

Lecture 28, 28 Nov 2006

Conservation Biology
ECOL 406R/506R
University of Arizona
Fall 2006

Kevin Bonine
Kathy Gerst



Conservation
& Economics

Lab this week:

meet 1230 s-side BSE 328 on 01 Dec

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Housekeeping, 28 November 2006

-Thank our speakers...
-Exam Key on website

Today: Economics and Sustainable Development (Ch12)

Thurs 30 Nov: Forbes Lobby Creativity Project

Tues 05 Dec: Final day of class

Thurs 14 Dec: Final Exam 1100-1300h in this room

Short oral presentations :
28 Nov - Amanda and Fred

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Global Climate Change Lecture Series

All lectures will take place at UA Centennial Hall.

All lectures begin at 7pm and are free to the public. Call 520.621.4090 for more information.

Tuesday, October 17
Global Climate Change: The Evidence
Malcolm Hughes, Professor of Dendrochronology

<http://cos.arizona.edu/climate/>

Tuesday, October 24
Global Climate Change: What's Ahead
Jonathan Overpeck, Director of the Institute for the Study of Planet Earth and Professor of Geosciences

Tuesday, October 31
Global Climate Change: The Role of Living Things
Travis Huxman, Assistant Professor of Ecology and Evolutionary Biology

Tuesday, November 7
Global Climate Change: Ocean Impacts and Feedbacks
Julia Cole, Associate Professor of Geosciences

Tuesday, November 14
Global Climate Change: Disease and Society
Andrew Comrie, Dean of the Graduate College and Professor of Geography and Regional Development

Tuesday, November 21
Global Climate Change: Could Geoengineering Reverse It?
Roger Angel, Regents' Professor of Astronomy

Tuesday, November 28
Global Climate Change: Designing Policy Responses
Paul Portney, Dean of the Eller College of Management and Professor of Economics

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fall 2006 conservation biology course
presents....
**a creativity project
exhibit**
*come see student projects integrating
artistic creativity with conservation
education, including:*

- original artwork
- creative writing
- children's books
- music
- multimedia
- games

thursday, november 30
forbes lobby
noon-2 pm

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Science a la Joe Camel

By Laurie David, Washington Post
Sunday, November 26, 2006; B01

At hundreds of screenings this year of "An Inconvenient Truth," the first thing many viewers said after the lights came up was that every student in every school in the United States needed to see this movie.

The producers of former vice president Al Gore's film about global warming, myself included, certainly agreed. So the company that made the documentary decided to offer 50,000 free DVDs to the National Science Teachers Association (NSTA) for educators to use in their classrooms. It seemed like a no-brainer.

The teachers had a different idea: Thanks but no thanks, they said.

In their e-mail rejection, they expressed concern that other "special interests" might ask to distribute materials, too; they said they didn't want to offer "political" endorsement of the film; and they saw "little, if any, benefit to NSTA or its members" in accepting the free DVDs.

Gore, however, is not running for office, and the film's theatrical run is long since over. As for classroom benefits, the movie has been enthusiastically endorsed by leading climate scientists worldwide, and is required viewing for all students in Norway and Sweden.

Still, maybe the NSTA just being extra cautious. But there was one more curious argument in the e-mail: Accepting the DVDs, they wrote, would place "unnecessary risk upon the [NSTA] capital campaign, especially certain targeted supporters." One of those supporters, it turns out, is the Exxon Mobil Corp.

That's the same Exxon Mobil that for more than a decade has done everything possible to muddle public understanding of global warming and stifle any serious effort to solve it. It has run ads in leading newspapers (including this one) questioning the role of manmade emissions in global warming, and financed the work of a small band of scientific skeptics who have tried to challenge the consensus that heat-trapping pollution is drastically altering our atmosphere. The company spends millions to support groups such as the Competitive Enterprise Institute that aggressively pressure lawmakers to oppose emission limits.

It's bad enough when a company tries to sell junk science to a bunch of grown-ups. But, like a tobacco company using cartoons to peddle cigarettes, Exxon Mobil is going after our kids, too.

