Name: ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ Pledge (sign): ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

Envr 201 Test #1

Point Total: 100 pts possible

4 pts 1. How long does it take global biodiversity to 'rebound' from a mass extinction event? Circle one:

    (a) 1–2 decades

    (b) 1–2 human generations

    (c) Several centuries

    (d) Several millenia

    (e) ***Millions of years***

20 pts 2. Define the following terms:

    (a) ecosystem

    An *ecosystem* is a community of interdependent biological organisms and its surrounding physical environment—its habitat.

    (b) keystone species

    A *keystone species* is a species that exerts a strong influence on the populations of a number of other species in an ecosystem. The disappearance of a keystone species can lead to large population changes in a number of other species—and possibly their disappearance as well.

    (c) ecosystem functioning

    Ecosystem functioning is the flow of materials and energy—through processes such as decomposition and photosynthesis—in an ecosystem due to the activity of the members of the biological community.

    (d) ecosystem stability

    Ecosystem stability is the ability of the ecosystem to maintain ecosystem functioning over time, particularly in response to disruptive events like drought or fire.

6 pts   3. List four distinct ecosystem services and briefly describe each.

Some examples are (this is not a comprehensive list):

- flood control: regulates the flow of water
- soil formation and maintenance by microorganisms and other organisms
- pollination: pollen carried by insects aid crop production
- nutrient cycling: flow of nutrients in ecosystems
- pollution treatment: assimilation and degradation of pollutants
- climate regulation: moderates swings in temperature and precipitation, and controls atmospheric composition
- source of raw materials such as wood and minerals
- genetic resources to improve domesticated plants and animals through breeding programs

6 pts   4. What does Aldo Leopold mean when he says that we must learn to 'think like a mountain?'

He means two things: (i) that we must consider the long-term consequences of actions, and (ii) that we must consider the ecosystem as a whole, accounting for interactions between species. The temporal aspect is fairly obvious, given the longevity of mountains. But Leopold also emphasizes the interactions between species when he says that "the cowman who cleans his range of wolves does not realize that he is taking over the wolf's job...he has not learned to think like a mountain."

8 pts   5. In some detail, summarize Gifford Pinchot's vision for natural resource conservation.

Pinchot advanced the cause of Progressive Conservation. He believed in the efficient use of natural resources to satisfy human needs and desires both now and (sustainably) into the future. Efficiency was his mantra, largely in reaction to the wasteful use of natural resources as the Nation expanded westward. The official end of the frontier in the last part of the 19th century brought the U.S. face-to-face with the fact that, though bountiful, the forests and other natural resources were not limitless.

Pinchot's believed that efficient use of forests and other resources meant that the resources should be owned by the federal government and managed by scientifically trained resource managers such as professional foresters. These scientists worked for the public good by managing these resources so as to obtain the maximum sustainable yield of goods and services.

8 pts 6. Distinguish between *multiple use* and *dominant use* criteria for the management of public land. Give examples of each.

Some public land systems are classified as 'multiple use' or 'dominant use' systems. Examples of multiple use systems are the national forests and rangelands, and dominant use systems are the national parks and wilderness refuges. Land resources can potentially be put to a number of uses: grazing, mining, recreation, timber production, wildlife preservation, etc. Lands designed as 'multiple use' must be managed to serve a broad range of possible uses (though sometimes weighted towards the needs of the states and municipalities closest to the land). The Multiple-Use Sustained Yield Act (MUSYA), which provides a mandate to the USDA Forest Service, defines multiple use as 'the management of...the national forests so that they are utilized in the combination that will best meet the needs of the American people.'

Lands managed for a dominant use, however, should have an overriding purpose. The purpose of the national parks is recreation, for example, while that of the wildlife refuges is for preservation. The lands must be managed with the intention of primarily serving their purpose, though other uses can sometimes merit consideration and can even override the dominant purposes on occasion. 'Dominant' use is not the same as 'exclusive' use, in other words.

8 pts 7. Vandermeer and Perfecto maintain that small-scale farms are *not* a true cause of rain forest destruction. Explain their reasoning.

They claim that blaming peasants for small-scale farming is really blaming the victim, as well as reversing cause-and-effect. Peasants are lured to the rainforest by employment opportunities offered mostly by large-scale timber and agricultural industries. Layoffs occur due to fluctuations in the market; the peasants then turn to subsistence farming. Thus, they are not driving rainforest destructions, but are largely a result of it.

