Resource & Environmental Economics Field Examination

January 15, 2004

Instructions:

- You have 4 hours to complete the exam. This time commences at the end of the 15-minute reading period during which no writing is allowed.
- Please use your assigned "alpha letter" on every page to identify your exam and number each page. Do not use your name or social security number. Write on only one side of the page leaving at least one inch margins. Upon turning in the exam make sure the pages are in order.
- You have four questions to answer with a choice between questions 4 and 5.

Answer all three of questions 1-3.

1. Suppose that nitrogen runoff from fields into rivers is importantly related to the volume of fertilizer used on farms, especially irrigated farms. Suppose estimates are needed on how fertilizer use would be affected by a tax on nitrogen in runoff. Outline a quantitative study you could use to estimate the effect of a tax on nitrogen runoff, fertilizer use, and farm profitability. How might data availability affect the quantitative methods that you choose?

2. Suppose that the Texas Parks and Wildlife Department (TPWD) is considering a plan to improve the coastal habitat of a rare Texas bird species. The bird's habitat extends across the southern coast of the state. The bird is quite well known; tourists frequently visit areas where the bird breeds; and landowners take pride when the bird appears on their property. The plan under consideration is anticipated to increase the bird's population by about 5%.

   a. Briefly discuss three methods that might be used to place an economic value on the 5% greater bird population. Indicate what exactly is valued by each method and whether the estimated values should be added together to obtain a total value, or whether they are three different values of the same thing.

   b. Take any one of the three methods discussed in part a and discuss (i) what type of data you might use and how such data might be collected, (ii) what basic econometric model would be estimated, and (iii) describe one or two of the most important challenges that you would need to overcome in order to obtain a valid measure.

3. Economists frequently refer to supply price as an indicator of the evolving scarcity of nonrenewable resources. Yet, this is also frequently criticized as inappropriate.

   a. Using an appropriate mathematical model incorporating resource depletion, develop and critique the theoretical motivation for the use of supply price as an indicator of scarcity. Explain model goals and components, procedure, and noteworthy outcomes. Given the insights emerging from such models, in what ways and under what conditions does price do a good job of indexing rising scarcity?

   b. What are some of the problems with the use of supply price as an indicator of scarcity?

   c. How do your answers to a and b change when considering a renewable resource?

Answer only one of questions 4-5.

4. You live on an island that is experiencing significant growth in its population and its economy. As the resident economist for Tropical Water Agency (TWA), you must devise a plan of action for better management of water resources.

   Currently,

   - there are no flowing rivers or surface water on your island; all fresh water is ground water.
   - all fresh water is the result of rain falling on mountain slopes and seeping into a central aquifer beneath the inner part of the island.
   - many landowners (including small businesses and farmers) and villages have small wells tapping the aquifer; there have never been any regulations on well use.
   - large corporations and hotels have begun securing property and constructing buildings; they commonly drill new wells for their use.
   - ground water levels appear to be falling.

   Recognizing that you are a management advisor, not the ultimate decision maker, describe two or three reform opportunities in complete detail. Discuss key concepts regarding each reforms' strengths and weaknesses that should be communicated to decision makers and stakeholders.

5. Many in society are expressing concern about the potential of global climate change as caused by current levels of greenhouse gas emissions. A recent study shows that climate change could result in the loss of over a million species. Other studies have suggested changes in future generations' welfare while others have indicated regional shifts in the distribution of income.

   a. Describe in theoretical terms the economic nature of the climate change issue including any reasons that current greenhouse gas emissions could be excessive.

   b. Suppose society has decided current emissions are excessive and is considering implementing emission reduction subsidies, emission quotas, or a tradable permit system.

      i. Describe in broad terms the differential economic effects of these strategies across emitting firms including an appraisal of welfare across the firms' and total social welfare.

      ii. Discuss the advantages and disadvantages of using tradable permits for control of greenhouse gases as compared with trading pollution rights for local air quality markets.