FISH 645: Bioeconomic Modeling and Fisheries Management
(3 credits)

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TR 10-12 or by appointment

TR 3:40-5:10 Juneau (LP 212) and by video conference to Fairbanks and other sites as demand warrants.

An introduction to analytic and computational models of discrete-time representations of bioeconomic systems, including comparative static and optimal control approaches to optimizing unitary and multiple criteria subject to deterministic and stochastic dynamic processes. Particular attention is given to bioeconomic models of optimal management of exploited populations of fish and shellfish. *Prerequisites: STAT F401 and MATH F200,*

exercises and exam: ≥90 = A; ≥80 but <90 = B; ≥70 but <80 =C; ≥60 but <70 =D; and < 60 = F.

Academic dishonesty cannot be excused; at best it represents indolence, at worst it is a willful and unconscionable act of intellectual theft. Students enrolled in this class are expected to conform with the UAF Student Code of Conduct (www.uaf.edu/catalog/current/academics/regs3.html

* Higgs R. 1982. Legally induced technical regress in the Washington salmon fishery. *Research in Economic History* 7:55-86.
* Anderson TL Hill PJ 1990. The race for property rights. *Journal of Law and Economics* 33: 177-197
* Dietz T Ostrom E Stern PC 2003. Struggle to govern the commons. *Science* 302: 1907-1912

b. Limited Entry
*JE Wilen. 1988. Limited entry licensing: a retrospective assessment. *Marine Resource Economics* 5: 313-324.

c. IFQs
*Hannesson R 1996. On ITQs. *Reviews in Fish Biology and Fisheries* 6:91-96.
National Research Council. 1999. *Sharing the Fish: Toward a National Policy on Individual Fishing Quotas*, National Research Council, National Academy Press. Washington DC. 422p.

d. TURFS
* Acheson JM. 1975. Lobster fiefs—economic and ecological effects of territoriality in the Maine lobster industry. *Human Ecology* 3: 183-207.
Gonzalez E. 1996. Territorial use rights in Chilean fisheries. *Marine Resource Economics* 11: 211–218.
* Criddle KR, M Herrmann & JA Greenberg. 2001. Territorial use rights: a rights based approach to spatial management. Pages 573-590 in M Dorn, S Hills, G Kruse, & D Witherell (Editors). *Spatial Processes and the Management of Marine Populations*, Alaska Sea Grant, Fairbanks AK.

e. CO-OPS/Enterprise Allocations
* Criddle KR & S Macinko. 2000. A requiem for the IFQ in US fisheries? *Marine Policy* 24: 461-469.
* Sylvia G, H Munro-Mann & C Pugmire. 2008. Achievements of the Pacific whiting conservation cooperative: rational collaboration in a sea of irrational competition. Pages 361-368 in R Townsend, R Shotton and H Uchida (editors). *Case Studies in Fisheries Self-Governance*. FAO Fisheries Technical Paper. No. 504. Rome, FAO
* Wilen JE & EJ Richardson. 2008. Rent generation in the Alaskan pollock conservation cooperative. Pages 361-368 in R Townsend, R Shotton and H Uchida (editors). *Case Studies in Fisheries Self-Governance*. FAO Fisheries Technical Paper. No. 504. Rome, FAO.

Homework 3 is due at end of this module.

7. Single Criterion Optimal Control of Deterministic Dynamic Populations — Week 9

Dorfman R. 1969. An economic interpretation of optimal control theory. *American Economic Review* 59: 817-831.
Clark CW Munro GR 1975. The economics of fishing and modern capital theory. *Journal of Environmental Economics and Management* 2, 92-106.
Berck P. 1979. The economics of timber: a renewable resource in the long run. *Bell Journal of Economics* 10:447-462.
* Bjorndal T. 1988. The optimal management of North Sea herring. *Journal of Environmental Economics and Management* 15:9-29.
Williams BK. 1989. Review of dynamic optimization methods in renewable natural resource management. *Natural Resource Modeling* 3:137-216.

Homework 4 is due at end of this module.

8. Comparative Static Analysis of Stochastic Populations — Weeks 10 & 11

Criddle KR. 1996. Predicting the consequences of alternative harvest regulations in a sequential fishery. *North American Journal of Fisheries Management* 16:30-40.
* Criddle KR & AY Streletski. 2000. Multiple criterion management of a sequential fishery. *Annals of Operations Research* 94: 259-273.
* Criddle KR, M Herrmann, JA Greenberg, & EM Feller. 1998. Climate fluctuations and revenue maximization in the eastern Bering Sea fishery for walleye pollock. *North American Journal of Fisheries Management* 18: 1-10.
* Criddle KR & M Herrmann. 2008. A state space bioeconomic model of Pacific halibut. *Natural Resource Modeling* 21:29-60.

Homework 5 is due at end of this module.

9. Single Criterion Optimal Control of Stochastic Dynamic Populations — Week 12

* Criddle KR. 1993. Optimal control of dynamic multispecies fisheries. Pages 609-628 in G Kruse, D Eggers, R

10. Comparative Static Analyses of Multiple Use Bioeconomic Systems — Week 13

McConnell KE & JG Sutinen. 1979. Bioeconomic models of marine recreational fishing. *Journal of Environmental Economics and Management* 6: 127-139.

Bishop RC & KC Samples. 1980. Sport and commercial fishing conflicts: theoretical analysis. *Journal of Environmental Economics and Management* 7: 220-233.

* Edwards SF 1991. Critique of 3 economics arguments commonly used to influence fishery allocations. *North American Journal of Fisheries Management* 11:121-130.

Easley JE Jr. 1992. Selected issues in modeling allocation of fishery harvests. *Marine Resource Economics* 7: 41-56.

* Criddle KR. 2004. Economic principles of sustainable multi-use fisheries management, with a case history economic model for Pacific halibut. Pages 143-171 in D.D. MacDonald and E.E. Knudson (editors), *Sustainable Management of North American Fisheries*, American Fisheries Society. Bethesda, MD.

11. Model Extensions — Week 14

a. Recreation and Other Non-commercial Uses

Henderson MM, KR Criddle, & ST Lee. 2000. The economic value of Alaska's Copper River personal-use and subsistence fisheries. *Alaska Fishery Research Bulletin* 6: 63-69.

Criddle KR, M Herrmann, ST Lee, & C Hamel. 2003. Participation decisions, angler welfare, and the regional economic impact of sportfishing. *Marine Resource Economics* 18:291-312.

b. Multiple Criterion Management

Merritt M & KR Criddle. 1993. Multiple criterion decision theory for judging management strategies and resolving conflict: a case study of the Kenai River recreational fisheries. Pages 683-704 in G Kruse, D Eggers, R Marasco, C Pautzke, & TJ Quinn II (Editors). *Management Strategies for Exploited Fish Populations*, Alaska Sea Grant College Program, Fairbanks AK, p. 683-704.

c. Risk

National Research Council. 2004. *Non-native Oysters in the Chesapeake Bay*. National Research Council, National Academy Press. Washington DC 325p.

Final Exam.