Program Objectives

By graduation, students will be able to:

1. Demonstrate a comprehensive understanding of ecological principles governing aquatic ecosystems, including species interactions, energy flow, and nutrient cycling.
2. Analyze the interplay of biological, chemical, and physical processes in freshwater and marine ecosystems from an ecological perspective.
3. Apply the scientific method to investigate ecological questions and solve environmental challenges.
4. Interpret ecological data from tables, graphs, and models to draw meaningful conclusions.
5. Assess the impacts of human activities on aquatic ecosystems and propose evidence-based solutions for conservation and sustainable management.
6. Communicate their ideas and findings to an audience through written and oral work

Program Assessment Tools

These tools will measure student performance and progress in achieving program goals:

1. Direct Assessment

Course-Embedded Assessments:

- **Foundational Knowledge:**
  - Exams and quizzes in foundational courses (e.g., Marine Biology, General Ecology, and Limnology) will assess students' understanding of ecological principles and processes.
  - Lab assignments in courses such as Biology Lab, Chemistry Lab, and Fish Ecology Lab will evaluate the application of ecological principles to real-world scenarios.
- **Ecological Systems Thinking:**
  - Interdisciplinary courses (e.g., Fish Ecology, Conservation and Management, Ichthyology, and Global Change and Conservation in Marine Systems) will include group and individual projects and presentations where students research and analyze ecological interactions.
- **Field and Applied Ecology:**
  - Practicum courses like Aquatic Ecology Practicum and Advanced GIS and Spatial Analysis will assess students' ability to apply ecological research methods and analyze spatial ecological data.

Skill-Based Assessments:

- Courses like **Intro to GIS Systems**, **Advanced GIS and Spatial Analysis**, and **Data Management** will assess technical skills in ecological data analysis, visualization, and geospatial modeling.

2. Indirect Assessment Tools

- **Student Surveys:** Annual surveys and exit interviews with students will gather feedback on curriculum effectiveness, perceived knowledge of ecological principles, and career readiness.
- **Alumni Surveys:** Periodic surveys will assess the program's impact on ecological career success, particularly in research, conservation, and resource management roles.

- **Employer Feedback:** Feedback from employers in ecological fields, such as conservation organizations, environmental consultancies, and government agencies, will be collected to evaluate program relevance.

3. Graduation and Career Metrics:

- **Retention and Graduation Rates:** Track student progress and retention to maintain high graduation rates.
- **Employment Outcomes:** Monitor job placement rates in ecology-related fields, with a focus on roles in research, resource management, and conservation.
- **Graduate School Enrollment:** Measure the percentage of graduates pursuing advanced degrees in ecological sciences.

Program Review and Development

- **Curriculum Mapping:** Program goals will be aligned with specific courses to ensure coverage of ecological concepts.
- **Advisory Committee:** We will utilize the WATS and the Quinney College of Natural Resources advisory committees to review program outcomes and recommend updates to the curriculum.
- **Continuous Improvement:** Incorporate assessment findings into annual program evaluations to refine course content, enhance ecological research opportunities, and introduce new electives based on emerging ecological issues and course offerings.

Standards and Competencies

Upon graduation, students in the Bachelor of Science in Freshwater and Marine Ecology (FWME) program will achieve the following standards, competencies, and marketable skills. These standards were chosen to align with the program's mission to prepare graduates for careers in freshwater and marine ecological research, resource management, and conservation while fostering the skills needed for continued academic growth or advanced study.

1. Ecological and Scientific Knowledge

Standards:

i. Demonstrate an understanding of ecological principles, including energy flow, nutrient cycling, species interactions, and ecosystem dynamics in freshwater and marine environments.
ii. Explain the interdependence of biological, chemical, and physical processes in aquatic systems.
iii. Understand anthropogenic impacts on ecosystems and ecosystem services.

Competencies:

iv. Integrate biological, chemical, and physical knowledge to solve complex ecological problems.
iv. Assess ecosystem health and evaluate the sustainability of human activities on aquatic systems.

Marketable Skills:

vi. Critical thinking in ecological contexts.
vi. Knowledge of marine and freshwater ecosystems and the key groups of organisms that inhabit them.
vi. Knowledge of applied freshwater and marine conservation and management strategies.

2. Research and Analytical Skills

Standards:

ix. Apply the scientific method to formulate research questions, design experiments, and interpret results.
ix. Demonstrate proficiency in ecological data collection, statistical analysis, and visualization.

Competencies:

2. Analyze ecological datasets using advanced tools like R and GIS.
3. Effectively visualize data in clear, engaging, and impactful ways to enhance understanding and communication.

Marketable Skills:

i. Expertise in scientific data management and analysis.
ii. Proficiency in geospatial technologies (GIS, R).

3. Technical and Field-Based Competencies

Standards:

iii. Demonstrate field and lab skills for assessing aquatic ecosystem properties, including biodiversity, water quality, and habitat characteristics.
iii. Use specialized tools and methods for sampling and monitoring aquatic systems.

Competencies:

v. Conduct field-based research with an understanding of ecological monitoring protocols.
v. Safely and effectively use ecological lab and field equipment.

Marketable Skills:

vii. Hands-on experience in aquatic fieldwork and laboratory techniques.
vii. Skill in ecological sampling, water chemistry analysis, and species identification.

4. Communication and Professional Development

Standards:

ix. Effectively communicate ecological concepts, research findings, and conservation strategies to diverse audiences.
ix. Demonstrate professional conduct, teamwork, and ethical practices in ecological research and management.

Competencies:

xi. Write science-informed research papers and reports using appropriate style and formatting.
xi. Deliver professional oral and visual presentations on ecological topics.

Marketable Skills:

xiii. Technical writing and scientific communication.
xiii. Experience in presenting complex ecological data to stakeholders.

5. Career Preparedness and Interdisciplinary Integration

Standards:

xv. Demonstrate the ability to work in interdisciplinary teams to solve ecological challenges.
xv. Align academic preparation with career goals in government, non-profits, or private sectors.

Competencies:

xvii. Use knowledge of natural resource policy and management to inform ecological decisions.
xvii. Demonstrate the ability to think critically about ecological economics, ethics, and sustainability.

Marketable Skills:

xix. Knowledge of environmental policy and natural resource management.
xix. Ability to collaborate across disciplines to solve real-world problems.

6. Assessment of Student Learning Outcomes

a. Coursework and Assignments:

1. Written exams, quizzes, and lab reports in foundational courses (e.g., Marine Biology, Oceanography, General Ecology, Limnology).
2. Analytical exercises in GIS and R courses to assess technical skills.
3. Group projects in interdisciplinary courses to evaluate teamwork and systems thinking.

b. Progressive Feedback:

1. Peer and self-assessments in collaborative learning settings to promote reflection and improvement.
2. Student and faculty evaluations of courses