumer satisfaction research, and environmental perception research in which the focus is on determining how much people perceive and value various aspects of a target object.

Primarily, Williams is cautioning against overly reductionist approaches that reduce relationships to place into component parts. With regard to normative sustainability, [Norton \(2015\)](#) cautioned similarly in this discussion of ‘chunking’ the human-nature relationship.

Models, or our simplifications of various phenomena, should be “based on an understanding of the complex systems with which we engage” ([McCool et al., 2015:304](#)). Within the conservation sciences, these systems are inherently complex. Individuals’ belief systems

about the environment and human management of that environment are complex, as are the workings of macro-scale SESs. Since a pragmatist EE is focused on these complex systems, at least in part, there is a need for methodological approaches that confront this complexity in an integrated, comprehensive, or holistic way.

5.2.2.2. Part two: A core burning question

Several times throughout this dissertation is the suggestion that claiming pragmatism as a theoretical foundation is rarely accompanied with specific implications for research practice. For example, the general points made in Section 4.2.1, such as the focus on ‘transferability’ and the benefit of flexibility, are often made only very generally. Similarly, I have stressed that EE provides more generalities than specifics. For example, what are the burning questions of EE? It seems the claim to study the interaction between the environment, the economy, and society is far too broad. As another example, how are equity, stability, and resilience operationalized?

This section attempts to contribute to the need for greater specificity. Because even though more integrated research is a general goal of a pragmatist EE, it seems worthwhile to attempt to narrow the focus within the context of complex SESs. Therefore, one burning question is suggested as the core element of subject matter within EE: “*what comprises the varied relationships that people have with the environment?*” This burning question is most certainly not the only question to be addressed within EE, but I suggest that all other questions stem from, or lead back to, relationships between people and the environment.

From a pragmatist perspective, this burning question is appropriate for two reasons. First, it acknowledges a reciprocity that is important to EE; humans are not only supported by the

environment, but they influence it as well. This influence can be both positive and negative, and recognizing a two-way relationship implies a mutual responsibility of stewardship for earth's finite resources. Second, with a focus on language, using 'relationships' instead of a term such as 'interaction' emphasizes the human responsibility and the dual goals of EE to describe the world while also encouraging action in a positive way. This two-way relationship is the primary difference between 'opportunities' and ecosystem services; the former implies the potential to draw stuff from the environment, but there is also a giving back element (e.g., restoration is an opportunity), while the latter is more about benefit flowing from nature to people (Bryan Norton, *personal communication*). Finally, the use of the term relationship implies an ongoing and dynamic connection between people and nature. Within the context of wilderness relationships, [Dvorak et al. \(2013:1520\)](#) noted that using relationships as a framing implies that peoples' connection to nature is not a static "singular mood or state of mind", but dynamic, cumulative, and enduring in the sense that they "develop over time and evolve as individuals renegotiate meaning across landscapes."

I suggest that studying the interactions between ecosystems, economies, and societies is too broad a focus for EE, but perhaps suggesting a focus on the composition of the varied relationships between people and the environment will be perceived as equally as broad. However, I assert that this burning question prioritizes the research programs within EE focused on valuation and values when coupled with the underpinning theory of normative sustainability. Other suggested topic areas, such as policies, governance, and institutions, global environmental issues, and technical change and the environment ([Castro e Silva & Teixeira, 2011](#)) are still relevant in that they: (1) relate to a macro-level SES and; (2) are motivated by making decisions in a way that can accommodate, sustain, or potentially alter relationships. The important

synergies between a pragmatist ecological economist and, say, a governance scholar and hydrologist is explored in chapter seven on SES research.

A pragmatist EE focused on relationships would prioritize development of methodological processes that could describe relationships in a way that is informative to decision-makers and capable of facilitating social learning. Following Dewey's version of experience, a relationship between a person (or community) and the environment should not be overly reduced to component parts, as stressed previously. However, there is still a need to define, to the greatest extent practicable, the complex relationships that people have with the environment. What makes up a relationship, and how do we understand and communicate it?

5.2.2.3. Part three: Relationship elements

From a pragmatist EE perspective, attempting to list or account for all the elements of the human-nature relationship is a futile effort. First, there are a variety of social and environmental contexts of interest to conservation social scientists, and the relationships are bound to vary across these different contexts. Second, human-nature relationships are complex and multifaceted, and different disciplines have historically thought of human-nature relationships in different ways. Despite the difficulties of clearly articulating that which is in a human-nature relationship, a pragmatist EE would adhere to the idea that a human-nature relationship is composed of those *elements* that influence, both positively and negatively, *individual well-being, social welfare, and the environment*. Both of these emphasized phrases are broadly conceptualized.

A pragmatist EE would start by assessing the relevant science to better understand what comprises a human-nature relationship. Such science includes, but is certainly not limited to,

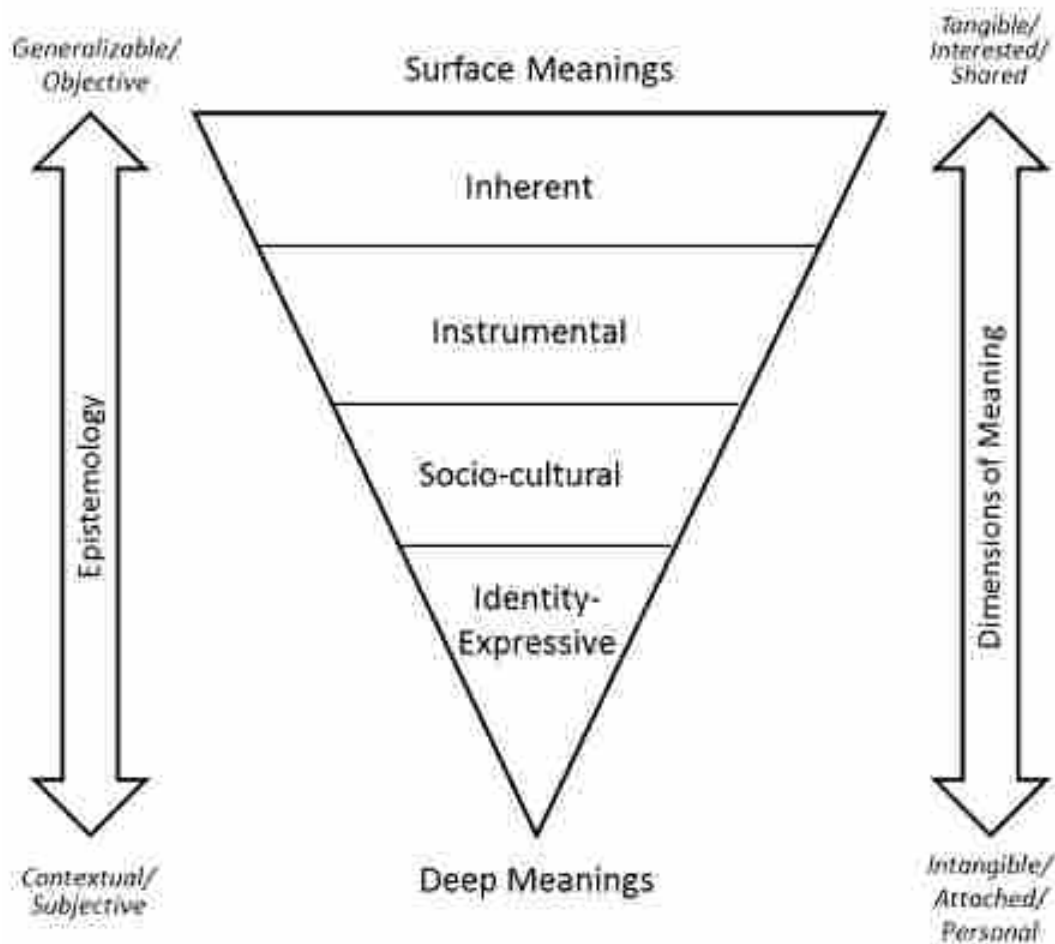
research related to ecosystem services, place¹⁰, and values. Again, values research could mean nearly anything, and future research synthesizing how disciplines that are particularly relevant to EE deal with the concept would be worthwhile. Immediately relevant disciplines include environmental psychology, ecology, conservation biology, economics, and environmental ethics and philosophy. While a full discussion of research related to ecosystem services, place, and values is beyond the scope of this work, a brief discussion may help to clarify the variety of elements that potentially constitute a human-nature relationship.

But first, Figure 5.2 is a useful framework for thinking about different general elements of the human-nature relationship. [Williams \(2014b\)](#) developed Figure 5.2 to help describe and organize the plurality of ways that research programs have addressed the concept of place. Meanings associated with relationships to places were thought of as inherent, instrumental, socio-cultural, and identity-expressive. Inherent meanings are those that are perhaps most generalizable, and they are often associated with material features of place that generalize from place to place and perhaps person to person. For instance, a scenic mountain vista, or high quality water are generally desired by all people and inherent in human-nature relationships. Instrumental meanings are associated with the physical properties of a place that contribute to desired behavioral or economic goals (e.g., fishing, timber resource). The third, socio-cultural layer refers to the elements of a human-nature relationship which are “socially or symbolically constructed within the cultural, historical, and geographical contexts of day-to-day life.” Such elements could include the connection to agricultural lifestyles in the western United States, where homesteading history, and irrigation of a mostly desert landscape have, in part, resulted in

¹⁰ Williams (2014) noted that because place research recognizes that relationships between people and locations are often a mix of natural and human-built environments, the use of ‘place’ instead of ‘environment’ or ‘nature’ is used. The relationships of interest to a pragmatist EE certainly include both built and natural environments, but in order to prevent conflation with place research I have refrained from using this term.

a highly studied human-nature relationship. Finally, there is the highly individualized identity-expressive layer. These elements of the human-nature relationship may be deeply personal, such as that associated with a place where a loved ones ashes were spread.

Figure 5.2. Relationship layers



Source: Adapted from [Williams \(2014b:77\)](#)

While Figure 5.2 was developed within the context of place research for the purpose of sorting through the plurality of ways that research programs have dealt with the concept, it may also provide a starting point for pragmatist EE to conceptualize the different main components of human-nature relationships. [Williams \(2014b\)](#) made the point that within place research, particular methodologies are more suited for investigation of particular meaning layers. This point holds true *within* values research and ecosystem services research, but the framework could also be considered in another way.

Particular concepts (e.g., place, ecosystem services) are perhaps more appropriate for articulating different elements of a human-nature relationship. Thinking of Figure 5.2 this way shifts thinking away from investigations of different research programs within the context of a particular big idea (e.g., place), to thinking *across* different big ideas for the purpose of a more comprehensive understanding of the human-nature relationship. To this end, a pragmatist EE might benefit from starting with the conceptual content of different big ideas. In an attempt to clarify what I mean, I briefly discuss ecosystem services, ‘human ecological meanings and services’ (an idea influenced by place research), and Sen’s capabilities approach and the incorporation of values.

Ecosystem services

The ecosystem services concept has made progress in identifying the connections between human well-being and the environment. The connections are most commonly thought of in terms of the benefits or human uses of nature. In relation to Figure 5.2 above, this common conceptualization of ecosystem services would suggest that the top two layers of the human-nature relationship are the focus. In full recognition of it being overly reductionist, Figure 5.3

illustrates those terms that may be commonly associated with ecosystem services. The word cloud was derived solely from a table in [de Groot et al. \(2002:396-397\)](#) after a removal of irrelevant words (determined somewhat arbitrarily). The typology developed by [de Groot et al. \(2002\)](#) represents an early and seminal ecosystem services typology, which connects ecosystem functions (e.g., “water regulation”, “recreation”, “spiritual and historic information”) to processes (e.g., “variety of natural features with spiritual and historic value”) to services “Use of nature for religious or historic purposes”.

The word cloud is a combination of functions, processes, and services. This may seem problematic because the subject of this section is ecosystem *services*, but the distinction between functions, processes, and services in practice is not all that clear. The most obvious example is the listing of ‘recreation’ as a function as opposed to a service. This lack of clarity reflects the challenge of reducing the complex human-nature relationship using a single framework such as ecosystem services. Nonetheless, the focus on human uses is perhaps the most common association with ecosystem services. That is, the concept does not generally ask the question as to why recreation is important (e.g., spiritual renewal, family bonding), but more as to what is important (e.g., boating, open terrain for snowmobiling). This reflects a greater focus on assigning value to the latter, as opposed to an investigation of the held values underlying why boating, for instance, is valuable. It follows then that ecosystem services, while without a settled definition ([Wallace, 2007](#)), is often criticized for its narrow economic framing. The focus on what recreation activities are important without much attention to the reasons (e.g., motivations, expected benefits) for recreating is reflected in the search for ecological endpoints ([Boyd & Krupnick, 2009](#)), service providing units ([Kontogianni et al., 2012](#)), and the definitive way to

[al., 2014](#)) and the focus on better accommodating cultural services¹¹ (e.g., [Bostrom et al., 2012](#); [Chan et al., 2012](#)). Like many concepts that are meant to be all-encompassing, as the ecosystem services concept gains popularity there appears to be less consensus regarding its definition or the appropriate typology for best understanding it. Some view this as an issue that needs to be resolved with a consistent definition and typology (e.g., [Wallace, 2007](#)), while others view it as a strength of the ecosystem services concept in that it is a flexible idea that can be adapted for multiple applications (e.g., [Costanza, 2008](#)).

On this debate of consistent definition versus flexibility, a pragmatist EE would make two points. First, flexibility is indeed a benefit, because different problem contexts will require different deliberative discussions, and thinking of ecosystem services in multiple ways may help those with conflicting interests communicate. If the term ‘ecosystem services’ can orient people at the table toward the human-nature relationship, then that is positive. But, it is important to stress that the ecosystem services concept is most commonly associated with economics, monetary valuation, nature commodification, and the reduction of everything nature provides to a single metric (primarily the instrumental layer on Figure 5.2). Many are working toward revising this preconceived idea but, despite that, the notion is prevalent.

This leads to the second point: language matters. Using the term ‘ecosystem services’ may not resonate with particular people, and it could be co-opted in a way that influences decision-making away from normative sustainability. Pragmatist EE should not ignore this possibility of using the ecosystem services concept, and the language embedded in it. Indeed, [Bekessy et al. \(2018\)](#) presented a critique of ecosystem services as a communication strategy,

¹¹ Cultural ecosystem services are broadly defined, by [Hein et al. \(2006\)](#), as those benefits derived from nature related to recreation, cognitive development, relaxation, and spirituality. In economic parlance, these include non-use values and option values, as well as direct use values, and those values related to spirituality and non-use, for instance, are quite challenging to monetize and enumerate.

and suggested that the concept may undermine public engagement. On the other hand, it is also important to understand that the ecosystem services concept is indoctrinated in some ways (i.e., explicitly called upon in policy documents), such as within the 2012 Forest Planning Rule—the guiding document for United States National Forest Planning ([U.S. Department of Agriculture Forest Service, 2012](#)). In other words, the ecosystem services concept, for better or worse, must be engaged within the context of National Forest planning.

Regardless of how ecosystem services are conceptualized, such research can highlight the various elements that *partially* constitute a human-nature relationship, including: environmental conditions (e.g., biodiversity, non-fragmented habitat, water quality, water quantity), environmental functions (e.g., carbon sequestration, nutrient cycling), recreation activities (e.g., private boating, commercial recreation), livelihoods or historical connections to the land (e.g., ranching, farming, homesteading culture), and/or raw materials (e.g., timber, oil and natural gas, food, medicine). To be clear, these different ecosystem services are not types of relationships, but constitute parts (or elements) of a relationship. Returning to the point made in Section 1.3.1, I am in agreement with [Flint et al. \(2013\)](#) that ecosystem services are not a type of relationship, but instead a concept that can capture a portion of the human-nature relationship (which may be large or small depending on context and individual/community).

After more than three decades of ecosystem services research, there are plenty of sources within the literature that could help to identify different elements of the human-nature relationship. Even though the ecosystem services concept may be subject to caricature descriptions, the goods-and-services language has almost certainly led to a focus on the benefit of the more tangible aspects of nature at the expense of understanding meanings and underlying

held values (i.e., the top two tiers of Figure 5.2). This means that the ecosystem service concept is not capturing all that comprises a human-nature relationship.

Human ecological meanings and services

Another way to conceptualize parts of the human-nature relationship is through “human and ecological meanings and services” (HEMS), which was coined by [Williams and Watson \(2007\)](#). This idea was intended to encompass the various benefits that humans associate with nature without relying on a narrow economic focus; it was meant to get ‘beyond the commodity metaphor’ ([Williams, 2014a](#); [Williams et al., 1992](#)). The research underpinning HEMS is primarily relationship to place research. The distinction is between ‘functional’ orientations to place, as defined by the capacity of places to meet specific needs and goals (i.e., human ecological meanings and *services*), and ‘symbolic’ orientations to place encompassing the representation of identity and cultural values (i.e., human ecological *meanings* and services) ([Williams, 2014a](#)). A functional orientation to place might consider benefits such as survival and security, self-regulation, goal attainment (e.g., a kite surfer visiting a place because of wind conditions), and achieving a stable sense of self ([Scannell & Gifford, 2010](#)). A meanings orientation might find a place to symbolize ‘escape, back-to-nature and simplicity’, ‘centrality and identification’, ‘obligations’, and ‘community and social interactions’ ([Van Patten & Williams, 2008](#)).

One could argue that ecosystem services can accommodate meanings, but explicit use of the term meanings both reflects the pragmatist focus on language and an explicit acknowledgement that human-nature relationships are comprised of elements that are perhaps obscured by the ecosystem services framework. Unsurprisingly, given the roots of place research

in environmental psychology, these elements are more inward looking through an assessment of what feelings are associated within the person-place relationship. These elements are reflected in the place word cloud (Figure 5.4), which was derived from [Huang et al. \(2016\)](#), a Q-methodology study on place meanings associated with travel destinations. This article has only a few citations, but it was chosen because it included 48 items related to place research, which is a higher number than is generally included in place research focused on creating constructs through typical psychometric approaches. Furthermore, choice of a Q-study primes the discussion below where I argue that Q-methodology can provide a nice middle ground between overly reductionist approaches and purely holistic (usually qualitative approaches).

A general point made by [Williams \(2014b\)](#) is that place research has, overall, focused on all the different layers of meanings (Figure 5.2). However, there are two points to be made about place research that may distinguish it from ecosystem services research, which may be mutually beneficial for synthesis purposes and, consequently, a more comprehensive understanding of the human-nature relationship. First, the incorporation of more qualitative approaches such as phenomenology, and the incorporation of particular disciplines such as environmental psychology and human geography ([Williams, 2014b](#)), have resulted in a robust amount of literature focused on the bottom two tiers of Figure 5.2 (i.e., socio-cultural and identity-expressive). Second, even the more generalizable research, which may be better suited to instrumental and inherent meanings, often focus less on what a place provides in terms of goods, services, and human uses. In other words, the various ideas developed within place research, including place identity, place attachment, place dependence, rootedness, genius loci, topophilia, and place-making ([Williams, 2014b](#)), often move beyond the instrumental meanings.

For instance, [Jorgensen and Stedman \(2001:241\)](#) break the relationship to shoreline lake properties in Wisconsin into three parts: (1) place identity (e.g., “I feel that I can really be myself at my lake property”); (2) place attachment (e.g., “My lake property is my favorite place to be”) and; (3) place dependence (e.g., “For doing the things that I enjoy most, no other place can compare to my lake property”).

Figure 5.4. Place word cloud



As another example, which explicitly uses relationship terminology, [Dvorak et al. \(2013:1525\)](#) conceptualized the relationship to the Boundary Waters Canoe Area Wilderness to include five parts: (1) place identity (e.g., “the boundary water is very special to me”); (2) trust in the management agency (e.g., “I share the Forest Service’s goals for the boundary waters”); (3) commitment to the management agency (e.g., “the connection I have with the Forest Service is something I really care about”); (4) Place meanings (e.g., “the boundary waters wilderness is a place to escape from civilization”) and; (5) Place dependence (e.g., “No other place can compare to the boundar waters”).

Sen’s capabilities and other values

By design, Sen’s capabilities approach is an empty framework in that its functionings (beings and doings) could include anything. Nonetheless, it may help in thinking about how environmental values research, in a more nebulous way, can further define that which comprises human-nature relationships. Following this approach, *being* a good steward or *being* free from social pressures may be an important part of the human-nature relationship for some, and the opportunity to realize this functioning depends on capabilities (e.g., availability of volunteer options and areas without cellphone service). Like the HEMS concept, Sen’s capabilities approach is intended to *explicitly* accommodate a wider range of held values and meanings. Figure 5.5 is the final, methodologically-weak word cloud, which is derived from [Tanner et al. \(2008\)](#) and [Nelson and Vucetich \(2013\)](#). The former is a meta-study of values across four protected areas in the United States, all of which used the same 24 scale items (e.g., an economic resource; a family or individual tradition); the word cloud was based upon those scale items. The latter reference is entitled *Wilderness, Value of*, and it includes 30 arguments for Wilderness

Word clouds are chaotic, and this section is somewhat chaotic. This is partly by design, because the reality is that human-nature relationships are chaotic when considered across all people. A pragmatist EE consider relationships to include elements that are both tangible and intangible, and long-lasting and ephemeral. To clarify what is meant by long-lasting and ephemeral, consider the following distinction made by [Williams \(2014a:93\)](#): “what differentiate aesthetic experiences from attachment is that the former is an immediate (sensory) response whereas attachment implies something that builds up and evolves over time.”

Having briefly outlined the complexity and variety of relationship elements, where does a pragmatist EE turn? I assert that a pragmatist EE should focus less on reducing the relationships between people and the environment into elements that are easily categorized and universally applicable. For decades, scholars have developed *partial* frameworks and concepts such as place and ecosystem services, and they have developed specific instruments to assess such ideas for the benefit of more sustainable and equitable decision-making. While these ideas continue to advance, a pragmatist EE sees the need to synthesize, or perhaps just add together, partial understandings. In other words, how do ideas such as ecosystem services, place, and human-nature values inform or strengthen one another?

To this end, it is suggested that what is needed are *processes and procedures*, whereby people can express their relationships with nature within the context of particular decision-making situations. These processes may be generally applicable, but the specific results will likely not yield generalizable laws. This is another way of saying that there is not a lack of a general understanding of what comprises a human-nature relationship (as broadly defined herein), but instead there is a lack of processes that can be practically implemented within real decision-making contexts that yield an understanding of disparate human-nature relationships.

We do not lack well-formed, top-to-bottom theory of partial understandings at this point (e.g., ecosystem services), as scholars working mostly within disciplines have for many decades considered human-nature relationships from a variety of angles, as shown by [Flint et al. \(2013\)](#). What we lack is methodologists who can create and pass along manageable ways to understand human-nature relationships in a way that directly supports the decision-making needs of those facing the public every day.

Of course, working to improve, say, rational-actor theory, the theory of planned behavior, or the theory of reasoned action is worthwhile research. We should continue to hone all *partial* understandings, but a pragmatist EE would hold that, individually, they will never be more than partial within the context of complex environmental problems. Wicked problems need more holistic approaches ([Norton, 2012](#); [Xiang, 2013](#)) and, to reiterate, whether true convergence ever happens is an open question. Peirce would say that it will happen with infinite inquiry.

5.2.2.4. Part four: Basic considerations for understanding relationships

A pragmatist EE, when aiming for normative sustainability, needs to address three big, interrelated problems when trying to understand human-nature relationships: (1) the holistic individual relationship; (2) potential aggregation and/or considerations of representativeness and generalizability and; (3) communication and social learning. The first problem is the focus of this section, which is followed by a shorter discussions related to the second problem. Regarding this ordering, it should be stressed that the three problems are not necessarily addressed sequentially. Also, communication and social learning is not a step in the process per se; ideally, it should inspire and influence all steps of a research process. With regard to social learning, there are many potential avenues of future research.

Considering the focus on understanding and conveying human-nature relationships, a pragmatist EE aspires to take a contextual and transactional approach. The term ‘transactional’ is applied in at least three different contexts that are relevant to this dissertation. The first is with regard to the human-nature relationship itself. That is, by framing the connection between humans and nature as a relationship, it is implied that there is a give and take, whereby individuals are active participants in the creation of relationships with nature ([Cole & Williams, 2012](#); [Dvorak et al., 2013](#); [Watson, 2004](#); [Watson et al., 2011](#)). The second way the term is used is with regard to methodology, where the researcher does not impose too much structure on the participant, but allows meaning to emerge through free-flowing methodological processes (this meaning of transactional is elaborated upon in this section). The third way a pragmatist EE is transactional is through communication and social learning. Debate and deliberation are transactional in that people can, in theory, learn and change through their interactions with one another.

Citing [Altman and Rogoff \(1987\)](#), [Williams \(2014a:90\)](#) noted: “a transactional approach does not unilaterally impose measures on an event, but it derives them from the event. What generalizes from study to study is not the measure, procedure, or technique but the construct and theory that underlies the research.” This quote is unpacked with three main discussion points.

First, a transactional approach stresses that a human-nature relationship should not be assessed solely through pre-selected researcher categories; there needs to be room for people to express diverse relationship elements. [Williams \(2014a:96\)](#) explained:

One can certainly ask respondents to rate a place in terms of their perceptions of its material and symbolic properties. But this is not the same as investigating what the place represents symbolically to an individual, community, or culture. From an interpretive or qualitative perspective, meaning is not so much a property of

the person or object, but a transaction between the two mediated through culture, social interaction, and individual past experience.

Asking both about properties and meanings can provide useful knowledge about a relationship, and a pragmatist EE recognizes the differentiation. As such, a pragmatist EE works to develop general research processes that can yield a more comprehensive understanding. As [Norton \(2005:563\)](#) suggested, improving a language to discuss environmental problems “emphasizes the open-ended and creative task involved in learning how best to describe and classify our experiences. Describing the world is more like painting a picture than taking a photograph.”

This analogy stresses the relative lack of precision in describing human-nature relationships, though it does not preclude the existence of technique and methodical process. Reductionist approaches resting mostly on positivistic paradigms aim for precision but, in the case of the conservation social sciences, the phenomena being studied are often inherently convoluted. Not that aspiring to precision, as most quantitative approaches do, is wasteful, but instead it implies that a *partial* understanding of a particular type is being derived. [Williams \(2014a\)](#) distinguished between research focused on quantifying the strength of bonds to a place (i.e., *degree* of attachment to place) and primarily-qualitative research focused on characterizing experiences and meanings as *kinds* of partial relationships.

The second point is that the generalizability of the underlying construct and theory refers to the paradigm being applied in research, and the normative commitments attached to such paradigms. For instance, a positivistic paradigm sees peoples’ actions as atomistic (as in the rational-actor model), whereas a pragmatist paradigm conceptualizes peoples actions as being driven by diverse, multifaceted beliefs (as per Dewey’s experience). Again, the normative commitments in a researcher’s mind should be consistent, but that does not mean research stemming from the different paradigms cannot yield mutually-informing knowledge.

This is the point stressed by [Williams and Patterson \(2007\)](#) in their critical assessment of an attempt to mix quantitative and qualitative methods. The authors contend that the issue, in the case of the particular application of interest, is not an attempt to mix methods but the unintended mixing of paradigms in a *single* analysis. To summarize, the issue the authors raise is that an ethnographic study is employed with qualitative interviews for the benefit of attaining a rich understanding of place meanings; however, a quantitative analysis of this rich data counteracts this potential benefit. The main message conveyed by [Williams and Patterson \(2007\)](#) is two-fold: (1) the unintended mixing of paradigms leads to an inability to assess the quality of knowledge and; (2) perhaps most importantly, the mixing of paradigms results in a situation where the strength of the different approaches (i.e., positivistic and interpretivist) is lost without a corresponding gain elsewhere.

The third, and final, point related to the initial quote above (i.e., [Altman & Rogoff, 1987](#)) is that the lack of generalizability to the ‘measure, procedure, or technique’ refers to the methods, or specific practices. A researcher can employ a variety of different methods within a positivistic, constructivist, or pragmatist paradigm, but the interpretation and implementation of such methods will differ depending on the researcher perspective.

In full recognition of these three points, a pragmatist EE proceeds cautiously with the development of general methodological processes that can potentially draw from the strengths of both ‘kind’ and ‘degree’ approaches. A pragmatist EE general methodology requires that homage is paid to all layers in Figure 5.2 or, at the very least, if particular layers of the relationship are not explored, then this should be explicitly stated.

5.2.2.5. A general process for investigating human-nature relationships

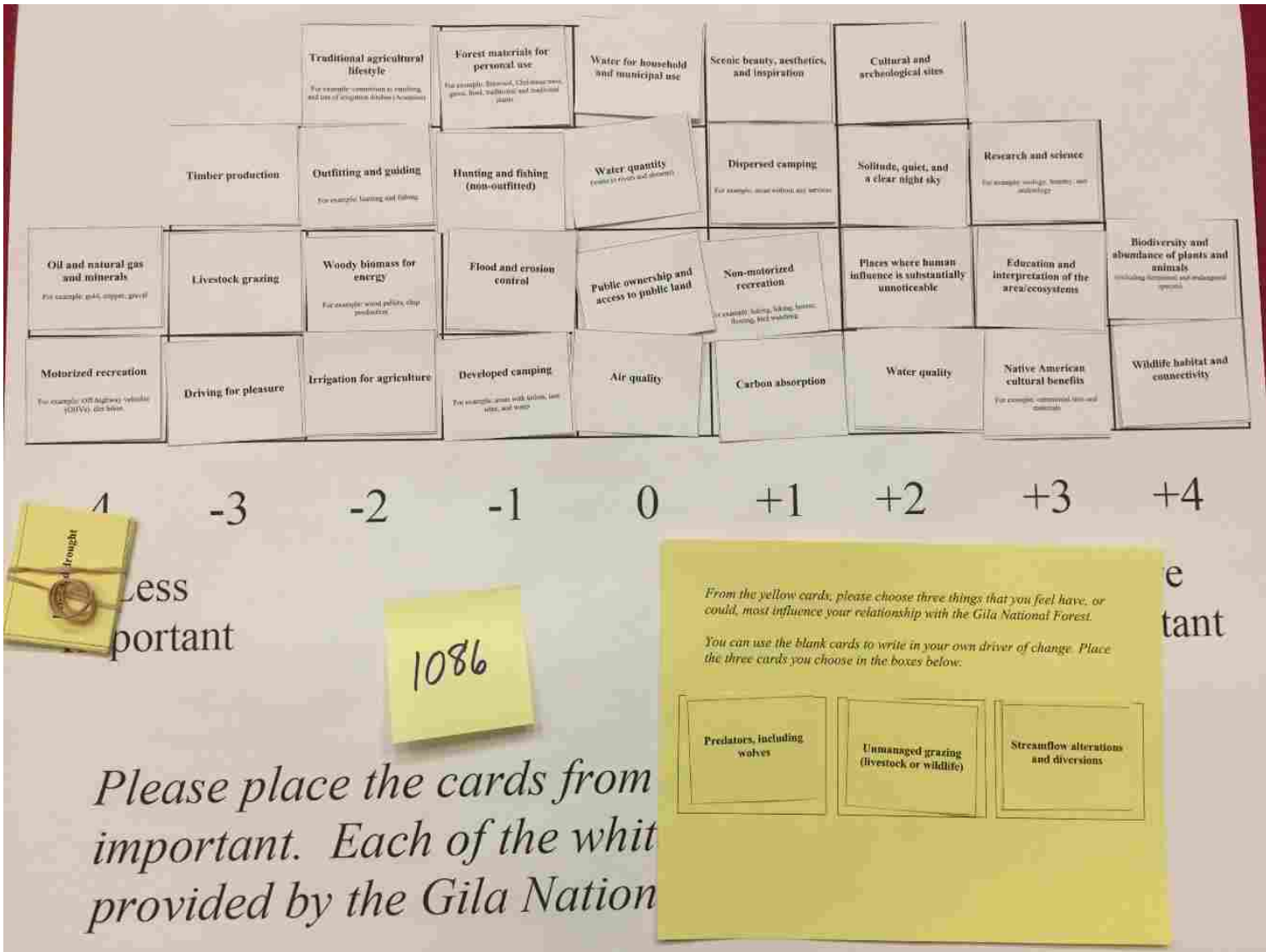
An example of a process that may be practically applied in a variety of decision-contexts is detailed by [Armatas et al. \(In Press\)](#). The application is based upon Q-methodology, but the process involves two main steps: (1) focusing in on the elements of the human-nature relationship and; (2) considering the drivers of change potentially influential to such relationships. Q-methodology is a method that has both qualitative and quantitative elements; and, appropriately, it was recently highlighted as a suitable method for EE ([Davies, 2017](#)). A brief review of Q-methodology can highlight why it is a potentially appropriate method for understanding human-nature relationships. Then, examples from the evolving and long-term research project detailed in the introduction are provided to support the assertion that this methodology can be implemented in a variety of decision-making contexts.

Q-methodology is a social science method with roots in psychology ([Brown, 1980](#); [Stephenson, 1954b](#)), which focuses on individual and subjective viewpoints about a topic of interest. The basic procedure in Q-methodology is to have a purposeful sample of individuals sort 30-50 items related to the topic of interest along a quasi-normal distribution. These items could be almost anything, but most often they are opinions or statements that capture, to the greatest extent practicable, the full range of ideas about some topic. The most appropriate topics are those which are controversial, involve tradeoffs and/or have the tendency to elicit conflicting ideas, such as decision-making within the context of complex environmental problems. The 30-50 items are developed through focus groups, meetings with experts, informal discussions, study-area-specific literature and anything else that can provide valuable insight into the place-based relationship. Ideally, the items draw on locally understandable language (i.e., respondents own words). The items are sorted relative to one another along a scale (defined numerically

and/or categorically); therefore, respondents are required to make tradeoffs and select items that are positively salient, negatively salient, and more neutral (Figure 5.6). The scale is relative, as the numbers have no 'real' values. Indeed, those that put the items in the same category may not assign the same importance to the item. Typically, this sorting exercise ('Q-sort') is accompanied with a follow-up interview to understand reasons for a respondent's sorting, as well as some basic demographic questions. The Q-sorts are factor analyzed to yield a limited number of general archetypal perspectives which are developed based upon respondents who sorted the items in a similar fashion.

There are a couple advantages of Q-methodology for the purpose of understanding a human-nature relationship. First, the method includes a fun, interesting, and challenging and thought-provoking exercise, where people grapple with a broad range of elements related to their relationship. In our experience, it is not uncommon to hear such superlatives from respondents, and people often take pictures of their completed Q-sort. Second, the method is conducive, and explicitly designed, to combining the Q-sorting activity with an interview whereby people express their reasoning for the Q-sort. This can yield a rich understanding of meanings related to the diverse relationships being expressed. For instance, in the study focused on understanding relationships between people and water derived from the Shoshone National Forest in Wyoming and Montana, a respondent who aligned with the 'Native American' perspective explained why cultural and spiritual values were so important: "Our way of governing, our way of teaching, our love for each other came from that River corridor...that is our stories, we come out of the water" ([Armatas, 2013:260](#)).

Figure 5.6. Example of completed Q-sort on Gila National Forest. Sorted ecosystem services and drivers of change selected



As another example, a respondent who aligned with the ‘Agricultural’ perspective discussed the importance of agricultural community, commercial irrigation, and history; a combination which nicely highlights human ecological *meanings and services* (HEMS):

I think it is important to understand that we are dependent on this commercial irrigation, though, I do not think of myself as a commercial irrigator. It is a huge enterprise, it is what we are dependent on. We would live in a desert valley if it were not for that, and all of the service industries that serve us like the fuel guy, the fertilizer, all the dealers that supply seed; they would have to be gone because we would not be here. Then you got the parts man, and the guy that fixes the tractor, and the guy that owns the tractor shop, the guy that services my pickup, there are just so many spin-offs of that. In ways too, it is just part of the history. We are in the museum cultural center [referring to the site of the interview] here in Hot Springs County, you look around and almost all of the; you look at the old photos and there is a doctor, but he also had a ranch. Or there is a dentist and he had, or there is a cobbler and they had a place up Owl Creek. They are all dependent on [commercial irrigation], so it is woven into a web. ([Armatas, 2013:256](#))

The third benefit of Q-methodology, from the perspective of a pragmatist EE, is that it is considered holistic. This case can be made, in part, because Q-sorts are analyzed as single entities. Each Q-sort represents a person’s sorting, which means that those people are not being broken into constituent parts ([Brown, 1980](#); [Watts & Stenner, 2012](#)). For instance, people are being grouped based upon their sorting of *all* the items. Interrelatedly, the holistic case can be made because all the items are sorted relative to one another. While components of the human-nature relationship are separated into constituent parts (as reflected in Figure 5.6), the fact that the respondent considers and sorts all of them does create a more comprehensive picture than, say, a list of scaled questions on a survey where one could theoretically answer the same way to every question. The implications of this type of analysis and process (e.g., forced choices) are numerous, and there are both strengths and limitations. In the spirit of wary assessment, a detailing of these implications is articulated in the next chapter.

Simply suggesting Q-methodology as the basis for a generally applicable process to understand human-nature relationships is inadequate. There is a need to provide further details within the context of conservation social science. For these details, a few examples from the ongoing research project outlined above are provided, which includes [Armatas et al. \(In Press\)](#) as the most recent development. This publication is entitled: *Protocol for Social Vulnerability Assessment to Support National Forest Planning and Management: a technical manual for engaging the public to understand ecosystem service tradeoffs and drivers of change*. The protocol outlines a step-by-step process for understanding human-nature relationships and the potential influences to such relationships. This protocol does not define ecosystem services in a single way, and it does not suggest that the same ecosystem services would be used to define relationships in all contexts. To show the flexibility in how ecosystem services are defined, consider the differences between the application of the protocol on the Shoshone National Forest for forest plan revision ([Armatas, 2013](#)), the Gila National Forest for forest plan revision ([Armatas et al., 2017b](#)), and the Flathead Wild and Scenic River system for comprehensive river management planning ([Armatas et al., 2019](#)).

On the Shoshone National Forest, respondents sorted 34 water-based ecosystem services, all of which fit into a cultural, provisioning, or regulating category. Whether the ecosystem service was biodiversity, water for fighting fires, water for commercial irrigation, or water for cultural and spiritual use, the approach was more aligned with understanding the instrumental (as reflected by objects, activities, or uses) benefits of nature. Even though there were ecosystem services related to the bottom two tiers of Figure 5.2 (i.e., socio-cultural, identity-expressive), such as ‘preserving lifestyles, livelihoods, and landscapes’ (agricultural community) and ‘Native American cultural and spiritual values’, there were still instrumental meanings attached. For

instance, the latter ecosystem services was defined as follows: “the water resources in the study area have special meaning to Native Americans, and can be *used* for cultural, spiritual, religious and ceremonial *purposes*” ([Armatas, 2013:202](#)). This phrasing implies meaning in at least three of the four tiers of the relationship, but the instrumental element is prominently referenced with the emphasized language.

It is worth noting that the follow-up interviews did capture the instrumental elements. A respondent related water quality to cultural and spiritual values of the Crow people: “It has been with the Crow Indians for a long time, the so called ‘Sweat’, and it is very important. When you have no place to sweat or dip [in the river] after that, you do not want to dip in the river so that affects that, you know, the pollution that goes into that river” ([Armatas, 2013:260](#)). Clearly there are deeper, lower-tier meanings embedded in this quote (and such meanings were elaborated by a different participant above), but the more instrumental need for clean water within the context of this culturally and personally meaningful event is implied too. It reinforces the interrelation between the different meaning tiers, as well as the breadth and complexity of human-nature relationships.

The approach of having respondents sort primarily instrumental elements changed slightly when a similar study was performed for the benefit of Forest planning on the Gila National Forest, which expanded the scope beyond water to the forest more generally. For the Gila National Forest project, respondents sorted 30 ecosystem services related to the forest, but this time there were ecosystem services that did not neatly fit into the typical categories, including “public ownership and access to public land” and “places where human influence is substantially unnoticeable”. It could be argued that these ‘ecosystem services’ are not purely instrumental, but align more with the deeper meanings in Figure 5.2. On the Flathead Wild and

Scenic River project (still ongoing), both the scale of analysis (river system level versus forest or region wide) and the driving policy mandates (Wild and Scenic River Act versus NFMA and Forest Planning Rule) are different. While the results from the Flathead study are not yet available, the elements of the human-nature relationship to be considered by participants span the tiers of Figure 5.2. This is partly due to a management focus less on the multiple use mandate, and more on the protection and enhancement of outstandingly remarkable values (ORVs). Tentatively, human and ecological meanings and services (HEMS) to be sorted by members of the public include: ‘being free from society and its regulations’; ‘personal achievement from testing skills in primeval and challenging conditions’; ‘solitude, peace and quiet, clear night sky’; ‘economic support to local communities’ and; ‘rustic lodging in forest service cabins’. In this decision-making context, the more tangible services are combined with the more intangible meanings.

In all three applications of this process (i.e., Shoshone, Gila, Flathead), a ‘drivers of change’ component was, or will be, included. This component has individuals indicate factors or influences (e.g., management actions, impacts from climate change, too many regulations, closing of trails), both positive and negative, related to their relationships with the natural resource of interest. The need to understand drivers of change is based upon the idea that it is not only important to understand how nature supports well-being, but also what could influence that well-being. This was an interest of the Millennium Ecosystem Assessment, and is stressed within several SES frameworks. A focus on drivers of change is also consistent with Sen’s capabilities approach, as functionings only become opportunities when one is capable of achieving such functionings. Sen articulated ‘conversion factors’ as a way to represent the path from

functionings to capabilities, and drivers of change is one way to think about that which impedes or facilitates this journey.

Furthermore, and perhaps most importantly, complex environmental problems are often characterized by the involvement of individuals or communities whose functionings compete in a way. That is, there are potential tradeoffs, for instance, between maintaining a livelihood in the timber industry and achieving spiritual renewal through birdwatching. In light of this, a pragmatist EE should focus on how different relationships could influence one another. In sum, our varied relationships with nature may conflict and, additionally, there are influential exogenous factors.

5.2.2.6. Guidance for interpretation of human-nature relationship research

To briefly review, the general process proposed above is an assessment of human-nature relationships. While the example relies mostly on the ecosystem services metaphor, a pragmatist EE would suggest the human-nature relationship is comprised of a variety of elements, including already existing concepts such as Sen's functionings, opportunities, and capabilities, the variously defined ecosystem services, and/or HEMS. Articulating any of these metaphors in a thorough way will require public engagement, literature review of study area specific literature, and the engagement of literature within multiple disciplines. Additionally, the drivers of change component is essential, as it generates thinking about the general problem of protecting and nurturing those relationships in a normatively sustainable way. And, to that end, it points us toward the various synapses of SESs. This is critically important, because it connects

relationships to the complex SES at large, at least in a fuzzy, fallible, and humility-laden¹² sort of way. This idea is explored in chapter 7.

Also, it should be noted that Q-methodology need not be involved, though it is an appropriate approach for public engagement. It is based upon abductive reasoning, and is systematic, well-established, and supported by a very engaged community. While the latter point may sound odd, it is worth mentioning the tremendous commitment of the Q-community (with an online gathering place at a Kent State Listserv). Questions posted several times a day are thoroughly engaged with by Q-methodologists. With a spirit of wary assessment, the Q-community is a good audience for a pragmatist EE.

The question then is what can be said generally about interpretation, or perhaps other related goals, of the research process proposed above. That is, when it comes to implementing the general human-nature relationship study, how would a pragmatist EE interpret the results or, relatedly, what elements of the research process might be honed to further the goals of decision-making of managers and planners, as well as social learning and communication? First, regardless of the chosen method, it is ideal to engage the public at all steps of the process within the context of interest (e.g., Shoshone National Forest, Gila National Forest). That is, primary data collection and dissemination of results is ideal. This could potentially allow for public deliberation and engagement, which is an integral facet of communication and social learning. However, if, for instance, a forest planning team is planning the revision of their forest plan and

¹² Be leery of those who project extreme confidence in their exact and precise explanation, understanding, and prediction of SESs (or the human-nature relationship for that matter). Because, fundamentally, the ultimate Peircean truth sought by SES research is to understand through models and frameworks the entirety of universe, in all its complexity. Of course, this is an unreachable truth at the end of infinite inquiry. As Aldo Leopold said, according to the poster overlooking the microwave of the Aldo Leopold Wilderness Research Institute: “no matter how intently one studies the hundred little dramas of the woods and meadows, one can never learn all the salient facts about any one of them.” Turns out he wrote this too, as he reflected about the natural wonders taking place in the month of April ([Leopold, 1966:35](#)).

do not have the capacity to engage the public with a research project, might there be something to learn from other studies on the human-nature relationship?

