PROGRAM REVIEW 2014-15

DEPARTMENT: Mathematics & Statistics, CNSM
PROGRAM: Mathematics
DEGREE: BA and BS

I. PROGRAM PRODUCTIVITY AND EFFICIENCY

1) Discuss or provide context for the following components of the PAIR data, and provide an explanation of any numbers that the committee might find unusually high or low in the data:
   a. Total SCH
   b. Number of majors
   c. Number of degrees
   d. Time to degree
   e. Department budget
   f. FTEs

   If the data do not accurately reflect the program, explain why not. Also, discuss trends, e.g., is enrollment growing or decreasing? Why?

Before answering question 1, we remark that the data compiled for the Department of Mathematics and Statistics (DMS) paints an imperfect picture of B.A. and B.S. program productivity and effectiveness at best, and that all statistics or numbers computed from the institutional data can only be used to create a partial and incomplete picture of the work of DMS for the B.A and B.S. programs.

The inaccuracies in and difficulties in interpreting the data arise from a number of sources including

- The exact queries that PAIR used to supply data to DMS are unknown.
- MATH and STAT courses at UAF are taught by DMS full-time faculty (= tenure/tenure-eligible faculty and two full-time instructors), temporary hires, and adjuncts here on campus; instructors at rural campuses; instructors for eLearning and summer sessions. This list of instructors includes those who contribute to the B.A. and B.S. program and many who do not do so directly. DMS's undergraduate mission at UAF is much, much broader than overseeing a B.A. and B.S. program.
- Beginning in Fall 2013, DMS took over eLearning MATH courses. However, for these recent semesters, the number of SCH hours from eLearning were attributed to "Outside" teaching (to the best of our understanding).
- DMS full-time faculty regularly teach during summer sessions, though in the SCH computation these courses were explicitly excluded from the computation "MATH and STAT lower" SCH and were tallied under "Outside."
- The PAIR data on faculty research productivity tracks many non-research faculty in DMS in addition to several adjuncts and faculty outside of DMS. It also inaccurately reports DMS research faculty grant activity. See annotated PAIR data.
- Many other reasons, but the ones listed above are sufficient to describe the difficulty in obtaining accurate counts.

Since the delivery of MATH and STAT courses is spread out over so many different instructors, campuses, and modes of delivery, in the program review we adopt the following conventions:

MATH and STAT: the phrase MATH and STAT refers to courses offered with these designations by UAF. This includes classes that are on-ground at UAF, online through eLearning, offered through rural campuses, and summer sessions.

DMS: This stands for "Department of Mathematics and Statistics," but the definition of faculty in this department changed over the period of review. Specifically, faculty in the Department of Mathematics and Statistics include full-time faculty (= 14 research faculty and 2 instructors) and adjuncts. Previous to Fall 2013, eLearning instructors were not employees of CNSM supervised by DMS. In Fall 2013, instructors of MATH and STAT courses through eLearning became part of DMS with the title of adjunct for those that were not full-time faculty in DMS already. Consequently, the number of faculty FTE and student credit hours attributed to DMS increased dramatically in Fall 2013. In the data provided by PAIR, this jump is not evident. This is puzzling. To the best of our knowledge, SCH from eLearning (and summer sessions and rural campuses) were attributed to "Outside" teaching even during the 2013-14 academic year.

Moreover, DMS oversees the approval of instructors of MATH and STAT courses at rural campuses and during summer sessions. We will use the acronym DMS in two (not mutually exclusive) ways. When talking in broad terms about all MATH and STAT courses, we may call these `DMS courses' since a huge percentage of these courses are offered for the undergraduate program and therefore contribute to the B.A. and B.S. program throughout the state. When we say 'DMS faculty' or `DMS MATH and STAT courses' this will mean the 16 full-time faculty in DMS and adjuncts, which subsequent to Fall 2013 includes adjuncts hired for eLearning, and the courses they teach. (That is, rural campus instructors, including CTC instructors, and course offerings are excluded. Because of the way data was collected, summer sessions faculty and courses are also excluded, though DMS faculty are involved in summer sessions.)

This said, we begin to address the items requested above. For more information about DMS, please see the four attached appendices.

