Review of the Food Science and Technology Department of Oregon State University

Report submitted April 2008
Reviewed by the Curriculum Council May 23, 2008

The Graduate Council conducted a site review of graduate programs in the Department of Food Science and Technology on March 3 and 4, 2008. This review was undertaken in conjunction with an external review team as well as a Curriculum Council team. The teams also benefited from the participation of Sally Francis, Dean of the Graduate School, Martin Fisk, Associate Dean of the Graduate School, and Susan Leslie, Academic Programs.

Internal Graduate Program Review Team:
- Darlene Russ-Eft, Department of Adult Education & Higher Education Leadership
- Chrissa Kioussi, College of Pharmacy

External Review Team
- Charles Bamforth, University of California, Davis (Chair of the review committee)
- Rolando Flores (University of Nebraska)
- Randy Rice (Alaska Seafood).

Curriculum Council Team
- Mike Bailey (Department of Electrical Engineering)
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Executive Summary
We found the Department of Food Science and Technology (FST) to be reasonably well functioning and respected within the University as well as regionally, nationally, and internationally. The undergraduate program is thriving even perhaps to the point of adversely impacting the research mission and graduate program. The graduate program, especially at the Ph.D. level has shrunk noticeably. These items and other successes and areas where improvement is needed are discussed at length below.

The FST department has infrastructure problems stemming from old, unreliable equipment that adversely affects training of both undergraduate and graduate students and the ability of the department faculty to reach its full research potential and be more competitive for major grant funding. Steps need to be taken partly by the department and partly with the aid of the College of Agricultural Sciences to address these problems.

Our report is organized as follows.
- Summary of Major Recommendations
- Undergraduate Program Review
- Graduate Program Review

Both the undergraduate and graduate program reviews contain their own recommendations and conclusions, some of which are reflected in the summary of major recommendations. There is some repetition but we did not want to lose the sense
of the input we received during the site visit by merging similar comments that seemed to us to convey a somewhat different point of view or strength of opinion.

**Summary of Major Recommendations**

1. FST should closely examine the relationship between increased undergraduate enrollment and the decrease in GPAs, both overall and among the different degree options. It may be worthwhile creating a “professional” half of the program, with the students qualifying to continue after the sophomore year. Whatever the cause of the GPA drop, it is important to adjust admission standards or ameliorate causes and restore the more traditional high quality 3.0 grade-point average of typical FST undergraduates.

2. Opportunities for undergraduate research should be extended.

3. The department needs to agree on the desired balance between the undergraduate program and the graduate program.

4. The Department should enhance linkages with relevant federal and state agencies and private industry. The Department should consider establishment of a more organized mechanism for gaining stakeholder inputs to planning. Involving relevant stakeholders may help to highlight the need for additional research funding for the department.

5. The faculty should continue to build linkages with other departments within the College of Agricultural Sciences (CAS) and outside of CAS, including Business and Forestry.

6. Attention should be paid to mentoring and supporting new faculty in their efforts to obtain research funding.

7. The Department should develop an admission process that ensures the recruitment of U.S. minority students. Further attention needs to be placed on recruiting domestic graduate students. Attention needs to be paid to recruiting and enlisting Ph.D. students on the Corvallis campus, whilst continuing the leadership and mentorship of graduate students in the Astoria facility.

8. There needs to be continued attention to boosting communication and linkages between on-campus and off-campus graduate students and faculty.

9. Attention should be focused on increasing the number of graduate advisors and mentoring new faculty into that role.

10. The Department should further evaluate the availability and relevance of graduate level classes.
11. Efforts should be made to increase teaching opportunities to graduate students, particularly through increasing the number of Teaching Assistantships.

12. The purpose and the rationale of the preliminary written examination requires attention.

13. The FST seminar program should be given priority attention.

14. The Department should consider instituting some form of laboratory rotation process for graduate students.

15. The Department is encouraged to develop a space and equipment utilization plan. As part of this plan, the Department should consider creating a graduate student lounge separate from the undergraduate student lounge.

