A Brief History of Conservation Biology
R. Noss

definition:

“Conservation biology is science in the service of conservation”
First known mention of conservation biology in the literature…

“In the new and growing field of conservation biology…”

-- Opening line of article by Errington and Hamerstrom (1937) on ring-necked pheasants in the inaugural issue of the Journal of Wildlife Management
“Ducks and Deer”
Proto-Conservation Biologists of the Early 20th Century

- Henry Cowles (e.g., Indiana Dunes, 1899)
- Victor Shelford (student of Cowles…)
- Arthur Tansley (coined “ecosystem”)
- Charles Elton (*Animal Ecology*, 1927)
- Aldo Leopold (*A Sand County Almanac*)
- Joseph Grinnell, Joseph Dixon, C.C. Adams, Herbert Stoddard, Paul Errington, and Adolph, Olaus, and Margaret Murie
- George Wright and Ben Thompson (National Park Service)
Victor Shelford

First president of Ecological Society of America (1916) and conceptual "father" of conservation Biology

*Naturalist’s Guide to the Americas* (1926)

Shelford dressed for the field at Reelfoot Lake, Tennessee, in 1937. Photo courtesy of Eugene Odum.
Goal, Ecological Society of America

“A nature sanctuary with its original wild animals for each biotic formation”

Approved, along with other principles offered by Shelford, by the ESA board and membership in 1931

• Helped bridge gap between resource management and ecology (for a while…)

• Personal friend of Charles Elton and John Weaver. Wrote essays incorporating the cutting-edge ecological principles of his time (i.e., the food pyramid, nutrient cycling, top-down regulation of prey populations by predators)

• Served as President of both The Wildlife Society and the Ecological Society of America and was a member of Shelford’s preservation committee

- Recognized both instrumental and intrinsic values in nature
- Game Management (1933), defined as “the art of making land produce sustained annual crops of wild game for recreational use”
- Later (1949, 1953) he wrote: “The last word in ignorance is the man who says of an animal or plant: ‘What good is it?’ if the land mechanism as a whole is good, then every part it good, whether we understand it or not.”
Leopold’s Land Ethic

• “A land ethic changes the role of *Homo sapiens* from conqueror of the land community to plain member and citizen of it. It implies respect for fellow citizens and respect for the community as such.”

• “A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.”
From: Noss (1992)

AN ETHICAL SEQUENCE

self
inger group
tribe
religious group
nation, own race
other races,
nations, people of
sentient animals
all other species
ecosystem-land-earth
Conservation biology today reflects its ethical roots, as espoused by Leopold and others

- **Value-laden**: Recognizes intrinsic as well as instrumental value in nature
- **Mission-oriented and problem-solving**, much like medical science
- **Evidenced-based** (or should be)
- **Instead of preventing disease and maintaining human health**, emphasis is on preventing extinctions and maintaining the health and integrity of the biosphere
Early Support for Use of Island Biogeographic Principles in Conservation

- Studies of land-bridge islands, isolated by rising sea levels after the Pleistocene, showed loss of bird species over time (e.g., Diamond 1972, Terborgh 1974)
- Loss of species from small, isolated nature reserves suggested similar processes were taking place (however, evidence was indirect, so open to other interpretations)
From: Robbins (1989)
Development of the Discipline and Profession of Conservation Biology

• 1969: The journal *Biological Conservation* founded
• 1970: The text *Biological Conservation* written by David Ehrenfeld
• 1985: Founding of the Society for Conservation Biology (SCB); Michael Soulé is first president
• 1986: Founding of journal *Conservation Biology*, David Ehrenfeld, editor, and first meeting of SCB (already 1500 members)
Michael Soulé – First President of SCB
1980s and early 1990s conservation biology: Strong interest in tropical rainforests and population viability
Reserve selection and design has always been a major theme of conservation biology, well before SCB was founded (e.g., Shelford’s committee work, 1930s)
"The National Parks do not suffice as a means of perpetuating the larger carnivores... The most feasible way to enlarge the area available for wilderness fauna is for the wilder parts of the National Forests, which usually surround the Parks, to function as parks in respect to threatened species."

