

Name: \_\_\_\_\_ Pledge (sign): \_\_\_\_\_

## Env Studies 201 Test #1 KEY

**Point Total:** 100 pts possible

5 pts 1. What is an ecosystem?

An ecosystem is a *biological community*, the *abiotic surroundings* (ie, habitat) upon which its members depend, and the interactions between organisms and between organisms and habitat. The community consists of mutually dependent populations of biological species; its actions modify the nature of the habitat. The boundaries of the ecosystem are usually porous, in the sense that material and energy can flow into and out of the ecosystem. Boundaries between ecosystems are not always well defined.

8 pts 2. What is the *environmentalist's dilemma*, as posed by Bryan Norton, and why is it a problem?

According to Norton, the environmentalist's dilemma is not that he doesn't know what he wants, he just has trouble justifying his position. Arguments based on economics, where nature is viewed only as a resource, are not satisfactory because they often do not go far enough in protecting the environment and they also do not properly represent the common environmentalist feeling that nature also has importance beyond its resource value in a marketplace. But biocentric arguments that assign intrinsic value of individual organisms often go too far, demanding more than most mainstream environmentalists (and certainly the general public) really want. The problem, then, is in representing environmentalist values and positions in a coherent way that is palatable to most citizens.

8 pts 3. List the main criticisms—as many as you can (no more than one sentence or phrase for each item)—of the Endangered Species Act.

Some common ones (others possible):

- Property rights infringement: the ESA can restrict the actions of private landowners
- Reactive, not proactive: by the time a species is 'listed' a lot of damage has already been done
- Not very successful: takes too long to list a species, critical habitat is often not designated, not many species have been 'saved' (de-listed)
- Wrong goal: more important to protect ecosystems rather than individual species, if that's what the ESA is about we should be more explicit about that goal
- Economics not considered in listing a species, doesn't allow trade-offs between competing land use

- 8 pts 4. Contrast the spiritual/religious aspects of the attitudes of the Puritans and of John Muir towards wilderness.

To the Puritans, wilderness represented a source of evil and Godlessness. Living in the wilderness meant living away from civilization and its moderating influence on human behavior, leading to debauchery and sin. Humans need the constraints of civilized society. In their view, this attitude is confirmed by the poor and savage behavior of native Americans and pioneers who spent too much time in the wild. Also, humans are above nature, superior to it; God gave them all of creation to 'subdue' and 'dominate.'

Muir took much the opposite attitude: he saw wild places as a place of spiritual renewal from the bad influences of too much civilization. This is because wild places were sacred to Muir ("no holier temple has ever been consecrated") and humans needed contact wilderness to more directly experience that divinity.

5. William Baxter advocates an anthropocentric viewpoint as the fundamental basis of a rational environmental policy.

- 8 pts (a) Explain why he believes this viewpoint can be consistent with clear air and water, and healthy functioning ecosystems.

An anthropocentric viewpoint is one in which we consider only the well-being and health of human beings, not (directly) those of non-humans such as penguins. Nevertheless, Baxter argues that the well-being of penguins are still protected in directly, because their health is connected to human welfare. For example, pollution that threatens their health would threaten humans as well, so their levels would not be permitted to rise too high. Humans also care about the well-being of penguins more directly: for example, for personal enjoyment (eg, existence value) or for their role in a healthy ecosystem that provides benefits to humans. So in protecting human welfare, we will also safeguard the welfare of non-humans and their environment, since we derive enjoyment from and depend on them.

- 8 pts (b) Explain why he believes that any viewpoint that considers the welfare of other organisms (independent of human welfare) is ultimately impractical.

He thinks that selfish interests are the motivations that best describe how humans actually act. Any system that depends on more altruistic motivations (eg, selfless concern for non-humans) will fail because ultimately, at heart, humans are selfish creatures and won't be very willing to sacrifice their well-being for non-humans.

Additional possible reasons he discusses:

- non-humans cannot directly express their desires (eg, can't participate in a marketplace) so it is difficult, perhaps impossible, to know what they want;
- unless there is 100% buy-in by all parties, sacrificing some human benefits for those of non-humans will infringe on the rights of some humans to pursue their own interests.

10 pts 6. What is 'Pleistocene rewilding?' Briefly describe the main arguments for and against it.

The general practice of *rewilding* is the re-introduction of species, usually keystone species or top predators, to areas where they have disappeared in an effort to restore ecological balance and improve ecosystem health and functioning. Normally the species would have disappeared relatively recently—within the last 100 years, for example—but Pleistocene rewilding aims to re-introduce megafauna (or close equivalents) that disappeared from North America during the Pleistocene era, which occurred about 10,000 years ago.

The major argument for Pleistocene rewilding is that NA ecosystems have not functioned at their full potential since the megafauna disappeared. Other justifications include aesthetics and a moral obligation to restore the NA ecosystem, since the original extinction may have been caused by humans. Supporters also believe that there are economic opportunities (eg, ecotourism: think 'Pleistocene Park') associated with such an ambitious project, and that it will help keep some species thriving that might otherwise go extinct in other areas (eg, developing countries in Africa).