**Undergraduate Program Review**

Growth and success of undergraduate program is to be commended. Undergraduate students exhibited obvious enthusiasm. They were positive about virtually all elements of their program. Advising was singled out as a major strength.

- Historically FST has had about 40-45 graduate students and about 40 undergraduate students. There has been a significant shift over the past 10 years. The graduate program has contracted into the 20’s and the undergraduate program is slightly over 100.

- The typical time to undergraduate graduation is hard to pin down; approximately 5 to 6 years seems a reasonable estimate. Most FST majors transfer from other majors or schools at about the junior level. Typically this delays progress towards the degree.

- Based on the information available to us at the time of the site visit, about 10% of FST undergraduates continue into the graduate program at OSU.

- About 10% of FST undergraduates get a chance to work in a lab.

- FST offers about 23 undergraduate scholarships per year totaling about $31,000.

- The OSU FST department has had a very successful increase in undergraduate enrollment, from 32 in 1996 to 90 in 2006.

- Much of that run-up has been the result of creating a Fermentation option, comprising about 63% of the FST BS graduates in 2006-2007.
• The rapid growth of the undergraduate program was the conscious result of new options in fermentation, advertising, recruiting, contacting high school teachers, and direct mailing to 4,000 undergrads.

• A limitation to further growth is lab space and faculty preparation time.

• With current resources, the undergraduate program could accommodate at most 110-120 students.

• Increased national placement of undergraduates is a goal of the program, not just placement in the Northwest. Students are resistant to leaving Oregon.

• At the same time as this increase in undergraduate enrollment, however, there has been a decline in FST undergraduate grade point averages, from a high of 3.10 to a current average GPA of 2.73. A graph given in the self-study shows that this decline appears to be correlated with the run-up in enrollment. This is supported by the fact that the average GPA in the Fermentation option (the option with the largest run-up) is 2.5, while the average for the other options is 2.9. (If you plug in the numbers from the graph, you get a correlation coefficient of \( r = -.77 \) between GPA and enrollment size for 1996-2006. This correlation becomes a very incriminating \( r = -.99 \) for the years 2003-2006.)

• The drop in GPA noted in the self-study probably has several causes. Suggested causes were: (a) A larger cohort of students not as well trained in background science. It was suggested to check the effect of basic science courses on overall GPA. (b) Students are older than average (26 years) and have non-traditional student responsibilities such as full-time jobs and/or families with children to attend to as well as their academic program.

• Undergraduates seem to be in great demand in industry, apparently getting multiple job offers with ease.

• The undergraduate teaching load among the faculty is a concern. It appears that their hard work has indeed created a successful undergraduate program, but at the expense of other scholarly work, such as grant-writing and establishing more intensive research programs.

• Teaching load of the faculty in CAS averages in 3-6 courses per year. In FST it is about 1-2 courses per year.

• Some FST faculty are clearly concerned that the attention paid to the undergraduate program over the past 5 years has had unfortunate impacts on the graduate program, especially concerning being competitive for top research grants. Some said it is time to emphasize the graduate program.

• The faculty is spread too thin due to undergraduate teaching with the attendant negative impact on departmental research.
• Perhaps a reasonable balance would be 75-80 undergraduates and an improved graduate program and research environment.

We talked with five FST undergraduates about the program. They told us:

• The FST faculty is very popular among the students. The students describe them as excellent, excited, know their material, have a passion for teaching, and get to know the students. They say that this is in sharp contrast to faculty in other departments, such as Biochemistry.

• All five of the students switched into FST from other programs. They all credited the quality of the faculty with making their decision. (In fact, if there was a bounty system on new students, Dan Smith would be a rich man…)

• The FST undergraduate courses are excellent and well-taught. Class sizes are typically 20-30. They go up to around 70 in the Food Law course, which is probably the case because it is a BacCore offering.

• The students have a moderate course load, typically averaging 15-16 hours/quarter (of all their classes, not just FST)

• The students estimate that they spend around 20-40 hours per week on assignments outside of class. This seems reasonable. There seemed to be a consensus that the basic science courses and a statistics course took a lot more time than their FST courses.

