Quiz

1. On p.176 in your text (Ch7) is the following quote: “the exponential growth curve ‘has no ecology.’” What does this quote mean?

2. Distinguish between the terms deterministic and stochastic. Which of these is more common in natural settings?

3. What is the biggest limitation on using PVA in conservation biology?

4. What does PVA stand for? MVP?

5. As cited in your text, list one possible drawback to increasing connectivity between habitat patches or reserves.
1. Biodiversity, Scale (Ch4)
2. Important Paradigms (Ch5)
   • Conservation Genetics (CH6)
   • Populations (CH7)

• Syllabus changes
• Thank you cards
• Return Papers
• Field trip
  - readings
  - locations (GrayHawk vs. Chir)
  - schedule (7am Sat. - ? Sun.)
  - groups
  - gear, cars

Quiz

= USFWS endangered spp bulletin, SDCP
WANT TO SAVE THE WORLD?
PAID INTERNSHIPS IN CONSERVATION BIOLOGY

Undergraduate conservation biology internships are available at the University of Arizona. Internships will span a one-year period, beginning in January 2004 and ending in December 2004.

Interns will receive a stipend of $4,000 and a research budget of $400 for the summer, and 2 units of upper-division biology credit each semester.

Interns will work with a scientist from a local organization or government agency that concerns itself with conservation biology, such as The Nature Conservancy, Native Seeds/SEARCH, or Saguaro National Park. Each intern will also have a University of Arizona mentor.

The application deadline is Friday, November 7, 2003. Your application should include a completed application form, a resume (no more than two pages), unofficial college transcripts, a one-page statement describing what conservation biology is and why it interests you, and at least one sealed letter of recommendation from an academic source. Applications are available at the address below. Your application must include a list of projects (available on the website) that you would like to do.

Eligibility: You must be 1) a U.S. citizen or permanent resident, 2) an undergraduate enrolled full-time at the University of Arizona, and 3) graduating in December 2004 or later. We strongly encourage students from traditionally underrepresented groups to apply.

INFORMATION MEETINGS:
- October 16, 12:00-1:00 PM, BIOSCIENCE EAST, RM 325
- October 17, 12:00-1:00 PM, BIOSCIENCE EAST, RM 325
- October 23, 12:00-1:00 PM, BIOSCIENCE EAST, RM 325
- October 24, 12:00-1:00 PM, BIOSCIENCE EAST, RM 325

Conservation Biology Internship Program
School of Renewable Natural Resources, University of Arizona
PO Box 210043, Tucson, AZ 85721
Phone (520) 621-7260; Fax: (520) 621-8801
Email: CBIP@email.arizona.edu

http://eebweb.arizona.edu/CBIPWeb

This program is funded by the National Science Foundation.
The Center for Creative Photography presents:

Exhibit Opens

*Emmet Gowin: Changing the Earth*

**October 18, 2003 - January 3, 2004**

The Center for Creative Photography is delighted to present this body of work by Emmet Gowin, inarguably one of the most gifted photographers of his generation. *Changing the Earth* offers its viewer a compelling, experiential engagement with the political issue of how we care for the environment, if political is understood in the broadest sense, as human relations. Gowin's work takes its place in a history of image-making that reaches back to William Blake, W. J. M. Turner, and Alfred Stieglitz, romantics for whom the material was inseparable from the spiritual.

The Tucson presentation will also feature work Frederick Sommer and Harry Callahan, teachers of Emmet Gowin.

**GENERAL INFORMATION**

**EXHIBITIONS:** Emmet Gowin: Changing the Earth

**DATE:** October 18, 2003 - January 3, 2004

**HOURS:** The gallery is open Monday- Friday, 9 a.m. to 5 p.m.; weekends, noon to 5 p.m. CCP will be closed November 11 for Veterans' Day, November 27 and 28 for Thanksgiving, and December 24 and 25 for Christmas.
tree top barbie, baseball cards
Survey finds big bonus in some EPA rules

Benefits said to substantially outweigh costs

By John H. Cushman Jr.
The New York Times

WASHINGTON — The White House office in charge of reviewing federal regulations has reported that the benefits of some major environmental rules appear to exceed the costs by several times and that the net benefits may be even larger than previously acknowledged.

