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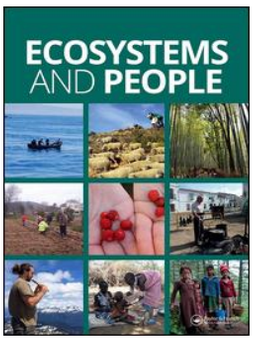

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PERSPECTIVE

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Looking into the dragons of cultural ecosystem services

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ABSTRACT

Cultural ecosystem services research is in a somewhat tumultuous state. The cultural ecosystem services (CES) idea is seen simultaneously as a welcoming, expansive addition to conservation policy-making and as a strange, square-peg-in-a-round-hole concept that should be replaced by a more appropriate metaphor or conceptual structure. This confluence of interest and skepticism suggests an opportune moment to take stock of CES, both as a concept and growing scholarly field. Here, we focus on dilemmas that characterize and constitute CES as a field of empirical inquiry and practice. We describe five tensions that characterize the field (and mirror tensions in interdisciplinary work more broadly): universalism and anti-universalism; reductionism and non-reductionism; historical and ahistorical approaches; politicized and depoliticized approaches; and objectivity and situated knowledges. We then suggest five non-mutually-exclusive roles that CES research can (and does) play: The Convener/Illuminator; the Process Police Officer; the Translator; the Revolutionary; and the Policy In-fighter. We provide examples of each tension and role, and posit that clarity and reflexivity may help to make sense of a fertile, if sometimes confusing, interdisciplinary field. Making more sense of, and being more explicit about, the contradictions and contributions of the CES field, can, we suggest, aid decision-makers, CES researchers, and others to better include these values in environmental management.

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Introduction

In 2018, the United Nations Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) announced a new assessment in its efforts to evaluate and make recommendations related to global biodiversity and ecosystem services: the Assessment of the Multiple Values of Nature. Member governments (137 at current count) request IPBES Assessments as a call to the scholarly community to summarize the state of knowledge on topics related to biodiversity and ecosystem services. The forthcoming 'Values Assessment,' as it is known in shorthand, will provide guidance on how to include not only economic value, but also cultural, moral, and other non-material values, in decisions that impact biodiversity and ecosystem services or nature's contributions to people (Díaz et al. 2018; IPBES 2018).

The announcement of the IPBES Values Assessment is a remarkable development in the broader field of ecosystem services. The assessment's move to recognize diverse values parallels developments in ecosystem services research, which has seen a proliferation of scholars studying non-material values of ecosystems, often under the moniker of 'cultural ecosystem services' (CES). This increase in attention takes many forms: a steady increase in publications (Gould et al. 2019); university programs and coursework; and scholarly workshops and panels.

All of this comes at a time when some within academia have called for the end of the CES concept (Kirchhoff 2019). The cultural ecosystem services concept has been something of a wayward relative of the larger ecosystem services framework since its inception; CES receive far less scholarly attention than biophysical ES categories, by many measures (Mandle et al. In press). Scholars have ridiculed, downplayed, and questioned the framework from multiple angles – both from within the ecosystem services field (Winthrop 2014) and from without (Leyshon 2014). Primary concerns include that the ES framework is too reductionist to effectively account for cultural values (Leyshon 2014); that ES are instrumental values of nature but many CES arise from not-solely-instrumental relationships between and with people and ecosystems (Comberti et al. 2015; James 2016); that the focus on ecosystems (rather than pluralistic perceptions of nature, environment, etc.) constitutes scientific imperialism (Kirchhoff 2019); and that the cost-benefit tradeoff approach that pervades much ES work is inappropriate for the meanings and relationships with nature that CES represent (Winthrop 2014).

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This confluence of public interest and scholarly skepticism suggests an opportune moment to take stock of CES as a concept and growing scholarly field. Where has CES research been and where is it headed? What are the field's ongoing and potential contributions to environmental management and policy? What dilemmas characterize and constitute CES as a field of empirical inquiry and practice?

We could address these questions in multiple ways. One possibility is a manifesto of sorts: a banner to organize around, a charter for future work, a clear presentation of a single, shared pathway. We do not take this approach. Instead, we take an approach borne of cross-disciplinary dialogue and recognition that in diversity – in this case, interdisciplinary and epistemological diversity – there is strength. Yet this recognition does not mean uncritical acceptance of every possible avenue; we also hope to spark critical analysis and reflexive discussion about the CES concept and its epistemological, social, political, ideological, and institutional positioning.

In this paper, we have two overarching goals. First, we aim to mark CES' distinctive strengths and contributions, not just to the field of ecosystems services, but also to the broader effort to understand relationships between people and ecosystems. Second, we address some of the tensions within the CES concept, with the goal of clarifying for scholars, practitioners, and others interested in CES the potential that self-reflexive, adaptive, and deliberate study of CES may have to address problems of environmental management. We hope that our simultaneous pursuit of these two purposes can help CES researchers to recognize and constructively engage both their own and other's divergent assumptions about what constitutes good and important CES work, while also confirming a larger shared goal to better recognize and include non-material values in environmental management and decision-making.

Looking into dragons – the genesis, specific objectives, and structure of this paper

In creating this paper, we took inspiration from a field that faces opportunities and dilemmas that parallel those in nonmaterial values research: cultural anthropology (LV, the third author, is an environmental anthropologist). The paper arose from an interdisciplinary empirical research collaboration between the three authors. Two of us (RG and AA) are thoroughly engaged in CES research. As an outsider to the field, LV observed and articulated multiple tensions and possibly divergent goals within the CES field – what we here call 'dragons.' This sparked a series of fruitful discussions about terminology, analytical framings, and diverse kinds of evidence considered acceptable within the CES field. After these initial conversations, we identified and refined the tensions, roles, and illustrative examples we present below through a combination of our knowledge of the CES field, consultation with the literature, and further discussion.

Emerging from these beginnings, this paper has two specific objectives. First, we aspire to think anthropologically about CES as an interdisciplinary field: to identify and reflect on how it is culturally, socially, politically, institutionally, and historically embedded. This effort requires us to pull back from our day-to-day practice (for RG and AA) as scholars active in the CES field to cultivate a 'critical estrangement' (Comaroff 2010) from it. This will hopefully allow us to recognize configurations of knowledge and practice that are largely tacit and submerged in – but powerfully shape – that day-to-day practice.