• The students were very enthusiastic about the instruction in all FST courses except one sequence, BEE 452-453. What they really liked was the applied science aspects of the courses. They stressed that they studied FST courses to learn the material because they wanted to understand why things happened as they did. This was in sharp contrast to their experience in core science courses where they said they studied (memorized) only to pass exams. In one venue they found science compelling and in the other a turnoff.

• The biggest blight in the FST undergraduate curriculum is the BEE 452 and BEE 453 combination. The students describe it as poorly organized, poorly taught, and covering much material that they don’t need to know.

• While some students obviously choose this major because they like eating and drinking, these students chose it because they wanted jobs in the scientific end of the food processing industry. They went so far as to point out how closely related FST is to “applied chemistry”, which they like.

• None of these five students is going on to graduate school. The two main reasons were (1) plentiful job opportunities if they get out now, and (2) they are not sure what they would want to specialize in if they did go to graduate school.
• The students do have opportunities to conduct undergraduate research, but those opportunities are not well-publicized. They say you have to go to various professors and ask about possibilities.

• We asked the students if the FST undergrads can reasonably graduate in four years. For these students the answer was no because all had come from other major and programs. For students in general it was hard to tell since almost all were behind.

• The students were concerned that the lab equipment used for teaching was old and broke down a lot. They are concerned that they will not be prepared to use the newer equipment that they will find in their jobs. Equipment is in short supply – students race to get the equipment they need.

• The Microbiology Lab is an enrollment problem for students. The class is a lecture-lab where the lecture accommodates twice the number who can enroll in the lab making a permanent and worsening lab access problem. Often students must try to get the lab during summer term. This is a road block to planning schedules and timely degree completion. Students (sometimes, often) can’t register for their planned program and have to return to advisors for plan B.

• Students in Fermentation don’t seem to be realistic about career options. Becoming a local (OR, WA, CA) brew master or vintner is a low paying long term prospect.

• Career path opportunities up to six figures are available for students in the Food Science option who are willing to move to where the major food processing companies are located.

• The students we met with were confident that jobs they would like to have are and will be available in abundance.

• Students said the FST faculty knows what is going on in the industry and what degree you need for what career path.

• The students said internships were readily available but information about them was less available. Students had to contact the head undergraduate advisor and/or a faculty member and ask about opportunities. When they did the faculty members were very responsive. The students suggested it would be helpful to have some advertising about internship possibilities – a more organized effort.

• When asked if an internship should be a required part of the FST undergraduate degree program, students said it was a good idea but would be impossible for some students unless the internship paid enough to enable those students to support themselves and/or their family.
• The students expressed a wish for a Food Product Development course, which apparently is a capstone experience in many food science programs. Now students do product development informally via a club.

In summary, our key findings and recommendations are:

1. FST should closely examine the relationship between increased undergraduate enrollment and the decrease in GPAs, both overall and among the different degree options. If there is indeed a correlation, serious consideration should be given to culling some students from the program in order to maintain the strength and reputation of the program.

2. Whatever the cause of the GPA drop, it is important to adjust admission standards or ameliorate causes and restore the more traditional high quality 3-point average of typical FTS undergrads.

3. Perhaps it would be worthwhile creating a “professional” half of the program like some other OSU majors do, and make the students qualify to continue with the program after the sophomore year. Qualification could be based on GPA or partly on GPA and some other good predictor of success.

4. Something should be done about BEE 452 and BEE 453. The sequence should be re-vamped to be more relevant and the strongly expressed concerns of students about the teaching effectiveness of the instructor should be addressed.

5. The opportunities for undergraduate research should be more widely publicized. Besides being enjoyable and educational, it might also inflect some of the undergraduates with the “research bug” and motivate them to enter the FST grad program.

6. The balance between the undergraduate program and the graduate program is an important issue that apparently has not been well discussed among the faculty. Our sense is that there is no consensus about the correct balance. We were told that such discussions are in their early stages.