And it has been doing so for longer than you may think. NSTA says it has received \$6 million from the company since 1996, mostly for the association's "Building a Presence for Science" program, an electronic networking initiative intended to "bring standards-based teaching and learning" into schools, according to the NSTA Web site. Exxon Mobil has a representative on the group's corporate advisory board. And in 2003, NSTA gave the company an award for its commitment to science education.

So much for special interests and implicit endorsements.

In the past year alone, according to its Web site, Exxon Mobil's foundation gave \$42 million to key organizations that influence the way children learn about science, from kindergarten until they graduate from high school.

And Exxon Mobil isn't the only one getting in on the action. Through textbooks, classroom posters and teacher seminars, the oil industry, the coal industry and other corporate interests are exploiting shortfalls in education funding by using a small slice of their record profits to buy themselves a classroom soapbox.

NSTA's list of corporate donors also includes Shell Oil and the American Petroleum Institute (API), which funds NSTA's Web site on the science of energy. There, students can find a section called "Running on Oil" and read a page that touts the industry's environmental track record -- citing improvements mostly attributable to laws that the companies fought tooth and nail, by the way -- but makes only vague references to spills or pollution. NSTA has distributed a video produced by API called "You Can't Be Cool Without Fuel," a shameless pitch for oil dependence.

The education organization also hosts an annual convention -- which is described on Exxon Mobil's Web site as featuring "more than 450 companies and organizations displaying the most current textbooks, lab equipment, computer hardware and software, and teaching enhancements." The company "regularly displays" its "many ... education materials" at the exhibition. John Borowski, a science teacher at North Salem High School in Salem, Ore., was dismayed by NSTA's partnerships with industrial polluters when he attended the association's annual convention this year and witnessed hundreds of teachers and school administrators walk away with armloads of free corporate lesson plans.

Along with propaganda challenging global warming from Exxon Mobil, the curricular offerings included lessons on forestry provided by Weyerhaeuser and International Paper, Borowski says, and the benefits of genetic engineering courtesy of biotech giant Monsanto.

"The materials from the American Petroleum Institute and the other corporate interests are the worst form of a lie: omission," Borowski says. "The oil and coal guys won't address global warming, and the timber industry papers over clear-cuts."

An API memo leaked to the media as long ago as 1998 succinctly explains why the association is angling to infiltrate the classroom: "Informing teachers/students about uncertainties in climate science will begin to erect barriers against further efforts to impose Kyoto-like measures in the future."

So, how is any of this different from showing Gore's movie in the classroom? The answer is that neither Gore nor Participant Productions, which made the movie, stands to profit a nickel from giving away DVDs, and we aren't facing millions of dollars in lost business from limits on global-warming pollution and a shift to cleaner, renewable energy.

It's hard to say whether NSTA is a bad guy here or just a sorry victim of tight education budgets. And we don't pretend that a two-hour movie is a substitute for a rigorous science curriculum. Students should expect, and parents should demand, that educators present an honest and unbiased look at the true state of knowledge about the challenges of the day.

As for Exxon Mobil -- which just began a fuzzy advertising campaign that trumpets clean energy and low emissions -- this story shows that slapping green stripes on a corporate tiger doesn't change the beast within. The company is still playing the same cynical game it has for years.

While NSTA and Exxon Mobil ponder the moral lesson they're teaching with all this, there are 50,000 DVDs sitting in a Los Angeles warehouse, waiting to be distributed. In the meantime, Mom and Dad may want to keep a sharp eye on their kids' science homework.

laurie@lauriedavid.com

Laurie David, a producer of "An Inconvenient Truth," is a Natural Resources Defense Council trustee and founder of StopGlobalWarming.org.

