Sagoff on Ecosystems as Self-Organizing Systems

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In “What Does Environmental Protection Protect?” Mark Sagoff confronts the titular question, which is fundamental to environmental science, philosophy, and policy. Rather than elucidating the article’s many praiseworthy features, my role here is that of critic. I focus on the section entitled, “Ecosystems as Self-Organizing Systems,” aiming to unpack its argument, object to it, and clarify its normative upshot.

 Sagoff’s critical discussion of the claim that natural ecosystems are complex adaptive systems (henceforth CAS) raises at least three questions: (1) a conceptual/normative question about the coherence, usefulness, or other value of conceptualizing natural ecosystems as complex adaptive systems, (2) a metaphysical question about the existence such things, and (3) a methodological question about whether (and how) *an ecologist* could test CAS. I concentrate on how Sagoff’s answers to the conceptual/normative and methodological questions relate to each other and his overall goal.

Sagoff begins by quoting multiple ecologists who endorse CAS. More specifically, those ecologists claim that natural ecosystems are rule-governed systems with organizational properties (like being self-organizing or composed of co-evolved entities) that emerge from relatively low-level phenomena. Sagoff responds that “none of this makes sense” (this issue, p. 16) because CAS cannot be tested. To explain, he argues thus (this issue, p. 17):

1. Assume heirloom (natural) sites are complex adaptive systems and so have organizational properties that hodgepodge (synthetic) sites lack.
2. Ecologists (as scientists) can in principle tell by observation whether a thing is a unicorn or elephant, because they can in principle detect the properties mentioned in the definitions of such things using the tools of their trade.
3. The only way to distinguish heirloom from hodgepodge sites is by historical documentation and stipulation.[[1]](#endnote-1)
4. Thus, ecologists (as scientists) cannot (even in principle) tell by observation or experiment whether sites are heirloom or hodgepodge, because they cannot (even in principle) detect the organizational properties attributed to natural ecosystems by proponents of CAS.
5. Therefore, there is no *ecological*[[2]](#endnote-2) way to test CAS, though there is a historical/stipulative way.[[3]](#endnote-3)

Premise 4 relies on the idea that scientists can in principle determine whether a coherent concept of a concrete object is applied correctly to any observed thing, because scientists can in principle detect the properties mentioned in the definitions of such things. So if *X* is a coherent concept of a concrete object, scientists can in principle apply *X* correctly. Since ecologists cannot even in principle apply the concept of a natural ecosystem as a complex adaptive system correctly, it is not a coherent concept of a concrete object. The concept is either incoherent or of an abstract, theoretical object.[[4]](#endnote-4) If the former, it should be abandoned. If the latter, natural ecosystems are not the kind of thing that policies can or should protect.

 To get from premise 3 to premise 4, one must think that using historical documentation and stipulation precludes being scientific and that to use the concept of natural ecosystems appropriately, scientists must be able to tell whether sites are heirloom or hodgepodge without such tools. But why think that? Scientists frequently use those tools. For instance, oncologists categorize patients as in remission or not based on historical documentation and stipulation, but that is not reason to abandon the concept of remission. Similarly, if one could use the fossil record to determine that all of a site’s species had been present for an evolutionarily significant timespan, then one could establish (scientifically) that the site is constituted by co-evolved entities and thus is a natural ecosystem according to one stipulative definition consistent with CAS.

In Sagoff’s argument, an implicit account of science (specifically ecology) does a lot of the work. It identifies (a) what tools and methods are characteristic of the discipline, (b) what it is possible to do with those, and thus (c) how this discipline is separable from others. Ecologists and philosophers of science can and do disagree about all those claims. One could object to the narrowness of Sagoff’s account relative to (a) and (b), and to its claim about disciplinary separability. By relying on this wholly implicit account, Sagoff leaves premise 4 inadequately defended.

Furthermore, premises 3 and 4 are both claims about what is possible. In Sagoff’s argument (this issue, pp. 17-18 and related endnotes), neither is defended. Nor does the earlier material about the history of the EPA and ERA provide evidence for a claim about what ecologists *cannot* do; historical material only provides evidence for claims about what a specific group of ecologists *have not* done and what is in general *difficult* for ecologists to do.

