Please attach a narrative (not to exceed 4 pages, excluding appendices) addressing the following:

- What are the student learning outcomes? Please provide a numbered list.
- Which learning outcomes were assessed?
- How were they assessed? (Programs must use at least one direct assessment of student learning.)
- Undergraduate programs should assess at least one University Undergraduate Learning Outcome (UULO) each year, which may or may not overlap with a program learning outcome.
- Graduate programs should assess at least one outcome related to one of the following graduate level requirements each year:
  - student engagement in research, scholarship, creative expression and/or appropriate high-level professional practice.
  - activities requiring originality, critical analysis and expertise.
  - the development of extensive knowledge in the field under study.
- What was learned from the assessment results?
- How did the program respond to what was learned?

Please limit the narrative portion of your report to no more than four pages. You may attach appendices with data, tables, charts, or other materials as needed. Please explain the relevant conclusions from any appendices in your narrative. Please contact the Office of Academic Assessment if you have questions or need assistance.

Learning Outcomes for the Ph.D. Program
All students graduating with a Doctor of Philosophy in Biological Sciences should be able to:

1. Master a critical set of key concepts specific for each sectional concentration.

2. Gain expertise with key methodologies and experimental techniques specific for each sectional concentration.

3. Read, comprehend, and critically evaluate the current published scientific literature.

4. Evaluate a scientific question and formulate testable hypotheses.

5. Independently design experiments to effectively test hypotheses.

6. Generate and collect reproducible data.

7. Access up-to-date methods for analyzing and tabulating data.

8. Communicate scientific results effectively in oral presentations to general and specialized audiences.

9. Communicate scientific results effectively in written reports for publication in peer-reviewed journals.

10. Apply and be competitive for extramural monies to fund research.

11. Instruct and engage students and members of the community at all levels to appreciate the importance of biology in their lives.

Learning Outcomes Assessed in 2018

Learning Outcomes 1 through 9 were assessed in 2018. These outcomes are all aligned with the graduate level requirements of “student engagement in research, scholarship, creative expression and/or appropriate high-level professional practice” as well as “the development of extensive knowledge in the field under study”. A variety of instruments were utilized including the Graduate Advisory Committee Annual Meeting Form, Colloquium Comment Sheets, Dissertation seminars, and Dissertation documents. In addition, there has been an ongoing discussion about graduate program development based on an open response survey that was distributed to students and faculty in 2017.

The Graduate Advisory Committee Annual Meeting Form includes information about course work, research accomplishments, research objectives for the following year, oral presentations, poster presentations, publications, grant applications, grant awards, and outreach activities. The form also contains sections completed by the advisory committee that detail student strengths/weaknesses and indicate whether the student is making adequate progress toward completion of the degree program.

Once a year, each graduate student gives a professional presentation to an audience of fellow graduate students and department faculty. The Colloquium Comment Sheets provide feedback on areas of strength and opportunities for development; comments may address background knowledge, clarity of research design and data analysis,
quality of slide design, oral communication skills, and ability to handle questions from the audience. Student presenters receive comments (anonymously) from both faculty and student peers the week after their presentation.

In the 2017 fall semester, an open response survey was distributed to all department faculty and graduate students to gather feedback about graduate program development. Topics addressed in the survey included recruitment activities, the admissions process, graduate curriculum and diversity of course offerings, the comprehensive examination process, progression to graduation, retention, career placement, and alumni outreach. Based on the survey responses, working groups were formed and conversations about graduate program development have continued throughout 2018.

What was learned from the assessment results?

Overall students in the Doctor of Philosophy program are achieving the learning outcomes, as evidenced by their scholarly engagement and successful completion of the degree program. Highlights from the 2018 assessment activities are listed below.

In 2018, there were a total of 38 students enrolled in the Doctor of Philosophy program.

- 38 students (100%) submitted the Graduate Advisory Committee Annual Meeting Form.
- The advisory committees determined that students were making adequate progress toward their degree for 36 of the 38 students (95%).
- Students gave a variety of professional presentations at meetings such as the UNLV Graduate and Professional Student Association Research Forum, the American Society of Microbiology Regional Meeting, the Nevada Native Plant Society Meeting, the Society for Developmental Biology Conference, and the Association for Research in Vision and Ophthalmology.
- Students received both research and travel grants from organizations such as the UNLV Graduate and Professional Student Association, the UNLV Graduate College Summer Doctoral Fellowship, NM INBRE, and NSF Travel Fellowship.
- Scientific articles were published that included doctoral students as authors in scholarly journals such as Molecular Microbiology, *Xenopus laevis*, PLOS One, and Water Research.
- Students participated numerous outreach activities, including participation with the Las Vegas Science Café, local Science Fairs, the Boys and Girls Club, the Nevada Native Plant Society, the UNLV Festival of Communities, and the Nevada Science Olympiad.