Total SCH

By all measures, DMS generates a huge number of SCH per year, through course offerings on-ground at UAF, on-line through eLearning, through rural offerings, and summer sessions. The demand for lower level math courses and service courses for disciplines like engineering, the sciences, and business is huge. Class sizes in many of the so-called on-ground (offered at the main UAF campuses) service courses have crept up over the last years with, for example, sections of Calculus typically capped at 75 students per section. Lower level STAT service courses like STAT 200 often are capped at 80 students.

For our few `major-only' courses — those which typically draw only students completing a MATH major — enrollments are much smaller.

We tabulate some of these data in the following table, in which the **average annual number** of SCH is listed.

	SCH **per year**
MATH upper and lower division	6256
STAT upper and lower division courses	1056
TOTAL undergraduate SCH	7312

As a department with a heavy investment in helping Alaskans achieve the quantitative knowledge they need for fulfilling major and degree requirements, job training, and just general knowledge, undergraduate SCH make up about 95% on average of all SCH produced by DMS. We note, however, that most of the students taking undergraduate courses offered by DMS are *not* Mathematics majors.

Indeed, note that the PAIR data does not separate out SCH for courses that satisfy B.A. and B.S. requirements and those that are service courses or satisfy some other need. As a rough proxy, from the ratio (the total number of service teaching SCH)/(total number of MATH and STAT SCH including the "outside" teaching credit hours) almost 70% of the SCH in DMS is service teaching.

Total number of baccalaureate majors:
The total number of baccalaureate majors (B.A. MATH, B.S. MATH, B.S. STAT) in DMS during the period under review has held steady, ranging between 60 and 69 majors

per year, or between 3.75 and 4.3 majors per full-time faculty member (including instructors and one mathematics educator).

Number of majors and number of degrees: B.S. in Mathematics
The headcount of majors in the B.S. in Mathematics has held steady at around 50 students per year; this reflects a ratio of about 4 majors per tenure-track DMS faculty member.

Again there is difficulty in reading too much into the PAIR data supplied to count majors. First, each year a few students arrive at UAF and indicate that MATH is their major, yet start out in DEVM 0XX. As a general rule, such students can not realistically graduate with a B.A. or B.S. degree, but they may take a long time to complete the paperwork to change their major officially.

In addition, at least anecdotally, many of our majors decide to become math majors in year 3 or 4 of their studies. These students are often double majors with other departments, who become interested in math while fulfilling other degree requirements. Such majors often postpone completing the necessary paperwork for adding or changing a major for several semesters.

In 2010, the B.S. degree in Statistics was phased out, and students interested in statistics now earn a Mathematics baccalaureate degree with a Statistics concentration. During the period under review, three students earned B.S. degrees in Statistics previous to 2010.

Number of majors and number of degrees: B.A. in Mathematics
The main purpose of the B.A. degree is to allow students seeking a B.A. to double major with another discipline. A student is only permitted to double major in one type of baccalaureate degree (B.A. or B.S.) so if the department in the student's other area of interest only awards a B.A., a student can only double major in Math if they earn a B.A. (An entirely impractical option for a student wanting a double major from a B.A.-granting department and from a B.S.-granting department is instead to earn two degrees, a B.A. and a B.S., which requires *many* additional credits and realistically *at least* one extra year of study.)

In addition, the B.A. degree in Mathematics not only provides students flexibility to double-major in two subjects of interest (*e.g.* Math and Spanish, Math and English), but it also provides a mechanism for students to pursue the new B.A. in Secondary Education with an emphasis in Mathematics, or students to earn secondary certification via the post-Baccalaureate Teaching Certification program. As Alaska

(and all other 49 states) need qualified public school math teachers, this degree is important to teacher training.

In FY 12, two students earned a B.A. degree in Mathematics; both were double-majors in Math and Spanish.

We note that offering the **B.A. degree in Mathematics requires no special or additional departmental resources.** The departmental course requirements for the B.A. and B.S. degrees in mathematics *are identical.* The difference between the two degrees is that degree requirements for the B.S. in Mathematics requires a lab science sequence, while the B.A. in Mathematics requires 18 credits in Humanities and Social Sciences. The number of B.S. majors outnumbers the number of B.A. majors, simply because of UAF's strength in the sciences.

If the B.A. degree were eliminated, there would be no change in departmental offerings or necessary resources.

Minors:
In addition to majors and graduates, DMS has a significant number of minors. Data from the Office of Admissions and the Registrar shows that there were 117 MATH minors and 1 STAT minor during the period under review, for an average of 23 minors per year.