In its annual review of the costs and benefits of regulations, the Office of Management and Budget examined a sampling of major rules and found that the total benefits — to the extent they can be measured — were at least triple the costs.

The conclusion is not surprising. Most agencies calculate the anticipated costs and benefits of rules before they are issued. While the estimates are often challenged, the agencies seldom issue major rules that are thought to cost more than their benefits would justify.

The budget office itself often challenges agency estimates of costs and benefits in the preliminary rule making process. But its annual report simply adds up the final estimates produced by the agencies, and therefore is little more than an aggregate balance sheet. The report was required by Congress several years ago, when lawmakers were trying to rein in what some believed to be unduly burdensome federal rules.

In this report, which was described on Saturday in The Washington Post, the Environmental Protection Agency was found to have produced significantly greater net benefits than last year’s report acknowledged. But the change was mainly due to accounting technicalities, not to any fundamental reassessment of the value of environmental controls.

In one change, the budget office expanded its review by looking back 10 years. This meant the latest report included the effects of the successful efforts of the 1990s to rein in the pollution that causes acid rain, a program that ended up costing much less than originally estimated and whose net benefits are estimated at $80 billion a year.

In another change, the budget office corrected an error that it said had made recent rules controlling smog and soot in the air appear to cost $20 billion a year too much. Costs and benefits of these rules have been disputed for many years, but a consensus has emerged recently that the benefits in lives saved and illness avoided are substantial. After prolonged challenge, the rules, issued by the Clinton administration, were upheld by the Supreme Court and are now beginning to take effect.

Just four clean-air rules, the report said, are producing benefits of $100 billion a year or more at a cost less than one-tenth of that amount.

The 233-page report counted the costs and benefits of only a handful of the 4,135 final rules published in the Federal Register during the fiscal year that ended on Sept. 30, 2002. The principal focus this year was on three rules issued during that year by the Energy Department, the Transportation Department and the EPA. They imposed estimated annual costs of $1.6 billion to $2 billion, but produced estimated annual benefits of $2.4 billion to $6.5 billion.

Looking back at 107 major regulations issued from 1992 to 2002, the budget office calculated that estimated annual costs were $36.8 billion to $42.8 billion, and annual benefits were $146.8 billion to $230.9 billion.

For every dollar spent complying with these regulations, in other words, the public got roughly at least three to eight dollars of benefits.
Report: CO₂ piling up in seas, adding to environmental worry

By Mike Toner

Rising carbon dioxide levels are increasing the acidity of the world’s oceans more rapidly than any time since, the age of dinosaurs — adding a worrisome new element to the debate over global environmental change.

Acid rain has long been recognized as a threat to forests, lakes and streams. But a new report, published Wednesday in the British Journal Nature, is the first to raise a flag over the prospect of a more acidic ocean.

The change could threaten the health of everything from microscopic plankton to coral reefs and reach from the surface to the depths.

“If we continue down the path we are going, we will produce changes greater than any experienced in the past 300 million years — with the possible exception of rare, extreme events such as comet impacts,” oceanographer Ken Caldeira, of the Lawrence Livermore National Laboratory, warned Wednesday.

Trend unchallenged

While scientists differ over the effect carbon dioxide and other “greenhouse gases” will have on future climates — and governments argue over who is to blame — the trend in carbon dioxide levels is unchallenged.

Continuous measurements of carbon dioxide — an inevitable byproduct of burning coal, oil and natural gas — have recorded steadily increasing levels of the gas in the atmosphere every year since 1958, a total rise of 17 percent during that period.

Barbing major cuts in automotive and industrial emissions of carbon dioxide, scientists expect the current levels to more than double by the end of the century.

The world’s population currently emits about 2 billion tons of carbon dioxide into the air every year, and about one-third of it eventually winds up in the ocean.

