

Graduate Certificate in Quantitative Resource Assessment

Rationale and need. - Recent literature indicates a need for students in natural resource programs and for those entering federal agency positions to have better training in statistics, mathematics and computational analyses. For example, the recent publication, “*Report to Congress: The shortage in the number of individuals with post-baccalaureate degrees in subjects related to fisheries science*”, cites lack of training in fisheries students in statistics, especially multivariate analysis, Bayesian statistics, sampling and nonparametric statistics. Similar needs were cited in “*A solid foundation: Imagining the ideal wildlife curriculum*”, which appeared in a special education section of *Wildlife Professional*. This unmet need also extends to other of natural resources management-related fields such as forestry, geography and environmental science.

This certificate program is targeted to graduate students in the Department of Statistics and the College of Natural Resources. Students must be enrolled either full-time or part-time as graduate students at the Blacksburg campus or enrolled as Virginia Tech students in the Commonwealth scholar program. The program will be flexible in that students will be able to take courses in both areas and thereby be able to complete a thesis or dissertation that has a quantitative focus. Completion of the slate of courses pertaining to an option will result in a certificate from the Graduate School.

Students must already be enrolled as students in the graduate program Fisheries and Wildlife Sciences. They must have completed Biometry (Stat 5605/5606), Statistics in Research (Stat 5615/5616) or equivalent.

Requirements. - To receive a Graduate certificate in Quantitative Resource Assessment, the student must have:

- registered no later than the last day to add courses for the semester in which they complete the last courses for the certificate,
- submitted his or her program of study for the certificate to the Graduate School, which has been signed by one of the faculty members on the Graduate Certificate in Quantitative Resource Assessment Oversight Committee, and
- attained a minimum GPA of 3.0 in the designated courses.

Coursework. - Students must take at least nine credit hours in statistics (see section “a” below) and at least nine credit hours in the natural resources options (see section “b” below). Students in natural resources must take two classes in their own option, and one from any natural resources option, which may include their own option.

- a. Statistics – students must take at least nine credit hours from Statistics in addition to an introductory sequence noted in item 2 above. These courses are taught either for statistics majors or for a mixed audience.
 - Stat 5444, 5444G – Bayesian methods
 - Stat 5504, 5504G – Multivariate methods
 - Stat 5404 – Nonparametric methods
 - Stat 5214, 5514G – Regression

Stat 5204, 5204G – Design of experiments
Stat 5524G – Sample Survey Theory
Stat 5544 – Spatial statistics

- b. Courses in Natural Resource area – students must take at least nine credit hours in Natural Resources:

Quantitative Option in Fisheries Science

FIW 5514 – Fish Population Dynamics and Modeling
FIW 5714 – Advanced Fisheries Management
FIW 5724 – Simulation Modeling for Fisheries and Wildlife Sciences

Quantitative Option in Wildlife Science

FIW 5214 – Vertebrate Population and Habitat Analysis
FIW 5224 – Wildlife Population Dynamics
FIW 5724 – Simulation Modeling for Fisheries and Wildlife Sciences
FIW 6004 – Advanced Quantitative Methods in Fisheries and Conservation
Biology
FIW 6214 – Advanced Habitat Analysis

Quantitative Option in Forest Resources and Environmental Conservation

For (Geog) 5104 – Seminar in Remote Sensing and Geographic Information Systems
For (Geog) 5154 – Hyperspectral Remote Sensing for Natural Resources
For 5214 – Advanced Forest Inventory
For 5224 – Forest Biometry
For 5254 – Remote Sensing of Natural Resources
For 5264 – GIS Applications in Natural Resource Management
For 5415, 5416 – Advanced Forest Resources Management and Economics
For 5984 – Natural Resources Applications in Operations Research
For (Geog) 6214 – Forestry Lidar Applications

Quantitative Option in Spatial Analysis

Geog 5034 – Analysis of Spatial Data
Geog 5084 – Intermediate Geographic Information Systems
Geog 5314 – Adv. Spatial Analysis in Geographical Information Systems
Geog 5354 – Advanced Remote Sensing and Phenology
For 5254 – Remote Sensing of Natural Resources
NR 6104 – Advanced Topics in Remote Sensing