a literature review on trophic cascades in marine, freshwater and terrestrial ecosystems that could be useful in summarizing this information to classes. The bibliography provides a thorough literature review from classic to current literature in ecology. The last chapter provides the author's perspective on research needs to advance the fields of ecology and conservation.

The book is enjoyable to read and mixes tales of Alaskan adventure with the study of ecology. The author's love for the Aleutian Islands is evident in his description of its species and habitats and in the stories of his research as he returned almost annually to this remote region over nearly 50 years. It is an inspiring read for ecologists working in any system. My only criticism is that Estes' career was not pure serendipity, as that would imply finding pleasant outcomes that were not looked for. In hindsight, the story of his career outlines how he took advantage of unexpected circumstance to make great contributions to the field of ecology.

Ginny L. Eckert
School of Fisheries and Ocean Sciences
University of Alaska Fairbanks
Juneau, Alaska, USA
E-mail: gleckert@alaska.edu

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Coyotes finally get their own biography

Flores, Dan. 2016. **Coyote America: a natural & supernatural history**. Basic Books, Perseus Books Group, New York, New York. vii + 271 p. $27.50 (hardcover), ISBN: 978-0-465-05299-8; $18.99 (e-book), ISBN: 978-0-465-09853-8.

Key words: coyotes; extirpation; human-canid interactions; persecution; predators; urbanization; Wildlife Services.

Coyote America is a fascinating account of an entirely American wild dog, the coyote (*Canis latrans*) or trickster of Native American legends. The book does an admiral job of synthesizing how society—from early humans (i.e., Native Americans) to the modern day—relate to the coyote both in legends as well as religion. And indeed, this book places far less emphasis on the ecology of the species than on its socio/cultural and socio/political history. Author Dan Flores frequently comments on how coyotes are really avatars or an alter-ego of ourselves, whereby humans can better see ourselves for what we are: territorial, cosmopolitan in living habits, having culture, very intelligent, and succeeding even against all odds. Because the coyote is an American original whose evolutionary history has taken place on this continent, not in the Old World, Flores names the book to reflect this, especially given this species' success in a world where humans have treated it so harshly.

Flores describes the book as a biography, telling the story of the coyote from its evolution 5 million years ago, closely related to wolves, to its present incarnation as the species that we tried to eradicate, but instead ended up with in our backyards. He even states that the coyote would be a fine candidate as a national totem, given the success that it has faced even in adversity. Because of how coyotes now live all around us, people who crave to be "re-wilded" and reconnected to nature find themselves drawn to this species and all it represents.

How people pronounce this species' common name is highly illuminating. According to the author, as a general rule of thumb, people who like the animal, live in cities, and who are left-leaning say "ki-YOH-tee," and people who dislike the animal and are from more rural backgrounds say the two syllable "ki-yote." While for a decade and a half I have studied coyotes as an ecologist and worked to advance this species' conservation, I might be one of the rare people to use both terms, although I now also refer to the eastern variety of the coyote as the "coywolf," due to its mixed coyote/wolf (and a little bit of dog) background (Way, J.G. and Lynn, W.S. 2016. Northeastern coyote/coywolf taxonomy and admixture: A meta-analysis. Canid Biology & Conservation 19(1):1–7).

Themes throughout Flores' book include coyote flexibility and adaptability, coyote biology and evolution, coyote individuality, coyotes and human culture, and European settlers' war on and persecution of coyotes. The author discusses at length the past century of coyote trapping, shooting (including aerial), and poisoning—much of which is still occurring under the guise of a government wildlife management and control program called Wildlife Services, with a subset of Americans evincing an irrational hatred and even fear of predators, canids (wolves and coyotes) specifically. It is clear that Flores, like myself, is not a fan of the coyote's varmint status and the needless cruelty that humans inflict on a highly ecologically important and intelligent animal.

This treatment has historical implications. In the 1920s, society began to disfavor many of the ways that coyotes were treated as vermin, and members of

professional societies such as the American Society of Mammalogists (e.g., Joseph Grinnell and his students at UC Berkeley, Lee Dice and George Melendez Wright) began to speak out against the US Biological Survey's fervor for killing predators. It really shouldn't surprise us now that the first group of Americans (after Native Americans, of course) to finally "get" coyotes were ecologists. The Murie brothers, who studied the impacts of coyote predation on elk in Yellowstone in the 1930s, strongly advocated conserving coyotes and other carnivores.