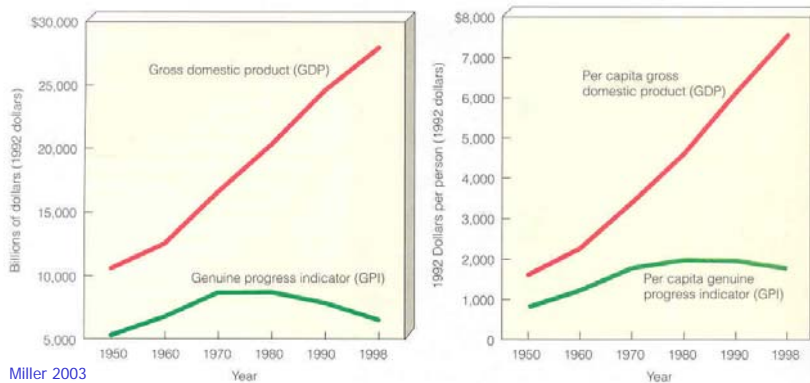
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Figure 2.13 An Indonesian boy wading in a polluted river suffers external costs. External costs are costs not borne by the buyer or seller; they may include water pollution, aesthetic harm, human health problems, property damage, harm to aquatic life, aesthetic degradation, declining real estate values, and other problems.

Brennan and Withgott 2005

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Miller 2003

Figure 2-5 Comparison of the gross domestic product (GDP) and genuine progress indicator (GPI, left) and the per capita values for these indicators (right) in the United States between 1950 and 1998. (Data from Clifford Cobb, Mary Sue Goodman, and Mathis Wackernagel)

Genuine Progress Indicator

Index of Sustainable Economic Welfare

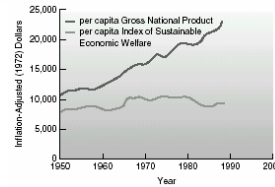


Figure 12.11 VanDyke, 2003
Changes in the U.S. Gross National Product (GNP) and Index of Sustainable Economic Welfare (ISEW) since 1950. Although the GNP has increased, the ISEW has failed to grow.

Economic Growth vs. Development

-efficiency, sophistication, utility

[Nonrival (air to breathe) or nonexclusive goods (UV protection from ozone)]

-Producer Pays/Polluter Pays

-Dramatically less waste (packaging, scrubber sludge)

-Taxation/Subsidies

-Pollution Rights

-Precautionary Principle

Product itself

Government strategies and regulation

-Stable, democratic government required?

Economics Primer...

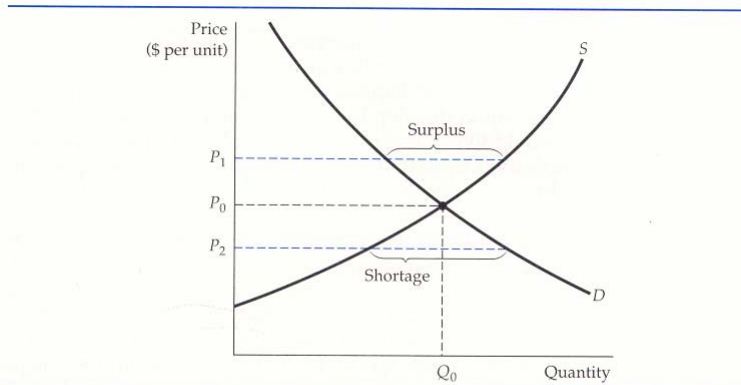
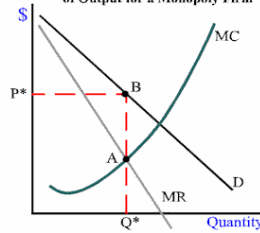


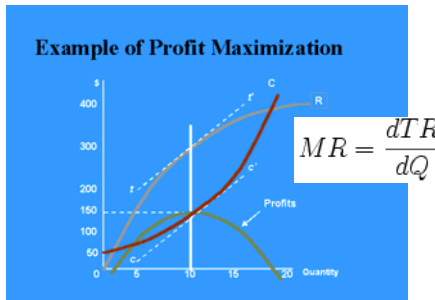
FIGURE 2.1 Supply and Demand. The market clears at price P_0 and quantity Q_0 . At the higher price P_1 a surplus develops, so price falls. At the lower price P_2 there is a shortage, so price is bid up.

