RESOURCE ECONOMICS PRELIMINARY EXAMINATION
August 22, 1997

You have until 8:15 to read the exam and ask any clarification questions. You then have until 12:15 (four hours) to complete this examination. Exams will be collected promptly.

Part I: Answer all of the following three questions

1. There are numerous cases in which a natural resource becomes threatened by the activities of people. One example is the habitat employed by migrating bird populations. The riparian zone of a river may serve as such a habitat, and some baseline water flows within the river may be crucially important for the sustenance of migrating flocks. However, growing water withdrawals by people tend to reduce instream flows. Carefully explain the role of a resource economist in addressing this issue. State your assumptions, data needs, what you would measure, and your specific input to developing strategies related to this problem setting. What policies might you suggest and why?

2. Many cities of the U.S. are reexamining their practices of managing solid waste disposal. Shrinking numbers of approved garbage disposal sites (landfills) and growing disposal costs call to question the flat rate pricing most communities use to recover landfill operation costs from households. That is, since the lump-sum monthly fees paid by residents are unrelated to their individual garbage loads, the incentive structure may be outdated. Yet, the monitoring costs associated with alternative rate structures can be large. Fully explain your proposal to conduct an economic evaluation of this problem. What alternatives would you consider and how would you perform an economic appraisal of the alternatives?

3. Derive the dynamically optimal fishery equilibrium (steady state) using the notation that follows. Let $F(X_t)$ be the amount of one-period growth in the fish stock in period t when the level of fish stock is X_t; let $U(H_t)$ be the total benefits derived from the harvesting of fish; let harvest in time t be a function of fishing effort, E_t, and the stock of fish (i.e., $H_t = G(E_t, X_t)$); let $C(H_t, X_t)$ be the cost of harvesting H_t when stock is X_t; and let r be the discount rate. [If you prefer to use continuous time analogues to these discrete period functions, you may do so.]

   Explain the economic intuition behind your condition for dynamic efficiency in a steady state. Explain whether the open access equilibrium level of the fish stock is larger or smaller than the dynamically efficienct steady-state level. When the framework above is modified so that harvesting costs are independent of fish stock, show whether the dynamically efficienct steady-state level of the fish stock is larger or smaller than the level corresponding with MSY.

Part II: Answer one of the following two questions

4. An increasingly important dichotomy in the economics literature of pollution has to do with the distinction between point and nonpoint pollutants. Distinguish these two types of pollution from an economic perspective and fully discuss the implications of this distinction for the design of efficient pollution contol policy.

5. Consider a nonrenewable natural resource in finite supply. Suppose that the cost of extraction is zero and the elasticity of demand for the extracted resource is constant and greater than unity in absolute value. Suppose further that a technology exists to produce a perfect substitute for the extracted resource and that the substitute has a constant, strictly positive production cost per unit.

   Describe the price path for the resource if (a) both the resource industry and the back-stop industry are competitive, (b) the resource industry is a monopoly and the back-stop industry is competitive, and (c) the same monopolist owns the resource industry and the back-stop industry.