Time to degree
We were instructed that to approximate time to degree, we should compute the ratio of degrees to majors. For the B.S. in Mathematics, this gives ratios of 0.13 to 0.20; if everyone in the program completed their degree in four years, the ratio would be 0.25, so our ratios reflect that some students take longer than that.

However, this ratio does not tell the whole story. According to our most recent SLOA, where actual time to degree was calculated for actual graduates, most of our graduates complete their degree in a timely manner. For example, of the 18 graduates in the last two years, thirteen students (72%) finished in the expected timeline given their academic goals (5 in four years, 4 in 5-6 years but with at least two degrees, 3 transfer students who completed in 3 years or less), and two more (11%) completed in a reasonable timeline given their late decisions to declare a math major. However, three students (16%) took longer than expected because they struggled with MATH 215 (Introduction to Proofs) or one of the two required upper-division courses (MATH 401, MATH 405) that require MATH 215 as a prerequisite.

Department Budget

As shown in the attached budget summary, almost 97% of the DMS budget in this period has been for labor -- fulltime faculty, adjuncts, an administrative assistant, student graders and tutors, and graduate teaching assistants. (The five-year average for labor was $1,894,177, of total expenditures of $1,954,417.) The remaining 3% of expenditures provides basic office supplies, routine replacement of computers on a 4-5 year basis, and a small amount for travel (less than $1000 per full-time faculty member, used for both professional development and research purposes). We note a sudden increase in labor for FY14 due to e-Learning adjuncts moving under DMS, but this was matched by a similar increase in SCHs.

Around $46,000 per year is generated by a student fee on core mathematics courses to support the Mathematics and Statistics Laboratory. Without this fee, we could not maintain the Lab, which provides walk-in and on-line tutoring by both undergraduate and graduate students. We also employee many student graders, to provide students routine personalized feedback in large service courses. We use graduate teaching assistants to provide recitation sections for large calculus courses, as well as occasionally to teach 100- and 200-level courses.

The Math Bridge program, which was initiated in this period, has been funded primarily by a legislative initiative and to a lesser degree by other funds. This is changing now, as we move Bridge to a framework of for-credit courses which will generate additional SCHs and thus tuition revenue to pay for the necessary student tutors.

Support for faculty travel has been minimal. Despite the high costs of travel to and from Alaska, we believe travel support is much less than at many of our peer institutions. This is unfortunate, since research in the mathematical sciences is often stimulated by the personal interactions that occur through professional travel.

While our department has a great need for a computer lab to support its undergraduate program, this has not been budgeted for. However, the more fundamental problem of a lack of appropriate space for such a lab has made this issue irrelevant.

FTEs

DMS has full-time faculty as follows:

DMS faculty with Mathematics Ph.D.	10
DMS faculty with Statistics Ph.D.	3
DMS faculty with Math Education Ph.D.	1
Full-time instructors	2
Total	**16**

The PAIR data reports that each of these 16 members of DMS works .75 time, since they are on nine month contracts. This means the DMS FTE count is 16(.75) = **12**, (when partial appointments in DMS are ignored). Since each of the numbers in the relevant PAIR data is below 12, presumably those on sabbatical were not counted in any FY. Typically two faculty are on sabbatical annually; thus the FTE would be 14(.75) = 10.5 which is more in line with the data shown there.

DMS runs a Math lab for students wishing to receive extra help in their MATH and STAT courses, employs student graders, and students assistants to the Math Bridge program. Also, some graduate students have TAships and run recitation sections for courses like Calculus I. These facts likely account for the high number of student FTEs, though this is not clear.

The reliance by DMS on adjuncts continues to be high: using the PAIR data we compute that adjuncts have taught in the range of about 14% (low) to almost 24% (high) of total teaching-related FTEs (=Adjunct+Faculty FTEs from PAIR data) during the time of review.

In Spring 2013, DMS began maintaining an internal database with data about MATH/STAT enrollments. (This was initiated to help with assessing student placement and success rates in various MATH courses in a longitudinal study. One outcome of maintaining and curating this database is the introduction of the ALEKS placement test for MATH courses at UAF.)

Based on data analyzed internally by DMS using this database, we report in the following tables some information on SCH and who taught MATH and STAT courses over the review period.