Until now, climate experts have taken some comfort in the realization that the oceans can buffer the atmospheric effects of rising carbon dioxide — such as global warming — by “scrubbing” carbon from the atmosphere for use by marine plants and animals.

But Caldeira and his colleague Michael Wickett say carbon dioxide removed from the atmosphere enters the oceans in the form of carbonic acid — the same substance that imparts the fizz to seltzer water and soda pop.

The oceans are now slightly alkaline. Researchers are not suggesting the seas will become as acidic as soft drinks, but they say the shift toward the acid end of the scale is accelerating.

Devastating effects

The change over the last century already matches the magnitude of the change that occurred in the entire 10,000 years preceding the Industrial Age.

As atmospheric carbon dioxide increases further during the next century — and more carbonic acid enters the ocean — Caldeira said the shift will occur more swiftly than at any time in the human experience.

Increasingly acid rain from industrial emissions and land has already had devastating consequences for forests, lakes, streams and the fish and other creatures in them.

In the absence of any research on ocean life, the potential impacts are speculative.

“Most ocean life resides near the surface, where the greatest change would be expected to come, but deep-ocean life may prove to be even more sensitive to changes,” Caldeira said.
Thinning Ice

There has been no end of scholarly studies confirming the gradual rise in global temperatures over the past century. Yet nothing focuses the mind on global warming and its potential consequences quite so sharply as the occasional news flash from some remote corner of the globe documenting startling changes in landscapes once thought to be immutable. Two years ago, for instance, scientists told us that the snows of Kilimanjaro, which inspired Ernest Hemingway’s famous short story, could vanish in 15 years, and that the seemingly indestructible glaciers in the Bolivian Andes might not last another 10. Last year brought evidence of disturbing and apparently irreversible changes in Alaska’s environment — melting permafrost, sagging roads, dying forests — arising from an astonishing rise of 5.4 degrees in Alaska’s average temperature over the past 30 years.

Now comes more unsettling news: a report from three scientists that the Arctic’s largest ice shelf — a 150-square-mile, 100-foot-thick mass of ice that has been sitting more or less intact off the northern Canadian coast for 3,000 years — is disintegrating. The scientists say the breakup results from a century-long warming trend that has accelerated in the last two years. It is not yet possible, they say, to tie the melting directly to rising atmospheric concentrations of so-called greenhouse gases, or to the human activities — chiefly the burning of fossil fuels like coal and oil — that create these gases. But they warn that a “critical threshold” has been breached, and that on the other side of this threshold lie abrupt changes in natural conditions we have long taken for granted.

There could be a bright side to all this, if it persuaded the Bush administration and Congress to take the issue of climate change more seriously. That is not happening. Mr. Bush remains fixated on a voluntary approach that offers little hope of meaningful reductions in industrial emissions of carbon dioxide, the main global warming gas. Congress, meanwhile, is fashioning an energy bill that will do little to reduce these emissions, and indeed could increase them by heaping new subsidies on the oil, gas and coal industries. Washington’s carapace of denial seems sturdier than any glacier.
Beached whales and dolphins may be suffering from 'bends'

REUTERS

LONDON — Sonar may cause a type of decompression sickness in whales and dolphins similar to the "bends" in humans, scientists said Wednesday.

Although it seems an unlikely illness for the aquatic creatures, researchers from the Zoological Society of London and the University of Las Palmas in the Canary Islands have found bubbles in the tissue of stranded whales and dolphins similar to the effects of decompression sickness, or DCS, in humans.

"The only way we can explain these findings is that it is a condition very similar to decompression sickness in humans," said Dr. Paul Jepson, coordinator of the UK Marine Mammal Stranding Project, which contributed to the research.

"Sonar may cause a disease like the bends," he said, adding that more research was needed to confirm the results.

The finding, reported in the science journal Nature, is the first evidence of a bendslike illness in the creatures.

Scientists suspect sonar signals disorient the animals, forcing them to come up to the surface too quickly, which could cause creation of damaging nitrogen bubbles in their tissue. Both low- and mid-frequency sonar have been linked to whale strandings.

