

# Assessment of Student Learning Outcomes (SLOs)

## Grand Valley State University

**Unit Name:** Biology (NRM Program)

**Person Reporting Data:** Alexandra Locher

**Student Learning Goal #1: Prepare students to be proficient in scientific oral and written communication.**

### **SLO 1.1**

Students will effectively communicate, in written form, scientific observations, analyses, and arguments in a format typically required by natural resources management professionals in their fields.

*Baseline:* Achieve and maintain 75% proficiency in writing among all graduates.

*Metric:* Assess the quality of capstone written reports.

*Timeframe Start:* Fall 2015

*Timeframe End:* Winter 2020

*Strategy Action:* We will use the General Education Writing Rubric to assess the quality of capstone written reports. This rubric classifies writing as “Baseline,” “Progressing,” “Proficient,” or “Distinguished” based on content, organization, expression of ideas, and appropriate grammar, style, and format.

*Responsible Party:* Capstone instructors

***Please highlight the status statement that is most applicable to SLO 1.1:***

- 0 – not yet initiated
- 1 – minimal progress
- 2 – substantive progress
- 3 – substantial progress
- 4 – achieved**

Please provide a written response for each question below.

**2016–2017 Findings:**

Based on data from 5 sections taught by 4 different instructors during Fall (2016) and Winter (2017) semesters (n = 64), 97% of students performed at a C or better (Progressing) and 92% of students performed at a B- or better (Proficient) on their written reports (Figure 1). This outcome is better than in previous years.

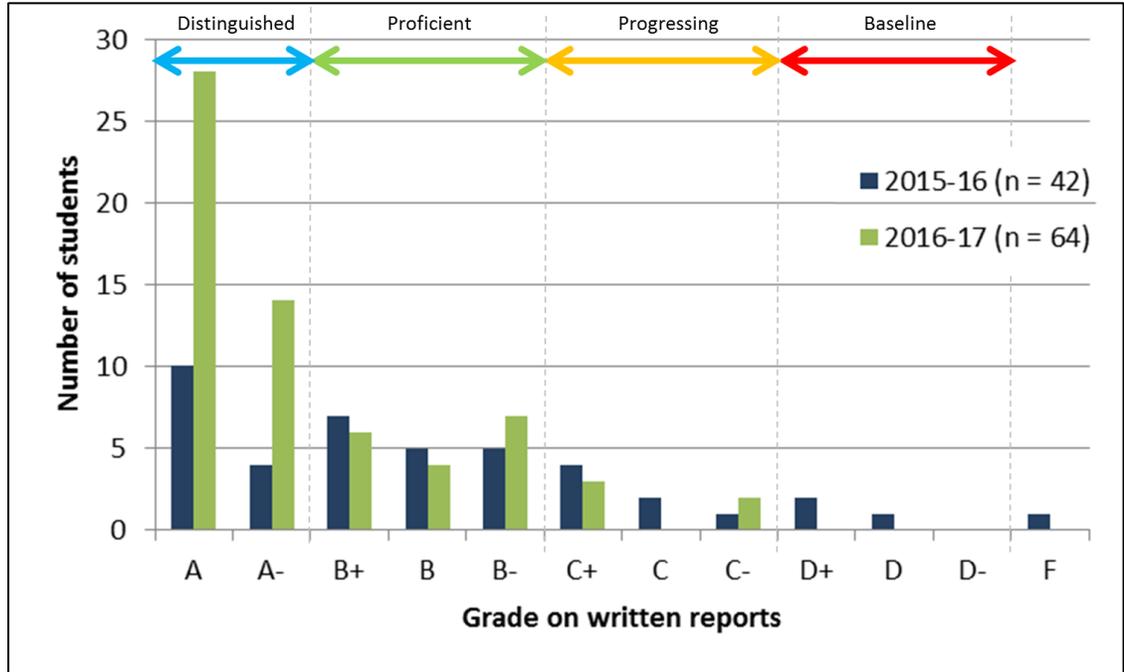


Figure 1. Grade distribution for scores on capstone written reports during the 2015-16 and 2016-17 academic years.

