Department of Mathematics and Statistics

Self-study for 2010 *Regents' Review*

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I.   Introduction and Background

1. Department of Mathematics and Statistics Mission Statement

"*The mission of the Department of Mathematics and Statistics at USU is to increase fundamental knowledge in mathematics and statistics; explore the frontiers of the mathematical sciences with other disciplines; to train new generations of mathematically literate and quantitatively skilled graduates; to provide intellectual leadership in mathematics and statistics that is of direct benefit to the state of Utah and its citizens; and to earn national and international respect for the quality of its scholarship and educational programs.*"

2. Introduction

The Department of Mathematics and Statistics at Utah State University has a complex role that includes academic research, graduate and undergraduate education, outreach to the K—12 school system and a very significant service teaching role. The Department accounts for approximately 8% of the nearly 200,000 student credit hours (SCHs) generated by USU each semester. Almost all undergraduates take at least one class in mathematics or statistics, and students in the Colleges of Science, Engineering, and Business all take two or more mathematics and/or statistics classes. Courses taught by the Department range from remedial mathematics, through quantitative literacy, to advanced graduate courses in theoretical and applied mathematics and statistics. Although most SCHs are at the lower division level, the growth in enrollments in the Department in recent years has primarily been at advanced levels, indicating that other faculty and units at USU increasingly value high level mathematics and statistics courses.

The Department has undergraduate majors in mathematics, statistics, actuarial science, and mathematics and statistics education. Students who wish to become middle and high school mathematics teachers take either the Mathematics Education major or the Mathematics/Statistics Composite Teaching major. Numbers of majors have been steadily increasing with the current Department total being about 220. Slightly more than half of the total *graduates* in the Department—24 out of a total of 40 in last academic year—are in mathematics and statistics education. In the College of Science, the Department of Mathematics and Statistics currently ranks behind only the Department of Biology in the number of graduating majors.

Graduate programs in the Department include M.S. degrees in mathematics, statistics, and industrial mathematics. The Master of Mathematics (M.Math.) degree is available to students that have, or are pursuing, teaching licensure in the state of Utah. It emphasizes breadth of mathematical training over depth in a few areas, and projects and theses for this degree are typically in mathematics education. The Ph.D. in mathematical sciences has four specializations: Pure and Applied Mathematics, Statistics, Interdisciplinary, and College Teaching. Numbers of graduate students fluctuate quite a bit, from a high of more than 60 to fewer than 40. Currently

there are 53 graduate students in the Department, of whom 37 are at the Masters levels and 16 are in the Ph.D. program. The graduate degree that generally has the highest enrollments is the M.S. in statistics.

Research in the Department may be categorized into four broad areas (with overlap among the areas): core mathematics, applied and computational mathematics, mathematics education and statistics. Departmental research strengths include differential geometry, differential equations, computational statistics, mathematical biology, environmental and ecological statistics, time series analysis, biostatistics and epidemiology, discrete mathematics, and the development of virtual manipulatives and concept tutorials for teaching mathematics. Most faculty in statistics and applied mathematics have productive collaborations with faculty in units all over Utah State University. In the last 25 years, five faculty in the Department have been recognized with College of Science or university-wide research awards and three have received state-wide recognition with Governor's Medals for Science and Technology.

Faculty in mathematics and statistics education are engaged in a great deal of outreach within local school districts and across the state. The mathematics and statistics education undergraduate majors include a substantial field-based component so that students in these majors have been in middle and high school classrooms many times before they do their student teaching at the ends of their programs. Departmental faculty have also been actively involved with the Utah State Office of Education on several issues, including setting standards for high school mathematics teachers and revising the K—12 mathematics and statistics curricula.

The Department of Mathematics and Statistics' role in the delivery of classes and programs state-wide through the Regional Campus and Distance Education (RCDE) network has expanded rapidly in recent years. While student enrollment at USU's Logan campus has been relatively static there has been considerable growth at regional campuses. The Department now has six permanent faculty and numerous adjunct instructors at four regional campus sites throughout the state. Dr. Eric Rowley, the Assistant Department Head at the Logan campus from 2007—2009, has moved to Blanding in southeastern Utah to coordinate the statewide delivery of mathematics education degree programs. In the foreseeable future it is expected that enrollments in distance education and at regional campus sites will continue to increase more rapidly than those on the Logan Campus of USU, and there is also a possible merger with the College of Eastern Utah looming, so in the short and medium terms the RCDE component of the Department's role will continue to expand quite rapidly.

3. Changes in the Department since the Last Review

The last external review of the Department of Mathematics and Statistics took place in 2002. At that time Professor Russell Thompson was in his second year as head of the department.

Professor Thompson continued to serve as head until June of 2008, at which point Richard Cutler took on the role following a national search.

The most important changes in the Department in the last eight years have been 1) the turnover of tenure track faculty, 2) the loss of faculty positions, 3) severe budget cuts and, 4) largely as a consequence of the budget cuts, changes in the formats by which several of the largest lower division courses are taught. In spring and summer 2007, and again in fall of 2008, the Department underwent exhaustive strategic planning exercises. See Appendix A for full and summary reports. The Department's ability to implement aspects of the strategic plan has been severely limited by the budget cuts caused by the world-wide financial crisis.

At the time of the last external review, there were 34 faculty (31 tenure track and three lecturers) in the Department at the Logan campus with one open tenure track position. In the intervening years there were three retirements, but 11 other faculty (nine tenure track and two lecturers) left USU for a variety of reasons. In addition, one assistant professor who joined the Department in 2003 left just two years later, and a lecturer position was also added to the Department in 2003 but was lost to recent budget cuts. Initially, hiring to replace the departing faculty followed the recommendations of the 2002 review but a sequence of budget cuts stopped that process. The Department's faculty numbers reached their nadir in the 2007—2008 academic year with 29 at the Logan campus and now stands at 30, of whom 27 are tenure track and three are lecturers. The shortage of faculty is, perhaps, the single biggest issue facing the Department of Mathematics and Statistics at this time but we note that most departments in the College of Science and throughout Utah State University are in a similar situation with approximately 25% of the faculty positions at USU having been lost to budget cuts in the last two years.

In the decade leading up to this review Utah State University sustained two rounds of substantial budget cuts. The first was due to a change in residency requirements for students coming from southern Idaho that led to a 10% drop in USU enrollments and an associated loss of tuition revenue. Then, starting in Fall 2008, USU has sustained approximately 17% cuts in the state-funded portion of its budget. Institutionally these cuts have been met with a variety of measures including the loss of many permanent and temporary faculty positions. At the Department level, in addition to loss of faculty, the Department has lost its computer system manager position and a substantial portion of the budget used to pay for adjunct instructors for the lowest level mathematics and statistics courses. Historically the Department taught all of its courses except business statistics (Stat 2300) in sections of size 30—50, depending on the level of the course. For the first time, in Fall 2009 five additional lower division classes and one upper division course have been taught in large lecture format, in most cases supplemented with recitation sections of approximately 35 students led by graduate and undergraduate teaching assistants. A consequence of the change to large lecture sections is that now the vast majority of the 15,000 or so student credit hours taught by the Department each semester is taught by

permanent faculty. At the time of the last Department review, more than half were taught by adjunct instructors and graduate students teaching assistants.

For many years there have been mathematics and statistics faculty at the Brigham City and Uintah Basin regional campuses (currently, two lecturers at each location). In response to growth in enrollments at other locations, a permanent lecturer position in mathematics was added to the Tooele campus in 2008 and a clinical associate professor position in southeastern Utah was created in a collaborative agreement with the College of Eastern Utah. A change in the philosophy guiding the regional campuses has led to greatly increased integration of regional campus faculty with their home departments at the Logan campus. Regional campus faculty are encouraged to participate as much as possible in their respective departments. For several years regional campus faculty in mathematics and statistics have attended the Departmental retreat in August and, increasingly have participated in Department meetings by internet video conferencing and in activities such as text book selection and in the development of online courses. The delivery of the Mathematics Education major statewide has necessitated an even greater degree of coordination among the regional campus and Logan campus faculty of the Department.

