Annual Program Assessment Report

Academic Year: **2017-2018**

Department: **Ecology**

Program(s) Assessed:

Indicate all majors, minors, certificates and/or options that are included in this assessment:

Majors/Minors/Certificate	Fish & Wildlife Ecology and Management Option
Bachelor of Science in Biological Sciences	Conservation Biology and Ecology Option
	Organismal Biology Option
	Biology Teaching Option

Annual Assessment Process

1. Data are collected as defined by Assessment Plan
2. Population or unbiased samples of collected assignments are scored by at least two faculty members using scoring rubrics to ensure inter-rater reliability.
3. Areas where the acceptable performance threshold has not been met are highlighted.
4. The scores are presented at a program/unit faculty meeting for assessment.
5. The faculty review the assessment results, and respond accordingly.
   a. If an acceptable performance threshold **has not been met**, possible responses:
      o Gather additional data to verify or refute the result.
      o Identify potential curriculum changes to try to address the problem
      o Change the acceptable performance threshold, reassess
      o Choose a different assignment to assess the outcome
   b. If acceptable performance threshold **has been met**, possible responses:
      o Faculty may reconsider thresholds
      o Evaluate the rubric to assure outcomes meet student skill level (example – classes with differing learning outcomes based on student level)
      o Use Bloom's Taxonomy to consider stronger learning outcomes
      o Choose a different assignment to assess the outcome

6. **Demonstrate the impact of the assessment response in next assessment cycle.**
7. Submit Assessment reports annually to report assessment activities and results by program. The report deadline is <u>September 15th</u>.

1. What Was Done

a) The following learning outcomes were reviewed during this assessment cycle.

Fish and Wildlife Ecology and Management Option

1) Demonstrate ability to apply quantitative reasoning and appropriate mathematical and statistical methods to describe or explain phenomena in the natural world.

2) Demonstrate understanding of the major areas of population ecology, interspecific interactions and interactions with the physical environment.

Conservation Biology and Ecology Option

1) Demonstrate ability to apply quantitative reasoning and appropriate mathematical and statistical methods to describe or explain phenomena in the natural world.

2) Demonstrate understanding of the major areas of population ecology, interspecific interactions and interactions with the physical environment.

Organismal Biology Option

1) Demonstrate ability to apply quantitative reasoning and appropriate mathematical and statistical methods to describe or explain phenomena in the natural world.

2) Demonstrate use of technology to effectively communicate results of literature reviews, research and analyses, and conclusions

3) Identify and declare in consultation with an advisor(s) an advanced area of biological and/or ecological emphasis based on previous coursework, experience, ability, and interest

Biology Teaching Option

1) Demonstrate basic understanding of the major disciplines in biology including general biology, physiology, genetics, evolution, and ecology

2) Understand and demonstrate use of formal and informal assessment strategies and tolls to direct planning of instruction for the continuous intellectual, social, and physical development of all learners including on-going pre-, formative and summative analysis of student learning, individually, in groups, and in whole class settings; plan lessons and instructional sequences based upon knowledge of subject matter, standards, learning outcomes, students and the community.

b) Include planning table – inform if there are changes to the assessment plan.

Below are the planning tables for each option, with the year of interest highlighted in blue. No changes have been made to the plan as outlined in the tables at this time.

Table 1. Planning Table, Fish and Wildlife Ecology and Management Option.				
Learning Outcome	2015-2016	2016-2017	2017-2018	2018-2019
Demonstrate effective written and oral communication.	X			
Demonstrate an understanding of physical and chemical factors that influence organisms, their physiology, and ecosystem function.		X		
Demonstrate the ability to apply quantitative reasoning and appropriate mathematical and statistical methods to describe or explain phenomena in the natural world.			X	
Demonstrate basic understanding of the major disciplines in biology including physiology, genetics, evolution, ecology and systematics.				X
Demonstrate an understanding of the process by which scientific knowledge is generated and evaluated.	X			
Demonstrate a basic understanding of demographic attributes of populations and the natural processes and the abiotic factors that influence population dynamics, as well as direct and indirect anthropogenic influences on populations		X		
Demonstrate a basic understanding of the variety of interactions among communities of organisms and the integration of communities into ecosystems			X	
Demonstrate awareness of historical, political, economic, and social factors in fish and wildlife management and natural resource conservation				X
Demonstrate a basic understanding of fish and wildlife management and conservation techniques	X			