**Provide an Analysis of Findings:**

NRM students continue to produce written reports that are of professional quality. In both years of this assessment period, students have demonstrated writing proficiency. Ninety-two percent of students achieved a score classified as “proficient;” thus, we met the target of at least 75% proficiency. Fewer than 1% of students received a score of C- or lower. Instructors continue to monitor writing skills and offer opportunities to enhance writing quality. We will continue to set the writing standard high and aim for 75% writing proficiency.

**Next Course of Action:**

We will continue monitoring writing proficiency.

**Sharing of What Has Been Learned:**

Assessment results will be accessible to students and the public through the NRM website.

### **SLO 1.2**

Students will effectively communicate, in oral form, scientific observations, analyses, and arguments in a format typically required by natural resources management professionals in their fields.

*Baseline:* Achieve and maintain 75% proficiency in oral presentation ability among all graduates.

*Metric:* Assess the quality of capstone oral presentations.

*Timeframe Start:* Fall 2015

*Timeframe End:* Winter 2020

*Strategy Action:* We will use a rubric similar to the General Education Writing Rubric to assess the quality of capstone oral presentations. This rubric will classify oral presentation quality as “Baseline,” “Progressing,” “Proficient,” or “Distinguished” based on content, organization, visual expression of ideas, and speaking ability.

*Responsible Party:* Capstone instructors

***Please highlight the status statement that is most applicable to SLO 1.2:***

- 0 – not yet initiated
- 1 – minimal progress
- 2 – substantive progress
- 3 – substantial progress
- 4 – achieved**

*Please provide a written response for each question below.*

#### **2016–2017 Findings:**

Based on data from 5 sections taught by 4 different instructors during Fall (2016) and Winter (2017) semesters (n = 64), 100% of students performed at a C or better (Progressing) and 98% of students performed at a B- or better (Proficient) on their written reports (Figure 2). This outcome is better than in previous years.

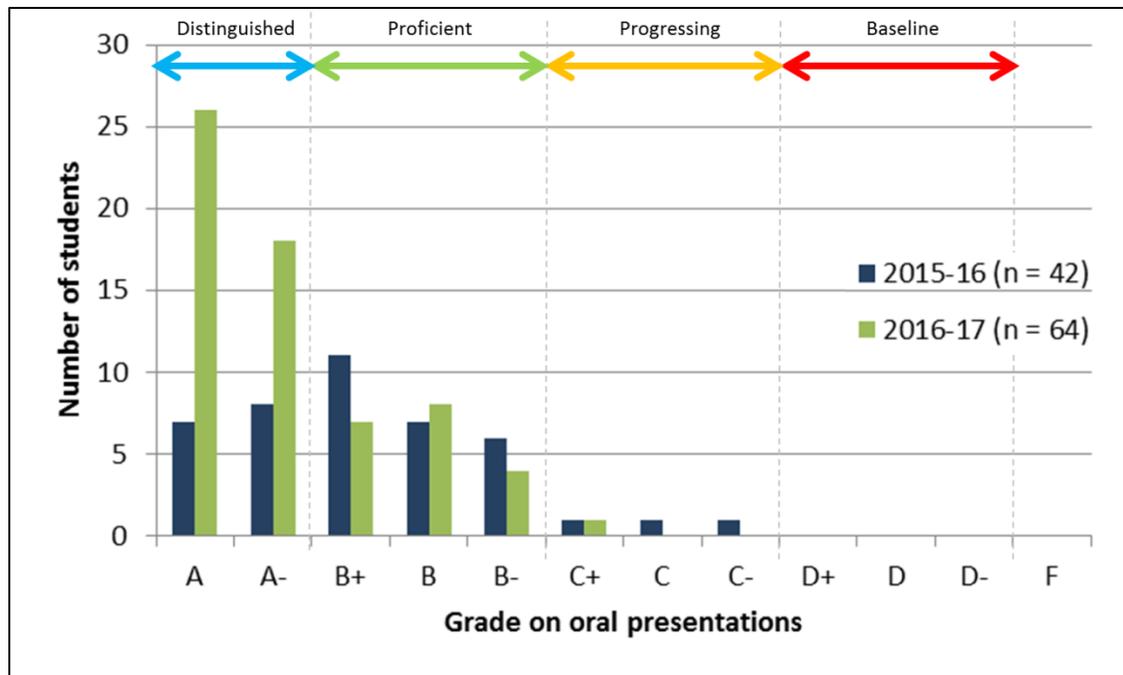


Figure 2. Grade distribution for scores on capstone oral presentations (n = 64) during the 2015-16 and 2016-17 academic years.