"It is widely accepted that there is a link between naval sonar use and mass strandings, predominately of big whales; what hasn't been fully understood is what the mechanism would be," Jepson added.

Autopsies by Spanish scientists on 10 of 14 beaked whales stranded in the Canary Islands after a multinational military exercise last year also showed evidence of DCS in the animals.

The creatures started to appear on the beaches about four hours after the start of the mid-frequency sonar activity.

"Beaked whales have the highest levels of nitrogen in their tissues normally because they dive so deep and that would be consistent with why it is the beaked whales that are most severely affected by sonar exercises," Jepson said.

Military sonar blasts areas of ocean with sound waves to detect submarines.
Scientist ties whaling to demise of sea otters

An ecological chain-reaction dating to industrial-scale hunting of whales in the North Pacific a half-century ago has driven the widespread decline of Alaskan seals, sea lions and otters that have puzzled scientists for decades.

The killing of whales caused a collapse in the food chain, the scientists believe.

As a half-million whales were wiped out by Japanese and Russian whaling fleets after World War II, killer whales that once preyed on the larger "great" whales had to look for other food to eat.

So, the scientists theorize, some of the killer whales turned to seals instead. But before this switch, there were never as numerous as whales. And it takes lots of seals to equal the calories in a single great whale.

It wasn't long before most of the seals were eaten up and the killer whales — also known as orcas — turned their attention to Steller's sea lions. Then, when those grew rare enough, they went after otters.

By C.J. Karamargin
ARIZONA DAILY STAR

The Southern Arizona Home Builders Association is waging an air campaign against what it considers biased media coverage.

A radio ad began airing this month that SAHBA hopes will fill an information "void" about a recent federal appeals court ruling concerning the cactus ferruginous pygmy owl.

The ruling was an important victory for private property rights, not a setback for the owl, said Roger Yohem, SAHBA spokesman.

But because much of the coverage of the Aug. 19 ruling failed to mention that, Yohem said, the trade group decided to launch the ad campaign.

"There's a huge void in our side of the story getting out," Yohem said. "There was too much focus on the animal side, not the people side. It was not as balanced as we thought it should have been."

The 60-second spot began airing the week of Sept. 8 on KLFX-FM and KTKT-AM, Yohem said.

An editor at the Arizona Daily Star rejected the charge of biased coverage in the newspaper. "I can't see it," said Dennis Joyce, assistant managing editor of the Arizona Daily Star. "I don't think there has been a void."

Star editors and representa-
Sonoran Desert Conservation Plan

The plan would guard today’s fragile lands for tomorrow’s generations

By Chuck Huckelberry
SPECIAL TO THE ARIZONA DAILY STAR

The Sonoran Desert Conservation Plan is simply our promise to be responsible stewards of our fragile Sonoran Desert environment for future generations. We must foster land uses that protect our natural landscapes as well as our environmental and cultural resources. This is the basic premise as well as pledge of the conservation plan. We have an ethical obligation to leave this place much as we found it for future generations to enjoy. For the first time, facts, science and a sense of public responsibility will guide future land use decisions, not politics or special interests.

The conservation plan will clearly guide future growth and development. The plan identifies critical and sensitive resources and then assigns high to low values for the conservation of these resources. The concept is simple — where there are high-value resources, it would be wise to build carefully, and where these resources are low or do not exist, building should be encouraged.

Critics of the plan say we will not have enough land left in Pima County upon which to build. They also say the county has developed unrea-

Where will our children live when the plan is enacted?

By Carole Pawlak
SPECIAL TO THE ARIZONA DAILY STAR

Some 92 percent of all land in Pima County falls under some type of land use restriction. For months, some of our environmental experts have been digging into the fuzzy details of Pima County’s proposed Sonoran Desert Conservation Plan. I asked them for a real-world evaluation of how it will affect the real people who live here.

What we found was a complex, well-organized campaign that is focused on taking away private property rights. The conservation plan is deceptive.

We found land-use policies that are arbitrary. Based on “guidelines” approved in June 2001 for land in “environmentally sensitive areas,” you can be required to set aside 80 percent of your “developable” land as permanent open space.