7. In order to broaden stronger elements of the undergraduate program, FST might consider some sort of bachelor’s program in seafood science, as seafood seems like a possible area of strength. Perhaps there is potential for some sort of QA/QC curriculum in seafood at the BS level. There is a shortage of such trained personnel in the Pacific Northwest, and if there are limitations to successful placement of fermentation graduates, this might be an area to investigate in order to keep vitality in the undergraduate program and continue successful placement of graduating students. Some investigation should occur to see if this has merit.
Graduate Program Review

The graduate program of the Department of Food Science at Oregon State has had better times in the past; but the best ones lied ahead. The major components that indicate a sign of trouble in the Department are the low numbers of graduate students and the flat numbers in research grant activity.

It was evident to the review team that the morale of the graduate students at Corvallis was lower compared with the attitude of the graduate students from the satellite centers (Portland and Astoria). The fact that the facilities are aged and new funds for renovation are not available at Corvallis create tough issues that the University administration needs to address sometime soon. However, it was also evident that the OSU-FST undergraduates that go into the graduate program have a completely different attitude, a more positive and progressive one. So, the components for success are there, but a new sense of graduate student community and direction needs to be reestablished on the Corvallis campus.

The graduate course offering of the Department needs attention as well, since many students complained that they do not have much to take. This is especially critical for the students that come from the OSU bachelor and/or master programs and who have taken most of the graduate courses. This is not unique to OSU-FST but deserves attention and should be part of the faculty plan for the future.

The success of enrollment and placement of students in the undergraduate program during the last years, associated with the stagnant numbers in the graduate student enrollment and grant procurement of the faculty is creating “the perfect storm.” There is no doubt that the faculty and administrators have this issue clear, since they used the “perfect storm” term. However, we feel that the most troublesome issue is that the faculty of the Department of Food Science was apparently expecting this review team to define the route forward for their graduate program and their research activities. It is our opinion that no recommendation from us can substitute the “soul searching” that the faculty of the Department needs to embark on. It is our recommendation that the faculty with internal and/or external assistance needs to make a realistic plan for the next five to eight years. This plan needs to identify the chart to follow in terms of their research activities in pursuit of grant activity that will make their graduate program a robust one. The option of abandoning the graduate program is not a valid one, so the only way for this Department is forward.

The potential for growth and success for the graduate program continues to rest on their subject areas of strength such as sensory, flavor chemistry, processing non-thermal, food safety (especially on sea food applications) and value-added packaging and processes. The soon to be in place OSU Wine Institute might create new opportunities, but it is arriving at a time that there are other similar projects going on in the nation with which it will need to compete.

In this “soul search” the faculty of the Food Science Department is not alone. Most if not all of the Food Science Departments in the nation are facing similar challenges such as reduced funding sources and more competition for available funds. Industry is looking for fast turn around to their problems solved by research; so, they tend not to go to
faculty for solutions unless the faculty has some unique process or labs. An example of this is the success that the Food Innovation Center has had.

- **Students** FST graduate student enrollment has remained relatively stable during 1995-2007. During that time there was an average of 33.5 graduate students. There have been slightly more M.S. students (18) as compared with Ph.D. candidates (16). However, the number of Ph.D. candidates has been declining, with only 7 Ph.D. candidates today.

- The graduate students appear to be selected based on their undergraduate grades and GREs, as well as a statement of objective or purpose. Due to budgetary constraints and lack of research funding, the department is not currently offering graduate teaching or research assistantships to recruit top applicants.

- Like the rest of the university, the department is well attuned to the goal of building diversity. The department, including the graduate program, reflects some of the same weaknesses as all of OSU in recruiting a diverse student body. There are, however, a good representation of female students and Asian students. U.S. minorities (African Americans, Native Americans, and Hispanics) are rarely represented among the graduate students.

See recommendations 5 through 10.

- **Faculty** The faculty demonstrate a strong commitment to the graduate students. Although overall representing a younger group of faculty members, they are extremely qualified and diverse in their areas of expertise.