**Provide an Analysis of Findings:**

NRM students continue to give professional quality oral presentations. Performance on oral presentations continues to be stronger than written reports. We will continue to set the oral presentation standard high and aim for at least 75% proficiency.

**Next Course of Action:**

We will continue monitoring proficiency in oral communication.

**Sharing of What Has Been Learned:**

Assessment results will be accessible to students and the public through the NRM website.

**Student Learning Goal #2: students demonstrate proficiency in knowledge of the unifying scientific principles and major professional concepts in natural resources management.**

**SLO 2.1**

Students will understand ecological concepts and principles including the structure and function of ecosystems, plant and animal communities, competition, diversity, population dynamics, succession, disturbance, and nutrient cycling.

*Baseline:* At least 75% of NRM students in BIO 460 will receive a C or better on an assignment assessing understanding of ecological concepts and principles

*Metric:* Assess the quality of a final project for BIO 460 (*Terrestrial Ecosystem Ecology*), a required cognate.

*Timeframe Start:* Fall 2015

*Timeframe End:* Winter 2020

*Strategy Action:* To assess students' understanding of ecological concepts and principles, we will evaluate the grade distribution of NRM students completing BIO 460. The BIO 460 curriculum investigates the structure and function of terrestrial ecosystems using a systems approach, and examines biotic and abiotic processes affecting ecosystem dynamics. In BIO 460, students are presented opportunities to reinforce or master ecological concepts and principles that were introduced in BIO 215 (*Ecology*) or other lower-level courses.

*Responsible Party:* BIO 460 instructors

***Please highlight the status statement that is most applicable to SLO 2.1:***

- 0 – not yet initiated
- 1 – minimal progress
- 2 – substantive progress
- 3 – substantial progress
- 4 – achieved**

*Please provide a written response for each question below.*

**2016–2017 Findings:**

Students completed a semester project in BIO 460 to help them capture the principles and concepts of ecosystem ecology and use that understandings in interpreting results of data collected in class. Students have the opportunity to submit a rough draft, get feedback, and incorporate revisions in a final product. Based on data from 2 sections taught by 2 instructors, approximately 39% of 57 students received an A or A- on their final projects, while 94% received a C or better (Figure 3). The number of students receiving an A on their final projects was lower during the 2016–2017 academic year than during 2015–2016. Fewer than 6% of students scored below a C. Thus, students in BIO 460 seem to be understanding principles of ecosystem ecology. We will continue monitoring this outcome in the future.

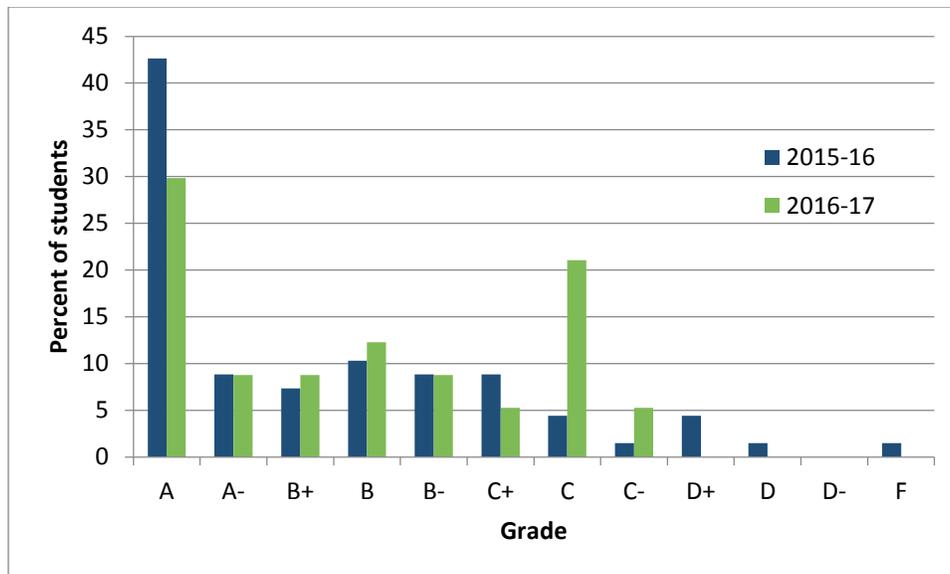


Figure 3. Grade distribution for scores on a final project in BIO 460 (Terrestrial Ecosystem Ecology). The final project was used to assess student understanding of the unifying principles and professional concepts in biology.