This question is implicitly referencing the idea of external validity, or the extent that results about the human-nature relationship (or the methodological process for investigating them) are applicable to other contexts. This is a major issue for science generally, and is the topic of the remainder of this section. Following the general interpretive guidelines outlined in Section 4.2.1, as well as the ontological assumptions related to the how humans experience the world (i.e., a rejection of atomistic human experience), a pragmatist EE should strive for ‘transferability’. This contrasts, or is an attempt to move beyond the dualism related ([Morgan, 2007](#)), to complete generalizability (i.e., law like human-nature relationships that apply in all cases) and context-dependence (i.e., results are only good for a single setting). It follows that a pragmatist EE would reject complete generalizability of human-nature relationships, but it also would caution against complete context-dependence. While it has been stressed throughout that context does matter, and thus generalizability is problematic, one would assume that similarities between different situations allow for some level of transferability of results.

This idea is taken from [Lincoln and Guba \(1985:297\)](#), who stated that “at best only working hypotheses may be abstracted, the *transferability* of which is an empirical matter, depending on the degree of similarity” between contexts. To this, [Morgan \(2007:72\)](#) added that there is a need to “investigate the factors that affect whether the knowledge we gain can be transferred to other settings.” I relate these factors, or the degree of similarity, to a search for ‘exemplars’. This term ‘exemplar’ is adopted to describe what factors might be relevant to a pragmatist EE when considering whether human-nature relationship research can be transferred to other settings. As stated, asserting transferability between two contexts is an empirical matter,

and this dissertation does not generally provide empirical evidence to suggest whether the relationships described, by [Armatas et al. \(2018\)](#) for instance, are transferrable from the Shoshone National Forest area to other settings. However, as a forward looking exercise, it might be helpful to discuss what types of factors might be investigated to assert transferability.

Since a pragmatist EE adopts an axiology that focuses not only on understanding human-nature relationships, but also on communicating such relationships for the purpose of decision-making and social learning, three different types of factors or exemplars are proposed. The first type could be referred to as ‘relationship’ exemplars, and it would suggest that there may be particular human-nature relationships that appear in different settings (thus suggesting a pattern). Empirically, one would have to apply the general methodology proposed above multiple times within similar SESs across space and time. A current working hypothesis would be that there likely exists an agricultural relationship, as explored in [Armatas \(2013\)](#), throughout a number of settings in the American West. For instance, the ‘agricultural’ perspective from the Shoshone study has similarities to the ‘water’ perspective from the Gila study. The relationship between the Rocky Mountain West, people, and agriculture has a long history, and broadly-applicable policies and shared histories suggest that some experiences of predominantly rural, agriculturally-influenced residents are transferable from, say, Glenwood, New Mexico to Cowley, Wyoming. This is not a license to stereotype, but the point remains that possible connections, or abductions, can be made across space and time.

It seems potentially beneficial to distinguish the transferability of human-nature relationships themselves, from potential transferability of methodological aspects. That is, a ‘relationship’ exemplar suggests that there may be examples of human-nature relationships that apply across different settings, whereas perhaps there are ‘process’ exemplars that are

particularly effective for fostering understanding of others and, ideally, empathy and compassion for the human-nature relationships of others. Of course, criteria would need to be established for gauging what would constitute *effective* process for fostering understanding or empathy. Within the context of forest planning, it could include number of lawsuits opposing a plan (or perhaps successful lawsuits), number of formal oppositions voiced during a public comment period, or incidents of incivility during public meetings. With regard to process exemplars, only untested working hypotheses can be currently proposed. For instance, it has been stressed that the colorful factor arrays (e.g., Figure 6.5 below) derived from the studies underpinning the social vulnerability protocol ([Armatas et al., 2017a](#); [Armatas et al., 2017b](#); [Armatas et al., 2018](#)) are particularly helpful for communicating with the general public, but to my knowledge this is not something that has been empirically tested.

From a pragmatist EE perspective, fertile ground for future research would be to empirically test the working hypothesis related to process exemplars within the context of human-nature relationship research. The goal would be to identify elements of the research process that break habits, and move people to a secondary experience where they engage reflective thinking. This could be the language used to describe components of human-nature relationships (e.g., ecosystem services, HEMS), the manner in which the drivers of change component is implemented, or something as simple as the physical presentation of the data collection materials. Experience suggests that the public engagement process described in [Armatas et al. \(In Press\)](#) can facilitate a move from habit to reflective thinking, but such research has not been formally conducted within this specific context at this point. The connections between research and social learning, such as the potential influence of using different language to describe the relationship components is likely the appropriate territory of a diverse range of

disciplines, including the humanities (environmental ethics to be sure, but also the arts), psychology, and behavioral economics.

For a pragmatist EE, and likely most of the hybrid disciplines relevant to the conservation sciences, the distinction between the methodological domain and the substantive domain is blurry. In other words, it is not easy to disentangle the goal to understand the world as it is through human-nature relationships, from an expressed focus on influencing beliefs through social learning, from the overarching purpose of informing decisions in a normatively-sustainable way. Therefore, it is appropriate to transition to the substantive domain to discuss the third type of exemplar.

5.2.3. *Substantive domain—part one: Research is practice*

A pragmatist EE, with its SESs viewpoint, recognizes the varied social and environmental contexts that surround and constitute complex problems. This means that a pragmatist EE searches for theory through practice. As a problem-oriented research tradition, EE does this in general, and pragmatism takes a similar stance. As [Norton \(1996b:108\)](#) stated, environmental pragmatism “works towards theoretical principles by struggling with real cases, appealing to less sweeping rules of thumb that can be argued to be appropriate in a particular context, rather than establishing a universal theory and ‘applying’ it to real cases.” This follows from the general pragmatist stance that theory is derived from practice, and not vice versa.

Relating this to exemplars, in addition to relationship and process exemplars, it may be possible to find transferability across decision-making contexts. The final exemplar to be discussed is ‘decision-making’, which can be thought of in terms of two questions. First, are

there elements of assessing and communicating human-nature relationships and drivers of change that are particularly effective in addressing the needs of, for instance, national forest planners? Do these elements differ within the context of comprehensive river management planning? Perhaps thinking of the human-nature relationship in terms of ecosystem services better facilitates conversation with the public during national forest planning than Wild and Scenic River planning. A second, related question is as follows: what facets of the human-nature relationships, both individually and as they relate to SESs at large, are particularly informative to decision-makers (e.g., planners, program managers, district rangers, the responsible official) within different planning and management contexts?

Relating the first set of questions to the second question acknowledges the somewhat arbitrary nature of separating decision-making from social learning. The same processes and information used to help the general public understand varied human-nature relationships can and should support decision-making whether, for instance, forest planners and managers are: grappling with questions such as closing or opening roads, approving timber sales, restricting recreation for endangered species, implementing a permit system, or leasing land for oil and natural gas extraction. Indeed, a pragmatist EE is about helping decision-makers understand the public, the public understand each other, and the public understand the decision-makers. The last point regarding the public understanding decision-makers may be counter-intuitive, but one stated benefit of the social vulnerability protocol, and the focus on conveying the various different human-nature relationships, is that it may help the public understand the magnitude of the challenge related to forest planning and management. In other words, forest planner and managers are confronted with a complex environmental problem, whereby several different human-nature relationships must be sustained, some of which are competing.

What types of knowledge (e.g., ‘kind’ versus ‘degree’, generalizable) and methods are most effective for helping decision-makers understand the public, the public understand each other, and the public understand the decision-makers is mostly an open question, and one that merits further study in specific contexts. From a pragmatist EE perspective, one way to start to address this question is to develop a research menu of sorts, which could help to illustrate and articulate the breadth of knowledge types related to human-nature relationships. Included in such a menu would be an accessible description of different general methods, and the benefits and weaknesses of different partial understandings. This research menu would not be in the form of a methodology and methods survey textbook, or even an article in an academic journal; it might be a general technical report for decision-makers, and perhaps something distilled even further for a general audience. Better articulation of the limitations and benefits of different scientific approaches is consistent with wary assessment.

Analogies can often miss the mark, but the food menu parallel might work. First and foremost, it stresses that every approach to understanding the human-nature relationship is partial. One does not eat a single dish, and then claim they ate the entire menu. Second, a brief and cursory review of different approaches can be beneficial (even if simplified), while still devoting significant resources to the chosen approach. One can get a sense of the menu and be pleased with the available options, while still consuming and really knowing their chosen dish. And third, it put less pressure on any one approach, dish, researcher, or cook to be perfect or authoritative and, with less pressure, comes creativity. The human-nature relationship is neither fully defined, nor discredited by a single approach.

A research menu would not only help researchers communicate and perhaps lead to better interdisciplinary research, it could facilitate the effectiveness of research in the substantive

domain where research meets practice. A pragmatist EE ideally engages with other science, decision-makers (e.g., forest planners and managers), and the general public. This transdisciplinary approach asks a lot of people who are not full time researchers. In the case of decision-makers, they have busy schedules which are often full of tasks that may or may not be relevant to the decision-context in question. Members of the general public are interested citizens who are performing their civic duty by engaging with public problems, but they are *giving* their generally-limited time. The point is that while transdisciplinary research needs active, and hopefully substantive, participation by non-researchers, the reality is that those being paid to perform such research are most immersed in the process. Of course, building trust is critical, but there is also a need to be *very* efficient with peoples' time.

A pragmatist EE research menu would likely inform transdisciplinary research mostly on the back end, as opposed to the front end. By front end, I mean the planning phase of transdisciplinary research where, in theory, non-scientists help to guide the research process itself. While transdisciplinary research is meant to engage the general public in research design, no attempt is made to articulate how a pragmatist EE might benefit such attempts. By the back end, I mean the communication phase when results are disseminated. The research menu could help to ensure that whatever partial understanding is being presented is contextualized within the bigger picture. It could be argued that engaging the public and non-researchers with methodological details is burdensome, confusing, generally not needed, and a waste of time from the researcher's perspective (i.e., the inner monologue pondering, *what kind of substantive methodological input could, me, the expert really get from lay people?*). However, a pragmatist EE would reject this stance, because it assumes that people cannot handle complexity and learn from doing so.

My intent here is not to present a fully formed research menu (another future research project perhaps), but a rough start is worthwhile. A good starting point is with the ‘kind’ versus ‘degree’ distinction made by [Williams \(2014a\)](#). It should be mentioned that [Williams \(2014b\)](#) is also an appropriate and interrelated starting point, as it provides a nice research menu through a place-research lens. The menu concisely outlines four ‘approaches’: phenomenological, semiotic¹³, cognitive/information processing, and social/discursive. My intent here is to start with the ‘kind’ versus degree’ distinction (Figure 5.7), because it operates at a more general, paradigmatic level. After providing a brief explanation of each item on the menu, I provide examples of research choices made within the ongoing research project of interest to this dissertation.

¹³ There is a deep history in pragmatism related to semiotics. See the appendix in [Norton \(2005\)](#) for a discussion on some of this history. This is the same appendix referenced earlier when I acknowledged Norton’s claim that pragmatism encompasses a revised version of positivism (Section 4.1). In a research article (not a book review), [Hickman \(2007-366\)](#), of pragmatist repute, complimented this appendix by claiming: “Norton’s appendix alone-some 59 pages-is worth the price of the book.”

Figure 5.7. A research menu: different ways to understand human-nature relationships

Pragmatist EE offerings



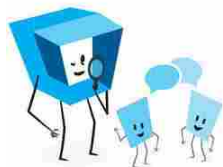
Degree without tradeoffs

Featuring Likert scales, psychometric constructs, levels of agreement/disagreement, factor analysis, cluster analysis, generalizability, and inherent and instrumental meanings



Degree with tradeoffs

Featuring non-market valuation techniques, econometrics, marginal WTP estimates, aggregated monetary values, forced choices, and inherent and instrumental meanings



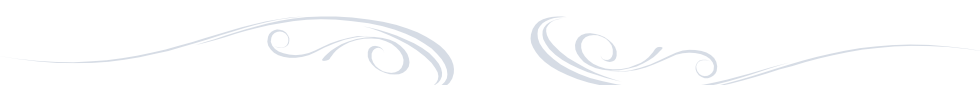
Kind without tradeoffs

Featuring phenomenological and social/discursive methods, interviews, scenario building, contextual understanding, and sociocultural and identity-expressive meanings



Kind with tradeoffs

Featuring Q-methodology, a game-like activity, scenario building, contextual understanding, quantitative and qualitative elements



5.2.3.1. Degree: strength of relationships without tradeoffs

For this approach, [Jorgensen and Stedman \(2001\)](#) is used as an example. The highly cited paper surveys lakeshore property owners with a 12-item scale (Table 5.1) to measure ‘sense of place’. Grounded in attitude theory, the research measures a general sense of place construct, within which three sub-constructs are nested: place attachment, place identity, and place dependence. Using standard multiple-contact survey methods and a five-point likert scale (disagree/agree), respondents express their sense of place. In this situation, a sense of place theory is *assumed a priori* and the strength is measured by respondent agreement. If all respondents responded strongly disagree, which is inversely coded as 1, then essentially there is no sense of place. An average of 12 summed across the total scale suggests a magnitude of 1 for sense of place. On the other extreme, an average of 60 (all answer strongly agree to all questions) suggests a magnitude of 5 for sense of place, or very *strong* sense of place. In this case, the authors found a mean value of 48.77 for the total scale; a fairly strong sense of place. Including sub-constructs allows for the existence of, for instance, a relatively low general sense of place with a strong level of place dependence. This is what Williams means by approaches that measure the ‘degree’ of a relationship, and such an understanding is derived with quantitative approaches.

There are all sorts of research and analytic techniques surrounding Table 5.1. Confirmatory factor analysis can be used to test the validity of the constructs, and exploratory factor analysis can be used to explore new constructs. Structural equation modeling can be used to connect latent factors to predicted outcomes. All of these techniques are underpinned by generalizability, which is an attribute of this ‘degree’ approach that is potentially attractive for decision-makers. In this context, generalizability refers to the belief that if the survey sample is

representative of the population, then *all* lakeshore property owners have, on average, a strong sense of place. Generalizability is how the inherent values are assessed (top tier of Figure 5.2). Place research applying this approach has led to sweeping conclusions, such as the thought that nearly all people are have a proclivity for particular types of landscapes ([Williams, 2014b](#)).

Table 5.1. Scale items for measuring sense of place

Factor	Item label	Item description
Place identity	IDENTITY1	Everything about my lake property is a reflection of me
	IDENTITY 2	My lake property says very little about who I am.
	IDENTITY 3	I feel that I can really be myself at my lake property
	IDENTITY 4	My lake property reflects the type of person I am.
Place attachment	ATTACH1	I feel relaxed when I'm at my lake property.
	ATTACH2	I feel happiest when I'm at my lake property.
	ATTACH3	My lake property is my favorite place to be.
	ATTACH4	I really miss my lake property when I'm away from it for too long.
Place dependence	DEPEND1	My lake property is the best place for doing the things that I enjoy most.
	DEPEND2	For doing the things that I enjoy most, no other place can compare to my lake property.
	DEPEND3	My lake property is not a good place to do the things I most like to do.
	DEPEND4	As far as I am concerned, there are better places to be than at my lake property.

Source: ([Jorgensen & Stedman, 2001](#))

Another potential strength of generalizability is the potential for aggregation. Cluster analysis can divide the population into portions, so one could learn, perhaps, that 80 percent of the population of lakeshore owners had a *really strong* sense of place and the other 20 percent did not have a significant sense of place. Maybe there are demographic or geographic differences between the clusters, which might inform decisions, such as the location for routing power lines. Survey research focused on human-nature relationships can estimate support (e.g., favor/oppose) for proposed policy measures, such as implementing higher fees at national parks, or creating a

recreation permit system. Using survey research as a polling tool to address complex problems is a possibility, though policies or other institutions (in the governance sense) may guide decision-makers towards or away from this possibility. The final strength (or perhaps danger) worth mentioning is that to the untrained eye, positivistic science is likely still considered to be “more scientific”. [Gardner \(2013\)](#) found this to be the case in an empirical study of an interdisciplinary academic research team.

With great power comes great responsibility, which is where a pragmatist perspective helps. There are not only several potential limitations with survey research, including declining response rates, representativeness based primarily on publicly available demographic statistics, and their generally unengaging format. But, most importantly, presenting respondents with a pre-constructed or hypothesized theory does not typically provide the full opportunity to explore the bottom two tiers of Figure 5.2. The deeper meanings are discovered through other approaches, which is a weakness of focusing on strength of relationship with no tradeoffs.

Notice that there are no tradeoffs required with this approach, and in this case it clearly makes little sense to ask if respondents would prefer attachment over identity. However, it is not uncommon for studies to apply a degree-without-tradeoffs approach to understand preferences for human-relationship elements that may be in competition. For instance, [Sherrouse et al. \(2014\)](#) studied ‘social values’ to inform decisions regarding ecosystem services tradeoffs, and their random mailback surveys had respondents rate 12 statements, all of which began with: ‘I value these forests because’. Tradeoffs were not forced in this part of the exercise, even though one could perceive competition between particular values (e.g., economic, intrinsic). Interestingly, another step of their survey had respondents allocate a hypothetical \$100 toward specific values at specific locations, which represents a slightly different approach (i.e., degree with tradeoffs).

The basic point remains that survey research employing scales is prevalent, and respondents have the freedom to choose the same answer every time (tradeoffs are not required).






5.2.3.2. Degree: strength of relationship with tradeoffs

There are several ways to understand the strength of a human-nature relationship through the application of approaches that force choices. Unsurprisingly, given its interest in choices between alternatives, economic research has developed and honed such methods, including contingent valuation and choice modeling. Estimating marginal WTP provides a strength of relationship with regard to one state of the environment over another. Contingent valuation is usually the method employed for a single change (e.g., mine or no mine, preventing an oil spill). Typically this single change is expressed in a stated willingness to pay, or a dichotomous choice; regardless, the tradeoff is a change in policy for a hypothetical payment.

Choice modeling presents a scenario with different levels of human-nature relationship elements. A ‘choice set’ (Figure 5.8) is the primary task in a choice modeling survey, and respondents are forced to decide between different states of the environment and, typically, a cost to their household. This makes WTP more implicit than a contingent valuation study, but a cost is still usually incorporated, which allows for estimating marginal WTP based on economic theory. Like approaches that measure strength without tradeoffs, respondents in this approach are *presented* with a scenario that is predetermined. In the case of this example, hypothetical changes in water quality and quantity and the attributes to be traded off were tied to four ecosystem services (e.g., agricultural community). If respondents were more concerned with some other

ecosystem service, such as whitewater boating, they cannot express that interest (other than in the survey comment section).

Figure 5.8. Tradeoff question example from a choice modeling approach

Choice Set 1		Expected outcomes after 10 years		
Management Outcomes		Alternative A	NO CHANGE in Management	Alternative B
Agricultural community		550,000 acres irrigated	550,000 acres irrigated	600,000 acres irrigated
Angling		5% of streams are excellent	10% of streams are excellent	10% of streams are excellent
River and riverbank biological diversity		5% of streams are biologically diverse	15% of streams are biologically diverse	25% of streams are biologically diverse
Motorized winter recreation		50% open	40% open	20% open
Annual cost to my household		\$300 (\$25 monthly)	\$540 (\$45 monthly)	\$840 (\$70 monthly)
My household would choose (select one only)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source: ([Armatas et al., 2018](#))

Assessing a human-nature relationship with this approach also allows generalizability, but in this case it is perhaps even more appealing to decision-makers as annual household marginal WTP can be estimated by simply aggregating individual WTP. Using mostly regression techniques, WTP estimates can be associated with population demographics and attitudes (e.g., males are associated with an increased WTP for motorized recreation). The weaknesses of this approach are similar to those above. However, this approach may be even less suited to assessing identity-expressive and cultural values, because the prospect of putting monetary units on particular elements of the human-nature relationship may be inappropriate, or perhaps even offensive, to some.

Also, the ability to generate monetary estimates is potentially both more enticing to decision-makers and more controversial. Regarding the latter point, some may view cost-benefit analysis based upon monetary estimates of *all* human-relationship elements as a way around public debate and deliberation. Consider the following by [Friedman \(1953:5\)](#):

Differences about economic policy among disinterested citizens derive predominantly from different predictions about the economic consequences of taking action—differences that in principle can be eliminated by the progress of positive economics—rather than from fundamental differences in basic values, differences about which men can ultimately only fight.

This well-known quote by Milton Friedman epitomizes that which makes critics of ecosystem service monetization nervous. As [Bromley \(2015:6\)](#) noted in response to this quote, Friedman was eager to show that the objective methods of economics could render “fighting not only old-fashioned, but unnecessary.” In defense of Friedman, it is possible that he never foresaw the application of economic analyses to complex natural resource problems where decisions are often about deeply personal issues. This defense is implicit in the point made by [Varian \(2014\)](#) when explaining the economic axiom of completeness, which assumes that a person can choose

when comparing two bundles of goods. [Varian \(2014:35, emphasis added\)](#) concedes that extenuating circumstances such as life or death choices may violate this axiom, though these choices are mostly “*outside the domain of economic analysis.*” Even the most ardent economists would likely find particular situations where economic methods are inappropriate, such as those involving life and death. A pragmatist EE, with its contextual approach, should partly focus on parsing those contexts where applying economic methods are appropriate or inappropriate for assessing human-nature relationships. Exactly how appropriate could be parsed from inappropriate in this case is another fertile area for future pragmatist EE research, though a focus on land management and planning policies would be a good start (a point briefly discussed in Section 5.2.4.1 below).

Prior to moving on to the next type of approach, it is worth noting that not all degree-with-tradeoffs approaches are formal economic methods that yield monetary estimates. An example of a degree-with-tradeoff approach that does not necessarily yield monetary estimates is the analytic hierarchy process (AHP) ([Saaty, 1987](#)). This method is well-established, and it assigns strength of preference to one alternative over many, and it can also be aggregated and generalized.

5.2.3.3. Kind: type of relationships with no tradeoffs

Another way to gain a partial understanding of a human-nature relationship is through an assessment of the kinds of relationships that exist. This type of understanding is often described as qualitative which, as discussed below, can create confusion. It is likely fair to suggest that describing the kinds of relationships that exist is more commonly done with qualitative

approaches where people explain, discuss, and elaborate upon their human-nature relationship. One way to achieve a kind-without-tradeoffs understanding is with hermeneutics ([Patterson & Williams, 2002](#)), and it aims to provide respondents with the ability to express, in their own words, what is meant by a human-nature relationship. This can yield interesting insights, which may not be typically captured by approaches focused on relationship strength. For example, through interviews [Van Patten and Williams \(2008\)](#) found that some associate their seasonal homes with ‘obligation’, or a sense of dread related to perpetual upkeep. A study in the Gates of the Arctic National Park and Preserve in Alaska, which included extensive interviews, found, among many interesting insights, that there are positive perceptions related to encountering people, that there is an inextricable tie between personal identity and wilderness, and that there are a variety of feelings associated with the challenge of accessing an Alaskan wilderness ([Glaspell et al., 2003](#); [Watson et al., 2004](#)). With regard to the Bitterroot National Forest in Montana, [Gunderson and Watson \(2007\)](#) found seven primary *types* of meanings, including ease of access to wild places, scenic beauty, unique contrast to other places in life, and those related to history, family, or tradition.

Understanding relationships with a kind-without-tradeoff approach allows one to better understand the bottom two tiers of Figure 5.2. Understanding the details and nuance of socio-cultural or identity-expressive meanings is challenging without free flowing conversation. These approaches are not typically generalizable or aggregated (though it is possible). Generalizing and aggregating deeply personal meanings, or even socio-cultural meanings, might be considered antithetical to the whole approach. Qualitative interview methods should not be equated with some generally non-scientific endeavor such as journalism. The qualitative researcher “builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the

study in a natural setting” ([Creswell, 1998](#)). Qualitative research, both in terms of data collection and analysis, are rigorous and systematic, which includes extensive time in the study area, a time-consuming and sometimes tedious data analysis process, and a theory building process that relies mostly on inductive reasoning ([Creswell, 1998](#)). Even though qualitative research is described as holistic, it should not be assumed that these methods do not reduce the data. Indeed, frequently qualitative coding techniques are applied to conceptually order the data into categories, which helps researchers make sense of the data to enable respondents “to speak in voices that are clearly understood” ([Strauss & Corbin, 1998:56](#)). So, even though the method is more holistic in that it does not constrain the respondent, analysis inevitably organizes the data for communication and dissemination of results. These results do not quantify the strength of feelings in the way that ‘degree’ approaches do.

Results from this approach, relative to degree approaches, may be perceived by decision-makers as more challenging to apply in practice; an assertion supported by [Glaspell et al. \(2003:62\)](#), who stated that “qualitative knowledge from studies of the deeper meanings of wilderness experiences has not typically been incorporated into management planning efforts.” However, the rich and contextual understanding of human-nature relationships is likely required to facilitate social learning. Suggesting, for instance, that a loss in water quality in a river or lake is strongly-moderately opposed by the population, or that the population has a WTP of \$90,000 per year to prevent such a change might appear to simplify decision-making, but it might not affect the public at a deeper level. On the other hand, learning that high quality water is directly tied to the maintenance of cultural identity, or a memory of fishing with a late-father might move the needle a bit more in the empathy and compassion department (these meanings may lead to valuable assertions that resonate with the public).

5.2.3.4. Kind: type of relationship with tradeoffs

The last general approach to be discussed is kind-with-tradeoffs. These approaches, such as Q-methodology, require tradeoffs but do not assign a strength to the relationship. This point was stressed above; even though Q-methodology requires prioritization of items, which measures the ‘degree’ of importance of items relative to each other, the approach does not measure the strength of a relationship as a whole in the way [Williams \(2014a\)](#) discussed. The use of a scale (e.g., -4 to +4 in Figure 5.6) and quantitative analysis does imply a quantitative method, but the fact that ‘kinds’ of relationships are explored and qualitative data is often used to support the different perspectives does highlight the hybrid nature of Q-methodology. Indeed, it was for these reason that [Stenner and Stainton-Rogers \(2004\)](#) called the method ‘qualiquantological’.

By virtue of requiring a tradeoff among different items, a situation is created where scarcity is implied. Indeed, one cannot “have it all” when sorting items in a Q-methodology study. This is why Q-methodology is a potentially appropriate methodological choice in situations where conflicting perspectives are expected. The forced tradeoffs of Q-methodology also has limitations, as it may be assigning meaning where there is none. This limitation is discussed further in the next chapter, but what I mean is that individuals doing a Q-sort may find that all items are so relevant that they have trouble placing some in the neutral zone (i.e., middle of Figure 5.6), or that not enough are relevant to them and, as a result, they are placing items in the negatively and positively salient zone when they, in fact, are meaningless to the respondent. Q-methodology imposes both a normal distribution via the Q-sorting process, as well as an assumption that midpoints are comparable between Q-sorts.

The primary point is that Q-methodology is potentially appropriate for gaining some insight into the degree of relative importance regarding particular elements of a relationship (i.e.,

the cards, as in Figure 5.6, are conceptualized as elements of the human-nature relationship and they are sorted relative to one another), as well as the kinds of relationships that exist more holistically (i.e., when a Q-method perspective is assessed overall). Like the kind-without-tradeoff approach, one cannot generalize or aggregate Q-method results, since data is collected using a purposeful sample to gain the broadest diversity of participants. The purpose of this type of approach is to understand the kinds of relationships that exist, as opposed to the magnitude or distribution of such relationships.

This brief overview of potential general approaches to understanding human-nature relationships is not exhaustive, nor are they mutually exclusive. For instance, Q-methodology is predominantly a kind-with-tradeoff approach, but a kind-without-tradeoff discussion component can, and should, be added. Often surveys include both types of degree approaches, as was the case with [Sherrouse et al. \(2014\)](#). It is typical for choice modelling and contingent valuation surveys to include ‘attitudinal questions’, which are usually scaled questions of the degree-without-tradeoff variety. A method such as scenario building, which is listed in both ‘kind’ approaches, may or may not incorporate tradeoffs. [Daw et al. \(2015\)](#) developed scenarios from focus groups which were guided to consider strengths and weaknesses of single future hypothetical scenarios, and then four such scenarios were placed side-by-side for comparison. Both processes imply tradeoffs, though scenario building may not take this shape in other cases.

Nonetheless, the purpose of presenting these four different approaches is to highlight different ways that relationships can be partially understood, as well as the potential strengths and weaknesses that correspond to such approaches that may be relevant to decision-makers. In the context of these different approaches, and the different elements that potentially comprise a relationship (Section 5.2.4), a researcher operating in the substantive domain can better convey

to decision-makers and the public the part that their approach provides. Also, this can help with guiding and communicating particular methodological decisions. For example, why take one approach over another, or why aggregate WTP estimates in one case and not in another? These questions are expanded upon with examples in the next section.

5.2.4. Substantive domain—part two: Practical considerations when studying human-nature relationships for application

A pragmatist EE searches for exemplars, which may build up over time when assessing and articulating human-nature relationships to support decision-making and social learning. Decision-making exemplars could include relating particular approaches, as selected from the research menu, to particular decision-making contexts. They could also include the decision as to whether to stress generalizability and aggregation or not, if implementing a ‘degree’ approach or a combination of two or more approaches. Generalizability refers to the level of external validity of results (i.e., do results apply to all people in the population of interest) and aggregation refers to the issue of summing individual results (e.g., WTP estimates) across the population of interest. These two methodological decisions are discussed below, but first there is a need to preempt a question that may arise, particularly with regard to the interrelated issues of generalizability and aggregation.

Does picking and choosing when to present (or not present) particular facets of an approach amount to relativism? In other words, is it problematic if one performs a ‘degree’ approach and decides to generalize and aggregate in one context but not in another? A pragmatist EE would assert “no” to both questions for two reasons. The first reason is the fundamental goal

of EE, and other conservation social sciences more generally, to not only describe the world as it is but to inform decisions toward some goal (e.g., normative sustainability). That is, the dual goal of description and action necessitate reflective thought about the implications of disseminating different types of knowledge. Second, answering no to the above questions implies taking the partiality-of-understanding belief and the division-of-labor belief very seriously. I think the former point has been made sufficiently, but the interrelated latter point refers to the idea that it is not good enough to simply state that some approach has weaknesses, which can be augmented by the work of others.

For instance, [Freeman \(1979:34\)](#) suggested that focusing attention on particular aspects of well-being such as income and consumption to the exclusion of others was implicit of the “division of labor between economists and others.” To this, [Brown \(1984:244\)](#) noted: “while this recognition is sufficient to clear positive economics, it at the same time points out the limits of welfare economics tools such as cost-benefit analysis.” According to [Norton \(2012:456\)](#), “where I think economists may remain open to criticism is that, having recognized the necessary incompleteness of their results, they do not do much to clarify what is missing” in a cost-benefit analysis. This is a major impetus for suggesting the need for a research menu, and it also supports generalizing or aggregating in some cases but not others.

5.2.4.1. Deciding on relationship approaches: searching for exemplars through decision-contexts

Often, at least within the United States, guiding administrative and legislative policy can highlight which approaches to partial understandings of human-nature relationships may be

needed. For example, the requirement for forest planners to consider economic, social, and ecological sustainability suggests a need for an understanding of both kind and strength of relationships. In other words, it is challenging to assess economic sustainability without capturing the strength of preferences for both marketed and non-marketed elements of human-nature relationships. On the other hand, it is challenging to capture elements of cultural sustainability without ‘kind’ approaches, as they are particularly effective for understanding the deeper, lower-tier meanings in Figure 5.2.

Wild and Scenic River planning, on the other hand, stresses an understanding of kinds of relationships. This is because the Wild and Scenic Rivers Act (WSRA) requires that outstandingly remarkable values (ORVs) are enhanced and protected, which include water quality and free-flowing water, as well as a variety of ORV categories such as wildlife, fisheries, scenery, and cultural and historic. Generally, the WSRA does not stress economics, or even human well-being. The focus on river protection, for the sake of the relevant ORVs, suggests that some measurement of well-being in terms of strength is perhaps less important than an understanding of how people relate to the river resource more qualitatively.

Having said that, this more general planning step in the context of wild and scenic rivers is inextricably tied to potential management actions, which are often dictated by the priorities of the general public as well as limited management funds. For example, Wild and Scenic river planning may require a decision as to whether to build a new river access *or* invest funds in more cultural and historical interpretive resources. Such decisions should be informed by an understanding of what people may prefer, as resource scarcity is forcing a choice of one alternative over another; this is within the purview of ‘degree’ approaches, both with and without tradeoffs. A pragmatist EE holds that there is no common metric for weighing the various

decisions facing managers and planners, but instead there is a need to, the greatest extent practicable, consider how disparate human-nature relationships may be affected by decisions. This process aimed at a comprehensive understanding of human-nature relationships, in conjunction with both public debate and deliberation about the meaning of normative sustainability and the various mandates of relevant land management policy, can provide a foundation for addressing complex social-ecological problems. Ultimately, then, an understanding of both kind and strength of relationships is likely ideal for deciding on issues related to complex environmental problems. But, in the case of Wild and Scenic river planning there may be a more pressing need for understanding the kinds of relationships that exist and the lower tier sociocultural and identity-expressive meanings.

Given the clear influence of policy (and other institutions) on the type of information that may best inform decision-making, there is a need to link other research, such as that related to governance, with a pragmatist EE focused on a comprehensive understanding of human-nature relationships. This is a point stressed further in the chapter after next on SES. For now, this cursory comparison of forest planning to comprehensive river management planning will suffice. In relation to forest planning, even without a thorough and nuanced governance study, it seems that informed decisions require both 'kind' and 'degree' approaches. For instance, the need to consider ecological, cultural, and economic sustainability within the context of policy mandates such as the National Forest Management Act and the Multiple-use Sustained Yield Act, and the Forest Service goal to meet the needs of current and future generations highlight the value of both kind and degree approaches. Meeting these various mandates inevitably raises the tricky task of generalizing and aggregating.

5.2.4.2. Supporting as many relationships as possible: a wicked problem

When understanding a human-nature relationship with a ‘kind’ approach, one does not gain any knowledge of how such relationships are distributed across the population or SES at large. That is, how many people feel a particular way is not knowable. As highlighted above, aggregation generally requires quantitative approaches focused on strength of relationships. The problem with such research is that, in a vacuum, they are limited. Generalizability, representativeness, and aggregation are all normative assumptions attached to positivistic paradigms (e.g., that there is one ‘true’ description of the distribution of relationships across the population), and these assumptions have been thoroughly questioned for many decades; indeed, the perceived issues with such assumptions was a main impetus for the ‘paradigm wars’ ([Denzin, 2010](#)). Within EE specifically, these assumptions are questioned through criticism of cost-benefit analysis, which is underpinned by aggregating individual marginal WTP estimates.

A full account of these criticisms is not needed here, but perhaps a single example is worthwhile. There are issues related to equity, as WTP is constrained by income, and those with higher income can bid more than those with lower income. This constraint is taken seriously, and survey instruments commonly include a ‘straight talk’ message reminding respondents to really consider their income and other life expenses when stating their WTP. Non-market valuation studies aim to create a hypothetical marketplace that is as real as possible. While this issue can be partly assuaged, at least in theory, by willingness to accept (WTA) formats ([Weber, 2013](#)) and income-adjusted WTP ([Breffle et al., 2015](#)), it is nonetheless a problematic issue. This problem is exacerbated when this partial ‘degree with tradeoffs’ understanding is aggregated to a large, potentially global scale. Essentially those calling for an abandonment of mathematical formalism

in EE (e.g., Clive Spash) are suggesting that such estimates are too flawed to apply, and perhaps even misleading in public discourse.

A pragmatist EE acknowledges the reality of such issues, but instead of discarding the theory and the knowledge it creates, it focuses on better articulating situations when such a partial understanding may be beneficial. For instance, aggregating individual marginal WTP estimates to yield monetary estimates of non-market benefits at a regional scale, while problematic, may serve as a starting point for facilitating negotiation in particular situations such as when a farmer (or group of farmers) are willing to install and maintain riparian buffer-strips between a river and their farmed parcels. This work will present costs to the farmers, and offsetting this costs could come from payments either by people interested in the resource or through general tax revenues. Regardless of the specific solutions, developing a ballpark estimate of the benefits provided by the buffer strips could facilitate negotiations or public acceptability of tax payments. While the buffer strip example has long been on my mind, it turns out that [Norton \(2011b:369\)](#) has already made this point ([Norton \(2015\)](#) reiterated it):

An estimate of key ecosystem services might prove useful in the future as a way to identify a fair price when some resource users pay others to maintain favorable environmental conditions for the former. For example, in some partnerships between upstream users to maintain riparian buffers and in other ways protect the downstream water quality. In contexts such as this, estimates of the monetary value of services may be very useful, even though there is reason for skepticism that the ecosystem services strategy of counting and aggregating toward a “total value of nature” is feasible.

This is a decision context where marginal WTP estimates, which are aggregated may be appropriate. For a pragmatist EE such estimates are never always appropriate or always inappropriate.

When such estimates and aggregations are appropriate is clearly a subjective decision, which should not be taken lightly. This decision can be made by assessing the monetary estimates themselves, and considering other partial understandings are helpful in such an assessment. For example, the Shoshone National Forest study ([Armatas, 2013](#)) was followed up with a non-market valuation study which estimated marginal WTP for four ecosystem services. However, the fact that the valuation survey clearly did not capture a particular ‘kind’ of relationship in the Q-methodology study raised serious doubts about the survey representativeness and, consequently, generalizability. Partly due to these questions, the valuation results were presented in the context of a larger, more comprehensive study of human-nature relationships, and they were not aggregated or assigned to a specific portion of the population; see [Armatas et al. \(2018\)](#) for full details. Furthermore, the valuation results were never published on their own, which was a deliberate knowledge-dissemination choice. This final point transitions us away from questions of interpretation to the related questions of research presentation and dissemination, and researcher reflexivity.

5.2.5. Substantive domain—part three: wary assessment of both research and researcher

A pragmatist EE, as stressed many times above, requires wary assessment of research, but it also requires a wary assessment of the researcher. This is consistent with full transparency of methodological decisions, and the prioritization of reflexivity. The decision to not report aggregated WTP estimates in [Armatas et al. \(2018\)](#) was partly due to a latent class analysis that only yielded three of the four perspectives found in the Q-methodology study ([Armatas, 2013](#)). However, there was another reason for not reporting aggregate WTP estimates, which is that the problem motivating [Armatas et al. \(2018\)](#) was perhaps too broadly defined.

Informing national forest decision-making in general and forest plan revision more specifically is a very general context, and the fact that the timing of the research was such that the results were only available after the plan revision was complete, it seemed that the controversial side of aggregate WTP estimates, as discussed above, was more pronounced than the decision-making benefits. Of course, these monetary estimates could still be used in the event that a relevant management decision arises, such as a proposal to reduce or expand motorized winter recreation on the Forest.

This raises the question as to why one would complete such a study if the timing was such that the specific results would not provide immediate decision-making or social learning benefits. In the spirit of wary researcher assessment, the answer is the methodological benefits of providing an approach that can capture more holistic human-nature relationships. From a pragmatist EE perspective then, it makes little sense to publish the choice modelling results on their own. While it would have been easy enough to create a context for publishing a choice modelling (CM) survey, the benefit would not be methodological (there are many CM studies) nor substantive, but instead mostly an additional publication on my resume. This latter point represents a conundrum for a pragmatist ecological economist (or any scientist for that matter), which is the temptation to reduce research to the smallest publishable unit for personal reasons, or disseminate knowledge that provides the most comprehensive picture. If communication and social learning are ultimately the goal, then it seems the latter is perhaps the most appropriate choice, at least in the context of conveying human-nature relationships in support of solving complex environmental problems.

5.3. Limitations and challenges of a pragmatist ecological economics

It would represent a flawed philosophy to put forth great effort in articulating an approach that focuses on highlighting the incompleteness of any single method without discussing potential limitations of what is proposed above. Perhaps the biggest limitation is the call for deliberative approaches where people can learn about different perspectives and, consequently, revise their beliefs to not only accommodate their own needs and desires but also those of fellow humans. A pragmatist EE should strive to develop such approaches, and the social vulnerability protocol ([Armatas et al., In Press](#)) theoretically represents such an approach to an extent. While the social vulnerability protocol does not have an explicit deliberative facet, it does stress the need to communicate results to the public for the purpose of better understanding and increased empathy related to others' viewpoints. The learning benefits of the social vulnerability protocol are only theoretical at this point, as no empirical study has been conducted testing the potential learning benefits of the approach.

The goal to create deliberative approaches that enhance social learning and potentially resolve conflict can seem futile in today's world, or at least in today's United States, where division and uncompromising ideology feel inescapable. Having recently expressed this potential Achilles heel of a pragmatist EE to an experienced conservation social scientist, a somewhat comforting reply was given. The essence of the reply was that there are two major schools of philosophical thought of relevance to this: deliberative democracy in the school of Habermas, and critical theory in the school of philosophers such as Foucault. The former calls for hashing out problems with reason and discussion, and the latter calls for creating change by uncovering and, consequently, dismantling the power structures that lead to an un-level playing field (*Dan Williams, personal communication*).

Another related limitation of a pragmatist EE is that it assumes that people are inherently social and potentially available for discussion and debate. There are a few sides to this debate, which raise questions as to whether this is a limitation. First, it seems humans increasingly minimize face to face interactions. Second, we have more information at our fingertips than ever before, which makes breaking habitual experience to get to a secondary experience that triggers reflective thought harder than ever. And a third, potentially positive reality is that circulating information is easier than ever; in this way we are more connected today than any other time in history.

The final limitation to be discussed is related to interdisciplinary and transdisciplinary research. If interdisciplinary research (working with different researchers) can create better processes for understanding and communicating the varied human-nature relationships, then it will require that researchers from diverse backgrounds get outside their comfort zone, risk spending time that may yield little results and, at times, suspend entrenched beliefs. This is challenging for anybody, but it may be particularly challenging for a cohort of people who spent at least a decade learning to think in a particular way. The challenge of interdisciplinary research has been discussed at great length elsewhere, and empirical studies have reinforced common perceptions, such as the perceived superiority of positivistic science ([Gardner, 2013](#)). There is no doubt about the various barriers of good interdisciplinary research, and at times institutional structures (such as tenure and the metrics used to evaluate it) may conflict with interdisciplinary research.

In addition to the challenges of getting researchers to work together, the incentive structures and long-established protocols within the research industry at large may impede interdisciplinary research. For example, promotions based upon productivity incentivize less (not

more) transparency, whether that manifests in the hoarding of data until all possible publications are complete, or the hesitance to share an idea with the fear that it might be taken and published before one has the time to fully develop it. These impediments are not only related to the desire for professional success. Peer-reviewed journals maintain a standard publication protocol that seem to hobble creativity as well. For instance, in what is now a largely digital publication process, it would seem reasonable to require all manuscripts that publish survey results include a *full* version of the survey instrument. If I had my druthers, I would like to browse not articles, but survey instruments. Imagine a feature where *Ecological Economics*, or better yet Elsevier, compiled all survey instruments by year, whereby a researcher could scan through them like the photos on their phone. Of course, a link to the relevant article would be readily available.

Regarding the potential limitation of transdisciplinary research (substantive engagement of non-researchers), there are perhaps more impediments to transdisciplinary research than interdisciplinary research. Similar to interdisciplinary research, the challenges of transdisciplinary research are well documented ([Flint et al., 2019](#); [Lang et al., 2012](#); [Talwar et al., 2011](#); [Wiek, 2007](#)), but I will provide a couple of obvious impediments within the context of federal land management and planning and understanding the human-nature relationship. First, there are logistical impediments to effective public engagement. Gathering public input is required for forest planning and comprehensive river management planning, for example, and ideally this is meant to extend beyond the federally required comment periods. Such public engagement requires significant resources for the agencies.