See recommendations 3 and 10.

- **Curriculum.** Over 40 courses can be taken by FST graduate students for graduate credit of which 26 courses are graduate-level only. There are, however, a relatively large number of slash courses. In addition, the consistency of slash courses, with regard to rigor, workload, requirements for graduate student participation, and level of instruction seems to vary depending upon the course and the instructor. The department may be well-served by evaluating its slash courses, especially the consistency in how such courses are taught across the curriculum, e.g., some courses were considered too difficult by undergraduates while in other courses students felt that extra work for graduate students was contrived. It may be desirable to make some courses solely 400 or 500 level based on past enrollment patterns, course material, and faculty desire to accommodate undergraduates and graduates.

A related concern among graduate students is that because there are so many slash courses, the “50% Rule” sometimes comes into play when students are designing a program of study. This can be particularly problematic for students who completed their undergraduate degree in the Department. The need to add additional graduate stand alone credit hours sometimes means that graduate students must take courses in forestry or toxicology.

See recommendations 11 through 16.
- **Research** The research interests and pursuits of the faculty provide the graduate students with the opportunity to participate in a research program. The faculty are diverse in their expertise, addressing a wide variety of issues in the field.

The faculty expressed a need to develop more and additional funding sources. It may be appropriate to begin a program to establish connections with state and federal agencies, as well as private industry. Such relationships could open up significant research opportunities for faculty and graduate students.

The graduate students appear to be well mentored by the faculty in their research pursuits, particularly those in the Astoria facility. Such mentorship has led to productivity in scholarship. The graduate students have a good record of publications. Nevertheless, graduate students must find a funded lab to undertake research, and there are no rotations within labs and disciplines.

There is a distinct sense of mission drift in graduate program-uncertainty, and lack of direction. However, graduate students in Astoria seem focused and functioning differently that FST students on campus. It seems like there is a lost opportunity in not utilizing graduate students in Astoria more, for example, for teaching.

See recommendations 1 through 4 and 8 and 15.

- **Financial Support** Due to budgetary constraints and lack of research funding, the department is not currently offering graduate teaching or research assistantships to recruit top applicants.

See recommendations 1 through 4.

- **Administration, Facilities and Infrastructure** The Department appears to be well served by the current Department Chair, Dr. Bob McGorrin. The review teams would like to acknowledge and commend Dr. McGorrin for his leadership in the self-study process.

The Department suffers from somewhat old and outdated facilities. It does, however, benefit from the Pilot Plant and from the Astoria Seafood Laboratory and the Food Innovation Center in Portland. Astoria seafood lab has standing and credibility widely recognized in both academic and industry circles. Astoria seafood program seems to be operating well.

FIC also stands out as strength. FIC functioning in an applied sense very well, as evidenced by 50% self-funding from revenue coming in. FIC connection to consumers via sensory testing and focus groups provides value for students in seeing the real world connection with what they are studying.

The graduate students, particularly those in the Astoria facility, appear to have access to sufficient resources and labs to carry out and complete their work.
For the Corvallis location, some effort should be made to locate industry or alumni sources of funding to help with improvements in infrastructure components, e.g. freezers, refrigerators.

It seems unlikely that a new building and infrastructure will be immediately forthcoming. Therefore, the FST program should focus energy on reshaping and constructing the size and type of program to work optimally with the existing infrastructure. This most certainly must include an assessment of how many students can be serviced in a quality fashion.

See recommendations 18 and 19.

- **Community and Participation** The extent to which the graduate students see themselves as part of a community or cohort is somewhat limited in the program. Furthermore, as compared with the undergraduate students, the graduate students seemed somewhat muted in their enthusiasm for the program. Nevertheless, one great strength of the program is that graduate students are included in activities involving departmental governance and operations.

