

Name: _____ Pledge (sign): _____

Env Studies 201 Test #1 KEY

Point Total: 100 pts possible

- 8 pts 1. In his famous essay, “The Historical Roots of Our Ecological Crisis,” Lynn White opines that *two important events* that have shaped our modern ecological crisis. What were these events, according to White? Briefly (1–3 sentences) explain each.
- The marriage of science and technology. Natural theology, which was motivated by a desire to better understand God through study of His creation, eventually transformed into modern science through this marriage. Natural theology combined with engineering (‘technology’) to tackle practical issues—like building a better plow—and spread the results widely in a manner that would improve the lives of common men but also drastically increase the environmental effects of technological advances.
 - Organized Christianity triumphed over paganism. According to White, this triumph “made it possible to exploit nature in a mood of indifference to the feelings of natural objects.” The divine was largely removed from the natural world.
- The combination of these two events, according to White, is that humanity acquired the means for widespread domination of nature at the same time as it lost connection or respect for nature.
- 9 pts 2. In our discussion about the merits of ‘Pleistocene rewilding,’ we described three general strategies for protecting biodiversity. What were they? Briefly (1 sentence) describe each.
- (a) Conservation: protecting natural resources for future human use. The condition of the wilderness area—the amount of disturbance or the ecosystem health—is less important than the fact that its services remain unimpaired over the long term.
 - (b) Preservation: wilderness set-asides where the amount of human disturbance is kept to a minimum.
 - (c) Reparationist: a restoration of ecosystems to some previous state after (possibly extensive) human disturbance.
- 5 pts 3. (a) What fraction of the U.S. is currently owned by the federal government? Where does most of this land lie?
About 30% of US land is owned by the federal government, most of it in the western states.
- 10 pts (b) List the four federal agencies that control the bulk of federal lands.
In order of the acreage of the land administered:
- Bureau of Land Management, BLM (39% of federal land)
 - Forest Service, FS (29%)
 - Fish and Wildlife Service (14%)
 - Park Service (12%)

8 pts 4. In his article supporting offshore oil drilling, Stephen Baird states that the effects of offshore oil drilling on the environment are not great:

According to the US Minerals Management Service, since 1975, 101,997 barrels spilled from among the 11,855 billion barrels of American oil extracted offshore. This is a 0.001 percent pollution rate.

Mary Annette Rose, who opposes offshore drilling, contends that these numbers are misleading. In what way(s) does she mean?

According to Rose, the numbers are misleading because oil spills during drilling and exploration are not the only way that these activities impact the environment.

- There are impacts from every stage of the process.
- There is a large risk from blowouts during events like hurricanes and storms.
- Other wastes are released: produced water (a mixture of water, hydrocarbons, radioactive materials, and other toxic materials), cuttings (crushed rock), diesel emissions, and other chemicals (biocides, solvents, corrosion inhibitors)
- the process of extraction and use will release greenhouse gases (carbon dioxide, methane) and contribute to global climate change and ocean acidification
- operators, oil spill victims and rescue workers are exposed to a greater hazard

12 pts 5. Gifford Pinchot and John Muir represent two distinct attitudes toward wilderness. Describe these attitudes in some detail.

Pinchot is a champion of scientific (and progressive) conservation. He believes that natural resources exist to be used, but in a way that is efficient (rather than wasteful) and that allows their continued use by future generations. He believes that scientists, such as trained foresters, should manage natural resources because their expertise is important in order to husband the resources wisely. These scientists should be employed by the government, who should hold and manage significant quantities of wilderness areas for the public good.

Muir is a champion of romantic preservation, a movement to keep wilderness areas relatively undisturbed. While he might acknowledge the necessity for development, Muir believed strongly in spiritual renewal in the wilderness to counteract the bad effects of (over-)crowded city life. He was an early proponent and defender of National Parks as areas that should not be developed at all but should be kept in their natural state (or as close as possible) for the enjoyment of all who seek wild areas.