Second, we attempt to – as Clifford Geertz described it – 'look into dragons.' In an oft-cited essay on the debate over cultural relativism, Geertz wrote: 'Looking into dragons, not domesticating or abominating them, nor drowning them in vats of theory, is what anthropology has been all about. … We have, with no little success, sought to keep the world off balance; pulling out rugs, upsetting tea tables, setting off firecrackers. It has been the office of others to reassure; ours to unsettle' (Geertz 1984, p. 275). Geertz's point is that it can be intellectually (and even morally) productive to take on uncomfortable and messy questions: they open the door to deeper revelations and critical self-awareness about our own analytic frames, the validity of our claims, and our accountabilities to others. To anthropology's typical stock in trade – apparently strange beliefs, 'unusual' social practices, obscure kinship systems – he gave the tongue-in-cheek name of 'dragons.' Empirically documenting those 'dragons' – instead of judging them as wrong, backwards, or ignorant; or seeking to change them through modernist education or development; or as he said, 'drowning them in vats of theory' – could be just unsettling enough to illuminate the fundamental plurality of the human condition. In a world full of dragons, Geertz suggests, the goal is not to slay them and impose epistemological unity, but to come to understand them through close observation and contextualization.

The study of CES, with its own apparently strange beliefs and unusual practices, is full of dragons. Indeed, CES are a 'strange case' of ecosystem services – a case riddled with contradictions, complications, and confusions. Following Geertz's lead, we suggest that rather than eliminating those dragons, bogging them down in 'vats of theory,' or resolving all of the internal inconsistencies and paradoxes, it can be productive to offer a careful empirical contextualization of the field. As mentioned above, the overarching goal of this 'looking into dragons' is to

open a space for critical reflexivity about the relationship between the CES field's philosophical and methodological pluralism, the validity of its claims and contributions, and its potential to frame and address complex problems of environmental sustainability in a collaborative fashion. This may be unsettling to some of those practitioners involved in it, but we believe it can also help to clarify the various expressions, potentials, and tensions of the CES field.

The structure of the paper mirrors the need for CES to reflect on its origins, its epistemological assumptions and objectives, and its engagements and accountabilities beyond academia. In Part I, we offer a brief intellectual history of the CES field. In Part II, we consider epistemological tensions that underlie or motivate much CES research, but that many researchers rarely (or never) explicitly consider. In Part III, we build on the discussion of tensions to consider the multiple roles that CES research takes (sometimes explicitly, often implicitly) in scholarship and decision-making regarding sustainability transitions and environmental management. Again, our goal is not to resolve these tensions or advocate for particular roles, but rather to suggest that explicitly recognizing and engaging with this diversity can generate productive reflexivity about the field's basic assumptions and modes of practice – even if in the short-run it sets us off balance.

Part I: brief intellectual history of cultural ecosystem services

In the 1980s and early 1990s, the conservation movement's messages largely focused on 'saving the planet' and 'saving biodiversity.' Humans were in many cases characterized, using a polarized (and often unrealistic) lens, as either harm-doers or 'ecological noble savages' (Vivanco 2003, 2006). As the 1990s progressed, it became clear that the pace of environmental degradation was still unsustainable – i.e. that it might result in the decline of human civilization. These dynamics contributed to the rise of new subfields, such as the 'crisis discipline' of conservation biology (Soulé 1985). They also gave impetus to new interdisciplinary fields, including ecosystem services – which highlights humanity's dependence on well-functioning ecosystems.

Modern western academics first mentioned the concept of ecosystem services in the 1970s, as an outgrowth of systems ecology (Westman 1977), then discussed it sparsely in the 1980s (e.g. Ehrlich and Mooney 1983). In 1997, researchers published two works that helped to define and popularize ecosystem services as a concept: Gretchen Daily's edited book *Nature's Services*, and Robert Costanza et al.'s *Nature* paper that estimated the global economic value of ecosystem services. A primary innovation of this foundational work was that it combined insight from ecology and economics. Multiple chapters in *Nature's Services* – those focused on particular ecosystems or on case studies – mention CES, though briefly, and solely as they relate to recreation, tourism, and cultural heritage (Daily 1997). The *Nature* paper lists 17 ecosystem services, among them two that fall into today's CES category: 'recreation' and 'cultural' (Costanza et al. 1997).

In 2005, the United Nations released the Millennium Ecosystem Assessment (2005). This assessment, like the IPBES assessment mentioned earlier, was the result of a multi-year process involving hundreds of experts around the world. The 'MA' formalized the ecosystem services concept at a global level. CES figure prominently in the MA's conceptual framework, which divided ES into four types: supporting services, regulating services, provisioning services, and cultural services. That CES emerged as a category warranting its own recognition clearly indicated that inclusion of non-material aspects was important to recognize a more complete suite of benefits from nature. Yet the MA did not include particularly rigorous consideration of how those non-material aspects should be conceptualized and treated. Some consider the CES category a poorly defined 'catch-all' bin for any sort of ecosystem benefit that does not fit in the other three better-specified bins (as a prominent example, 'recreation' is almost always listed as a CES, but it is conceptually distinct from many other ecosystem benefits associated with CES, such as identity and heritage (Biedenweg et al. 2019)). Though CES have their own chapter in the MA, it is only one of 27 chapters. This duality – recognizing the importance of CES while effectively marginalizing it – portended the role of CES in the coming 15 years.

In the years since the MA, the ecosystem services field overall has expanded. One aspect of this expansion is that it has incorporated more social science work, some of which addresses CES (Droste et al. 2018). As a recent review concludes, much social science work on ES 'demonstrates a reflexive and critical lens on the role of ES research and includes a critique of market-oriented perspectives' (Droste et al. 2018, p. 1). Reviews of CES in particular (rather than ES overall) demonstrate that a growing number of papers address CES specifically (Milcu et al. 2013; Gould et al. 2019). Ample research also demonstrates increasingly shared understanding of the basics of what CES are and why they matter (Daniel et al. 2012; Milcu et al. 2013; Collier 2014; Plieninger et al. 2015; Fish et al. 2016). This consensus, fundamental in many ways, suggests a valuable role for approaches and portrayals that do not 'drown in vats of theory,' but that distill the complexity of a multi-faceted concept to allow for its broader discussion and uptake. It seems important to recognize

the promise of this distillation, along with the fact that some (though not the majority of) CES research enters into decision-making conversations at multiple scales (Gould et al. 2019).

Simultaneous with these developments is the diffusion and circulation of CES within and across multiple scholarly fields. CES research draws on increasingly diverse methods and academic disciplines, reflecting increasingly diverse epistemological stances and strategic orientations toward environmental institutions, processes, and policies. The diversity of concepts encompassed by CES means the field has deviated more and more from the typical ES toolkit. A recent perspective on frontiers in CES work pointed out five emerging research trends, many of which require methods uncommon in research on material ES. The trends were: broadening definitions and conceptualizations of CES; addressing collective aspects of CES and attending to process; acknowledging that CES are reciprocal, relational and dynamic; embracing narrative and other qualitative evidence; and better connecting to biophysical details (Gould et al. 2020).