Table 2. Planning Table, Conservation Biology & Ecology Option				
Learning Outcome	2015-2016	2016-2017	2017-2018	2018-2019
Demonstrate effective written and oral communication.	X			
Demonstrate an understanding of physical and chemical factors that influence organisms, their physiology, and ecosystem function.		X		
Demonstrate the ability to apply quantitative reasoning and appropriate mathematical and statistical methods to describe or explain phenomena in the natural world.			X	
Demonstrate basic understanding of the major disciplines in biology including physiology, genetics, evolution, ecology and systematics.				X
Demonstrate an understanding of the process by which scientific knowledge is generated and evaluated.	X			
Demonstrate the ability to use logic and reasoning to evaluate one's own work and the work of others.		X		
Demonstrate understanding of the major areas of population ecology, interspecific interactions and interactions with the physical environment.			X	
Demonstrate understanding of ecological patterns and processes at levels of organization above the population, including community ecology and ecosystem ecology				X
Demonstrate an understanding of the ways that ecological principles can be used to solve practical problems	X			
Demonstrate an understanding of current patterns of biodiversity and extinction, and why these patterns are of concern		X		
Demonstrate an understanding of the ways that natural and human related factors alter population dynamics and extinction risk, community dynamics ecosystem function and evolutionary processes.			X	
Demonstrate an understanding of the methods by which conservation problems are identified and addressed				X
Demonstrate basic understanding of the ways that economic, legal and social issues affect conservation problems, policies and solutions	X			

Table 3. Planning Table for Organismal Biology Option Learning Outcomes				
Learning Outcome	2015-2016	2016-2017	2017-2018	2018-2019
Demonstrate effective written and oral communication.	X			
Demonstrate an understanding of physical and chemical factors that influence organisms, their physiology, and ecosystem function.		X		
Demonstrate the ability to apply quantitative reasoning and appropriate mathematical and statistical methods to describe or explain phenomena in the natural world.			X	
Demonstrate basic understanding of the major disciplines in biology including physiology, genetics, evolution, ecology and systematics.				X
Demonstrate an understanding of the process by which scientific knowledge is generated and evaluated.	X			
Demonstrate the ability to use logic and reasoning to evaluate one's own work and the work of others.		X		
Demonstrate use of technology to effectively communicate results of literature reviews, research and analyses, and conclusions			X	
Demonstrate the ability to apply the interdisciplinary building blocks to understand integrated problems at the organism level				X
Demonstrate understanding of the relationship between genetics and evolution and the influence of these disciplines on organismal diversity	X			
Demonstrate an understanding of the hierarchy of biology including the organismal scale and including population, community, and ecosystem ecological processes		X		
Identify and declare in consultation with an advisor(s) an advanced area of biological and/or ecological emphasis based on previous coursework, experience, ability, and interest			X	
Identify and declare in consultation with an advisor(s) an academic theme for coursework directed toward a specific career that incorporates biological sciences				X

