**~Soulé’s (1985) normative postulates~**

1. Biological diversity is good and should be preserved

2. Untimely extinctions are bad
   - SUPERKILLING

3. Evolution is good (genotypic variation) and should continue
   - process
   - extinct in the wild?

4. Ecological complexity should be maintained
   - emergent property

5. Biotic diversity has intrinsic value
   - intrinsic vs. instrumental
Biodiversity contains the accumulated wisdom of nature and the key to its future. If you ever wanted to destroy a society, you would burn its libraries and kill its intellectuals. You would destroy its knowledge. Nature’s knowledge is contained in the DNA within living cells. The variety of genetic information is the driving engine of evolution, the immune system for life, the source of adaptability.

Callicott 1997

What is Conservation Biology?
Primack Ch1, Meine et al. 2006

Talking Points:
Conversation ≠ Conservation

Do you see the irony?
What is Conservation Biology?
Primack Ch1, Meine et al. 2006

Talking Points:
Interdisciplinary

Figure 1: Cancer biology and conservation biology are both synthetic, multidisciplinary sciences. The dashed line indicates the artificial nature of the borders between disciplines and between "basic" and "applied" research. See text.

Crisis Discipline?
“In crisis disciplines, one must act before knowing all the facts; crisis disciplines are thus a mixture of science and art, and their pursuit requires intuition as well as information” (Soulé 1985).

-Noss 1999
What is Conservation Biology?
Primack Ch1, Meine et al. 2006

Talking Points:
Big Game → Biodiversity

Modern Con Bio starts in Colter’s Hell...

John Colter 1807
(~Lewis and Clark)
Yellowstone Area
Romantic-Transcendentalist Preservation Ethic vs. Resource Conservation Ethic

Preservation vs. Conservation

Utilitarian

~Romantic-Transcendentalist Preservation Ethic:
Ralph Waldo Emerson
Henry David Thoreau
John Muir
  - Sierra Club 1892
  - NGO
  - Education, Lobby, Law/Politics

Yellowstone National Park 1872
Yosemite National Park 1890

ESA 1917 --> Nature Conservancy 1950
A Successful life

"To laugh often and much; to win the respect of intelligent people and the affection of children; to earn the appreciation of honest critics and endure the betrayal of false friends; to appreciate beauty; to find the best in others; to leave the world a bit better, whether by a healthy child, a garden patch, or a redeemed social condition; to know even one life has breathed easier because you have lived."

- Ralph Waldo Emerson -

“Many go fishing all their lives without knowing that it is not fish they are after.”

“Beware of all enterprises that require new clothes.”

“It is not worthwhile to go around the world to count the cats in Zanzibar.”

“Wherever a man goes, men will pursue him and paw him with their dirty institutions, and, if they can, constrain him to belong to their desperate oddfellow society.”
"poetico-trampo-geologist-botanist and ornithologist-naturalist etc. etc. !!!!"

John Muir
(1838-1914)

Teddy Roosevelt
(president 1901-1909)

~resource conservation ethic:

Figure 1.3
Theodore Roosevelt, the twenty-sixth president of the United States (1901–1909), greatly supported the role of the federal government in conservation.
“To Roosevelt, it was clear that a handful of individuals and their companies were reaping most of the profits from natural resources that rightfully belonged to all citizens.” Van Dyke 2003, p. 10

early 1900s “Trustbuster”

Resources for use, but forever.

National Wildlife Refuge System (52 designations by TR)
Sustainable Use
Maximum Sustained Yield

USE those resources!

MSY = Maximum Sustainable Yield

Logistic Growth Curve

The growth of population of *Paramecium caudatum*
Journal of Wildlife Management (1937)
Wildlife Society Bulletin

vs.

Conservation Biology
Biological Conservation

(~movement from individual game species toward large scale and generalized approaches)

1985

the founding of the Society for Conservation Biology (SCB), with the explicit mission “to help develop the scientific and technical means for the protection, maintenance, and restoration of life on this planet – its species, its ecological and evolutionary processes, and its particular and total environment.”

(from Noss 1999)
What is Conservation Biology?
Primack Ch1, Meine et al. 2006

Talking Points:
N. American focus
    changing in last decade or so...

Modern Conservation Biology
- National Parks
- U.S.