II.   Departmental Programs and Academic Support Functions

1. Undergraduate Majors

The Department of Mathematics and Statistics has five formal undergraduate majors: Mathematics, Statistics, Mathematics and Statistics, Mathematics Education, and Mathematics and Statistics Composite Teaching. There are also minors in Mathematics, Mathematics Education, Statistics, and Biomathematics. Entrance requirements to the majors in the Department of Mathematics and Statistics are:

- New freshmen admitted to USU in good standing qualify for admission to the major.
- Transfer students from other institutions need a 2.2 transfer GPA, and students transferring from other USU majors need a 2.0 total GPA for admission to this major in good standing.
- Students may be admitted to the Mathematics Education major and to the Mathematics and Statistics Composite Teaching major by satisfying either of the above conditions. However, in order to be admitted to the Secondary Teacher Education Program (STEP), and to graduate from the Mathematics Education major, or minor, or the Mathematics and Statistics Composite Teaching major, students must have a cumulative GPA of at least 3.0 in the equivalent of MATH 1210, 1220, and 2210, and an overall GPA of at least 2.75.

Course requirements for all the majors and their options and emphases are given in Appendix B. Brief descriptions of all courses offered by the Department are also in Appendix B and syllabi for all courses offered in the current academic year may be found in Appendix E.

The Mathematics major has an Applied Mathematics *option* and a Computational Mathematics *emphasis*, which requires significant coursework in the Department of Computer Science. (In USU's terminology, an option may require different coursework than the major but does not result in an annotation on the students' transcripts, whereas emphases are noted on students' transcripts.) Both the Mathematics and Statistics majors have Actuarial Science emphases, but most students take it as an emphasis of the Statistics major. The Mathematics Education major has long been the largest or close to the largest major in the Department. No other institution of higher education in Utah produces more middle school and high school teachers of mathematics. In 2003, to prepare mathematics education graduates better to teach the statistics portions of the K—12 mathematics curriculum, the Department created a Mathematics and Statistics Composite Teaching major. This program is perhaps unique—we know of no others—or at least very rare in the United States. All students that graduate from the Mathematics Education and Mathematics and Statistics Composite Teaching majors are eligible for "Level 4" certification for teaching mathematics in K—12 schools in the state of Utah, which is the highest level attainable and permits the graduates to teach mathematics courses through calculus and AP statistics.

Table 1 shows the numbers of graduating majors in the Department since the last external review. The composite teaching major is currently the largest major in the Department and between them, the Mathematics Education and Mathematics and Statistics Composite Teaching majors have accounted for over half the total graduates with B.S. degrees in the Department in the last eight years.

Table 1: *Number of graduating students in the Department of Mathematics and Statistics, by major, for academic years* 2002—2003 *through* 2008—2009.

Major	Year						
	2002—2003	2003—2004	2004—2005	2005—2006	2006—2007	2007—2008	2008—2009
Mathematics	9	12	15	18	18	6	9
Mathematics Education	16	13	11	17	6	7	7
Math/Stat Comp Teach	0	4	4	15	14	20	17
Mathematics & Statistics	1	0	0	0	2	3	1
Statistics	7	5	3	6	5	11	6
Total	**33**	**34**	**33**	**56**	**45**	**47**	**40**

Between the 2004—2005 and the 2005—2006 academic years there was a significant jump in the number of majors graduating from the Department. In 2007—2008 there was an abrupt drop in the number of students completing the mathematics major, for which we have no

explanation. In most years there are about 200 declared majors in the Department of Mathematics and Statistics (we currently have 220) and with approximately 45 graduates a year the conversion (graduation) rate is almost 25%.

For comparisons purposes, Table 2 contains total numbers of graduating majors in the College of Science, by Department, for the same period as covered by Table 1. The Department of Biology has the highest number of graduating majors for all years included. For 2002—2005, the Department of Computer Science has the next highest number, but starting in 2006 the Department of Mathematics and Statistics has about the same or slightly more graduating majors than Computer Science.

Table 2: *Numbers of graduating majors in the College of Science, by Department, for academic years* 2002—2003 *through* 2008—2009.

	Year						
Department	2002—2003	2003—2004	2004—2005	2005—2006	2006—2007	2007—2008	2008—2009
Biology	70	74	94	74	83	77	65
Chemistry and Biochemistry	13	13	14	17	20	26	24
Computer Science	47	38	41	57	45	39	20
Geology	18	3	9	5	4	4	17
Mathematics and Statistics	**33**	**34**	**33**	**56**	**45**	**47**	**40**
Physics	13	15	21	16	12	22	13
Interdisciplinary Studies	2	6	2	3	2	2	1
College of Science Total	**196**	**183**	**214**	**228**	**211**	**217**	**180**

Source: College of Science graduation records.

Table 3 shows the disposition of current majors by program and gender. Approximately 62% of current majors are women. The Mathematics and Statistics, Mathematics Education, and Mathematics and Statistics Composite Teaching majors all have substantially more women than men. The number of declared mathematics majors looks healthy but what we have observed in recent years is that a number of these people make a late decision to complete the Mathematics Education major or the Mathematics & Statistics Composite Teaching major. In 2005—2006 the number of graduating majors in the Department (Table 1) was 56, which was a 70% increase over the preceding year. In the three academic years following 2005—2006 the Department had fewer graduating majors, but with a historic graduation rate of almost 25% of the number of majors, and a current total of 220 majors, we anticipate that in the near future the number of graduating majors in the Department will rebound to about 50 per year or slightly more.

Table 3: *Numbers of majors in the Department of Mathematics and Statistics, by major and gender in Spring semester* 2010.

Gender	Major					Total
	Mathematics	*Statistics*	*Mathematics & Statistics*	*Mathematics Education*	*Mathematics & Statistics Composite Teaching*	
Women	30	9	8	45	45	137
Men	30	14	1	20	18	83
Total	**60**	**23**	**9**	**65**	**63**	**220**

2. Graduate Programs

The Department of Mathematics and Statistics has masters and doctoral programs in all four broad areas in the Department. The masters programs all require between 30 and 36 semester credits (10—12 courses). The M.S. degrees in mathematics and in statistics have Plan A (thesis), Plan B (project) and Plan C (coursework only) options. Students are strongly encouraged to take the Plan A or Plan B options, which require formal oral defenses scheduled through the School of Graduate Studies, and the Department will only financially support students in these options.

The M.S. in Industrial Mathematics was introduced in the mid 1990s. It requires a mix of coursework in core mathematics, applied mathematics, and statistics, and also requires an internship. Given the nature of the internships that students have completed in this program, which include fisheries and ecological projects, the M.S. might be more appropriately named an M.S. in *Interdisciplinary* Mathematics.

The Master of Mathematics (M.Math.) degree is designed for secondary teachers of mathematics and entrance to the program is restricted to persons that already hold, or are pursuing, teaching licensure in Utah. The purpose of the degree is to give students a broader perspective of mathematics and its many applications than may be obtained with a B.S. degree. Accordingly, the program emphasizes breadth in mathematics (and statistics) coursework over depth in a smaller numbers of areas. Up to 15 of the 36 credits required for the M.Math. may be from graduate education courses taught in the Emma Eccles Jones College of Education and Human Services.

The School of Graduate Studies requirements for doctoral programs at USU are 60 semester credits beyond an M.S. degree, or 90 credits beyond a bachelors degree. For the Ph.D. in Mathematical Science, students entering the program with an M.S. are required to do 30 credits of formal courses in mathematics and/or statistics (about 2 years' work) at the 6000 and 7000 level, and the remaining 30 credits is for their dissertations. Detailed requirements for all graduate programs may be found in the Department's General Catalog pages in Appendix B.

