Annual Assessment Report

Environmental Science Major
Spring 2017

I. *Program Assessment Meetings*
The annual Environmental Science assessment meeting took place Wednesday, May 10, 2017 and lasted approximately 45 minutes. Niamh O' Leary (Major Chair), Chris Bailey, and Jackie Schnurr were present. In addition to the meeting numerous informal conversations and exchanges related to assessment took place throughout the academic year.

We discussed the outcomes data and its interpretation as presented in III. below, and the warranted changes to the assessment plan for 2017, discussed in IV. below.

II. *Closing the Loop*
In our last round of assessment we decided to raise the bar and consider an outcome met if 70% of students get a C or higher, and 50% of students get a B or higher. This replaced a lower bar of considering an outcome met if 70% of students got a passing grade on an assessed activity. How this played out is evident in section III. below.

III. *Examination of Data Collected for This Year's Targeted Learning Outcomes*
In last year's annual assessment report we indicated that we would review chosen course elements in ENVR 101L to make sure that they are explicitly tied to assessment outcomes of the major. ENVR 101L is a key course for the major so it's essential that we confirm that this course and its elements address various assessment outcomes well.

This year we examined outcomes related to the lab paper in ENVR 101L. The relevant four outcomes are included below, listed by number from the 2017 assessment plan and presented with the corresponding objective and goal of the environmental science major.

GOAL 5: Learn and practice skills that contribute to successful pursuit of a career related to the environment
- Objective 5.3: Learn and practice writing skills
  - *Outcome 5.3.1*: Demonstrate ability to write in a clear, concise, and technically accurate manner
  - *Outcome 5.3.2*: Demonstrate ability to write using the conventions of scientific writing
  - *Outcome 5.3.3*: Demonstrate ability to use and cite literature appropriately
  - *Outcome 5.3.4*: Show proficiency in writing a primary scientific paper

Students in the course complete a graded draft of the lab paper, receive feedback to improve their work, and then submit a final version. Our benchmark from the 2016 assessment plan is that outcomes are considered met if 70% of students get a C or higher, and 50% of students get a B or higher, on an assessed course element.

Table 1. Assessment data gathered on ENVR 101L lab paper, fall 2016. n =30.

	Draft Lab Paper	Final Lab Paper	Benchmark
C or higher	60%	80%	70%
B or higher	20%	70%	50%

Thus, the associated four outcomes are met for the final paper, but are not met for the draft paper.

The data show growth in the quality of student work between the draft and the final paper. This indicates that the inclusion of the draft is a valuable tool by which each student receives specific feedback on their work. We should retain the draft lab paper as an important element in the course as the exercise of the draft and the feedback received on it clearly help students meet outcomes in the final lab paper. However, the data on the draft paper are disappointing, considering that the students receive detailed guidelines (attached as Appendix 1 to this document) on how to write the draft lab paper and its sections. A strategy to respond to the insight gleaned from these data is described in IV. below.

IV. *Program Changes for the Upcoming Year*
The data presented in III. above allowed us to discover that students aren't being as successful on the draft lab paper as could reasonably be expected. We reviewed the guidelines that students receive on how to write the draft lab paper and its sections. We determined that the format was somewhat wordy and that it should be changed to make it easier for students to clearly see the structure of a scientific paper and the appropriate content and conventions for each of its sections. We decided a checklist format was more appropriate. The checklist makes it clearer to students what the purpose of their work is, and simplifies the process of relating their work to assessment outcomes. We have attached the new checklist as Appendix 2 to this document and have included it in our 2017 assessment plan (see page 8 and Appendix 2 of 2017 assessment plan).

V. *Action Plan for the Upcoming Year (2017-2018)*
Continue to examine and review course elements in introductory course(s) to make sure that they are explicitly tied to assessment outcomes of the major. In 2018 we plan on examining what the ENVR 101L final exam is telling us about whether associated

outcomes are being met. Data from the ENVR 101L final exam will be available in December 2017 and O' Leary will review it thereafter.

Determining the Characteristics of a Corn Field
ENVR 101L
Guidelines for Corn Lab Paper

Your lab paper will begin with a title page that includes your name and a title for the paper that adequately represents what was done and its scope. Divide the rest of the paper into 5 named sections as follows.

1. INTRODUCTION
The **introduction** should begin with some brief background to the study. Discuss what energy capture, GPP, and NPP are, and why they are important. **Use your own words!** Include the Latin name of corn (*Zea mays*) parenthetically after the common name (corn) the first time you mention corn in the introduction. End the introduction with a discussion of the goals of the study. What were we trying to measure and why? Include reference to the cornfield and its characteristics, as well as to calculation of NPP.