Also, there is the potential that non-researchers, particularly decision-makers (e.g., planners and managers), may not have the time, capacity, or desire to engage in conservation social science. More input from practitioners, within the context of specific decision-making

situations, is needed. But, as previously mentioned, their schedules are often very full with day to day tasks, and sometimes a forest plan revision is performed as extra work without additional staff. These realities can make research, even if fully funded, seem like extra work for already busy decision-makers.

5.4. Next steps: A brief reorientation for the reader

Up to this point, considerable effort has been put towards articulating a pragmatist EE. To this end, a thorough review of pragmatist philosophy was presented for the purposes of establishing a research paradigm and worldview. This was followed by a lengthy discussion of a pragmatist EE, which yielded a core burning question (i.e., what constitutes the varied relationships that people have with the environment?), a general methodological overview of how human-nature relationships can be partially understood (i.e., the research menu), and major considerations and challenges related to integrating an understanding of such relationships into decision-making (e.g., questions related to aggregating individual relationships). While I believe this “40,000 thousand-foot view” is cohesive on its own as a philosophical and conceptual pragmatist EE, further clarity and strength may be added to the case made herein through additional discussion; such discussion comprises the final two substantive chapters of this dissertation.

First, the research-menu idea is revisited with a discussion that focuses on providing greater clarity of what a kind-with-tradeoffs approach (Q-methodology) provides, particularly as it relates to other items on the research menu. Specifically, the objective of the next chapter is to weigh into a long-running debate related to Q-methodology from the perspective of a pragmatist

EE. I consider the discussion in the next chapter to be pragmatist EE *in practice*, but not because it includes details related to the knowledge derived from pragmatist EE research. Indeed, it does not focus on the substance of human-nature relationships as reflected in the word clouds above (Figures 5.3, 5.4, and 5.5). Instead, the next chapter focuses in greater detail on what different methods (with accompanying normative assumptions) provide and do not provide. This statement may imply a theoretical discussion about methods, and in some ways it is. However, my aim is not to improve the different methodological approaches per se, but instead to demonstrate how a pragmatist EE might: (1) interpret the different approaches and; (2) facilitate better communication about different approaches to understanding human-nature relationships for the purpose of improved interdisciplinary and transdisciplinary research.

The final substantive chapter (chapter 7) will focus on SES research with an aim of contextualizing an understanding of human-nature relationships within the larger goal of making more sustainable decisions. There is a need to sustain such relationships for both current and future generations, which highlights a much larger issue where natural systems (e.g., the health of ecosystems) and social systems (e.g., political and cultural institutions) must be considered and understood. SES research is well positioned to provide this understanding.

6. PRAGMATIST ECOLOGICAL ECONOMICS IN PRACTICE: FOCUSING ON CLEAR AND CONTEXTUALIZED METHODOLOGY

When introducing the research menu above, it was asserted that a pragmatist EE should focus on conveying the complexity of human-nature relationships by, in part, highlighting the partiality of any one approach. In other words, when presenting results (e.g., in peer-reviewed articles, public forums, or to practitioners) from, for instance, a kind-with-tradeoffs approach, a pragmatist EE would also strive to contextualize this information within the bigger picture. Perhaps by briefly describing what a degree-without-tradeoffs approach would provide in comparison, or what place research might convey in comparison to ecosystem services.

It was also suggested that by committing to such a contextualization, one may better achieve both interdisciplinary and transdisciplinary research. To reiterate, clearly conveying how different partial-relationship understandings fit (or do not fit) with one another may help researchers communicate and, consequently, integrate research more effectively in a way that trends toward a holistic picture of the human-nature relationship. However, a pragmatist EE is focused on advancing interdisciplinary and transdisciplinary research, as well as applying research for the benefit of addressing complex environmental problems (through both decision-making and social learning). Therefore, a pragmatist EE would assert that, in general, researchers need to expand their perceptions about what is relevant and irrelevant information within a given study. While the complexities of regression analysis are likely beyond the scope of a qualitative study, the basic differences (and/or similarities) between a kind-without-tradeoffs study and a degree-without-tradeoffs study are likely not. Articulating such differences and similarities are the focus of this chapter.

This chapter provides a detailed example of what the process might look like when developing a concise research menu item. Specifically, this chapter has one primary objective: to articulate how a pragmatist EE would address the debate between Q-methodology (a kind-with-tradeoffs approach) and R-methodology (a degree-without-tradeoffs approach). To complete this objective, four primary aims are pursued: (1) demonstrating the standard statistical approaches in both Q-methodology and R-methodology; (2) articulating the normative assumptions of Q-methodology and R-methodology with a focus on showing how such assumptions justify standard statistical procedures; (3) comparing the results of the different approaches using the same data set (i.e., data collected for the Gila National Forest study ([Armatas et al., 2017b](#)) and; (4) providing a pragmatist EE interpretation of what Q-methodology and R-methodology contribute within the context of national forest planning.

To be clear, this chapter is primarily presented from a Q-methodology perspective (the reasons for which are discussed first below). However, the chapter is not a description of Q-methodology, as several such works are available (e.g., [Brown, 1980](#); [Watts & Stenner, 2012](#)), nor is it a critique of either Q-methodology or R-methodology (i.e., there is no conclusion stating that one is “better” than the other). Indeed, a pragmatist EE finds value in both approaches from the research menu, and suggests that applying both can lead to mutual reinforcement of findings.

6.1. Starting with Q-Methodology: Wary assessment and a long-running debate

Figure 5.7 presents four ways to partially understand human-nature relationships, so this chapter could reasonably start with any of the four approaches. I start with Q-methodology, as a kind-with-tradeoffs approach, for two main reasons. The first reason is practical and personal, as I am currently nearing Q-method data collection as project lead for the third time, and following

pragmatism it seems prudent to warily assess the methodology underpinning the social vulnerability protocol.

The second reason for starting with Q-methodology is that it is probably the most misunderstood and controversial research methodology referenced herein. That is not to say, for instance, that qualitative interviews or choice modeling are not misunderstood or criticized. But Q-methodology, as a social science method for understanding viewpoints about a topic of interest, has been considered with discomfort and unease by some for a long time. In fact, debates about the method, which began in the 1930s, continue today. The debate has implications for both research and application. Regarding research, it is not uncommon for Q-methodology studies to be met with peer-review skepticism by those who are unfamiliar with the approach ([Ramlo, 2015](#)). This is likely more a symptom of the debate than a cause of it. For instance, in a book review of the work that constituted the official debut of Q-methodology, [Cronbach and Gleser \(1954:330\)](#) discouraged students from adopting the approach based upon the fear that it would “misdirect much research effort” and, additionally, they asserted that factor analysis of Q correlations “appears to have little value.”

While this review pre-dates the majority of the ‘paradigm wars’ and the gradual legitimization of multiple research paradigms, it likely set the tone for the debate that continues today. In other words, if one accepts that there are multiple ways to practice science, then a common accompanying belief is the inability to separate methods (primarily statistical techniques in this case) from worldviews and research paradigms. A pragmatist perspective, with an emphasis on context, would hesitate to suggest that factor analysis of Q correlations has little value generally; perhaps it has little value for testing, confirming, or discovering psychometric constructs as commonly understood as the more typical roles of factor analysis.

Prior to delving further into this discussion, it is worth highlighting the extent of the debate related to Q-methodology. It should also be noted at the outset that the second player in the debate discussed below is R-methodology (specifically factor analysis within the context of the psychometrics), which is not an approach that I have applied in practice. While survey research often subsumes R-methodology, and thus shares some common assumptions (e.g., random samples, generalizability), it is worth highlighting my limited expertise in the areas of factor analysis and psychometrics. The acknowledgment serves as an invitation to engage in productive debate with R-methodology experts and, while I am confident in my assessment of R-methodology below, it also signals the existence of potential deficiencies (and the need for further research) related to this popular research area.

6.1.1. The unproductive (and sometimes nasty) debate surrounding Q-methodology

In Section 3.1, I argued that the debate related to methodological pluralism in EE lacked nuance, and was generally unproductive because those engaging in the debate failed to elaborate on the worldview level of the scientific macrostructure. Ultimately, I make a similar argument with relation to the Q-methodology debate, though this debate spans all three levels of the scientific macrostructure (worldview, paradigm, and research programs (particularly as it pertains to the methodological domain)). Arguing that the debate surrounding Q-methodology is the result of miscommunication, or perhaps misconception, with regard to different levels of the scientific macrostructure is not an original point.

To be sure, the point has been reiterated since William Stephenson suggested that the critiques of Cronbach and Glaser were based upon false premises ([Stephenson, 1954a](#));

essentially, Stephenson was making the case for a different, non-positivistic research paradigm. Interestingly, Stephenson's thinking was heavily influenced by pragmatists such as John Dewey, Charles Peirce, and Williams James ([Good, 2010](#); [Stenner, 2009, 2011](#); [Stephenson, 1983b, 1989 \[2005\]](#)). Fast forward 60 years and, within the context of Q-methodology as a mixed methods approach, it has been stressed that Q-methodology is misunderstood because, despite its conceptualization as a comprehensive methodology, which includes normative philosophical assumptions and general methodological guidelines, criticisms focus mostly upon methods (e.g., factor analysis, forced Q-sort) ([Newman & Ramlo, 2010](#); [Ramlo, 2015](#)). Several others, long ago and more recently, have made the point that critiques of Q-methodology, mostly with regard to its statistical procedures, fail to consider Q-methodology more comprehensively (e.g., [Brown, 1980](#); [Brown, 1993](#); [Brown et al., 2015](#); [Stenner, 2011](#); [Stenner & Stainton-Rogers, 2004](#); [Stephenson, 1978 \[2014\]](#)). Given the fact that many have made this argument, and that there are several articles that outline the historical and current debate surrounding Q-methodology ([Brown et al. \(2015\)](#) and [Ramlo \(2015\)](#) are informative), the intent is to only briefly outline the debate.

Q-methodology was officially debuted by William Stephenson in 1954 ([Stephenson, 1954b](#)), but many ideas underpinning the approach were published and debated much earlier ([Burt & Stephenson, 1939](#); [Stephenson, 1935](#); [Stephenson, 1936](#)). The crux of the debate is the purpose for which factor analysis is applied. Factor analysis is an interdependence technique (input variables are not defined as dependent or independent) where the interrelationship among a large number of variables are explained in terms of a smaller number of common underlying dimensions (factors) ([Hair et al., 2010](#)). The typical approach in factor analysis is to correlate items, tests, or traits. +Q-methodology, along with its Q-sort data collection technique, uses factor analysis to find shared viewpoints within a purposeful sample of people with regard to

some topic of interest. Viewpoints are considered ‘shared’ when multiple people complete Q-sorts similarly. In Q-methodology, the correlation matrix, which is subject to factor analysis, include correlations between people, not the more typical correlation matrix including correlations between tests (this difference is illustrated below). It is this analytic facet that [Cronbach and Gleser \(1954\)](#) found so dubious, and it is a source of the ‘measurement’ issues raised by [Kampen and Tamás \(2014\)](#).

The critique provided by [Kampen and Tamás \(2014:3121\)](#), which perceives a variety of issues, concludes that Q-methodology should be recognized for what it is: “an analysis technique that in attempting to combine the strengths of quantitative and qualitative inquiry inherits weaknesses from both (respectively reductionism and subjectivity).” This critique of Q-methodology resulted in a reply from [Brown et al. \(2015:524-527\)](#), who both addressed each specific critique and concisely reviewed the historical debate surrounding Q-methodology with supporting literature. To this rebuttal, [Tamás et al. \(2015:539-540, emphasis original\)](#) then stated:

Readers who are by reason of time or competence unable to pick through the details in our exchange and in the reference material should *not* use Q-methodology. While there are some circumstances in which ignorance of the inner workings of a method are scientifically acceptable, these require a degree of scientific consensus supported by empirical evidence that is certainly not found in the case of Q-methodology. On a final note, we are troubled by the reliance of our detractors on evasion, substitution, hyperbole and personalization in their arguments.

This is not the only debate surrounding Q-methodology to devolve to the point of incivility, as is reflected in a more recent exchange that was specific to the factor analytic elements of Q-methodology ([Akhtar-Danesh, 2017a, b](#); [Braswell, 2017](#); [Brown, 2017](#)).

The above block quote is worth discussion, because it raises several important elements of the debate that impede the potential for productivity. In other words, a healthy debate can often yield improvements on both sides but, unfortunately, the Q-methodology debate has mostly yielded missed opportunities. First and foremost, a pragmatist perspective with its wary assessment requirement would caution the application of any scientific approach without an understanding of its details. Second, the authors' comment about scientific consensus is unclear, and they separate method from methodology in the same sentence. In other words, are they suggesting that there is a lack of scientific consensus about the validity of Q-methodology as a comprehensive methodology, or is there a lack of consensus about particular details of the method and its analytic technique?

From a pragmatist perspective, it does not seem possible to assess either in a vacuum and, most importantly, a critique of methodology can be improved by: (1) assessing the underlying normative assumptions of the respective methodologies and; (2) articulating, as the critic, one's own worldview and paradigmatic approach to science (e.g., if one adopts an extreme rationalist view (Figure 2.1), or a purist/oppositional view (Figure 2.2), then skepticism of Q-methodology is understandable, particularly if one adheres to a positivistic paradigm). Without these two elements, it is difficult to realize the potential benefit of any critique (i.e., improved methodology or the creation of new insights). It seems, by and large, the majority of criticisms of Q-methodology lack these two elements, which minimizes their potential benefit and maximizes the potential for detrimental misconceptions.

On the other side of the debate, rebuttals in support of Q-methodology could be improved. The final sentence of the quote above implies an unprofessional tone by the Q-rebuttal, and a reading of [Brown et al. \(2015\)](#), while informative and well supported by the

literature, does impress a defensive tone. Even though such a tone may be understandable given the fact that the lead author (i.e., Steven Brown) has spent an entire career discussing and clarifying Q-methodology, it is nonetheless unproductive. For those critiques of Q-methodology that assess the data collection technique and analysis in a vacuum, there seems to be an accompanying rebuttal that simply suggests the critique is missing the big picture. In short, Q-methodology responses often miss an opportunity to advance the conversation. The debate does highlight a level of incommensurability, as the participants appear to continually ‘talk past one another’.

It may be worth engaging in the debate, particularly because it provides an opportunity to demonstrate how a pragmatist EE might provide a different perspective and advance the conversation. There are two broad issues worth highlighting which could be addressed to advance the conversation. First, there is the issue of Q-methodology versus R-methodology (described in-depth below) as *single* approaches. That is, whether the debate could yield improvements to either Q-methodology, as a non-generalizable, small and purposeful sampling, tradeoffs eliciting approach to understanding viewpoints, or R-methodology as a generalizable, random sampling, degree-without-tradeoffs approach to developing psychological constructs. The second issue is the *combination* of Q-methodology with R-methodology, which would typically require two different data collection efforts. This issue is an important one, and arguably the greatest benefit of the Q-methodology debate is that it has, in part, motivated conversations about how to best combine the strengths of both approaches (e.g., [Baker et al., 2010](#); [Danielson, 2009](#)).

However, this chapter focuses on the first issue, as this is the primary subject of the debate, and its continuation has led to less attempts to clearly articulate and embrace the differences

between Q-methodology and R-methodology and more attempts to make the two similar. For instance, [Thompson et al. \(2012\)](#) compared two random sample surveys, one of which employed a Q-sort data collection technique and the other employed a standard psychometric instrument with Likert-style scales. The Q-sort contained 36 statements and the Likert-scale questions included the same statements as individual items. Essentially, the authors were implementing the Q-sort technique with survey methodology to see if similar factors emerged in both surveys. [Thompson et al. \(2012\)](#) found that the results were similar, though the logistics of employing a Q-sort as a mailed survey was deemed relatively challenging, and ultimately reinforced the observation by [Danielson et al. \(2009\)](#) that traditional Likert-style surveys are the better approach to understanding the prevalence of viewpoints about a particular topic. This chapter focuses on highlighting the differences between Q-methodology and R-methodology, which may lead to insights how the two approaches could inform, reinforce, and/or contradict one another. To facilitate this discussion, the same data (i.e., Gila National Forest data) is analyzed through these different lenses.

6.2. Q-methodology: A different way to study psychology

It is important to stress that Q-methodology, as originally conceptualized by William Stephenson, was intended to provide an alternative approach to psychological study; one which eschewed an ontology that assumed human behavior was atomistic and mechanistic ([Stenner, 2009](#); [Stephenson, 1989 \[2005\]](#)). As [Stephenson \(1978 \[2014\]:48\)](#) lamented late in his life: “Q-methodology was meant to be the foundation for a subjective science. Instead it remains as Q-technique, Q-analysis, Q-method, alongside multivariate analysis, discriminative function, variance analysis, R factor analysis and the like tools of statistical minds.” This ‘subjective

science' includes normative assumptions and basic beliefs about practice related to, for instance, sample sizes, representativeness, and interpretability.

Discussion of this subjective¹⁴ science is presented below, but there is a need to first discuss the specifics of the debate (i.e., Q-methodology and R-methodology). The latter half of the above quote highlights the importance of discussing terminology. Indeed, the literature focused on the topics of 'Q-methodology', 'R-methodology', 'R-type' factor analysis, and 'Q-type' factor analysis can create confusion as there is inconsistency related to the meaning of each of these terms (e.g., sometimes Q-methodology and Q-analysis are used interchangeably, and sometimes there is an explicit difference between the two).

Generally, though, the purpose of factor analysis is data summarization and data reduction. The underlying assumption with for both types of factor analysis is that the data has unobservable latent entities, or factors, which represent a combination of multiple variables. The data summarization, according to [Hair et al. \(2010:98\)](#), is about uncovering the structure in the data where "individual variables are grouped and then viewed not for what they represent individually, but for what they represent collectively in expressing a concept." Data reduction results because many variables are grouped into a much smaller number of factors, each of which essentially represents a single variable (as a combination of several variables) with a unique 'collective' representation. A correlation matrix with an underlying structure is expected to have many instances of pairs of variables being highly correlated.

¹⁴ Subjective in this context is not referring to methodology in the sense that quantitative research methods are often assumed to be more 'objective' than qualitative research methods (a debatable, though prevalent, assumption). Instead, subjective is referring to ontological and, consequently, epistemological assumptions. The differences between such assumptions related to Q-methodology and R-methodology are discussed below, though the practical implications of such differences for the analysis discussed herein are discussed without certainty.

The raw data yielded from completion of this exercise is shown below in Table 6.1. The variables in the columns represent people's Q-sorts (i.e., "W"), and the observations in the rows represent the statements being ranked (i.e., "N" statements being ranked). Due to the quasi-normal distribution of the Q-sort (and assuming each respondent completes the Q-sort as instructed), each of the variables (i.e., Q-sorts) has equal means and standard deviations. This means that the data do not need to be standardized prior to analysis for the purposes of comparing the Q-sorts of different individuals. Using the data in Table 6.1, a correlation matrix between all Q-sorts is derived.

Table 6.1. Raw data matrix in Q-methodology

		Persons (Q sorts)			
		A	B	...	W
Statements (items)	1	-4	+2	...	-3
	2	+1	+3	...	-2

	N	0	4	...	1

Table 6.2, which is a slightly modified version of Table 6.1 shows how the Q-sorts are correlated. The explanation of how the correlation coefficient is derived is drawn from [Brown \(1980\)](#) and [Armatas \(2013\)](#). The equation used for computation of the correlation coefficient in Q-methodology is as follows:

$$r_{a,b} = 1 - \frac{\sum_{n=1}^N d^2}{2Ns^2} \quad (1)$$

where d is equal to the difference between scores for each statement (e.g., $d_{1,2}^2$), N is the number of statements being ranked, and s^2 is equal to the variance for the forced distribution. The variance for the forced distribution is represented by the following formula ([Brown, 1980:264](#)):

$$s^2 = \frac{\sum fx^2}{N} \quad (2)$$

where x^2 is equal to the square of the raw score on the Q-sort (-4, -3, ..., 3, 4 in our example in Figure 1) and f is the frequency at which it occurs on the Q-sort (i.e. the number of statements that can be given that score).

Table 6.2. Calculating the correlation between Q-sorts

		Persons (Q sorts)				
		A	B	...	W	$d_{1,2}^2$
Statements (items)	1	-4	+2	...	-3	36
	2	+1	+3	...	-2	4

	N	0	4	...	1	16
					$\sum_{n=1}^N d^2$	250

Using Table 6.2 as an example, Q-sort A scored statement 1 as -4, and Q-sort B scored statement 1 as +2 (both of these scores would be found by looking for the column placement of statement 1 by each Q-sorter), which yields a difference of 6. The difference would then be

squared ($6^2 = 36$), and summed for all statements in the Q-set for Q-sort A and Q-sort B. To continue the example, let us assume that the sum of the squared differences of the statements between Q-sort A and B is 250. The final aspect of the correlation coefficient equation that needs calculating is the denominator, which is as follows:

$$2Ns^2 = 2N(\sum fx^2 / N) \quad (3)$$

To continue the calculation using the Q-sort in Figure 1, the scores of -4, -3, -2, -1, 0, +1, +2, +3, and +4 have frequencies of 2, 3, 4, 5, 6, 5, 4, 3, 2, respectively. Therefore, fx^2 for the far left column of the Q-board is expressed by: $(2)(-4^2) = 32$, and the column with a score of -3 is expressed by: $(3)(-3^2) = 27$, and so on and so forth. After several calculations and remembering that N equals the total number of statements (which can also be computed by totaling the frequencies), the variance of the forced distribution in this example is as follows:

$$s^2 = \sum fx^2 / N = 160 / 34 = 4.71$$

The denominator for the correlation coefficient equation can now be calculated:

$$2Ns^2 = 2(34)(4.71) = 320.28$$

Calculating the correlation coefficient between Q-sort A and Q-sort B in this example is now possible:

$$r_{a,b} = 1 - \frac{\sum_{n=1}^N d^2}{2Ns^2} = 1 - \frac{250}{320.28} = 1 - .78 = .22$$

By calculating the correlation coefficients between all Q-sorts, one is able to create a correlation matrix (W by W, where W is number of Q-sorts). Table 6.3 provides an example of what a correlation matrix with four Q-sorts looks like. For the Gila National Forest study, there were 122 participants, which resulted in a 122 by 122 correlation matrix, but four of those pairwise

correlations are included in Table 6.3. The particular pairwise correlations selected were strategic, as will become evident in the discussion below differentiating cluster analysis and Q-type factor analysis (not to be confused with Q-methodology). A high positive correlation means that two Q-sorts were similar, or in other words, two people placed the cards onto the Q-board (Figure 6.1) in a similar way.

Table 6.3. Correlations between Q-sorts (variables in Q-methodology)

	Q-sort 2	Q-sort 24	Q-sort 31	Q-sort 92
Q-sort 2	1.000	-0.51	0.78	-0.49
Q-sort 24	-0.51	1.000	-0.70	0.90
Q-sort 31	0.78	-0.70	1.000	-0.57
Q-sort 92	-0.49	0.90	-0.57	1.000

In terms of technical details, Q-methodology is distinguished from ‘R-methodology’ by its Q-sort data collection technique and the derivation of a correlation matrix that includes the relationship between peoples Q-sorts. In other words, from the correlation matrix through final factor solution, the mechanics are mostly the same. To be clear, there are some differences, but these differences are mostly the result of paradigmatic differences (e.g., issues of representativeness, fundamental ontological beliefs). For example, Q-methodology studies do not apply ‘Cronbach’s Alpha’, because such a reliability test is not applicable to Q-methodology. This point is elaborated on below, but first it is necessary to briefly introduce the basics of ‘R-methodology’.

6.2.2. R-methodology: data and deriving the correlation matrix

R-methodology was a generic label applied by William Stephenson based on the well-known correlation statistic of Karl Pearson (i.e., ‘Pearson’s r ’) for all methods “which employ tests or traits as variables and operate using a sample of persons” ([Watts & Stenner, 2012:10](#)). An R-methodology study starts with data oriented as shown in Table 6.4 , where the columns in the data matrix are test/trait variables that could represent almost anything (e.g., height, weight, IQ score, introvert/extrovert test score, attitudes, behavioral observations, socio-demographic variables, etc.) and the rows represent people and their corresponding measurements for each test.

Table 6.4. Initial data matrix for R-methodology analysis

Tests, traits (e.g., attitudes, socio-demographic characteristics)				
Persons	1	2	3	m
A	ax1	ax2	ax3	axm
B	bx1	bx2	bx3	bxm
C	cx1	cx2	cx3	cxm
D	dx1	dx2	dx3	dxm
N	nx1	nx2	nx3	nxm

Source: Adapted from [Watts and Stenner \(2012\)](#)

Often, the variables are measured differently or on different scales, which does not allow direct and meaningful comparison. For example, Table 6.5 provides a hypothetical table of data that may be of focus in an R-methodology study. Directly comparing height and weight, for example, does not make much sense (e.g., consider the question: “is 72 inches bigger than 240 pounds?”).

Table 6.5. Data from a hypothetical R-methodology study

Variables				
Persons	Height (inches)	Weight (pounds)	Wing span (inches)	IQ (numeric score)
A	72	240	74	80
B	80	220	80	115
C	60	150	57	78
D	53	110	56	140
E	61	185	66	98

In order to better compare these variables, it is common to standardize the measurements to yield ‘z-scores’, where the mean of each variable is zero and the standard deviation is one. Table 6.6 provides z-scores for the data in Table 6.5. The z-scores highlight how a particular score for a person compares to the entire sample with regard to each variable individually. For example, a z-score of 0.635 for height, for person A, represents that that particular person is 0.635 standard deviations above the mean (average) height of the sample. It is important to note that standardization does not change the shape of the distribution ([DeVeaux et al., 2012](#)), therefore variables assumed to be normally distributed prior to standardization are assumed to be normal after standardization. Generally, normalcy is assumed for multivariate statistical methods, along with other assumptions such as homoscedasticity and linearity; while these assumptions are also generally assumed for factor analysis, they are perhaps only important in terms of their effect on reducing correlations between variables ([Hair et al., 2010](#)). In other words, as an interdependence technique, which is not trying to assert an independence/dependence relationship, factor analysis is more concerned with identifying

interrelated variables; thus, factor analysis is in many ways “more affected by not meeting its underlying conceptual assumptions than by the statistical assumptions” ([Hair et al., 2010:104](#)).

Table 6.6. Standardized measurements, or z-scores of hypothetical data

Persons	Variables			
	Height	Weight	Wing span	IQ
A	0.635	1.124	0.706	-0.856
B	1.382	0.743	1.279	0.494
C	-0.486	-0.591	-0.916	-0.933
D	-1.139	-1.353	-1.012	1.458
E	-0.392	0.076	-0.057	-0.162

These standardized scores can then be used to directly compare each of the variables. For the purposes of factor analysis, variables need not be standardized, as a correlation matrix where a ‘Pearson’s r’ is created for each pairwise combination of variables is possible without standardization. That is, there is nothing inherently mathematically wrong with completing factor analysis on variables that are not standardized, but the standardization is common as it ensures that variances are equal ([Jolliffe & Cadima, 2016](#)). The ‘Pearson’s r’, also known as the product-moment correlation coefficient, is the “mean of the products of the pairs” of standardized variables ([Stephenson, 1954b:53](#)), as represented by the following equation¹⁵:

$$r_{ab} = (\sum_1^n (s_a s_b)) \div (n - 1) \quad (4)$$

¹⁵ It may be noticed that equation (4) is different from equation (1), even though both are stated as equations for measuring correlation of two variables. While different representations, it should be noted that they are equivalent, as shown by [Brown \(1980:272-275\)](#).

Where r is the correlation coefficient, a and b are variables, s is the standardized score, and n ¹⁶ is the number of observations (people) in the data set. Using Table 6.5, the correlation between height and weight is calculated as follows:

$$r_{(height)(weight)} = \left((0.635 \times 1.124) + (1.382 \times 0.734) + (-0.486 \times -0.591) + (-1.139 \times -1.353) + (-0.392 \times 0.076) \right) \div (5 - 1)$$

$$r_{(height)(weight)} = 0.88$$

If this is done for all combinations of variables, a correlation matrix results, as shown in Table 6.7. The correlation matrix is the subject of factor analysis, and while this particular matrix is not suitable for analysis due to the small sample size (i.e., $n=5$), it is important to clearly show the starting point for factor analysis in the case of R-methodology studies differs from that in Q-methodology.

Table 6.7. Correlations between tests or traits (variables in R-methodology)

	Height	Weight	Wing span	IQ
Height	1.000	0.8846	0.9588	-0.2514
Weight	0.8846	1.000	0.9122	-0.5072
Wing span	0.9588	0.9122	1.000	-0.1459
IQ	-0.2514	-0.5072	-0.1459	1.000

¹⁶ It is worth highlighting that “ n ” is the number of observations in this equation, and “ N ” is the number of statements in equation (4). This highlights the reversing of people and items in the two approaches.

With regard to Q-methodology, then, ‘factoring’ people instead of tests/traits is done with a specific, “different form of data” (i.e., Q-sorts), which allows one to “ascertain the degree of agreement, or disagreement, between the entire set of item rankings produced by any two persons” ([Watts & Stenner, 2012:18](#)). This highlights a difference between Q-methodology and R-methodology, where the former implements a data collection instrument where all the items are interrelated to yield a single combination and the former does not (i.e., items are, in practice, independent). Furthermore, Q-methodology find “groups of persons [i.e., factors] who have rank ordered the heterogeneous stimulus items in a very similar fashion” ([Watts & Stenner, 2012:18](#)), whereas R-methodology initially starts by finding what test/traits are correlated and grouped. That is, the simple correlations between people, as shown in Table 6.3, are the starting point for Q-methodology, whereas R-methodology starts with a correlation matrix similar to Table 6.7. The implications of these differences between Q-methodology and R-methodology are elaborated on, with the help of an example, below; however, it is worth clarifying this area of the literature that is potentially confusing.

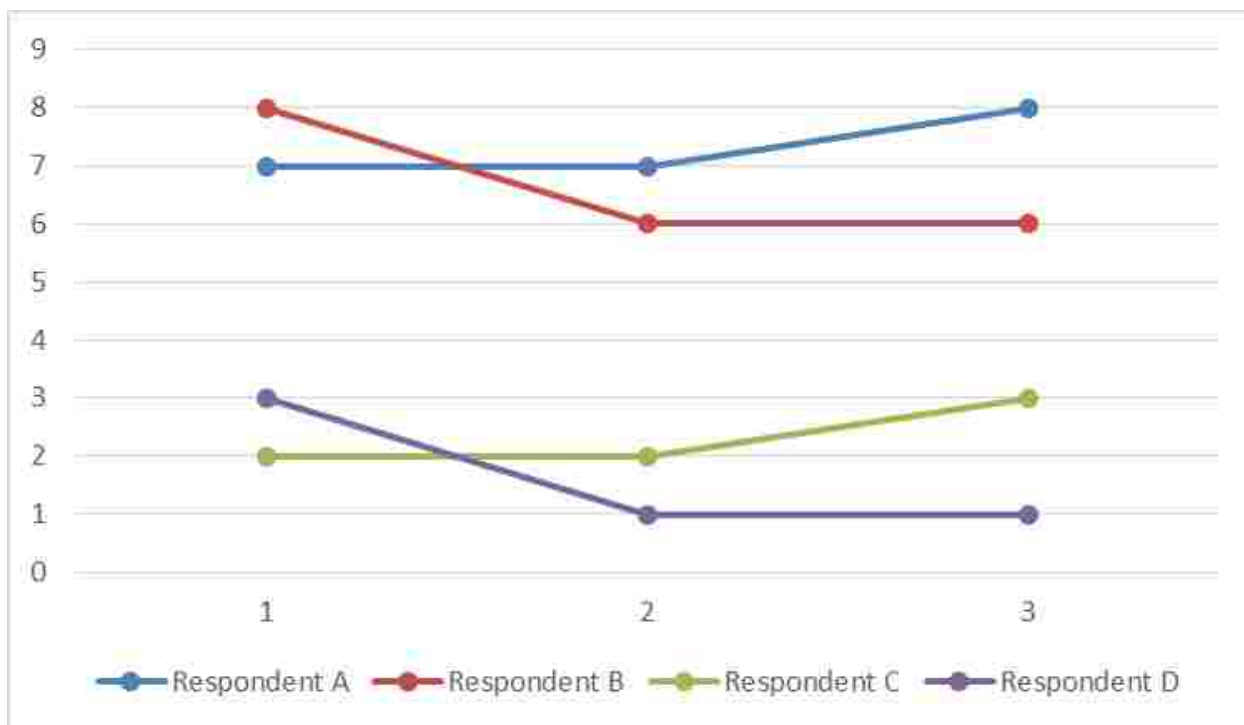
6.2.3. *Confusing Q-methodology and ‘Q-type’ factor analysis*

[Hair et al. \(2010\)](#) identified two types of exploratory factor analysis: R-type and Q-type, where the former uses the correlation of variables as input for analysis, and the latter is based on the correlation of individual respondents. Accordingly, Q-type factor analysis identifies “groups or clusters of individuals that demonstrate a similar pattern on the variables included in the analysis”, which differs from cluster analysis in that it is “based on the intercorrelations between the respondents, whereas cluster analysis forms groupings based on a distance-based similarity measure between the respondents’ scores on the variables being analyzed” ([Hair et al.](#),

[2010:101](#)). In other words, cluster analysis of a group of respondents on variables would be less concerned with patterns across variables (e.g., two people show a decrease in value when moving from variable one to variable two) and more concerned with similarities across variables in terms of value (e.g., two people have similar values for two variables).

To demonstrate this difference, Figure 6.2 is provided, and the authors note that cluster analysis would group respondents with A and B as one pair, and C and D as another pair, based on their proximity. While Q-type factor analysis would group A and C as one pair, and B and D as another pair, based upon the similar changes in direction of value across variables.

Figure 6.2. Comparisons of score profiles for Q-type factor analysis and cluster analysis



Source: Adapted from [Hair et al. \(2010\)](#)

In this context, Q-type factor analysis is referring to the correlations of people instead of variables, but it is assumed that matrix of data at issue for both ‘Q-type’ and ‘R-type’ factor analysis is the same. That is, the data being analyzed with ‘Q-type’ factor analysis is of the type shown in Table 6.5, where the variables (i.e., tests/traits) are generally assumed to be independent. To be clear, some level of ‘multicollinearity’ is desirable in factor analysis, as the general purpose is to find linear combinations of variables (so there is an underlying assumption that the variables are correlated) ([Hair et al., 2010](#)); however, the type of data discussed by [Hair et al. \(2010\)](#) is not Q-sort data, whereby the forced distribution introduces a level of dependence among the items being sorted. For example, based upon the assumption that respondents follow the forced distribution, if we are provided with the knowledge of how a respondent sorted 29 of the 30 ecosystem services onto Figure 6.1, then we know with certainty what the value of the final ecosystem service is. Such certainty is not built into the data being collected in Table 6.5.

To demonstrate the influence of the forced distribution, Figure 6.3 illustrates the values for the 30 items sorted in the Gila National Forest study for four respondents. These four Q-sorts are those included in Table 6.3 above, which showed both highly positive and negative correlations. Those positive pairwise correlations (e.g., QSORT 2 and QSORT 31) demonstrate both a similarity in distance and pattern. In other words, the values of the different items being sorted are not only close in value, but in most cases they also demonstrate similar changes in value across the different items. This is different from Figure 6.2, which highlights the influence of the forced Q-sort.

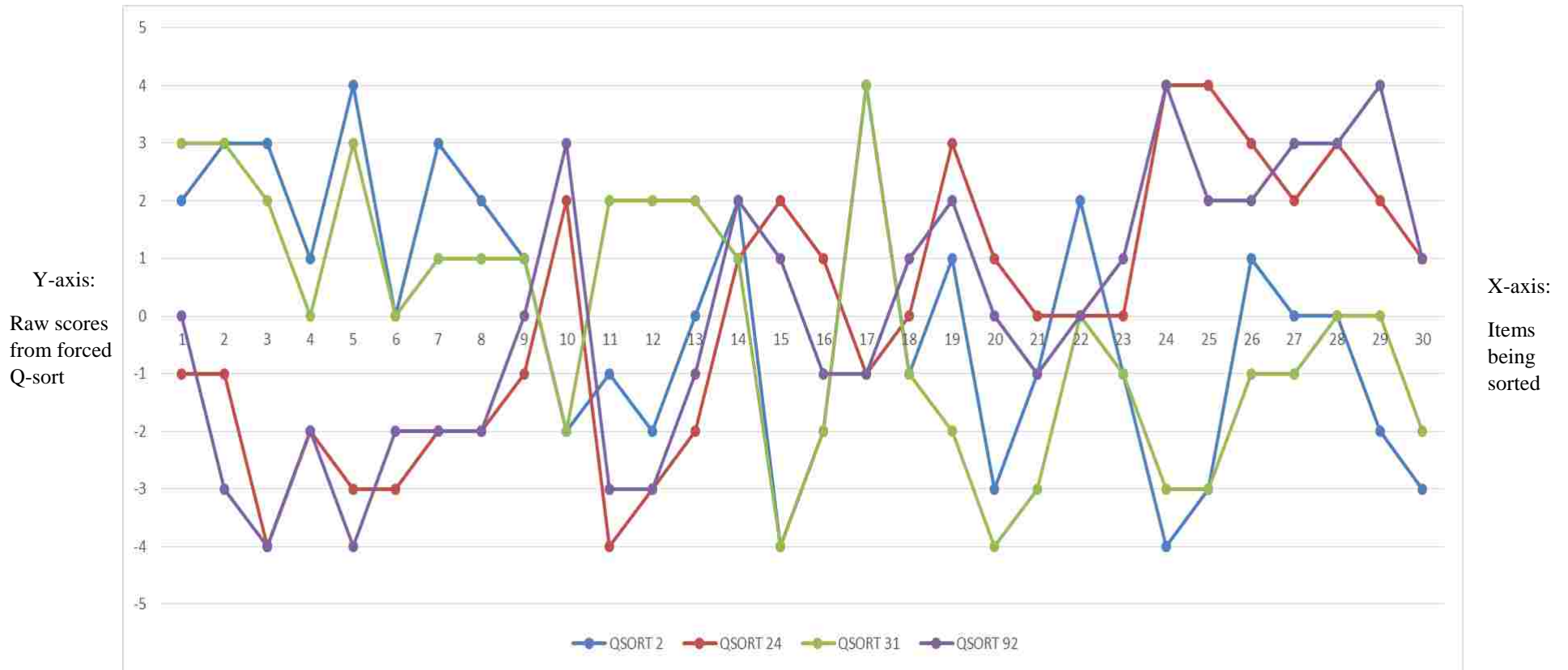
William Stephenson, as the creator of Q-methodology, was quite clear that the matrix of data applied within Q-methodology (collected with the Q-sort) was independent of that used in R-methodology (as shown in Table 6.5; however, critics of Stephenson such as Cyril Burt were

adamant about only one matrix being at issue ([Stephenson, 1954b](#)). The debate regarding the ability of simply inverting the data in Table 6.4, for instance, and then factoring people instead of tests/traits culminated in a joint paper between Cyril Burt and William Stephenson entitled, “alternative views on correlations between persons” ([Burt & Stephenson, 1939](#)). In this paper, the scholars laid out their points of agreement and disagreement and, in the end, ‘agreed to disagree’.

These divergent perspectives on how to group people led to Q-methodology on the one hand, and Q-type factor analysis on the other. According to [Newman and Ramlo \(2010:507\)](#), “Q-methodology” is different from “Q-factor analysis”, where the former constitutes a complete methodology with a “set of procedures, theory, and philosophy that focuses on subjectivity.” The latter, as advocated by Burt and others, was grouping people by, in essence, simply inverting a standard matrix of data so that people were correlated instead of variables. This is the approach to Q-type factor analysis that [Hair et al. \(2010\)](#) is referring to above. The association of Q-type factor analysis and cluster analysis is unsurprising, as the latter is typically how people are grouped with regard to the type of data shown in Table 6.5. Additionally, Figure 6.3 demonstrates that highly correlated Q-sorts are also in close proximity (in the cluster analysis sense).

Several papers have focused on comparing ‘Q-type’ factor analysis and cluster analysis, and in such comparisons (e.g., [Akaah, 1988](#); [Hagerty, 1985](#); [Morf et al., 1976](#)) the type of data being analyzed with the different techniques is similar to that in Table 6.5. Q-type of factor analysis is not well liked, as it is both computationally difficult ([Hair et al., 2010](#)) and is considered by some as statistically dubious ([Watts & Stenner, 2012](#)).

Figure 6.3. Scatterplot of item placement of four respondents from a Q-methodology study



Also, in the same way that traditional factor analysis only groups variables into factors, and thus requires cluster analysis to understand how different people align with the different factors; Q-type factor analysis would only group people, leaving little clear understanding of what variables are underlying the groupings of people.

In their book about latent variable models (e.g., factor analysis, latent class models), [Bartholomew et al. \(2011:244\)](#) use the term ‘Q-methodology’, even though they mostly describe a Q-type factor analysis. Interestingly, they also noted that Q-methodology “became detached from both psychology and statistics and exists as a separate entity with its own journal, conferences and so on...it is, perhaps, appropriate to observe that although the original link with factor analysis has become tenuous, if not tendentious, the existence of this field of study bears testimony to fertile ground which factor analysis has provided for the generation of new methods of statistical analysis.” While I cannot attest to the detachment from psychology and statistics, the latter part of the statement moves away from the confusion between Q-type factor analysis of the data shown in Table 6.5 to Q-methodology as a distinct and comprehensive methodology.

6.3. Moving beyond the correlation matrix: Comparing factor analysis procedures of Q-methodology and R-methodology

As noted above, the basic steps and mechanics of analyzing the different correlation matrices in Q-methodology and R-methodology are similar. However, there are several facets, such as how (or if) particular factor analytic steps are completed, which vary between the two. These variations are due to the normative assumptions and general methodological beliefs underpinning Q-methodology and R-methodology. As [Stenner \(2008:1, emphasis original\)](#)

explained in the introduction to a special issue on theoretical perspectives related to Q-methodology (in an article entitled *Between method and ology*): “it is the technical aspects of *method* that have been emphasized to the relative neglect of the philosophical aspects of *ology*.”

In order to facilitate this discussion of general factor analytic procedures, results from the analysis of the Gila National Forest data is presented to highlight the difference between Q-methodology and R-methodology in terms of factor analytic procedures. Therefore, the study is briefly introduced. The data used for analysis and discussion in this chapter is from an effort to support the Gila National Forest in their forest plan revision process ([Armatas et al., 2017b](#)). Using a Q-sort (Figure 6.1), data was collected from 122 people during the week of June 12th, 2017. Over the course of five public meetings around the Gila National Forest, the participants were asked to prioritize the 30 ecosystem services listed in Table 6.8.

Prior to commencing, there is a need to highlight the obvious limitation of analyzing this data within the context of R-methodology, which is that it is collected within the context of Q-methodology. Therefore, the sample is purposeful, not random, which would prevent any assertions of generalizability to the population. Another limitation of analyzing Q-sort data through an R-methodology lens is that the ranking of the items, due to the forced Q-sort, are interrelated. When using scales to measure psychological constructs, each item is independent in the sense that one could select the same answer to every question. However, for illustrative purposes, I will proceed with an R-methodology analysis of the Gila data as if these limitations did not exist; that is, let us assume that the results below reflect those gathered from a random sample of the population using a survey instrument whereby each of the ecosystem services in Table 6.7 were individual questions in Likert-scale format.