While the two shared some common goals at time—both would oppose too much private ownership or overdevelopment of wild areas, for example—they would also clash over the use of wilderness areas. In particular, they fought over the plan to dam Hetch Hetchy, a part of Yosemite National Park, for water and energy. So Pinchot's view of nature was ultimately more pragmatic and anthropocentric: natural resources were just that, resources to be used (efficiently, to be sure) in order to improve human welfare. While Muir also believed in (nondestructive) *recreational* use, his view tended toward the more biocentric, celebrating the innate value of undisturbed wilderness areas.

6. William Baxter wrote a short book entitled *People or Penguins: The Case for Optimal Pollution*.

5 pts (a) Baxter states that an anthropocentric case can be made on behalf of penguins. What is it? Penguins should be protected from the effects of DDT (or other human activities) because humans care about their welfare for some reason. It may be that people derive some material benefit from the penguins' well-being (eg through tourism or through fulfilling their role in a healthy, functioning ecosystem), or simply that they derive satisfaction from the fact that they are doing well. In either case, it is the human preferences that are the main motivation, not the intrinsic worth of the penguins themselves.

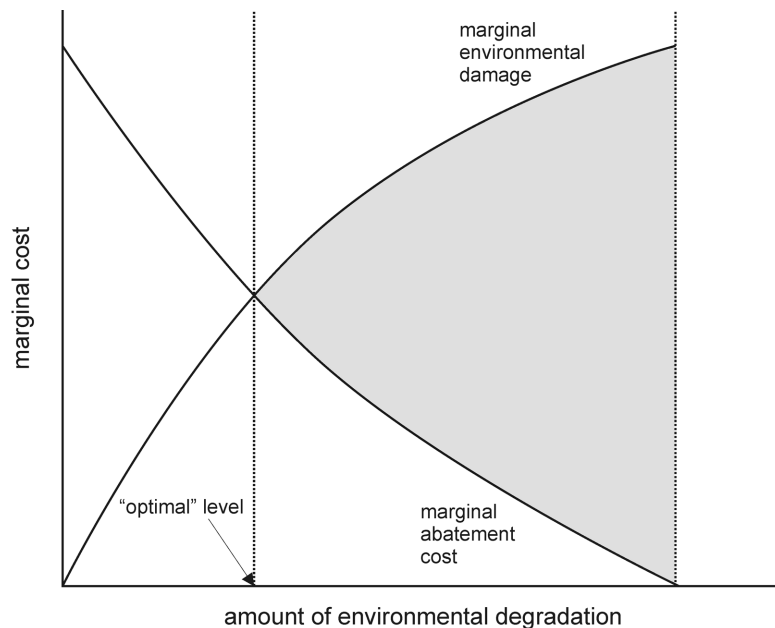
16 pts (b) Baxter contends that, in most cases, the optimum level of pollution (or, more generally, environmental degradation), is *not zero*. Explain in detail (use the back side of this page if necessary) how this optimum level can be determined.

According to neoclassical economics, the optimum level of environmental degradation is that which maximizes aggregate human wealth, which results in the most efficient allocation of scarce resources. This is a utilitarian approach, with wealth serving as a surrogate for human happiness. To maximize human wealth, we need to know two things:

- the marginal cost of environmental degradation (also called the *marginal environmental damage function*, MED). Knowledge of this function allows us to quantify the monetary benefit of avoiding environmental degradation to any arbitrary degree; and
- the marginal cost of avoiding environmental degradation (also called the *marginal abatement cost function*, MAC). Knowledge of this function allows us to quantify how much it would cost to void a given amount of environmental degradation.

In both cases, the *marginal* cost is the cost per unit of degradation. It assumes that the amount of environmental degradation can be 'divided up' in this manner; examples would be tons of DDT emitted into the environment, or acres of forest that is converted into another use. If both marginal cost functions are known, wealth is maximized—degradation has achieved its optimal level—at the point where the marginal costs of the two are equal. The cost of further degradation would be greater than the savings gained by failing to prevent that degradation, while preventing further degradation would not yield sufficient savings to offset the cost of avoiding that degradation.