A. Leopold (1949)
Early National Parks in the U.S. and Canada: Destination Tourism Financed by the Railroad Industry
Everglades National Park
- Established in 1934 to protect an ecosystem!
Reserve design “principles” were developed in the 1970s by Diamond, Terborgh, Wilson, Willis, and others. These principles were drawn from island biogeographic theory and observational data, especially for vertebrates.

They proved controversial… (e.g., Simberloff and Abele 1976)

From Diamond (1975)
UNESCO Man and the Biosphere Program Established in 1977

Conceptual Layout of an Ideal Biosphere Reserve

- M - Monitoring site
- E - Education site

Adapted from Hough (1988)
MUMs extend the Biosphere Reserve zoning model to multiple spatial scales and many different landscape types.
Buffer Zones: Continue to Make Sense, But Have Become “Politically Incorrect”

Yellowstone National Park

Targhee National Forest
The Corridor Idea Also Goes Back a Long Way in Conservation History

Examples:


Core-Buffer-Corridor Model for Human-Dominated Regions

From Noss (1992)
Inverted Model (Reverse Matrix) for Wildland-Dominated Regions
Larry Harris (1942-2010) authored the influential book, *The Fragmented Forest* (1984), which brought “fragmentation” into common usage in conservation biology and stressed the need for corridors as well as matrix management.
One of Larry Harris’s proposed linkages in Florida, early 1980s

The Pinhook Swamp linkage is now mostly protected
MUM Network
(from Harris and Noss 1985, Noss And Harris 1986)
Florida – Proposed Statewide Network
Mid-1980s
From Noss (1987)
Beginning in 1991, the State of Florida used refined versions of Noss’s statewide network map to guide land acquisition under P-2000 and Florida Forever.
Over 80% of Panther 62 point locations within the Ecological Network.
Problem: Simplistic designs are easy to caricature for nefarious purposes (thanks, Michael Coffman, Emeritus Professor, Michigan Tech)
The Matrix Matters (Ricketts 2001). For example, this…

Kissimmee Prairie, FL
…Or this? The “binary” model of core areas vs. matrix is appropriate in some landscapes, but not in others.
Modeling approaches in conservation biology are becoming more sophisticated, for example SEPMs to explore alternative future scenarios and improve reserve network design.
Site-Selection Algorithms:

Integrate Conservation Goals for Species and Ecosystems

- Computerized mathematical algorithms linked to GIS (spatially explicit)
- Highly efficient in achieving stated goals for each conservation target (feature)
- Address 2 kinds of problems:
  - Meet a variety of biodiversity goals while minimizing net expected costs – the minimum set problem
  - Maximize biodiversity benefit (e.g., representation of features) within a fixed budget – the maximal coverage problem
Conservation Biology: A Metadiscipline?

• Brings in information from many disciplines (e.g., economics, anthropology, political science, philosophy), but dominated by biologists, especially ecologists and geneticists

• Dominated by terrestrial studies, though freshwater and marine studies increasing

• University graduate programs mostly train students for academic careers

• Still not taken seriously by most decision-makers; considered a “religion” by some right-wingers
Increasing Internationalization

Conservation biology, as represented by SCB, is still dominated by North Americans in membership (esp. U.S.), but international involvement has increased markedly. SCB now is organized as 7 regional sections, with representation on the Board of Governors. Global conferences alternate among the regional sections (i.e., now biennial, held in North America once every 14 years?). Today we have ca. 8,000 members, down from ca. 14,000.
Ecology and conservation biology are sciences of case studies.

Is every case idiosyncratic or can we develop empirical generalizations to guide us?
Theory is Important!

Four main theories on a landscape scale (Damian et al. 2008 *J. Appl. Ecol.*):

- **Patch size theory** (patch size influences species richness and composition)
- **Matrix theory** (the type and condition of surrounding matrix influences richness and composition within patches)
- **Complexity theory** (habitat structural complexity influences species richness)
- **Hierarchy theory** (both local and landscape factors influence species distributions and diversity)
The bad news…

Conservation biology is still losing the war.

Science is necessary, but not sufficient…