- In the Spring of 2018, 26 graduate students gave Colloquium presentations; in the Fall of 2018, 21 students gave presentations. All student Colloquium presentations were deemed satisfactory.
- 6 students (3 SP, 1 SU, 2 FA) successfully prepared and defended their dissertation, culminating in conferral of a Doctor of Philosophy degree.
Regarding the open response survey about graduate program development that was administered in Fall 2017, a set of working groups were formed around 7 major themes: (1) recruitment, (2) orientation for new graduate students, (3) curriculum, (4) comprehensive exams, (5) progress through the program & retention, (6) career placement & alumni outreach, and (7) mentorship. Each working group contained both faculty and graduate student members. Working groups met throughout the fall semester to prepare for another “town hall” discussion that occurred in Spring 2018. During the Spring discussion, each group presented challenges/areas for growth as well as solutions/ideas for program development. Priorities were identified, and interested individuals (both faculty and students) combined into a single working group that has continued to work on graduate program development throughout 2018.

How did the program respond to what was learned?

There is a group of 5 individuals (3 faculty, 2 graduate students) leading efforts for ongoing graduate program development. This group was formed after the “town hall” discussions that occurred in Fall 2017 and Spring 2018; the group met 3 times during the Fall 2018 semester to prioritize action items based on the reports from the previous committee work (work began in Fall 2017 and continued through Spring 2018).

Recruitment was prioritized, given the approaching application deadline for prospective students. Primary goals for improving recruitment were:

a) to identify and fix problems potentially encountered by prospective graduate students investigating the SoLS program and the graduate school application process and to generally improve the SoLS website, where possible.

   - We were able to make some easy improvements through communication with the Office of Information Technology. Also, the following requests were made at faculty meetings: changes to the SoLS website, regular updating of SoLS news on the departmental Facebook page, and for all faculty to update their personal pages.

b) to make a SoLS logo to be voted on by the department and student body (e.g., for promotional mugs/other materials to be handed out to each seminar speaker)

c) to construct a template-based graduate student webpage (with bios, pictures and research descriptions) linked to the SoLS main page

d) to recruit top SoLS’ undergraduates through a brief, standardized presentation to be given in junior/senior-level BIOL courses.

Many of these action items are still in progress.

Career development needs were also addressed. Action items identified were:

a) to create a graduate student trainee mentor network by creating a database of the names, employers, jobs, and skills of departmental speakers and people we connect with at conferences; these records could be maintained in a searchable database or a well-developed LinkedIn page

b) to recruit people into LinkedIn (Friends of SoLS network) through a newsletter
c) to encourage every seminar speaker to discuss the following during their lunch with the graduate students: their journey into science, barriers/obstacles they overcame, the pros and cons of their job, and any advice to benefit our graduate trainees; also to expand this gathering to include interested undergraduates
d) to showcase our current students' work in the SEB atrium right before the Juanita Greer White Lecture (an annual distinguished lecture that coincides with graduate program recruitment)
e) to establish an internship program for graduate students

Many of these action items are still in progress and/or will require approval from SoLS faculty. The graduate program development committee will resume work in January 2019.

A change implemented in the 2017 Fall semester was an initial “pilot” offering of a new graduate core course for incoming students. This new course was designed to help incoming graduate students prepare for independent research and careers in the biological sciences. The course was organized into modules on the following topics: (1) library resources, (2) learning styles and effective communication, (3) developing research questions and hypotheses, (4) writing an effective literature review, (5) experimental design, sampling, and statistical techniques, (6) preparing effective figures and tables, (7) writing effective grant and scholarship proposals, (8) oral and poster presentations, (9) science ethics, (10) writing Graduate Research Fellowship proposals and in-house review of student proposals (many students subsequently submitted their GRFP proposals to NSF), and (11) best practices for success in graduate school and beyond. Twelve faculty participated in offering various modules.

Feedback was gathered from the first cohort of students both immediately after completing the core course as well as a few months later. Based on student and faculty feedback, a few revisions in course content and structure were implemented for the Fall 2018 offering of the course. Some additional faculty also participated in leading course modules for the first time in 2018. Feedback was gathered from the second cohort of students immediately after their completion of the course. Feedback from both groups of students will be presented at a faculty meeting in Spring 2019. The faculty will continue to evaluate “what worked” and “what needs development” in the graduate core course. In general, the feedback from the 2018 student cohort was predominantly positive.

In sum, although current students in the Doctor of Philosophy program are successfully achieving the learning outcomes, both students and faculty are engaged in various facets of program development.