At the same time, terminology within the CES space remains unsettled. As scholars have discussed extensively, the term 'Cultural Ecosystem Services' is problematic for multiple nuanced reasons (Raymond et al. 2013; Kirchhoff 2019). Each of the words that comprise it carries their own-contested histories and shortcomings within environmental studies and beyond (Raymond et al. 2013; Russell et al. 2013; Kirchhoff 2019). Nevertheless, many scholars (including us) use CES in ways that closely mirror the intent of the concept of nature's nonmaterial contributions to people, which aims to address some of those shortcomings (Pascual et al. 2017; Díaz et al. 2018).

Part II: dilemmas of diversity? Epistemological and methodological tensions inherent in CES work

Critical reflection on the CES framework requires us to reckon with the diversity and pluralism inherent in much interdisciplinary work; in this diverse and plural space, deeply rooted divergences and tensions – or dragons, to return to the metaphor used earlier – shape the way we integrate distinct research traditions (Moon and Blackman 2014). CES is radically interdisciplinary: its intellectual roots are in scientistic and positivistic domain of ES, but the field has rapidly expanded to incorporate more humanistic, liberatory, and pluralistic methods and epistemologies. This raises questions about the compatibility of such widely disparate approaches, since fluid integration is not automatic (Thompson Klein 2010).

At the root of some of these tensions is not simply unsettled terminology, as discussed above, but fundamental philosophical differences. Consider, as an example, just one of the three words that comprise CES: 'culture.' Quantitative and reductionist scientific methodologies can contrast sharply with the qualitative and ethnographic approaches many social scientists use to study culture. Moreover, the emphasis in the culture concept on holism – that culture is a particularistic and dynamic set of intertwined and mutually-shaping relationships between beliefs, social institutions, and everyday practices – opposes universalistic, reductionistic, ahistorical, depoliticized, and objectivistic frameworks for thinking about culture. CES scholars engage with these ideas in some places (e.g. Russell et al. 2013), but there remains unfinished business in the CES field to fully accommodate and incorporate the holistic assumptions and aspirations embedded in the use of the word 'culture.' In this piece, we face such dragons. Though it is not a census, nor do we claim that these are the only tensions that exist, this section describes some of the primary axes of philosophical diversity within CES work (Figure 1).

Universalism and anti-universalism

Are there universal aspects to CES, and if so, what are they? The natural and economic sciences that shaped the broader ES framework emphasize the importance of generalizability borne of positivistic and replicable research methods (Daily et al. 2009). This approach contrasts with certain social sciences' (notably anthropology's) viewpoint of the importance of particularity and plurality derived from ethnographic and qualitative methods (Rosaldo 1989).

Some CES work aims for universalism. Much of this work involves principles, approaches, or tools that might be derived from or applied in particular contexts but can be generalized to others. The most prominent work of this type develops typologies or principles of CES in general; though all of this work recognizes that contexts differ, it offers classifications and principles that are intended to apply broadly. At least a dozen review or thought pieces fall into this category (Millennium Ecosystem Assessment 2005; Chan et al. 2012), as does the Common International Classification of Ecosystem Services (CICES), which is promoted by the European Environment Agency (www.cices.eu). A few works provide specific tools designed for universal use, sometimes with small adaptation for local contexts; GRACE (Guidance for the Rapid Assessment of Cultural Ecosystem Services) is one example (Anthem et al. 2016). A recent development is the idea of 'psychological ecosystem services' (Bratman et al. 2019), which the Millennium Assessment considers to be under the CES umbrella (Millennium Ecosystem Assessment 2005). Researchers have proposed that these services, which involve

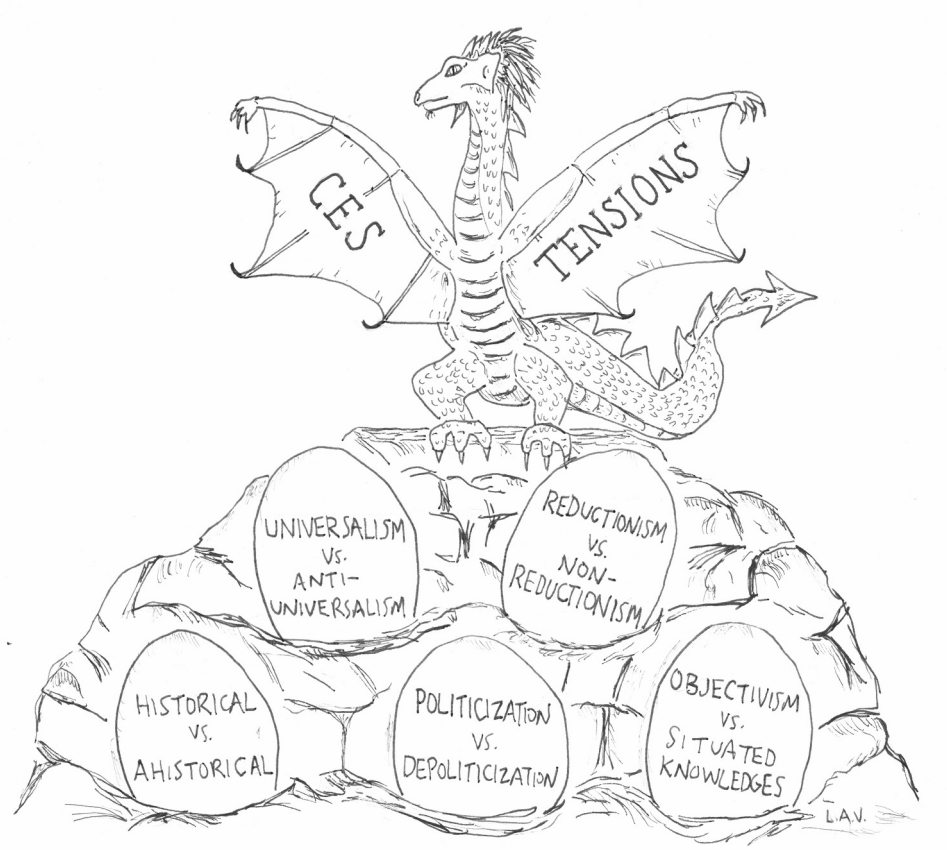

Figure 1. The epistemological 'dragons' of cultural ecosystem services: epistemological tensions present in cultural ecosystem services research.

improvements in mental health from exposure to green space (mostly in urban areas), can be modeled using a standard, universally applicable model and process (Bratman et al. 2019).

Much CES research, however, involves studies of particular situations, stories, and contexts that do not aim for universal applicability. Contrasting the effort for universally applicable typologies, some such work creates entire typologies locally and suggests that a universal typology of these values may not be possible (Pascua et al. 2017). Other studies emphasize the highly place-specific and contingent nature of claims made, and tailor their questions and approach to a particular socio-ecological context (Leong et al. 2019). Many other place-specific studies explore widely recognized CES concepts, but do not claim generalizability of their findings (Plieninger et al. 2013).