Pindyck and Rubinfeld 1992
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Figure 10-2 The Profit Maximizing Level of Output for a Monopoly Firm

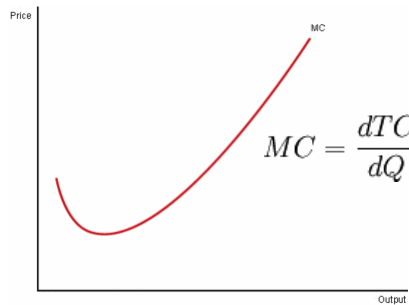


Marginal revenue



<http://images.google.com/imgres?imgurl=http://www2.gsb.columbia.edu/faculty/ghcal/B7006-001/pricing/img007.gif&imgrefurl=http://www2.gsb.columbia.edu/faculty/ghcal/B7006-001/pricing/sld007.htm&h=480&w=640&sz=9&hl=en&start=1&btnid=ADDqNBKkEnLp0M.&tbnh=103&tbnw=137&prev=/images%3Fq%3Dmarginal%2BRevenue%26svnum%3D10%26h%3Den%26in%3D%26client%3Dfirefox-a%26its%3Dorg.mozilla-en-US:official%26sa%3DN>

Marginal cost



Wikipedia, 14 Nov 2006

Adam Smith 1909 (voluntary transactions)
Invisible Hand – “turning selfish,
uncoordinated actions into increased
prosperity and relative social harmony”

-
- Tragedy of the Commons
 - Externalities
 - Private Property
-

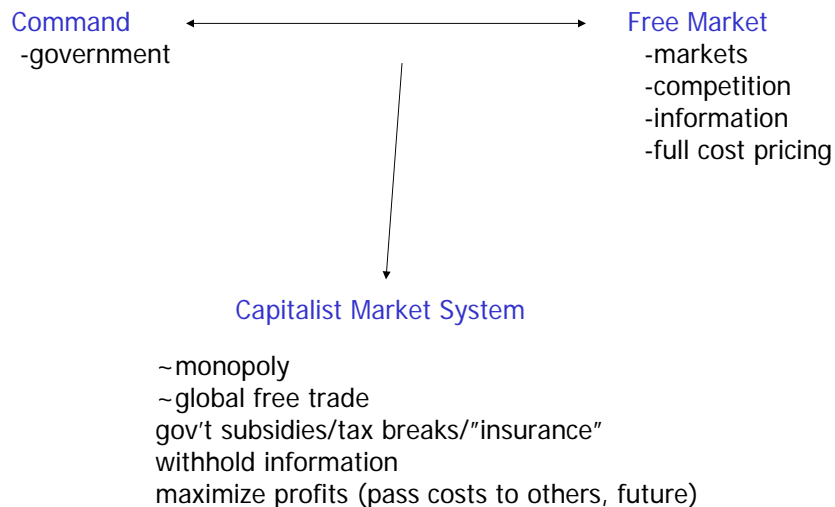
Market Failure

resources misallocated:

“a few individuals or businesses benefit at
expense of the larger society” (Primack 2006)

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Traditional Neoclassical Economics (Miller 2003):



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nomadic Maasai

Private Property?

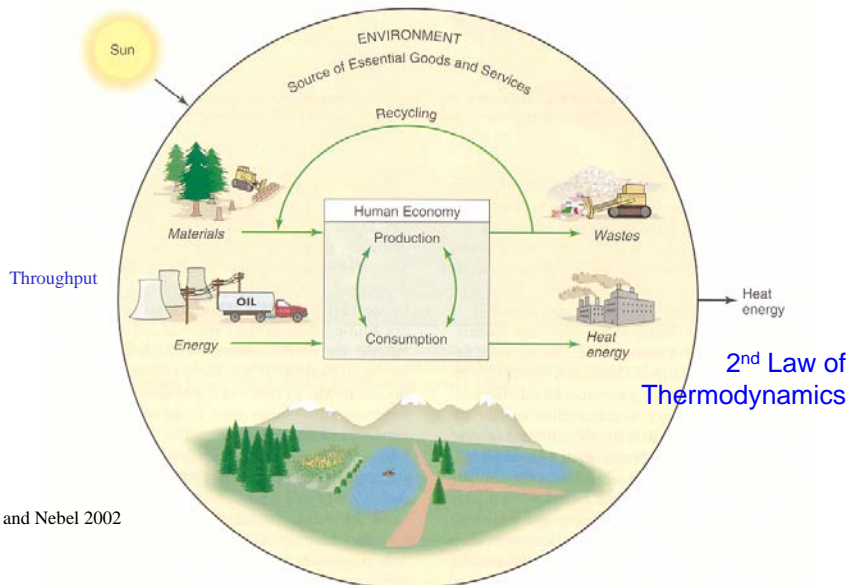
TABLE 28.1 Water use by people in different sorts of communities in Arabia People in indigenous desert settlements use one-tenth the water of people in modern towns. The figures are for all domestic water use, including drinking, washing, bathing, and other water demands.