Table 4. Planning Table for Biology Teaching Option Learning Objectives				
Learning Outcomes	2017-2018	2018-2019	2019-2020	2020-2021
Demonstrate effective written and oral communication			X	
Demonstrate an understanding of physical and chemical factors that influence organisms, their physiology and ecosystem function				X
Demonstrate basic understanding of the major disciplines in biology including general biology, physiology, genetics, evolution, and ecology	X			
Understand the central concepts, tools of inquiry, and structures of the disciplines and can create standard-based learning experiences that make these aspects of subjects or content knowledge meaningful for students		X		
Create learning environments that allow all students to be socially and academically successful, by validating students' cultural heritages, integrating their life experiences, and promoting their overall development; demonstrate knowledge, skills, and dispositions to address the instructional responsibilities needed to integrate Indian Education for All across the curriculum in a culturally responsive manner.			X	
Understand and use a variety of instructional strategies to foster students' motivation for learning and encourage the development of students' conceptual understandings and performance/work force skill; use knowledge of effective communication techniques and make appropriate use of educational technology to support planning, instruction, and student learning				X
Understand and demonstrate use of formal and informal assessment strategies and tolls to direct planning of instruction for the continuous intellectual, social, and physical development of all learners including on-going pre-, formative and summative analysis of student learning, individually, in groups, and in whole class settings; plan lessons and instructional sequences based upon knowledge of subject matter, standards, learning outcomes, students and the community.	X			
Demonstrate the ability to reflect on classroom decision-making with regard to content, diversity, pedagogy and assessment in order to improve teaching and learning; are reflective practitioners that examine their own biases and endeavor to provide equitable educational opportunities for students; demonstrate an understanding that education happens in a context and develop effective relationships with family and community members.		X		

2. What Data Were Collected

a) What was collected to assess learning outcomes listed above? (If multiple programs/minors are included, please indicate if different criteria was used).

Fish and Wildlife Ecology and Management Option
-Data on successful completion of courses, including STAT 216, 217, 410
-Data on selected questions on population models from BIOE 370 & 440
-Data on selected questions on population ecology from BIOE 370, 428, & 455

Conservation Biology Option
-Data on successful completion of courses, including STAT 216, 217, 410
-Data on selected questions on population models from BIOE 370 & 440
-Data on selected questions on population ecology from BIOE 370, 428, & 455
-Data from selected essay questions from BIOE 440, 480, and 428

Organismal Biology Option
-Data from successful completion of calculus course (Math 161Q, STAT 216 or BIOB 318)
-Data from test questions on population growth statistics in BIOE 370
-Data on selected questions on population models in Ecology (BIOE 370)
-Data from successful completion of capstone course (BIOE 499)
-Data showing students have consulted advisor and developed plan

Biology Teaching Option
-Data on successful completion of BIOB 160 &/or 170
-Data on successful completion of EDU 395 and/or EDU 382

b) How were data collected?
-Instructors & professors contributed data, using grades for assignments and for classes

-committee consulted Degree Works for information on class completion

NOTE: Student names must not be included in data collection. Totals of successful completions, manner of assessment (publications, thesis/dissertation, or qualifying exam) may be presented in table format if they apply to learning outcomes.

3. Explain How Data Were Analyzed

a) Explain the assessment process. Who participated in the process, the nature of the rubric utilized (or other norming methods), and the threshold outcome desired.

Department Head Diane Debinski and Dr. James Pritchard, an instructor associated with the department, participated in writing this report.   The rubrics and thresholds (Tables 5-8) were determined in prior years by faculty committees associated with each of the degree options.

Rubrics & Thresholds:

Table 5. Rubrics, Thresholds, & Assessment Design for Conservation Biology and Ecology Option

Assessment Design, Fish and Wildlife Management and Ecology Option			
Outcome	**Indicator**	**Rubric**	**Threshold**
Demonstrate the ability to apply quantitative reasoning and appropriate mathematical and statistical methods to describe or explain phenomena in the natural world	STAT 216 BIOB 318 BIOE 370	Successful completion of statistics or biometry course Test questions on population growth statistics in general ecology and wildlife ecology courses	≥ C- ≥70%
Demonstrate a basic understanding of the variety of interactions among communities of organisms and the integration of communities into ecosystems	BIOE 370 BIOE 428 BIOE 455	Successful completion of courses in general ecology, freshwater ecology, or plant ecology	≥70%

Table 6. Rubrics, Thresholds, & Assessment Design for Conservation Biology and Ecology Option