#### Provide an Analysis of Findings:

Based on their performance on a final project in BIO 460, students demonstrated an understanding of the unifying scientific principles and major professional concepts in biology. The grade distribution pattern differed between the 2015–16 and 2016–17 academic years, with fewer students receiving an A grade and more students receiving a C grade. The difference may be attributed to different instructors, or different final projects (one instructor assessed a written report while the other instructor assessed a poster presentation.)

#### Next Course of Action:

We will continue monitoring student understanding of unifying scientific principles and note differences in assessment results between instructors and/or types of final projects.

#### Sharing of What Has Been Learned:

Assessment results will be accessible to students and the public through the NRM website.

### SLO 2.2

Students will be able to identify, measure and map land areas, and conduct spatial analyses.

#### 2.2.1

*Baseline:* Students will show significant improvement in knowledge of map measurements, concepts, and spatial analyses between the beginning and end of the semester.

*Metric:* Compare scores in individual students enrolled in NRM 250 (*Resource Measurements and Maps*) from pre- and post- quizzes on their ability to identify, measure and map land areas, and conduct spatial analyses.

*Timeframe Start:* Fall 2015

*Timeframe End:* Winter 2020

*Strategy Action:* The ability to identify, measure and map land areas, and conduct spatial analyses is imperative for success as an NRM professional. NRM 250 is a required core foundational course, and it is a prerequisite for several upper-level NRM courses including NRM 395 (*Applications of GIS in Natural Resources*), NRM 452 (*Watershed and Wetland Management*), and NRM 462 (*Forest Ecosystem Management*). Therefore, to quantify student proficiency in learning these skills, we will compare scores on pre- and post-quizzes in NRM 250 addressing resource measurements, map reading, and spatial skills.

*Responsible Party:* NRM 250 instructor

### 2.2.2

*Baseline:* At least 85% of NRM seniors will retain knowledge of spatial concepts and applications.

*Metric:* Determine the number of incorrect responses for 2 spatial questions asked on a quiz implemented at the end of capstone courses.

*Timeframe Start:* Fall 2015

*Timeframe End:* Winter 2020

*Strategy Action:* Assessing retention is important in determining student ability to identify, measure and map land areas, and conduct spatial analyses in situations beyond NRM 250. To quantify student retention in learning these skills, we will average the number of incorrect selections on 2 multiple choice questions assessing knowledge of spatial-related applications and concepts.

*Responsible Party:* NRM faculty

*Please highlight the status statement that is most applicable to SLO 2.2:*

- 0 – not yet initiated
- 1 – minimal progress
- 2 – substantive progress
- 3 – substantial progress
- 4 – achieved

Please provide a written response for each question below.

**2016–2017 Findings:**

During the fall of 2016, there were 82 enrolled students in NRM 250. The pre- and post-quizzes consisted of 14 multiple-choice questions. Scores on the pre-quiz averaged  $6.2 \pm 0.48$  (Figure 4). Scores on the post-quiz averaged  $9.5 \pm 0.54$ . Scores on the post-quizzes were significantly higher than on the pre-quizzes, which indicate that students had gained skills in resource measurements, map reading, and spatial skills. The post-quiz scores in 2016 were slightly lower than the previous year, but this difference was not significant.