Type of community	Domestic water use per person (L/day)
Modern Arabian town without major industry ^a	240
Traditional agricultural village	120
Small desert settlement with supply by government water truck	80
Small desert settlement with traditional water supply	28

Source: After Goudie and Wilkinson 1977.
^a New York City has a similar usage rate.

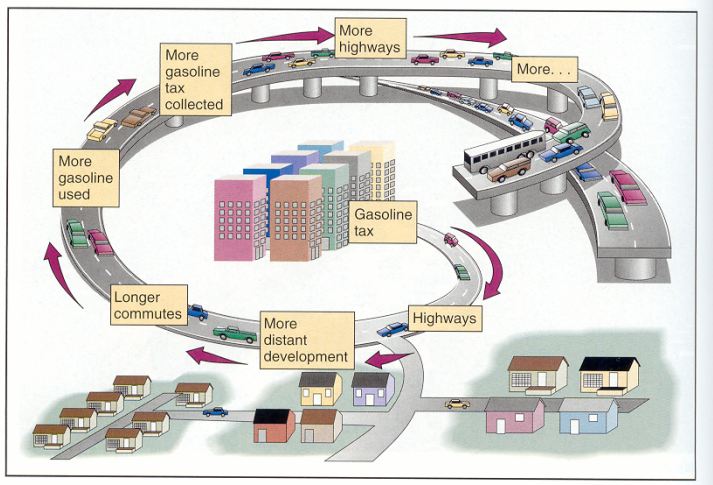
(Hill et al. 2004)

ANIMAL PHYSIOLOGY, Table 28.1 © 2004 Blackwell Publishing Ltd



Wright and Nebel 2002

▲ FIGURE 23-3 Environmental economic view of economic activity. The natural environment encompasses the economy, which is constrained by the resources found within the environment.



► FIGURE 24-5 The development cycle spawned by the Highway Trust Fund.

Wright and Nebel 2002

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Internal Market Costs

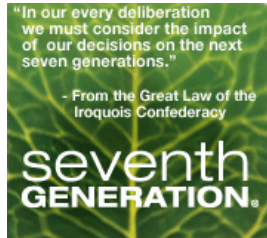
VS.

Externalities

-External to Market Forces

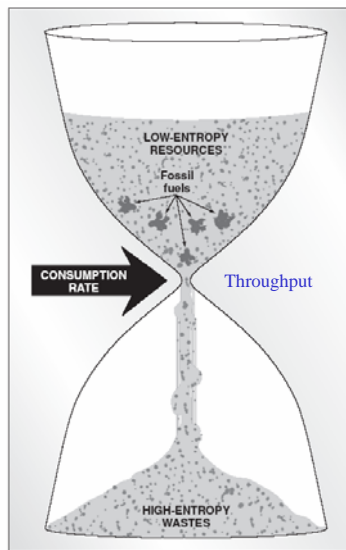
- Noise
- Pollution
- Acid rain
- Erosion
- Global Warming
- Eutrophication
- Disease
- Asthma
- Birth Defects
- Behavior and Intelligence

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Vs. Positive DISCOUNT RATE

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Index of Sustainable Economic Welfare
(p. 355 Van Dyke 2003)

- 1 Income Distribution
- 2 Net Capital Growth
- 3 Natural Resource Depletion/
Environmental Damage
- 4 Unpaid Household Labor

(social and environmental justice)

Figure 12.9
The "hourglass analogy" of economist Nicolas Georgescu-Roegen illustrates the relationship between entropy and economics. The sand in the upper part of the hourglass represents earth's low-entropy resources. As humans consume these resources, high-entropy wastes are produced. Regardless of the consumption rate, the sand in the upper half is destined to run out.