	Sections taught	SCH
MATH and STAT (total including grad)	831	50433
MATH and STAT taught by DMS faculty	525	38835

Of the 525 sections taught by DMS faculty,
64.4% (338 sections) were taught by permanent faculty
(= tenured/tenure-track and instructors), and
35.6% (187 sections) were taught by adjunct faculty.

To analyze these data further, we tabulate which type of teacher (research faculty, instructor, adjunct) in DMS taught courses at various levels of the curriculum. Summer session courses, though often taught by DMS faculty, are excluded from these tallies.

		100-level Sections taught
DMS MATH and STAT (total)		113
Permanent DMS faculty		39 (35%)
	Research DMS faculty	3 (3%)
	DMS instructor	36 (32%)
Adjunct DMS faculty		74 (65%)
		Sections of MATH 200, 201, 202; STAT 200
DMS MATH and STAT (total)		144
Permanent DMS faculty		70 (49%)
	Research DMS faculty	64 (44%)
	DMS instructor	6 (4%)
Adjunct DMS faculty		74 (51%)
		Sections of MATH and STAT > 202 Including service courses MATH 205, 206, 262, 272, 302
DMS MATH and STAT (total)		179
Permanent DMS faculty		155 (87%)
	Research DMS faculty	139 (78%)
	DMS instructor	16 (9%)
Adjunct DMS faculty		24 (13%)
		Sections MATH/STAT >= 600
DMS MATH and STAT (total)		89
Permanent DMS faculty		77 (87%)
	Research DMS faculty	73 (82%)
	DMS instructor	4 (5%)
Adjunct DMS faculty		22 (13%)

Breakdown by course level of DMS faculty

From this table, it is clear that DMS relies heavily on adjuncts to teach 100-level courses (65%) and calculus and introductory STAT courses (51%). In contrast, of the 179 total undergraduate sections of MATH and STAT classes at the level of 205 or above, 87% were taught by permanent faculty

The department has concerns about this heavy reliance on adjunct faculty; in particular, many in DMS would like to see permanent research faculty (not instructors) rotate through the lower-level classes on a regular basis, since many of our majors and majors in other math-heavy departments (Engineering) start their degrees at this level. DMS would like to see fewer adjuncts teaching Calculus sections here at UAF too. However, at the moment, while we can manage our current program with the FTEs we have, we do not have enough buffer or flexibility to have research faculty regularly teach all sections of Calculus and to rotate into 100-level courses on a regular basis.

2) Describe the way this program fits into the department as a whole.
What other programs are offered in the department and how are they connected with this program?
What percentage of faculty and staff time is devoted to this program as opposed to others offered?
What are the budgetary needs associated with this program in particular, e.g., how many faculty teach exclusively or predominantly the courses required for this program?
Do those courses meet requirements for other programs?
Are there any special equipment, space, commodity or other needs associated with the program that are not covered by student fees?

How the program fits into the department as a whole; what other programs are offered in the department and how are they connected with this program?
The Department of Mathematics and Statistics is responsible for five different degree programs:

1. B.A. in Mathematics
2. B.S. in Mathematics
3. M.S. in Mathematics
4. M.S. in Statistics
5. Ph.D. in Mathematics.

In addition, DMS offers a minor in Statistics, a minor in Mathematics, and a Graduate Certificate in Statistics. Within the B.A. and B.S. degrees in mathematics, there is an option to concentrate in Mathematics or to concentrate in Statistics.

DMS acts as an integrated whole: all permanent faculty with research responsibilities teach at all levels of the curriculum (undergraduate and graduate),

while the two instructors teach almost exclusively at the 100-level and some calculus courses (one instructor regularly teaches the graduate student Teaching Seminar, Math 600). In particular, with the exception of the two instructors who do not have research responsibilities, all permanent DMS faculty are involved in all aspects of the undergraduate (B.A. and B.S.) and graduate programs. Faculty are not pigeon-holed into teaching particular courses as is commonly found in, say, the sciences; this is because an instructor with a Ph.D. in Mathematics (or Statistics) can teach all courses at the undergraduate level in MATH (or STAT respectively). Indeed, this is a great strength of the undergraduate program; permanent research faculty are involved in all aspects of the degree programs offered by DMS.

What percentage of faculty and staff time is devoted to this program as opposed to others offered?