Table 4 shows the numbers of graduates from the Department's M.S. and Ph.D. programs for the *calendar* years 2003—2009. The total size of the graduate programs in the Department of Mathematics and Statistics increased by more than 50% between 2006 and 2009 so the average number of graduates is greater for 2007—2009 (14 per year) than for 2003—2006 (nine per year). The number of students graduating in 2009 is slightly inflated because five or six students that should have graduated in 2008 did not do so for a variety of health, personal, and academic reasons. But for these issues, the total numbers of graduates would have been 13 or 14 in 2008 and 16 or 17 in 2009. The five Ph.D. students that graduated in 2009 represent a high point for the Department. It is a goal of the Department to increase the number of Ph.D. graduate students to a point where there are 5—6 doctoral graduates per year. Particularly in statistics, there is an unusual opportunity for Ph.D. graduates from Utah State University to get academic positions at better recognized institutions.

Table 4: *Numbers of masters and doctoral graduates in the Department of Mathematics and Statistics between* 2003 *and* 2009.

Program	Year							Total
	2003	2004	2005	2006	2007	2008	2009	
Masters Level								
M.Math. (*Mathematics Education*)	1	0	0	0	1	1	2	**6**
M.S. in Industrial Mathematics	2	0	0	0	1	0	0	**3**
M.S. in Mathematics	2	3	2	3	6	0	3	**18**
M.S. in Statistics	4	6	2	4	3	6	12	**37**
Sub-total Masters Programs	**9**	**9**	**4**	**7**	**11**	**7**	**17**	**64**
PhD in Mathematical Sciences								
Interdisciplinary Specialization	0	0	0	1	0	0	1	**2**
Pure and Applied Mathematics	0	2	2	0	1	0	2	**7**
Statistics Specialization	0	1	0	1	0	1	2	**5**
Sub-total Ph.D. Program	**0**	**3**	**2**	**2**	**1**	**1**	**5**	**14**
Total All Graduate Programs	**9**	**12**	**6**	**9**	**12**	**8**	**22**	**78**

The largest graduate program, by far, is the M.S. in statistics. Almost half of the total graduates and more than half the M.S. graduates have been in this program. In some years as much as 80% of the applications to all graduate programs in the Department have been to the M.S. in statistics. The only limitations on the size of this program are the amount of financial support available for graduate students and the ability of the statistics faculty to advise many students through theses or projects. The M.S. in mathematics has consistently produced about three graduates a year, many of whom have subsequently pursued a Ph.D. at USU or another institution. The M.S. in industrial mathematics was created to fill a perceived need in the state, but has rarely attracted many students, perhaps because of the lack of major industry near USU.

Although it is not yet evident in the numbers of graduates, the M.Math. program has been growing in the last few years. In the decade before the 2002 external review there had been about one student per year in the program and the Department considered eliminating it. However, the M.Math. has been revitalized by new mathematics education faculty that are interested in it. There are ten students currently in the program (Table 5), several of whom have just completed undergraduate majors in mathematics education or mathematics and statistics composite teaching, or who graduated in mathematics education from the Department some years ago and have returned to pursue a higher qualification.

The numbers of students currently in the Department's graduate programs are given in Tables 5 and 6, broken down by program and gender of student. Overall there are approximately the same numbers of men and women, but there is some self-selection by program: most of the students in the M.S. degrees in mathematics and industrial mathematics are men and most of the students in the M.Math. program are women.

Table 5: *Numbers of students in M.S. and M.Math. programs in the Department of Mathematics and Statistics in the* 2009—2010 *academic year, by gender*.

| Gender | Master of Science (M.S.) | | | M.Math. | Total |
	Mathematics	*Industrial Mathematics*	*Statistics*	*Mathematics Education*	
Women	2	0	8	9	19
Men	8	2	7	1	18
Total	**10**	**2**	**15**	**10**	**37**

The current count of 14 Ph.D. students is higher than historical levels, and is also due to the expansion of the graduate programs between 2006 and 2009. Although there are four specializations in the Ph.D. in Mathematical Sciences there have only ever been a handful of graduates from the Interdisciplinary specialization and even fewer from the College Teaching specialization. Given the number of faculty in the Department that do interdisciplinary research it is surprising that more Ph.D. students have not been attracted to this alternative.

Table 6: *Numbers of students in the Ph.D. in Mathematical Sciences in the Department of Mathematics and Statistics in the* 2009—2010 *academic year, by gender and specialization.*

| Gender | Ph.D. in Mathematical Sciences | | |
	Pure and Applied Mathematics	*Statistics*	**Total**
Women	1	1	2
Men	6	8	14
Total	**7**	**9**	**16**

The Department of Mathematics and Statistics teaching assistant budget is approximately $460,000 per year, which is large by Utah State University standards but allows the Department to meet its huge service teaching obligations in a cost effective way that also supports the Department's goals in research and graduate education. Stipends for graduate students range from $13,500 for M.S. students to $15,000 for new Ph.D. students and $17,000 for students that have been advanced to candidacy for the academic year. Most graduate students get summer funding from teaching or research for another $3,000 to $4,000. Depending on the balance between M.S. and Ph.D. students the TA budget pays for between 28 and 32 graduate students. Support for other students comes from faculty research grants and the instructional fees paid by students taking remedial mathematics courses. A small number of students elect to do an M.S. in statistics while pursuing a doctoral degree in another discipline and are completely funded in that other discipline. Also in a small number of cases, graduate students with less exemplary undergraduate records are initially admitted to M.S. programs with partial stipends.

For 2009—2010 the total cost of a health insurance policy for a student with no spouse or children was approximately $1,100. The Department of Mathematics and Statistics pays 40% of this cost, with another 40% paid by USU's provost's office via the Department and the remaining 20% paid by the student. Students with graduate assistantships, including teaching assistants, research assistants, and grading assistants have reduced rates of tuition. M.S. students have the non-resident portion of tuition waived and there are generally a small number of waivers for the resident portion of tuition as well. Ph.D. students get all resident and non-resident tuition waived for up to 70 credits.

Issues facing the graduate programs in the Department of Mathematics and Statistics are familiar ones: finding funding for graduate student assistantships, attracting and retaining good students, having the resources to teach enough classes for graduate students, and having the faculty resources to advise students. That the Department has been able to support as many as 60 graduate students when the teaching assistant budget covers about half that number suggests the Department has done quite well at finding resources to support graduate students. Most of the Ph.D. students in statistics have been partially supported by research grants held by their advisors and that has allowed the TA budget to stretch to a handful more students each semester. For faculty and students in interdisciplinary areas of mathematics and statistics obtaining an IGERT grant to support many graduate students is a realistic goal and target for the future.

3. Mathematics Education Outreach

Consistent with its strong mathematics and statistics education programs, the Department has been actively engaged with local middle and high schools, particularly with mathematics and science teachers in those schools, and with the Utah State Office of Education (USOE). This section briefly describes some of the interactions.

The Mathematics Education and Mathematics and Statistics Composite Teaching majors have very substantial field-based components. These majors require two clinical experiences (Math 3300 and 4300, *School Laboratory for Mathematics Teachers Levels* 1 and 2, respectively) that take the students into classrooms in the local middle and high schools. In Math 4500 (*Methods of Secondary Mathematics Teaching*), students spend three hours on each of Tuesday and Thursday morning for 10 weeks actually teaching pieces of classes under the joint supervision of a faculty member in the Department of Mathematics and Statistics and mathematics teachers in the schools that have agree to have the students in their classrooms. Typically, the first hour on the Tuesday and Thursday is spent discussing the experience of the previous day and on discussing the lesson plans for the new day with the middle and high school teachers as active participants. Finally, in their last semester, students in the mathematics and statistics education majors spend the majority of their time student teaching under the supervision of faculty in the Department of Mathematics and Statistics and in the College of Education and Human Services. All this activity within middle and high school classrooms is completely dependent on the cooperation of the mathematics teachers in the schools, which has been built up painstakingly over 20+ years primarily by Professor Jim Cangelosi.

