WSU B.S. Environmental Science Program
2018-2019 Assessment Plan

Mission Statement
The WSU B.S. Environmental Science Program seeks to educate and train students in scientific methods and principles, producing students who are environmentally literate. Our program combines classroom, laboratory, and field experiences that prepare our graduates to address interdisciplinary environmental issues in both natural and urban settings.

Program Level Environmental Science Program Outcomes
Students successfully completing the WSU B.S. Environmental Science Program should be able to:
1. identify and explain environmental processes and human/environment interactions.
2. apply interdisciplinary perspectives and approaches to environmental problems.
3. critically assess and evaluate environmental problems at a local and global scale.
4. acquire the ability to monitor and sample environmental conditions.
5. design effective oral presentations and scientific papers.

2018-2019 Assessment Learning Outcomes
1. Students will correctly apply unit conversions in flow rates, fluxes, and mass balance calculations.
2. Students will convey ecological concepts effectively in written form.
3. Students will correctly interpret environmental data and relationships among environmental variables displayed in figures and charts.
4. Students will quantify uncertainty and propagation of error in environmental calculations.

Curriculum Map

<table>
<thead>
<tr>
<th>Course</th>
<th>LO1 unit conversion</th>
<th>LO2 ecological writing</th>
<th>LO3 data and relationships</th>
<th>LO4 uncertainty and error</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEL 1010 (physical geol)</td>
<td>I</td>
<td>-</td>
<td>I</td>
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<tr>
<td>BIO 1500 (life diversity)</td>
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<td>I</td>
<td>I</td>
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<tr>
<td>BIO 1510 (life mechanism)</td>
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<tr>
<td>GEL 2130 (mineralogy)</td>
<td>D</td>
<td>-</td>
<td>D</td>
<td>-</td>
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<tr>
<td>GEL 3100 (air and water)</td>
<td>D</td>
<td>-</td>
<td>D</td>
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<tr>
<td>BIO 4130 (ecology)</td>
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<tr>
<td>BIO 5100 (aquatic ecol)</td>
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<td>M</td>
<td>M</td>
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<td>GEL 5150 (soils)</td>
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<td>D</td>
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<tr>
<td>BIO 5440 (terrestrial ecol)</td>
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<td>M</td>
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<td>M</td>
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<tr>
<td>GEL 5510 (fate&amp;transport)</td>
<td>M</td>
<td>-</td>
<td>M</td>
<td>D</td>
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</tbody>
</table>

I = Introduced; D = Developed, reviewed, practiced; M = Mastery demonstrate
Assessment 1 – unit conversions

Learning Outcome
Students will correctly apply unit conversions in flow rates, fluxes, and mass balance calculations.

Data Sources
a. student quiz in GEL 3100 (formative)
   b. student exams in GEL 5510 (mastery)

Data Gathering and Timeline
ESP faculty will collect assignments and administer exams as part of normal class requirements. The following samples of student work will be evaluated:

GEL 3100 (Fall 2018)
   a. An end-of-term “exit quiz” involving a unit conversion problem
GEL 5510 (Winter 2019)
   b. One homework assignment or quiz involving unit conversion problems
   c. Repetition of the homework assignment or quiz within the same semester to assess students’ learning during the course

Data Evaluation
Both stand-alone unit conversion problems as well as problems that include unit conversion as a necessary step will be analyzed. Student performance will be coded for
   a. Documentation of the unit conversion process
   b. Correct/incorrect unit conversion
   c. The type of mistake will be noted for incorrect answers to aid in the identification of patterns of incorrect mistakes.

Criteria for Acceptable Performance

On the GEL 3100 exit quiz, students will:
   a. document unit conversions 80% or more of the time
   b. correctly execute unit conversions 75% or more of the time.

In GEL 5510 assignments and exams, students will:
   c. document unit conversions 90% or more of the time
   d. correctly execute unit conversions 85% or more of the time.
Assessment 2 – ecological writing

Learning Outcome
Students will convey ecological concepts effectively in written form.