Table 6.8. List of ecosystem services that participants prioritized

Provisioning services (extractive resources and uses)

1. Forest materials for personal use (for example – firewood, Christmas trees, gems, food, traditional and medicinal plants)
2. Timber production
3. Oil and natural gas and minerals (for example – gold, copper, gravel)
4. Woody biomass for energy (for example - wood pellets, chip production)
5. Livestock grazing
6. Water for household and municipal use
7. Irrigation for agriculture

Cultural Services (recreation, historical, scientific, community and cultural, and personal-enrichment benefits)

Recreation and leisure related cultural benefits

8. Outfitting and guiding (for example – hunting and fishing)
9. Hunting and fishing (non-outfitted)
10. Non-motorized recreation (for example - hiking, biking, horses, floating, bird watching)
11. Motorized recreation (for example – Off-highway vehicles (OHVs), dirt bikes)
12. Driving for pleasure
13. Developed camping (areas with toilets, tent sites, and water)
14. Dispersed camping (areas without any services)

Other cultural benefits

15. Solitude, quiet, and a clear night sky
16. Native American cultural benefits (for example – ceremonial sites and materials)
17. Traditional agricultural lifestyle (for example – connection to ranching, and use of irrigation ditches (Acequias))
18. Education and interpretation of the area and ecosystems.
19. Research and science (for example - ecology, forestry, and archeology)
20. Places where human influence is substantially unnoticeable.
21. Cultural and archeological sites
22. Public ownership and access to public land
23. Scenic beauty, aesthetics, and inspiration

Regulating Services (environmental benefits)

24. Flood and erosion control
25. Carbon absorption
26. Biodiversity and abundance of plants and animals (including threatened and endangered species)
27. Wildlife habitat and connectivity
28. Water quality
29. Air quality
30. Water quantity (water in rivers and streams)

*Note: Italicized categories of ecosystem services, and numbers associated with ecosystem services were not given to participants. In other words, each card had an ecosystem service only (e.g. “Livestock grazing”, “Outfitting and guiding (for example – hunting and fishing)”)

6.3.1. *Factor Analysis and Principal Components Analysis*

Up to this point, the term ‘factor analysis’ has been used generally; however, it is also a specific analytic method that is usually differentiated from ‘principal component analysis’. Both methods are widely used and, according to [Hair et al. \(2010\)](#), the purpose of research is often the driving factor for deciding which is the most appropriate. If prediction is the focus of the research, and the ultimate goal is to “summarize most of the original information (variance) in a minimum number of factors”, then principal component analysis (PCA) is perhaps most appropriate; however, if “identifying underlying factors or dimensions that reflect what the variables share in common”, then common factor analysis may be more appropriate ([Hair et al., 2010:107](#)).

Variance, as the square of the standard deviation, “represents the total amount of dispersion of values for a single variable about its mean”, and the distinction between two factor analytic methods relates to how the methods incorporate unexplained variance and explained variance ([Hair et al., 2010:105](#)). PCA considers the total variance, or both the explained and unexplained variance. Explained variance, or common variance, is defined by the portion of a variable variance which is shared with all other variables. Unexplained variance includes unique (or specific) variance, which refers to the variance only associated with a specific variable, and error variance is variance that is due to “unreliability in the data-gathering process, measurement error, or a random component in the measured phenomenon” ([Hair et al., 2010:105](#)). Common factor analysis, on the other hand, considers only the common or shared variance ([Hair et al., 2010](#)).

The way that this is done is within the diagonal of the correlation matrix (i.e., the cell in the correlation matrix that represents how variables are correlated with themselves); PCA inserts

values of 1.0 (unities) into the diagonal, and factor analysis inserts communalities into the diagonal. A variables communality is the “estimate of its shared, or common, variance among the variables as represented by the derived factors” ([Hair et al., 2010:105](#)). In practice, the two different approaches have been shown to yield very similar results, though PCA is perhaps more common, which may be due to it seeking a single unique solution (as opposed to the factor indeterminacy in common factor analysis). It is worth noting that analysis of both data sets relevant to this dissertation (i.e., the Shoshone National Forest data and the Gila National Forest data) applied both PCA and common factor analysis. For practical purposes, there was little difference in the final factor solutions. For the examples provided below, PCA is used in both the R-methodology and Q-methodology approach to data analysis, and even though some insist that the resulting dimensions in PCA be called ‘components’ instead of ‘factors’, I will be using the general term factors to describe the dimensions extracted from the data.

6.3.2. Assessing the correlation matrix prior to factor analysis

Since factor analysis is a method focused on the interrelationship between variables, it is typical to assess the correlation matrix prior to factor analysis to understand if factor analysis is suitable.

R-methodology

In R-methodology, to assess for suitability, the correlation matrix is inspected to see if there are at least some high correlations between variables. To gain this understanding, two statistical tests were performed. First, the Bartlett test of sphericity, which tests for the presence

of correlations among the variables ([Hair et al., 2010](#)) indicated clear statistical significance (p -value < 0.001); suggesting sufficient correlations to proceed. Additionally, a "Kaiser-Meyer-Olkin factor adequacy", or KMO test, was run to measure sampling adequacy (MSA). This test provides an overall adequacy for proceeding with factor analysis, and it also highlights the suitability of proceeding with specific variables. According to [Hair et al. \(2010\)](#), if an MSA value falls below 0.50 for a variable, then it should be dropped prior to running factor analysis. The KMO test yielded a suitable overall value, and it also highlighted three variables worth dropping. From the start, PCA was performed on 27 variables (ecosystem services) with 122 observations (people assigned importance to ecosystem services).

Q-methodology

Formal measures of sampling adequacy (e.g., KMO test) are not typically applied to the correlation matrix within Q-methodology. In fact, there is little formal assessment of the correlation matrix in Q-methodology ([Brown, 1980](#)), though one should visually inspect the correlation matrix for correlations. As [Hair et al. \(2010\)](#) suggested, it is appropriate to visually inspect the correlation matrix to note if there are at least several pairwise correlations above 0.30 (without this then factor analysis is likely inappropriate). The reason for this discrepancy in process between Q-methodology and R-methodology is that the former, in its interest in finding whether or not there are similar Q-sorts about some (usually contentious) topic, generally assumes that there will be some level of similarity between some Q-sorts. In the case of the Gila study, extremely low KMO and Bartlett's tests would suggest a lack of common variance where each Q-sort is a factor of its own (i.e., 122 idiosyncratic viewpoints), which seems unlikely. It is generally assumed that the topic of interest (e.g., the importance of ecosystem services) will

result in some groupings of similar Q-sorts (presumably because everyone sampled had some interest in the ecosystem services).

For the purpose of this discussion, both the Bartlett test of sphericity and a KMO test were run on the correlation matrix for the Q-methodology study (i.e., correlations between Q-sorts). The sphericity test indicated clear statistical significance (p-value < 0.001), suggesting sufficient correlations to proceed. On the other hand, the KMO test indicated a potential problem, which is that the matrix is singular. A singular matrix suggests that its determinant is zero, or that it contains rows or columns which are proportionally interrelated; two frequent causes of this are when the number of variables are greater than the number of cases, and two or more variables are highly correlated ([ttnphns \(user 3277\), 2019](#)). The correlation matrix at issue has both of these characteristics, with a variable (Q-sort) to observation (ecosystem service) ratio of 4:1, and inspection of the correlation matrix does indeed show several highly correlated variables, one of which is reflected in Table 6.3 (i.e., 0.90 pairwise correlation). Within the context of factor analysis (PCA specifically in this case), a large number of variables relative to observations can lead to a large number of significant factor loadings on the initial few factors extracted, which may make interpretation of the factors more difficult ([Jolliffe & Cadima, 2016](#)). Relatedly, highly correlated variables may lead to an overemphasis on the contribution of a factor, in terms of variance explained (i.e., size of the eigenvalue—calculated as the sum of the squared loadings on a factor) ([whuber \(user 919\), 2013](#)). These interrelated issues, and the rationale as to why they are not of major concern to Q-methodology, are discussed in the next section.

In this section, the rationale for not implementing potential fixes to this issue are discussed from the Q-methodology perspective. Potential fixes related to this issue of a singular

matrix, at least from the R-methodology perspective, is to drop some of the highly correlated variables, and/or increase sample size. Indeed, this works with the correlation matrix at issue, but it requires a large reduction in variables (which also consequently decreases the Q-sort to ecosystem services ratio). By removing the first 110 Q-sorts, a KMO test yields both a suitable overall value and suitable single item variables. While dropping variables (and/or adding observations) is an option, at least statistically (as demonstrated by the approach described above within the context of R-methodology), there are reasons for why one would avoid such actions within the context of Q-methodology. For example, if measures of sampling adequacy, such as the KMO test, suggest a problematic variable, which is either lowly or very highly correlated with other variables, then it may be justifiable to drop this variable. However, in Q-methodology, it is not common practice to drop Q-sorts. A Q-sort that is incomplete, or clearly highlights a person who misunderstood the task, could be dropped; but a Q-sort that is complete and otherwise acceptable represents a perspective of an individual that was selected to provide their opinion. It is as legitimate as any other perspective, and if it is not correlated with any other Q-sorts then it suggests that it is a unique or idiosyncratic viewpoint.

As for the potential action of increasing sample size, or the number of ecosystem services sorted by respondents in this case, it is both impractical and counter to the methodology. It is impractical in the sense that one cannot add ecosystem services to be sorted after data collection is complete. Most importantly, it is counter to the process of developing the list of items to be sorted in a Q-methodology study. That is, one aims to include a diverse range of items that generally represents the subject matter related to the topic of interest. If one can reasonably argue that, for instance, 30 ecosystem services represents the broad range of ecosystem services derived from the Gila National Forest, then adding additional ecosystem services for the sole

purpose of satisfying a KMO test seemed unjustified. Again, the implications of challenging factor interpretation and potentially biased eigenvalues are discussed below in the section on factor extraction.

6.3.3. *Factor extraction*

Factor extraction is usually not ‘spelled out’ in contemporary textbooks, because the actual process, if done by hand, is computationally arduous. Statistical software packages (e.g., R, STATA) complete the process in seconds. While [Armatas \(2013:122-129\)](#) includes an example of by-hand factor extraction, the reader is spared this tedious description. Instead, a concise discussion by [Hair et al. \(2010:108-109, emphasis original\)](#) is included, because it nicely captures the actual extraction process; while light on technical details, it highlights the conceptual workings of the extraction process:

Both factor analysis methods [(i.e., common factor analysis and principal components analysis)] are interested in the best linear combination of variables – best in the sense that the particular combination of original variables accounts for more of the variance in the data as a whole than any other linear combination of variables. Therefore, the first factor may be viewed as the single best summary of linear relationships exhibited in the data. The second factor is defined as the second-best linear combination of the variables, subject to the constraint that it is orthogonal to the first factor. To be orthogonal to the first factor, the second factor must be derived from the variance remaining after the first factor has been extracted. Thus, the second factor may be defined as the linear combination of variables that accounts for the most variance that is still unexplained after the effect of the first factor has been removed from the data. The process continues extracting factors accounting for smaller and smaller amounts of variance until all of the variance is explained. For example, the components method actually extracts n factors, where n is the number of variables in the analysis. Thus, if 30 variables are in the analysis, 30 factors are extracted.

So, what is gained by factor analysis? Although our example contains 30 factors, a few of the first factors can represent a substantial portion of the total variance across all the variables. Hopefully, the research can retain or use only a small

number of the variables and still adequately represent the entire set of variables. Thus, the key question is: *How many factors to extract or retain?*

The initial results of factor analysis is an unrotated factor matrix, and the common approaches to factor analysis such as PCA will result in orthogonal factors. The extraction process in both Q-methodology and R-methodology, which in this example used PCA, are identical. The result is an unrotated factor matrix, which is generally inspected for the purposes of deciding how many factors to retain and rotate.

6.3.4. *Retaining and rotating factors – choosing the ‘right’ factor solution*

Ultimately, the factor analytic process in both Q- and R-methodology will reach a point where the analyst commits to a particular factor solution for full interpretation. The process of choosing the ‘right’ factor solution is an iterative process whereby a final factor solution is chosen after weighing both statistical criteria and theoretical/conceptual criteria (i.e., considerations about the research problem and theory – [Hair et al. \(2010\)](#) label this as the ‘a priori criterion’). In practice, the researcher often considers several different ‘factor solutions’ and chooses the solution that is ‘best’ based upon the aforementioned criteria, which will be detailed more below. As [Hair et al. \(2010:109\)](#) noted, “an exact quantitative basis” for reaching the final factor solution has not been developed. Like a lot of statistical analysis such as regression analysis, there is an art to it and there are inevitably judgment calls.

With regard to choosing how many factors to retain and rotate¹⁷, statistical considerations often focus on eigenvalues and, interrelatedly, factor loadings of each factor. Eigenvalues are the

¹⁷ The process of rotation in factor analysis is critical. It does not change the structure of the data in anyway; it changes the how we view the data in a way that better highlights its structure. I do not discuss rotation in any detail,

sum of the squared factor loadings for each factor, and they are a measure of how much variance in the variables are explained by the factors ([Brown, 1980](#); [Watts & Stenner, 2012](#)). A common rule of thumb is that eigenvalues over one indicate that a factor should be retained for analysis, though this depends on the number of variables. The reason for this is related to the factor loadings, because each squared loading contributes to an eigenvalue, and the squared loading also represents the amount of variance within a single variable captured by the factor. Therefore, the eigenvalue signals the proportion of total variance captured by a factor. If there are over 100 variables, and variances are equal (with standardization if necessary), then an eigenvalue of one will not explain even a percentage point of the study variance. [Hair et al. \(2010\)](#) suggests that 20-50 variables is when the eigenvalue test may be most useful, as under 20 variables may lead to too few factors being extracted, and over 50 may lead to too many being extracted. The percentage of variance explained (ratio of eigenvalues and total variance) is another consideration, and it refers to the amount of variance a factor solution explains. For the social sciences, this criterion is not all that rigid, and it is not uncommon for factor solutions with 50 percent of variance being retained.

The scree plot test includes plotting the eigenvalues and choosing the factor solution at the ‘elbow’, or where there is a leveling off. This signals the point when each additional factor captures roughly the same proportion of remaining variance. With only similar, bite-sized pieces of variance left, added effort does not necessarily yield a more parsimonious discussion of the data. Lastly is the significant loadings test, which is more of a guideline really, and it refers to how many variables load ‘significantly’ onto a factor. ‘Significance’ is usually considered both

and there are several ways to rotate the factor solutions (e.g., VARIMAX, QUARTIMAX, and by-hand theoretical rotation). The analysis herein is performed with VARIMAX.

in a statistical and practical sense. Statistical significance often depends on sample size and, for a sample of 122 observations (in the case of R-methodology analysis of the Gila data), [Hair et al. \(2010\)](#) suggests a statistical cutoff of 0.50, though high loadings are preferable (a loading of +/- 0.70 indicates 'well defined-structure'). Practical significance is less precise, but loadings under 0.50 should not necessarily be disregarded all together ([Hair et al., 2010](#)). If a variable does not make the statistical cutoff, but it makes sense for interpretation, then asserted practical significance is an accepted practice.

With regard to this process of potentially paring down ones options for factor solution through statistical considerations, there appears to be little difference between R- and Q-methodology. That is, these statistical considerations are paired with study objectives, and conceptual, theoretical, and philosophical assumptions to make a *judgement* call on what factor solution is 'right'. The indeterminacy involved with choosing a factor solution may be an issue for statisticians, so much so that some question the validity of factor analysis in general ([Rencher & Christensen, 2012](#)). Nonetheless, this judgement call inevitably involves a significant amount of factor interpretation within the context of one's study.

6.3.5. *Interpretation of the rotated factor matrix*

In both R- and Q-methodology, it is generally the *rotated* factor matrix that is fully analyzed and interpreted. Once a final factor solution is chosen, the analyst will typically spend a great deal of time working with the rotated factor matrix. However, the basic meaning of the rotated factor matrix does vary significantly between R- and Q-methodology, and it is this difference in meaning that can begin to clarify why particular issues that are of concern in R-

methodology are not necessarily issues in Q-methodology (e.g., highly correlated, and potentially redundant variables).

R-methodology

In R-methodology, the factor matrix will show factor loadings of the items relative to each factor. Table 6.9 shows the rotated factor matrix for a six-factor solution using the Gila data (full details as to why this particular solution was chosen is discussed below), where each ecosystem service has a loading on the six different factors. The factor loadings are correlations between each variable and each factor ([Hair et al., 2010](#)), and the squared factor loadings represent the percentage of variance in the original variable that is explained by a factor. For example, a loading of 0.80 on a factor means that 64% of the variance of a particular variable is explained by that particular factor. When several variables load ‘significantly’ onto this same factor, then this combination of variables can be interpreted as some latent construct. As mentioned above, using the general guideline of [Hair et al. \(2010\)](#) for statistical significance as it relates to sample size suggests, a factor loading of at least 0.50 (absolute value) is adopted for the Gila data.

If the first factor is used as an example, nine (bolded) variables have loadings above 0.59 (absolute value). As a group, these variables can be interpreted as some underlying construct; this factor is dubbed ‘multiple use versus wilderness’, as there is an indication that positive responses (on a scale of importance) to ecosystem services such as ‘timber production’ are accompanied with negative responses to ecosystem services such as ‘places where human influence are substantially unnoticeable’. Additional interpretation of this factor is discussed

below, but the point to be made here is that the factor matrix itself provides substantive information to the analyst, which can be supported or questioned by existing theory.

Table 6.9. Factor loadings for a six factor solution in R-methodology

Ecosystem Services	Factors					
	1	2	3	4	5	6
timber production	-0.62	-0.34	-0.24	-0.12	0.32	-0.07
Oil, gas, minerals	-0.63	-0.11	-0.33	-0.27	0.16	-0.09
woody biomass energy	-0.28	-0.11	0.22	0.01	0.74	-0.20
livestock grazing	-0.62	-0.35	-0.40	-0.10	0.35	-0.08
irrigation for ag	-0.64	0.03	-0.37	-0.01	0.33	0.08
outfitting and guiding	-0.19	-0.44	-0.10	-0.01	0.46	-0.31
Hunt/fish (no outfit)	-0.31	-0.77	-0.07	0.01	-0.21	-0.23
non-motorized rec.	0.59	0.04	-0.08	0.41	-0.13	-0.13
motorized rec.	-0.17	-0.23	-0.15	-0.67	0.01	-0.32
driving for pleasure	0.08	-0.04	-0.02	-0.84	0.01	-0.10
Solitude, clear sky	0.78	0.13	0.04	-0.31	0.03	0.22
Native cultural	0.14	0.20	0.78	0.13	-0.01	0.18
traditional ag lifestyle	-0.59	-0.22	-0.43	-0.06	0.46	0.01
education and interp.	0.04	0.63	0.30	0.17	-0.22	-0.08
research and science	0.06	0.73	0.22	0.15	-0.21	-0.02
Places human influence unnotice	0.81	0.07	0.14	0.17	-0.14	0.11
Cultural/archeological	0.15	0.37	0.69	-0.02	0.08	-0.01
carbon absorption	0.35	0.48	0.15	0.49	-0.17	0.01
Biodiversity/abundance	0.45	0.36	0.31	0.40	-0.36	0.21
Habitat/connectivity	0.42	0.02	0.37	0.27	-0.52	0.04
water quality	0.07	-0.10	0.20	0.14	-0.08	0.84
air quality	0.15	0.32	-0.13	0.23	-0.25	0.60
beauty and inspiration	0.79	0.19	-0.08	-0.04	-0.07	0.12

Note: bolded factor loadings are greater than absolute value of 0.5

Returning to the concerns above related to a singular correlation matrix, it becomes clear why too many significant loadings on a factor (in the event of a high number of variables) could be problematic. If R-methodology analysis included 100 or more variables, and a large number of them were found to load onto a single factor, it may be challenging to interpret the meaning of such a latent construct, particularly if some items are very similar. For instance, if a survey asked people to respond to separate items related to ‘natural gas extraction’, ‘oil extraction’ and

‘mineral extraction’, and all three loaded onto a factor with many other items, then interpretation of the different extractive ecosystem services might be challenging. If these three items were also highly correlated in the correlation matrix, then there could be reason to drop one (or more) in order to yield a more parsimonious construct. This issue of redundancy within psychometric scale development is important, as discussed by [DeVellis \(2003\)](#). While an abundance of high factor loadings (and a potential redundancy in variables) is potentially challenging for interpretation and the final development of parsimonious constructs in R-methodology, the interpretation of the rotated factor matrix in Q-methodology is different. Consequently, a redundancy in variables is not a major concern.

Q-methodology

Q-methodology, as it treats peoples’ Q-sorts as variables (and the sorted statements as observations – e.g., ecosystem services), results in factor matrices that relate Q-sorts to individual factors. Table 6.10 is a *portion* of the rotated factor matrix for the Gila data (to save space, only 20 rows are included in the Table, though 122 Q-sorts were analyzed as variables). The basic interpretation of the factor loadings in Table 6.10 is the amount of variance in each individual Q-sort explained by a given factor. For instance, a loading of 0.80 means that 64% of variance in an individual Q-sort is explained by the factor. Using the cutoff of 0.50 for statistical significant (established above using the recommendation of [Hair et al. \(2010\)](#)), Table 6.10 shows those significantly loading Q-sorts, along with a total number of significantly loading Q-sorts across all 122 variables in the final row.

The total number of significantly loading Q-sorts in this final row implies 12 Q-sorts that are not captured, which necessitates a brief discussion. These Q-sorts either do not load onto any factor significantly, or they are ‘cross-loading’ in that they load onto more than one factor. Q-sorts that do not load onto any factors are those whose variance is not significantly captured by any of the factors, and these represent unique, or idiosyncratic viewpoints. That is, these Q-sorts are not very similar to any of the other Q-sorts. For instance, all of the factor loadings for Q-sort 18 are below 0.20, and inspection of the correlation matrix (not included in this dissertation) shows low correlations with all other Q-sorts as well. While this could be justification for dropping the Q-sort from analysis, this is generally avoided in Q-methodology (as discussed above). Variables that indicate significance on more than one factor represent Q-sorts that are partially explained by more than one factor (for practical purposes, Q-sort 19 constitutes such a cross-loader).

As noted above, these factors will be more fully interpreted through R- and Q-methodology lenses below, but a critical contrast between the two approaches is worth discussing, which is that Table 6.10 does not provide *any* substantive information other than which Q-sorts were completed in a similar fashion. For instance, with regard to factor 1, it can be interpreted that the four bolded positively loading Q-sorts were similar, and that the two negatively loading Q-sorts were similar. Together, the six are also similar, in a mirror-image sort of way. However, without either going back to the original Q-sorts or calculating factor scores (as discussed below), there is little to be said about the nature of these factors with regard to the ecosystem services. Of course, this is similar to R-methodology in the sense that the rotated factor matrix only highlights the existing constructs, and it is the calculation of factor scores that indicates how different respondents align (or do not align) with particular factors.

Table 6.10. Factor loadings between 20 Q-sorts and four factors (Gila study)

QSORT	Factor 1	Factor 2	Factor 3	Factor 4
1	0.2457	0.5928	0.2356	0.0953
2	-0.6352	0.3981	0.4584	-0.2619
3	-0.5398	0.6844	0.0242	0.1305
4	0.2061	0.4706	0.2008	0.2992
5	-0.1828	0.4000	0.0633	0.0616
6	0.0157	0.4572	-0.2391	0.1269
7	-0.4433	0.3075	0.7045	-0.1018
8	0.0040	0.6151	-0.0457	-0.0342
9	0.4861	0.1206	0.4740	0.3890
10	0.4349	-0.0481	0.6727	-0.0305
11	0.2012	0.1641	0.6096	0.2720
12	0.5044	0.0951	0.5832	0.2322
13	0.6454	0.0254	0.1361	0.4166
14	-0.0653	0.4189	0.1487	-0.1006
15	-0.2654	0.2429	0.5718	-0.2353
16	0.4244	-0.0005	0.5064	-0.3530
17	0.7621	-0.2559	0.3611	-0.1558
18	-0.1819	0.1725	0.1761	0.1639
19	0.4656	0.1282	0.4816	0.0504
20	0.7985	0.0390	-0.1743	-0.0238
Total statistically significant Q-sorts	75	16	13	6

Note: bolded factor loadings are above 0.50 in absolute value

Note: statistically significant Q-sorts are the total number above an absolute value of 0.50

A fundamental difference remains, though, which is that the underlying assumptions and process in Q-methodology (namely the purposeful, relatively small sample of Q-sorts) leads to a fairly specific (and somewhat empty) interpretation of Table 6.10. People are not being classified in the cluster analysis sense, whereby one could assert, for instance, an association between gender and a particular factor. Q-sorts are being grouped based upon their similarity, but the fact that 75 people (Q-sorts) load significantly onto factor one does not suggest in any way the prevalence of that factor within the population. To be sure, the large number of Q-sorts loading onto factor one suggests that, within the sample, the greatest number of similar Q-sorts are represented by factor one. However, to understand what these similar Q-sorts looked like, one needs to calculate factor scores.

Returning to the concern of a singular correlation matrix and too many highly loading variables, it seems interpretation of the factor matrix is not confused by an additional highly correlated Q-sort, as the factor matrix itself is not interpreted in great detail. As discussed below, the ‘factor arrays’, as developed from the calculated factor scores, is that which is interpreted. And, while the factor scores are calculated from highly loading Q-sorts, the calculation is an averaging of similar Q-sorts; consequently, redundancy appears to have minimal practical effect. This point is further discussed and clarified in the next section on factor scores.

6.3.6. *Estimating factor scores*

Factor scores are estimated values of how observations (e.g., individuals in R-methodology survey research) rank or place on the factors ([DiStefano et al., 2009](#)). For instance, a high factor score on a factor for an individual suggests that, for the positively loading items on that factor, the individual generally answered highly to those questions. These scores can be used for a variety of subsequent analyses; “they can be correlated with measures of different constructs to help clarify the nature of the factors or they can be entered as predictor variables in multiple regression analyses or as dependent variables in analyses of variance” ([Grice, 2001:430](#)). How these scores are actually computed is not straightforward, nor is there consensus on which method to use for computation ([DiStefano et al., 2009](#); [Grice, 2001](#)). [DiStefano et al. \(2009\)](#) categorized several different methods for calculating factor scores into unrefined and refined methods, where the former generally refer to simple summation methods (e.g., sum the scores for each individual on each item related to a factor) and the latter refers to more complex methods where individual factor loadings on *all* variables are used to create factor scores that are linear combinations of the observed variables. This section will very briefly discussed the

calculation of factor scores in R-methodology and Q-methodology. The mechanics of the calculations are not discussed within the context of R-methodology for several reasons, including the variety of available methods, the complexity of the refined methods being beyond the scope of this discussion, and the primary (and pragmatist) focus on communicating the conceptual underpinnings more broadly. On the other hand, calculation of factor scores in Q-methodology is discussed as the vast majority of Q-studies appear to use the same method, which is a fairly simple ‘unrefined’ approach.

R-methodology

In R-methodology, there are a variety of ways to calculate factor scores for individuals. [Hair et al. \(2010\)](#) discussed using a surrogate variable to represent an entire (e.g., the item most strongly loading onto the factor), creating a summated scale (similar to the unrefined methods discussed by [DiStefano et al. \(2009\)](#)), or calculating factor scores using a more refined method. Generally, given that they often maintain orthogonality and can claim to be closer to the ‘true’¹⁸ factor scores ([DiStefano et al., 2009](#); [Hair et al., 2010](#)), it seems that factor scores in R-methodology are commonly calculated using refined methods, which often yield standardized scores. For instance, Table 6.11 shows the factor scores for 10 of the 122 observations (individuals) of the Gila data analysis with R-methodology. The statistical package *R* was used,

¹⁸ When discussing factor scores in practice, it is typically implied that such scores are estimates. R-methodology has positivistic leanings and, consequently, it is often assumed that all individuals are, *in reality*, aligned with psychological constructs (e.g., we are all somewhere along the extroversion/introversion spectrum). The ‘true’ factor score represents this position, but it is generally accepted that this exact position is not knowable; but refined methods are meant to get us closer to that knowledge.

and the calculation of factor scores was done within the *psych* package, which uses a regression algorithm as its default ([Revelle, 2018](#)).

Table 6.11. Example of factor scores estimated in R-methodology

Individuals	Factors					
	1	2	3	4	5	6
1	0.688	-1.160	-0.622	0.529	1.409	-0.310
2	-2.276	0.708	-1.014	0.225	1.351	-0.465
3	-0.042	-0.931	-1.259	-0.966	2.120	-1.402
4	0.125	-2.294	0.496	0.346	0.859	0.016
5	-0.877	-1.491	-0.315	-0.532	-1.152	-0.683
6	1.127	0.429	-1.240	-0.305	2.028	-2.847
7	-2.226	0.064	-0.228	0.156	0.629	0.840
8	-0.213	-1.571	-0.784	0.961	-0.880	-2.432
9	-0.124	-0.660	-1.689	0.174	-1.328	1.605
10	-1.268	-0.053	0.738	0.845	0.088	2.079

The computational aspect is not discussed, but it is worth stressing that this is a refined method, where the factor scores for all variables (e.g., ecosystem services) were used to estimate the *position* that each person has on each factor. Position refers to the distance from the mean of zero, and the factor scores indicate the number of standard deviations. For instance, individual seven has a fairly extreme negative factor score on the first factor, which suggests that they the scores they reported on the variables for factor one followed the suggested pattern (positive values on multiple-use ecosystem services and negative values on the wilderness related ecosystem services). As another example, individual three had a factor one score close to zero, which means that this individual likely did not demonstrate such a pattern in their answers. Table 6.12 supports this interpretation, which includes the ecosystem services that load highly onto factor 1, the loading magnitude and sign, and the reported scores (on a scale from -4 to +4) from the raw data for the individuals.

Table 6.12. An example of what underlies factor score interpretation in R-methodology

Ecosystem Service	Factor 1 loading	Value for Individual 7 (-4 to +4)	Value for Individual 3 (-4 to +4)
Timber production	-0.62	+3	+3
Oil, gas, minerals	-0.63	+1	0
livestock grazing	-0.62	+4	+4
irrigation for agriculture	-0.64	+3	+1
traditional ag lifestyle	-0.59	+4	+4
non-motorized recreation	0.59	-2	-1
Solitude, clear sky	0.78	-3	+1
Places human influence is unnoticeable	0.81	-4	-3
beauty and inspiration	0.79	-1	0

There are a variety of analyses that can be completed with respect to the factor scores, but a common approach is to group individuals by factor using cluster analysis. This allows an analyst to find groups of people who are positioned similarly on the factors. Clusters generally maximize heterogeneity between and homogeneity within based on factor scores. For instance, individual two and individual seven are similarly positioned on factor 1, though they do depart on other factors (Table 6.11). The calculation and interpretation in R-methodology, as will become apparent, differ significantly from Q-methodology.

Q-methodology

Calculation of factor scores in Q-methodology, at least based upon seminal texts such as [Brown \(1980\)](#), qualifies as an unrefined method. This is clearly shown in a moment, but it is important to note that calculating the factor scores is conceptually different in that they estimate the placement or rank of the items being sorted. Table 6.13 reflects the parallel to the R-methodology factor scores (Table 6.11). As shown, *ecosystem services* (not individuals) are given factor scores, and the interpretation relates the specific ecosystem service to all of the

individuals that *loaded highly* onto the specific factor (thus the unrefined approach to calculation). For instance, for those Q-sorts that loaded highly onto factor four, we would expect to see high values for public ownership and access (factor score of 1.89) and low values for carbon absorption (factor score of -2.11).

Table 6.13. Factor scores from Q-methodology analysis

Ecosystem Services	Factor Scores			
	Factor 1	Factor 2	Factor 3	Factor 4
Forest materials for personal use	-0.68	1.27	0.24	-0.51
Timber production	-1.27	0.96	0.90	-1.15
Oil and natural gas and minerals	-1.90	-0.56	0.12	0.18
Woody biomass for energy	-0.97	0.10	-0.13	-1.11
Livestock grazing	-1.48	1.72	1.71	0.46
Water for household use	-0.75	-1.30	0.86	0.87
Irrigation for agriculture	-1.18	-0.19	1.03	0.09
Outfitting and guiding	-0.65	1.07	0.11	-0.92
Hunting and fishing (non-outfitted)	-0.06	1.47	0.33	0.23
Non-motorized recreation	1.02	0.83	-1.28	-1.13
Motorized recreation	-1.57	-0.46	-1.70	1.58
Driving for pleasure	-1.07	-1.07	-1.46	0.78
Developed camping	-0.45	0.17	-1.18	-1.00
Dispersed camping	0.52	0.01	-0.74	-0.33
Solitude quiet and clear night sky	0.88	-0.73	-0.66	1.35
Native American cultural benefits	0.22	-1.18	-0.21	-0.20
Traditional agricultural lifestyle	-0.95	1.17	1.37	0.60
Education and interpretation	0.17	-0.84	-0.07	-1.15
Research and science	0.66	-1.06	0.51	-0.57
Places where human influence	1.07	-0.84	-1.54	-1.42
Cultural and archeological sites	0.24	-0.97	-0.42	-0.27
Flood and erosion control	0.13	0.11	1.09	0.11
Carbon absorption	0.45	-1.34	-1.52	-2.11
Biodiversity and abundance	1.57	-1.70	0.35	-0.69
Wildlife habitat and connectivity	1.55	0.27	0.11	0.78
Water quality	1.10	0.49	1.45	0.78
Air quality	0.72	-0.04	0.67	0.69
Water quantity	0.76	1.03	1.49	0.81
Public ownership and access	1.12	1.79	-0.61	1.89
Scenic beauty aesthetics and inspiration	0.80	-0.18	-0.83	1.36

Table 6.14 illustrates this with respect to the four Q-sorts that loaded highly onto the factor, and it generally supports the interpretation above. While this interpretation may be valid

in the context of Q-methodology, there are facets of the factor score calculation and application that are particularly salient for this comparison between Q- and R-methodology.

Table 6.14. An example of what underlies factor score interpretation in Q-methodology

Q-sort	Factor 4 loading	Value for carbon absorption (-4 to +4)	Value for public ownership (-4 to +4)
45	0.61	-4	+4
56	0.83	-4	+3
82	0.60	-2	+2
112	0.65	-3	+4

The first facet, which is potentially seen as a limitation from the R-methodology perspective, is that the calculation of factor scores is both unrefined and subjective in that decisions as to what Q-sorts are used to calculate the factor scores are made by the researcher. The approach to calculating factor scores for each factor is a simple weighted average of the highly loading Q-sorts (the process seems roughly equivalent to the ‘weighted sum scores’ approach ([DiStefano et al., 2009](#))). However, decisions as to what is highly loading, or which of the highly loading Q-sorts to include (e.g., should cross-loading Q-sorts be used to calculate factor scores for the relevant factors), is up to the researcher. Prior to discussing this further, it is worth showing the typical process used to calculate factor scores (as summarized by [Brown \(1980\)](#) and [Armatas \(2013\)](#)).

A ‘factor weight’ is calculated for the Q-sorts that are chosen (how is discussed in a moment) as the subset to represent the factor via the interpretable ‘factor array’. The factor weight is used based upon the rationale that “some Q-sorts are closer approximations to a factor than are other Q-sorts” ([Brown, 1980:240](#)). By accounting for the factor weights, it means that a

Q-sort with a loading of 0.90, for example, will contribute greater to the factor scores than a Q-sort with a loading of 0.65. Computing the factor weight is done with the following equation:

$$g = \frac{f}{1 - f^2}$$

where g is the weight, and f is the factor loading of the Q-sort on the relevant factor. The weights are then applied to the raw scores for each ecosystem service for that Q-sort. This process is done for all the chosen Q-sorts within the subset. Then, the weighted values for each statement are summed across all Q-sorts chosen, which results in the total score for each statement on each factor, and is represented by K_n :

$$K_n = \sum_{y=1}^Y g_y c_y \quad (5)$$

where n is equal to the statement number, Y is the subset of W participants (Q-sorts) that load onto the factor of interest, g is the weight for participant y , and c is the raw score participant y gave for statement n . This is a process that takes place for all ecosystem services and factors, which is followed by one last adjustment. As [Brown \(1980:242\)](#) explained, “since factors contain differing numbers of subjects producing [sic] statement totals of differing magnitudes, it is convenient for purposes of comparability to normalize the total column.” Normalizing the total for each statement is done with the following equation:

$$z_n = \frac{K_n - \overline{X_K}}{S_K}$$

where K_n is the total value (equation (5)) for the statement (i.e., ecosystem service) n , $\overline{X_K}$ is the

mean of K across all statements ($\overline{X_K} = \frac{\sum_{n=1}^N K_n}{N}$), and s_K is the standard deviation of K . This

normalization process is why factor scores in Q-methodology are sometimes described as z-scores.

This calculation illustrates the unrefined nature of the factor score calculation, but it also clearly shows that the factor scores are dependent upon the chosen ‘subset’ of participants that load onto a particular factor. Choosing this subset is called ‘flagging’ in the Q-analysis process, and often statistical programs designed for Q-methodology (e.g., *PQMethod*) have a simple calculation for doing this automatically; however, this option may result in the selection of factor loadings as low as 0.30. Often, analysts completing Q-methodology will manually flag only those Q-sorts that have particularly high loadings (again, a subjective decision). Indeed, in the case of the Gila study, I manually flagged Q-sorts only if they both had loadings above 0.50 and were not cross-loading. Even this ‘rule’ was sometimes violated, as Q-sort 19 (Table 6.10) was considered cross-loading with at 0.47 and 0.48 loading on factor one and factor three, respectively. This process highlights another potential criticism of Q-methodology, which is that while the factors in the rotated matrix are orthogonal when using PCA and varimax rotation, the flagging process and unrefined calculation of factor scores results in some correlation between the factor scores.

While the unrefined approach to calculating factor scores may be seen as a limitation, the process is seen as a means to an end, which is deriving factor arrays that are distinct from one another as possible. The factor arrays are that which is ultimately interpreted for the purpose of discussion, and the factor scores are primarily used to develop these factor arrays.

A factor array is an *approximate* representation of each factor, which is developed by first ordering the factor scores for each ecosystem service from highest to lowest, and then inserting the ecosystem service back into the forced distribution. What results is a typified viewpoint, or a weighted average of those Q-sorts done similarly (i.e., those flagged Q-sorts). For example, the two highest factor scores for each factor would occupy the ‘+4’ column in the forced distribution (Figure 6.1), the next three highest scores would occupy the ‘+3’ column, and so on. One implication of this is that each factor is individually interpreted in terms of how all the ecosystem services are positioned within the typified distribution. The factor arrays for the Gila study are presented below within the context of the comparison of results between Q- and R-methodology.

Before moving onto this comparison of results, it is worth stressing that by avoiding the ‘flagging’ of cross-loaders (and to a lesser extent unique Q-sorts that do not load highly onto any factor)¹⁹ the factor arrays are kept more distinct without the addition of a Q-sort that shares common variance with more than one factor. For instance, Q-sort 9 in Table 6.10 shows a loading of 0.49, 0.47, and 0.39 on factors one, three, and four, respectively. An inspection of Q-sort nine shows several commonalities between the factor arrays (presented momentarily) representing each of these factors, but these similarities between the individual Q-sorter and the factor arrays are also accompanied by differences between factor arrays. For instance, Table 6.15 lists seven ecosystem services and the respective raw scores for Q-sort nine, factor array 1 (environmental perspective), and factor array 3 (water perspective). As shown, Q-sort nine aligns with the environmental perspective on oil and natural gas and minerals, wildlife habitat and

¹⁹ Since the factor weights are multiplied by the raw scores of each Q-sorter that is flagged, a low loading close to zero will have little practical effect on the factor scores.

connectivity, and carbon absorption. On the other hand, Q-sort nine aligns with the water perspective on flood and erosion control, irrigation for agriculture, and water for household use.

Table 6.15. Raw scores (highlighting the effect of cross-loading Q-sorts)

Ecosystem Services	Q-sort 9	Factor array 1 (Environmental perspective)	Factor array 3 (Water perspective)
Oil and natural gas and minerals	-4	-4	0
Wildlife habitat and connectivity	+2	+4	0
Carbon absorption	0	+1	-3
Livestock grazing	+1	-3	+4
Flood and erosion control	+4	0	+3
Irrigation for agriculture	+1	-3	+2
Water for household use	+2	-2	+2

Note: raw scores are taken from column in Q-sort (or factor array) forced distribution

However, when comparing the environmental perspective with the water perspective, it can be seen that these six ecosystem services are not aligned. Therefore, using Q-sort nine to calculate the factor scores for both of these perspectives would only confound their differences but pulling the six ecosystem services closer together within the factor arrays for the environmental and water perspective. Within Q-methodology, it is for this reason that cross-loading Q-sorts are generally referred to as ‘confounding’ Q-sorts, and they are not used to develop the factor arrays (i.e., they are not flagged).

6.4. Comparison of Q-methodology and R-methodology analysis of the same data: An example related to forest plan revision

This section provides an overview of the results and interpretation of factor analysis of the same data within the traditions of Q-methodology and R-methodology. Starting with Q-methodology, four factor arrays are presented with limited discussion, as the specifics of the results are fully discussed in [Armatas et al. \(2017b\)](#) (and elements of the results and analysis were covered above). Furthermore, the specifics of analysis, such as why a four factor solution was chosen, or what the scree plot looked like, are not presented below. These specifics have been presented elsewhere with regard to the Gila National Forest ([Armatas et al., 2017b](#)), as well as the Shoshone National Forest ([Armatas, 2013](#)). However, since an R-analysis of the Gila data has not been presented elsewhere, a full description of methodological process and results are presented.

With regard to interpretation, an attempt is made to distinguish the ontological, epistemological, and axiological assumptions of the two approaches. However, it is worth noting that this discussion is primarily through a Q-methodological lens, which is a way of implying that my presentation of R-methodological assumptions may be oversimplified (particularly related to ontology and the lack of distinction between clearly established concepts within social psychology such as attitudes, events, and traits).

6.4.1. Q-methodology analysis: Overview of results from the Gila study

The results summarized are drawn from a report provided to the Forest Planning Team on the Gila National Forest ([i.e., Armatas et al., 2017b](#)). These results are mostly just presented,

without any of the underlying rationale or process. It provides the basis for comparing the results yielded from an R-analysis. To be clear, the analytic process (at least with regard to factor analysis) was similar in both cases. That is, this Q-methodology analysis involved multiple iterations of data analysis; several different factor solutions were considered, and the standard statistical tests (e.g., Scree test, significant-loadings test) were performed to guide the selection of the factor solution.

Figures 6.4 through 6.7 are the factor arrays derived from the factor scores for factor one through four, respectively. Spending time with these four factor arrays will reveal four different general viewpoints about what ecosystem services derived from the Gila National Forest are important and unimportant. The basic interpretation of the factor arrays is that those ecosystem services toward the right of the distribution (i.e., +2 to +4) are positively salient ecosystem services for that viewpoint, those to the left (i.e., -4 to -2) are negatively salient, and those ecosystem services toward the middle of the array (i.e., -1 to +1) are more neutral. Again, this forced distribution is why Q-methodology represents a kind-*with-tradeoffs* approach. The final note on basic interpretation is that the ecosystem services highlighted in black on each factor array are ‘statistically distinguishing’ statements, or those statements where the factor score between one factor and all others is greater than the difference between the standard error for that factor and all other factors. Full details of this calculation are not provided herein, though they are available in Appendix B.9 of [Armatas \(2013\)](#).

The four factor arrays were dubbed: environmental, utilitarian, water, and motorized. These factor arrays are presented, in part, to facilitate the comparison of results between an R- and Q-analysis. As will become evident below following the R-analysis, there are commonalities between the factor arrays in Q-analysis and the factors in R-analysis. The full interpretation of

each factor array is articulated within [Armatas et al. \(2017b\)](#); very brief interpretations are provided herein.

The environmental factor array generally represents viewpoints that place a high level of importance on regulating ecosystem services (e.g., biodiversity and abundance of plants and animals, wildlife habitat and connectivity, water quality) and on particular cultural services that would generally be thought of as reflective, or underpinned by intrinsic values (e.g., non-motorized recreation, solitude, quiet, and clear night sky, places where human influence is substantially unnoticeable). The utilitarian factor array represents a viewpoint that prioritizes provisioning services (e.g., timber production, livestock grazing) and cultural services that clearly provide economic benefits (e.g., hunting and fishing outfitting, traditional agricultural lifestyle). The water factor array represents an agricultural perspective, particularly as it relates to livestock grazing, irrigation, traditional agriculture lifestyles, and water quality and quantity. Lastly, the motorized factor array highlights the priorities related to motorized recreation, accompanying benefits such as scenic beauty and solitude, and the need for public access. While this interpretation of the four factor arrays is brief, it is mainly presented for the purpose of setting up: (1) a discussion of how Q-methodology, based upon its normative assumptions would fundamentally interpret such factor arrays and; (2) a comparison with R-methodology results.

