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**Abstract**

Two economists working in the field of ecosystem services and conservation discuss why a flexible approach to using any of the existing frameworks is probably better than creating a new and 'ideal' framework. They describe work they have both done with NOAA's Office of National Marine Sanctuaries as an example of how to modify an ecosystem services framework to suit a range of cultural and ecological conditions.

**Graphical/Visual Abstract and Caption**



Photo Credit ( Left to Right) : Robert Schwemmer/NOAA

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Caption ( Left to Right): Members of the Chumash community paddle a traditional redwood plank canoe (tomol) at sunrise. National Marine Sanctuary of American Samoa

## 1. INTRODUCTION

“The field will grow where creativity and openness are starting points, and where the paradigm of ecosystem services remains ‘a work in progress’. An adaptive view of the world requires an adaptive research agenda, critical in its mission, and mindful that solutions are never total and beyond revision.” Fish et al. 2016

Reviewing an article recently, one of us came across a somewhat predictable attack on the concept of Ecosystem Services (ES), running roughly as follows. The ES framework is too based in Western scientific and anthropocentric logic. It presupposes a unidirectional relationship between humans and nature in which humans derive benefits from a passively producing nature. The authors thought the concept should adopt the perspective of many indigenous cultures, in which humans are not removed from nature, but in a reciprocal or multidirectional relationship. They went on to recommend an alternative framework for integrating humans and nature into conservation, the name of which is not important to this discussion.

We both work with researchers and conservation practitioners who are often unfamiliar with ES concepts, and we see a particular set of challenges in this field. As interdisciplinary economists, we are also attuned to the weaknesses of any given ES framework. In this article, we argue for caution in the proliferation of either ES frameworks or frameworks to replace ES and instead for greater flexibility in applying any given framework, particularly when applied by conservation practitioners. We make these arguments for a number of reasons, but mostly to make the work of conservation practitioners more effective by preventing their continued ‘retraining’, and also by giving them more agency- thus increasing the reach and effectiveness of a more flexible framework. To explore these issues we

provide some background on ES and a range of the frameworks currently in use. We then discuss our arguments in some detail, providing examples from our own work, mostly on work we have done together. We then make recommendations for improving the effectiveness of current ES frameworks for practitioners.

## 2. What are Ecosystem Services

Ecosystem services (ES), commonly defined as the benefits humans derive from nature, comprise a set of frameworks for the conservation and management of wild and mixed-use landscapes (MEA 2005; Haines-Young & Potschin 2012; Sukhdev et al. 2012; IPBES date). Arising from the Millennium Development Goals and work preceding it (e.g., deGroot et al. 2002), ES is an explicitly anthropocentric approach to understanding the relationship of nature and humans; in some way heir to the concept of biodiversity as a conservation tool (though the two can be used together: see Ruckelshaus et al. 2015). As this is a short opinion piece, we are not going to detail how any given ES framework operates. For more detail, we suggest consulting some of the above literature. Most frameworks divide these benefits into categories, often based on the MEA; Provisioning, Regulating, Cultural, and sometimes Supporting. Provisioning including material goods directly consumed by humans (e.g., timber products); regulating including mediating processes of ecosystems (e.g., storm force absorption by coral reefs); cultural includes a range of material and non-material goods and services used for cultural purposes (e.g., sacred groves in India). Supporting ES include all the underpinning ecological processes which allow any of the above services to occur (e.g., primary productivity).

NGOs and others often quote Baba Dioum, who said "In the end we will conserve only what we love; we will love only what we understand; and we will understand only what we are taught." (Dioum, 1968). Whether entirely true or not, this statement argues for ES having an advantage over biodiversity as an instrumentalist approach to conservation. Biodiversity is abstract to most humans, its impact on their lives not immediately obvious (see Flood et al. 2020). For many, a monetary or market value is a clear indicator of importance; that value

arises in an anthropocentric frame. In the language of economics, biodiversity is not a final good, but an intermediate good leading to some end that people readily identify and value. For example, biodiversity of pollinator species is important, but not what most people see or consume. While we may recognize its value, that is mainly because our motivating stimulus (i.e., what we really care about) is the food that results from that pollinator diversity.