As is the case for many of the issues we discuss, these two approaches lie on a spectrum, and can co-exist. One example of that coexistence is a set of CES indicators that authors suggest should be selected and modified based on local input (Hernandez-Morcillo et al. 2013). Another is the idea that local situations can inform universal principles – for instance, analyzing interviews about CES in one place can suggest new categories of CES that may, or may not, be relevant elsewhere (Gould and Lincoln 2017). Further, our experience suggests that the core idea of CES, and perhaps some general procedural principles, may be quite universal, while many other aspects of CES (e.g. relevant types of CES) will be localized, particular, and place-specific.

Reductionism and non-reductionism

Are the most appropriate methodological tools for the study of CES those that break the phenomena in question down into units (or component parts) through reductionism (Van Riel 2014), or those that describe and contextualize those phenomena in a holistic fashion (Parkin and Ulijaszek 2007)? Some CES research operates within reductionist paradigms, and this work integrates most easily with other ES efforts. InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs), for example, is a modeling system that employs spatial data to demonstrate a variety of ecosystem services that are associated with different land use/land cover scenarios. InVEST's Recreation model represents recreation as the number of people who visit a location; it calculates numeric projections of visitor numbers based on quantities and locations of social media postings (Wood et al. 2013). Studies that measure other types of CES from social media separate CES into categories (Thiagarajah et al. 2015), and some use machine learning to code/categorize social media

content (Richards and Tunçer 2018). Another study that uses reductionist approaches surveyed participants about the scenic beauty and aesthetic appeal of different landscape types (e.g. mountains, agricultural fields) to acquire a mean value for each landscape type. The authors then applied these values to a map of the study area (weighting each landscape type by the mean value) to determine demand for recreation (Peña et al. 2015).

But other researchers have challenged the capacity of reductionistic approaches to accurately capture some CES-related phenomena. Cultural meanings and nonmaterial values often cannot be separated neatly into the categories in CES typologies; they intertwine and overlap, often in context-specific ways. Even when researchers ask about a specific CES (e.g. spirituality or recreation), interviewees can respond with a discussion that includes many other CES (Klain et al. 2014; Gould et al. 2015). This resistance to reduction is especially challenging for economistic frameworks and can lead to problems of double-counting (Boyd and Banzhaf 2007) – i.e., of 'counting' a particular experience more than once in a ledger of benefits (e.g. if spirituality is part of someone's enjoyment of recreation, counting the spiritual and recreational benefits of a whale-watching trip as separate 'double-counts' the spiritual benefit of the experience).

Just as it can be difficult to isolate particular CES, it also can be difficult to connect particular CES to particular landscape elements. Numerous researchers have worked to parse which landscape elements or characteristics lead to which CES (Plieninger et al. 2013; Graves et al. 2017). This work is extremely helpful in efforts to bring CES into the ES-mapping fold. Yet mapping techniques cannot capture many deeply meaningful values – such as the multilayered meanings people make about territory and landscape or the spiritual value of forests (Nahuelhual et al. 2016).

The co-existence of reductionist and non-reductionist approaches is neither a given nor impossible. A pair of prominent biologists make this point in a series of thoughtful essays; they argue that though reductionism can be a powerful tool to deepen understanding, its blinders to context are a hindrance. They suggest that reductionist approaches are compatible with understanding how broader context impacts the specific characteristics of the parts, and encourage all studies to consider the larger systems that shape and surround them (Lewontin and Levins 2007). This advice seems relevant to CES research.

Historical and ahistorical approaches

Does CES work address or acknowledge historical influences on present-day CES, or does it take an ahistorical stance that focuses on current values? Much CES work is synchronic, focusing only on the present. Recreation and aesthetic studies are the most prominent manifestation of this tendency. Research on recreational (and tourism-based) CES explores how people spend their leisure time recreating in natural areas (Boll et al. 2014; Lankia et al. 2015; Willis 2015). Aesthetic value studies similarly assess the perceived beauty or aesthetic appeal of particular landscapes or landscape components (Frank et al. 2013; Schirpke et al. 2016; Figueroa-Alfaro and Tang 2017). This work continues to develop; for example, a 2018 Special Issue of the journal *Ecosystem Services* focused on recreation and aesthetic values (Hermes et al. 2018). Other CES research with a present-day focus includes mapping studies that connect landscape features to CES. These studies generally take a one-time-period approach (van Zanten et al. 2016; Van Berkel et al. 2018).

One of the critiques leveled at this approach is not simply that it is non-historical – benignly ignoring history – but that it displays an ahistorical failure to take into account that such values are not static and that historical factors are critical to understanding contemporary valuations of ecosystems (Munslow 2006). Much CES work does in fact emphasize that CES are intertwined with history – that they can change due to cultural, political-economic, and social dynamics over time. One ES-based assessment of heritage values and identity, for example, includes detailed descriptions and consideration of the historical context of two case studies (Tengberg et al. 2012). Another study explores present-day CES associated with Hawaiian coral reefs with explicit attention to historical details. Findings include that fishers give away a third of reef-caught fish in the study area, and the study recognizes that catch-sharing is rooted in longstanding cultural practices and values (Kittinger et al. 2015). A study in Madagascar discusses how cultural ecosystem services in a particular community are governed by a social contract with the ancestors; a deep consideration of context demonstrates that for this community, CES are intertwined with history (von Heland and Folke 2014). Another study in Singapore combines archival materials, social media, and surveys to study if and how CES changed through time. Its results likely mirror what would be found in many other contexts: that in the past, values such as cultural heritage, spirituality, and sense of place were more prominent than values such as recreation and aesthetics; the latter are more prominent now (Thiagarajah et al. 2015).

Another level of attentiveness to history recognizes the complex and ongoing effects of colonialism and settler histories on the uses and meanings of nature, especially in situations where land dispossession, state power, and institutional racism have disrupted local

(often Indigenous) ecological management systems. Multiple publications focus on contexts in which colonial legacies impact human-ecosystem relationships in complex ways. This work contributes to understandings of – and attempts to redress – contemporary histories of continued marginalization (Gould et al. 2014; Pascua et al. 2017; Leong et al. 2019). In these circumstances, ahistorical approaches run the risk of rendering ongoing injustices invisible and alienating local communities for which these histories remain unfinished and/or oppressive. Ahistorical approaches may be expeditious and necessary in some CES research contexts, but it is likely that much CES research would benefit from greater efforts at historical contextualization.