Figure 6.4. The environmental factor array

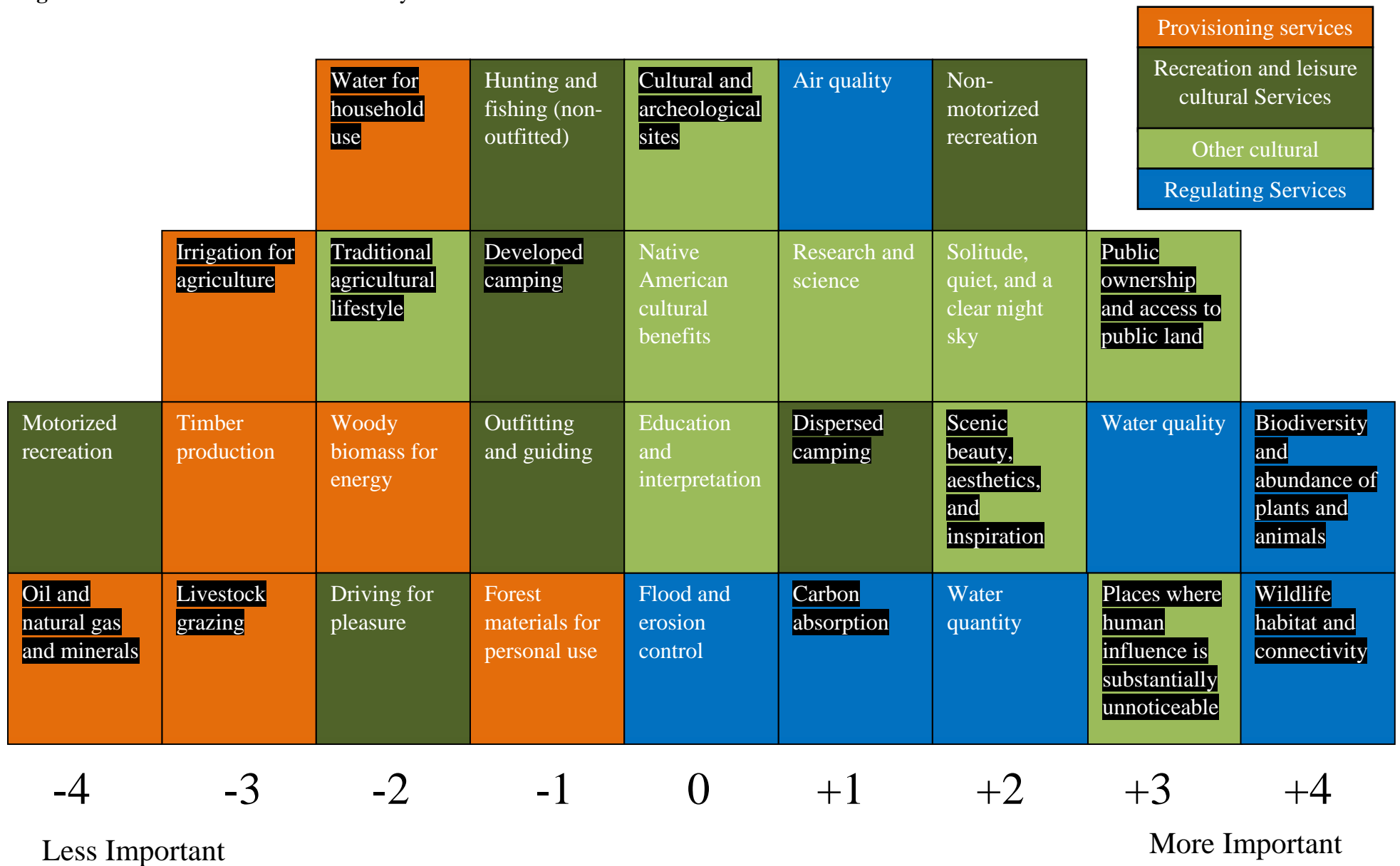


Figure 6.5. The utilitarian factor array

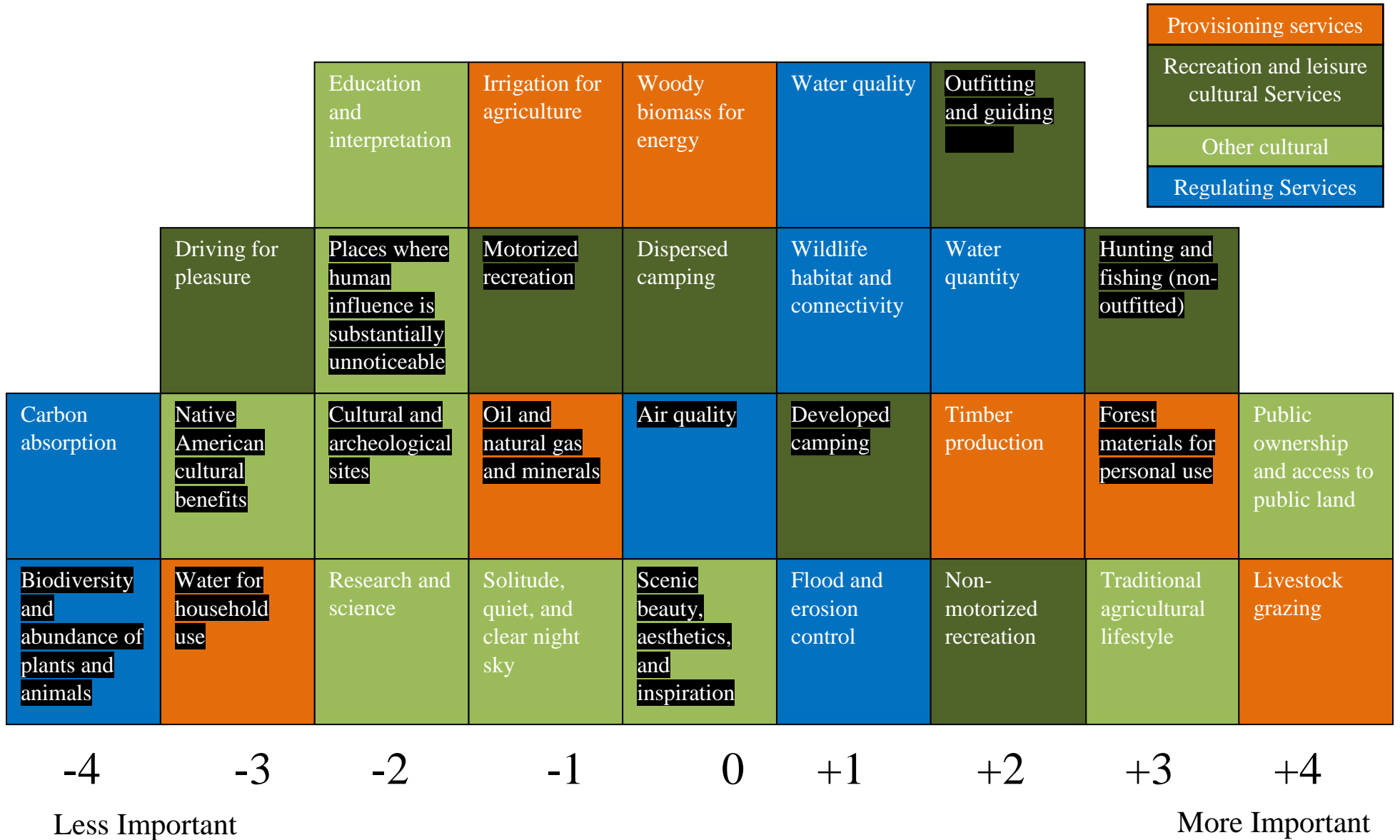
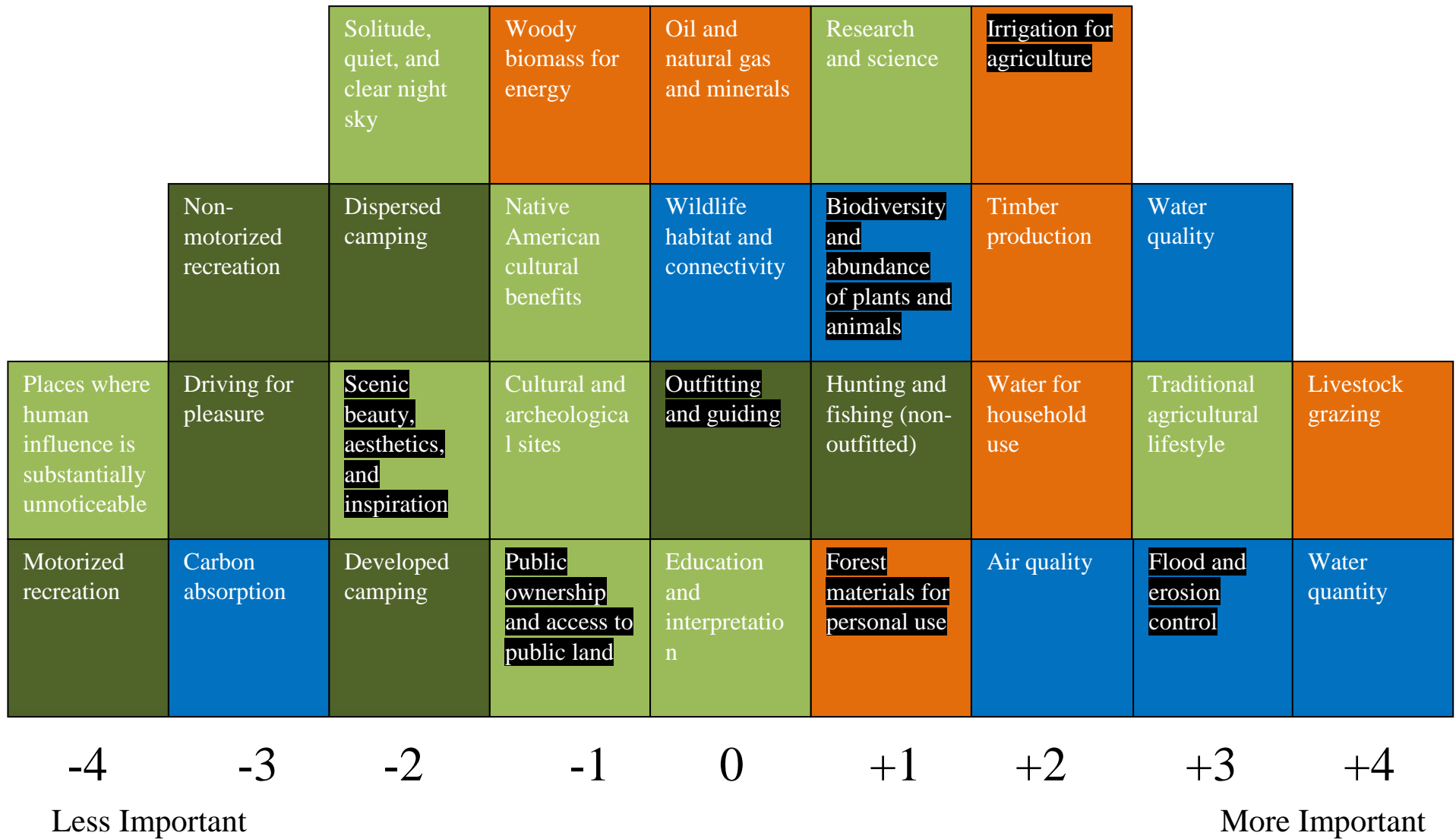


Figure 6.6. The water factor array



6.4.1.1. General interpretation of results in Q-methodology based on normative assumptions

Above are the results typically gleaned from a Q-method approach, but the question remains as to how Q-methodology, given its underpinning normative assumptions, would interpret these results. As previously mentioned, Q-methodology was intended to be a ‘science of subjectivity’ (see [Good \(2010\)](#) for a historical account of this ‘quest’). It should be made clear that ‘subjectivity’ in this context is not referring to the nature of research. Or, as discussed by Babbie, the idea that there is objective research (i.e., researcher values are cast aside and an accepted systematic process yields results that can be perfectly replicated by any researcher) and subjective research (i.e., research where judgements and values of the researcher affect the results in a way that makes replication challenging). As highlighted above, there are elements of factor analysis, particularly within the Q-methodology tradition, that require subjective choices by the researcher. Even though a pragmatist EE would suggest that articulating such judgements, as well as the reasoning behind them, can facilitate replication and more ‘objective’ research, there are nonetheless elements of the research process that could be considered subjective (to be clear, this is an issue for R-methodology as well).

However, the assertion that Q-methodology is the study of ‘subjectivity’ is not referencing this objectivity versus subjectivity discussion (i.e., the one about methods choices), instead it is meant to distinguish the ontological assumptions (and consequently epistemological and axiological assumptions) of Q-methodology from those of R-methodology. The meaning of subjectivity in Q-methodology is articulated by [Brown \(1980:46, emphasis original\)](#):

Fundamentally, a person’s subjectivity is merely his own point of view. It is neither a trait nor a variable, nor is it fruitful to regard it as a tributary emanating from some subterranean “stream of consciousness.” It is pure behavior of the kind we encounter during the normal course of the day, as when a person prefaces his remarks with “As far as I’m concerned...,” or “In my opinion...,” or whatnot.

This quote reflects some of the original epistemological and ontological thinking of William Stephenson, who considered viewpoints, as expressed through the behavior of a Q-sort, as “manifestations of a person’s predispositions to act based on lived experiences” ([Wolf, 2009:8](#)). From an R-methodology perspective, one might suggest that ‘behavior’ (or behavioral intention) is often seen as a variable, or that ‘predispositions’ could be interpreted as relatively stable, enduring ‘traits’ or more specific and short-lived ‘attitudes’. So, for Q-methodology, a person’s subjectivity is akin to everyday conversation.

Clearly distinguishing between Q- and R-methodology in this respect is challenging and, while it is likely due in part to my lack of expertise in social psychology, it may also be partly attributed to a lack of clarity in the Q-methodology literature (a healthier debate between the two traditions might help to remedy this ambiguity). Nonetheless, it seems that the main distinction is that subjectivity is seen as a viewpoint that cannot be defined *a priori* nor from the external standpoint of the researcher (Brown 1980). For instance, measuring a psychological construct in R-methodology, such as introversion/extroversion (trait), it is typically established prior that a select number of scale items will measure the construct and that particular answers to those items will indicate if a person is extroverted or introverted. The existence of ‘correct’ answers in R-methodology that makes it ‘objective’; not in the sense that it is more correct to be introverted or extroverted, but that specific answers to the scale items will lead to a particular designation on that construct. As [Brown \(1980:3\)](#) explained, by specifying that a particular response to a set of scale items yields a particular interpretation, “the observer elicits his concept on the spot, and the subject’s response breathes life into it...by constructing meanings [in the tradition of Q-methodology], the observer uses the subject’s responses to assist him in bringing his concept into being, a transaction that is more akin to creativity than to measurement.” This point makes it

clear that the researcher is still influential to how the viewpoints are interpreted in Q-methodology (perhaps the naming of factor arrays as the most clear example of this), but relating Q-methodology to a creative transaction (as opposed to a measurement) implies both an ontology and epistemology that is more constructivist than positivist.

The importance of lived experiences for creating knowledge, as well as the belief that a point of view is derived not necessarily from some pre-existing atomic and identifiable thing, but perhaps a more elusive feeling reflects the influence of pragmatist philosophy (see Section 4.1.2) on Q-methodology. Indeed, [Stephenson \(1983b:76, emphasis original\)](#) suggested that the concern of Q-methodology (i.e., terminal axiological goal) was with “*understandings*, in the common conversations and everyday communicability between people, and within oneself—the folkways of a people and their culture.” In this context, ‘understandings’ are equivalent with points of view about some topic of interest, which “form in feeling”; [Stephenson \(1983b:76\)](#) explicitly draws this idea from Charles Peirce’s ‘law of mind’. [Peirce \(1892:554\)](#) was clear that this ‘law’ lacks the rigidity of those pertaining to physical matter, as there “always remains a certain amount of arbitrary spontaneity in its [(i.e., the mind)] action.” Therefore, as discussed in Section 4.1.2, it follows that Peirce considered experience to go far beyond what our ears, eyes, nose, and skin report: “Peirce takes anything that is compelling, surprising, brute, or impinging to be an experience, regardless of what causes us to feel compelled and regardless of whether we can identify the source of the compulsion” ([Misak, 2004a:155](#)).

Subjectivity is a first-person perspective or viewpoint, “no more and no less” ([Watts, 2011:40](#)). And given its alignment with Peirce’s ideas, it is important to perceive this viewpoint not as “permanent or semi-permanent disposition or mental orientation”, but only as a subjective viewpoint in their “current *outlook* or *positioning* relative to some aspect of their immediate

environment” ([Watts, 2011:40, emphasis original](#)). The connection between viewpoint and context is another commonality between pragmatist philosophy and Q-methodology. Each individual Q-sort, then, represents a person’s viewpoint within the context of some topic in a particular place and time. If these viewpoints are conceptualized as human-nature relationships, as done herein, then it is expected that the viewpoints will evolve and change over time. Indeed, a major implication of adhering to a pragmatist philosophy is the belief that public debate and deliberation can lead to social learning (and consequently a trend toward human-nature relationships that facilitate normative sustainability).

A major challenge of considering a Q-sort as a first-person viewpoint which, according to Brown (1980:3), may have a meaning and significance that is different from the meaning “assumed by the observer or anyone else”, is transitioning from the individual viewpoint (Q-sort) to the collective viewpoint (factor array). In the case of the Gila National Forest study, 122 individual viewpoints regarding the importance of ecosystem services derived from the Gila National Forest were expressed within the context of the forest plan revision. Four archetypical viewpoints emerged through factor analysis (e.g., Figure 6.6), which raises the question as to how these shared viewpoints are interpreted. While articulating ‘Q as a constructivist methodology’, [Stenner \(2009:63, emphasis original\)](#) stated (with support from Stephenson):

The concrete actuality represented by a given factor analytic 'solution' is to be thought of as an approximation [of a constructed meaning], not of the 'meaning' of particular items or the 'nature' of some aspect of the Q-sorter, but of the *forms of feeling* 'running through' ([Stephenson, 1983a, p. 216](#)) and hence *synthesizing* each of the factors. It is this underlying feeling that must be sought out in factor interpretation. Just as each individual Q-sort concerns not just feeling towards this or that item but feeling towards the complete item *set*, so Q-factors concern common feeling state vectors within a sample of such sorts.

As approximations, it is expected that individuals inspecting a factor array that they aligned with might remark: “that is not an exact representation of my viewpoint, but its close.” This potential discrepancy in meanings assigned to individual Q-sorts highlights: (1) the value of the follow-up discussions above individuals Q-sorts (and the potential benefit of integrating better qualitative research techniques into Q-methodology – as discussed in Chapter 7); (2) the potential limitation of assuming that the normal distributions are comparable across Q-sorts (e.g., that the middle of the distribution are those ecosystem services that are either neutral or not well understood by the respondent) and; (3) the *critical* importance of clearly conveying to audiences (both scientific and lay) that ‘shared’ viewpoints do not represent mutually exclusive groups of people, but typified viewpoints derived from similar Q-sorts. While the factor arrays do represent a collective viewpoint in some ways (i.e., a weighted average of several Q-sorts in the sample), the normative assumptions of Q-methodology, summarized in Table 6.16, are not grouping people in the manner that is likely commonly thought of in the conservation social sciences.

A pragmatist perspective, with its focus on language, would note that the term ‘grouped’ may be problematic. Anecdotally, stating that Q-methodology ‘groups people’ is something that I have done frequently, and while it does not seem to trigger questions or concerns from the public, it may confuse discussions with other researchers. It suggests that people are put into mutually exclusive categories, and it also tempts one to think that characteristics of that group of people (e.g., gender, income, eye color) might be associated, or worse, connected with causality to a factor array. While making such connections can be done with other methods (namely random sampling approaches and statistical techniques such as ANOVA of clusters and regression), Q-methodology is not such an approach. Understanding the distribution of viewpoints across a population is not possible, primarily because the purposeful sample does not

allow for “counting noses”, as [Brown \(1993:120\)](#) phrased it. That is, there is no way to assert that a particular viewpoint represents some percentage of the population, nor can one connect viewpoints with demographics.

Table 6.16. Normative assumptions of Q-methodology

Ontological assumptions	Epistemological assumptions	Axiological assumptions
<ul style="list-style-type: none"> • First-person viewpoints (e.g., self-reflections) are outlooks relative to one’ environment and day-to-day experiences. • Viewpoints are not amenable to deconstruction into component parts (e.g., attitudes). 	<ul style="list-style-type: none"> • Viewpoints are time and context bound; constructed and made tangible through Q-sorts, interacting with items, and follow-up discussion with researcher. • Similarities among individual viewpoints are likely to emerge (factor analysis facilitates finding such similarities) 	<ul style="list-style-type: none"> • Explore and discover new insights about viewpoints related to the topic of interest. • Understand potential tradeoffs among different items. • Describe viewpoints in terms of the orientation of all items in the Q-set. • Understand <i>diverse</i> range of viewpoints with purposeful sample.

Having said that, abductive reasoning, another connection between pragmatism and Q-methodology, might allow one to create hypotheses for further investigation which could allow for the connection of particular viewpoints with population characteristics. For example, the ‘Native American’ viewpoint in the Shoshone National Forest study, dubbed as such due to the paramount importance assigned to ‘Native American cultural and spiritual values’, was the weighted average of eight participants ([Armatas, 2013](#)). Even though all eight participants identified as Native American (Eastern Shoshone Tribe and Crow Tribe) in the Q-methodology study, one cannot equate this with a hypothesis test of statistical significance related to the group of people loading significantly onto the ‘Native American’ factor and the Native American

population more generally. That is, just because one loads highly onto the Native American factor, or the agricultural factor (both from the Shoshone study) does not mean that they are more likely to be tribal members (or farmers and rancher in the case of the agricultural factor). As [Bartholomew et al. \(2011\)](#) observed, there is no probability model behind Q-methodology; the results are purely descriptive.

Despite the descriptive nature of Q-methodology, it can lead to reasonable hypotheses such as that expressing a viewpoint via Q-sort which emphasizes Native American cultural values is more likely to occur if one identifies as Native American. Abductive reasoning, as [Wolf \(2009:26\)](#) noted, is “to propose something new, or to *discover*”, which aligns with the discussion of abduction in Section 4.1.2. Another potential hypothesis, given the participant above who stressed the web of farming and ranching connections, is the agricultural viewpoint being the most prevalent in the Wind-Bighorn Basin of Wyoming. As it turns out, the random sample choice modeling study supports both of these hypotheses. As discussed by [Armatas et al. \(2018\)](#), the ‘Native American’ viewpoint was not discovered in the survey data, which may be due to a survey sample that was very underrepresented by the Native American population. The latent class analysis also suggested that the ‘agricultural’ viewpoint was the most prevalent.

It may seem implausible or contradictory to accept, on one hand, that Q-methodology is exploring and understanding shared viewpoints which do not pre-exist as variables or constructs; while, on the other hand, suggesting that survey research could be used to understand the distribution of Q-methodology viewpoints within some population (or similarly, the potential association between some viewpoint and demographic characteristics). In other words, if one adheres to the belief that Q-methodology viewpoints do not ‘belong’ to people, then it does not follow, ontologically, that survey research could be used to count who holds what Q-

methodology viewpoint. [Danielson \(2009:224\)](#) acknowledged this potential conflict in an article focused on combining Q-methodology and survey methods: “Some Q users of a more constructivist persuasion remain resistant to ‘reifying’ Q discourses by converting them into survey measurements.”

Of course, with regard to this issue, scientific worldview is important. From a pragmatist perspective, the potentially conflicting ontological assumptions underpinning these different methodologies are reconciled through the understanding that both provide a partial understanding of the phenomena being studied (e.g., the human-nature relationship within the context of a pragmatist EE). [Danielson \(2009\)](#), sounding much like a pragmatist, cautioned against “unwarranted fixation on preserving the detailed specificity of individuals at the expense of the gains in understanding to be had by self-conscious use of imperfect-but-workable theoretical boxes.” A pragmatist perspective would see Q-methodology as complementary to, not competing with, R-methodology approaches. Individually, the approaches accomplish something different, and the mechanics of the different approaches are employed to those different ends. For example, Q-methodology does not employ a Cronbach’s Alpha test, as the items included in such a study (e.g., Table 6.8) are not ‘measuring’ a specific construct. Q-methodology does not typically employ a random sample, as the diversity of opinions are of interest as opposed to the distribution of such opinions across a population. In order to better highlight what R-methodology provides, I proceed with an illustrative example whereby the data from the Gila study is analyzed with more traditional factor analysis.

6.4.2. *R-methodology analysis: Overview of results from the Gila study*

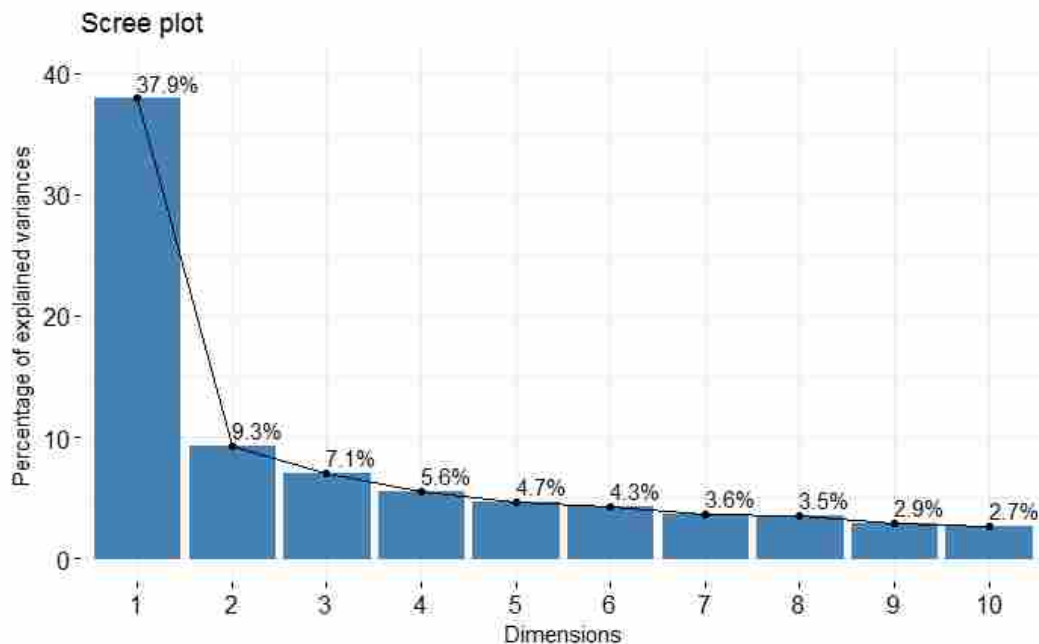
Deciding how many factors to retain for the R-methodology factor analysis was based on the standard considerations discussed above (e.g., scree plot, significant loadings test, and eigenvalues test). Initially, five different factor solutions were assessed, all of which were rotated using varimax rotation. This rotation is common practice in Q-methodology (and thus appropriate for comparison) and, in addition, within the context of R-methodology, [Hair et al. \(2010:115\)](#) suggested that it "has proved successful as an analytic approach to obtaining an orthogonal rotation of factors."

Prior to further assessment of these solutions, variable X1 (forest materials for personal use) was dropped as it did not significantly load onto any factor within any solution, the variable only correlated with one other variable at a value above 0.50, and in all solutions the communality was below 0.50. Assessment of four-, five, and six-factor solutions highlighted additional variables to be dropped due to low loadings and low communalities. After a couple analytic iterations, it was concluded that 23 variables was appropriate, which was supported by the KMO test with a higher value for overall suitability and the lowest score for a single variable of 0.65. Factor analysis of a correlation matrix with 23 variables resulted in a six-factor solution, though the five-factor solution was a close second. In terms of statistical criteria, there is no clear 'winning' solution. The Scree Test indicates a robust first factor, but there is not much of an 'elbow' following the initial factor.

The decline in variance explained after factor one is quite gradual. The eigenvalue test, which often suggests retaining factors with a value greater than one suggests somewhere between five and six factors. Regarding the number of variables with significant loadings on

each factor, all three potential factor solutions have factors with only two significantly-loading variables (some might suggest a two-variable factor is unconvincing).

Figure 6.8. Scree plot for the PCA of the Gila data with ecosystem services as variables



While the four-factor solution only has one factor with only two significant variables (which is understandable because there are only so many variables to ‘go around’), I would argue that conceptual and theoretical criteria highlighted more compelling stories with both the five and six-factor solutions. Ultimately, I will move forward with a full interpretation of a six-factor solution.

When considering Table 6.17 below, and selecting a final solution for full interpretation, one could argue for a few different factor solutions. The first factor tells the most complete story and, in all factor solutions, the second factor and beyond provide story fragments. Across all factor solutions, the first factor could be labeled “multiple use versus wilderness”, as negative

loadings on several production ecosystem services (i.e., timber production; oil and natural gas and minerals; livestock grazing; irrigation for agriculture; traditional agricultural lifestyle) are paired with positive loadings on several wilderness-related ecosystem services (i.e., non-motorized recreation; solitude, quiet, and clear night sky; places where human influence remain substantially unnoticeable; scenic beauty, aesthetics, and inspiration). This suggests a negative correlation between the two groups of variables. In other words, negative scores on production services are associated with positive scores on wilderness services (or vice versa).

It is worth noting that moving to a six-factor solution from a five/four-factor solution results in two variables becoming insignificant (i.e., they do not load onto a factor): (1) biodiversity and abundance and; (2) wildlife habitat and connectivity. This slightly changes the story with the first factor, and it is debatable whether it makes the factor label of “multiple-use versus wilderness” more or less appropriate. At the same time, moving to a six-factor solution results in a factor with ‘wildlife habitat and connectivity’, with a negative loading, and ‘woody biomass for energy’ with a positive loading. This two-variable factor (factor six) provides, perhaps, a mini-story where the desire to have intact areas of wildlife habitat is in conflict with this specific form of renewable energy. It is viable interpretation, as woody biomass for energy is particularly intensive in its requirement to extract wood products from the forest. A suitable name for this factor could be “open space and energy needs”.

Table 6.17. Factor loadings on each variable in a four-, five-, and six-factor solution

Variables (ecosystem services)	# of factors in solution			# of factors in solution			# of factors in solution			# of factors in solution			# of factors in solution				
	Four	Five	Six	Four	Five	Six	Four	Five	Six	Four	Five	Six	Four	Five	Six		
	1 st factor			2 nd factor			3 rd factor			4 th factor			5 th factor			6 th factor	
timber production	-0.68	-0.70	-0.62														
Oil, gas, minerals	-0.70	-0.70	-0.63														
woody biomass energy							-0.55						0.74				
livestock grazing	-0.72	-0.75	-0.62														
irrigation for ag	-0.78	-0.78	-0.64														
outfitting and guiding				-0.66	-0.51		-0.51										
Hunt/fish (no outfit)					-0.73	-0.77											
non-motorized rec.	0.60	0.60	0.59														
motorized rec.								0.61		-0.62		-0.67					
driving for pleasure								0.82		-0.82		-0.84					
Solitude, clear sky	0.63	0.65	0.78														
Native cultural				0.62									0.71				
traditional ag lifestyle	-0.76	-0.78	-0.59														
education and interp				0.67	0.68	0.63											
research and science				0.71	0.77	0.73											
Places human influen.	0.80	0.82	0.81														
Cultural/archeological				0.71									0.66				
carbon absorption					0.52	0.48						0.49					
Biodiversity/abundance	0.57	0.59															
Habitat/connectivity	0.66	0.66												-0.52			
water quality							0.54				0.85						
air quality							0.73				0.62						
beauty and inspiration	0.67	0.70	0.79												0.84		

Note: variables dropped were – forest materials for personal use, water for household use, developed camping, dispersed camping, flood and erosion control, water quantity, and public ownership and access.

Note: factor loadings less than an absolute value of 0.50 are generally omitted from display. The single exception is the loading on ‘carbon absorption’, which is deemed practically significant for both interpretive reasons and its nearly 0.50 loading.

Accepting a six-factor solution also suggests that the grouping of the four ‘other cultural services’ (i.e., Native American cultural benefits, cultural and archeological sites, research and science, and education and interpretation) on a single factor, as is the case in a four factor solution, is not the best interpretation. Instead, the second factor in the final solution, which could be dubbed the “science and education” factor, shows a negative loading on ‘hunting and fishing (non-outfitted)’ and positive loadings on ‘education and interpretation’, ‘research and science’, and ‘carbon absorption’. The reason for the negative correlation with hunting and fishing is difficult to know, but it may be the result of a perception science and research can potentially result in decreased opportunities for hunting and fishing. This interpretation is tenuous, but the rationale is based upon the Shoshone National Forest study, where the recreation perspective considered science and education to be a threat to recreation (particularly motorized winter recreation) because it was perceived that science often leads to less recreation opportunities. Specifically, it was suggested that science focused on conserving grizzly bears yields restrictions on motorized recreation. A similar rationale might explain the negative correlation between science and hunting and fishing. For instance, some may question whether ‘hoot owl’ restrictions on fishing (the practice of regulating angling when water temperatures are high) use science to justify overly cautious management actions. The positive loading variables suggests a connection between gaining scientific knowledge about forests and its relation to the ecosystem service that most clearly mitigates climate change.

Under a six-factor solution, the third factor groups ‘Native American cultural benefits’ and ‘cultural and archeological sites’ together. Interpreting this factor as “culture – now and then” is logical, given that the Gila National Forest region has several cultural and archeological

sites that also represent Native American culture. The most well-known site is the Gila Cliff Dwellings, which provides a window into the Mogollon Culture of the late 1200s.

Two factors have yet to be discussed. The fourth factor groups ‘motorized recreation’, ‘driving for pleasure’, and ‘carbon absorption’ together. The two motorized benefits have positive loadings, and carbon absorption has a negative loading. This factor, perhaps named “motors and the atmosphere”, highlights the potential tension between climate change mitigation and motorized recreation. Lastly, there is the “clean air and water” factor, which groups together ‘water quality’ and ‘air quality’. This grouping of variables is not surprising, and they were grouped in all three factor solutions that were considered.

A six factor solution, as discussed, is summarized in Table 6.18, which includes factor name and the items (i.e., ecosystem services) categorized by positive and negative loading. If these ecosystem services were included in a survey instrument with a Likert-scale format with a random sample, then mean (average) values for each factor could be calculated in relation to different sub-groups of the population. For instance, one could test, using an analysis of variance, whether different income levels or gender were associated with the latent dimensions. This would generally involve completing cluster analysis to understand which respondents were similarly positioned on the six factors. Additionally, the factors, as discussed below, are considered existing constructs and would be subject to a variety of statistical tests including internal consistency (Cronbach’s alpha). One could complete hypothesis testing as well, to examine significant differences between groups, significant correlations with other survey measurements (e.g., length of residency), and or model testing.

Table 6.18. Factors derived from R-methodology analysis of Q-sort data

Factor Name	Ecosystem Services	
	Positively Loading	Negatively Loading
Multiple use versus wilderness	non-motorized recreation; solitude, quiet, and clear night sky; places where human influence remain substantially unnoticeable; scenic beauty, aesthetics, and inspiration	timber production; oil and natural gas and minerals; livestock grazing; irrigation for agriculture; traditional agricultural lifestyle
Science and education	education and interpretation; research and science; carbon absorption	hunting and fishing (non-outfitted)
Culture – now and then	Native American cultural benefits; cultural and archeological sites	
Motors and the atmosphere	Motorized recreation; driving for pleasure	carbon absorption
Open space and energy needs	Woody biomass for energy	wildlife habitat and connectivity
Clean air and water	Water quality; air quality	

Due to the hypothetical nature of this R-methodology analysis of Q-sort data, I will not proceed with such tests. However, the reasons for why such tests are not completed in Q-methodology will become more apparent as interpretation and the different normative assumptions of R-methodology studies are discussed.

6.4.2.1. General interpretation of results in R-methodology based on normative assumptions

The debate regarding factor analysis in Q-methodology and R-methodology originated, and to a lesser extent continues, within the context of psychology. As noted above, Stephenson, like Dewey, was interested in shifting psychological study away from an atomistic and mechanistic ontology, which is typically assumed in mainstream psychometric theory. For instance, in an introductory textbook on psychometric theory, [Raykov and Marcoulides \(2010:2\)](#)

started by defining ‘constructs’ as an “abstract, possibly hypothetical entity that is inferred from a set of similar demonstrated or directly observed behaviors.”

This description does not necessarily distinguish R-methodology from Q-methodology, as ‘viewpoint’ in the latter are inferred from similar Q-sorts. However, as additional basic ideas are introduced the differences in normative assumptions, from ontology to axiology, start to become clear. For example, [Raykov and Marcoulides \(2010:6, emphasis added\)](#) suggested that the practical reason for measuring and evaluating constructs is to “help classify and describe individual *atomistic* behaviors. This leads to substantial reduction of complexity and at the same time helps us understand the common features that *interrelated* behaviors possess.” Without such research and complexity reduction, “chaos and ensuing confusion would not allow them to *deduce* any principles that may *underlie or govern* these behavioral phenomena” ([Raykov & Marcoulides, 2010:6, emphasis added](#)).

The axiological goals of explanation and prediction are not goals in Q-methodology, which strives for understanding and communicating viewpoints about some topic of interest. The goal is to understand a viewpoint, “not to explicate it in terms of other theories” ([Stephenson, 1983b:81](#)). R-methodology aims to both understand, as the discussion of the six-factor solution above reflects, and explain in terms of other theories. As [Raykov and Marcoulides \(2010:8\)](#) explained a challenge of psychometric theory is that constructs “cannot be defined only in terms of operational definitions but must also demonstrate relationships (or lack thereof) with other constructs and observable phenomena.” For instance, one could assess the factor scores of individuals in R-methodology, or use cluster analysis of the factor scores to find groups of people, and find that people positioned highly on the wilderness versus multiple-use factor are also positioned highly on the science and education factor, and the clean air and water factor.

This would show a relationship between a preference for wilderness ecosystem services, public land for the benefit of knowledge creation, and clean air and water. While this makes sense intuitively, these particular answers on a survey could be associated with other behaviors, such as the practice of leave no trace principles while recreating. Q-methodology, on its own, is focused in part on giving voice to different viewpoints (a point stressed in the social vulnerability protocol ([Armatas et al., In Press](#))), but these viewpoints are expressed in terms of how *all* of the different ecosystem services (Table 6.8) relate to one another. This facet of Q-methodology does not necessarily lump ecosystem services together across all people. For instance, the wilderness versus multiple use factor in the R-analysis suggests that all of the variables defining that factor are interrelated, and the factor scores suggest that all people, to some extent, see these variables as interrelated. Q-methodology does not make this connection, but instead might find that one viewpoint that lumps, for instance, livestock grazing with non-motorized recreation in the positively salient zone of the forced distribution (see Figure 6.5).

While delving further into psychometrics is beyond the scope of this dissertation, the above interpretative guidance related to R-methodology is hopefully sufficient to make the point that the debate related to Q-methodology versus R-methodology, which mostly focuses on technical-methods facets, is unproductive due to a lack of attention given to normative assumptions and worldviews.

6.5. Applying a pragmatist lens to assess and add productivity to the debate

Within the context of the conservation social sciences, a pragmatist perspective recognizes that Q-methodology and R-methodology both have something *different* to offer.

Clarifying these differences with better articulation of worldviews and normative assumptions (paradigms) of each approach provides a robust foundation for weighing in on the debate.

Furthermore, clearly understanding the differences between the approaches may yield productive insights, such as ways that each approach can support understanding and decision-making related to human-nature relationships. This section begins with a formal assessment of the Q versus R debate, which is followed by a few examples of how the different approaches may complement each other within the context of conservation social sciences.

6.5.1. Debate assessment: Both sides can do better

As suggested above, both sides of the debate can improve by better communicating the worldviews and normative assumptions underpinning their argument. However, it should be noted that Q-methodology proponents, as they occupy the minority camp (i.e., R-methodology is far and away the more popular and accepted methodology), will likely need to put forth greater effort in distinguishing the two approaches.

From a pragmatist perspective, R-methodology critiques might benefit from critiquing the language used by Q-methodology proponents as a way to highlight why confusion and misunderstanding exists (and persists). For instance, a common critique aimed at Q-methodology is that factor analysis employed in Q lacks rigor as it does not focus on issues of validity and reliability. For instance, [Kampen and Tamás \(2014\)](#) criticized the lack of attention to assessing “measurement validity (does the instrument measure what it is supposed to measure)”, which is a large concern in R-methodology. Within this tradition, one way to understand if a scale item is correlated with an unobserved latent construct is to ascertain whether the items within the scale

are correlated with each other (a common technique is applying Cronbach's coefficient alpha) ([DeVellis, 2003](#)). However, given the differences in axiological goals and ontological assumptions, a focus on validity is not a major concern in Q-methodology ([Brown, 1980](#)); though one could argue that returning to respondents to check to see if their viewpoint was captured is a type of validity check. But, different assumptions remain, such as the exploratory nature of Q-methodology and the desire to yield interesting insights about some subjective topic such as the importance of ecosystem services assumes that any viewpoint, assuming the Q-sorting exercise is understood, is valid. This is the point made by [Brown \(1980\)](#), who equated the interaction between the respondent and the Q-sort as less of a 'measurement' exercise and more of a creative transaction.

In defense of [Kampen and Tamás \(2014\)](#) and those that came before them, this misunderstanding may stem from the language used by Q-methodology proponents. [Stephenson \(1954b\)](#) originally introduced Q-methodology as an 'alternative' way for psychological study, which 'measured' subjectivity. The former highlighted word implies competition with R-methodology, and the latter word often corresponds with positivistic research goals such as explanation and prediction. It seems that contemporary proponents of Q-methodology are not advocating the *measurement* of viewpoints, but instead exploring and communicating shared viewpoints. A Q-sort is not often referred to as a survey instrument. Personally, I have framed the Q-sort this way on occasion, but 'interactive exercise' or 'game-like activity' are my more common labels.

While these axiological goals may differ, it must be conceded that both traditions presume there are viewpoints to be identified and mapped, though Q-methodology considers these viewpoints to be constructed as opposed to existing in dormancy waiting to be discovered.

Try as I might, I fear that this nuanced difference could be articulated better, and entire articles focused on teasing apart this ontological difference (e.g., [Stenner, 2009](#); [Wolf, 2009](#)) have, in my opinion, proved unsatisfactory. This lack of satisfaction is partly due to an inadequate attention given to the difference that the disparate ontological assumptions make for analysis and interpretation. From a pragmatist perspective (and following the pragmatic maxim), if viewing Q-methodology viewpoints differently than R-methodological constructs is significant methodologically, then the exact reasons why needs to be better articulated. If this difference simply allows Q-methodologists to worry less about issues such as validity, then R-methodologists are likely justified in their frustration. It seems paying less attention to issues such as construct validity is better supported by the axiological goals for exploration and abductions *and*, importantly, the fact that a purposeful sample precludes any assertions about the greater population.

Often, the distinction between Q-methodology and R-methodology is that persons are correlated, not tests or traits. Even though this is true, it neglects to clearly highlight the reasons for why particular methods choices are made including, but not limited to: the use of ‘centroid’ factor analysis (considered by some to be outdated and simplistic ([Akhtar-Danesh, 2017b](#))), a sparse employment of standard R-methodological factor analytic techniques (e.g., Cronbach’s alpha), and the use of factor analysis instead of the generally preferred person-grouping technique of cluster analysis. To be clear, many Q-methodologists do articulate normative assumptions, but normative assumptions are not often connected to particular methods choices. For example, from a pragmatist perspective, the use of factor analysis instead of cluster analysis is preferred in Q-methodology for three primary reasons: (1) ontologically, viewpoints are not necessarily mutually exclusive or possessed by people; (2) a purposeful sample does not allow

generalizing to the greater population, which suggests that understanding how many people adhere to a particular viewpoint in a sample is not all that informative and; (3) perhaps most importantly, cluster analysis does not provide the same insight and nuance into how the *entire* set of items were prioritized (i.e., it does not allow for the development of factor arrays). To highlight the different potential contributions of Q- and R-methodology, a few examples are provided in relation to the Gila study.