Dr. Brynja Kohler runs the *Mathematics and Statistics Education Journal Club*, which is a group of faculty, graduate students, undergraduate students, and interested teachers that meet once a week to discuss articles and books on topics in mathematics and statistics education. Faculty participants in the Club include statisticians and pure mathematicians who have interests in mathematics and statistics education. Through internet video conferencing students across the state have been able to participate in these meetings.

The *Mathematics and Statistics Professional Development and Working Group* (*MSPDAWG*) is engaged in a number of collaborative and outreach efforts with secondary school teachers. Dr. Kohler and Dr. David Brown obtained funding from the Institute for Advanced Study via the Park City Mathematics Institute to offer workshops to middle and high school mathematics and science teachers on a variety of topics, including statistics, discrete mathematics, and mathematical biology. The workshops have been well-attended and, with new funding, are continuing. Among the workshop presenters, in additions to Drs. Kohler and Brown, have been statisticians Dr. Kady Schneiter and Dr. John Stevens. In cooperation with Logan City School District, MSPDAWG has worked on implementing the *Japanese Lesson Study*, an approach whereby teachers and university faculty work together to formulate long-term learning goals for students and then write lesson plans to implement the goals.

In 2004 only about 40% of mathematics courses in secondary schools in Utah were delivered by teachers with appropriate training and endorsements in mathematics. To address this major problem, Professor Jim Cangelosi initiated the *Utah Mathematics Endorsement Project* (*UMEP*) that delivers high level mathematics coursework to teachers of mathematics throughout the state. Through this program, 100 or more teachers obtain a level 4 endorsement

in mathematics *each year*, about four times the total number of graduates of mathematics and statistics education majors in the Department. UMEP is funded primarily by NSF through a Mathematics and Science Partnership grant, with supplemental funding provided by the USOE. To date, eight faculty in the Department have participated with Professor Cangelosi in the delivery of mathematics, probability, and statistics courses to secondary mathematics teachers throughout the state by internet video delivery.

Mathematics and statistics education faculty are engaged with the USOE on a number of issues at any given time, most recently on matters relating to criteria for mathematics endorsements of elementary and secondary teachers, and the development of a new statistics course for high school students that is at a level below that of AP statistics. In spring of 2007 Professors Russell Thompson, Jim Cangelosi, and Richard Cutler worked with mathematics educators from all over the state to rewrite the mathematics curriculum for grades K—12.

Other outreach activities that the Department of Mathematics and Statistics has participated in are the hosting and judging of mathematics and general scholarship competitions for secondary school students. The State Mathematics Contest used to be hosted by Utah State University, the University of Utah, Weber State University and Brigham Young University on a rotating basis, spending three years at a time at each location. Recently Utah Valley University was added to the group of hosts and this year the structure is a little different with USU being a "satellite" host location for the contest. MATHCOUNTS is a national organization that runs an annual competition in mathematics for middle school students, with both team and individual competitions. The Department of Mathematics and Statistics at USU is hosting the regional competition this year. The Sterling Scholar program is a statewide program that awards scholarships to outstanding high school seniors in a number of areas, including mathematics, science, English, and speech/drama. For many years, faculty in the Department have participated in the judging of the student scholars in the mathematics area.

4. The Mathematics Placement Examination

In February 2007, the Department of Mathematics and Statistics instituted a test (the MPE) to place students into lower division mathematics and statistics courses from remedial algebra through Calculus I and introductory statistics. Implementing the test was part of a statewide initiative to address poor student preparedness and performance in these courses, and all state-funded institutions in Utah use the same College Board ACCUPLACER tests. The administration of the exam and the advising associated with the exam is carried out by Departmental advisor Linda Skabelund and a team of peer (i.e., student) advisors under the general supervision of the Director of Undergraduate Studies and the Department Head. Initially there was some resistance to the implementation of the MPE, but advisors all across campus have embraced it as a useful advising tool and the Department of Mathematics and Statistics

views the MPE and the associated advising as being an integral part of the Department's service to students in all areas at Utah State University.

Although it is a relatively short time since the implementation of the MPE, preliminary analyses of MPE data suggest that it is having a positive effect in at least some areas. The DFW rate—the percentage of students that get D or F grades or withdraw from the course—for Stat 1040 (*Introduction to Statistics*) and Stat 2300 (*Business Statistics*) almost halved immediately upon implementation of the MPE. The DFW rate for Math 1050 (*College Algebra*) has also dropped. The students who were ill-prepared for Math 1050, Stat 1040 and Stat 2300 are now being advised into prerequisite algebra courses but there are some concerns about their success in those courses. The DFW rates for Math 0900 (Elements of Algebra), a developmental mathematics course that does not carry USU credit, and Math 1010 (Intermediate Algebra) are high and have not changed with the implementation of the MPE. Analyses of the MPE data through spring semester 2009 may be found on the Department's website under the Assessment tab http://www.math.usu.edu//index.php?program=ass&folder=assessment_outcomes .

At the same time the MPE was introduced the Department also introduced a refresher course for courses in which the MPE places students. The refresher course, which is completely self-supporting, helps students prepare for taking mathematics courses after they have not taken a course for several years for any reason. Analyses of refresher course data, which is also posted on the assessment portion of the department's website, indicates that it has been effective in raising student scores on the MPE to the extent that students who complete the refresher typically qualify for admission into a course at least one level higher than they did before they took the refresher.

III.   Faculty

1. Faculty Head Count and Full-time Equivalents

The number of faculty in the Department currently stand at 30 at the Logan campus, of whom 27 are tenure track and 3 are lecturers, and six at the regional campuses, of whom five are lecturers and one is a clinical associate professor. Table 7 contains the numbers of faculty in the Department for the academic years 2001—2002, the year of the last external review, to the present time. Over this period the full-time equivalent (FTE) faculty count was essentially the same as head count with two small exceptions. In 2001—2002, Professor James Cangelosi was half time in the Department of Mathematics and Statistics and half time in the Department of Secondary Education in the College of Education. Professor Cangelosi became a full-time member of the Department of Mathematics and Statistics in 2002. Since 2008 Professor James Powell has had an interdisciplinary role that includes a 25% appointment in the Department of Biology.

Table 7 shows the number of permanent faculty in the Department since the last external review. As with most other departments in the College of Science and many units throughout Utah State University, the Department of Mathematics and Statistics has lost several positions in the budget cuts that are the result of the world-wide financial crisis.

Table 7: *Numbers of permanent faculty in the Department of Mathematics and Statistics, by rank, for 2001—2002 through 2009—2010 academic years.*

Academic Rank	Logan Campus								
	2001—2002	2002—2003	2003—2004	2004—2005	2005—2006	2006—2007	2007—2008	2008—2009	2009—2010
Professor	14†	13	12	13	13	14	12	12‡	14‡
Associate Professor	12	13	10	10	11	10	7	7	5
Assistant Professor	5	4	4	6	4	6	6	7	8
Principal Lecturer	2	2	1	1	2	2	2	2	1
Senior Lecturer	1	1	1	1	0	0	0	0	2
Lecturer	0	0	2	2	2	2	2	2	0
Sub-total	**34**	**33**	**30**	**33**	**32**	**34**	**29**	**30**	**30**

	Regional Campuses		
Lecturer	*Data not available*	4	5	5
Clinical Associate Professor	*Data not available*	0	0	1
Sub-total	*Data not available*	**4**	**5**	**6**
Grand Total	*Data not available*	**33**	**35**	**36**

*Data not available.
† Total FTE = 13.5 due to one professor being 0.5 FTE in the Department of Mathematics and Statistics and 0.5 FTE in the Department of Secondary Education in the College of Education.
‡ Total FTE is 11.75 due to one professor being 0.75 FTE in the Department of Mathematics and Statistics and 0.25 FTE in the Department of Biology.