Depoliticization and politicization

Does CES research position itself as a depoliticized scientific enterprise (i.e. an instrument that policy and decision-makers can use), or does it delve into sensitive, nuanced phenomena grounded in imbalances of power? How does recognition of these two states manifest in research processes and products? There are two interrelated aspects of these questions: first, the relationship between CES and expectations of objectivist research in policy or decision-making, and second, researchers' fundamental attitudes toward the idea that power structures and biases are embedded within research processes.

In one paper that discusses forms of relationship with decision-makers, researchers outline two general approaches to how ES researchers interact with policy: approaches wherein policymakers are recipients of data and approaches wherein policymakers are involved in the research process. The first approach 'espouses that objectivity can be attained, and focuses on the importance of internal and external validation of study findings' (Raymond et al. 2014, p. 147). In the second approach, 'decision-makers are often actively engaged in valuation at multiple phases of the project. They inform the social and environmental contexts to the problem, and may be actively engaged in the identification, rating or rankings of values. Consequently, the separation between processes of evidence gathering and decision-making is less clearly delineated' than in the first, policymakers-as-data-recipients, approach (Raymond et al. 2014, p. 147).

The two approaches to interacting with decision-makers mirror much larger concepts in research on science-policy connections – concepts that question whether the academic process can in fact be separated from policy, political concerns, and institutions of power. Researchers' attention to and attitudes toward these issues are another way this tension manifests. One school of thought takes the 'honest broker' approach, which suggests that facts and science are separate from such influences, and scientists can remain objective about their science and serve as 'honest brokers' between scientific facts and decision-making or other institutions (Pielke Jr 2007). Another school of thought holds that researchers cannot avoid engaging with the inherently political nature of the research process; in other words, every decision in research – e.g. what to research, how to go about it, who is involved – is political and embedded in the systems and institutions that pervade and structure society (Jasanoff 2004; Sabbagh 2017).

Much CES research is, at least as it appears in publications, depoliticized: it takes the approach of collecting and analyzing data, then presenting results to policymakers (or publishing results in places where motivated policymakers can find them). A study in the U.S. Great Lakes region, for instance, compiles and analyzes multiple distinct data sources (e.g. citizen-science bird counts; boat slips) as proxies for CES, and then suggests areas to prioritize for restoration based on levels of CES (Allan et al. 2015). Another example is a study in Indonesia that uses choice modeling combined with ethnographic research to understand how channelization of an urban river will impact CES (Vollmer et al. 2015); the stated hope is that the work will inform decision-making about channelization.

A much smaller subset of CES research is 'politicized' in that it recognizes research processes' political embeddedness. Work in this category resonates strongly with our Policy In-fighter and Revolutionary roles (see below), but has nuanced differences related to its conceptualization as an epistemological position, rather than a role. Politicized CES work identifies that studying CES can be considered a political act. For politicized CES research in the Revolutionary role, for example, the goal is not to produce findings for policy and other decision-making processes, but to involve and empower groups often left out of those processes and to break barriers between academic researchers and communities. Using participatory methods that empower 'participants' (e.g. Ranger et al. 2016) and co-writing with community collaborators as co-authors (e.g. Amberson et al. 2016) are two ways this happens.

Both depoliticized and politicized approaches to CES research likely have important roles to play in the world's complex and varied governance systems. More deliberate awareness of various studies' stances on this issue, and of the benefits and drawbacks of each approach, may help to make CES research more effective.

Objectivity and situated knowledges

This tension addresses the nature of CES knowledge claims. Does research (1) illuminate existing objective phenomena (Gauch 2003); (2) consider that 'reality'

is impacted by and co-created with participants through the research process (Clifford and Marcus 1986); or (3) emerge from what Donna Haraway (1988) terms 'situated knowledges?' (Haraway defines situated knowledges as processes of knowledge construction that are shaped by socio-cultural filters of worldview, gender, class, epistemology, etc., and that generate positional perspectives on a phenomenon.) Many modes of inquiry with positivistic roots may approach CES as phenomena that exist to be measured. This contrasts with approaches – such as those often embraced by qualitative social sciences – that focus on co-construction and intersubjectivity. As anthropologist Johannes Fabian observed, one the fallacies of objectivist social science is that cultural 'facts' are like blackberries, out there waiting to be plucked. Instead, Fabian writes, they are the product of relationships and dialogues between researchers and community members, and of how those actors jointly create intersubjective meaning and synthesis (Fabian et al. 1971). This tension, then, asks whether CES data are blackberries (out there waiting to be picked) or whether they are blackberry pie (made collaboratively, and a little different depending on the actors involved).

Many studies that focus on recreational and aesthetic values aim to objectively measure CES indicators (Hermes et al. 2018). As one example, researchers digitally altered photographs of forest landscapes to understand the esthetic appeal associated with forests with different biological characteristics (e.g. different species evenness or color diversity) (Graves et al. 2017). Though recreation and aesthetic values may dominate this type of CES research, some studies that take an objective approach address values other than recreation and aesthetics. One study in Germany asked the question: 'What signs of use relating to non-material benefits or rather CES can be seen?' (Bieling and Plieninger 2013, p. 653). Examples of physical objects they recorded include: benches at scenic points (aesthetic values), trail signage or campfire sites (recreational values), and trailside shrines (spiritual values).

Other CES research explicitly acknowledges that CES data are created in the process of trying to elicit them. Kenter et al., writing in the journal *Ecosystem Services* and suggesting future directions for research on 'social values,' assert the need to be explicit about this. They note that in some dominant approaches to ES values, values are 'implicitly described as "out there" to be captured,' but that current research (by themselves and others) demonstrates 'that values, particularly around complex and often contested goods such as ecosystems, are formed through processes of valuation … ' that involve researchers and participants (Kenter et al. 2016a, p. 369).

As in many of the previously discussed tensions, some CES work also occupies a liminal space between the two extremes of this tension. In this work, researchers imply that their presence and process may impact results and shape interpretations, but do not extensively discuss these issues. In one of the more explicit statements of this sort, a study of ES mapping recognizes that the 'outcomes from mapping of ES' social values reflect the interaction of a series of factors related to the mapping exercise itself and to the participants' (Nahuelhual et al. 2016). It is likely that many CES scholars understand these situated-knowledge dynamics to some extent, but do not discuss them. Deeper exploration of taken-for-granted assumptions around objectivity and its limits may help to refine and strengthen CES research.

Part III: the roles that CES research plays

The epistemological diversity evident in the tensions described in Part II is associated with a variety of roles that CES researchers and their work occupy in sustainability transitions. For people studying CES, there is no pre-determined, single pathway. Instead, there is a range of possibilities that reflect different epistemological and political positions and roles that are not necessarily exclusive. As the examples below demonstrate, they often intertwine and overlap. The position researchers take are shaped by their answers to two important questions: What is the goal of CES research? And, what is its value to its various interlocutors and stakeholders, including policy-makers, environmental institutions and managers, and the rural and indigenous communities it engages? Reviewing the literature, we see five archetypal roles that derive from answering these questions (Figure 2).