6.5.1.1. Q-methodology and national forest plan revision

As clearly stated, the typified viewpoints represented by the factor arrays above cannot be generalized to the greater population, and so forest decision-makers do not understand how the viewpoints are distributed across the population. However, there are several other potential benefits for planning and management that a Q-methodology study focused on a human-nature relationship can provide. The potential benefits are clearly outlined in [Armatas et al. \(In Press\)](#) and [Armatas et al. \(2017b\)](#), which included two broad categories of benefits: (1) public relations and; (2) decision-making. The former broad benefit highlights the potential ability of the typified viewpoints, as reflected by the factor arrays, to help members of the general public understand each other in a way that may facilitate empathy for others. Furthermore, the factor arrays can provide managers with a cognitively manageable way to visualize the diverse viewpoints of the public, and the fact that the result are not generalizable could be framed as a positive in this context—as the approach does not imply the prioritization of some viewpoints over others. Another benefit of the Q-methodology viewpoints is that it may add legitimacy to other peoples' perspectives through the tangible and understandable factor array illustrations. If there is

skepticism among the public about a particular shared viewpoint, then seeing the factor array and understanding it came from a structured scientific process may lend credence to the viewpoint.

Regarding the ‘decision-making’ benefit, Q-methodology can provide an understanding of perceived tradeoffs among elements of the human-nature relationship, which may help decision-makers understand the ‘winners’ and ‘losers’ of a particular decision ([Armatas et al., In Press](#)). For instance, the factor arrays for the utilitarian and water archetype (Figure 6.5 and 6.6, respectively) reflect the view that livestock grazing is important within forest plan revision, whereas the environmental archetype (Figure 6.7) views this more negatively. This understanding helps to highlight “what archetypes are sensitive to changes in the provision of particular ecosystem services” ([Armatas et al., In Press:80](#)).

The understanding of the viewpoints provided to managers and planners is comprehensive in that all the items ranked are included in the factor arrays. In the case of the Gila, this allows for an understanding of how the entire set of items relate to one another. While forcing people to tradeoff different items in this fashion may not always be appropriate, it is a suitable task within the context of forest plan revision, which is focused on maintaining social, economic, and ecological sustainability. The ecosystem services contributing to this three-tiered sustainability are potentially conflicting in a number of ways, and while people may ‘want it all’, that does not necessarily reflect the reality of planning and management.

As a final point, Q-methodology forces the consideration and prioritization of the entire set of items (R-methodologists would note that cognitive abilities of respondents only justifies the ranking of a smaller set of items), which has implications for interpretation. As mentioned above, even if participants are only actively interested in a limited number of ecosystem services in Table 6.8, the Q-sorting activity requires that some level of relevance is assigned to each one.

Unlike a survey item, which often includes a ‘do not know’ or ‘no opinion’ option, Q-sorts assume that each item can be reasonably placed within a viewpoint. Even though the center of the Q-sorting activity (i.e., the middle of the forced distribution) is reserved for items that may be neutral, less relevant, or not understood, there is the possibility that meaning is being assigned to items when there may none. There is also the possibility that people place cards that are irrelevant or misunderstood toward the left side of the distribution (i.e., the negatively salient side). This stresses the importance of providing thorough and clear instructions to participants prior to a Q-sort, as well as engaging in a follow-up discussion about each individual's Q-sort. This latter point is critical. While there is certainly room for improvement with the follow-up discussion element of Q-methodology (namely, better integration of qualitative research methods), the ability to add depth through discussion is a benefit to planners and managers who are managing people as much as natural resources.

On the other hand, and from a social learning perspective, the ranking of all items may be a positive aspect of Q-sorting. The reality of forest planning and management is that any given individual may only be interested in a few issues, but when the general public is considered at large it is likely that all ecosystem services in Table 6.8 are relevant. That is, while not all ecosystem services are relevant to all people, each individual ecosystem service is likely relevant to somebody. Consequently, when considering 122 people who each consider a handful of ecosystem services to be relevant, by forcing thoughtful interaction with all items, there may be increased potential for people to learn about the variety of viewpoints different from their own through an understanding of the variety of ecosystem services derived from national forests that support human well-being. In this context, Q-methodology may benefit from less focus on

parsimonious constructs; a focus that may result in the deletion of redundant and/or cross-loading variables.

As will become evident below, that which is provided by Q-methodology differs from that provided by an R-methodology study; however, these differences may be complementary in some cases.

6.5.1.2. R-methodology and national forest plan revision

The ability to estimate the prevalence and strength of psychological constructs within the context of environmental values across a general population is the most obvious difference provided by R-methodological approaches. Again, for the purposes of discussion, let us assume that the R-methodology results presented above reflect those gathered from a random sample of the population using a survey instrument whereby each of the ecosystem services in Table 6.8 were individual questions in Likert-scale format. If this were the case, then the six factors could be related to the population in a variety of ways.

One could understand, for instance, if particular income levels were associated with a difference in preference for the provision of ecosystem services in the ‘wilderness versus multiple-use’ factor. These differences are typically expressed in *degree*, based upon the factor scores assigned to each construct, and they would be interpreted as the different subgroups of people being located at different places on the latent dimension. The ability to connect people to latent constructs with some degree of strength is potentially beneficial to decision-makers as it can help to set priorities, and since the results are meant to represent the population at large then such priorities could be treated in the same manner as a vote. Additionally, groups (and their

associations with factors) can be related to other characteristics, such as geographic dispersion and behavior, including jobs, membership with relevant organizations, preferred recreation activities, and tolerance of encountering other recreationists on the forest. Such knowledge is important for decision-makers charged with facilitating sustainability and accommodating a host of human-nature relationships. However, it should not be assumed that this knowledge is *all* that is needed in the face of complex ecological problems such as forest planning; indeed, a pragmatist EE would argue the focus on tradeoffs and the potential social learning benefits of Q-methodology are also important components.

6.6. The big takeaways of Q versus and R

As mentioned at the outset of this chapter, the debate surrounding Q-methodology and R-methodology has generally been unproductive. While one could argue that the persistent skepticism about Q-methodology likely resulted in those applying it to better articulate what it does (and does not) provide, it could also be argued that misdirected critiques have resulted in the methodology being adopted less. Or perhaps most importantly, it could be argued that the stagnant debate has hampered communication and, thus, potential methodological integration. Regardless, the fact that the debate remains (albeit [Brown et al. \(2015\)](#) suggested that the critiques are less frequent in current times) implies that there is still a lack of clarity related to the different approaches.

This chapter focused on weighing in on this debate through a pragmatist EE lens, which involved a wary assessment of both the statistical approaches and the underpinning normative assumptions, as well as a comparison of results of analyzing the same data set with the two

traditions. It must be noted that this chapter is not authoritative or exhaustive, particularly as it relates to the discussion of normative assumptions of R-methodology and the practical implication of the different ontological assumptions underpinning the two approaches. However, asserting that Q- and R-methodology provide different types of understanding of the human-nature relationship, which both support natural resource planning and management in important ways is perhaps well-supported. Two main takeaways are provided in conclusion.

First, we are a collective, 7.5 billion strong, and so despite the limitations of aggregation and generalizability, there is a *need* to consider human-nature relationships in chunks. That is, understanding 7.5 billion relationships is not possible for the purposes of day-to-day normative sustainability, so there is a need to generalize to some extent. R-methodology has developed the tools to do this. However, relying singularly on such tools is untenable as well. Adding depth and nuance to our understanding of the human-nature relationship with exploratory and abductive methods such as Q-methodology is needed for communicating with and engaging the public in planning and management processes. Q-methodology, by virtue of its forced distribution, can put the public in the shoes of managers and planners. With a handful of important human-nature relationship elements, the exercise makes the impossible task of meeting a three-tiered sustainability feel tangible.

Second, in addition to supporting planning and management with a more comprehensive understanding of the human-nature relationship, it seems that Q-methodology and R-methodology could inform each other methodologically. As Q-methodologists spend hours inspecting factor arrays and the associated comments provided by respondents in order to provide a compelling, concise, and well-supported interpretation of a particular viewpoint, abductions may emerge. For instance, a suggested interpretation above was that the factor with

two positive loaders (research and science, and education and interpretation) and a single negative loader (hunting and fishing) was due to a concern that additional science is a reason to restrict hunting and fishing. This is an abduction, based primarily on a finding of the Shoshone study related to motorized recreation. An R-methodology study is well equipped to test this hypothesis.

Of course, this point could be criticized by those concerned about ‘reifying’ Q-method viewpoints, as mentioned by [Danielson \(2009\)](#). But, a pragmatist EE would suggest that as long as the principle of wary assessment is embraced, then it is perhaps not too risky a pursuit. Additionally, it should not be implied, or always assumed that interpretive research always precedes more positivistic research. Generally, a pragmatist EE would avoid prioritizing either method, as it suggests one approach is interesting, perhaps, while the other is the “real” science.

7. SOCIAL-ECOLOGICAL SYSTEMS RESEARCH: POSITIONING THE HUMAN-NATURE RELATIONSHIP AMONGST IT ALL

SES research represents “a re-integration of thinking about, analyzing and studying humans as an integral part of the biophysical world. Nature no longer simply sets the context in which social interactions take place. Likewise, the human enterprise is not an external disturbance acting upon an ecosystem” ([Schoon & Van der Leeuw, 2015:167](#)). As noted by [Folke et al. \(2016:1\)](#), the SES approach “emphasizes that people, communities, economies, societies, cultures are embedded parts of the biosphere and shape it, from local to global scales”, and vice versa. According to [Colding and Barthel \(2019\)](#), this fundamental ontological belief has, over the course of 20 years, led to three major sources of inspiration: (1) the original SES conceptualization by [Berkes and Folke \(1998\)](#), which focused on combining ideas of institutional resilience (i.e., the way in which natural resource systems, mostly common property regimes, are managed by humans through cultural norms, policies, etc.) with ecological resilience (i.e., ecological knowledge related to the self-organization of ecosystems); (2) the robustness definition of SES research developed by [Anderies et al. \(2004\)](#), which expanded the definition of the social element of SESs to account for designed system resilience (i.e., robustness), whereby humans are seen to consciously shape the institutions of the system and; (3) the multitier conceptualization developed by Elinor Ostrom and others ([McGinnis & Ostrom, 2014](#); [Ostrom, 2007, 2009](#)), which focused on creating a shared language to discuss and understand the myriad variables, both social and ecological, that comprise complex natural resource management systems.

The purpose of this chapter is to demonstrate that social-ecological systems (SES) research can facilitate the operationalization of a pragmatist EE. That is, SES research can help

to position a comprehensive understanding of the human-nature relationship within the larger system by highlighting a broad range of ‘variables’, including governance institutions (e.g., laws, administrative rules, social norms) and biophysical systems (e.g., watersheds), which are likely to interact and affect human-nature relationships in a variety of ways.

From a pragmatist EE perspective, this is critical information, as a more comprehensive understanding of the human-nature relationship (variable) is, on its own, insufficient for decision-making, communication, and social learning within the context of complex environmental problems. Returning to Bryan Norton’s language related to normative sustainability (which partly borrowed from Amartya Sen), a pragmatist EE strives to identify and understand the broad range of ‘opportunities’ important to human-nature relationships, but it is recognized that there are ‘constraints’ (or a lack of constraints) that influence the realization of such opportunities. SES research can highlight these constraints and potentially how they interact with human-nature relationships. The broad range of variables influential in SESs can also underscore the various knowledge needs, much of which is broadly covered within the conservation sciences. It could be argued then that SES research can also facilitate an understanding of the role of a pragmatist EE relative to the broad conservation (social) sciences.

In addition, it is argued that a pragmatist EE can benefit SES research which, as discussed below, is itself facing a bit of an identity crisis. Specifically, the main arguments of this chapter are:

- A pragmatist EE, with the clearly stated normative assumptions established above, establishes a stance on what SES research does. Namely, it is a heuristic or conceptual mapping tool, not a formal decision-making apparatus complete with quantitative predictive models.

- SES research can support a pragmatist EE by highlighting where governance within the context of complex environmental problems can be improved (i.e., it can help to ‘operationalize’ pragmatist EE research findings in practice);
- A pragmatist EE can help to address the critique that the social system is oversimplified within SES research (e.g., that preferences are assumed as homogenous, SES does not allow for human agency, etc.) and;
- SES research can help a pragmatist EE acknowledge the missing knowledge gaps (i.e., avoid the ‘so-much-is-missing critique’ outlined in Section 5.2.7);

In order to make these arguments, this chapter proceeds with a basic justification of the proposed integration of SES research and a pragmatist EE, which is that they fundamentally share origins and general goals. Second is a general review of SES research, including common criticisms, areas of agreement with regard to ontology, epistemology, and axiology, parallels with the normative assumptions in pragmatist EE, and the myriad frameworks currently available for application within SES research. Third, a methods section for the analysis herein is presented, which includes a justification for the chosen SES framework, a brief overview of the study on human-nature relationships on the Shoshone National Forest, and the basic goals and limitations of the analysis. Finally, the four aforementioned (bulleted) arguments are discussed and supported with examples primarily related to forest planning and management.

7.1. The common origins, goals, and challenges of social-ecological systems research and ecological economics

Social-ecological system (SES) research and EE have much in common. First and foremost, [Colding and Barthel \(2019:1\)](#) places EE at the birth of the SES concept:

The [SES] concept was originally used in a transdisciplinary research project at the Beijer Institute of Ecological Economics that started in early 1998. The purpose behind this project, referred to as “Dynamics of Ecosystem-Institution Linkages for Building Resilience,” was to analyze critical linkages in social-ecological systems, and to generate insights on how to interpret, respond to, and manage feedbacks from complex adaptive systems.

[Cote and Nightingale \(2011\)](#) also connected the SES concept with EE and the Beijer Institute; interestingly, the Beijer Institute was mentioned above (Section 3 footnote) as EE was discussed within the context of transdisciplinary science and sustainability. These early efforts shared many of the same ideas, such as the ‘coevolutionary paradigm’ ([Folke et al., 2005](#); [Kallis & Norgaard, 2010](#); [Norgaard, 1994](#); [Ropke, 2005](#)).

The common roots of EE and SES were generally motivated by concerns stressed in the Brundtland Report, which yielded similar broad objectives. Reflecting the early ideas of [Berkes and Folke \(1998\)](#), one primary goal of SES research was stated by [Folke and Gunderson \(2012:55\)](#) as developing “strategies that build resilience rather than attempt to control for optimal production and short-term gain” while also harnessing human ingenuity to encourage sustainable development approaches that are cognizant of biosphere limitations. A common intuition that emerged in response to such ambitious goals was the inadequacy of any single approach or discipline in the face of complex environmental problems. According to [Adger \(2006:269, emphasis added\)](#), a number of research traditions focus on elaborating “the nature of social-ecological systems while using theories with explanatory power for *particular* dimensions of

human-environment interactions.” In other words, due to the all-encompassing nature of SESs, a single researcher is likely to study some component of a SES and then position that study within the broader framework. Presumably, this exercise can both contextualize the particular interaction being studied within the SES at large, and advance theory about how particular variables within the system interact.

Of course, a consequence of disciplinary integration and a focus on complex SESs is a nebulous scientific landscape, as reflected by hybrid disciplines, and the lack of a unifying methodology. Interrelatedly are issues of scientific identity, which within the context of EE were clearly established above. However, identity issues were also recently discussed within the context of SES research. In an exploration of 20 years of social-ecological systems discourse, [Colding and Barthel \(2019:8\)](#) called for a more unifying definition of the SES concept, lest the door is left “open for scholars to come up with their own homegrown interpretations and definitions of SES, creating an overall confusion of the concept’s scientific relevance.” Similarities between EE and SES research can also be found in the critiques of the respective fields, including criticizing an adherence to overly reductionist mathematical formalism (and the resulting neglect of nuance) and a homogenization of complex social entities (e.g., preference homogeneity, atomistic ontological assumptions). The similar origins, goals, and challenges of SES research and EE suggest that synergies exist for the benefit of both general efforts.

7.2. Normative assumptions of social-ecological systems research: consensus may be impossible, but clarity is not

The idea that social and natural systems are separate entities, or that all social interactions are simply occurring independent of some environmental backdrop has, in numerous arenas, been dispatched for the idea that society and the environment interact in diverse ways creating equally diverse outcomes. Integrated systems, from this perspective, have been variously dubbed ‘coupled human and natural systems’, ‘coupled human-environment systems’, ‘socio-environmental systems’, ‘social-environmental systems’, and ‘social-ecological systems’. In the literature, these various terms appear to be as treated synonyms, though some authors have made explicit distinctions, such as between the meaning ‘human’ and ‘social’ ([Scholz, 2011](#); [Scholz & Binder, 2004](#)). The chosen *metaphor* in this dissertation is ‘social-ecological systems’ (SESs), which is a choice based upon its prevalence in the literature.

The application of a SES perspective is a common denominator within a number of research traditions, including ecological economics. This may partly explain its increasing popularity. According to [Schoon and Van der Leeuw \(2015\)](#), research on SES has grown exponentially from 30 citations in 1970 on the topic to over 14,000 in 2013. [Colding and Barthel \(2019\)](#) illustrated a similar trend between 1998 and 2016. In light of this rapid increase in popularity, it is perhaps unsurprising that SES research struggles to find a united identity; that is, as many apply the idea in different ways, its meaning becomes less clear. Like EE, its rapid increase in popularity has resulted in calls for answers to the “what are we doing question”. It seems that the multiple applications of SES frameworks is a good thing, and given the variety of worldviews and paradigmatic beliefs in the conservation sciences one would not expect complete consensus on the exact nature of SESs (ontology), how and what constitutes knowledge about

such SESs (epistemology), and the purposes of SES research (axiology). However, being clear with each application, as to what normative assumptions are underpinning the work, is critical for a coherent conservation social science.

Like the research menu and the various benefits associated with each approach to partially understand human-nature relationships, coherence about SES research will facilitate communication with both other researchers and the general public. In order to add clarity as to how a pragmatist EE views SES research, it is necessary to highlight the various stances surrounding the subject. Following pragmatism, the contrast between different views may lead to greater agreement about the “what are we doing question”. To start, common critiques of a *positivistic* SES research are provided. This qualifier is added, because it would be unfair and confusing to label the critiques below as targeting SES research in general. Not all practice SES research through a positivistic lens, and it is arguable that the type of SES conceptualization being criticized was not the original intent. Specifically, the original intent of SES researchers (e.g., Berkes, Folke, Ostrom) was not to develop formal models whereby all variables (both social and environmental) can be modelled formally and quantitatively. To be clear, the critiques are profound and important, and they are generally accepted and reflected in the chosen conceptualization of SES presented herein. The balance, or perhaps vacillation, between reduction and complexity (as discussed in Section 5.2.2.1) is an important goal of a pragmatist EE, as so it is with a discussion of SES research.

7.2.1. *Common critiques of positivistic SES research*

[Olsson et al. \(2015\)](#) provided a rather harsh critique in their article partly entitled, ‘why resilience is unappealing to social science’. While SES research has been adopted widely (and thus does not necessarily need to be framed by resilience theory) ([Stojanovic et al., 2016](#)), the critique by [Olsson et al. \(2015\)](#) remains as a critique of SES research for two reasons. First, SES research is heavily influenced and, to some extent (at least historically), is inextricably tied to ecological resilience theory. As shown below, this is particularly true when conceptualizing how systems function. Second, [Olsson et al. \(2015\)](#) are criticizing the prospect of resilience thinking being applied as a ‘boundary concept’ for integrating social and natural dimensions of sustainability, which is an overarching goal of SES research. Their critique is centered on five principals in resilience theory that “create theoretical tensions and methodological barriers between the natural and social sciences and thus stand in the way of a constructive dialogue on knowledge integration between disciplines” ([Olsson et al., 2015:2](#)).

The five principals in resilience theory considered are: ‘systems ontology’, ‘system boundary’, ‘equilibria, thresholds, and feedback mechanisms’, ‘self-organization’, ‘the notion of function and functionalism.’ Regarding system ontology, the primary point is that some social scientists are reluctant to use systems as a way to describe social reality and, furthermore, the attempts to do so have been controversial and the systems conceptualized have been quite different from that in resilience theory and SES research. The second critique is with regard to the difficulty of deciding on what constitutes the boundary of a system, which is perhaps not unique to resilience theory.

The third issue relates to the application of ecological systems concepts related to equilibria, thresholds, and feedbacks, and the authors suggest that applying these concepts to

social systems is problematic. For instance, in SES research, systems are considered to have thresholds that, when exceeded, “result in changed system feedbacks that lead to changes in function and structure” ([Walker et al., 2006:2](#)). And according to [Olsson et al. \(2015\)](#), the idea that social systems change not only function but structure (e.g., institutions) is perhaps unrealistic. Regarding feedbacks, it has been suggested that the concept applied to ecological systems (i.e., positive and negative feedbacks) is too simplified for social systems, because the interactions in the latter are dictated by norms and agency as opposed to structural forces ([Davidson, 2010](#); [Olsson et al., 2015](#)).

The issue of agency, or perhaps the lack thereof, in SES research is a common critique. Several have suggested that a systems conceptualization is problematic when integrating natural and social systems because it does not account/allow for agency ([Cote & Nightingale, 2011](#); [Davidson, 2010](#); [Fabinyi et al., 2014](#); [Murphy et al., 2017](#); [Olsson et al., 2015](#)), or the idea that individuals make choices largely based on their own free will (as opposed to be guided by larger social forces). [Stojanovic et al. \(2016:2\)](#) noted that SES research “inadequately theorize and operationalize ‘the social’.” This critique stems from the idea in SES research that systems are self-organizing without intent ([Levin, 1998](#)). Though, as pointed out by [Walker et al. \(2004:7\)](#), while this may be the case, “the capacities and intent of the human actors strongly influence the resilience and trajectory of the SES.” This idea that human actors have agency, yet the systems themselves are self-organizing, is a problem according to [Olsson et al. \(2015\)](#).

The idea of a self-organizing system makes sense in ecology, as there is often an overarching driver, the ‘attractor’. For instance, “all leaves in a deciduous boreal forest orient themselves toward the sun to optimize the amount of sunlight that they can capture, thus maximizing the uptake of solar energy, which is an attractor of that system” ([Olsson et al.,](#)

[2015:4](#)). In the social realm, the ‘market’ as conceptualized by Adam Smith with the ‘invisible hand’ idea is provided as an example, as market equilibria are the result of decentralized and nonintentional processes that occur regardless of the awareness of those participating in the market ([Olsson et al., 2015](#); [Ullmann-Margalit, 1978](#)). While consumers in a market are free to choose whatever they prefer, it is perhaps debatable as to whether their free will is constrained by overarching forces such as budget and utility.

The final critique to be discussed is the notion of function applied within SES research. The primary concern is that an SES view “is implicitly based on an understanding of society that resembles *consensus* theories in sociology, according to which shared norms and values are the foundation of a stable harmonious society in which social *change is slow and orderly* – and where, in analog, resilience thus become the equivalent of stability and harmony or the *good norm*” ([Olsson et al., 2015:5, emphasis added](#)). With regard to ‘consensus’ theories, [Olsson et al. \(2015\)](#) suggest that transformational change is often explained by conflict theories in sociology, where differences in opinions and values result in conflict (typically against those in power), and thus can result in radical change. This idea underpins the suggestion by [Fabinyi et al. \(2014:2\)](#) that SES research is biased by “the tendency to aggregate or homogenize social complexity and thereby assume that people’s interest, expectations, and experiences are the same.” Regarding the ‘good norm’, this highlights another ‘bias’ identified by [Fabinyi et al. \(2014\)](#), which is that it is value laden and mostly assumed to be a good thing.

[Cote and Nightingale \(2011\)](#) question whether SES research allows for an understanding of equity and justice through questions of who ‘resilience outcomes’ benefit, and they suggest that a focus on the function of institutions implicitly adopts a conservative approach to social change that may mask normative factors. Some are concerned that SES research, with its

functionalist approach, is too heavily aligned with the neoliberal economics paradigm ([Olsson et al., 2015](#)). These critiques are underscored by the debate between deliberative democracy and critical theory, as discussed in relation to the limitations of a pragmatist EE (Section 5.3). Indeed, researchers with a background in critical theory often question SES research ([Stojanovic et al., 2016](#)).

These critiques are not presented to set up a systematic response to each individual point, but instead to highlight the basic areas of concern related to the SES research paradigm. Fundamentally, the critiques highlight basic concerns related to the application of a positivistic ontology embraced in ecological resilience theory to social units, both at the individual and aggregated level. This is a valid concern, particularly because SES research emerged from research traditions that lean toward an objectivist ontology within a positivistic paradigm. According to [Schoon and Van der Leeuw \(2015\)](#), SES research is historically influenced by the coalescence of thought in political economics, ecology and its theory of resilience, and complexity science (an approach interested in complex, dynamic, and unpredictable systems) over the past 25 years.

However, the concerns are mostly referring to a simplistic, and fairly literal transfer of ecological principles to the social realm, and the question is whether this is the intent of those adopting an SES perspective. That is, to what extent are the principles of resilience theory and systems thinking embraced? Are the principles perfectly transferable theories to the social domain, or are they metaphors and basic heuristics meant to guide understanding? A pragmatist EE, given its normative assumptions, would certainly caution against developing definitive formal models of SESs, as literal extension of ecological concepts to the social realm misrepresents and distorts decades of work by scholars in various fields, such as sociology. A

pragmatist EE suggests that the ecological principles serve better as metaphors and heuristics; ideas such as feedback and threshold can create a common language to compare theories, which was an original intent of Ostrom's framework. Interestingly, even within ecology resilience theory more narrowly there was a hesitation to claiming definitive models. As C.S. Holling, an ecologist, early EE thinker, and SES pioneer noted in his seminal work on resilience theory: "however, complex, [ecological models] are still so simple that they should not be viewed in a definitive and quantitative way. They are more powerfully used as a starting point to organize and guide understanding" ([Holling, 1973:6](#)). This sentiment has carried over to complex SESs, as [Holling \(2001:391\)](#) stated, we can never fully understand complex SESs, "we are always left with best judgments, not certainties."

The primary point related to these critiques is that many practicing SES research would likely accept, for instance, that actors do not have homogenous interests; indeed, complex systems are explicitly assumed to be heterogeneous ([Liu et al., 2007](#)). It also seems that the above critiques have at least been heard. For instance, as pointed out by [Schlüter et al. \(2017\)](#), formal modeling of SESs requires, on the human behavioral side, finding relevant theories, grappling with the incompleteness of decision-making theories, and introducing causality with regard to how psychological, social, and environmental factors includes decision-making. [Schlüter et al. \(2017:23\)](#) accepted these challenges, despite that: "In sum, the challenge of modellers is to identify and transform relevant theories on human decision-making into crisp causal relationships, while the best available knowledge is fragmented, context dependent and descriptive. Given these challenges, it is no surprise that many models rely on rational choice, which is based on a clear, unified and well-established theory that has and can be easily formulated in mathematical equations." While this continued pursuit of formal quantitative

models of SESs, despite the clear limitations, would likely mystify some, a pragmatist EE would withhold judgment until the case was made as to how such work could enhance communication, social learning, and decision-making toward normative sustainability. Short of good arguments toward this end, a pragmatist EE views SES research as a heuristic, and it can be argued that this is the primary intent of much of the SES research community. But, the question remains, a heuristic of what, how is it developed, and for what purpose?

7.2.2. *Ontology and the nature of social-ecological systems*

Integrated SESs are assumed to be composed of various components (or variables), where the different components interact with one another creating outcomes and feedbacks in complex ways. These components, often described as governance or institutional structures are common ontological units of analysis in SES research. [Berkes and Folke \(1998\)](#) focused on institutions and property rights. The meaning of ‘institutions’ is, perhaps, somewhat counterintuitive; typically referring to rules (e.g., 2012 Forest Planning Rule), laws (e.g., Clean Air Act), and societal norms (e.g., not littering). The focus on governance institutions in SES research is stressed by many, and is perhaps the most common unit of analysis in SES research. Additionally, the focus on ‘human-nature *interactions*’ constitutes an ontological unit of analysis ([Adger, 2006](#); [Liu et al., 2007](#)). According to [Schoon and Van der Leeuw \(2015:169\)](#), the interaction identified by SES frameworks “serve as building blocks for understanding how institutions and people co-produce outcomes.” This is consistent with the focus on the *processes, elements, and linkages* that comprise the governance of systems (primarily water systems in this specific context) ([Pahl-Wostl, 2009](#); [Pahl-Wostl et al., 2010](#)). However, there are few bounds as to what constitutes a component or variable in an SES (hence the ‘amongst it *all*’ in the title to

this chapter). The broad scope of several frameworks (as shown below), and the general acceptance that a diversity of disciplines need to engage in SES research is testament to the broad range of potential units of analysis. Given this, it seems most appropriate to suggest that SES research is focused broadly on the system as an ontological unit, though nested within systems are a variety of variables which interact in a variety of ways. The complexity of SESs requires that some simplification for the purposes of understanding and research in practice, which is why specific interactions and variables within the system are ultimately the focus; though the system as a whole should remain in sight.

What exact variables constitute a system, and how they interact is the major open question of SES research. Ecological and complex systems principles are generally discussed within this context, but the specifics of what, for instance, ‘feedbacks’ entail within the context of variable interactions is both open for discussion. Ideally, a broad range of disciplines engage in the discussion. That is, the various outcomes that take place within SESs are context dependent, and it is difficult (if not impossible) to declare that particular outcomes will *always* take place when particular variables are present within a SES (the system is not conceptualized like a car engine). Complex SESs are characterized by reciprocal effects and feedback loops, non-linear changes and thresholds, high uncertainty, surprises, legacy effects and time lags, and heterogeneity ([Liu et al., 2007](#)). Reciprocal effects and feedback loops refer to the interactions between people and nature; for instance, the authors provide an example in Kenya where intensive agriculture for decades without application of additional nutrients leads to soil degradation and declining yields which, in turn, results in rapid conversion of the remaining forestland for additional agriculture. An example of a non-linear change is provided for a case in Wisconsin, where “fallen trees that provide critical fish habitat in lakes and stream drastically

decrease when housing density exceeds about seven houses per kilometer of shoreline”, and thresholds refer to the point where a system may change dramatically from one state to another ([Liu et al., 2007:1514](#)). The changing of states of an SES, and the implicit suggestion that SESs can have multiple stable states, is rooted in ecological resilience theory. In his seminal paper, [Holling \(1973\)](#) questioned the traditional viewpoint that ecological systems fluctuated around a single equilibrium, and suggested that systems can move between multiple stable states. Clearly the lack of an ‘ideal’ state complicates decision-making and normative sustainability goals. But, ontologically it seems that SES research emphasizes that there are not necessarily multiple realities at an given time, but that SESs are dynamic and always changing, and that that change in a system is both unpredictable and may yield unprecedented outcomes.

Due to the complex nature of SESs, it is assumed that ‘high uncertainty’ and ‘surprises’ are characteristic of the systems ([Holling, 2001](#)). Surprises refer to the occurrence of the unforeseen (e.g., when the introduction of a wildlife species to achieve some end goes wrong). Legacy effects and time lags refer to the temporal aspect of how human-nature interactions can have effects long into the future (or present effects resulted from historical human-nature interactions). Lastly, heterogeneity acknowledges that human-nature interactions vary across space, time and organizational units. [Liu et al. \(2007:1516\)](#) noted, for instance, that “the socioeconomic difference among people in Wisconsin lead to different choices and behaviors, which in turn result in very different ecological outcomes than one would find were everyone to have the same preferences for ecosystem services”. Two other aspects of SESs yet to be discussed is that they are both ‘adaptive’ and ‘self-organizing’ ([Levin, 1998](#); [Walker et al., 2004](#)), where adaptability refers to the ability of human actors to influence the trajectory of the system toward some desirable state.

As a result of the qualities discussed above, [Schoon and Van der Leeuw \(2015:167\)](#) explained that “the behavior of a complex system is generally said to be emergent – behavior that cannot be inferred from the behavior of its components – and subject to self-organization so that some form of aggregated or global order emerges from uncoordinated local interactions. In short, the macro-level behavior or pattern of the system is more than the sum of the micro-level behaviors of its components.” The idea of a system being emergent was an underlying message in the initial work on ecological systems by [Holling \(1973\)](#). Ontological implications of emergent systems include unpredictability and uncertainty, and a lack of universality. Clearly, these ontological characteristics will have implications for both epistemology and axiology, and the latter set of assumptions are discussed next.

7.2.3. Axiology and the reasons for conducting SES research

Like pragmatist philosophy and EE, the goals of SES research include both those related to a cognitive interest (understand and explain the world as it is) and an action interest (manage the world based on an idea of how it ought to be). Regarding the action interest, [Berkes and Folke \(1998\)](#) claim that motivation of SES research is primarily that the conventional approaches to resource management were mostly not resulting in sustainability. Therefore, SES thinking is focused on how to manage resources better. The stress on ‘management’ within the context of the SES paradigm implies some level of human meddling for the benefit of humans, which distinguishes it from ‘deep ecology’ (i.e., preservation of ecosystems independently of their utility to people) and the animal rights movement ([Berkes & Folke, 1998](#)). The overarching specific goal of SES research is improved governance.

Governance is commonly defined as a complex process of interaction and decision-making, which necessarily goes beyond governmental organizations and includes diverse actors such as communities, private sector organizations, and non-governmental organizations ([Graham et al., 2003](#); [Lemos & Agrawal, 2006](#); [Pahl-Wostl, 2015](#); [Tropp, 2007](#)). According to [Stoker \(1998:17, emphasis added\)](#), this broad conceptualization of the decision-making process “reflects the interest of the social science community in a shifting pattern in styles of governing”, and that governance is “ultimately concerned with creating the conditions for ordered rule and collective *action*.” As noted by [Dietz et al. \(2003\)](#), the delegation of power to environmental agencies (e.g., EPA) does not always lead to conflict resolution, which has led governments to experiment with different governance approaches to complement the more traditional management approaches.

The term ‘action’ is emphasized above to stress the proactive element embedded within the governance concept, as clearly demonstrated within the definition of environmental governance provided by [Lemos and Agrawal \(2006:298\)](#): “environmental governance is synonymous with interventions aiming at changes in environment-related incentives, knowledge, institutions, decision making, and behaviors.” [Stoker \(1998\)](#) provided five ‘propositions’ with regard to the governance concept:

1. Governance refers to a complex set of institutions that are drawn from but also beyond government.
2. Governance recognizes the blurring of boundaries and responsibilities for tackling social and economic issues.
3. Governance identifies the power dependence involved in the relationships between institutions involved in collective action.
4. Governance is about autonomous self-governing networks of actors.

5. Governance recognizes the capacity to get things done which does not rest on the power of government to command or use its authority. It sees government as able to use new tools and techniques to steer and guide.

SES research, ultimately, is focused on providing knowledge that can facilitate effective governance in the face of myriad environmental problems and the interrelated human insatiability for natural resources.

Given this general focus, the remaining open question in terms of axiology is related to the terminal goal(s) of the science itself (e.g., communication, prediction, understanding, or explanation, etc.). On this question, there is no clear agreement. For instance, [Binder et al. \(2013:1\)](#) suggested that the main focuses of SES research include: “combining material or energy flows and economic flows”; “modeling human behavior and drivers that specifically impact on an ecosystem or an ecosystem service”; “identifying and modeling specific goods that are relevant for the human system as well as for the ecological system” and; “studying resilience and adaptive management of social-ecological systems.” While these foci could imply a variety of terminal goals, the stress on modeling does imply some level of prediction and/or explanation.

Perhaps somewhat differently, SES research has, in large part, been about developing frameworks, which can provide *common language* regarding several components applied for viewing a particular reality ([Binder et al., 2013](#); [Ostrom, 2009](#)). With this suggestion that SES research includes both ‘modeling’ and the development of ‘frameworks’, it is worthwhile to briefly define these terms. [Rapoport \(1985:256\)](#) stated: “conceptual frameworks are neither models nor theories. Although these latter terms are used in many different and often contradictory ways, let me suggest that models describe how things work, whereas theories explain phenomena. Conceptual frameworks do neither; rather they help to think about

phenomena, to order material, revealing patterns – and pattern recognition typically leads to models and theories.” As noted by [McGinnis and Ostrom \(2014\)](#), frameworks provide a basic vocabulary of concepts and terms that may be used to construct causal explanations. Theories posit “*specific* causal relationships among core variables. In contrast, a model constitutes a more detailed manifestation of a *general* theoretical explanation in terms of the functional relationships among independent and dependent variables important in a particular setting” ([McGinnis & Ostrom, 2014:2, emphasis added](#)).

This nuanced difference between *specific* causal relationship of variables within an SES and a *general* explanation of all variables together is critical. First, it stresses that the SES framework itself is mostly empty in its projection of specific theories, which leaves open the opportunity for causal explanations, if appropriate, from a variety of disciplines. At the variable interaction level, for instance, sociological theories about change and social movements can be inserted into the overarching SES conceptualization. Second, it implies that no single theory will adequately capture how all the variables in an SES specifically interact, such an implication would seem counter to an emergent system and other ontological assumptions. This suggests that SES conceptualizations are heuristics, not formal prediction and decision-making tools at the overarching system level. The third point to be made is a note about the focus of language in pragmatism, which is that the use of ‘independent and dependent variables’ in the above definition of a model is potentially misleading, as statistical techniques such as regression analysis, which apply this language, are commonly focused on yielding assertions of causality. Given this potential for conflation, a pragmatist EE might recommend discarding the ‘model’ terminology all together, with perhaps ‘heuristic’ or ‘conceptual map’ as substitutes.

A focus on frameworks implies an abduction phase, which could potentially lead to more formal conclusions regarding prediction and causality. However, [Colding and Barthel \(2019:6\)](#) interpreted Ostrom's multitier framework as mainly concerned with identifying variables that influence SESs, which may have been neglected otherwise, for the purpose of comparing different theories and developing a shared language for the purpose of "communication and wider understanding." This interpretation of Ostrom's work, which appears to represent a shared axiology among most SES researchers, follows from her challenge to the "presumption that scholars can make simple, predictive models of social-ecological systems (SESs) and deduce universal solutions, panaceas, to problems of overuse or destruction of resources" ([Ostrom, 2007:15181](#)). While identifying causal effects among a specific, generally small set of variables in an SES may be a shared goal among SES researchers, there is certainly disagreement both about the generalizability of such effects across SESs as well as the extent to which such effects are understood (i.e., can causal effects be measured precisely and quantitatively, or is the understanding more general and qualitative?).

7.2.4. Epistemology and methodology for understanding social-ecological systems

Following [Laudan \(1984\)](#), paradigmatic assumptions are mutually defining and constraining, which means that ontological and axiological assumptions imply, with some level of specificity, epistemological and methodological assumptions. Unsurprisingly, given the range of disciplinary interest in SES research and the varying stances on ontology and axiology, there is no single epistemology or methodology to highlight. Viewing the world in a holistic manner and embracing its complexity is considered as one of the more promising aspects of SES research ([Berkes & Folke, 1998](#); [Cote & Nightingale, 2011](#)), but it is also a perspective that has

led to the general acceptance that SES research requires, very broadly, interdisciplinary and transdisciplinary research. Again, as [Adger \(2006:269, emphasis added\)](#) noted, a number of research traditions focus on elaborating “the nature of social-ecological systems while using theories with explanatory power for *particular dimensions* of human-environment interactions.”

The general idea that SES research combines interdisciplinary and transdisciplinary approaches to construct frameworks, model, and/or theorize about complex systems is, perhaps, the common denominator. Regarding epistemology (how knowledge is judged in terms of validity) and methodology (how knowledge is gained), there seem to be no limitations. These questions are seemingly left to be addressed within the context of the various disciplines and research traditions participating in SES research.

Other issues of epistemology such as who can know, or how knowledge is presumed to exist and be shared is equally as broad. However, given ontological assumptions such as the importance of context and the lack of universality, as well as the existence of time lags, these epistemological issues clearly remove the privilege commonly assigned to the western scientist (usually assigned to the positivistic paradigm). Indeed, the need for nuanced and locally specific knowledge clearly includes all types of research (e.g., all items on the research menu). Additionally, it includes traditional knowledge, which is a topic thoroughly discussed by Fikret Berkes, a prominent SES proponent ([Berkes, 1999, 2009](#)). Traditional knowledge, as discussed by [Armatas et al. \(2016\)](#), is systematically observed over generations, passed down and iteratively updated, and often locally specific; all important, arguably scientific, facets of knowledge within the context of SES research.

This brief discussion of normative assumptions of SES research establishes basic beliefs, but it is worth explicitly stating where a pragmatist EE stands on the normative assumptions of

SES research. Additionally, it may be helpful to place such assumptions next to those in a pragmatist EE. This is the focus of the final brief section prior to a discussion of methods.

7.2.5. A summary of normative assumptions in social-ecological systems research and pragmatist ecological economics

Table 7.1 summarizes the normative assumptions adopted for SES research for this dissertation and for a pragmatist EE. To facilitate the example of an SES analysis of human-nature relationships, the basic assumptions of a pragmatist EE are also provided. As shown, SES research does not focus in on specific variables in all cases. Different SESs, and the purpose of a particular research project, will likely dictate what a conceptual map of an SES looks like, as well as the specifics of each individual variable. As discussed above, this requires several different approaches to fill in the details of the conceptual map or heuristic. This chapter proceeds with an example of how SES research and a pragmatist EE might relate to one another.

Table 7.1. Normative assumptions of SES research and a pragmatist EE

SES research	Pragmatist EE
Ontological assumptions	
<ul style="list-style-type: none"> • Unit of analysis is the SES generally, with a specific focus on variables and their interactions. • Complex SESs span various spatial and temporal scales, included interacting variables with feedbacks, and are unpredictable, heterogeneous, non-linear, dynamic, context dependent (not universal), and emergent. 	<ul style="list-style-type: none"> • Unit of analysis is the human-nature relationship and the various, innumerable elements comprising it. • The human-nature relationship is complex, context dependent, nested within an SES, and dynamic and evolving.
Axiological Assumptions	
<ul style="list-style-type: none"> • Providing a common language for the comparison of theories about composition and interaction of variables within an SES. • Provide a conceptual map or heuristic to generally describe SESs at large. • A typical focus on social and institutional factors. • Facilitate governance of natural resource systems toward normative sustainability. 	<ul style="list-style-type: none"> • Describe and understand the human-nature relationship comprehensively. • Communicate such relationships with the goal of enhancing social learning and establishing normative sustainability goals. • Develop and communicate concise methodological approaches to understanding to researchers and public. • Support decision-making by articulating complex human-nature relationships and positioning such relationships within the SES at large.
Epistemological Assumptions	
<ul style="list-style-type: none"> • Comparing, contrasting, and potentially synthesizing different theories may yield improved understanding of specific variables and interactions. • Context-free generalizations of SESs at large is not possible (transferability is the goal). • Knowledge is derived through engagement of multiple disciplines. 	<ul style="list-style-type: none"> • Wary assessment and democratic deliberation yield tentative truths. • Context-free generalizations of comprehensive relationships is not possible (transferability is the goal). • Knowledge is derived through experience; science is systematic but not privileged because warranted <i>and</i> valuable assertions are needed.

7.3. Methods for demonstrating the an social-ecological systems analysis of the Wind-Bighorn Basin of Wyoming and Montana

The purpose of this chapter, stated at the outset, is to demonstrate how SES research can help to operationalize the understanding of the human-nature relationship yielded by pragmatist

EE. To this end, a conceptual framework developed within SES research is applied to the Wind-Bighorn Basin as an example. The hypothesis of this chapter is that SES can highlight relevant variables in the system that may, using Sen's language, constrain (or not constrain) human-nature relationships.

This section lays out the methods for this analysis, which begins with a brief review of available SES frameworks and a discussion of the chosen conceptual framework. This discussion is followed by a brief description of the human-nature relationship research completed in the Basin. Finally, a basic discussion of how the SES framework is actually applied to the Basin is presented, along with a few caveats with regard to the analysis.