Biodiversity is crucial ecologically and even to an extent culturally, but from a decision making or policy perspective, practitioners need a conceptual framework that brings a range of disciplines together. There is a fair amount of research discussing how ES can serve as a “boundary object” to help do just this (Abson et al. 2009; Ainscough et al. 2019; De Vreese et al. 2016; Schleyer et al. 2017; Steger et al. 2018). A “boundary object” is a concept that is amorphous enough to be adapted to various disciplinary uses, but also serves to create a common task to bring these disciplines together. While not all relevant disciplines see ES as equally valuable or important, the concept can provide a degree of common ground. Steger et al. (2018) discuss how some of these boundary objects become standardized into what is referred to as “infrastructure.” They also found that while provisioning and regulating ES tend toward greater standardization and therefore are becoming more like infrastructure and less like boundary objects, cultural ES, our particular area, still functions as a boundary object. There are many concerns with any given ES approach (see Albert et al. 2014). Ainscough et al. (2019) and Raheem et al. (2019) found that the concept is not always well-understood by practitioners in different fields, and misconceptions are widespread. Ainscough et al. state “those identifying primarily as practitioners also signalled being overwhelmed by the variety of categorisations (sic) and tools available, and the background information required for their appropriate application (page).” The very anthropocentricity of the area can be problematic to a range of practitioners, stakeholders, and experts. This focus leads many to feel that ES ignores nature’s intrinsic value. This is true to an extent. For many people, not just ecologists, the “value” of “nature” should not be reduced to what “non-expert” humans are willing to pay for it. Regardless, that assertion becomes immaterial once we realize that the destruction of nature is due in part to societies’ inability to reconcile the value of what they

can easily monetize or quantify (dams, jobs) with the value of things they might care about but don't buy in markets (clean rivers, less-polluted air), and things that benefit them that they might not think about (healthy insect communities, intact old growth forests). Therefore, while even an economist might agree that nature has an intrinsic value, that perspective doesn't address how most societies make decisions about nature.

Another concern is ES's connection to economics, particularly to a neoclassical rational-planning cost-benefit framework (Randall 1985). For example, categorizing ES into final goods and services is an economics approach. In environmental economics, ES is used as a way to structure non-market valuation exercises as part of assessing total economic value; ES lends itself to valuation methods like Choice Experiment (Heal et al. 2006).

This leads many to believe that ES results in monetization (it can) or commodification (it could) of nature. Both of us have had discussions with people - even those who don't work in any environmental field- who insist that any valuation exercise proliferates a capitalist, neoliberal agenda, further destroying the planet. There are also excellent arguments in the economics, psychology, and philosophy literature about methodological problems and inconsistencies with non-market valuation methods (Kahneman 1986; Norton 2005).

However, from a pragmatic or policy perspective, non-market valuation methods have been recognized as acceptable by the US Supreme Court (Arrow et al. 1993) and are often the only way for the government to sue for damages to environmental resources. They have their place.

Other subtler arguments include that the western-science or utilitarian philosophy driving ES is based on a one-way relationship between humans and nature. This philosophy tends to see humans as separate from nature, and nature as a thing or system that provides humans with benefits. This critique is fair, and a troubling limitation if part of what we're trying to do is address how humans interact with nature. We both work using ES in planning contexts including indigenous communities, and have heard this issue brought up in several contexts. One colleague in particular used the lovely phrase "the benefits humans provide to nature" as a way of reframing this reciprocity.

### 3. The appeal of new frameworks and why we think they're a bad idea

All of these above concerns can lead researchers to seek alternative frameworks to manage or conserve nature, and in fact the different frameworks reflect different priorities. One could say that the IPBES framework deals with reciprocity better than a straight MEA approach, for instance. TEEB might make more sense for a firm than CICES would. CICES itself might be more useful in the field than the original MEA formulation of services. The US EPA's FEGS model is designed as a discrete and finite classification system of ecosystem services that do not allow for overlap between services, where the EPA's NESCS framework provides a list for components of final ES and gives the user greater flexibility in how to define distinct ES (DeWitt et al., 2020 & Newcomer-Johnson, 2020). Acknowledging the strengths and weaknesses of both EPA frameworks, the EPA developed NESCS Plus to combine the desirable features of both, thus in attempting to further provide clarification of two existing frameworks that were built upon the MEA, a third framework within the EPA was developed, begging the question why are three frameworks needed when flexibility could have been into a single EPA framework to address concerns and be more widely applied throughout the agency and other management agencies. This diversity is excellent. Additionally, a new framework might stand a higher probability of publication in the peer-reviewed literature than a revision of an older one; scholars working with older frameworks risk not getting published, promoted, or recognized.