What is not apparent from the numbers in Table 7 is that there has been considerable turnover in the faculty in the Department in the last eight years. Fourteen permanent faculty members (12 tenure track faculty and two lecturers) in the Department in 2002 have since left for a variety of reasons, including retirement, dual career issues, non-renewal at USU, to be Department Heads at other institutions, and to pursue their career objectives at other institutions.

Several of these faculty had active research programs with extensive publication records and/or external funding. Six of the current faculty in the Department are 65 years of age or older, so in the short term a relatively high rate of faculty turnover is likely to continue. What is uncertain is whether replacement of faculty that retire or leave will be possible, given the current financial climate and the prospect of further budget cuts. As faculty left, hiring followed the recommendations of the 2002 external review. New faculty were added in applied and computational mathematics (Dr. Howland and Dr. Yeung, who left after two years at USU), core mathematics (Dr. David Brown, Dr. Nghiem Nguyen, and Dr. Nathan Geer), mathematics education (Dr. Brynja Kohler), statistics education (Dr. Kady Schneiter), and statistics (Dr. John Stevens and Dr. Mevin Hooten). In addition, Dr. Bryan Bornholdt and Claudia Mora Bornholdt joined the Department as lecturers. Although all areas of the department are in need of additional faculty, core mathematics has suffered disproportionately in terms of losing and not replacing active research faculty.

Although the number of full professors currently in the Department is the same as in 2001—2002, there has been some turnover in this rank. Six senior faculty left and there have been six promotions in the interim: one in applied mathematics, one in core mathematics, and four in statistics. At the time of the last external review in 2002 there were no full professors in statistics; now there are four, with two more likely in the next few years.

2. Faculty Credentials, Rank, Diversity, and Research Interests

Appendix C contains CVs for all faculty in the Department of Mathematics and Statistics. Table 8 is a brief summary of faculty by gender, ethnicity, credentials, and research interests grouping. In 2002 five of the 34 permanent faculty in the Department at the Logan campus were women. Professors Renate Schaaf and Emily Stone, and lecturer Beverly Ridenhour left within a few years but Claudia Mora Bornholdt, Peg Howland, Brynja Kohler, and Kady Schneiter were all hired in the last six years, so the number and percentage of women faculty is approximately the same as it was in 2002.

Table 8: *Disposition of current permanent faculty gender, ethnicity, degree, research grouping and research interests.*

Name	Gender	Ethnicity	Highest Degree	Rank	Research Groups	Research Interests
Logan Campus						
Ian Anderson	Male	White	Ph.D.	Professor	Core Mathematics	Differential geometry, Mathematical physics
LeRoy B. Beasley	Male	White	Ph.D.	Professor	Core Mathematics	Matrix theory, linear algebra, discrete math

Bryan Bornholdt	Male	White	Ph.D.	Senior Lecturer	Teaching, Math Ed	Teaching, math ed
David D. Bregenzer	Male	White	M.S.	Principal Lecturer	Teaching	Teaching
David E. Brown	Male	White	Ph.D.	Assistant Professor	Core Math, Math Ed	Discrete math, graph theory, math ed
James S. Cangelosi	Male	White	Ph.D.	Professor	Mathematics Education	Math education, psychometrics
Lawrence O. Cannon	Male	White	Ph.D.	Professor	Mathematics Education	Math Education
Christopher Corcoran	Male	White	Sc.D.	Associate Professor	Statistics	Computational biostatistics
Daniel C. Coster	Male	White	Ph.D.	Professor	Statistics	Applied statistics, public health
Adele Cutler	Female	White	Ph.D.	Professor	Statistics	Machine learning, computational statistics
Richard Cutler	Male	White	Ph.D.	Professor	Statistics	Ecological statistics, Applied statistics
Mark Fels	Male	White	Ph.D.	Professor	Core Mathematics	Differential geometry
Nathan Geer	Male	White	Ph.D.	Assistant Professor	Core Mathematics	Quantum and super algebras, topology
E. Robert Heal	Male	White	Ph.D.	Professor	Math Ed, Core Math, Statistics	Analysis, statistics, math education
Mevin Hooten	Male	White	Ph.D.	Assistant Professor	Statistics	Bayesian, spatial, and ecological statistics
Peg Howland	Female	White	Ph.D.	Assistant professor	Applied Mathematics	Numerical linear algebra
Joseph V. Koebbe	Male	White	Ph.D.	Associate Professor	Applied Mathematics	Numerical analysis, Applied math
Brynja Kohler	Female	White	Ph.D.	Assistant Professor	Math Ed Applied Math	Math education, Math biology
Piotr Kokoszka	Male	White	Ph.D.	Professor	Statistics	Probability and time series analysis
Claudia Mora Bornholdt	Female	Hispanic	M.S.	Senior Lecturer	Teaching, Math Ed	Teaching, Math Education
Nghiem Nguyen	Male	Asian	Ph.D.	Assistant Professor	Core Mathematics	PDEs, nonlinear waves, fluid mechanics
James Powell	Male	White	Ph.D.	Professor	Applied Mathematics	Mathematical biology, Applied mathematics
Kady Schneiter	Female	White	Ph.D.	Assistant Professor	Math & Stat Ed, Statistics	Math & Stat education, Statistics
John R.	Male	White	Ph.D.	Assistant	Statistics,	Bioinformatics, meta-

				Professor	Statistics Ed	analysis, applied stat
Stevens						
Juergen Symanzik	Male	White	Ph.D.	Associate Professor	Statistics	Computational and graphical statistics
Russell Thompson	Male	White	Ph.D.	Professor	Core Mathematics	Differential equations
Kathryn Turner	Female	White	Ph.D.	Associate Professor	Core Math, Applied Math	Numerical analysis, optimization
Zhi-Qiang Wang	Male	Asian	Ph.D.	Professor	Core Mathematics	Nonlinear DEs, nonlinear analysis
Dariusz Wilczynski	Male	White	Ph.D.	Associate Professor	Core Mathematics	Geometric and algebraic topology
Stanley C. Williams	Male	White	Ph.D.	Professor	Core Mathematics	Measure theory, modern analysis
Regional Campuses						
Ted Campbell	Male	White	M.S.	Lecturer	Teaching	Teaching
Camille Fairbourn	Female	White	M.S.	Lecturer	Teaching	Teaching
Patricia Hayes	Female	White	M.S.	Lecturer	Teaching	Teaching
Eric Rowley	Male	White	Ph.D.	Clinical Associate Professor	Teaching, Mathematics Education	Teaching, Mathematics Education
Piotr Runge	Male	White	Ph.D.	Lecturer	Core Math Teaching	Core Math Teaching
Gregory Wheeler	Male	White	M.S.	Lecturer	Math Education Teaching	Math Education Teaching

3. Department Teaching Role

The Department of Mathematics and Statistics has the largest service teaching role of any department at USU. Table 9 contains numbers of student credit hours (SCHs) for the academic years 2001—2002 to 2008—2009 (Fall and Spring semesters only), which are also expressed as a percentage of the total SCHs for the College of Science and USU. The Department consistently accounts for about 8% of USU's total SCHs and about 37%—38% of the College of Science. In comparison with other units, the departments with the next highest numbers of SCHs are English and Biology (19,592 and 18,368, respectively in 2007—2008 compared to 27,759 for the Department of Mathematics and Statistics that year) and the SCHs generated by the Department of Mathematics and Statistics exceed those generated by each of the Colleges of Natural Resources, Agriculture, and Engineering. Enrollment in the Department's courses

generally mirrors the overall enrollment at USU. For example, in 2005—2006 USU SCHs dropped by about 11.4% from the previous year and the Department's SCHs dropped by about 13.8%.