Data Sources
a. student term papers in BIO 4130 (formative)
   b. written exam questions in BIO 5100 or BIO 5440 (mastery)

Data Gathering and Timeline
ESP faculty will collect assignments and administer exams as part of normal class requirements. The following samples of student work will be evaluated:

BIO 4130 (Winter 2019)
   a. Final writing intensive term papers from environmental science majors

BIO 5440 (Fall 2018)
   a. A comprehensive exam question with a written response addressing one or more of the environmental concepts listed below.

Examples of Ecological Concepts
- Trophic cascade
- Keystone species
- Succession
- Stability/Resilience
- Competitive exclusion
- Competitive coexistence
- Density dependence
- Others are possible

Data Evaluation
Student writing samples will be read by Environmental Science faculty and evaluated for understanding and effective communication of ecological concepts using the following rubrics:

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Exceeds Expectations</th>
<th>Meets Expectations</th>
<th>Needs Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrated Understanding of</td>
<td>Three of the following: ■ student uses concept terminology correctly (definition)</td>
<td>Two of the following: ■ student uses concept terminology correctly (definition)</td>
<td>One or none: ■ student uses concept terminology correctly (definition)</td>
</tr>
<tr>
<td>Ecological Concept</td>
<td>■ student describes concept within appropriate ecological context</td>
<td>■ student describes concept within appropriate ecological context</td>
<td>■ student describes concept within appropriate ecological context</td>
</tr>
<tr>
<td></td>
<td>■ student connects concept to related concepts</td>
<td>■ student connects concept to related concepts</td>
<td>■ student connects concept to related concepts</td>
</tr>
<tr>
<td>Written Communication of</td>
<td>Three of the following: ■ student uses correct writing mechanics</td>
<td>Two of the following: ■ student uses correct writing mechanics</td>
<td>One or none: ■ student uses correct writing mechanics</td>
</tr>
<tr>
<td>Ecological Concept</td>
<td>■ student expresses thoughts and ideas clearly</td>
<td>■ student expresses thoughts and ideas clearly</td>
<td>■ student expresses thoughts and ideas clearly</td>
</tr>
<tr>
<td></td>
<td>■ student synthesizes original and/or established ideas</td>
<td>■ student synthesizes original and/or established ideas</td>
<td>■ student synthesizes original and/or established ideas</td>
</tr>
</tbody>
</table>

Criteria for Acceptable Performance
In formative BIO 4130 work, 70% of students will meet or exceed expectations. In the BIO 5440 exam responses, 85% of students will meet or exceed expectations.
**Assessment 3 – figures and charts**

**Learning Outcome**
Students will correctly interpret environmental data and relationships among environmental variables displayed in figures and charts.

**Data Sources**
- student assignments and exams in BIO 4130 (formative)
- student assignments and exams in BIO 5440 (mastery)

**Data Gathering and Timeline**
ESP faculty will collect assignments and administer exams as part of normal class requirements. The following samples of student work will be evaluated:

**BIO 4130 (Winter 2019)**
- One final exam question requiring students to draw the correct value from a graph that will depict a described environmental relationship.

**BIO 5440 (Fall 2018)**
- One final exam question requiring students to read a graph or figure and interpret the environmental relationship.

**Data Evaluation**
Students will be asked to interpret both existing figures that represent an environmental relationship, either as a homework assignment or an exam question. Student performance will be coded for
  - Ability to correctly draw values from a figure or graph
  - Ability to differentiate the appropriate choice from among multiple lines/bars/etc. on a figure

**Criteria for Acceptable Performance**

In BIO 4130 assignments and exams, students will:
  - Correctly draw a value from a figure with a curve 70% of the time
  - Correctly depict the methodology to draw the correct value 75% of the time.

In BIO 5440 assignments and exams, students will:
  - Draw correct values from a figure 85% or more of the time