That said, we have found that framework proliferation has several drawbacks for practitioners. We will discuss four:

1. ES work is hard. We shouldn't make it harder by continually revising the approach;
2. Regulations often require that practitioners estimate the impacts for a given policy change. Regardless of the framework, the end result requires identification and characterization of these changes. As a result many government agencies tend to adopt one framework to implement over time.

3. Monitoring benefits from consistency. Consistency is easier to achieve with a single framework.
4. Many practitioners and academics think of research frameworks as inflexible, but sites and cultures have widely varying requirements for reporting impacts. Existing ES frameworks are more flexible than many think. We believe that working within and modifying a given framework for a particular situation is better than constantly striving to devise a more perfect one.

### **3.1 ES work is hard; we shouldn't make it harder**

Effectively implementing any interdisciplinary framework is challenging. ES frameworks require cooperation and shared understanding across social and natural sciences and across cultures. Ainscough et al. (2019) discuss the need for three types of knowledge-systems, normative, and transformative- in addressing issues related to sustainability. That is, anyone practicing in a sustainability-related field needs to know not only the information relevant to different disciplines and material (systems), how any system “ought to be” (normative), and then the skills and knowledge of how to get a system to that point (transformative). While systems knowledge may be taught in training programs, normative and transformative knowledge-judgement- rarely is (Faber 2008). Ainscough et al. also found that ethics were rarely mentioned in ES publications.

Each discipline has its own ‘language’ which shapes how its practitioners communicate, and each culture has its own identity and value systems (MacLeod 2018). Even environmental or ecological economists might not know much about how ecological systems or ecologists work. Conservation practitioners often have expertise in a particular field (e.g., marine ecology), taxon (e.g., toothed whales), or region (e.g., tropical nearshore waters), but not in economics or other social sciences.

Social scientists don't always see eye to eye. Anthropologists and economists don't share the same cosmology. Psychologists or political scientists might be closer to economists in some way, but are trained quite differently. Finally, none of the social sciences share the



same root training as nearly all the natural sciences (e.g., all undergraduates will take a similar set of science classes whether they major in physics or biology). Adding different cultural worldviews further increases the energy required to produce results that can be supported by everyone involved.

Practitioners sometimes know that there are several frameworks. The proliferation of frameworks increases the level of uncertainty as to which is ‘the best’ or ‘the most current’ and can make learning one particular framework challenging. Flood et al. (2020) point out decisionmakers’ need for a simple to use approach to integrate ES into science-policy matters, and that even if researchers feel they might be oversimplifying a concept, decisionmakers still need a simpler version. All of this demonstrates that simply integrating an ES frame onto existing planning processes is challenging and time consuming. However, Ainscough et al. found that problem-oriented, as opposed to disciplinary approaches have “most successfully created spaces where the knowledge and understandings from multiple disciplines are being integrated.”

### **3.2. Regulation/Requirement**

In the United States there are several regulatory requirements that require the evaluation of ES (see Harwell 2020). It is important to note that not all of these regulations specifically use the term “ecosystem services,” as this terminology did not gain popularity until the early 2000s. We will highlight a few of these regulations here. The National Environmental Policy Act (NEPA), enacted in 1970, requires all federal agencies to analyze the affected environment and the economic impacts of proposed policy changes. When environmental quality or access to resources improves or declines, the level of ES also changes; agencies seek to qualify and quantify these changes as they apply to different user groups.

The Regulatory Flexibility Act, originally passed in 1980, requires agencies to consider the impact of regulations on small businesses. Many businesses rely on healthy environments and the services they provide (e.g., dive boats and fishing charters, tourism venues). Like

NEPA, this act recognizes that changes to environmental quality or access may also impact businesses. To meet this mandate, agencies seek to describe any potential impacts.

A presidential memorandum (White House 2015), directly addresses and incorporates ES into federal decision making. Given these requirements, agencies will choose a framework to use that meets the requirements of regulations and executive orders. Implementing a new framework takes staff time, training and dedication, and continually changing the framework creates inefficiencies. Promoting flexibility within one framework allows consistent implementation across time and geographies, while still meeting the site and governmental needs.

### **3.3 Monitoring**

Long term monitoring requires consistency. The ES concept is fairly well defined, but its frameworks and applications continue to evolve. Unlike in ecology, long-term monitoring programs in social science research are rare; an ES framework creates a unique opportunity to monitor both ecological and social changes over time. However, continually changing the framework makes consistency difficult and may actually lead to confusion. An executive summary or infographic might not explain that the underlying framework has changed over time, and a reader might make inappropriate comparisons with the study results.