On the other side of the coin, books such as Mark Twain's *Roughing It*, which cast coyotes in a negative light calling them "spiritless and cowardly… and a slinking… living, breathing allegory of Want," doomed them for generations and were a driving force in establishing government services to ranchers wanting to control them. The efforts of a diverse array of people, including filmmaker Walt Disney, scientists, and environmental organizations, have helped improve coyotes' image, but to this day around 70,000 members of this species are killed annually by Wildlife Services at taxpayers' expense.

Despite its subtitle, *Coyote America* is less natural history and mostly a historical account about humans' unsuccessful and unnecessary attempts to eradicate coyotes. In that sense, this book reminds me more of Rick McIntyre's *War against the wolf: America's campaign to exterminate the wolf* (1995. Voyageur Press, Stillwater, MN) and T. DeLene Beeland's *The secret world of red wolves: The fight to save North America's other wolf* (2013. University of North Carolina Press, Chapel Hill, NC) than Dave Mech's wolf ecology and behavior tomes (e.g., The way of the wolf. 1991. Voyageur Press, Stillwater, MN; The arctic wolf: Ten years with the pack. 1997. Voyageur Press, Stillwater, MN). With that said, Flores does mix in some ecology. For instance, he frequently mentions the fission-fusion society of coyotes, whereby they are much like humans in that they can survive in packs like wolves or as lone or paired animals. While I understood his point that the coyote's sociality allows for unusual flexibility among individuals, I have never heard the "fission-fusion" anthropological term applied to coyotes, but nevertheless found the comparison appropriate. However, I would note that wolves and coyotes are very similar where undisturbed in that they are highly social, family-oriented animals, with many earlier American explorers even noticing this trend, as discussed by Flores. The coyote's slighter body size and associated smaller average home range/territory and prey allow it to survive better near people. The author further notes that coyotes' evolutionary adaptations to living near a top predator (i.e., wolves) also give them many biological tools for surviving near people, such as high reproductive potential and low first age of reproduction.

The other major ecological theme that Flores discusses throughout the book is the coyote's range expansion in what he calls a reverse-direction coyote manifest destiny. The author does an admirable job of explaining how coyotes have reached just about every area–rural or urban–in North America and often mentions how persecuting coyotes (mostly) in the West has allowed them to colonize most of the East. While this is a common notion held by many scholars, I disagree with this premise, as there is little doubt that even if all coyote control ceased, coyotes would still have colonized the many areas that they did. The reason for this is threefold: (1) improved coyote habitat where humans converted forests to farmland, reminiscent of the "native" prairie habitat where this species was first observed by European explorers, and which offers abundant small- and medium-sized prey; (2) the long-distance (up to hundreds of miles from their natal range) dispersal of young coyotes for survival and reproductive purposes; and (3) most importantly, wolf extirpation, which allowed young dispersing coyotes to colonize new habitat with little competition or fear of getting killed. Thus, it is important to note that the widespread persecution of coyotes and their colonization of most of North and Central America are likely two different things. Flores would likely agree with me, especially since in the beginning of the book he describes how across history animals and plants have colonized new land with changing environmental conditions. For instance, fossil remains show coyotes living as far east as Pennsylvania in the late Pleistocene.

Toward the end of the book, Flores describes how coyotes hybridized with wolves and dogs to produce "coywolves," or eastern coyotes, as they colonized Eastern North America. This is yet another eerie similarity that the coyote shares with people, since we are also the product of hybridization with two earlier human species which contributed to our modern DNA profile. The notion of the prevalence of coyote hybridization with wolves has come more to the forefront due to recent DNA studies on red wolves (*Canis rufus*) and eastern wolves (*Canis lycaon*).