This can be illustrated in the following cost-benefit diagram. The amount of wealth accumulated by avoiding the degradation is the area between the two functions to the right of the optimum level of degradation (the shaded area in the figure).



- 9 pts (c) List three potential criticisms of this approach to resolving environmental disputes, briefly (1 sentence) describing each.

Here are some possible criticisms.

- For some, environmental decisions have an ethical component that is not equivalent to goods and services that are exchanged in a market.
- CBA is based on (strong) utilitarianism, which is flawed because it can result in the 'tyranny of the majority' at the expense of the rights of a few.
- Pareto optimality requires a fully-informed consumer, but not every member of the public, whose wealth is being maximized, is aware of the value of functioning ecosystems
- Estimates for both MED and MAC are too uncertain—the science and economics may not be up to the task of properly estimating them—and they also tend to be biased low, resulting in excessive environmental damage and an inefficient allocation of resources.
- Some environmental/ecosystem services may be truly irreplaceable, so a basic tenet of CBA—that of substitutability ('everything has a price')—is violated.
- Distributional/justice issue: even though *aggregate* wealth is maximized by CBA, the 'winners' of environmental disputes do not have to compensate the 'losers' so there are issues of the rights of the 'losers.'
- Distributional/justice issue: there may be a socio-economic element to environmental decisions, where the costs of environmental degradation consistently fall on poor minorities who have less voice in environmental decisions.
- Distributional/justice issue: there may be an inter-generational component to environmental disputes, where the 'losers' may be future generations that pay for the benefits accrued to present-day winners.

- 18 pts 7. Explain in detail why greater biodiversity is generally believed to lead to healthier ecosystems; be complete. In your answer, you should be sure to define the term 'biodiversity' and also describe what it means for an ecosystem to be more 'healthy.'

Biodiversity refers to the variability of life in all its forms and levels of organization. There are several different ways to describe or measure biological diversity: at the species levels, at the genetic level (both inter- and intr-species), and at the landscape/ecosystem level. As stated in the question, it is hypothesized that greater biodiversity leads to healthier ecosystems.

An ecosystem is a biological community (collection of species populations), its physical surroundings, and the interactions between and among them. Many processes occur in ecosystems, and most of them can be classified as part of an *energy flow* or a *materials flow*. These flows, or processes related to them, can be used to characterize ecosystem health: common examples include biological productivity rates, population levels, and total ecosystem biomass.

A healthy ecosystem is generally one in which energy/materials flow are high, energy transfer and nutrient recycling is relatively efficient, and population levels are stable and recover quickly from disturbances. Most ecologists believe that, usually, greater biodiversity leads to healthier ecosystems. There are a number of reasons but they basically boil down to the following two reasons.

- *Greater diversity will lead to greater efficiency at using available resources.* This means that a given ecosystem—a given set of abiotic resources—will support greater biological productivity and biomass in the ecosystem. More ecological 'niches' would tend to be occupied, and those niches will be used more efficiently. There will be a higher probability of finding species 'superstars' that are particularly adept/efficient at using resources. Energy/material flow will tend to be higher between trophic levels.
- *Greater diversity will usually confer greater stability* in flow rates and population levels in the ecosystem. Stability in this context means two things: that extreme events, such as drought, flood, fire or disease, will affect ecosystem functioning less drastically, and that the time to recover from such events will also be shorter. Why might this happen? Genetic diversity within a species means that there will more likely be individuals who are less susceptible to extreme events. As well, a diverse assemblage of species means that if conditions change enough over time that one species declines or cannot adapt to, another would be available to make use of the resource (niche) that was abandoned by the first species (this is an example of the 'portfolio effect.' Evolutionary potential will also be greater, meaning that species can adapt better to more gradual changes.