The courses in the Department that have the highest enrollments are:

- The developmental mathematics courses *Elements of Algebra* (Math 0900) and *Intermediate Algebra* (Math 1010), which have enrollments of 390 and 858, respectively, this spring semester.
- *College Algebra* (Math 1050) (492 students in spring), which is a prerequisite for a number of courses including calculus, *Statistical Methods* (Stat 2000), and *Introduction to Logic and Geometry* (Math 2020) for students in elementary education, and also satisfies USU's quantitative literacy requirement.
- *Calculus Techniques* (Math 1100) (241 students), which is a survey of calculus methods taken primarily by students in the Jon M. Huntsman College of Business.
- *Calculus I and II* (Math 1210, 1220) (combined enrollment of 494), which serve students in the College of Engineering, the College of Science, and the all majors in the Department of Mathematics and Statistics.
- *Linear Algebra and Differential Equations* (Math 2250) (133 students), which primarily serves mechanical engineers.
- *Introduction to Statistics* (Stat 1040) (357 students), which is the course taken by many students in the humanities, arts, and social sciences to satisfy USU's quantitative literacy requirement.
- *Statistical Methods* (Stat 2000) (117 students), which serves students in many disciplines including agriculture and the social sciences that need an introductory statistics class at the precalculus level but which uses standard statistical notation.
- *Business Statistics* (Stat 2300) (257 students) for students in the College of Business.
- *Statistics for Scientists* (Stat 3000) (189 students), which is a calculus-based introductory statistics class that serves students in the College of Engineering, the College of Science, and several majors in the Department of Mathematics and Statistics.

Although the vast majority of the Department's SCHs are generated at the lower division level, there has been greater percentage growth at the senior undergraduate (5000) level. This semester there are an unprecedented 66 students in *Complex Variables* (Math 5270), as well as 52 in *Introduction to Probability* (Math 5710) and *Partial Differential Equations* (Math 5420).

Until 2009—2010 over half the SCHs in the Department were taught by graduate students and adjunct faculty. The budget cuts of the last year have taken away most of the Department's funding for adjuncts, plus teaching positions. Consequently, permanent faculty are teaching large lecture sections of Math 1050, 1100, and 2250 and Stat 1040, 2300 and 3000.

Table 9: *Raw student credit hours for the Department of Mathematics and Statistics, the College of Science, and Utah State University for* 2001—2002 *through* 2008—2009. *Department student credit hours expressed as a percentage of the College of Science and USU, and ratio of student credit hours to full-time equivalent faculty.*

Source of SCHs	Year							
	2001—2002	2002—2003	2003—2004	2004—2005	2005—2006	2006—2007	2007—2008	2008—2009
Mathematics & Statistics	30,961	30,942	32,287	31,716	27,354	28,758	27,759	29,435
College of Science	84,251	82,105	86,243	82,482	73,005	76,190	76,431	78,939
Utah State University	404,128	395,781	400,742	385,607	341,790	344,957	348,191	351,306*
Math & Stat as a Percent of College	36.8%	37.7%	37.4%	38.5%	37.5%	37.8%	36.3%	37.3%
Math & Stat as a Percent of USU	7.67%	7.82%	8.06%	8.22%	8.00%	8.34%	7.97%	8.38%
Math & Stat SCH to FTE Ratio	924	937	1,076	961	854	845	957	989

Data obtained from Utah State University Blue Book 2009.

*Estimated from actual Fall 2008 *data plus Spring* 2007 *data multiplied by ratio of Fall* 2008 *to Fall* 2007.

4. Faculty Teaching Loads

This section pertains only to faculty at the Logan campus. Teaching loads for faculty at regional campuses are negotiated with the directors of those campuses and depend on a number of parameters.

The standard load for lecturers in the Department is three courses per semester, plus a significant course supervisory role, which typically entails managing a number of graduate student instructors and adjunct instructors. Until recently nearly all courses were taught in sections of between 30 and 50, with enrollments sometimes significantly lower in senior undergraduate (5000 level) and graduate (6000 and 7000 levels) courses. The one exception was Stat 2300 (*Business Statistics*) which was taught in a large lecture format with smaller recitation sections. The same lecturer taught this course every fall and spring semester throughout the period since the last review and was credited with two classes towards his teaching load for this

class. Now that several lower division classes are taught in large lecture format, some by lecturers and others by tenure track faculty, the initial algorithm for assigning credit for teaching large lecture sections is to credit the instructor with two courses. The Department will have to revisit this issue in the near future because there is a qualitative difference between teaching 160 students and teaching 500 students, but it is not clear what numerical values with regard to teaching loads to assign to these two cases, and all those in between.

In the past the Department has followed a traditional model with respect to teaching loads for tenure track faculty. The standard load has been four semester courses per year for most faculty with reductions for assistant professors in their first two years and for faculty who have very large administrative assignments, such as the Department Head and Assistant Head. The last external review recommended differential teaching loads for faculty with different involvement in research and graduate student advising, and the future directions committee report to the Department recommended the same thing and actually suggested some specific teaching loads. The enormous budget cuts of the last few years have hampered the Department's ability to address this important issue, but some progress has been made. Untenured faculty are now getting reduced teaching loads for all years in the probationary period and this year three of the most productive senior faculty had three-class loads. At the other end of the spectrum, three senior faculty volunteered for increased teaching duties. A general goal of the Department is to decrease teaching loads for consistently productive research faculty to three per year and for the most successful faculty to occasionally have two classes per year loads. With reduced teaching loads comes a higher expectation of research productivity, particularly in the area of external funding.

5. Faculty Research and Scholarly Productivity

5.1 *The Role of Research in the Department of Mathematics and Statistics*

Research and scholarship are integral components of the responsibilities of tenure track faculty in the Department of Mathematics and Statistics and successful performance in this area is required for tenure and promotion to associate professor and to full professor. Several faculty in the Department have national and international reputations in their respective areas of research.

Until about 2006, the standard role statement for tenure track faculty in the Department assigned equal weight (45%) to Teaching and Scholarship/Research. Starting in 2006, in accordance with USU's faculty code, new faculty were required to identify an *area of major emphasis*. For faculty in Mathematics and Statistics education Teaching and Outreach is generally the combined area of major emphasis. For tenure track faculty in other areas in the Department, Research/Scholarship as the area of major emphasis, and is identified as such explicitly and by having a slightly higher role statement percentage.

5.2 *Research and Scholarship Highlights*

Many faculty in the Department have active research programs and have achieved considerable success in their respective fields. This section details just a few of the achievements in research and scholarship of faculty in the department of Mathematics and Statistics.

The *National Library of Virtual Manipulatives* (NLVM) is a nationally and internationally renowned collection of java applets for teaching mathematics in elementary and secondary schools. The NLVM was created by Drs. Robert Heal and Larry Cannon of the Department of Mathematics and Statistics together with Drs. Jim Dorward and Joel Duffin of the Emma Eccles Jones College of Education and Human Services. Each day during the school year, the NLVM website receives an amazing 6 million hits, which is about 40% of all the internet traffic at Utah State University. Over 1,000 schools and school districts in the United States alone have adopted the NLVM. Outside of the United States, the *Learning Federation of Australia and New Zealand* has adopted the NLVM for use in those nations' public school systems. Translations of the NLVM into French, Chinese, Spanish, Arabic, and Danish have already been completed, and additional translations are underway. The development of the NLVM was supported by two large NSF grants (with Cannon PI on one and Heal the PI on the other) totaling almost $2 million, by an Eisenhower Professional Development Grant and by a Utah Higher Education Technology Initiative Grant. Recently the four co-creators of the NLVM were recognized for their achievement with *Governor's Medals for Science and Technology*, the highest recognition of achievements in these areas in Utah.