Assessment Design for Conservation Biology and Ecology Option			
Learning Outcome	**Indicator**	**Rubric**	**Threshold**
Demonstrate the ability to apply quantitative reasoning and appropriate mathematical and statistical methods to describe or explain phenomena in the natural world.	STAT 216, 217, 410 BIOE 370 BIOE 440	Completion of 3 semesters of statistics Selected questions on population models Selected questions on population models	≥ C- ≥70% ≥70%
Demonstrate understanding of the major areas of population ecology, interspecific interactions and interactions with the physical environment.	BIOE 370 BIOE 428 or 455	Selected questions on population ecology, interspecific interactions and interactions with the abiotic environment Selected questions on population ecology, interspecific interactions and interactions with the abiotic environment	≥70% ≥70%
Demonstrate an understanding of the ways that natural and human related factors alter population dynamics and extinction risk, community dynamics ecosystem function and evolutionary processes.	BIOE 440 BIOB 480 BIOE 428	Selected essay questions Selected exam questions Selected exam questions	≥70% ≥70% ≥70%

Table 7. Rubrics, Thresholds, & Assessment Design for Organismal Biology Option

Assessment Design, Organismal Biology Option			
Outcome	**Indicator**	**Rubric**	**Threshold**
Demonstrate the ability to apply quantitative reasoning and appropriate mathematical and statistical methods to describe or explain phenomena in the natural world	MATH 161Q STAT 216 or BIOB 318 BIOE 370	Completion of 1 semester of calculus OR Completion of 1 semester of statistics Selected questions on population models in Ecology	≥ C- ≥ C- ≥ 70%
Demonstrate use of technology to effectively communicate results of literature reviews, research and analyses, and conclusions	Capstone course	Graded presentation of techniques	≥ 70%
Identify and declare in consultation with an advisor(s) an advanced area of biological and/or ecological emphasis based on previous coursework, experience, ability, and interest	Advising sessions	Documented declaration of advanced area and course list	100%

Table 8. Rubrics, Thresholds, & Assessment Design for Biology Teaching Option

Biology Teaching Option			
Outcome	**Indicator**	**Rubric**	**Threshold**
Demonstrate basic understanding of the major disciplines in biology including general biology, physiology, genetics, evolution, and ecology	BIOB 160, 170 or BIOB 256, 260 BIOO 412 or 433 BIOB 375 BIOB 420	**Successfully complete one or more class, chosen from the following**	**≥C-**
Understand and demonstrate use of formal and informal assessment strategies and tolls to direct planning of instruction for the continuous intellectual, social, and physical development of all learners including on-going pre-, formative and summative analysis of student learning, individually, in groups, and in whole class settings; plan lessons and instructional sequences based upon knowledge of subject matter, standards, learning outcomes, students and the community.	Completed class	Practicum (EDU 395)	**Passing, or completion.**
		Assessment (EDU 382)	
	Teaching Practicum	Teaching Practicum REPA Items 17-20	
	TWS	TWS Sections 3 & 5	
	Student Teaching	Student Teaching FEPA Items 17-20	
	Graduate Survey	Graduate Survey Items 8-9	
	Employer Survey	Employer Survey Items 8-9	

4. What Was Learned

a) Results: Below each option is summarized with the average grade or percent of students successful for each Learning Outcome (LO) relative to the courses associated with that outcome (Tables 5-8).

Fish & Wildlife Option

LO#1: 75.55, 77.8 & 83.3% students successful

LO#2: 80.35, 79.7, and 89.4% average grades

Table 1 summarizes LO elements for the Fish & Wildlife Option. Data from STAT 216 in spring semester were used to assess LO #1. 75.55% of students in the Fish & Wildlife Ecology & Management Option were successful in passing the course, exceeding the threshold of $\geq$70%. These students need two more semesters of statistics. This outcome could be revisited with the other classes to determine overall success rate. Data were also gathered from BIOE 370 (General Ecology) and from BIOE 440 (Conservation Biology) with 77.8% and 83.3% respectively of students successful in meeting the objective. Three ways of measuring the outcome is quite robust.

An average course grade was used to assess LO #2. BIOE 370 (General Ecology) data from Spring 2018 were used, with an average grade of 80.35%, a good outcome for our students. Data from BIOE 428 (Plant Ecology) were gathered to reveal an average course grade of 78%, meeting and exceeding the threshold of $\geq$70%.