Transferable?
What is Conservation Biology?
Primack Ch1, Meine et al. 2006

Talking Points:
...Leopold → Soulé...
Evolution of rights...

monarchs
white males
“all men”
humanity
sentient beings
nature?

(see Nash essay in Callicott 1997 chapter)
Plastic Trees in Los Angeles?

“Perhaps our grandsons, having never seen a wild river, will never miss the chance to set a canoe in singing waters.”

-Leopold

Values, Ethics, Philosophy...

**Ethics:**

constrain self-serving behavior in deference to some other good

**Tragedy of the Commons**

**Role of religions?**

interpretation...
Genuine and enduring conservation can occur only when humans knowingly use resources at less than maximum sustainable rates or forgo the use of some resources altogether. [RESTRAINT]

- Philosophy (e.g., Plato)
- Religion (e.g., Judaism)
- Nobility and their Forests


The Tragedy of the Commons

Garrett Hardin

The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.

As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility to me of adding one more animal to my herd?" This utility has one negative and one positive component.

1) The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly +1.

2) The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of -1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another. . . . But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit—in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.
Values, Ethics, Philosophy...

Systematic organization of values

Basis for estimation of worth

VALUE OF BIODIVERSITY

- Instrumental/utilitarian
- Intrinsic/inherent
Intrinsic v. Instrumental Valuation

Table 2.1
Four Categories of the Instrumental Value of Biodiversity

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goods</td>
<td>Food, fuel, fiber, medicine</td>
</tr>
<tr>
<td>Services</td>
<td>Pollination, recycling, nitrogen fixation, homeostatic regulation</td>
</tr>
<tr>
<td>Information</td>
<td>Genetic engineering, applied biology, pure science</td>
</tr>
<tr>
<td>Psycho-spiritual</td>
<td>Aesthetic beauty, religious awe, scientific knowledge</td>
</tr>
</tbody>
</table>

Madagascar Periwinkle Argument
(Callicott 1997, p. 30)

Vincristine to treat Leukemia

“Arrogant and Trivial”
**Table 2.1 Ecosystem Services and Functions**

<table>
<thead>
<tr>
<th>Ecosystem service*</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas regulation</td>
<td>Carbon dioxide/oxygen balance, ozone for protection against ultraviolet light</td>
</tr>
<tr>
<td>Climatic regulation</td>
<td>Greenhouse gas regulation, dimethyl sulphide production affecting cloud formation</td>
</tr>
<tr>
<td>Disturbance regulation</td>
<td>Storm protection, flood control, drought recovery, and other aspects controlled by vegetation structure</td>
</tr>
<tr>
<td>Water regulation</td>
<td>Provisioning of water for agricultural (such as irrigation) or industrial (such as milling) processes or transportation</td>
</tr>
<tr>
<td>Water supply</td>
<td>Provisioning of water by watersheds, reservoirs, and aquifers</td>
</tr>
<tr>
<td>Erosion control and sediment retention</td>
<td>Prevention of loss of soil by wind, runoff, or other removal processes; storage of silt in lakes and wetlands</td>
</tr>
<tr>
<td>Soil formation</td>
<td>Weathering of rock and the accumulation of organic material</td>
</tr>
<tr>
<td>Nutrient cycling</td>
<td>Nitrogen fixation, nitrogen, phosphorus, and other elemental or nutrient cycles</td>
</tr>
<tr>
<td>Waste treatment</td>
<td>Waste treatment, pollution control, detoxification</td>
</tr>
<tr>
<td>Pollination</td>
<td>Provisioning of pollinators for the reproduction of plant populations</td>
</tr>
<tr>
<td>Biological control</td>
<td>Keystone predator control of prey species; reduction of herbivory by top predators</td>
</tr>
<tr>
<td>Refuge</td>
<td>Nurseries, habitats for migratory species, regional habitats for locally harvested species, or overwintering grounds</td>
</tr>
<tr>
<td>Food production</td>
<td>Production of fish, game, crops, nuts, and fruits by hunting, gathering, subsistence farming, or fishing</td>
</tr>
<tr>
<td>Raw materials</td>
<td>The production of lumber, fuel, or fodder</td>
</tr>
<tr>
<td>Genetic resources</td>
<td>Medicine, products for materials science, genes for resistance to plant pathogens and crop pests, ornamental species (pets and horticultural varieties of plants)</td>
</tr>
<tr>
<td>Recreation</td>
<td>Ecotourism, sport fishing, and other outdoor recreational activities</td>
</tr>
<tr>
<td>Cultural</td>
<td>Aesthetic, artistic, educational, spiritual, and/or scientific values of ecosystems</td>
</tr>
</tbody>
</table>

* Ecosystem "goods" included in ecosystem services.


