Gunderson, L. 2013. How the Endangered Species Act promotes unintelligent, misplaced tinkering.
Ecology and Society **18**(1): 12. http://dx.doi.org/10.5751/ES-05601-180112

Response, part of a Special Feature on Law and Social-Ecological Resilience

How the Endangered Species Act Promotes Unintelligent, Misplaced Tinkering

Lance Gunderson [1]

In her thoughtful article Melinda Harm Benson (2012) borrows the phrase 'Intelligent Tinkering' from Aldo Leopold (1949) to discuss relationships between resilience theory and one of the most powerful environmental statues in the US. The Endangered Species Act (ESA) is a federal law that provides special consideration for about 1300+ species (USFWS 2012) that reside mainly in the United States and territories. Resilience theory has come to include a wide range of ideas that are rooted in a systems perspective or holistic framework. Moreover, resilience theory was developed to explain surprising, non-linear and unpredictable changes in complex systems (such as ecosystems or social-ecological systems).

As suggested in the article by Benson, and a large body of literature (Gunderson et al. 2009, Allen and Gunderson 2011 are two syntheses of that literature), resilience theory is one of the conceptual foundations to the approach of natural resource management called adaptive environmental assessment and management (Holling 1978, Walters 1986). Because of the complexity and unpredictability of natural resource systems, adaptive management was proposed to confront inherent uncertainties in resource systems by designing actions to test key uncertainties. In other words, adaptive management requires managers and scientists to take actions that generate learning while achieving other goals. Such an action-based approach is very consistent with a Leopoldian approach of 'Intelligent Tinkering'. Yet for the most part adaptive management has been at odds with the implementation of the ESA.

Perhaps one reason for this article and this special feature (Allen et al. *in press*) is to create a discourse on the problems created by an ecological theory of disequilibrium for environmental laws and statues (such as the ESA) that are generally based on assumptions that nature operates near or at equilibrium. The ESA, as written and applied in practice creates a management framework that limits the range of actions that managers are willing or capable of doing in the hope of stabilizing species populations. Indeed, I agree with Benson and others in this special feature, that the ESA does not promote but rather hinders intelligent tinkering with the ecosystems within which endangered and threatened species reside. In case after case, the types of management actions that are needed to test understanding and achieve multiple social objectives in these complex systems are deeply constrained and often prohibited by the ways in which the ESA is interpreted and applied. In other words, the ESA increases the gap between understanding and action.

The Endangered Species Act has become a champion law of stakeholders, environmentalists, and legal activists because of the power of the act to deter and halt federal actions, yet it has also been invoked to limit and curtail actions in adaptive management programs. Volkman and McConnaha (1993) were among the first to indicate that the ESA constrained adaptive management trials in the Columbia River basin. Zellmer and Gunderson (2009) compared the application of the ESA in the Colorado River/Grand Canyon setting with the Everglades and showed how the ESA confounds and stymies adaptive management. In all of these cases, the act has been used by legal advocates to gain political power and push other agendas such as the ultimate goals of removal of dams in western rivers, or well-meaning, but misguided, notions of biodiversity conservation (such that no intervention is the best thing for conservation). While political power and politics are ingredients in the debate about ESA and adaptive management, at the heart of the debate is a fundamental disagreement about how to manage uncertainty.

How to resolve uncertainty is one of the key barriers between the ESA and adaptive management. Adaptive management suggests that effects of federal actions cannot be totally understood or predicted before the fact (Walters 1986). In other words, the impacts of a dam on humpback chub populations (Coggins et al. 2006) or the cutting of old growth forests on spotted owls cannot be predicted with any precision. Yet, when the ESA is invoked, the uncertainty about actions and effects usually ends up in a court of law or administrative hearing with an end result of scientists seeking spurious certitude rather than testing the effects in the field.

In summary, I agree with Benson in that the ESA would benefit from a reinterpretation through a lens of resilience theory. In reframing the way in which the act is applied, the focus on endangered species management should be as much on the ecosystems within which these species reside as on the populations themselves. Also, the focus should be on restoring resilience of the populations, rather than stabilization of the populations. A listed species is one in which the resilience is decreased to the point where the population is vulnerable to extinction. It is the fear that any action will push the species

[1]Emory University, USA

into extinction that limits the ability to take actions that may be needed to restore resilience. Increasing the resilience of a listed species should be the ultimate goal of the recovery as outlined in the Endangered Species Act. The article by Benson helps move the debate in that direction.

Responses to this article can be read online at:
http://www.ecologyandsociety.org/issues/responses.php/5601

LITERATURE CITED

Allen, C. R., M. H. Benson, J. Ebbesson, A. G. Garmestani, and E. Hey, editors. *In press*. Law and Social-Ecological Resilience. *Ecology and Society* SF 78. [online] URL: http://www.ecologyandsociety.org/issues/view.php?sf=78.

Allen, C. R., and L. H. Gunderson. 2011. Pathology and failure in the design and implementation of adaptive management. *Journal of Environmental Management* 92:1379-1384. http://dx.doi.org/10.1016/j.jenvman.2010.10.063

Benson, M. H. 2012. Intelligent tinkering: the Endangered Species Act and resilience. *Ecology and Society* 17(4): 28. http://dx.doi.org/10.5751/ES-05116-170428

Coggins, L. G., W. E. Pine III, C. J. Walters, D. R. Van Haverbeke, D. Ward, and H. C. Johnstone. 2006. Abundance trends and status of the Little Colorado River population of humpback chub. *North American Journal of Fisheries Management* 26:233-245. http://dx.doi.org/10.1577/M05-075.1

Gunderson L. H., C. R. Allen, and C. S. Holling, editors. 2009. *Foundations of ecological resilience*. Island Press, Washington, D.C., USA.

Holling, C. S., editor. 1978. *Adaptive environmental assessment and management*. Blackburn Press, Caldwell, N. J., USA.

Leopold, A. 1949. *A Sand County Almanac, and Sketches Here and There*. Oxford University Press, New York, U.S.A.

United States Fish and Wildlife Service (USFWS). 2012. *Endangered Species Program*. [online] URL: http://www.fws.gov/endangered.

Volkman, J. M., and W. E. McConnaha. 1993. Through a glass darkly: Columbia River salmon, the Endangered Species Act and adaptive management. *Environmental Law* 23:1249-1272.

Walters, C. J. 1986. *Adaptive management of renewable resources*. Macmillan, New York, N.Y., USA.

Zellmer, S., and L. Gunderson. 2009. Why resilience may not always be a good thing: lessons in ecosystem restoration from Glen Canyon and the Everglades. *Nebraska Law Review* 87:894-947.