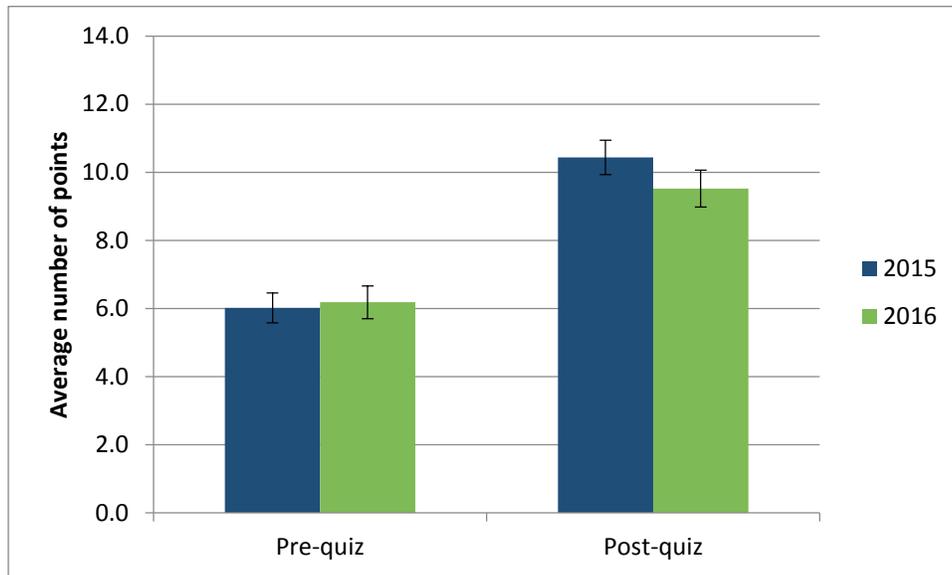


Figure 4. Average scores of pre- and post-quizzes for students enrolled in NRM 250 (Resource Measurements and Maps). The quizzes consisted of 14 multiple choice questions assessing student abilities to identify, measure and map land areas, and conduct spatial analyses.

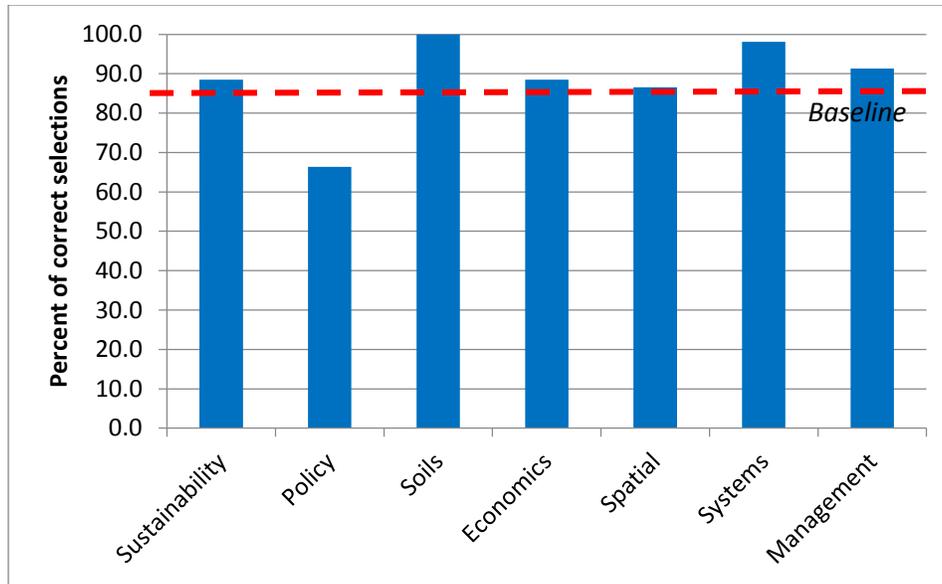


Figure 5. Percent of students with correct selections on multiple-choice questions assessing retention of knowledge and skills in various content areas related to natural resources management. The quiz was implemented at the end of the Winter 2017 semester in capstone courses. N = 52 quizzes.

**Provide an Analysis of Findings:**

Although NRM 250 students significantly improved their scores between pre- and post-quizzes, there is room for more improvement. Frequently-missed questions were noted and course content will focus on enhancing retention of the more challenging material. An assessment of skills and knowledge in NRM implemented in the capstone courses revealed that more than 85% of graduating seniors retained knowledge related to spatial concepts and applications.

**Next Course of Action:**

We will continue monitoring performance between pre- and post-quiz scores and make efforts, such as problem sets and critical thinking exercises, to improve scores on post-quizzes implemented in NRM 250, and also improve retention of knowledge as assessed from quizzes implemented in the capstone courses.

**Sharing of What Has Been Learned:**

Assessment results will be accessible to students and the public through the NRM website.

**SLO 2.3**

Students will be able to evaluate and understand the economic, ecological, and social trade-offs of alternative land uses and ecosystem management decisions at local, regional, and global scales.

