THE CHRONICLE OF HIGHER EDUCATION

THE CHRONICLE REVIEW

Is There Really Balance in Nature?

By Kathryn M. Flinn | NOVEMBER 08, 2015

When, as an undergraduate, I took a course on Shakespeare, the syllabus included a plea: "Please, in the name of all that is holy, do not call Shakespeare 'the Bard.' "

Now I teach ecology, and I often wish to issue a ban of my own on the phrase "the balance of nature." Students constantly refer to the "delicate balance" of an ecosystem, or to human activities "disturbing the balance" — and no wonder. The "balance of nature" pervades science reporting from NPR to *The New York Times.* I cringe every time I see it — this concept has been dead to most ecologists for at least 30 years.

S. Mark Weidman, Alamy

Hearts Content, a 120-acre old-growth tract within the Allegheny National Forest, in Pennsylvania, has been intensively studied by ecologists.

Another reason to wince at the "balance of nature" is that no one really knows what it means. In a 2007 study, the psychologist Corinne Zimmerman and the biologist Kim Cuddington analyzed hundreds of college students' opinions on the subject. The majority had a strong belief in the balance of nature, and many connected it with constant population numbers, stable species interactions, or an absence of disturbance. But the various definitions showed rampant ambiguity, circularity, and contradiction. In fact, the ecologist Daniel Simberloff recently labeled the phrase a "panchreston" — meaning everything and nothing.

The persistence of the idea of a "balance of nature" might seem like a simple failure of communication between scientists and laypeople, a mere time lag between scientific advancement and public acceptance. Certainly this is part of it. But when I quit excising "balance of nature" with red ink and started discussing it, I found a more complex debate both within and beyond the scientific community — a conversation that fundamentally questions the uses and limits of science.

Most definitions of the "balance of nature" do agree on a few essentials, which the ecologist Daniel Botkin has distilled into three postulates: Nature undisturbed is constant; when disturbed it returns to its original condition; and that constant condition is good and desirable. This means that a particular population of fish will tend to stay at a constant number, the maximum its environment can support. If we reduce the population by overfishing, and then we stop fishing, the population will return to the same, maximum number. Likewise, a forest will tend to have the same species of trees indefinitely, species suited to their environment. If we clear the forest, the same species of trees will eventually grow back.

These ideas have not held sway from antiquity to the present without a deep, intuitive appeal. As humans, we often experience nature as stable — or at least more stable than our own lives. We seek out landscapes that remain the same. I

like to revisit the old-growth hemlocks at Hearts Content, in northwestern Pennsylvania, to remind myself that these trees keep growing despite our comings and goings. We also sometimes witness nature creeping in and taking over — and we love comeback narratives, in which forests reclaim abandoned farms or steelhead trout spawn in a river that once caught fire.

If there is no inherent balance to protect or restore, our conservation goals must be based on human values.

Early ecological work supported this intuition. Scientists saw fish-population numbers growing to a maximum, then remaining constant. Predators and prey, like the lynx and the hare, kept each other in check. Forests, once cleared, redeveloped through predictable stages, apparently on their way to becoming the permanent, mature forests they had been before, in sync with their soils and topography.

But as ecology matured in the late 20th century, constancy became increasingly problematic. In 1990 the historian of science Donald Worster described "a new ecology of chaos," in which the only constant was directionless change. Cleared forests might develop along several possible paths. They might never grow to resemble past forests. Even if they did, certain trees succumb to insects, earthworms invade, deer populations boom, climates change, a few rare plants wink out, and a lot of exotic plants move in. Even at Hearts Content, you can’t step in the same forest twice.

This emphasis on chaos and change almost became a new orthodoxy among scientists. But if the assumption that all nature has an orderly balance is mythological, so is the assumption that all nature consists of a welter of randomness. Neither dogma can capture the stability or resilience of real ecosystems. These are topics for empirical study, and increasingly, ecologists are finding interesting answers.

To measure stability or resilience, ecologists first have to decide which properties of ecosystems matter. Much research on stability has measured variation in productivity — the mass of vegetable matter an ecosystem produces over time. Scientists know much less about variation in other ecosystem components we might care about, like species diversity or composition. And although ecologists have learned a lot from short-term studies in tractable systems such as artificial grasslands, it is unclear how well the findings translate.

As usual in ecology, scale matters. What varies from plot to plot may appear constant across a larger area; what fluctuates over shorter time periods may remain stable over many years. At the largest scales, all ecosystems are finite and transient. This shouldn't stop researchers from quantifying stability in ecologically important properties and on ecologically relevant scales.

The biologist James Brown and his colleagues examined 22 years of rodent censuses in the Chihuahuan desert of Arizona, 50 years of bird surveys from northern Michigan, and 10,000 years of pollen fossil records from Europe. In all three cases, the number of species at a site remained remarkably constant, despite large changes in the identity of those species as environments changed. Based on these and other examples, the researchers make the provocative suggestion that the diversity of ecosystems may remain relatively constant over time. Could this form a new definition of "balance"?

Many ecologists are also asking whether some ecosystems are more resilient than others, and what attributes would cause this resilience. In 2014, David Wardle and Micael Jonsson compared the responses of 30 forested islands in Sweden to experimental trimming and burning over 14 years. Plant diversity and composition recovered from burning faster on larger islands, which were more fertile and productive but less diverse. This could mean that we should expect more-productive habitats to show more resilience. However, the larger islands could also have been faster to recover simply because they lacked a particular, slow-growing shrub. Results like these should spur further efforts to figure out which ecosystem properties actually create resilience.

We can translate Botkin's first two tenets of the "balance of nature" concept into testable hypotheses — that specific ecosystems are stable in specific ways, that specific ecosystems are resilient in specific ways — and science is making progress by testing them. But the third tenet, that nature's constant state is good and desirable, moves beyond science to ethics. It suggests that humans, the implied agents of disturbance, should not interfere. This argument is seductive because it gives us a well-defined role. To my mind, it makes the concept of the "balance of nature" not just obsolete and ambiguous but actually dangerous.

Laissez-faire conservation is both practically and intellectually easy. If each ecosystem has one stable state that science can discern, conservation goals become clear. Plus, our main responsibility is to do nothing. But if there is no inherent balance to protect or restore, then we have to generate our own conservation goals, based on human values. We can no longer ask science to discern what is good and desirable. And once we're choosing what is good and desirable, we can no longer pretend we're not interfering.

This active, post-"balance of nature" conservation scares many people, in part because our choices tend to be self-serving, and our interferences often have unintended consequences. But conservationists increasingly recognize it as the only option. Many are optimistic. More and more environmental thinkers advocate embracing our participation in ecosystems. Scores of prominent conservationists are celebrating not only classical wilderness but also the wildness in our backyards and urban centers. Active approaches such as rewilding and assisted migration are gaining support.

The journalist Emma Marris, for one, in her 2011 book *Rambunctious Garden,* proposes a single solution to address a whole menu of subjective conservation goals. She emphasizes preserving open land, whether it's an ideal native landscape or a "trash ecosystem" — regardless of whether it fits our notions of balance.

But prioritizing multiple, often conflicting goals is difficult — and then there's the work of actually taking action. To the extent that conversations about balance, stability, and resilience help us work out those values and actions, we should keep having them.

For these reasons, I include the "balance of nature" in my syllabus. If it pushes students to examine their language and received ideas, distinguish questions that science can and cannot solve, and search for their own answers, then I feel that I'm doing my job.

Kathryn M. Flinn is an assistant professor of biology at Baldwin Wallace University, in Berea, Ohio.

This article is part of:
Current Issue