### **3.4 Confidence**

We have both worked with experts from different fields to assemble ES inventories. We have trained practitioners to do the same, and to use ES for monitoring. We've found that people can find it difficult to both apply an unfamiliar framework and allow for flexibility in that application. In our experience, the literature and conversations with others, adaptability is key when doing original ES work. This is especially true when the worldview of a particular framework is incongruent with the worldview of a culture receiving those services or involved in managing a given area. Adaptability requires a certain confidence. Confidence can come with familiarity, but it also requires the belief that what you're doing is appropriate and correct.

We consistently urge practitioners to find what works for their particular situation. “Situation” in this case doesn’t just mean a set of biotic or socio-economic indicators for a particular patch of ground or ocean. It also means the integration of multiple worldviews across cultures. Shakespeare’s (1917) King Henry says, “We are the makers of manners, Kate.” Economists, thankfully, are not royalty, with power to dictate customs, but we all have roles to play in directing the evolution of ES science and its application. We have found it crucial to instill a sense of ownership in that process, to help everyone on board become the makers of manners.

#### **4. Discussion**

We have discussed some background on ES, reasons why scholars and practitioners might be drawn to create new frameworks for examining the link between humans and nature, and why we think it advisable to use caution on that front. Now we will discuss some support from the literature pertinent to our position, some possible opposition to our arguments, some recommendations about how to proceed, and provide an example from our shared work.

Ainscough et al (2019) examine trade-offs between ES as a boundary object and policy and decision makers’ needs for greater standardization. Through analysis of survey data, they found a number of interesting perspectives. One recommendation was that incorporating social and cultural values into decision making was seen by many participants as an “important step in the future development of the ecosystem services concept.”

Below we will enumerate and respond to some possible arguments against our argument.

1. One response to our assertion that ES is hard is to say “all science is hard. Why should these practitioners get a break?”

Fair enough. But it has repeatedly struck us that it is quite important to reduce what economists would call the ‘transaction costs’ of saving the planet. Behavioral economists, social marketers, and public health experts all know that making crucial tasks easier is essential to their uptake. If we want to better integrate humans into conservation, we should simplify that integration. Additionally, what any of us are looking for is effectiveness, not

difficulty. Ruckelshaus et al. (2015; 12-13) discuss four pathways to successfully informing decisions and creating change in conservation and biodiversity/ecosystem services work. They point out that while multiple publications might be effective, the more effective approaches tend to involve stakeholder development of a given framework or approach, and an evolving approach to deepening familiarity with a given framework. They also point out in their 'Cross-Cutting Lessons' section (18), "[n]o matter how much interdisciplinary scientists think they are oversimplifying biophysical or socio-economic processes, decision-makers typically ask for simpler, easy-to-use and understandable decision support tools that can be readily incorporated into science-policy processes. In our experience, even simple tools are plenty complicated for parameterizing and interpreting at early stages of applying BES information."

2. Regulations require a framework. Sure, but shouldn't they require the best one?

Yes, of course. But what does that mean? It's possible that the 'best' framework is the one optimized over time with consultation across many expert and stakeholder constituencies. Ruckelshaus et al. (2015) comment on this fairly extensively. It's also possible that the 'best' framework is the one modified for a particular situation. Given the exigencies of protecting marine ecosystems (for example), it seems irresponsible to waste much more time on perfecting something. Piet et al. (2020), among others, discuss the need for an iterative approach to ecosystem-based management. The needs of a given area or patch are distinct, and the process required to develop good management frameworks will vary somewhat from patch to patch.

3. Consistency over time. Does consistency with an imperfect framework matter?

Yes. Comparability across years is crucial. The cost of waiting for an ideal framework, or the cost of switching frameworks in the middle of a process most likely outweighs the benefit of being able to compare consistent reporting. Again, following the guidance of Ruckelshaus et al. (2015) and Piet et al. (2020), developing an iterative and adaptive approach will yield what might be the best outcome anyway.

4. Developing confidence. Might this confidence override professional judgement?

Not out of the question. It is possible that in seeking a perfect fit with local conditions or cultural norms, practitioners will make decisions resulting in double counting or which run counter to monitoring methods in nearby but culturally different regions. However, as with many of the above arguments, we maintain that openness and flexibility are more important than rule following at this stage for this purpose.