### 2.3.1

**Baseline:** Students will show significant improvement in their understanding of economic, ecological, and social concepts and implications in natural resources management between their time in NRM 150 (*Introduction to Natural Resources*) and capstone.

**Metric :** Compare composite scores of NRM students enrolled in NRM 150 and Capstone (NRM 495, or NRM 496/497) from a quiz assessing their ability to evaluate and understand the economic, ecological, and social trade-offs of alternative land uses and ecosystem management decisions at local, regional, and global scales.

**Timeframe Start:** Fall 2015

**Timeframe End:** Winter 2020

**Strategy Action:** The Capstone course allows students to synthesize materials from the NRM program and demonstrate proficiencies in their ability to implement management approaches that integrate economic, ecological, and social aspects of systems. Assessment of scores on a pre-quiz during NRM 150 will allow us to identify specific strengths and/or weaknesses of the NRM program in evaluating and understanding trade-offs among alternative land use practices and ecosystem management decisions at multiple spatial scales. Additionally, comparison of scores on pre- and post-quizzes will allow assessment of the success of capstone in helping students master skills in synthesizing and integrating materials from the NRM program.

**Responsible Party:** NRM faculty.

### 2.3.2

**Baseline:** At least 75% of NRM students in NRM 451 (*Natural Resources Policy*) will receive a C or better on an assignment assessing understanding of economic and social concepts and principles.

**Metric :** We will analyze the grade distribution of scores on an assignment in NRM 451.

**Timeframe Start:** Fall 2015

**Timeframe End:** Winter 2020

**Strategy Action:** NRM 451 (*Natural Resources Policy*) is a required course in the NRM core. Assessment of student scores on an assignment related to their understanding and application of economic and social concepts and principles will indicate student ability to synthesize aspects related to social dimensions of natural resources management.

**Responsible Party:** NRM 451 instructor.

Please highlight the status statement that is most applicable to SLO 2.3:

- 0 – not yet initiated
- 1 – minimal progress
- 2 – substantive progress
- 3 – substantial progress**
- 4 – achieved

Please provide a written response for each question below.

**2016–2017 Findings:**

2.3.1

We analyzed scores on a quiz assessing knowledge of NRM competency areas for 62 students enrolled in NRM 150 during Winter 2017 and 52 students enrolled in capstone during Winter 2017. Quizzes were administered in the beginning of the semester for NRM 150 students and at the end of the semester for capstone students. On average, NRM 150 students scored 7.1 points out of 13 total questions. Capstone students averaged 10.4 out of the same 13 questions. The percent of incorrect responses within all competency areas lower for capstone students than NRM 150 students (Figure 6). The most notable improvements were in competency areas related to sustainability, soils, and management.