Conservation Biology Option

LO#1: 75.55, 77.8 and 83.3% students successful

LO#2: 79.3% student success; 79.7 and 89.4% average grades

LO#3: 83.3, 81.5, and 79.7% students successful on selected exam questions

LO#4: 81.5, 86, and 78% average grades

For undergraduates within the Conservation Biology and Ecology Option of the BS in Biological Sciences, 4 broad elements of competence were assessed in this round of annual assessment, using 8 specific elements identified in Table 2 with data from 5 different courses. Student scores exceeded the threshold identified in the assessment document.

No changes to the curriculum are recommended on the basis of these data, as they reveal that all of the identified thresholds were met. Each broad element of competence that was assessed is numbered. For each element, either mean student scores are shown, or the percentage of students above a class grade threshold is reported.

Compiling statistics on the sequence of three courses in statistics will require revisiting grade reports for each cohort. The faculty might consider revising the LO or coming up with a method to systematically revisit the progress of one representative cohort of students each time the LO comes up for assessment.

Organismal Biology Option

LO#1: 75.5 and 80.8% and 77.8% student success

LO#2: 92% average grade

LO#3: 100% completion

For undergraduates within the Organismal Biology Option for the BS In Biological Sciences, three broad elements of competence were assessed in this round of annual assessment, using specific LO elements identified in Table 3. Student scores for all objectives exceeded the threshold identified in the assessment document.

Between 75.5% and 80.8% of students were successful in outcome #1, quantitative reasoning. Scores in the capstone course BIOE 499 reveal that students were successful in communicating science, with an average score of 92% on an assignment. Finally, 100% of students meeting with advisors identified an area of specialization, giving students direction and purpose in their studies.

Biology Teaching Option

LO#1: 100% student success

LO#2: 50 and 25% completion rates (but will rise as students complete subsequent years)

This is our option with the lowest enrollment. Staff and faculty are discussing ways to grow the number of students in this option, as teaching biology in high schools seems an essential function and one where MSU graduates could prosper.

For undergraduates within the Biology Teaching Option for the BS In Biological Sciences, two broad elements of competence were assessed in this round of annual assessment, using specific LO elements identified in Table 4. For Learning Outcome #1, we found 100% of students were successful, with all of them passing at least one of the listed classes, usually BIOB 160 & 170 (revealed through Degree Works). For Learning Outcome #2, 2 of our 4 students has completed EDU 382 and one of those also completed their practicum. The assessment for LO #2 can be out of synchrony with the pattern of courses taken by the students. In the future, we may want to keep track of and use data from a different year, essentially gathering data for a cohort over 2 or more years. Another possibility would be to modify the assessment schedule to address this outcome. The TWS certification, and surveys of graduates & employers are possibilities but need to be revamped. We will bring this issue to the faculty for discussion.

In this assessment, we have changed the assessment of EDU 395 & 382, from "signature assignments" to a simple completion of the course, simplifying data collection.

b) Describe how results were communicated to the department and used to develop plans for improvement.

Results will be communicated to faculty during the Fall of 2018, during one or more faculty meetings. We will solicit ideas for measurement methods. Also, we will seek to recruit a group of faculty to serve on a Learning Outcomes & Assessment sub-committee that can efficiently and coherently make future suggestions for improving the department's learning objectives & assessment process.

5. How We Responded

a) Based on assessment, are there any curricular plans for the following year? (Such as plans for measurable improvements, or realignment of learning outcomes).

At the moment, we do not plan on changes to the curriculum. Given the new template for reporting, however, we will bring to the faculty the idea of consolidating and simplifying the learning objectives. The creation of similar or identical learning objectives across the four options would make the process more manageable.

b) When will the changes be next assessed?

During the next cycle of assessment.

6. Closing the Loop

a) Do any of the outcomes this year represent improvements based on assessment from previous years (show multi-year use of progress).

Our assessment of the Biology Teaching Option Learning Objective #1 has become more focused on successful completion of the lower-level BIOB 160 & 170 courses.