An example of allowing flexibility while maintaining the same basic structure across time and space comes from NOAA's Office of National Marine Sanctuaries (ONMS) Condition Reports process. Condition Reports are scientific summary documents developed with input from staff, other government agencies, academics, users, and tribal and indigenous communities. Based on the Drivers-Pressures-State-Ecosystem Services-Response (DPSE) approach, they evaluate resource conditions in the context of these categories. In addition to rating status and trends of natural and cultural resources, human pressures on resources and management responses, teams also evaluate drivers and ES. Condition Report procedure is to rate the status of any of 13 ES that are relevant to a sanctuary, including "sense of place" and "heritage." Teams have five options for ratings, ranging from "good" to "poor," based on the capacity to provide them, and whether management is required to restore that capacity. Teams also rate trends as "improving," "declining," or "stable."

Like many federal agencies, ONMS works with native and indigenous peoples. In January 2020, ONMS held a workshop to evaluate the status and trends of ecosystem services provided by Olympic Coast National Marine Sanctuary (OCNMS). The sanctuary works with four Coastal Treaty Tribes, the Quinault Indian Nation, and the Hoh, Quileute and Makah Tribes. This was only the third condition report for the sanctuary system to include drivers and EAS and the second to work with native people. The first, Channel Islands National Marine Sanctuary Condition Report, involved the Chumash tribe, who opted to provide their own independently-authored ES assessment. Their assessment stated "The Chumash perspective on ecosystem services is different from that presented elsewhere in the

[condition] report” ([ONMS](#), 2016). In this example, the Channel Islands report provided an analysis of ES and included separate assessment by the Chumash that was consistent with their world view.

Olympic Coast National Marine Sanctuary wanted to provide a single analysis for each ES rather than separate assessments by ONMS and the Tribes. But the Olympic Coast tribes have been living in the region for thousands of years. To simplify their long history, heritage and cultural connections to the land and sea to status and trend ratings is inconsistent with their world view, and would be disrespectful.

As a result, ONMS held a stakeholder workshop in May 2020 to discuss how to create flexibility within the DPSER framework and condition report process. The workshop included sanctuary staff; resource protection specialists, maritime and cultural experts, economists, natural scientists and native and indigenous peoples. The group decided that where a site and community felt it appropriate, instead of rating a given ES, staff and workshop participants would develop a context-specific narrative, which would be reviewed by community members.

During the workshop other considerations were also discussed. For example, in American Samoa, native staff stated that in their cultural tradition, it was not always acceptable to even talk about certain practices as ES. They are simply aspects of their culture. Furthermore, staff from both Hawai'i and American Samoa pointed out that certain activities that the MEA might consider as 'recreation' were not seen as recreational by their societies. A Hawai'ian colleague recommended that we consider assessments of 'humans' contribution to nature' as part of a list of cultural ES.

As a result of this work, ONMS staff can now skip rating an ES and instead provide an appropriate narrative. Further, ONMS is committed to considering the reciprocal relationship between humans and nature - not focusing solely on how people benefit from nature, but the ways in which people live in harmony with nature and the depth of that relationship.

This openness and flexibility does several things. It provides indigenous peoples with different approaches to gaining knowledge about and access to the decision-making

process. It also makes for a more regionally accurate catalog of impacts and services. It helps staff who are trained in Western scientific approaches recognize, respect, and account for differences in perceptions of nature and our relationship to it, thus reducing friction or conflict between groups or individuals. Lastly, flexibility reduces the need to continually retrain staff to new frameworks.

Most ES frameworks in wide use undergo regular revision and updating. Researchers want to build new frameworks for better integrating new knowledge. This process should not stop, and recommending that it does would be worse than pointless. Rather, people who work directly with practitioners should recognize and respect their own particular constraints, and develop patience with the “imperfections” of existing frameworks. This helps ensure that the perfect does not hinder the good. Modifications in the field should also filter back to the academy. This is already happening; practitioners we work with often stay in touch with groups that regularly do these sorts of updates. Finally, a hybrid approach which combines aspects of different frameworks with local variations, might be best for specific cases.

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Photo Credit [ Left to Right ] : Robert Schwemmer/NOAA

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Caption [ Left to Right]: Members of the Chumash community paddle a traditional redwood plank canoe (tomol) at sunrise. National Marine Sanctuary of American Samoa



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