'The Convener and Illuminator'

As the Convener and Illuminator, CES research convenes distinct parties to explore and illuminate individual and collective values and perspectives on how ecosystems benefit people. Some CES processes in this category make space for individuals to reflect on what is meaningful to them. This normally takes place through one-on-one interviews or surveys that inquire after concepts related to CES. A study based on interviews with diverse actors in coastal British Columbia, Canada, provides an example (Klain and Chan 2012). Respondents in this type of work often mention that these relationships are not something they commonly think about, and that being prompted to consider and articulate them can shed light on the non-material connections they have with nature (Gould et al. 2015).

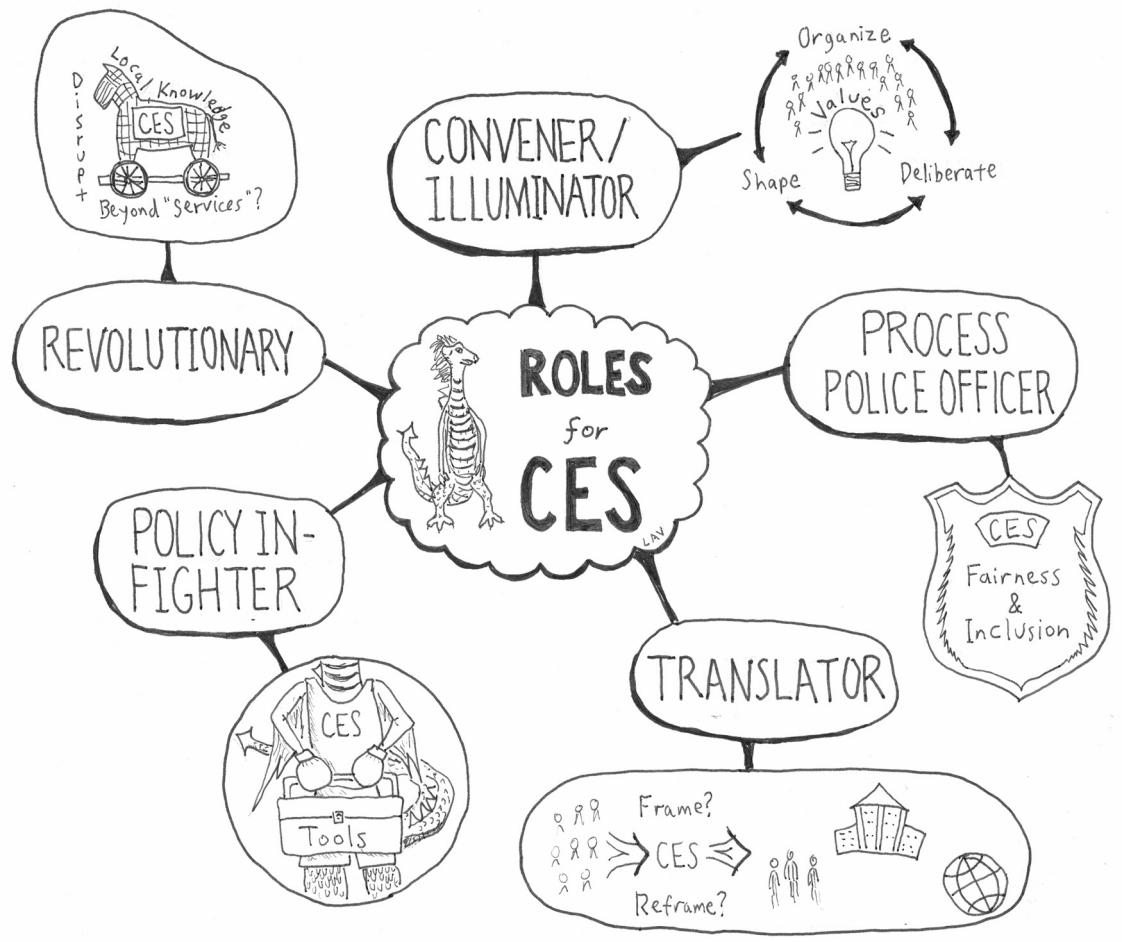

Figure 2. Five roles that cultural ecosystem services research plays.

Many CES studies also encourage group-based discussion and reflection. In so doing, they bring together groups of people to discuss topics related to their nuanced relationships with ecosystems – topics that might not emerge in everyday conversation. A number of studies that play this convener role organize participatory workshops designed to better understand place-based CES and translate these values to natural resource managers (Pascua et al. 2017). A related area of discussion and research is the role of deliberation in CES work (Wilson and Howarth 2002; Kenter et al. 2016b). In contexts where communal values are prioritized over individual ones, deliberation may be a particularly important decision-making process (Kenter et al. 2011).

'The Process Police Officer'

Some CES research implicitly – and occasionally explicitly – advocates for more inclusive processes that incorporate a broader suite of voices in the management decisions the research might affect. This research attends closely to the processes involved in eliciting nonmaterial values of ecosystems. As the 'Process Police Officer,' the goal is to ensure a process in which diverse perspectives are elicited and represented, especially those of local communities, indigenous communities, or other groups whose views might not otherwise play a prominent role in policy construction.

The use of participatory processes recognizes the need to engage with participants as co-creators of knowledge, rather than as study subjects. One approach is the SPICED framework (Hernandez-Morcillo et al. 2013), which advocates for processes that are Subjective (i.e. 'informants have a special position or experience that gives them unique insights' (p. 436)); Participatory; Interpreted and communicable; Cross-checked and compared; Empowering; and Diverse and disaggregated. Other specific approaches include the Community Voice Method, a film-based approach, to understand benefits from marine ecosystems (Ranger et al. 2016), and the use of participatory mapping approaches to understand ecosystem services and disservices from a heathland ecosystem in eastern Germany (Plieninger et al. 2013).

CES concepts can help to illuminate how different groups relate to a given ecosystem, as well as potential alignments or conflicts between them (Milcu et al. 2013; Sarkki et al. 2016). CES approaches that

highlight sometimes-underrepresented groups' perspectives include a study that explores CES (along with other ES) that residents of a small city receive from restoration of a particular portion of Brazil's Atlantic Forest (Brancalion et al. 2014); the aforementioned study that convenes local, and largely indigenous, communities in two areas in Hawai'i to discuss and characterize indigenous and place-based CES (Pascua et al. 2017); and a study that characterizes the CES that low-income residents of a riparian area in Jakarta, Indonesia receive from the river corridor (Vollmer et al. 2015). Other work has sought to illuminate cultural conflicts around ecosystem use, including work with seven stakeholder groups in an area slated for hydroelectric dam development (Darvill and Lindo 2016); wine producers and local residents in wine-producing regions (Winkler and Nicholas 2016); and locals', managers', and politicians' perceptions of a stormwater management park in Helsinki, Finland (Kati and Jari 2016).