Brennan and Withgott 2005

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**Rachel Carson**

_Silent Spring 1962_

- Bioaccumulation
- Levels and scale
- Environmental degradation threaten _human health_
- Increased Public Awareness

**Figure 1.6** Van Dyke 2003

Environmental Ethics (pp. 64-68 of Primack Ch3)

1. Environmental
2. Economic
3. Social

Justice

Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.

-US EPA

Phytoremediation

Brownfield

Abstract: Phytoremediation is an emerging technology for remediating brownfields, landfills, and other contaminated sites. Many laboratory and field tests have demonstrated that trees and other vegetation can absorb, transform, or contain a variety of contaminants, including soft and heavy metals and volatile organics through hydraulic control, absorption, and mycorrhizal activity in the root zone. However, phytoremediation cannot be applied in a "off the shelf" fashion because plants grow differently on different soils, different microenvironments, and different types of contaminants. Site- and contaminant-specific protocols are needed to effectively use phytoremediation.

But trees and other plants do more than remediate pollutants. In many cases, a landscape with trees and other plants can have a significant impact on humans. For instance, a green landscape can reduce stress, reduce violence, and strengthen neighborhood ties. And because of the deep attachments many people have to trees, tree removal—sometimes an element of phytoremediation—can be problematic.

What are the implications of these ecological and social functions of vegetation for brownfield redevelopment? We address how to combine the biological and ecological issues of phytoremediation to maximize effectiveness as a clean-up technology while also outlining the potential for significant social implications of a greener environment. A new phased phytoremediation strategy is outlined and specific from an experiment in the Calumet region of Chicago is presented as a case study to illustrate ways to develop site-specific phytoremediation protocols. Potential social implications of this and other phytoremediation applications in Calumet are also addressed.
1. Yeoman Creek Landfill

**Location:** Southeast Waukegan

**Backstory:** From 1959 to 1969, a 70-acre landfill with no protective liner

**Damage:** PCBs (highly toxic, cancerous materials), industrial solvents, lead, zinc, explosive landfill gases

2. Joliet Army Ammunition Plant

**Location:** Between Interstate 55 and Illinois State Route 53

**Backstory:** By 1945, the largest munitions factory in the world

**Damage:** Unexploded ordnance, TNT, dynamite, and metal in soil and groundwater

3. Outboard Marine Corp.

**Location:** North end of Waukegan Harbor

**Backstory:** Site once housed a sport engine manufacturer and a coke and gas plant.

**Damage:** PCBs in harbor sediment and soil

4. Lenz Oil Service

**Location:** Route 83 in Lemont

**Backstory:** From 1961 to 1985, an oil and solvent recycler

**Damage:** A contaminated oil layer underground threatens the nearby Des Plaines River.

5 & 6. Kerr-McGee (two out of four still in cleanup)

**Location:** West Chicago to south of Warrenville

**Backstory:** A lighting company that worked with the federal atomic energy program

**Damage:** Radioactive byproduct in Kress Creek, the DuPage River, yards, parks

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**Pesticides and Child Development in Mexico’s Yaqui Valley**

With spindle arms and big round eyes, one set of pictures shows the sick figures drawn by young children everywhere. Next to them is another group of drawings, mostly disconnected squiggles and lines, resembling nothing. Both sets of pictures are intended to depict people. The main difference identified between the two groups of young artists: long-waved protocols exposed.

Children’s drawings are not a simple read of technology, but Elizabeth Guillote, an anthropologist, wanteds to try new methods. Guillote was interested in the effects of pesticide on children. She devised tests to measure childhood development based on techniques from anthropologically and medicine. Searching for a study site, Guillote found the Yaqui Valley region of northwestern Mexico.

The Yaqui Valley farming country, worked by generations of the indigenous group that gives the region its name. Similar, pesticides arrived in the area in the 1960s. Some Yaqui abandoned the agricultural innovations, spraying their farms in the valley to increase their yields. Yaqui farmers in the area residing sinfully, however, generally chose to bypass the chemicals and to continue following more natural farming practice. Although differing in farming techniques,