In addition, peasant farmers tend to have a hard time getting more than 1–2 years' productive use of cleared land in tropical rainforests. This is because the soil is acidic and nutrient-poor, and because of the problem of pests (insects, diseases, weeds) that remain to attack the crops even after the forest is cleared. Industrial-scale agriculture is more destructive partly because of its larger scale but also because of the intensive use of fertilizers and pesticides needed to make the land productive. Such practices can greatly effect nearby ecosystems.

8. Gregg Easterbrook has trouble with the fact that the spotted owls are protected by the Endangered Species Act despite the fact that they are actually a subspecies, not a true species.

6 pts (a) What is the difference?

Subspecies are 'distinct local populations' of a species. These populations are often be separated geographically from other populations of the species and may have developed distinct characteristics, but would could still interbreed with other subspecies if they were brought together.

8 pts (b) What is the main biological justification for protecting subspecies?

If they remain isolated, subspecies may be well on the way to evolving into new species. Subspecies are liable to drift apart, genetically speaking, from the parent species. Thus, protecting subspecies promotes greater biological diversity. In addition—this is really a tactical reason, though with a biological foundation—protecting a subspecies can protect its critical habitat, which may be part of a valuable ecosystem (see next question).

6 pts   9. What is the importance of an 'umbrella' or 'indicator' species to preservationists?

Indicator species can be used as a surrogate measure of ecosystem health. By listing such a species as 'endangered,' it becomes an 'umbrella' to protect the land (and other species) within its designated critical habitat. Thus, they are used to protect valuable ecosystems.

They also help with public relations: by protecting 'characteristic megafauna' (such as the northern spotted owl), preservationists gain a 'poster child' for their cause. The goal is to protect biodiversity, but that is a little abstract and can be a hard sell. But preventing a particular species—especially a cute/cuddly one—from going extinct is something a little more tangible.

6 pts 10. (a) What exactly is optimized when a *Pareto optimum* is achieved?

A Pareto optimum maximizes wealth; presumably it also maximizes the aggregate happiness of a group of people.

8 pts   (b) Explain how cost-benefit analysis (CBA), coupled with the *potential compensation criterion*, leads to a Pareto optimum.

CBA is used to find the economically 'efficient' price, where marginal costs and benefits are the same. This is the point that maximizes the net monetary benefits, leading to the largest possible wealth *in the aggregate.* But there can be winners and losers, meaning that this isn't a Pareto optimum (where there are no losers). But the CBA 'sweet spot' can correspond to a Pareto optimum if winners compensate the losers for their losses. Thus there will be no losers, and the winners are still better off. This is a Pareto optimum.

6 pts   (c) List three major criticisms of depending too heavily on CBA to guide environmental policy, and briefly describe each item.

Here are a few (they are not completely independent of one another).

- Some factors (the pleasure of a scenic view, ecosystem services that are irreplaceable, emitting pollutants that increase the risk of cancer) cannot be easily assigned a market value. And when they are, there is usually great uncertainty in the value, as well as bias (environmental factors seem to be consistently undervalued).
- There is a distinction between consumer *preferences* and moral *values.* The latter are absolute in a way that preferences are not, and are literally 'priceless.'
- CBA is based on utilitarianism, where actions are good if they increase aggregate happiness. This school of thought can be criticized because actions are judged solely on their consequences rather than the nature of the acts themselves. Utilitarianism is often contrasted to the 'categorical imperative' of Kantian ethics, where actions are judged on their own worth on the basis of reason and duty.
- Usually in CBA, the people who bear the environmental benefits and costs are not the same. Thus, even if aggregate happiness is increased, there can be a group of people who are worse off in a morally reprehensible manner (eg, exposed to toxic levels of pollutants).
- Maximizing wealth (the goal of CBA) does not necessarily equate to maximizing happiness. In other words, money may be an imperfect metric for happiness: even if you accept utilitarianism, CBA may not maximize happiness.
- CBA is based on the ideal of a *rational* and *informed* consumer. However, people do not always act rationally (eg, 'buyer's remorse'). More importantly, the lack of scientific knowledge or education on the effects of certain actions on 'the environment' mean that the consumer is not fully informed of the consequences of a particular action. Thus s/he is not in a position to assess the effects on his/her happiness. Environmental costs cannot be adequately determined in such a case.
- CBA doesn't consider future generations in a way that is satisfactory to some environmentalists, particularly the practice of 'discounting.' (To be fair, economists can justify the practice. However, scientific and pricing uncertainty can be magnified by the practice).