I appreciated how Flores frequently compares the similarities, or avatar likeness, of humans and coyotes throughout the book, including our collective hybrid background and wide range. He clearly admires coyotes, calling them "an occasional magic show of life… making us more American the more we know about them." He frequently mentions how they are not a threat to people and modern lifestyles. In fact, an important theme throughout the book is how cities are resource-rich ecosystems that provide high-quality coyote habitat. In other words, it is unreasonable for people in cities to expect that urban wildlife, such as coyotes, not be there. Flores points out that coyotes, even in historical records, were frequently associated with humans. In fact areas of high human density now function as 21st century wildlife

preserves where coyotes in places such as Los Angeles, Chicago, and just about every other major metropolitan area in North America, typically live considerably longer than their rural counterparts. This, according to Flores, is a key wildlife lesson for our time.

I liked *Coyote America*. It was well written and easy to read. I strongly recommend it as essential literature in university courses on environmental studies, wildlife management, and general ecology and public policy. This book will appeal to ecologists as well as to a general audience seeking to better understand how modern humans have treated coyotes and build a new paradigm for a reformed and more holistic vision of how to manage coyotes with respect and compassion. The book has an excellent index along with an eight-page selected bibliography that summarizes many of the seminal works that the author used to write his book.

In sum, the reader will come away with a better historical context of coyotes and why they are important to all Americans. A copy of *Coyote America* should be given to all legislators to help in making informed and more cost-efficient and humane wildlife policies.

Jonathan Way

Eastern Coyote/Coywolf Research
89 Ebenezer Road, Osterville
Massachusetts 02655 USA

E-mail: easterncoyoteresearch@yahoo.com

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Ecological surrogates—Are they here to stay?

Lindenmayer, David, Philip Barton, and Jennifer Pierson, editors. 2015. **Indicators and surrogates of biodiversity and environmental change**. CRC Press, Boca Raton, Florida, USA. xii + 203 pp. $79.95 (paper), ISBN: 979-1-4987-4870-4.

Key words: bioindicator selection; ecological surrogates; knowledge gaps; management relevance.

Although surrogates and indicators of biodiversity have come under criticism, a new book meets the controversy head-on with a simple statement: as long as there are limits to resources and time, quantifying every aspect of an ecosystem is unrealistic and surrogates are necessary. And if these surrogates are necessary, so also is a measured and deliberate approach to their use and evaluation.

Indicators and surrogates of biodiversity and environmental change, edited by David Lindenmayer, Philip Barton, and Jennifer Pierson, is not necessarily a compendium of the state of the science, but a carefully constructed summary of where we are now and where we need to go. This book will be valuable reading for ecologists, conservation professionals, and managers, as well as for novices who are willing to wade through some technical terminology to obtain an incredibly useful understanding of ecological indicators and surrogates.

One of the clever constructs of the book is the structure the editors asked the authors to follow: identify ten points that address (1) things we know, and (2) knowledge gaps. At its best, this format provides an excellent framework for assessing the existing science and the next research frontiers. The authors were obviously charged with keeping these summaries concise. The 2–4 paragraph structure for these sections led to easy, focused reading, which was as enjoyable as it was informative. Chapter 10 is a strong example of this, as it clearly lays out key points in the categories of known and not-known, all within the context of applying bioindicators in freshwater ecosystems.

Yet some chapters lost the organizational vision along the way. Certain authors clearly chose to organize their chapters without adhering to the framework of known and not known. The "knowledge gaps" sections are diverse in their interpretation: some chose to make this section more about paths forward, while others blurred the lines between what we know and don't know throughout. The downfall is that this leaves the reader feeling unclear about the key steps to identify appropriate indicators for understanding complex ecosystems.

The editors state early in the book that terminology is a challenge in the field of ecological indicators and surrogates. Thus they chose to leave decisions about vocabulary and definitions to the authors themselves. Some chapters include glossaries, which are extremely valuable for non-specialists who are less familiar with indicators and surrogates. Other chapters that did not opt to include glossaries could have benefited greatly from the chance to clarify and define terms, including the occasional unexplained acronym.

The book achieves its best goals when the chapters provide an overview of the state of the science along with specific information about resources and ongoing initiatives. This is excellently done in Chapter 6, where the author gives an overview of decision theory and its use for selecting biodiversity indicators. There are many regional and international initiatives that have faced the challenges of selecting surrogates. For example, the IUCN Climate Change Flagship Species program relied