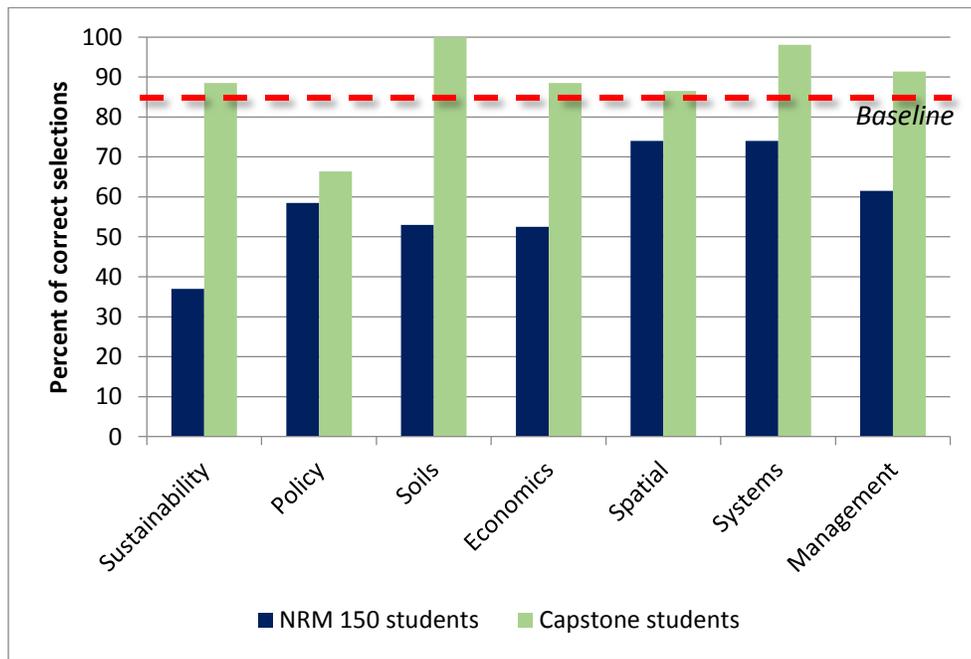


Figure 6. Percent of correct selections on quiz questions assessing knowledge of basic competency areas in natural resources management. Quizzes were administered to NRM 150 students at the beginning of the Winter 2017 semester, and capstone students at the end of the Winter 2017 semester.

### 2.3.2

We assessed grades for 17 NRM students enrolled in 1 section of NRM 451 (*Natural Resources Policy*) on a final project analyzing a natural resource policy issue and proposing a specific policy solution. All (100%) of students received a score of C or better on this policy assignment (Figure 7). These results indicate that students effectively were able to synthesize a problem, propose meaningful outcomes, evaluate tradeoffs, and justify recommendations for a policy option. Students during the 2016–2017 academic year performed better than those during the previous year.

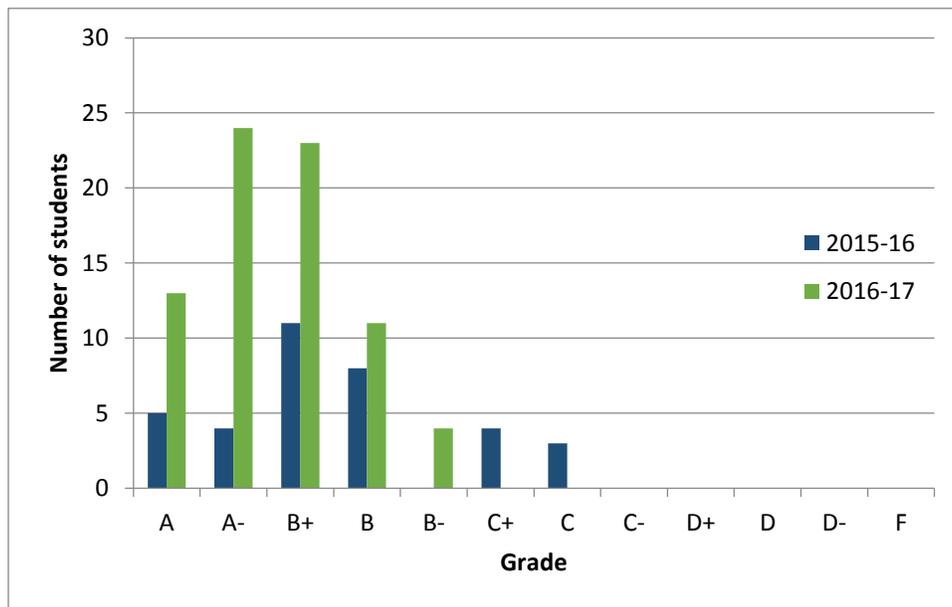


Figure 7. Distribution of NRM student grades on a final project in NRM 451 (*Natural Resources Policy*). The project was designed to analyze a natural resources policy issue and propose a specific policy solution.

#### Provide an Analysis of Findings:

NRM students are knowledgeable of concepts, principles, and applications within basic competency areas related to natural resource management. The results reveal, however, that knowledge of resource policy was not as strong as other competency areas. This result may have been because NRM 451 (*Natural Resources Policy*) was not a required course in the NRM curriculum until we implemented a program change beginning fall 2015. Many of the capstone students began their program under a previous catalog, and may not have taken NRM 451. This result validates our decision in requiring NRM 451 in the core curriculum.

Students that do take NRM 451 are proficient in aspects related to natural resources policy, as evidenced by their performance on a final project.

**Next Course of Action:**

We will continue to monitor student proficiency and retention of skills and strive to improve scores. We should see an improvement in scores from capstone students over the next few years, as all NRM students should now be under the 2015 or later catalog years and will have taken NRM 451.

**Sharing of What Has Been Learned:**

Assessment results will be accessible to students and the public through the NRM website.