These policies are not county laws, yet the supervisors are implementing them as formal regulations. That means you are required to comply or they will deny your permits and zoning applications.

Under these conditions, only 290,000 acres in unincor-
Study finds many are mistaken about war

WASHINGTON — A majority of Americans have held at least one of three mistaken impressions about the war in Iraq, according to a new study released Thursday.

The three common mistaken impressions are that:

- U.S. forces found weapons of mass destruction in Iraq.
- There’s clear evidence that Iraqi President Saddam Hussein worked closely with the Sept. 11 terrorists.
- People in foreign countries generally either backed the U.S.-led war or were evenly split between support and opposition.

Overall, 60 percent of Americans held at least one of those views in polls reported between January and September by the Program on International Policy Attitudes, based at the University of Maryland in College Park, and the polling firm Knowledge Networks based in Menlo Park, Calif.

“While we cannot assert that these misperceptions created the support for going to war with Iraq, it does appear likely that support for the war would be substantially lower if fewer members of the public had these misperceptions,” said Steven Kull, director of Maryland’s program.

In fact, no weapons of mass destruction have been found in Iraq. U.S. intelligence has found no clear evidence that Saddam was working closely with al-Qaida or was involved in the Sept. 11 attacks. Gallup polls found large majorities opposed to the war in most countries.

Kull and other analysts noted that the Bush administration had misstated or exaggerated some intelligence findings, with Bush himself saying in May: “We found the weapons of mass destruction and we’ll find more as time goes by.”

Getting it wrong on the Iraq war

Polls show many Americans have misperceptions about key facts of the Iraq war:

Primary news source for those who believe:

Since the war ended, the U.S. has found Iraqi weapons of mass destruction

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fox</td>
<td>33%</td>
</tr>
<tr>
<td>CBS</td>
<td>23%</td>
</tr>
<tr>
<td>NBC</td>
<td>20%</td>
</tr>
<tr>
<td>CNN</td>
<td>20%</td>
</tr>
<tr>
<td>ABC</td>
<td>19%</td>
</tr>
<tr>
<td>Print</td>
<td>11%</td>
</tr>
<tr>
<td>PBS/NPR</td>
<td>17%</td>
</tr>
</tbody>
</table>

U.S. has found clear evidence that Saddam Hussein was working closely with al-Qaida terrorist group

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fox</td>
<td>67%</td>
</tr>
<tr>
<td>CBS</td>
<td>56%</td>
</tr>
<tr>
<td>NBC</td>
<td>49%</td>
</tr>
<tr>
<td>CNN</td>
<td>48%</td>
</tr>
<tr>
<td>ABC</td>
<td>45%</td>
</tr>
<tr>
<td>Print</td>
<td>40%</td>
</tr>
<tr>
<td>PBS/NPR</td>
<td>16%</td>
</tr>
</tbody>
</table>

Source: PIPA/Knowledge Networks poll of 3,334 adults, June-Sept. 2003: 1.7% error margin

Graphic: Judy Trabul, Todd Linderman

© 2003 KRT
Quiz

1. On p.176 in your text (Ch7) is the following quote: “the exponential growth curve ‘has no ecology.’” What does this quote mean?

2. Distinguish between the terms deterministic and stochastic. Which of these is more common in natural settings?

3. What is the biggest limitation on using PVA in conservation biology?

4. What does PVA stand for? MVP?

5. As cited in your text, list one possible drawback to increasing connectivity between habitat patches or reserves.
• Exponential growth
density-independent, deterministic

In a closed population (no immigration or emigration), population growth is a function of birth and death rates

\[ \frac{dN}{dt} = (b-d)N \]

Ring-necked pheasant on Protection Island
2. Logistic growth

density-dependent, deterministic

\[ \frac{dN}{dt} = rN \left( \frac{K-N}{K} \right) \]

intraspecific competition stabilizes population size
birth rates go down and/or death rates go up with increasing population size

carrying capacity (K)
1. On p.176 in your text (Ch7) is the following quote: “the exponential growth curve ‘has no ecology.’” What does this quote mean?