Critics say that the project will cost far too much and will not be successful in improving NA ecosystems since the extinctions happened so long ago and the ecosystems have changed drastically since then. They also think the project will be very costly and that the money and effort would be better spent to conserve the species in their (current) native lands. Critics also do not believe that popular and political will would support such an ambitious project whose scientific merit is debatable.

12 pts 7. Explain the criticisms that Mark Sagoff has for Pareto efficiency as a dominant method to address controversial environmental issues. In your answer, define a Pareto optimum.

A Pareto optimum situation occurs when no change in allocation of goods or services can occur that makes people happier without making at least one person worse off. In microeconomics, Pareto inferior situations are generally to be avoided and certain ideal marketplace conditions are theoretically able to produce a Pareto optimum if all buyers and sellers are motivated by pure self-interest. If coupled with the potential compensation criterion—whereby losers are compensated by winners—a Pareto optimum corresponds to the maximum economic efficiency: the maximum possible output of goods and services for a given initial distribution.

Sagoff's biggest problem is with the idea that Pareto optimality (or economic efficiency) is an ethical obligation for a society. He doesn't think that willingness-to-pay is a good indicator of the true value of ecosystems. Sagoff makes a sharp distinction between the value given to something when a person is thinking as a *consumer* compared to thinking as a *citizen*. Basically, personal preferences do not necessarily coincide with what we desire in an ideal society. Some aspects of the value of wilderness cannot ever be properly captured by the marketplace or included in cost-benefit calculations.

8. Rice, Gullison and Reid do not feel that 'sustainable management' of mahogany is a viable way to preserve biodiversity in tropical rainforests.

5 pts (a) What exactly do they mean here by 'sustainable management?'

Basically they mean it in a relatively narrow sense: taking no more than the maximum sustainable yield of mahogany. This might mean restraint in harvesting as well as replanting. They do not initially consider the effects on other parts of the rainforest ecosystem, though it becomes clear in their article that they believe that achieving the maximum sustainable yield of mahogany would degrade the rest of the ecosystem in undesirable (and likely unsustainable) ways.

- 8 pts (b) What are the *ecological* reasons that uncontrolled logging of mahogany may better preserve biodiversity than sustainable management?

Sustainable management of mahogany would likely entail a certain amount of replanting of mahogany trees. Unfortunately, this species doesn't do well when germinating under shady conditions; the seeds grow best after disturbances (such as forest fires) opens up a clear area. So replanting would entail clearing large openings in the forest. This would be good for the mahogany species...but bad for overall forest biodiversity. Hence, sustainability for the individual tree species involves practices that are unsustainable in the sense of preserving biodiversity for future generations.

- 8 pts (c) What are the *economic* reasons that uncontrolled logging is better than sustainable management?

An resource economist views the existing stand of mahogany trees as capital, and the maximum sustainable yield as 'biological interest' off that capital. So viewing mahogany purely as a resource, one option is to harvest at the maximum sustainable yield and thus obtain the value of that yield as gross income indefinitely.

But nothing is risk-free: natural disasters (or perhaps changing government policies) could reduce future mahogany harvesting rates. Another option would be to harvest ALL the mahogany, or at least harvest it as rapidly as possible, sell or stockpile the timber and invest the proceeds in financial markets. So now the income is economic, rather than biological interest off those investments. Economic analysis by Rice *et al.* showed that the financial risk is less and the profits greater if the mahogany is harvested quickly rather than sustainably.

- 12 pts 9. G. Evelyn Hutchinson stated that ecosystem communities tend to become more complex—more biodiverse—and more stable with time. What was his reasoning? Answer in some detail (use the back of this sheet if necessary).

Increasing biodiversity is a result of successful biological invasions over time. A new species can thrive in a habitat in one of three ways:

- by displacing an existing species,
- by filling an unoccupied niche, or
- by partitioning an existing niche.

The first way would not increase biodiversity, but would increase the efficiency at which natural resources are being used: if a new species displaces an existing species, it is presumably because it out-competes the species for available resources. The other two methods would both increase biodiversity and would also tend to increase ecosystem efficiency either because previously unused resources are now being used (option 2) or because species specialize to use a given resource more efficiently (option 3).

Hutchinson argued that the level of biodiversity and ecosystem complexity would tend to increase and approach to upper limit that is dictated by a variety of factors (maximum food chain length, climate, habitat size and variability, etc). Due to survival pressures, ecosystem efficiency—ie, efficiency of nutrient recycling and of energy transfer between trophic levels—would also tend to increase with biodiversity. This will result in greater stability: population and biodiversity levels tend to have fewer oscillations, to have greater adaptability to long-term trends, and to be more robust to abrupt changes. One main theory as to why that would be so is the so-called *portfolio effect* of complex ecosystems: the biological community is likely to have individuals and species that can thrive under a greater variety of conditions. This is similar to the logic of diversity in managing an investment portfolio to reduce the risk of unpleasant surprises.