The *differential geometry and mathematical physics* group, which currently comprises Drs. Ian Anderson and Mark Fels from the Department of Mathematics and Statistics, and Dr. Charles Torre of the Department of Physics, has long history of publications, success in attracting external funding, attracting and supporting visitors and mentoring graduate students. Dr. Anderson, the senior member of the group, has consistently held NSF research grants for many years, and recently has been granted unprecedented access to the Maple computer package for the development of packages related to differential geometry. Dr. Anderson is a former winner of the Wynne Thorne research award—USU's highest award for research faculty—and is in much demand for symposia and colloquia throughout the world.

Dr. Piotr Kokoszka has longstanding research interests in time series analysis, particularly the GARCH family of models, and also collaborates with faculty in the Department of physics analyzing data on the upper atmosphere. He was co-PI on a $680,000 NSF grant in physics to study the upper atmosphere between 2004 and 2008 and is currently the principal investigator on two NSF research grants, one in statistics to study change points in functional time series and the other in physics to develop a statistical framework to evaluate change in the upper atmosphere. Dr. Kokoszka has over 80 publications in refereed journals and was College of Science Researcher of the Year in 2007.

Dr. Jim Powell maintains very successful research collaborations with faculty in the Department of Biology, the College of Natural Resources, and the USDA Forest Service Rocky Mountain Research Station. Among the numerous grants that he has had—which have generated more graduate student support than any other faculty member in the Department— have been large research grants from NSF, to model mountain pine beetle phenology, and DARPA. Dr. Powell was the College of Science Researcher of the Year in 2008.

Drs. LeRoy Beasley and Zhi-Qiang Wang have maintained extraordinary levels of research productivity over long periods of time in matrix theory and differential equations, respectively. Each has well over 100 publications in refereed journals. Dr. Beasley has advised more M.S. and Ph.D. students and has more graduate student co-authors than any other faculty member in the Department. Dr. Wang was College of Science Researcher of the Year in 1998. Both are very much in demand as speakers internationally.

Dr. Christopher Corcoran is an integral member of the Center for Epidemiologic Studies at Utah State University. He has been co-investigator with 15% to 30% time commitment and support on six NIH grants, most of which have been related to the Cache County Study on Memory and Aging.

Dr. Adele Cutler is the co-developer (with Professor Leo Breiman of UC Berkeley) of the *Random Forests* statistical software and of archetypal analysis. Dr. Cutler has held NSF research grants for the development of each of these methods, for Random Forests with Leo Breiman and for applications of archetypal analysis in physics with Dr. Emily Stone, an applied mathematician and former member of the Department.

5.3 *Departmental Research Performance*

In the last two years 18 of the 27 tenure track faculty (66.7%) have published a paper in a refereed journal and a further three have published new editions of books or substantial contributions to books, for an overall publishing rate of 77.7%. These numbers were obtained directly from faculty CVs. In terms of external funding, four faculty (Anderson, Geer, Hooten, and Kokoszka) are PIs on research grants from NSF, NOAA and USGS. Four additional faculty (Corcoran, Fels, Powell, and Symanzik) are Co-PIs on research grants or are PIs on subcontracts of larger grants held elsewhere, and 3 faculty (Cangelosi, Kohler, Brown) have grants for educational outreach.

Comparison of departments at different institutions is always difficult. For some years, USU obtained such information from *Academic Analytics, LLC*. The end result for each institution and each department at each institution was a weighted index that involved

publications in refereed journals, citations, and funding from major agencies such as NIH and NSF. The Department has data from these assessments for 2006—2007 and 2007—2008. Although much criticism of the methodology is possible, and the numbers of faculty and publications do not quite match up with Departmental counts, both are close and there is no reason to believe that the Academic Analytics LLC methodology is biased for or against USU.

The comparison group for USU that was chosen was land grant institutions in the western United States, excluding California and Hawaii. Specifically, the Department of Mathematics and Statistics at USU was compared with Departments of Mathematics and Statistics, Departments of Mathematical Sciences, and Departments of Mathematics at Colorado State University, Montana State University, New Mexico State University, Oregon State University, the University of Arizona, the University of Idaho, the University of Wyoming, and Washington State University. In each of 2006—2007 and 2007—2008 USU's Department of Mathematics and Statistics ranked fourth. In 2006—2007, Washington State University, the University of Arizona, the University of Idaho, and New Mexico State University were ranked 1, 2, 3, and 5 in the group of peer institutions. In 2007—2008, the University of Idaho and New Mexico State University switched places. In the 2007—2008 survey, USU ranked first among the nine institutions (the eight listed above plus USU) in terms of journal publications per faculty, second in terms of citations per faculty member, but only seventh in terms of external funding. These ranks coincide with the perceptions of many senior members of the Department, namely, that the Department is doing well in terms of publications, and the publications are of high quality so they are being read and cited, but, with some notable exceptions, the Department has not been as successful as it should be in getting external funding. It has been a high priority for the current Department Head to encourage and facilitate faculty proposal writing, in some cases with reduced teaching loads.

IV.   Department Administration and Staff

1.   Departmental Administrative Structure

Dr. Kathryn Turner is the Assistant Head of the Department at the Logan campus, and Dr. Eric Rowley is the Assistant Head for regional campuses and distance education. There are four major standing committees in the Department: Undergraduate, Graduate, Mathematics Education, and Computer. The chairs of the first three of these committees are listed as program directors in USU's General Catalog (Appendix B). Dr. Dan Coster is the current Director of Undergraduate Programs and is also the Coordinator of the Actuarial Science Program. Dr. Piotr Kokoszka is the Director of Graduate Programs, and Dr. Jim Cangelosi has been the Director of Mathematics Education Programs for many years. There are four staff assistants in the Department and, at this time, two graduate student assistants that maintain the Department's

various computer systems and technology classrooms. All program directors, staff, and faculty report directly to the Department Head; there is no additional internal hierarchy.

In addition to substituting for the Department Head when he is not available, the assistant Department Head has overall supervisory responsibility for the Departments teaching. Included in this assignment are scheduling, assigning instructors to all courses at all levels, identifying and hiring adjunct instructors as necessary, overall supervision of adjunct and graduate student instructors, and handling student complaints. Assistant Department Head is, perhaps, the most difficult administrative assignment in the Department. When he left the Logan campus to move to Blanding, Dr. Eric Rowley retained the Assistant Head duties associated with the regional campuses and distance education, including approval of instructors, some scheduling issues, interfacing with program directors, and dealing with student issues.

The Undergraduate Committee makes recommendations concerning undergraduate matters to the Department and Department Head. The Graduate Committee does likewise with graduate programs. These is some overlap in the duties of these committees in that 5000 level classes count towards both graduate and undergraduate programs, and some courses are "dual listed" at both the 5000 and 6000 or the 4000 and 6000 levels. All major programmatic changes are forwarded to the faculty for approval.

The Mathematics Education Committee makes recommendations on matters relating to the Department's mathematics and statistics education programs at the undergraduate and graduate levels. Generally, such recommendations are forwarded to the Undergraduate Committee or the Graduate Committee, whichever is appropriate for the program, but some mathematics and statistics education issues fall outside of the purview of these committees.

The Computer Committee is charged with developing Department policy concerning computer systems and support, and the management of technology classrooms, and in the supervision of computer system staff. In the past the Department has had a full time staff member as computer system manager with part-time assistance from a graduate student or undergraduate student operator, but that position was lost to budget cuts when the last system administrator moved to a new position in fall of 2008. The Department currently has two (very capable!) graduate student assistants maintaining the computer systems and technology classrooms under the direction of the computer committee.