2. MATERIALS AND METHODS
The **materials and methods** section should describe how the experiment was performed. Use the **past tense** and the **active voice**. Include mention of the number of groups that collected data. Give enough detail so that someone who wished to repeat the experiment could do so from your account. However, do not state the obvious. For example "a sharp pencil and 8 1/2" X 11" paper were used to record the data on a data sheet" is too much detail. The reader will presume you are keeping track of the data gathered on paper rather than by memorization.

3. RESULTS
The **results** section should include:

a) Five figures, each one showing a histogram for one of the 5 variables of interest (ears/plant, plants per quadrat, height, wet weight and dry weight). Each of these figures should have appropriate axes that are labeled, and a descriptive caption below it. Number figures consecutively, Figure 1 through Figure 5.

b) A table ("Table 1") similar to Data Sheet 3 in the lab handout, that shows mean and standard deviation values for all 5 variables. Make sure to include a descriptive table caption above your table.

c) Well-written short paragraphs that describe the data as evident in your figures and table. Refer to figures and the table by number to support your statements.

d) Calculations of NPP for this ecosystem.

4. DISCUSSION
- The **discussion** section should address the following questions. Which variables showed the most spread? Which showed the least? Why might this be? Refer to the figures and the table by number to support your statements.
- Compare the net primary productivity of this field with that of other ecosystems with reference to specific information in your textbook (hint: see Figure 3.28 in your textbook).
- Cite the textbook using the APA citation style, as used in the sample scientific paper we discussed (yes, the one about pig stomachs!).
- Discuss whether GPP of the agroecosystem can be calculated from our data.

5. LITERATURE CITED
The **literature cited** section will include information on the one citation you used, the textbook. Again, use the style modeled in the sample scientific paper, which is the APA style.

General Points
- As with all written assignments, points will be deducted for poor wording, misspellings, typos, sloppiness, and so on.
- Be brief in the report, but be thorough.
- Make sure that each number you write has appropriate units associated with it.
- Use a scientific tone and scientific vocabulary.
- Use your own words; don't pull language from the lab handout or other sources.
- Include page numbers.

Due Date
The report is due first as draft, then as a final version, on the due dates noted on the syllabus. ___*You must turn in the graded draft with the final version of the paper.*___

Reminder: This is an individual assignment. You must abide by the Wells Honor Code in your work.

Checklist Guidelines for Lab Paper on Corn Study

TITLE PAGE
- ❑ Title describes nature and scope of study
- ❑ Title includes reference to where and when study conducted

INTRODUCTION
- ❑ Introduction sets stage for study
- ❑ Definitions of GPP and NPP are included in own words
- ❑ Value of knowing NPP and measuring ecosystem characteristics is described
- ❑ Latin name of corn (*Zea mays*) included parenthetically after the common name the first time the species is mentioned in the introduction
- ❑ Introduction ends with the specific goals of the study

MATERIALS AND METHODS
- ❑ Complete information on how the study was done
- ❑ Past tense and active voice used
- ❑ Sample size (number of groups) included

RESULTS
- ❑ Five histograms
  - o Each histogram has labeled axes
  - o Each histogram has a descriptive caption below it
  - o Figures are numbered consecutively, Figure 1 through Figure 5, as part of the caption
- ❑ Table
  - o Includes correct means and standard deviations for 5 variables, each with appropriate units
  - o Descriptive caption above table, caption starts with "Table 1."
- ❑ Narrative
  - o Brief description of results as evident in the figures and table
  - o Narrative includes reference to figures and table by number
- ❑ Calculations
  - o Step by step calculations of net primary productivity (NPP)
  - o NPP value accurate and presented with appropriate units

DISCUSSION
- ❑ Statements addressing spread of variables. Discuss which variables showed the most spread? Which showed the least? Why might this be?
- ❑ Reference to figures and table by number to support statements
- ❑ Comparison of calculated NPP with that of other ecosystems – use data in Figure 3.28 in your textbook.
- ❑ Citation of textbook using APA style
- ❑ Consideration of whether or not GPP can be calculated from data. Why or why not?

LITERATURE CITED
- ❑ APA citation style
- ❑ Complete citation

PAPER OVERALL
- ❑ Paper is divided into sections, each with a section title
- ❑ Paper is well-written and proofread
- ❑ Writing style is clear and concise
- ❑ Scientific tone and scientific vocabulary are used
- ❑ Use of own words
- ❑ Pages numbered
- ❑ Paper stapled