At the same time, because Departmental graduate students are on the Corvallis campus, as well as in Astoria and potentially Portland, there is not a strong sense of community among graduate students. Indeed, the graduate students stated that they were more familiar with undergraduate students as compared with their graduate student peers. While students acknowledged this weakness in the program, they also acknowledged that this is often their choice, as they are busy with their research and their studies, and usually do not choose to make time for efforts aimed at building community. It may be that providing graduate students with a graduate student lounge would facilitate more interaction.

In addition, the graduate program would be well-served by strong communication and linkages among on-campus and off-campus graduate students and faculty.

Re-structure and re-build the graduate seminar in order to more successfully engage both PIs and students. There were numerous comments about the absence of vitality in the seminars, and the need to breathe new life into it.

See recommendations 9 and 19.

- **Annual Reviews** The program apparently undertakes an annual monitoring of graduate student progress. Although not an areas of comment by either graduate students or faculty, this review would serve to “catch” struggling or failing students and should be continued.

- **Level and Quality of Student Performance** According to the self-study document, the Department has awarded 80 M.S. degrees and 49 Ph.D degrees in the period from 1995 to 2007. The top-5 most productive graduate advisors accounted for over 53% of the graduate degrees awarded. Of these five, three have either been reassigned or have retired. At the same time, a group of 8 new tenure-track faculty that were hired since 1999 appear to be making early and consistent contributions to graduate advising.
Between 1995 and 2007, faculty published 401 refereed journal articles, edited 8 books, wrote 102 book chapters, had 76 presentations published in conference proceedings, and gave 290 presentations at professional conferences. A majority of these had a graduate student as the first author.

See recommendation 10.

**Level and Quality of Faculty Performance** Input for this section will be taken from the external team report. The faculty appear to be well qualified and diverse in expertise, which enables them to address any major issue pertaining to natural resources. The faculty, however, needs to improve their productivity in grantsmanship, since this will help to support research efforts and graduate students.

See recommendations 1 through 4.

- **Quality of the Scholarly Community (including collaborative ventures)** The Department appears to be well connected with private businesses throughout Oregon and the Northwest. Faculty need to develop closer relationships with state and federal agencies in order to increase research funding collaborations and possibilities.

See recommendations 1 though 4.

- **Professional Viability of Graduates** The Department conducted a survey of FST graduate alumni; of whom 34 had received graduate degrees in the period from 1995 to 2006, and 20 self-identified as M.S. students while 10 self-identified as Ph.D. students. There was no adjustment for non-response bias. All of the respondents were employed, about 50% holding business/industry or private sector positions. The remainder hold faculty positions at a college or university (20%), are pursuing a graduate or post-doctoral fellowship (17%), or are employed in other research positions. Two thirds of the alumni group declared that their current employment is directly related to their graduate training in their FST field of study. While 90% of the alumni respondents would choose the same major and same degree and 66% would choose OSU, only 55% would choose the same major professor.

See recommendation 17.

- **Satisfaction Survey of Graduates** There did not appear to be a comparison of the FST alumni students with the OSU Graduate School Exit Survey.

- **Ranking of the Graduate Program** There did not appear to be any comparison of the Graduate Program with other similar programs.

**In summary, our key findings and recommendations are:**

We found the Department of Food Science and Technology to be reasonably well functioning and respected within the University as well as regionally, nationally, and internationally.
Our key findings and recommendations fall broadly into three categories: A. Research capabilities and faculty resources; B. Graduate education and issues for graduate students; C. Facilities and administration.

A. Research Capabilities and Faculty Resources

1. The Department should have a long-term plan of action for increasing linkages with relevant federal and state agencies, as well as continued linkages with private industry. Such linkages may help with future research funding.

2. The faculty is encouraged to continue to build linkages with other departments within the College of Agricultural Sciences (CAS) and outside of CAS, including Business and Forestry.

3. Attention should be paid to mentoring and supporting new faculty in their efforts to obtain research funding.

4. The Department should consider establishment of a more organized mechanism for gaining stakeholder inputs to planning. Involving relevant stakeholders may help to highlight the need for additional research funding for the department.