The **vast** majority of MATH and STAT teaching effort is dedicated to service courses at the level of 202 or below. Of these courses, only the calculus sequence is required for the major. (The calculus sequence is primarily populated by majors in engineering and the sciences, not mathematics majors, and STAT 200 is also not populated by Mathematics majors)

Permanent research MATH DMS faculty with a 60/30/10 contract will, in a typical year, teach three undergraduate courses and perhaps one graduate course. More specifically, DMS offers six MATH graduate courses per year which are shared among ten math faculty. The three Statistics faculty teach graduate courses roughly twice a year. All undergraduate STAT courses are service courses, and a MATH faculty member can expect to teach ***at most*** one undergraduate elective or required major course a year, *i.e.* a course that serves students earning B.A. or B.S. degrees in Mathematics (which often still doubles as a service course).

DMS has one administrative assistant, one part-time staff member who serves the Math Bridge program, and one or two student office assistants. In addition, the department hires a number of students (graduate and undergraduate) to work as graders, tutors in the Math Lab, and tutors for the Math Bridge program. A few graduate students are hired to lead recitation sections for calculus or to teach their own class. These student workers are involved with the B.A. and B.S. degree only in so far as they are involved with tutoring or grading for classes that contribute to the degree.

What are the budgetary needs of this program in particular? How many faculty teach courses exclusively or predominantly to serve this program?

Most courses taught by permanent faculty in DMS serve this program. No permanent faculty member (research faculty or instructor) is exclusively devoted to the B.A. or B.S. degree. Research faculty teach graduate courses in addition, instructors teach 100-level courses that do not count to a Mathematics degree (service courses or CORE courses), and the Mathematics educator does not teach any courses that count toward the undergraduate Mathematics degrees.

Using DMS' internal database, we find that of the 525 sections taught over the past 5 years by faculty affiliated with DMS (including adjuncts), 293 of them (55%) served this program.

At the risk of being repetitive, we reiterate that in a typical year, a full-time, non-instructor DMS faculty member will teach 4 courses; of those, either 3 or 4 of them will serve this program, with the remaining course serving the graduate program.

Finally, it is important to note again that most of our upper-division courses (and several of our graduate courses) meet service needs of external programs, as well as serving the needs of the B.A. and B.S. in MATH. All undergraduate STAT courses are primarily service courses for other programs, and play a minor role in the math major.

Do these courses meet requirements for other programs?

Yes! They meet many requirements in many programs, as well as satisfying baccalaureate Core requirements. In fact, every course required for the MATH B.S./B.A. satisfies a requirement or serves as a prerequisite for another program, with the exception of five courses: MATH 401, 404, 405, 422 and 490. However, even these five courses may be used to fulfill the "upper-division math elective" requirements in Physics, Computer Science, and Electrical Engineering. All STAT undergraduate courses are service course for other departments.

Specifically:
Courses that can be used to fulfill the requirements of the B.S. and B.A. in Mathematics often serve as prerequisites for courses in a number of other programs; in many of these courses (see the discussion of Service Teaching from part 1), the majority of the students are taking the courses to meet requirements other than those of the B.S. and B.A. in Mathematics.

Courses frequently used as **explicit prerequisites** for courses in other majors (please consult the catalog for abbreviations) include:

- MATH 200 (Calculus I): courses in EE, ES, GE, MSL, MIN, CHEM, PHYS; graduate courses in ECON.
- MATH 201 (Calculus II): courses in CHEM, CS, EE, ENVE, FISH, ME, PETE, PHYS.
- MATH 202 (Calculus III): courses in CHEM, CS, EE, ES, PETE, PHYS.
- MATH 302 (Differential Equations): courses in ATM, EE, ES, GE, GEOS, ME, PETE, PHYS.
- MATH/CS 307 (Discrete Mathematics): courses in CS.
- MATH 314 (Linear Algebra): courses in GEOS, NRM, CS.
- STAT 300: graduate ECON; graduate FISH.

Moreover, many mathematics courses that can be used to fulfill requirements for the B.S. and B.A. in Mathematics are **required components** of a number of majors at UAF. Again, the population of many of these courses (*e.g.* MATH 302, MATH 307) often includes mostly students who are taking the courses to satisfy requirements of other programs, rather than using these courses to satisfy the requirements of the Math B.A. or B.S.