Some CES researchers argue that processes must include not only diverse actors, but also a broad range of nonmaterial values that represents what is meaningful to participants. Recent work examining CES in the Black Sea describes how 'a lack of characterization and valuation' of diverse CES leads to the risk of excluding 'the cultural value of ecosystems from consideration' (Fletcher et al. 2014, p. 151–152). Other work implies that it can be helpful to characterize diverse and deeply rooted values in a way that can enter or inform decision-making conversations, even if those values cannot be quantified or definitively measured, but serve more as a 'seed dropped out there.' In the words of one participant in a study about CES associated with Hawaiian forests:

> [This study] would be able to plant the seed for the quote-unquote decision-makers in the arena that we don't function [in] on a regular basis. And even if we did function there, we probably wouldn't fare as well. But you would be able to be that stepping stone that helps link us a little bit more closely together … I look at you folks as being … a voice. Not *the* voice, but *a* voice for us … .You can share something of what we hold of value … .You can share it in such a way so that once the seed has been dropped out there, there's no way that people can say, 'oh, we did not know' (Gould et al. 2015, p. 584–5).

'The Translator'

As the Translator, CES research acts to translate culturally specific knowledge between groups – e.g. between a particular population and a suite of decision-makers. This role expands upon the role of Process Police Officer (which ensures that all voices are heard), as it seeks not just to share voices across boundaries, but also to interpret them. Most CES-related approaches along these lines engage with communities to understand what about nature is meaningful or important to them. Formalities of CES concepts and academic discourse may not be explicitly referred to in community-based research; rather, they inform the whole investigation. Research in this vein reports, reconfigures, or collectively processes that in-depth community work in ways that aim to be accessible to decision-makers – often, though not always, using the language of CES. One study conducted interviews to understand Indigenous participants' relationships with ecosystems, then created indicators for use in natural resource management based on those interviews (Amberson et al. 2016). Another study introduced study workshops to the community as about human-ecosystem relationships, then discussed (with the community and beyond) how to include that work within the CES framework. This study also led to suggestions of ways to expand the CES framework (Pascua et al. 2017).

Some CES studies translate local meanings into ecosystem services language to describe and couch important concepts. One in-depth study demonstrates how culture and ecosystems intertwine to produce ecosystem services in an agropastoral community in Madagascar. It explains centuries-old relationships between people and place through the lens of ecosystem services, with a heavy emphasis on how culture intertwines with more tangible services through constructs like the 'social-ancestral contract' (von Heland and Folke 2014).

Some Translators have taken this approach a step further, advocating for modifications of the ecosystem services concept to allow it to better incorporate culture and a wider array of human-ecosystem relationships. A prominent example of this is the suggestion of a 'services to ecosystems' framework to complement the ecosystem services framework (Comberti et al. 2015). This services-to-ecosystems idea incorporates ideas of reciprocity between humans and ecosystems. Especially because concepts of reciprocity are particularly central to many Indigenous and local communities (Diver et al. 2019), this reconceptualization could serve a strong translational role – i.e., it could package those important ideas of reciprocity in language that resonates with current decision-making structures.

'The Revolutionary'

As the Revolutionary, CES research seeks to provoke, perhaps even steward, an incipient social and epistemological revolution in which considerations of culture, local specificity, and multiple knowledge systems are inserted into global decision-making processes. The Revolutionary role manifests in two tightly connected ways. First, CES research serves as a Trojan Horse – a way to 'sneak these values in' to established decision-making processes because they are disguised, or packaged, in a way that allows them entry. Second, it elucidates and challenges the reductionistic logic and

methodologies typical of Western objectivist (natural science, economics) approaches. These challenges are even directed at ES work itself, accusing it, for example, of not adequately attending to issues that matter to people, and asserting that people often think 'beyond services' in their multi-faceted relationships with nature (Pascua et al. 2017).

Research in southern Chile provides examples of both aspects of the 'Revolutionary' role. One study, fashioned along Trojan Horse lines, employed methods that mirror those in much ecosystem services work, including mapping and monetary analysis, but focused on intangible agricultural heritage – a topic that receives scant attention in many policy contexts. The researchers employed the ecosystem services framework to discuss complex issues of heritage, knowledge systems, and social networks (Nahuelhual et al. 2014), aiming both to disrupt and to introduce important complexity into the decision-making sphere. In a paper two years later, these same researchers again played the revolutionary role, this time by challenging reductionistic approaches to mapping ecosystem values. They described in detail how the mapping exercises common in CES work capture only a subset of values that are important to people; they inadequately capture, for example, territorial protection spirits (*Ngen*) important to the Indigenous Mapuche (Nahuelhual et al. 2016).

The recent move to re-conceptualize ecosystem services as 'nature's contributions to people' can also be seen as carrying revolutionary potential; it was largely a response to (years of) critique of economics-derived 'services' as the central metaphor for human-ecosystem relationships (Raymond et al. 2013; Díaz et al. 2018). The Nature's Contributions to People concept, which emerged from conversations in and around IPBES, suggests that the ecosystem services term does not leave enough space for, or adequately represent: a) the pervasive role that culture plays in all human-ecosystem connections, and b) Indigenous and local knowledge. (Gould et al. (2020) contains more discussion of the interface of the CES and Nature's Contributions to People concept.)

'The Policy In-Fighter'

For the Policy In-Fighter, the ultimate goal of CES is policy creation and implementation through whatever pragmatic means necessary. The fact that the ES concept has garnered significant attention in policy and practitioner spheres (Adams and Morse 2019) motivates many Policy In-Fighters, and validates the inclusion of a *cultural* or *non-material* framing of ES.

Yet the degree to which Policy In-Fighter studies engage with policy processes varies. Some studies involve decision-makers (most often people with responsibility for land management) within the research team (e.g. Campbell et al. 2016). Other studies incorporate detailed conversations with decision-makers into their research plans; these conversations most often address desired products. Researchers in Belgium, for instance, developed an online tool to assess ecosystem services (with a focus on CES and regulating services such as water purification and noise reduction), and claim that 'the role of practitioners and end-users in the design of policy support tools should be considered prior to their design' (Broekx et al. 2013, p. 66).

Some Policy In-Fighters approach CES in largely functional terms: they aim to provide decision-makers with tools to help them use ES frameworks. A study in Spain, for instance, noted decision-makers' initial interest in ES maps led to 'informal discussions with decision-makers in which maps' usefulness was discussed.' These decision-makers then used the research products to help assess their 'operational potential' (Casado-Arzuaga et al. 2014, p. 1402). Another reason to engage with decision-makers is to improve researchers' understanding of local communities' policy priorities, as described by a study of CES among Indigenous fishers in Madagascar (Oleson et al. 2015).