Nevertheless, suppose the argument can be defended. Then what should we do? In the penultimate sentence of the section, Sagoff says ecologists have considered abandoning the ecosystem concept (this issue, p. 18). Maybe everyone should do so. However, that claim is in tension with Sagoff’s suggestion that people studying natural history rather than abstract theory can contribute to environmental protection (this issue, p. 4) and the absence of an argument that *historians* should abandon the ecosystem concept.

If we embrace the claim that historians can use the concept of a natural ecosystem as a complex adaptive system while ecologists should not, we face practical obstacles. Many people are ecologists *and* historians, alternately or simultaneously. Insofar as this is so, it may be psychologically difficult or impossible to compartmentalize these disciplines’ conceptual resources.

Sagoff might be agnostic about historians, simply believing that *ecologists* should abandon this concept. This is more promising. However, Sagoff only argues against the concept of a natural ecosystem *as a complex adaptive system*. There might be a different, still *ecological* definition of natural ecosystems against which objects can be tested using ecologists’ tools, whatever those are. Of course maybe any replacement should, as Sagoff would suggest, be less abstract and more grounded in knowledge by acquaintance.

Despite his emphasis on concepts, Sagoff’s recommendation might not be primarily about a concept we should abandon; it might be about a claim we should believe. The section’s last sentence (Sagoff, this issue, p. 18) quotes O’Neill’s statement that there are no “integrated, equilibrial, homeostatic” ecosystems. This is an unsupported metaphysical claim; it is neither the conceptual/normative nor methodological claims previously discussed.[[5]](#endnote-5) Furthermore, the claim originally under scrutiny was CAS, which does not entail that natural ecosystems are equilibrial or homeostatic. If anything, since co-evolved entities evolve continuously, CAS suggests that natural ecosystems composed of them are not static and could only appear equilibrial under certain restricted timeframes. So even if the metaphysical claim is true, it does not contradict CAS.

Alternatively, Sagoff’s recommendation might be that ecologists should not try to determine endpoints for ecological regulation. His criticisms might target only ecologists who attempt to set regulatory goals using the concept of a natural ecosystem as a complex adaptive system, since such goals would refer to organizational properties for which they cannot test. However, this does not foreclose the possibility that this very concept of a natural ecosystem might be appropriate in other contexts. Perhaps historians, artists, or others should set regulatory goals, and in doing so refer to complex adaptive systems and their organizational properties.

Despite Sagoff’s article’s strengths, the argument outlined above would benefit from greater support for its possibility claims, defense of its implicit account of ecology, and clarification of the normative, action-guiding conclusion we are meant to draw if we accept the argument.

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References

Sagoff, M. (2013) What Does Environmental Protection Protect?, *Ethics, Policy & Environment*, 16, pp. 1-36.

Notes

1. It is unclear how important ‘stipulation’ is and what Sagoff sees as being stipulated: (a) that there is any difference whatsoever between heirloom and hodgepodge sites, or (b) that the two kinds are differentiated by the specific organizational properties under discussion. [↑](#endnote-ref-1)
2. Sagoff introduces the argument by foreshadowing a stronger conclusion, without the modifier ‘ecological’ or the final clause (this issue, p. 17). However, his noun choice indicates that *scientists* are his subjects throughout, and the argument would be invalid without the modifier (given premise 3), so I prefer this recreation. [↑](#endnote-ref-2)
3. The conclusion is not that heirloom sites lack the organizational properties they are purported to have, nor that hodgepodge sites have them; the argument is not a *reductio* of premise 1. [↑](#endnote-ref-3)
4. Sagoff does not use ‘incoherent,’ preferring ‘magical thinking,’ ‘faith,’ and ‘myth’ (this issue, pp. 17-18), so it is unclear whether he thinks the concept lacks coherence, usefulness, or another value. I use ‘incoherent’ to simplify the exposition. [↑](#endnote-ref-4)
5. A possible supporting argument is: (A) If there is no (scientific) way to test whether *X* is *F*, then there is no *X* that is *F* (that is, the concept has no application). (B) There is no (scientific) way to test CAS, so (C) there are no natural ecosystems that are complex adaptive systems. I cannot engage with (A) here; my worry is that (B) is inadequately defended. [↑](#endnote-ref-5)