The role of the Department Head is laid out in quite some detail in the faculty code. She or he is the point of contact between USU's upper administration and the Department. She or is responsible for all budgetary and personnel matters in the Department, including hiring of faculty and staff, promotion and tenure recommendations, and the assignment of teaching and administrative duties. From the faculty code, ". *In intradepartmental routine matters and in matters of policy, the decision of the Department Head is final,"* subject to appeal to the dean, Provost, etc.

2. Staff

The Department of Mathematics and Statistics has four staff assistants. Broadly, their duties are as follows.

Cindy Moulton is the staff assistant with primary responsibility with graduate programs in the Department, including correspondence, School of Graduate Studies paperwork, and preparing Electronic Personal Action Forms (EPAFs) that allow university employees to be paid. Ms. Moulton also handles the travel arrangements for half the faculty, assists the scholarship committee, manages text book issues for the Department, and works with the Assistant Department Head on scheduling and room acquisition.

Erika Perkins is the receptionist for the Department, answers main Departmental telephone number, greets visitors and students, answers questions when possible and directs inquiries to appropriate persons. Ms. Perkins is responsible for the bimonthly payroll for all hourly employees, takes care of J-1 visas for visiting scholars and the travel arrangements for half the faculty.

Linda Skabelund is the undergraduate advisor for the Department for majors and for all students taking mathematics and statistics courses. She is the chief administrator for the Mathematics Placement Examination and leads a team of peer advisors in placement and advising of students that are taking mathematics and statistics classes. Ms. Skabelund represents the Department at campus-wide meetings of advisors and is the point of contact with advisors at high schools in the region and throughout the state. She also organizes and participates in recruitment events and makes all arrangements for outreach activities, including workshops for teachers and mathematics competitions for middle and high school students.

Nancy Smart provides administrative assistance to the Department Head. She handles all financial matters for faculty and staff, including salary, grants, sabbaticals, and leaves-of-absence, and is in charge of accounting and purchasing for the Department. Ms. Smart assists the Department Head with personnel matters, including preparing promotion and tenure materials, packages for faculty and student awards, evaluation of faculty and staff, and correspondence. Ms. Smart schedules meetings and appointments for the department, coordinates staff activities, and supervises the training of new staff.

Detailed descriptions of staff responsibilities are given in appendix C.

The Department of Mathematics and Statistics is extremely fortunate to have these four immensely capable and hard working individuals as staff members. The smooth running of the Department—which is a huge operation—is largely due to the staff. There are times, typically the beginning and end of fall and spring semesters, during which all staff and the Department

Head and Assistant Head are extremely busy, but, in general, four staff is adequate administrative support for the Department.

V.   Departmental Budget

The annual budgets for the Department of Mathematics and Statistics for fiscal years (FY) 2005—2006, FY 2008—2009, and for the current fiscal year are given in Table 10.

Table 10: *Department of Mathematics and Statistics budgets for* 2005—2006, 2008—2009, *and projected for* 2009—2010.

Category	FY 2005/06	FY 2008/09	Projection FY 2009/10
E&G Budget (Includes Faculty/Staff and Wage Related Faculty)	2,362,317.00	2,525,668.00	2,423,518.00
Graduate Assistant Budget	426,220.00	465,710.00	465,710.00
Wages (Payroll) Budget	40,771.00	44,549.00	44,549.00
Operating Budget (Increased by 18,608 permanently for Grad. Insurance)	52,600.00	78,181.00	93,515.00
Incoming funds from other sources			
Math 0900/1010 Fee Account (M1010 credits increased to four AY 2007-08)	164,981.76	276,838.83	285,387.86
Department portion of Grant F&A	23,016.82	10,767.77	14,000.00
Other Misc. budget transfers that effect the budget	63,703.31	104,321.15	57,962.04
Outgoing Funds/Expenses			
Faculty & Staff Base Salaries paid	(2,367,564.73)	(2,361,740.00)	(2,341,953.01)
Graduate Assistant Salaries paid	(362,527.97)	(404,312.50)	(432,564.25)
Graduate Student Insurance	not available	(29,884.63)	(28,022.24)
Expenses to Operating Budgets			
Operating Costs (Includes Search costs)	(109,200.94)	(121,530.37)	(118,180.00)
Payroll for Graders/UTF's for the AY	(22,142.26)	(31,004.24)	(39,580.33)
Payroll for Student support staff	(6,949.79)	(23,893.62)	(38,358.69)
Payroll pd for temporary instructors/recitation leaders	(236,050.18)	(436,839.74)	(324,015.69)
Total Budget Surplus or (Deficit)	5,645.02	(25,256.35)	11,967.69

The vast majority of the Department's budget is for faculty and staff salaries and the Teaching Assistant budget. The money in the Math 0900 and Math 1010 fee accounts purely covers the cost of instruction in these two courses. Thus, all the money raised by these fees is

paid out to adjunct instructors and teaching assistants that teach the course. The policy of the Department in the last two years has been to support graduate students first, subject to suitability for teaching.

Between fall 2008 and fall 2009, the Department lost one permanent lecturer position (Dr. Eric Rowley), one temporary lecturer position (Ms. Nancy Petty), a computer technician position, and $50,000 in on-going "wage related" salary money that was used to pay adjunct instructors and additional temporary lecturers. This loss is reflected in $102,000 drop between FY 2008—2009 and FY 2009—2010 in the first line of the budget. In fact, the difference here would be greater but for the fact that four faculty in the Department earned promotions at the end of 2008—2009 and received substantial (10%—15%) pay raises. The loss in teaching capacity in the Department, at the adjunct rate of $4,000 per class is 28 classes: six for each lecturer, four for the Teaching Assistantships that are being used to support the Department's computer systems, and 12 additional classes for the $50,000 cut in wage related budget. The only way to continue to teach the same number of students with such a loss of funds for teachers was to move several service courses into a large lecture format starting in fall 2009.

VI.   Major Issues Facing the Department of Mathematics and Statistics

The Department of Mathematics and Statistics recognizes that USU, like many institutions of higher education throughout the United States, is facing unprecedented budget shortfalls and that the ability to address preexisting (and, in some cases, long-standing) institutional problems is severely limited. However, it seems important to identify such problems at the Departmental level with a view towards addressing them in the future.

- *Loss of faculty positions*. In addition to increasing teaching loads for the remaining faculty, the loss of faculty hurts graduate programs in the range of advanced courses that can be offered and the reduced number of potential advisors, all of which make doctoral level graduate programs less attractive to prospective students.

- *Budget cuts*. The cuts to the Department's budget mean that the Department is less able to reduce teaching loads for the most productive research faculty, and this discourages writing and submission of grant proposals and also means faculty are less willing to take on time consuming administrative assignments.

- *Salary compression and inversion*. This is a problem throughout USU that was under discussion before the major budget cuts began in fall 2008. Utah State University is competitive with other institutions at the assistant professor level, but faculty that have been at USU for more than five years often have salaries only a little higher than new

hires and much less than surveys indicate their colleagues with comparable records are earning at other institutions. Salary compression is highest at the full professor level and worse in statistics than in mathematics. For example, according to the academic salary survey carried out by the American Statistical association and published in the December 2009 Amstat News, the median nine-month salary for full professors that have been two to seven years in rank is about $111,000 and the first quartile is approximately $95,000. The highest paid statistician in the Department of Mathematics and Statistics, a person who is principal investigator on two active NSF research grants and has more than 80 publications in refereed journals, has a salary of less than $84,000. In the longer term it is difficult to retain good people in any area in the Department when they can earn so much more elsewhere.

- *Space needs*. In the self-study for the 2002 external review, the Department Head described the Department's office and lab space as "barely adequate," and noted that the Department's lecturers all had offices in a different building (Geology) from the rest of the faculty. The Department is scheduled to move into the new Agricultural Sciences Building when it opens in spring 2012. This move will have the benefit of providing the Department with modern facilities, but will result in a substantial loss of office space for the Department.