A close relationship between researchers and decision-makers throughout the research process – from research design to check-ins during research – tends to support the uptake of CES findings. For example, a study in New York City that involved decision-makers provided information on a suite of CES provided by the City's parks, which informed park planning (Campbell et al. 2016). Another study from Germany predicted a suite of ecosystem services, including aesthetic CES, that would result from different land-use scenarios; the researchers conducted workshops with regional planners to design scenarios, and those planners later used the results (Frank et al. 2014). The two studies mentioned above also follow this pattern; in the studies in Belgium and Spain, the 'end-users' consulted in early research stages later used the tool created (Broekx et al. 2013; Casado-Arzuaga et al. 2014).

Conclusion

Interdisciplinary research plays an important role in the environmental realm; the complex systems that characterize human-ecosystem relationships arguably cannot be adequately understood using only disciplinary approaches. Scholars have reflected on the interdisciplinary environmental-research space, and the joys and tensions it produces, for decades (Pickett et al. 1999; Lélé and Kurien 2011; Moon and Blackman 2014; Leslie 2017). Though this work agrees on many core principles of interdisciplinary

work (e.g. mutual respect), literature on the topic also leaves the impression that we are still, as an academic community, figuring out exactly what that interdisciplinary space will look like. CES research can be considered a sub-field of that interdisciplinary environmental space – and it seems to be dealing with some of the more thorny complexities of interdisciplinary work. The epistemological tensions and highly varied roles discussed above are manifestations of these complexities. To conclude, we draw on scholarship on interdisciplinary research generally to reflect on issues that transcend these tensions and roles, and to suggest ways forward for CES research.

There is no single form of interdisciplinarity; instead, there are multiple pathways and formations that emerge out of particular historical contexts, relationships, locations, and political-economic dynamics (Graff 2015). One common framework for understanding and undertaking interdisciplinary research revolves around the normative goal of bringing distinct disciplines together to create a new integration of knowledge that approaches (or achieves) its own internal coherence, methodological unification, and vision for long-term research and exploration (Lattuca 2001). The picture of CES we present above – of contrasting paradigms and epistemological and methodological diversity and tensions – appears far from this ideal. Calls for the end of CES as a conceptual framework may be, at least in part, a response to a messiness that verges on the 'undisciplined.' When the 'internal coherence' and 'methodological unification' ideal of interdisciplinarity is applied, unification around a common set of principles, values, and political and institutional priorities seems a valuable goal for CES scholars to explore. Sparking discussion around this idea is one reason we wrote this paper.

But the 'unification' ideal of interdisciplinarity is not the only version. Another version – this one likely more common, or required, when research bridges larger epistemological divides like the ones we have reviewed here – calls not for unification, but for peaceful and productive co-existence that leads to collaborative processes of framing and addressing problems. One aspect of this view can be that interdisciplinarity is not an integration of disciplinary knowledge and methods, but a critique of and challenge to – maybe even liberation from – the limits of disciplines themselves (Lattuca 2001). When considering this view of interdisciplinarity, it is worthwhile to note the advances CES scholars have made in articulating the relevance of non-material values in environmental management and policy (Gould et al. 2019). These advances suggest that the 'undisciplined' territory of CES does not necessarily mean lax and unrigorous thinking, a lack of epistemic clarity, or methodological sloppiness. Interdisciplinary spaces can engender anxiety, conflict, ambivalence, and contradiction, but they may also prove influential even if they never develop a stable niche (Graff 2015). Sparking reflection on how to achieve both peace and joint productivity is yet another reason we wrote this paper.

In this light, CES represents an emergent and unstable field – perhaps even proto-field – that is at the edges of another interdisciplinary field (ecosystems services) but draws on an even broader array of disciplines, epistemologies, and approaches. Like much interdisciplinary work, it is dynamic and constantly morphing. CES research, in other words, is still working through acceptable modes of discovery, validation, and languages. One especially clear example of this is that scholars have suggested replacing the term CES with not only Nature's nonmaterial Contributions to People, but also non-material ecosystem services (Small et al. 2017; Pascual et al. 2017). We do not feel strongly about terminology, but support a nuanced interdisciplinary approach to the nonmaterial ways nature impacts human well-being (2020).

The CES field is also working through its relationship with other fields, other disciplines, and their paradigms. As one important example, CES research interacts in evolving ways with other concepts that address non-material values related to ecosystems: relational values, social values, and the multiple values of nature (Kenter et al. 2015, 2019; Chan et al. 2016, 2018)). It also aligns with research that addresses CES issues, but does not use that term; examples include anthropological research that explores the values associated with land-use types (Hoelle 2018) and research that melds ecology and economics to explore the recreational value of clean water (Keeler et al. 2015). How we will deal with this plurality is not yet clear. While some scholars in the CES space might seek the ideals of disciplinary integration referred to above, others may thrive in a more plural and ambiguous space.

By recognizing the tensions and diverse (and sometimes divergent) roles of CES, our goal here has not been to identify weaknesses. Instead, we wish to suggest that the field's ongoing definition and development be grounded in reflexivity and respect for the power of often-complementary diverse approaches. Scholars of interdisciplinarity emphasize that reflexivity can promote effective interdisciplinary cultures and practices (Romm 1998; Blanchard and Vanderlinden 2010; Knaggård et al. 2018). This work suggests that for CES, reflexive exploration of assumptions, objectives, and 'habits of thought' (Strober 2010) holds great potential: reflexivity can strengthen mutual learning, collaborative problem-solving, inclusion of diverse perspectives, and the field's ability to contribute to the sustainability

transition. Closely connected to reflexivity is the ability to name, recognize, and honor different perspectives. This mutual awareness can help scholars to come to some agreement about how to integrate complementary forms of knowledge as they frame and address complex problems that siloed disciplines cannot address. Undergirding all of this potential is that being explicit about our analytic frames, and nodding to the frames that others use, will help CES researchers to be transparent about CES work with everyone involved – not only within academia, but also in policy arenas, environmental institutions, and diverse kinds of communities around the world.

We do not deny that such reflexivity can be unsettling. It is, as yet, hard to tell how far down the pathway of reflexivity CES scholars are willing to go. It also hard to tell how productive that might be; excessive 'navel-gazing' could distract from the general urgency of addressing environmental challenges, or, at a smaller scale, lead to missing possible political openings to increase consideration of non-material values in decision-making. In other words, the implications of this paper are not entirely clear. We hope we have described the state of things in a helpful way – and we will see what happens from there. And that is what looking into dragons is meant to do.

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