B. Graduate Education and Issues for Graduate Students

5. The Department should consider developing a comprehensive plan for recruitment of minority students. In particular, the current admission process has the potential to let qualified minority candidates slip through the cracks.

6. The last Graduate Program Review identified the high number of international graduate students. Some progress has been made, but further attention needs to be placed on recruiting domestic graduate students.

7. The self-study document prepared by the Department identified that there has been a drop in Ph.D. candidates over the past four years from 19 students in 2003-4 to 7 students in 2006-7. More energy and attention needs to be paid to recruiting Ph.D. students and to the graduate student experience. The review team felt a lack of enthusiasm among the graduate students and faculty on the Corvallis campus.

8. Continue the leadership and mentorship of graduate students in the Astoria facility, including the monthly graduate student meetings to discuss research. The graduate students in the Astoria facility were very satisfied with the leadership and mentorship that they experienced. They appeared to be working well as a team, and the facilities were considered adequate.

9. Efforts should be made to continue to develop processes to ensure communication and linkages among on-campus and off-campus graduate students and faculty. This may help to solve the issue of enthusiasm, given perceived satisfaction with leadership and mentorship in the Astoria facility. Some possibilities include but are not limited to: (a) scheduling on-campus seminars and other similar activities such
that they do not conflict with off-campus activities, (b) scheduling off-campus seminars that do not conflict with on-campus activities and courses, and (c) providing a van for students to travel to campus or to one of the off-campus facilities as a group.

10. Attention should be focused on increasing the number of graduate advisors and mentoring new faculty into that role. The self-study document noted that five graduate advisors accounted for over 55% of the graduate degrees awarded. Furthermore, three of the five advisors have either retired or have been reassigned to new positions.

11. The Department must further evaluate 400/500 “slash” courses, and especially examine the consistency with which such courses are taught across the curriculum. Graduate students complained that they have to seek courses through forestry and toxicology to fill out their credit requirements. The Department self-study mentioned that all faculty members are expected to develop a graduate course in their areas of expertise that will be taught every other year. Such development would provide a great addition to the program.

12. Efforts should be made to increase teaching opportunities to graduate students, particularly through increasing the number of Teaching Assistantships. The department should continue to develop graduate teaching assistants for courses with large enrollments. It would seem that MS students could be utilized for some of the graduate teaching assignments. A second year MS student should be capable of picking up some of the TA load, at least for some of the lower level courses. For Ph.D. students who want teaching experience, the Department could consider offering course credit in return for teaching.

13. The previous Graduate Program Review identified a concern about the lack of consistency in communicating information about the program requirements, particularly the preliminary written exams. Concerns still exist regarding the qualification exam. The purpose and the rationale of this exam were not clear to the review team. The multiple levels of screening and testing of graduate students seem unnecessary. It is suggested some streamlining could take place and not utilize the “optional” exam. The present approach also seems to leave the program open for criticism as arbitrary.

14. The previous Graduate Program Review identified that the FST seminar program was of concern. Over the past years no major restructuring has been done. There appear to be no scheduled seminars, and when they do occur, they are not well attended by faculty or students. Both students and faculty expressed interest in improving the current seminar status, and this should be given priority attention.

15. Graduate students must find a funded lab to undertake research, and there are no rotations within labs and disciplines. This may lead to issues as to exposure of students to the various science and technology techniques and approaches as well as possible personnel conflicts. The Department should consider instituting some form of lab rotation process for graduate students.
16. The Department should continue to conduct annual reviews with graduate students. It can help to keep graduate students on track and can serve to “catch” struggling or failing students.

17. The Department should continue to conduct surveys of recent graduates, as this provides valuable feedback.

C. Facilities and Administration

18. The Department is encouraged to develop a space and equipment utilization plan. Certainly Wiegand Hall is an older building, but attention should be placed on replacing old equipment and obtaining new equipment, such as autoclaves, cold storage units, freezers, and centrifuges.

19. An area of concern for graduate students involves the lack of a graduate student lounge. As part of the space utilization plan, the Department should consider creating a graduate student lounge separate from the undergraduate student lounge.