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Herman Daly

Former Environmental Economist with Worldbank
Professor at U. Maryland

Utility vs. Throughput

Utility not measurable; it is an experience

Circulatory system vs. digestive system
(perpetual motion machine)

Wealth vs. Ilth (accumulation of goods vs. bads)

Micro vs. Macro economics
(MR=MC vs. endless)

*"SATISFICING"
Development vs. Growth*

If resources infinite then price = 0,
but if pay for resources then can redistribute wealth



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Center for the Advancement of the
Steady State Economy

<http://www.steadystate.org/Index.html>

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utility curves

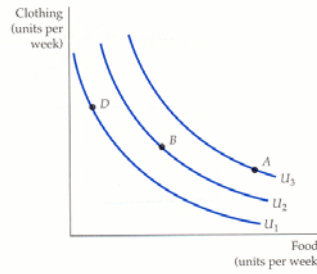


FIGURE 3.3 An Indifference Map. An indifference map is a set of indifference curves that describes a person's preferences. Any market basket on indifference curve U_3 , such as market basket A , is preferred to any market basket on curve U_2 (e.g., basket B), which in turn is preferred to any market basket on U_1 , such as D .

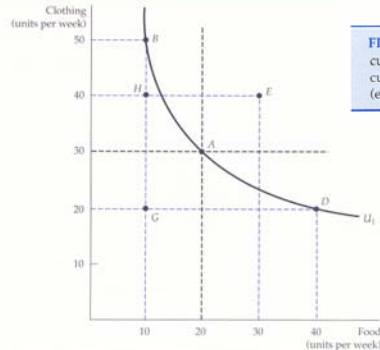
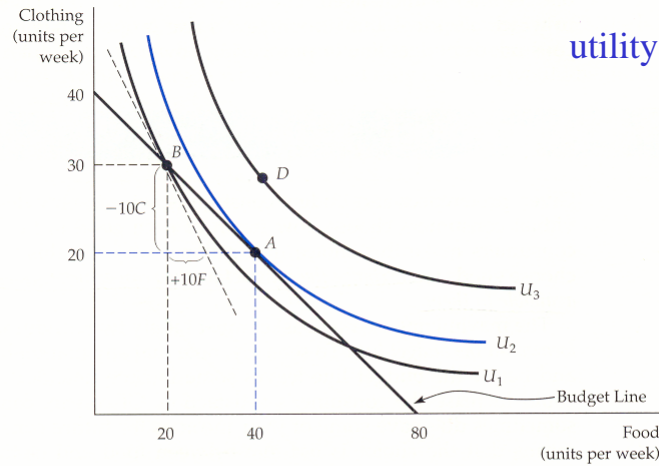


FIGURE 3.2 An Indifference Curve. A person's indifference curve U_1 shows all market baskets that generate the same level of satisfaction as does market basket A . The person prefers market basket E , which lies above U_1 , to A , but prefers A to market basket H , which lies below U_1 .

Pindyck and Rubinfeld 1992

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utility curves

FIGURE 3.11 Maximizing Consumer Satisfaction. When the budget line and the indifference map are combined, consumers maximize their satisfaction by choosing A . At this point the budget line and indifference curve U_2 are tangent, and no higher level of satisfaction can be attained. At A , the point of maximization, the marginal rate of substitution between the two goods equals the price ratio. At B , however, the marginal rate of substitution (1) is greater than the price ratio ($1/2$), and maximization does not occur. Pindyck and Rubinfeld 1992

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Table 2.1 Ecosystem Services and Functions

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

*Ecosystem "goods" included in ecosystem services.

Sources: Adapted with permission from Robert Costanza et al., "The value of the world's ecosystem services and natural capital," *Nature*, May 1997.

Brennan and Withgott 2005