7.3.1. *The rationale for the chosen analytic framework*

Several SES frameworks have been developed and refined, primarily in the last 20 years. [Binder et al. \(2013\)](#) compared ten SES frameworks with regard to a variety of elements, including purpose, conceptualization of social system (e.g., resource users (actors) and the governance system that influences the actions), social scale (e.g., decision-makers, society, local stakeholders), spatial scale (e.g., regional, global), and types of interactions (e.g., interaction between social and ecological system). The ten frameworks, with their basic purposes, are listed in Table 7.2. For the purpose of illustrating the relationship between EE and SES research, several frameworks were ruled out (i.e., DPSIR, ESA, ES, MEFA, SLA, and TVUL) because they do not conceptualize social dynamics at a detailed level ([Binder et al., 2013](#)). For instance, Figure 7.1 is a general representation of the ecosystem services framework adapted from [Martín-](#)

[López et al. \(2014\)](#) and, while it does generally show how the social system is integrated, there is little detail with regard to this integration.

Table 7.2. Frameworks and their respective purpose

Framework	Purpose
Driver, Pressure, State, Impact, Response (DPSIR)	Develop an improved understanding of, indicators for, and appropriate responses to impacts of human activities on the environment along the causal chain-drivers-pressure-state-impact-responses.
Earth Systems Analysis (ESA)	Understand the global interactions in and dynamics of the earth system as well as its sustainable evolutions.
Ecosystem Services (ES)	Analyze the integral, dynamic, and complex interactions of biotic and abiotic components of an ecosystem in relation to the supply of services this system provides to support life on Earth.
Human Environment Systems Framework (HES)	Provide a methodological guide or template for analyzing the structure of social-ecological systems and understanding the processes and dynamics between the social and ecological systems as well as within different scales of the social system.
Material and Energy Flow Analysis (MEFA)	Analyze the metabolic profiles of societies. Analyze the material and energy flows as representing the metabolism of a society, region, or nation.
Management and Transition Framework (MTF)	Support the understanding of water systems, management regimes, and transition processes toward more adaptive management; enable comparative analyses of a wide range of diverse case studies; and facilitate the development of simulation models based on empirical evidence.
Social-Ecological Systems Framework (SESF)	Provide a common language for case comparison for organizing the many variables relevant in the analysis of SES into a multitier hierarchy that can be unfolded when needed, and for facilitating the selection of variables in a case study.
Sustainable Livelihood Approach (SLA)	Analyze which combination of livelihood assets enable the following of what combination of livelihood strategies with sustainable outcomes.
The Natural Step (TNS)	Provide a framework for planning toward sustainability based on: constitutional principles (how the system is constituted); outcome (principles for sustainability); and process to reach this outcome (principles for sustainable development).
Vulnerability Framework (TVUL)	Analyzes who and what are vulnerable to multiple environmental and human changes, and what can be done to reduce these vulnerabilities.

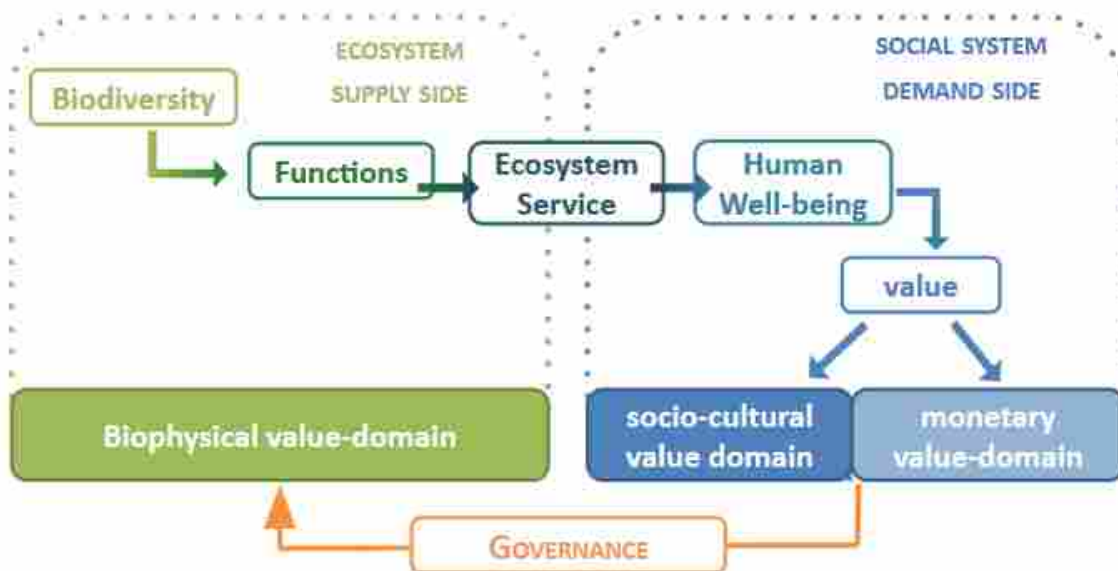
Source: Adapted from [Binder et al. \(2013\)](#)

For example, an ecosystem services ‘framework’ does not focus on social or institutional factors that may prevent someone from reaping an ecosystem service that supports their well-being. According to [Partelow and Winkler \(2016:9\)](#), the ecosystem services concept is not

usually “applied as a holistic conceptual framework to explain the whole SES”; that is, it does not contribute significantly to an understanding of how governance or institutional structures influence provision of ecosystem services. It is within this arena that SES research can highlight what EE does not provide, which is why the ecosystem services framework is not chosen in this case. It is arguable that the ecosystem services concept is not a framework, but more of a concept or metaphor for highlighting how natural systems support human well-being. The latter is what gave rise to the ecosystem services concept in the first place ([Norgaard, 2010](#)). And so, while relevant, it is excluded from future discussion.

The HES, MTF, and SESF appear to be the most appropriate for the assessment of the variety of (informal) variables of an SES that would influence human-nature relationships as conceptualized herein. Ultimately, the MTF framework was chosen as the primary framework, because it was developed with the expressed interest of analyzing complex water governance regimes, and it focuses on identifying the various elements, linkages and processes that constitute water management and governance in river basins ([Pahl-Wostl, 2009](#); [Pahl-Wostl et al., 2010](#)). This latter aspect is critical, as it allows for capturing the social dynamics of how human-nature relationships are influenced by a variety of factors. As such, it is well suited for framing a study focused on improving water governance within the context of a large river Basin in the western United States. The study focused on water, complemented a biophysical vulnerability assessment, and included both a kind-with-tradeoffs approach and a degree-with-tradeoffs approach.

Figure 7.1. Ecosystem services cascade that conceptualizes the SES



Source: ([Partelow & Winkler, 2016](#))

7.3.2. The management-transition framework (with support from Ostrom's SES)

Although the MTF was chosen, the analysis presented below could have been provided within the context of the SESF. Both frameworks are directly informed by the Institutional Analysis and Development (IAD) framework developed by [Ostrom \(2005\)](#) and, according to [Pahl-Wostl et al. \(2010:574\)](#), “the IAD framework introduces some characterizations of policy processes and social interactions which are very useful for a process analysis.” Namely, ‘action arenas’ and ‘action situations’, which are concepts central in both frameworks, and are thus central in the hybrid presented herein. [Pahl-Wostl et al. \(2010\)](#) concisely explained:

Action Arenas comprise Action Situations in which participants with diverse preferences interact, exchange goods and services, solve problems, or develop new rules...the notion of an Action Situation is very broadly interpreted in the MTF though. It captures interactions of individual actors who negotiate about a

specific problem as well as aggregated interactions among collective actors which lead to a general policy framework.

It seems that the influence of the IAD framework on both the MTF and the SESF also resulted in the use of similar variables for defining the various subsystems, which makes them comparable.

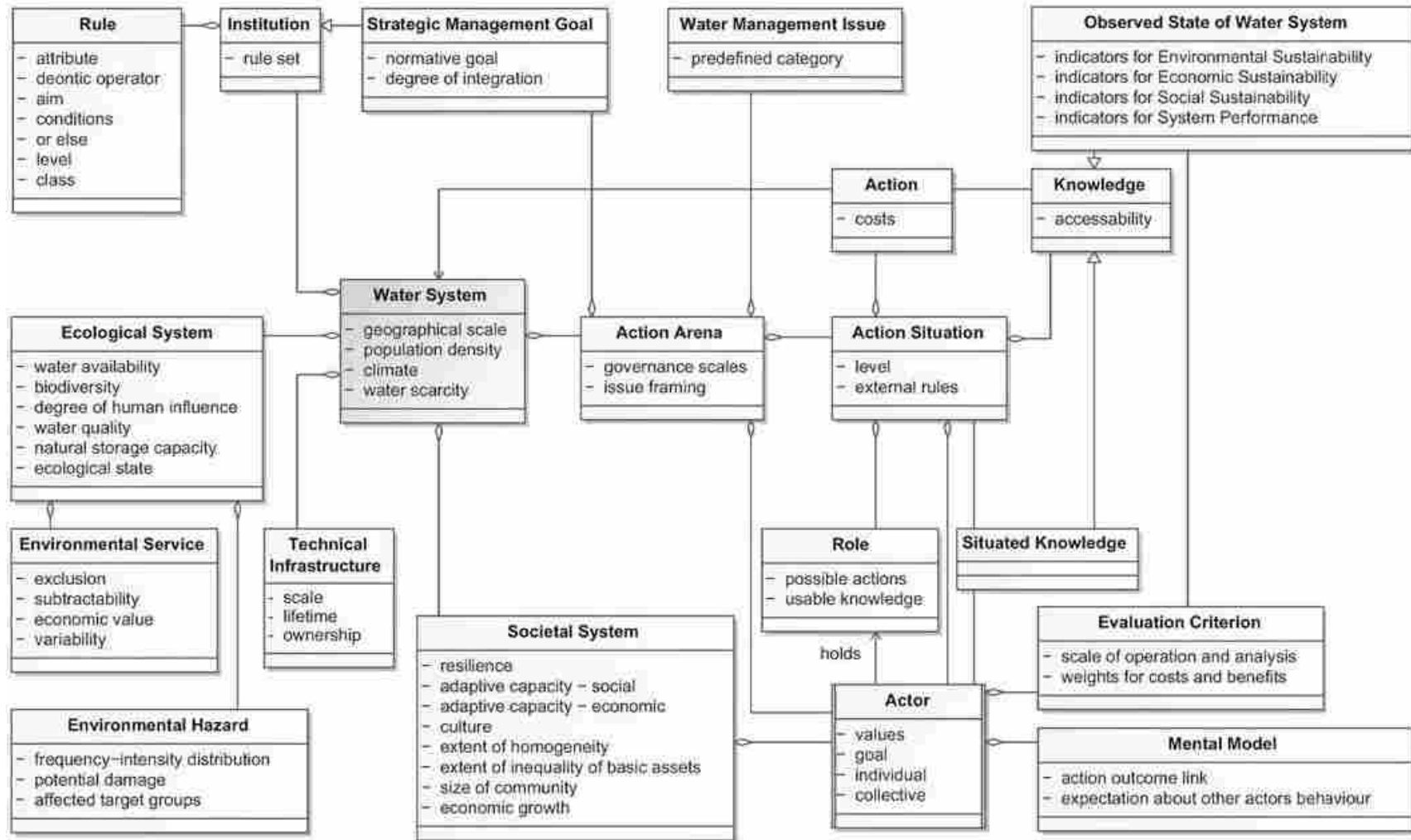
The MTF was the central output of an interdisciplinary research project including nearly 40 partners and over 100 individual researchers ([Pahl-Wostl et al., 2008](#)). The schematic for the MTF provides a conceptual map for an unspecified water system (Figure 7.2). With regard to the different interactions between variables, lines without any arrow denote some unknown association. For instance, the ‘observed state of the water system’ is assumed to associate, though in an unknown way, with ‘evaluation criteria.’ The former variable includes the specific indicators that could be used as metrics for defining the desirability of the water system ([Pahl-Wostl et al., 2008](#)), such as miles of blue ribbon trout fishing, availability of culturally important plants, or species biodiversity. These indicators are posited as important knowledge for public debate related to the governance of the system. ‘Evaluation criteria’ is that which ‘actors’ use to “evaluate the degree of satisfaction” with the observed state of the water system ([Pahl-Wostl et al., 2008:86](#)), which could include a specific target for miles of blue ribbon trout fishing, or the removal of a species from the threatened and endangered list. Arrows denote “a generalization ([and add] ‘is a’ link – e.g. situated knowledge is a kind of knowledge)”. Lines with a diamond point denote an “aggregation (‘has a’ link – e.g. an actor has a mental model)” and, lastly, the arrow with ‘holds’ next to it denotes a clear unidirectional relationship. The significance of this unidirectional, ‘holds’ interaction between the ‘actor’ and ‘role’ variable is described by [Pahl-Wostl et al. \(2008:86\)](#):

‘Roles’ are based on a shared understanding of their meaning and function. A ‘role’ is held by an ‘actor’ during an ‘action situation,’ whereas ‘roles’ belong to the ‘action situation’ and not to the ‘actor’. ‘Role has been derived from

“position” as used in the IAD framework. Given the link to game theory, position in IAD is linked to distinguishing players according to the pre-defined rules of the game. Similarly, a ‘role’ is linked to a range of possible actions and entitles actors holding this role to certain knowledge.

With regard to interpreting Figure 7.2 more generally, each box represents a first-tier variable, each of which can be further specified. For instance, the ‘actors’ variable is defined by four different categories, corresponding with the four perspectives investigating in the SNF study. Each of the actor variables can be further defined by second-, or third-, level variables. Based upon the meaning of different connecting arrows, we can interpret actors as having ‘mental models’, ‘evaluation criteria’, and ‘situated knowledge’. As another example, ‘action situations’ have ‘knowledge’, ‘actors’, and ‘roles’ (which are *held* by actors). It is worth defining ‘mental models’, and distinguishing between ‘knowledge’ and situated knowledge’. According to [Pahl-Wostl et al. \(2008\)](#), mental models are “representations of the world in the minds of ‘actors’”, which includes beliefs about what outcomes particular actions will yield, and the expectations of other actors.

Figure 7.2. Management-transition framework conceptualizing the water system of an unspecified SES



Source: (Pahl-Wostl et al., 2008)

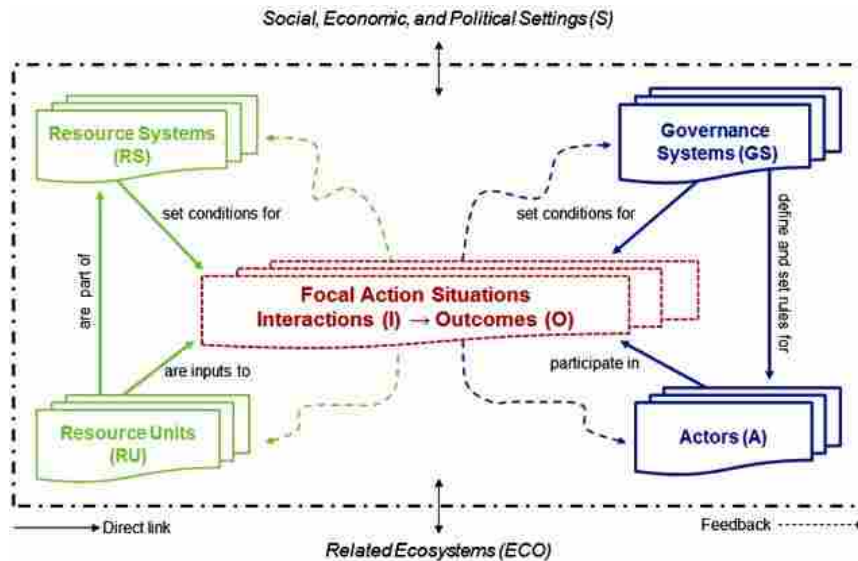
It is worth noting the constructivist subtext of the quote, as well as that Dewey's view of experience subsumes the mental model, knowledge, and situated knowledge. *Situated* knowledge is defined as knowledge "activated" in a particular action situation, and it "captures the importance of framing and reframing and the embeddedness of knowledge in a social context" ([Pahl-Wostl et al., 2008](#)). The regular, non-situated knowledge variable captures "meaningful information and experience", and access to information such as "reports" is provided as an example ([Pahl-Wostl et al., 2008](#)). It seems the distinction, in pragmatist parlance and the context of Dewey's experience, is that situated knowledge is that information thought to be valuable assertions, which may break the habitual experience and trigger the secondary experience where deeper thinking and social learning commence. This is, if we assume that deception and lies are not part of situated knowledge, and surely many social theorists would not make such an assumption, including political ecologists. Non-situated knowledge seems to encompass warranted assertions, or that information that is generally accepted as tentative truth.

Relative to the SESF schematic (Figure 7.3), the MTF provides a more detailed starting point in terms of first-tier variables (or 'classes' in the case of the MTF)—henceforth, variables is the chosen term²⁰. Specifically, the SESF shows the interaction between eight first-tier variables, each of which subsumes lower level variables (Table 7.3), whereas the MTF starts with nearly 20 first-tier variables (each of which is further characterized by lower-level variables). A result of more variables is increased detail related to interactions, which is potentially preferable. Although refraining from adding too much detail in terms of interaction

²⁰Terminology differs between the SESF and the MTF. The former uses 'first-tier variable' to denote systems, the action arena, and other settings, and the latter uses 'classes' as "classes of elements and their relations, attributes, and applicable methods that have been identified as important to describe water management systems" ([Pahl-Wostl et al., 2008:83](#)). Both the first-tier variables and the classes are further defined by lower-level variables or elements. To limit confusion, the term 'variable' is used, but it is used informally in that variables need not be represented quantitatively, nor do their interactions with other variables need to be represented mathematically.

aligns with the anti-foundationalist leanings of pragmatism, one can maintain a pragmatist approach by treating the MTF schematic as a starting point without treating proposed interactions as concrete.

Figure 7.3. The Social-ecological system framework for representing complex systems



Source: [McGinnis and Ostrom \(2014\)](#)

Highlighting the general nature of the SESF (Figure 7.3) is not a criticism, as it was a deliberate design choice because it is intended to be tailored and detailed depending on the context. However, given the current focus on the water system, as well as the importance of communication within a *pragmatist* EE, the additional detail within the MTF is attractive. While the SESF schematic (Figure 7.3) is not used directly in this analysis, the development of an extensive list of potential relevant second-level variables (Table 7.3) is beneficial.

Table 7.3. First- and second-tier variables of an SES

First-tier variable	Second-tier variable	First-tier variable	Second-tier variable
Social, economic, and political settings (S)	S1 – Economic development S2 – Demographic trends S3 – Political stability S4 – Other governance systems S5 – Markets S6 – Media organizations S7 – Technology	Resource units (RU)	RU1 – Resource unit mobility RU2 – Growth or replacement rate RU3 – Interaction among resource units RU4 – Economic value RU5 – Number of units RU6 – Distinctive characteristics RU7 – Spatial and temporal distribution
Resource systems (RS)	RS1 – Sector (e.g., water, forests, pasture, fish) RS2 – Clarity of system boundaries RS3 – Size of resource system RS4 – Human-constructed facilities RS5 – Productivity of system RS6 – Equilibrium properties RS7 – Predictability of system dynamics RS8 – Storage characteristics RS9 – Location	Actors (A)	A1 – Number of relevant actors A2 – Socioeconomic attributes A3 – History or past experiences A4 – Location A5 – Leadership/entrepreneurship A6 – Norms (trust-reciprocity)/social capital A7 – Knowledge of SES/mental models A8 – Importance of resource (dependence) A9 – Technologies available
Governance systems (GS)	GS1 – Government organizations GS2 – Nongovernment organizations GS3 – Network structure GS4 – Property-rights systems GS5 – Operational-choice rules GS6 – Collective-choice rules GS7 – Constitutional-choice rules GS8 – Monitoring and sanctioning rules	Action situations: Interactions (I) → Outcomes (O)	I1 – Harvesting I2 – Information sharing I3 – Deliberation processes I4 – Conflicts I5 – Investment activities I6 – Lobbying activities I7 – Self-organizing activities I8 – Networking activities I9 – Monitoring activities I10 – Evaluative activities O1 – Social performance measures (e.g., efficiency, equity, accountability, sustainability) O2 – Ecological performance measures (e.g., overharvested, resilience, biodiversity, sustainability) O3 – Externalities to other SESs
Related ecosystems (ECO)	ECO1 – Climate patterns ECO2 – Pollution patterns ECO3 – Flows into and out of focal SES		

Source: Adapted from [McGinnis and Ostrom \(2014\)](#)

For instance, the MTF highlights the importance of considering excludability, subtractability, economic value, and variability of ecosystem services; however, consideration of the second-level (and potential third-level) variables subsumed by the ‘resource unit’ (Table 7.3) potentially add further detail (e.g., how do the interactions between different resource units influence ecosystem services?). In summary, the MTF is operationalized with support from the variable development within the SESF. The generality and abstract nature of SES frameworks can be challenging to follow, an issue that will hopefully be assuaged by the analysis provided below.

7.3.3. The Basin and the methods for understanding the human-nature relationship

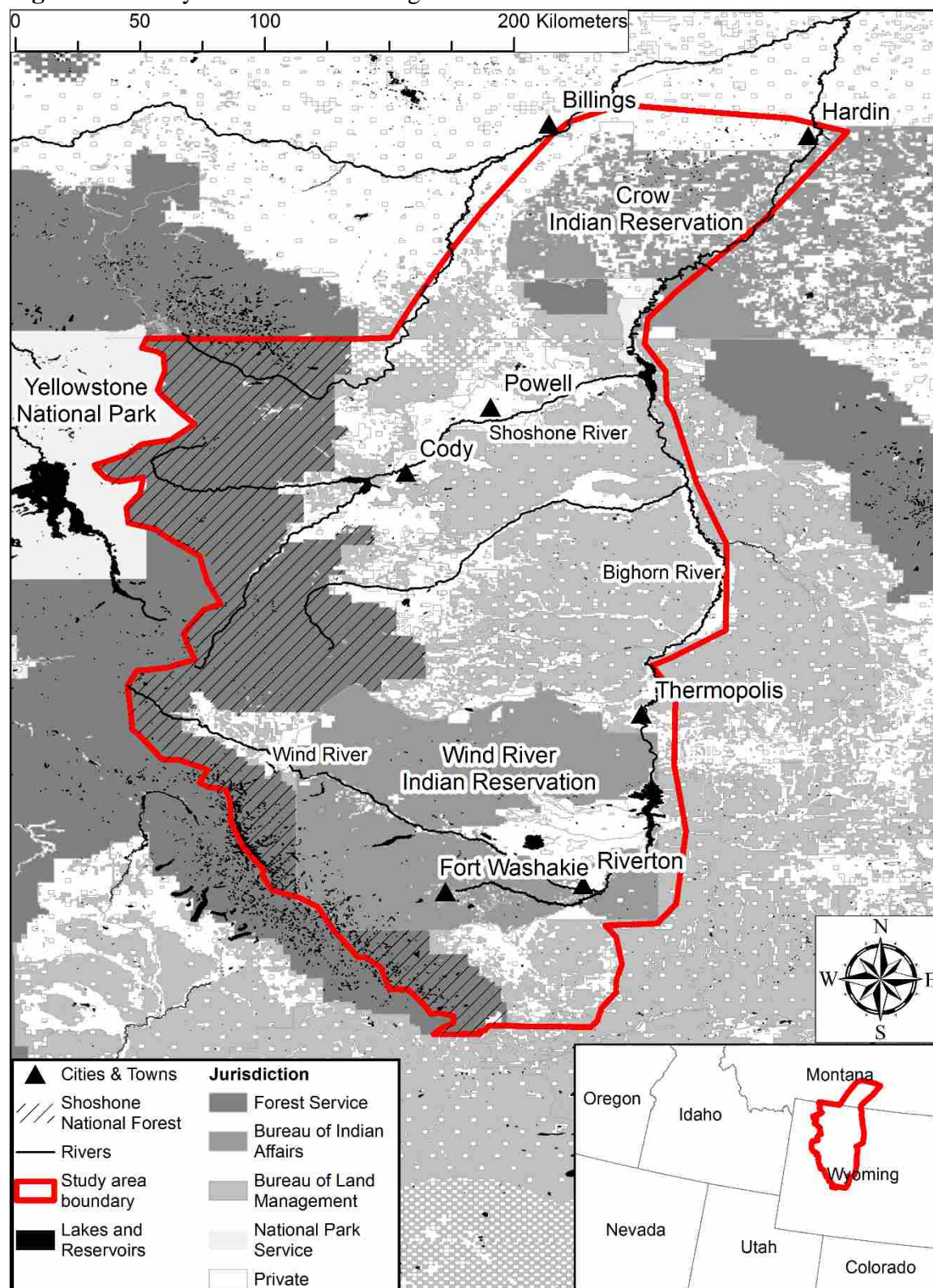
Application of an SES framework to the case study on the Shoshone National Forest (SNF) requires a brief overview of the background of the research. The details of this study are extensively documented elsewhere ([Armatas et al., 2017a](#); [Armatas, 2013](#); [Armatas et al., 2018](#)), with only a brief overview provided herein. The SNF study was initiated to provide a comprehensive understanding of the broad range of perspectives about the importance of water-based ecosystem services, and the perceptions of what factors or influences could potentially affect the flow of important ecosystem services to society. This social-science study was intended to complement a biophysical vulnerability assessment by [Rice et al. \(2012\)](#), which suggested that water resources in the study area (Figure 7.4) were vulnerable to climate change and land-use change. The study included both a Q-methodology study and a choice modeling study, and the purpose was specifically to support the Forest Plan Revision process on the SNF. The rationale was that the SNF is a major part of the landscape, and its management and planning have a significant impact on the adjacent communities in the Wind/Bighorn River Basin (Basin). If the ambitious goals of the Forest Planning Rule are to be achieved (e.g., provide

for ecological, social, and economic sustainability both on and off the forest), then USFS decision-makers need to know their audience.

What we found was that the social system is heterogeneous. There are a diverse range of perspectives about what ecosystem services are important, and in some cases the ecosystem services important to some people are conflicting (i.e., there is some level of subtractability or rivalry) with those ecosystem services important to others. Four general perspectives about what ecosystem services are important were uncovered and explored: the agricultural perspective (highly valued irrigation, water for stock, and the agricultural lifestyle), the environmental perspective (highly valued biodiversity conservation, conservation of keystone species, and other regulating ecosystem services), the Native American perspective (highly valued Native American cultural and spiritual use, water quality, and in-stream flow), and the recreation perspective (highly valued motorized winter recreation and river fishing). Each of these perspectives also highlighted specific drivers of change considered to be influential to their ability to derive these benefits from the water system.

This information is potentially helpful for decision-makers as it serves as a nuanced and detailed reminder of the varied needs and wants of the nearby communities regarding the SNF and its surrounding area. However, the primary focus of the study was not to highlight structures, processes, and functions of the governance system that may be facilitating or impeding the receipt of these benefits. To be sure, the discussion of threats, and the focus on vulnerability, did provide some understanding of structures, processes, and functions of the governance system that may be influential (as discussed in [Armatas et al. \(2017a\)](#)). But, it remains, that the study did not explicitly focus on the governance system, and the various elements that may enhance or detract from one's human-nature relationship.

Figure 7.4. Study area of the Wind-Bighorn Basin



Source: [Armatas et al. \(2017a\)](#)

Therefore, the next section will apply the MTF framework to the Basin and, based upon the understanding yielded from the empirical research in the Basin, it may become clear what variables are relevant to managing the Basin's water resources toward normative sustainability. That is, the general purpose of the SES framework applied herein, based on the express purpose of the MTF and SESF, is to understand the most important variables and processes to support adaptive water governance and management with a focus on transitioning toward a *new regime*. As suggested by [Pahl-Wostl et al. \(2010:578\)](#), a general research question within the context of the MTF framework might be: "What are the characteristics of multi-level governance regimes that increase adaptive capacity and foster or impede social learning and transitions towards adaptive water management?" One characteristic is the human-nature relationship, but positioning this characteristic within the SES and governance system more broadly may be helpful.

7.3.4. Methods (and caveats) for applying the MTF to the Basin

Prior to presenting the results of analysis below, it is worth briefly highlighting how the framework is actually applied. The starting place is the MTF, as developed during an interdisciplinary study ('NeWater project') on integrated water management ([Pahl-Wostl et al., 2008](#)). This framework, like most interpretations of SES frameworks, is a general starting point where additional detail is added via specific case studies. Additional general details can also be added with other SES frameworks, which as described above was the intent of including Ostrom's framework. For instance, the analysis of the SES in the Basin includes a variable for 'operational outcomes', which is not an original variable in the MTF. Inclusion of this variable from Table 7.3 specifies potential outcomes that actors within the Basin might propose.

The basic method for applying the SES to the Basin was, first and foremost, by equating ‘actors’ with the human-nature relationships identified by the research in the Basin (Figure 7.5). Two points are required for clarification. First, as discussed in the previous chapter, Q-methodology does not find groups of people, however, the choice modeling study did classify people via latent class analysis ([Armatas et al., 2018](#)), which found three classes of people, which we cautiously suggested represented the distribution of the Q-methodology viewpoints identified by [Armatas \(2013\)](#). The fourth, missing ‘actor’, in this the Native American viewpoint, which was not discovered via latent class analysis; the reason for this is almost certainly the result of a biased sample (i.e., very few Native American respondents) in the choice modeling study. However, the combination of the two studies suggests at least four general viewpoints worth consideration within the context of decision-making and sustainability. The second point is that the ‘actor’ variable in the MTF is broadly defined, with attributes including their “values, goals, and whether they are collective or individual” ([Pahl-Wostl et al., 2008:87](#)). For the analysis and application of the MTF below, ‘actors’ are not conceptualized as specific individuals or collectives, though such a specification would be potentially fruitful (perhaps with a social network analysis), instead they are conceptualized as unspecified embodiments of the four human-nature relationships explored in the Basin research. A fairly major caveat related to the partiality of these human-nature relationships is discussed in a moment, but first it is worth concluding the basic methods for the analysis below.

Figure 7.5 presented in the next section basically mirrors the original MTF, except for a slight change in appearance (e.g., block arrows are used instead of diamond-pointed arrows). As a reminder, lines without any arrow denote some unknown association, thin arrows denote “a generalization (‘is a’ link – e.g. observed state of water system is a kind of knowledge”, block

arrows denote an “aggregation (‘has a’ link – e.g. an actor has a mental model)” and, lastly, the red arrows denote a clear unidirectional relationship. Another facet of the analysis below is that when specific variables correspond with each other (e.g., an actor is assumed to have a mental model in the MTF), this is reflected by a number preceding a letter, which is an approach borrowed from the SES application by [Bennett and Gosnell \(2015\)](#). For example, the environmental actor (1A) has a mental model (1M), or rough perception of the world, that is driven by ecological sustainability ideals and the belief that public-land policy should, and can, help to achieve these ideals. The agricultural actors (2A), on the other hand, has a mental model (2M) that focuses on water law, the historical significance of agriculture in the Basin, and a livelihoods perspective. All variables that the ‘actors’ have (i.e., those with block arrows pointing towards the actors—situated knowledge, evaluation criteria, mental model) correspond with one another, as represented by number first-letter second labeling. The remaining classes and labels do not correspond in this way, which is shown by ‘letters first’ in all other cases. For instance, ‘action situations’ have ‘operational outcomes’, but Figure 7.5 is not suggesting that an operational outcome of ‘instream flow right’ (OO1) is the result of ‘public meetings’ (AS1).

Returning back to the previously mentioned caveat; first and foremost, the human-nature relationships developed in the Basin study are partial, which of course follows from chapter five. That is, the analysis below could be improved through further research from the research menu and, importantly, the research methods previously employed could be improved. For instance, the qualitative element of the Q-methodology study, whereby individuals discuss their Q-sort (and the relevant drivers of change to their important ecosystem services) was not rigorously designed or analyzed, at least as per the standards of qualitative research. Therefore, the quotes of individuals in the Basin presented below, and the interpretations that follow should be

considered with this limitation in mind. Having said that, I am confident in my understanding of the Basin and its people, based upon: empirical research (two separate data collection efforts), extensive literature review of the study area, nearly 100 personal contacts and discussions through the Q-study, thousands of miles of travel around the study area, a personal connection yielding additional time spent in the study area, and an interest in history of water in northwest Wyoming.

The final methods-related point to be made is that the analysis could be more thorough. For the purposes of both highlighting how SES research can help to operationalize the understanding of human-nature relationships yielded from a pragmatist EE, and supporting the specific bulleted arguments in the introduction (e.g., addressing the critique that the social is over-simplified), the analysis focuses only on a few examples. In other words, not every ‘actor’, or unspecified embodiment of the human-nature relationships studied in the Basin, is discussed in detail, nor are all governance structures highlighted within Figure 7.5 discussed. Below, the application of the MTF framework is applied to the Basin, which is followed by a discussion of the four bulleted arguments in the introduction.

7.4. Application of the Management and Transition Framework: An example from the Wind-Bighorn Basin of Wyoming and Montana

Figure 7.5 illustrates the conceptualization of the Basin SES through the MTF. The heuristic is meant to support the axiological goals of facilitating governance toward normative sustainability, which requires communication and social learning (Table 7.1). This interest in proactive management, and potentially shifting the function and structure of a system, implies

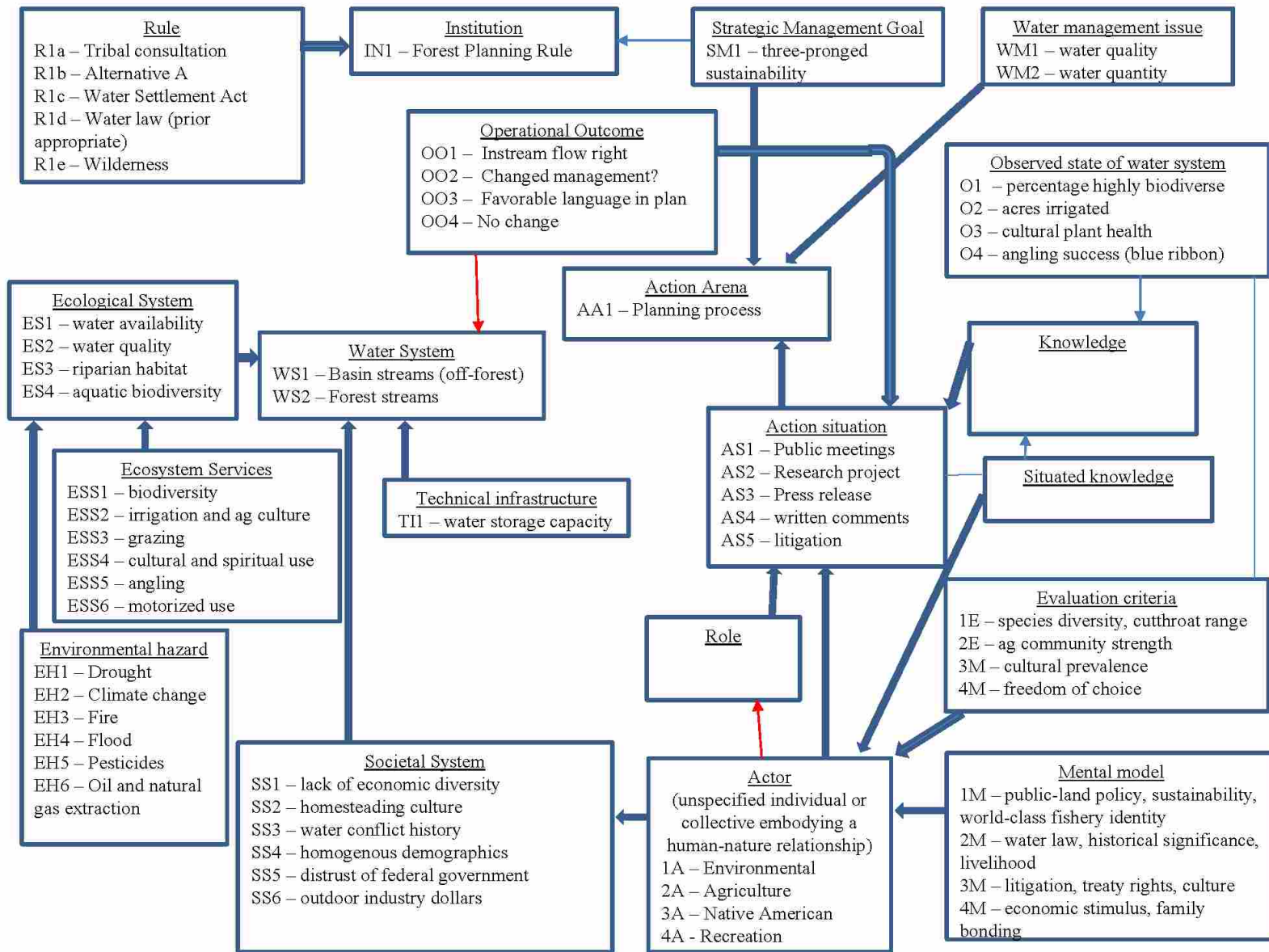
that the system is currently (or may in the future) be undesirable. In response to the critique related to the ‘desirable for who’ question, a pragmatist EE looks to human-nature relationships to understand if the system is desirable, and the SES concepts of robustness and rigidity can help to make the point relevant to this critique.

Robustness as recommended by [Anderies et al. \(2004\)](#) for the purposes of SES research, refers to the human-designed elements of the system (e.g., not only physical infrastructure, but also institutions such as administrative rules), which maintain a desired system ([Carlson & Doyle, 2002](#)). Robustness is seen as positive, but SES research also has a concept that is seen as negative. One is vulnerability, and indeed robustness is sometimes thought to be the converse of vulnerability ([Gallopín, 2006](#)). But, for this section, the idea of rigidity is considered. Within the context of their general framework of adaptive change, [Gunderson and Holling \(2002\)](#) defined rigidity traps as situations where a ‘maladaptive system’ emerges because of: (1) high potential (accumulated wealth or abundant natural capital); (2) high connectedness (social control that deters novelty and innovation); and (3) high resilience (systemic ability to resist external disturbance). Rigidity traps are common in large bureaucracies where adaptation is impeded not due to a lack of management or financial resources, but because of a lack of flexibility that oftentimes stems from political reasons ([Allen & Gunderson, 2011](#); [Gunderson & Holling, 2002](#)). It can be difficult to distinguish between robustness and rigidity of an SES, because understanding the difference between the two depends upon perceptions of who decides, and what constitutes a ‘desirable’ system state ([Robards et al., 2011](#)).

Whether a system is robust or rigid is a matter of perspective, or perhaps a matter of one’s human-nature relationship. The analysis of the Basin within the SES framework is through two examples, which highlight different human-nature relationships that likely perceive the

desirability of SES differently. The first example provided is the perspective of the agricultural ‘actors’, who would likely consider the resistance to change as a sign of a resilient and robust SES that is not easily pushed into an alternative, less desirable state, despite stressors such as climate change. Then, a different perspective is presented, which suggests that the SES is stuck in a rigidity trap, whereby issues such as poor water quality and inadequate flows persist despite efforts to change the current, undesirable state. If Figure 7.5 is considered as a conceptual map or heuristic for describing the SES, then some of the processes and structures preventing this change come into view. While this analysis does not yield a suggestion as to whether governance should favor one human-nature relationship over another, as such a suggestion would require public deliberation and debate about normative sustainability, the analysis does yield recommendations related to the primary institution included in this analysis: the forest planning rule (variable ‘IN1’ in Figure 7.5).

Figure 7.5. The Basin SES as comprised by relevant variables identified in the MTF



7.4.1. *A robust SES from the agricultural perspective*

In the MTF framework, actors are defined quite broadly, so those falling into the agricultural actor group (2A) could be individuals (e.g., farmers, ranchers, or interested citizens), or collectives of individuals acting in an official (e.g., Stock Growers Association, irrigation districts) or unofficial (e.g., a ranching community) capacity. Actors also encompass non-governmental organizations that may be participating in action situations, such as the Greater Yellowstone Coalition (an actor in 1A). As mentioned, for the purposes of this analysis, ‘actors’ are generally unspecified, but they are assumed to embody the human-nature relationship that corresponds with the viewpoint explored in the Basin empirical research. A general picture of the agricultural actor (2A) emerges based on their evaluation criteria and mental model. The ‘evaluation criteria’ and, relatedly, the ‘observed state of the water system’ were developed based upon the research in the Basin. For instance, agricultural community strength was a common discussion in the Q-methodology study, and this important element of the human-nature relationship was measured with ‘irrigated acres’ in the choice modelling survey.

As is evident in Figure 7.5, the variables for ‘role’, ‘knowledge’ and ‘situated knowledge’ are unspecified, which is because a specific ‘action situation’ is not being analyzed. As suggested by [Pahl-Wostl et al. \(2008\)](#), situated knowledge is that specific information that actors ‘activate’ within specific action situations, and the role is also specific to the action situation. For the purpose of this discussion, the action situation is broadly the Forest Planning Rule and the processes it engages such as public input, but there are specific lower level situations where situated knowledge might be deployed differently. It is arguable that the research performed for the social vulnerability protocol constitute an ‘action situation’ (AS2), where different actors see an opportunity to strategically deploy their valuable assertion. This likely took place during the

research performed by [Armatas \(2013\)](#), as the study focused on obtaining input from a variety of people including those in strategic positions with an interest in particular policy. For example, some of those who aligned with the ‘recreation’ perspective, who would be categorized as recreation actors (4A), were representatives for winter motorized recreation organizations, and they were likely deploying situated knowledge with a ‘role’ in the research project to influence outcomes in the Forest Plan. The ability to gather diverse perspectives within the forest planning process (AA1) is partly by design, and it is informed by the strategic management goal (SM1), which calls for economic, social, and ecological sustainability.

Getting back to the agricultural actors (2A), the SES heuristic suggests that given the evaluation criteria and mental model, these actors may deploy situated knowledge focused on the ‘economic’ and ‘social’ (and even ‘ecological’) aspect of the strategic management goal. This is easily highlighted by drawing attention to components of the ecological and water system such as ecosystem services and technical infrastructure. Participants in this case study were quite clear that irrigation and agricultural lifestyles (ES2) have both economic and cultural significance. The agricultural community is represented through a shared identity and culture dating back to the homesteaders of the late 1800s. [Bonner \(2003\)](#) and [Bonner \(2005\)](#) documented the formation of the Basin as it relates to water development and homesteading. Inherent within this formation is the ongoing irrigation of a desert landscape, despite the perpetual conflict between landowners and federal entities (SS5), and the influence of power and ‘big money’ over vulnerable homesteaders.

This homesteading history and culture (SS2) is entwined with the contemporary agricultural community, and it drives the discourse regarding the reasons why water for agricultural use should be maintained. As a county commissioner and farmer in the Basin

explained regarding the web of connections within the agricultural community (block quote in Section 5.2.5.2). The idea that the Basin would not exist without agriculture is prevalent throughout the agricultural community, and it is an idea that is used as justification for why water should continue to flow to agricultural use. The reasons are not only economic, historical and cultural, but also ecological. Furthermore, if these reasons are not convincing enough, one participant stressed that we need to remember “that the whole system was set up for commercial irrigation in the first place.” Another participant, not earning income from agriculture but nonetheless “supportive” of the “vibrant ag community”, noted: “we have a reservoir up here that is basically built for storage for irrigation...none of it is dryland farming, it is all irrigation.”

These elements of the human-nature relationship reflect the socially-constructed and ecologically-evolved characteristics of the Basin, and the choice of the words “set up” by one participant support this; however, a qualitative researcher might be skeptical of this analysis of the human-nature relationship because thorough qualitative analysis has not been presented (as previously mentioned). However, this provides a nice opportunity to show that: (1) employing multiple methods can help to inform and strengthen our partial understandings of the human-nature relationship in light of the limitations of some methods on their own and; (2) that introducing the theories of different research traditions can strengthen our understanding of different variables (and their interactions) in the SES.