2. Distinguish between the terms deterministic and stochastic. Which of these is more common in natural settings?

3. What is the biggest limitation on using PVA in conservation biology?

4. What does PVA stand for? MVP?

5. As cited in your text, list one possible drawback to increasing connectivity between habitat patches or reserves.
1. Which of the following factors are thought to be important for Florida panther population viability?
   - density-dependence (intraspecific competition)
   - environmental variation
   - succession or disturbance
   - demographic stochasticity
   - genetic stochasticity
   - inbreeding depression
   - lack of habitat or connection between habitat patches
   - source/sink dynamics

2. Which of these factors increase or decrease in importance as the long-term viability (>100 yrs) of Florida panthers is considered?

3. What do the authors conclude is necessary for Florida panther viability?

4. What level of confidence do you have in their conclusions? Do you agree with their conclusions?

5. How do bias and judgement make themselves apparent in this reading?
1. Disturbance
2. Heterogeneity
3. Productivity

Diversity

Biodiversity and Rarity

**Figure 5.23**

Populations of bush cricket (*Metrioptera bicornis*) subunits exemplify that population size is less variable as heterogeneity increases. Dark circles indicate patches where local extinctions occurred. White circles indicate patches with extant populations. Population variability was measured by the coefficient of variance (cv) of local population size, and habitat heterogeneity was measured using digitized infrared aerial photographs. Each patch was assigned values according to how much the patch deviated from the standard level of gray in the photographs (SD-hue).

*After Kindvall (1996).*
Figure 4.4
A general species-area relationship among some Caribbean islands. Note that species richness on islands increases with increasing area.

Based on data from Darlington (1957:483).

Species-Area Relationship
Figure 4.5
An illustration of the relationship between area and species richness of (a) granivores and (b) all small mammal species in woodlots (crosses) and contiguous forest sites (squares). Species richness increases with woodlot area. In (a), note that granivore species richness increases with area more rapidly in contiguous forest than in woodlots. This pattern suggests that species richness not only declines with habitat loss, but also with habitat fragmentation.

After Nupp and Swihart (2000).

Van Dyke 2003

Woodlots vs. contiguous forest
Species-Area Relationship

3 step loss of biodiversity (Rosenzweig)

1. Endemics
2. Sink populations
3. Stochasticity

Therefore end up with lower steady state species richness and loss of biodiversity

Endemism and Islands (Tuatura, Silversword)
Island Biogeography

\[ S = cA^Z \]

S = species richness
\( c \) = taxon specific constant
A = area
\( Z \) = extinction coefficient for taxon
Figure 4.6
When the size of a natural area is decreased, the first species lost are endemics. Next, sink species (those that are not reproducing fast enough to replace themselves) go extinct locally. Finally, failure to replace accidental losses fast enough brings the province to a still lower steady state of biodiversity.

After Rosenzweig (1999).
Endemics
Habitat Size
Habitat Loss

Habitat Generalists
vs.
Habitat Specialists

Figure 4.7
The "cookie cutter" model of the effects of habitat loss on endemic species. If the cookie cutter strikes at subarea A, seven species lose habitat but none is exterminated. In contrast, if the cookie cutter strikes subarea B, an area containing species with more restricted ranges, seven species lose habitat, and four species are exterminated. Thus, random habitat loss produces a disproportionately high rate of extinction in endemic species.

Island Biogeography (MacArthur and Wilson 1967)

Metapopulations Spatial Relationships Nature Reserves

Figure 5.9
The equilibrium model of island biogeography predicts that numbers of species on an island represent an equilibrium between rates of immigration and extinction. Immigration rates increase with decreasing distance from an island’s colonizing source. Extinction rates increase with decreasing area of the island. The four equilibria shown (A, B, C and D) depict different combinations of island size and distance from its colonizing source. The equilibrium theory of island biogeography predicts that large islands near a colonizing source will have more species than small islands far from a colonizing source.
END