Regarding multiple methods, the above interpretation that the current state of the SES is desirable (and *strongly* important) is supported by the choice modeling study (degree-with-tradeoffs) detailed in [Armatas et al. \(2018:13\)](#), which asserted that the agricultural relationship’s

preference for the status quo (no change in the current management of the Basin SES) was due to the current state being favorable²¹ to agriculture:

The average household marginal willingness to pay to maintain the status quo is \$2,195 per year. This is a staggering figure and the general message is clear: the agricultural perspective, as defined in the economic assessment [(choice modeling)], has a strong preference for the status quo. Commonly, a preference for the status quo is labeled a ‘bias’ as people in general resist change; however, the social assessment [(Q-methodology)] suggests that those adopting the agricultural perspective do prefer the current state of the environment in the Basin.

The challenges of interpreting this WTP estimate within the context of a choice modeling study are described by [Armatas et al. \(2018\)](#), but the point remains that it is a strong preference.

With regard to other research traditions and theories, it seems a *very* brief aside on political ecology is worthwhile, as it can show how one might use the SES framework as a common language to compare different theories. Like EE’s fellow hybrid discipline, political ecology lacks a single agreed upon definition (see [Healy et al. \(2013\)](#) for a discussion about their compatibility). But, at the core of the concept is the idea that environmental conflict and degradation are the product of political processes and that research through this lens can “reveal winners and losers, hidden costs, and the differential power that *produces social and environmental outcomes*” ([Robbins, 2012:20](#)). This foundational idea to political ecology supports the ontological interpretation of an SES as socially-constructed and ecologically evolved.

As another example of how political ecology might benefit this SES analysis, its focus on power could add depth to the understanding of how situated knowledge interacts with the actor

²¹ Favorable in that, according to research-related discussions with experts, the Basin is essentially maxed out on irrigation. There is one area called the ‘Polecat Bench’ that people talk about as a possibility for future irrigation and farming, but the Basin is essentially reached irrigation capacity.

variable, as well as this research project as an action situation (AS2). The final support of this aside is that political ecology's concept of 'community' can support the interpretation of the agricultural relationship in light of its limited qualitative-research rigor. [Li \(1996:502\)](#) noted that "contests over the distribution of property are articulated in terms of competing representations of community", and the deployment of different representations of community can bring about particular effects (e.g., that activating situated knowledge to maintain what is perceived as a desirable SES). This concept of community also supports the idea that SESs are heterogeneous, and that methods that attempt to tease apart heterogeneity (R-factor analysis/cluster analysis, latent class analysis, Q-methodology) are beneficial. Political ecology argues that the image of the community as one homogenous, harmonious collective is misguided, as it disregards subgroupings and different communities of interest; or it conflates communities of place (the community of the Wind-Bighorn Basin) with communities of interest (actors embodying different human nature relationships) ([Leach et al., 1997](#); [Robertson, 1984](#); [Walker & Hurley, 2004](#)).

Returning back to the SES analysis, Figure 7.5 only includes the Forest Planning Rule as an institution (IN1), as this is the primary focus of this example; however, the Forest Planning Rule is influenced by other 'institutions', which are reflected as 'rules' associated with IN1. The flexibility of the Forest Planning Rule is heavily bounded by other laws, such as Wilderness designation. Activities off of the Forest are also regulated by current laws, such as prior appropriation water law, which is another reason that this particular SES is resistant to change. To the agricultural actors, these facets of the SES are likely perceived as robustness. The same facets from a different perspective may be seen more negatively as rigidity.

7.4.2. *A rigid SES from the environmental perspective*

The ‘environmental actors’ (1A) might consider the SES to be rigid (in a negative sense). Those within the environmental community stress the importance of leaving water in the stream to support aquatic health and biodiversity. Although the historical and cultural connection to water may not be as strong as that of the agricultural community (an assertion based primarily on the length of agricultural history in the Basin and their high WTP to maintain it), those who support environmental uses of water believe that pristine environmental qualities are part of the community identity (1M). As one participant noted with regard to maintaining high quality water and conserving particular aquatic species: “we have a reputation around here for being a world class, if not world class then national, fishing destination and the cutthroat trout has a huge profile.” (1E)

While I did not attend any ‘action situations’ where the debate between the agricultural actors and the environmental actors could be witnessed, this case study captured the sentiment that would likely manifest itself within such a situation. Specifically, situated knowledge could be deployed that focused on ecological legitimacy (or lack thereof) and the need to give climate change greater attention. For instance, the potential conflict between these two actor groups is evident in one participant’s quote:

The second it hits ranch land the water quality starts to fall apart. And I grew up on a ranch and a farm, and they are not the stewards of our waterways or our land. That is one of the biggest misconceptions.

Ecological legitimacy is another concept explored in political ecology ([Neumann, 2005](#); [Pulido, 1996](#)), but this quote highlights the perceived interaction between the Basin streams (WS1), water quality (ES2), and agricultural ecosystem services (ESS3 and ESS4). The share and importance of both private and federal land for agriculture is significant. It dominates private

land use in the study area with 86 percent of private land in Park County being agricultural land ([Taylor et al., 2012](#)), and federal land in the study area, both under BLM and FS jurisdiction, is also important for grazing operations. Half of the agricultural operations in Park County hold grazing permits, and two-thirds of those permits are for land owned by the Federal government ([Taylor et al., 2012](#)). The importance of federal land for grazing is not with regard to acreage, which is relatively small, but for its supply of forage during particular times of year.

These operations are, in part, responsible for degraded water quality in the study area. Irrigation ditch malfunctions have led to sediment plumes that result in large fish die-offs, and several reaches have been added to the 303(d) list of impaired waters for fecal coliform because of irrigation return flows and cattle grazing along the river ([Wyoming Department of Environmental Quality, 2012](#)). Another participant was concerned about the ability of farmers to responsibly use herbicides and pesticides (EH5):

My brother lives on a portion of our land over in the Bighorn Valley, and they did a test on his well and there is a high concentration of the stuff to help plants grow better, so that he can't even drink that water. So he needs to bring water in. I think that we need to do stricter studies on that, so either dig our wells deeper or do something to monitor the farmers so that they do not over spray their crops.

The concern about climate change was not only evident in the kind-with-tradeoffs approach, but also in the degree-with-tradeoffs approach. Those who indicated that conserving aquatic biodiversity was important to them commonly indicated that climate change was a threat (1M). The connection between a desire for environmental use of water and a concern for climate change appears to exist.

Another perception among those in the environmental actor group, which may be one way to influence more equitable management, is that the current allocation of water is simply

unfair. With full acknowledgment of the agricultural right to water (R1d), one participant explained:

I mean I grew up on a ranch, my dad still ranches but I feel like that is an unfortunate situation because I feel like ag should get some of the water, but it shouldn't get all of the water.

Another participant asserted:

We have seen basically that the people that control in-stream flow don't care whether we have good fishing or not, good aquatic insect hatches or not, whether we have a healthy river at all. They really do not care, so basically at this point I see us having really bad in-stream flows, inconsistent from year to year. Very poorly managed, short sighted and made for irrigation of agricultural goods and services and that is it. They care nothing about anything else besides ag.

This sentiment reflects a concern, perhaps, that the water governance regime is driven too much by top-down mechanisms which, according to [Pahl-Wostl et al. \(2010\)](#), is likely to reduce adaptive capacity and inhibit social learning. These are characteristics of a rigidity trap.

As stated above, these are brief analyses facilitated by an SES framework, but hopefully the examples are sufficient to support the discussion of the four arguments outlined in the introduction. That is, that SES is a heuristic, that it can help position and operationalize EE within the larger SES which, consequently, highlights other variables and interactions not fully capture, and that a pragmatist EE can help to address the oversimplification of the social critique.

7.5. SES research and a pragmatist EE: might they help one another?

The four main arguments just summarized are discussed in turn with the focus on highlighting how the two areas of research may support one another.

7.5.1. *SES research: a heuristic or conceptual mapping tool – not a formal decision-making apparatus*

At risk of losing its scientific relevance, [Colding and Barthel \(2019\)](#) argued that there is a need to clearly define SESs and the research intended to understand them. Similar to EE, SES research may be in a place where the disparate applications and perspectives are unlikely to lead to consensus and a single unified application. However, it is reasonable to suggest that applications of SES research should *clearly* state what basic beliefs and assumptions at the outset, based upon the understanding that there is no single universal conceptualization of SES research.

From a pragmatist perspective, it is clear that SES research can provide a useful heuristic for describing and understanding complex SESs (Table 7.1). A pragmatist EE would reject using definitive, formal models of the type discussed by [Schlüter et al. \(2017\)](#) for the purposes of *making* decisions, but if mathematical, formal, and definitive models of an SES can facilitate debate about the complexities of addressing wicked problems then it is likely worthwhile. In other words, a pragmatist EE would suggest that formal models of SESs can inform the *process* towards making a decision, but the limitations and simplified representation should be clearly stated. For instance, formal human-behavior models (e.g., choice models for non-market valuation of ecosystem services) can be quite helpful for informing decision-making (as discussed in Section 5.2.7.2). But, such approaches should not be seen as a way around debate and deliberation, nor should they obscure (or at least neglect to fully acknowledge) the deeper meanings of the human-nature relationship or the complexities of SESs (e.g., the social elements thoroughly studied by sociologists). This aligns with the suggestion by [Olsson et al. \(2015\)](#) that

scientific pluralism (i.e., where several disciplines contribute theories, methods and ideas) is the way forward for addressing complex social-ecological problems.

Ultimately, policy-makers and on-the-ground decision makers cannot replace judgment with a formal model of complex SESs and a unified theory of how the world works. To be clear, a pragmatist EE does not think that all the variables and sub-variables reflected in Figure 7.5 can be linked in a seamless web of quantitative representations. An anecdote may clarify exactly what is being stated (and what is generally meant by ‘formal’, ‘mathematical’ and ‘definitive’ when referencing SES conceptualizations). I was once a significant contributor (i.e., lead organizer) to a major National Science Foundation proposal, which proposed representing the Basin as a complex SES whereby several analytic procedures incorporated all the variables in the system. These analytic procedures included simulating landscape forest and wildfire dynamics, which informed a simulation of water quantity, quality, and temperature, which informed the simulation of impacts to Yellowstone cutthroat trout, which influenced the values of water-based ecosystem services. On another side of this SES representation, WTP estimates from an economic survey, with other variables such as economic growth, eventually led to the simulation of the net value of agriculture and the simulation of land-use change. *All* of these simulations culminated in a ‘goal programming’ of adaptive management strategies and water allocations to maximize net benefits from ecosystem services. The proposal, devastatingly, was returned without review due to a mistake made during a rushed submission process. However, the point is that such an application of SES research for decision-making and understanding the complex system does not align with a pragmatist EE, nor should such tools be accepted by policy-makers as a silver bullet answer to making tough choices. Instead, the contribution of several disciplines (including formal modeling of a limited number of variables where appropriate) should be

considered; and such contributions themselves should be designed to engage other disciplines and non-scientific communities. A pragmatist EE would argue that what will result is a more comprehensive understanding of complex SESs that is both closer to the tentative truth and more likely to facilitate communication and social learning.

While formal models of entire SESs for making decisions would not align with a pragmatist perspective, an SES conceptualization (e.g., Figure 7.5) can provide a roadmap for considerations within the context of complex environmental problems. SESs can help to set the agenda for science, civil discourse, and debate. That is, when considering the Basin and the various and sometimes conflicting human-nature relationships, giving voice, acknowledging, and perhaps questioning all variables, from actors to institutions, is the process by which decisions should be made and learning achieved. For instance, increasing in-stream flow, whether through changing water law and prior appropriation or establishing senior in-stream flow rights (where possible), is a broad institutional question which will clearly affect actors differently. Explicit discussions of these effects is advisable, which could perhaps provide some insight into the strengths and weaknesses of relevant institutions within the context of normative sustainability. An SES perspective highlights the various interrelated elements of this discussion, which minimally include livelihoods, homesteading culture and water conflict history, ecological concerns, lack of economic diversity, and confidence (or lack thereof) related to established institutions. It is a conversation starter, but there is a need, particularly as it relates to the actors and human-nature relationships, for a comprehensive understanding, including good qualitative research that helps the public understand the variables with greater depth.

Formally modeling the impacts of, for instance, the effect of potentially losing the ten percent of late season river flow in the Basin derived from glaciers ([Cheesbrough et al., 2009](#)) on

these ‘variables’ (e.g., homesteading culture) *could* be done, particularly if such variables can be represented quantitatively (perhaps through willingness-to-pay estimates). However, as discussed in Section 5.2.3, such knowledge is only a partial representation of the human-nature relationship and, as discussed in Section 5.2.4, quantitative representations may instill a false sense of certainty in decision-makers. Given these basic beliefs about what SES research is (Table 7.1), what recommendations can be made with regard to improved governance? That is, can an SES lens support the application of research, such as the social vulnerability study on the Shoshone National Forest?

7.5.2. *SES research can facilitate the operationalization of pragmatist EE research findings*

With a focus on improving governance regimes through interventions targeting “environment-related incentives, knowledge, institutions, decision making, and behaviors” ([Lemos & Agrawal, 2006](#)), SES research can guide thinking toward potential improvements in the decision-making process. For the SES analysis above, the institution of focus was the Forest Plan Revision process. While it is challenging to recommend specifically how the Forest Plan itself might directly address issues with the water resources of the Basin’s SES outlined above (as many issues are regarding off-forest jurisdiction), USFS forest plans are meant to facilitate landscape scale sustainability. As such, there may be some process improvements that could enhance governance to this end.

The primary change suggested is improved, or at least required, processes for engaging the general public. The public engagement processes on the Gila National Forest, the Shoshone National Forest, and the Flathead Wild and Scenic River system were very different public

engagement processes. This lack of consistency is typical within national forest planning, which is to say that the planning staff have a wide range of discretion regarding the public engagement process. While flexibility is beneficial, the lack of any standard approaches is problematic given that, as shown above, perspectives about what constitutes a desirable system are likely to vary significantly. In other words, a reasonable assumption, at least from a pragmatist EE perspective, is that a given SES will include several actor groups and corresponding mental models or, more generally, human-nature relationships. Thus, it would follow that *any* official federal effort aimed at sustaining such relationships should include scientifically robust processes for documenting and disseminating such relationships. A pragmatist EE will support these processes, but SES research may highlight the relevant action situations, interacting ecological and social variables (e.g., water system, environmental hazards, social system variables, and ecosystem services), as well as lynchpin governance institutions.

The second recommendation for improved governance within the context of Forest Plan revisions is to explicitly address potential tradeoffs that may result from different forest management decisions. This should not simply include language related to the variety of important elements of the human-nature relationship that a forest plan are intended to accommodate, but it should articulate and acknowledge how some actor interests may be accommodated at the expense of others. Of course, overall, it can be stated that these interests will be balanced (to the greatest extent practicable). The Planning Rule charges the ‘responsible official’ to ensure that a plan contains components that focus on the three prongs of sustainability, but the SES analysis above highlights that in some situations contributing to one prong may result in the reduction of another prong. The SNF plan, which was completed in 2015, outlines situations where livestock grazing could be reduced, primarily for the purpose of

habitat restoration. The perspective of the agricultural actors suggests that such a change would constitute a negative change. While SES research does not necessarily lead to a consideration of tradeoffs, conceptualizing the system in terms of its desirability (i.e., robust versus rigid) will both align with a pragmatist EE perspective and address the critique related to the question of who the SES is desirable for.

One way to potentially integrate these tradeoff discussions would be to include a section within a planning document that focuses on human-nature relationships in a more comprehensive, socially-centric way. There are a variety of documents that relate to the forest plan revision, including an extensive environmental impact statement and various appendices; however, two primary documents are perhaps the most suitable place for the tradeoff discussion: (1) the plan and; (2) the record of decision. The plan is the formal document that outlines the general direction for future management, and the SNF plan ([United States Department of Agriculture, 2015b](#)) is organized mostly by individual resource, which is a fairly typical approach to planning documents (including comprehensive river management plans). That is, plans are segregated into sections on, for instance, water, soil, air, forests, fire, livestock grazing, recreation, scenery, and minerals. For each of these resources, ‘management direction’ is articulated in a *very* general manner with ‘desired conditions’, ‘guidelines’, and ‘management approach’. While the planning document does focus on social elements of the human-nature relationship such as through the management direction related to recreation, or the management challenges related to society and the economy, these details are generally limited. And, perhaps most importantly, the sections are segregated in a way that obscures potential interactions between, say, ‘tribal interests’ and ‘recreation’.

The suggestion to integrate more explicit tradeoff discussions does not imply dispatching with these standard plan elements (indeed, such a move is likely legally questionable), but instead to include additional discussion that aims to represent different human-nature relationships more holistically. For example, including the Q-methodology factor arrays (e.g., Figure 6.6), with accompanying narratives, could enhance understanding of different perspectives. At the same time, it stresses to the interested public that there are both a diverse range of wants and needs to be accommodated, and that individual resources (e.g., recreation, air) are not managed in a vacuum. Additionally, an SES heuristic could be included to highlight the position of the human-nature relationship ‘amongst it all’, which stresses the ‘not managed in a vacuum’ point.

If such discussions are either considered too detailed, inappropriate, and/or onerous for the actually planning document, then they may be more appropriate in the record of decision. This document, written by the ‘responsible official’, conveys a summary of both the implications of the chosen plan alternative as well as the rationale for said alternative. In the case of the Shoshone National Forest ([United States Department of Agriculture, 2015a](#)), the record of decision highlighted a range of implications, including an increase in motorized winter recreation relative to other alternatives. The increase of this particular recreation opportunity was justified as a response to ‘public comments’, but additional details about who benefits and potentially loses from such a decision, as outlined in both [Armatas et al. \(2018\)](#) and [Armatas et al. \(2017a\)](#), would have better contextualized and illustrated a clear process to that decision.

The final recommendation goes beyond the forest plan revision process to the institutions underlying it. According to the record of decision for the SNF, in accordance with the 1982 National Forest Management Act, each forest plan alternative needs to be considered in terms of

net present value (NPV), which analyzes “all outputs, including timber, grazing, recreation and minerals, to which monetary values are assigned” ([United States Department of Agriculture, 2015a:19](#)). Mentioning the NPV requirement provides an opportunity for the responsible official to highlight the multiple institutions underpinning forest planning, and the need for multiple methods aimed at understanding the human-nature relationship.

A comprehensive NPV would require both market and non-market techniques, the latter of which apply degree-with-tradeoffs approaches; however, meeting the three-pronged sustainability of the Forest Planning Rule requires an understanding *not* provided by an NPV calculation. For instance, the inability to capture Native American cultural and spiritual values renders an NPV calculation incomplete and, as a result, automatically choosing the alternative with the highest NPV may not be advisable. Furthermore, an NPV calculation is not capturing the complexities of the SES at large, such as institutional requirements of the Forest Planning Rule to accommodate cultural sustainability (which includes intrinsic value), as well as the potential changes in the SES that may result from the interaction between, say, the ecological system and environmental hazards.

As it happens, the alternative with the highest NPV was not chosen on the SNF, though the chosen alternative was said to be a close second. The rationale for why this alternative-selection criteria was not rigidly followed was not elaborated upon, likely because the top NPV calculations were close enough ([United States Department of Agriculture, 2015a](#)). However, even if the chosen alternative had an NPV that was significantly lower than other alternatives, overriding NPV as a selection criteria could be justified with other approaches to understanding the human-nature relationships and an acknowledgement of the complexity of the SES, as represented by the conceptual map.

A pragmatist EE would argue that these discussions should be made explicit in both public engagement activities and in official planning documents, but there is also a recognition that an EE approach (in this case both a kind-with-tradeoffs study and a degree-with-tradeoffs study) does not illuminate all the pertinent and relevant information that is represented in Figure 7.5. That is, an SES framework, as an overarching reminder of the various interrelated variables, implicitly calls on more than an understanding of human-nature relationships as defined herein.

7.5.3. SES research can help a pragmatist EE acknowledge the missing knowledge gaps

SES conceptualizations can highlight the broad range of relevant variables even if only a small number of variables are analyzed in depth. In other words, SES frameworks can provide an overarching picture of how a complex system (e.g., a large national forest and its surrounding communities) is influenced by various elements of the system and, as a result, it can help identify relevant, and more specific, aspects for in-depth research and investigation ([Ostrom, 2009](#)).

While a pragmatist EE focuses on the human-nature relationship, defined broadly as those connections that support human well-being and social welfare, it is beneficial to understand how those relationships are positioned within the SES at large.

In other words, a pragmatist EE can yield an understanding of a SES, but only to an extent. Similar to the way that any item on the research menu can only provide a partial understanding of the human-nature relationship, EE can only provide a partial understanding of an SES. That is, other disciplines and research traditions are required. A large interdisciplinary project discussed by [van Riper et al. \(2017\)](#), which focused on ecosystem service valuation and roughly falls within the SES paradigm outlined above, included perspectives and conceptual

frameworks from environmental anthropology, ecological economics, geography, landscape architecture, political science, conservation psychology, and environmental sociology. In a non-exhaustive list, [Hinkel et al. \(2014:1\)](#) suggested that the disciplines and research fields involved in SES research include “sustainability science, landscape ecology, ecological economics, geography, resource economics, and resilience thinking, which all contribute different and valuable perspectives on social-ecological interactions and outcomes.” Some research traditions are explicitly called upon, such as ecological economics ([Perrings, 2006](#)), while others, such as anthropology and political ecology, have been suggested to address some of the aforementioned SES critiques ([Fabinyi et al., 2014](#)).

The different disciplines²², individually, will not provide detail for *all* variables in an SES conceptualization. For example, a pragmatist EE (from a social science perspective) can provide some understanding of several variables in Figure 7.5, such as actors, mental model, evaluation criteria, ecosystem services, societal system, and perhaps knowledge about the observed state of the water system. However, fully understanding how, for instance, the ecological system, water system, and relevant environmental hazards influence the flow of ecosystem services requires other disciplines such as ecology and hydrology. In addition, understanding the nuances of the forest planning rule as an institution which, in the context of multiple actor interests, can influence the achievement of normative sustainability in a complex ways requires governance and policy understanding. University of Montana’s own Martin Nie is a leading scholar related to this understanding (e.g., [Brown & Nie, 2019](#); [Nie, 2019](#); [Nie & Schembra, 2014](#)). Similarly,

²² In this context, the term ‘disciplines’ is a somewhat ambiguous term, as the goal of inter/trans-disciplinary research in the conservation sciences, over the last few decades, has confounded its meaning. For instance, while resource economics draws a mostly unified methodology and theory from mainstream economics, ecological economics does not. Similarly, political ecology does not have a unified methodology or theory. This discussion is mostly avoided, at least explicitly, by the use of the terms ‘research tradition’ or ‘approach’. On the other hand, the ambiguity related to methodology and theory underlies the entire dissertation.

understanding other potentially relevant institutions that influence normative sustainability is likely beyond the scope of pragmatist EE.

To add further focus, a pragmatist EE, as an approach to understand relationships, likely provides the most detail, relative to other variables, about the actor and mental model.

Understanding the importance of resource (A8 in Table 7.2) is a major focus of a pragmatist EE, and gaining such an understanding, as reflected above, can lead to insights into different mental models. The mental model, as outlined by both SES frameworks relied upon herein, suggests that the mental model is comprised of the ‘action outcome link’, ‘expectation about other actors’ behavior’ (Figure 7.2), and ‘knowledge of the SES’ (A7 in Table 7.3). When considered in conjunction with the different actor’s human-nature relationships, the mental model variable encompasses beliefs about the legitimacy of an actors corresponding relationship. These beliefs are evident in the discussion above, as reflected by the agricultural actor’s assertion that the Basin was developed for the purpose of agriculture and, as a result of this history, there is a level of entitlement to the continued support of the agricultural relationship.

7.5.4. A pragmatist EE assumes heterogeneous social systems and human experience

One common critique of SES research is that the framework representing complex systems treat the social variables in an overly simplistic way (e.g., human individuals are assumed to have no agency, or the idea that free will is constrained by structural forces such as the desire to maximize utility). If SESs are viewed as formal and definitive models, then perhaps this critique holds because, as pointed out by [Schlüter et al. \(2017\)](#), many such models operationalize human elements with the rational actor model, which is easily represented with

mathematical formulas as in microeconomic theory. It seems this critique is less valid if SES conceptualizations are treated as heuristics or conceptual maps, which represent basic starting points to guide inquiry or discussion within the context of some complex environmental problem.

Nonetheless, even if SES conceptualizations are treated as heuristics, as is the case herein, there is still a need to articulate how variables such as actors (e.g., 1A in Figure 7.5) interact with other variables such as the action situation. From the start, it seems that SES frameworks are empty in the sense that no theory about variable interaction is assumed or proposed. Through the application of a pragmatist perspective, it is assumed that actors would enter an action situation as individuals in a democratic process. Mental models and the interrelated human-nature relationships are assumed to be constantly evolving. Of course, a lifetime of previous experiences may lead to strong relationships and beliefs, but a pragmatist philosophy assumes that such beliefs are open to change. And therefore, the common goals of communication and social learning within SES research and a pragmatist EE may be achieved.

While a pragmatist philosophy would hesitate to theorize how actors would specifically behave in particular contexts, it is generally assumed that human-nature relationships and the experiences that form them will be heterogeneous. This basic assumption is consistent with the hesitation to formally model SESs, and it also suggests that the most effective way to address complex environmental problems is through democratic processes.

7.6. Common roots and several compatibilities

The primary goal of this chapter was to demonstrate how SES research might help to operationalize the understanding of human-nature relationships yielded by a pragmatist EE. This was equated with the positioning of human-nature relationships within the SES, or ‘amongst it all’. The motivation for this discussion was based primarily upon common roots between the two research areas and, as shown through a discussion of the normative assumptions, a number of other commonalities (Table 7.1). The SES analysis provided an example to support four main arguments, which are that: (1) SES research represents heuristics (not definitive models); (2) the overarching conceptualization of the SES can facilitate direction related to how a pragmatist EE understanding of the human-nature relationship may be implemented in practice (e.g., specific recommendations for improving the composition of forest plans and records of decision); (3) a pragmatist EE can help to address the critique that the social is oversimplified in SES research and; (4) SES research can help a pragmatist EE acknowledge the missing knowledge gaps, such as the need for engagement with experts on governance and policy institutions.

This chapter should not be perceived as authoritative, as it is unlikely that the diverse range of application in SES will yield a consensus. However, the chapter does make clear (hopefully) a set of basic beliefs related to the nature of SES research, as well as the relationship between SES research and a pragmatist EE.

8. CONCLUSIONS: A SUMMARY, ‘TENTATIVE’ STANCES, AND FUTURE RESEARCH

This dissertation concludes with a brief summary of discussion points and findings, then several tentative stances are presented. In the spirit of pragmatism, the stances presented are tentative in that pragmatism does not achieve settled truth. Finally, future research is proposed (normally limitations would also be discussed at this juncture, however, I suggest that this has been adequately covered in Section 5.3).

8.1. A summary

Ecological economics is a promising research tradition focused on balancing competing values, tradeoffs, and insights for more equitable decision-making. The focus on sustainability implies a consideration of both current and future generations, and its explicit interest in issues such as equity and distribution, and a focus on integrating ecological principles and the broad social sciences is meant to distinguish it from environmental economics. Despite these laudable goals, many have argued the interdisciplinary and transdisciplinary field is built upon tenuous philosophical and theoretical foundations. As a result, there are several big-picture concerns, including an amorphous body of literature, which makes identifying fundamental characteristics such as subject matter a challenge. There are also concerns about relativistic science, where sorting good knowledge from bad is not possible. Some question the future viability of the field. In addition to these existential problems, I suggest that attempts to add more clarity to the field through philosophical and theoretical discussion have been of limited value, as they lack a common framework for discussing science more generally.

To address these issues, pragmatist philosophy is recommended as a foundation for research in ecological economics, and the recommendation is conveyed through an established scientific macrostructure framework. The synthesis of ecological economic literature and pragmatist philosophy yielded recommendations for a core subject matter task: a comprehensive understanding of human-nature relationships. To achieve this goal, a focus on better processes and methods for understanding the various elements comprising the human-nature relationship is recommended, which includes a synthesis across big ideas (e.g., place research, ecosystem services). Communication and discussion of human-nature relationships is meant to facilitate social learning for the purpose of achieving normative sustainability, as opposed to the more traditional focus on strong or weak sustainability.

A pragmatist EE focuses on a more clear articulation of the middle ground between just one approach to science and relativism. This middle ground is embraced where a plurality of methods, ethics, beliefs, and human experiences are integrating into science. Specifically, a research menu is proposed whereby different methodological approaches to understanding the human-nature relationships are explicitly discussed and compared. This facilitates interdisciplinary research and, consequently, yields a more comprehensive understanding of the relationships. In order to demonstrate the rigor and process of developing such a research menu, a methodological debate between Q- and R-methodology is presented. The perspective of a pragmatist EE is injected into this debate and recommendations are provided for how the debate can shift from a situation of scholars talking past one another to one of greater discussion. Recommendations include a focus on language, better articulation of the reasons for choosing particular statistical approaches, and a focus on underpinning normative assumptions.

While a pragmatist EE may provide a path to a comprehensive understanding of human-nature relationships, it is acknowledged that meeting its ‘action’ oriented purpose (i.e., supporting decision-making) requires knowledge related to how human-nature relationships are positioned within social-ecological systems (SESs) at large. That is, decision-making for the purposes of normative sustainability requires more than an understanding of human-nature relationships, such as an understanding of the influence of governance and institutional structures on the ability to realize that which is important to the diverse range of relationships. Therefore, an SES perspective is proposed. The benefits of such a perspective are conveyed through the application of an SES framework to a study of human-nature relationships in the Wind-Bighorn Basin in Wyoming and Montana. Specifically, it is argued that an SES perspective can help to operationalize an understanding of human-nature relationships; that an SES perspective can highlight those variables in the system that are not understood with a pragmatist EE, such as the nuances of administrative rules and policy and; that a pragmatist EE can support SES research by clearly defining the normative assumptions of the latter research area (and its general nature—i.e., a heuristic or conceptual map).

Synthesizing ecological economics with pragmatism is appropriate for a variety of reasons. Interestingly, environmental pragmatists set out to defend anthropocentric interests in the environmental ethics arena where non-anthropocentric views reigned supreme, while ecological economists, at least from the social-science side, set out to do the opposite by pulling economics away from its traditional instrumental and anthropocentric focus (or at the very least contextualizing it more effectively). A pragmatist ecological economics can help to connect the dots of the theoretically rich conservation social sciences that have long grappled with the relationships between humans and the environment. Joining pragmatism and EE provides

established beliefs about the nature of reality with its contextual ontology, the way we learn with Dewey's experience model, the way to deliberate knowledge with wary assessment, and a clear purpose to communicate, understand, and learn about (in no particular order) human-nature relationships.

8.2. The research menu and a dialectical tension: a final food analogy

Pragmatist EE is interested in adding clarity to the dialectical tension between approaches that *create* and *reduce* options for understanding human-nature relationships. There are no connotations implied to the emphasized terms. In other words, the current research menu highlights four approaches, two of which I argue create options (the 'kind' approaches) and two of which reduce options (the 'degree' approaches). But, a pragmatist EE asserts that *create* and *reduce* are not value laden in this context; one is not better than the other.

Full acknowledgement of the depth of human-nature relationships, and the complexity of SESs and the problems we face, is what creating does. It allows for a transaction between researcher and respondent. These items of the research menu likely touch all levels of the human-nature relationship, but they create more opportunities to explore the lower tiers of Figure 5.2. If we are ranking items on the menu, the kind-without-tradeoffs approach (i.e., pure qualitative research) is the most creative. If you're into creative, you're gonna love this beef Wellington. But Q-methodology, as a kind-with-tradeoffs approach, also creates options with its exploratory nature. It starts with a large number of, for instance, ecosystem services and then pares that list down to a smaller, but still substantial, set of items for sorting. Then, a fun game-

like activity is completed and the discussion after should have few bounds. If you're into creative, but maybe want a little reduction, I'd say try the Christmas Burrito.

Helping our human brains process the complexity and depth of our situation, to then carry on and make decisions (hopefully toward normative sustainability), is what reducing does. The researcher generally steps away from the subject and watches. These items focus on the top tiers of the human-nature relationship, though all tiers are engaged (e.g., economic theory does not prevent engaging a diverse range of motivations and, to some extent, it is assumed (as discussed in Section 4.2.3.2)). Continuing the menu rating, the degree-with-tradeoffs approach is full of reduction. Choice modeling, or the even more reduced contingent valuation, takes elements of the human-nature relationship and elicits preferences, which might be in monetary terms. You like a nice roux? Try the beef bourguignon. One benefit of this approach is that the vast majority of people know how to think economically, which facilitates communication. Of course, reducing the human-nature relationship in this way has its limitations, but it is nonetheless attractive for the purposes of processing, carrying on, and informing decisions. If reducing human-nature relationships to mostly monetary terms is not your taste, then perhaps the degree-without-tradeoffs approach might suit you: try the ragù (from Caffè Dolce). R-methodology approaches, broadly drawing on psychology, do not reduce down to the monetary dimension, but it still mostly focuses on those top tiers of the human-nature relationship. Likert scales, three to five items per construct, and generalizability potential, simplify complexity in a way that is beneficial to decision-making as well.

Having established that *reduce* and *create* lack connotations in this context (other than tastiness), a research menu may illuminate the dialectical tension in a way that promotes interdisciplinary research. This was hopefully demonstrated in chapter six. As for

transdisciplinary research, my case is currently tenuous (and mostly avoided), but I do believe that better communicating science to the public, with explicit attention given to methodology, is critical. What this looks like in practice is hard to anticipate, but a pragmatist EE hypothesizes that pulling the curtain back on methodology can not only improve research but also enhance public understanding of human-nature relationships. The potential substantive implications of this better communication with the public could be highlighted with SES research, as it could orient relevant variables around this comprehensive science communication. That is, science communication could constitute a variable in an SES, which interacts with other variables in a variety of ways. One such variable would almost certainly be trust between the public and management agencies. Perhaps a brief anecdote can highlight this interaction, and the presence of Q-methodology within this anecdote makes it particularly relevant.

Trust research related to planning and management has been done in the Bitterroot Valley of Montana ([Liljeblad & Borrie, 2006](#); [Liljeblad et al., 2009, 2010](#)). And, somewhat ironically, a recent planning meeting was conducted in this same Valley, in anticipation of formal forest planning predicted to begin not until 2021. The meeting was covered by the local newspaper to highlight the lack of trust between the Forest Service and the public ([Chaney, 2019](#)). I attended this ‘collaborative’ group meeting held in Lolo, MT as a citizen interested in the process. The meeting focused on building stakeholder trust and familiarity prior to formal forest plan revision on the Lolo and Bitterroot National Forests. The meeting was meant to get the Forest and a fairly specific group of stakeholders together for, fundamentally, relationship building. Some participants were unsatisfied with the process of who was invited, which is the primary focus of the article by [Chaney \(2019\)](#).

However, gathering ‘public input’ was also a part of the meeting, which included a Q-methodology exercise. While some input was collected, nearly all of the meeting was spent discussing process. This discussion was motivated in part by a Q-methodology ‘values exercise’ and a methodological question posed regarding factor analysis. The discussion resulted in significant tension. By significant, I mean that it influenced the meeting; indeed, one participant suggested that the collaborative group should not complete the Q-methodological ‘values’ exercise. Another piled on that factor analysis was a “fishing expedition” that led to a false sense of understanding. These two responses were apart from the original question, which was posed by a public figure who claimed that factor analysis would result in the discarding of some values over others. It should be noted that, in the end, those who completed the exercise (several did not) seemed engaged, and the discussion that followed as the group talked about their different ‘values’ was lively, though limited due to the loss of time resulting from the preceding discussion.

8.3. A pragmatist *ecological economics*

The reader is hopefully satisfied with the full articulation of a *pragmatist ecological economics*, but there may be some confusion and discontent as to what constitutes the *pragmatist ecological economics*. The focus on human-nature relationships certainly captures the majority of this, but are there particular items on the research menu that may be more or less representative of an ecological economics approach? I would suggest that the answer is ‘yes’ in the short term, and maybe ‘no’ in the long term. In the short term, it might be suggested that the ‘tradeoff’ approaches on the research menu are representative of an ecological economics approach; not only because those are the methods that have been empirically applied within the

context of this dissertation (i.e., Q-methodology and choice modeling), but also because economics is generally focused on making choices in the face of constraints, whether those are budgetary or within the context of rivalrous and/or excludable goods. It must be conceded that tradeoff approaches, and thus a pragmatist *EE* in the short term, has a consequentialist bent. That is, tradeoffs are generally forced and the underlying subtext is that human-nature relationships are competing. There are likely implications of such a framing, and indeed these are discussions had by environmental philosophers and ethicists (another future research topic perhaps).

In the long term, however, it might be suggested that familiarity will build with the research menu, and research skills will develop in a way that allows for clear and concise articulation of the various items on the research menu. As this happens over time, basic methodology may become less prominent in discussions, and the focus may shift toward the human-nature relationship itself (i.e., the ‘results’ of research); such an occurrence would more generally represent a pragmatist *conservation social science*. In other words, as a community of researchers become familiar with, and proficient in applying, *all* of the various items on the research menu with a fundamental goal of understanding human-nature relationships, then labelling some researchers as ecological economists, and others as, perhaps, environmental psychologists, will become more arbitrary. This would represent a situation where the conservation sciences become less unique in the sense outlined on the first page of this dissertation; that is, a more unified scientific foundation may emerge in relation to those interested in studying human-nature relationships to address complex environmental problems. This stance naturally transitions to a pragmatist *EE* stance on the term ‘convergence’, which is used frequently throughout the dissertation with regard to benefits of inter- and transdisciplinary research.

8.4. Convergence?

It has been variously mentioned that a pragmatist EE may result in methodological convergence, perhaps toward a more comprehensive tentative truth; it is also stressed that, following Peirce, this will likely not fully take place. But what, really, is meant by convergence? This does not necessarily mean that approaches on the research menu will blend to a single, super methodology where one set of normative assumptions underpin a set of research methods. Indeed, this would not be desirable, as the different menu items offer something different, as highlighted in the dialectical tension discussion above. Instead, convergence is referring to a unified idea that any single approach focused on the human-nature relationship is resulting in a partial understanding. Convergence is referring to the idea that as more partial understandings of the human-nature relationship are combined, a more *comprehensive* tentative truth of that relationship is yielded. However, the dynamic nature of relationships and SESs precludes a full and final truth, instead it is an understanding that is iteratively updated in perpetuity.

Finally, convergence in pragmatist EE is the idea that different approaches to science focused on the human-nature relationship are not competing, but partners in a collaboration imbued with wary assessment. Consensus is agreeing to participate in an endless dialectical dance, whereby one is open to updating their methodological beliefs and assumptions through long-term engagement with the research menu. Over time, methodology may converge in the sense that particular choices, such as when to monetize or when to aggregate, become standard practice in particular contexts. However, such standard practice would only signal a tentative methodological truth, as the dynamic nature of both the human-nature relationship and SESs would prevent any 'end-all-be-all' exemplars.

8.5. Social-ecological systems research: a heuristic vulnerable to a critique of language

A beer-worthy conversation is whether SES research is a discipline (roughly defined as a community of researchers). On one hand, one can spend a tremendous amount of time studying SESs, it is possible to establish normative assumptions for such research (Table 7.1), and lots of scholars are engaged in SES research. On the other hand, it is mostly devoid of specific theories related to variable interactions, I am not aware of SES departments, and when the analytic focus zooms in on specific variables one is no longer studying the system per se.

The pragmatist EE stance is that SES research is a perspective, which yields heuristics and conceptual maps. SES research does not constitute a discipline with this framing. For instance, even though it is suggested that a focus on governance and institutional structures is a large part of SES research, and studying governance likely constitutes a discipline, SES research remains devoid of disciplinary status because governance scholars need not connect such institutions to the rest of the SES. In other words, one could study, for instance, how the forest planning rule affects the decision-making of on-the-ground practitioners without wading into how such decisions influence a variety of human-nature relationships. It seems disciplines study specific variables and their interactions, and the SES frameworks provide a common language for comparing theories and an overarching conceptual map.

So, SES is a theoretically-empty heuristic and this interpretation can address critiques related to an oversimplification of the social elements in the system. However, a pragmatist EE would highlight that SES research *is* vulnerable to a critique of the language used. Embracing SES as a heuristic implies that the ‘system’ language is mostly a metaphor, or at least it is not taken to mean that an SES can be understood and ‘solved’ like a car engine. Of course, a car engine is a closed system, and SESs are not. However, the point remains that the common

language meaning of a 'system' is that it can be grasped in a definitive way. Therefore, when communicating about SESs, both to other researchers and the public, this potential misunderstanding should be conveyed. From a pragmatist EE perspective, the 'system' analogy is powerful, as it simplifies the complexity in a way that may be beneficial in light of our limited brains. But, it is also recognized that a systems framing may be perceived as a certain understanding, which would be a misunderstanding within the context of SESs and complex environmental problems. Like the human-nature relationship understanding, SES research faces a similar dialectical tension between creating and reducing, where the former separates variables apart and the latter aims to understand the emergent system as a single unit.

8.6. Future research

A search of this dissertation for 'future research' yielded four main areas, and two more are added for a total of six.

1. Social learning: This is clearly a big theme above, and two primary claims are made related to social learning. First, it is suggested that a better understanding of the human-nature relationship will yield social learning. This is largely unsubstantiated of course. But research could investigate, such as with a degree or kind *without* tradeoffs approach, whether this may be the case. For instance, does a comprehensive understanding of all relationship layers, from the inherent to the deeply personal, change one's opinion about how we should manage this planet? Empirical research is important. But for me also investigating the theory (e.g., double-loop learning) is a future research direction. Second, and interrelatedly, it is mentioned that particular items on the research menu (or language used in the public domain) trigger social learning.

Specifically, it is put forth that primary, habitual experiences may be broken, thus triggering a secondary experience where deeper thinking is engaged. For instance, the question as to whether Q-methodology, relative to survey research, is more or less engaging, and potentially influential in someone's thinking, seems worthy of investigation.

2. Values research: Synthesizing how disciplines that are relevant to EE conceptualize values would be worthwhile. Immediately relevant disciplines include environmental psychology, ecology, conservation biology, economics, and environmental ethics and philosophy. This could facilitate interdisciplinary research, while also helping to identify what, within the context of normative sustainability, would be debated and discussed by the scientific community and the general public. It is also likely such a synthesis would illuminate a host of human-nature relationship elements.
3. Research Menu: The research menu needs to be more fully built! Perhaps there are more than four categories, but there are likely several methods within each category. Concise descriptions of each approach, couched within the macrostructure framework, could be beneficial. This is likely a thorough literature review, perhaps with qualitative data collected from experienced researchers about the approaches.
4. Should we put a dollar value on it? It was mentioned that a pragmatist EE would focus on parsing the decision-contexts where monetization may be more or less appropriate. One clear case where it has been generally not used is spiritual and cultural values, particularly as it relates to indigenous populations. [Venn and Quiggin \(2007\)](#) found it to be generally inappropriate, and

it was avoided in the Basin choice modeling study as well. This future research might start with an analysis of relevant institutions, such as the forest planning rule and guidelines for planning and management more generally.

5. Generalizability theory: The issue of moving between the individual and the collective (e.g., aggregating WTP estimates, assuming representativeness, asserting transferability) is a topic that has been discussed, which likely needs to be better understood prior to suggesting specific future research areas, but such areas most certainly exist.

6. Future foundational work: It was claimed at the outset that by comparing different foundational approaches, such as critical realism compared to pragmatism, within the context of EE would clarify how they were different. While pragmatism is adopted and thoroughly explored, many other potentially relevant approaches to science are likely worth investigating. For instance, investigating how participatory action research compares to a pragmatist EE may help to better define both approaches.

8.7. Thank you

Finally, thank you for reading this long exploration. As a foundational piece, it is necessarily large, as context and the review of many fundamentals are important. This often made me wonder if you, the reader, were unsatisfied by the philosophical nature, where it can feel like nothing is being “done”, and that questions outnumber answers. I mean, I just spent 357 pages talking about social learning, and yet social learning is on the list of future research topics.

The point is, as empirical, data-driven scientists, the usual approach is to get to the data as quickly as possible, and include only enough context to position the data. This dissertation is the mirror opposite. And so it is, on a note of gratitude, I end this dissertation, with an eye toward future research.

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