These courses include:

- *Math 200 (Calculus I):* Required for the General Science B.S.
- *MATH 200 (Calculus I) and MATH 201 (Calculus II):* Required for the B.A. and B.S. in Chemistry
- *Math 200/201/202:* required for Physics B.S. (all concentrations); American Chemical Society-approved B.S. in Chemistry; Computer Science B.S. and B.S./M.S.
- *Math 200/201/202/302:* Required for Civil Engineering B.S., Computer Engineering B.S., Electrical Engineering B.S., Geological Engineering B.S., Geophysics concentration of GeoScience B.S., Mechanical Engineering B.S. and B.S./MS, Mining Engineering B.S., Petroleum Engineering B.S.
- *MATH/CS 307* (Discrete Mathematics): Required for the Computer Engineering B.S. and Computer Science B.S.
- *MATH 310 (Numerical Analysis):* required for the Computational Physics concentration of the Physics B.S.
- *MATH 314 (Linear Algebra):* required for Geophysics concentration of the GeoScience B.S.; recommended for Electrical Engineering B.S.
- *STAT 300 (Statistics)*: Required for the Computer Science B.S.

- *STAT 401 (Regression and Analysis of Variance)*: Required for the B.S. in Wildlife Biology and Conservation; required for the Fisheries M.S.
- *STAT 401 (Regression and Analysis of Variance) or 402 (Statistical Sampling):* Required for the Fisheries B.S.
- *One upper-division MATH elective:* required for Computer Science B.S. (from a list of 7 courses) and B.S./M.S.; Applied Physics and Technical Management concentrations of the Physics B.S.; Electrical Engineering B.S..
- *Two upper-division MATH electives:* required for the Physics B.S. concentrations of Physics, Atmospheric Physics, Computational Physics.

In addition to MATH and STAT courses required for particular majors, several of our courses may be used to meet requirements. These include:

- *STAT 300* (Statistics) may be used to fulfill a requirement for the Geology, Paleontology and Geospacial Sciences concentrations of the GeoScience B.S.; B.S. in Biology (all concentrations); Wildlife Biology and Conservation B.S..
- *Math 310 (Numerical Analysis)* may be used to fulfill a requirement for the Petroleum Engineering B.S.
- *MATH 200 (Calculus I)* may be used to satisfy a requirement for the B.S./B.A. in Biology; the B.A. in Economics; the B.S. in Fisheries; B.A. in General Science; B.S. in Natural Resource Management; B.S. in Wildlife Biology and Conservation.
- *MATH 302, MATH F302, MATH F310, MATH F314, MATH F371, MATH F405W, MATH F408, or MATH F460* may be used to satisfy a requirement for the Computer Science B.S.
- *STAT 401 or STAT 402* may be used to satisfy a Biology elective for the Ecology and Evolutionary Biology concentration of the B.S. in Biology
- *STAT 401 or STAT 461* can be used to satisfy requirements of the Ph.D. in Geophysics
- *Math 421* (Applied Analysis) can be used to satisfy requirements of the Ph.D. in Geophysics.

A number of our undergraduate courses, indeed, attract beginning graduate students in the sciences with weak mathematical backgrounds (*e.g.* MATH 202, MATH 314, STAT 401).

Interestingly, the CS major requires so many math courses that their graduates automatically satisfy the requirements for a minor in math. Several other engineering disciplines also require such a large number of math courses that their

students need only one additional course to earn a math minor. We have seen that many of these students elect to earn minors in Mathematics.

Are there any special equipment, space, commodity or other needs associated with the program that are not covered by student fees?

A number of the courses that are either required or serve as electives for the MATH B.S./B.A. program would serve students better if technology could be an integral part of the class experience. However, computer lab space is not available for most courses. (When the Computer Science department split off from DMS to join CEM, they became sole owner of the previously joint MATH-STAT-CS computer lab in Chapman.) It is not reasonable to require that all students have laptops, because of the cost. So far, MATH instructors have made do by using whatever laptops students have as an impromptu lab space, or simply have chosen not to incorporate explicit use of technology in the classroom experience.

Since STAT 401 has a lab component, and DMS does not have a computer lab, the department with funds from the Provost purchased about 22 laptops which reside in a closet in Reichardt. The TA for the STAT 401 lab wheels these laptops into the classroom for the lab section for student use.

There is a **pressing need for a Computer Lab** for the Math B.A. and B.S. programs.

3) Does this program have sufficient resources (people, space, time, funding, student interest) to adequately meet its objectives in a sustainable manner?

The department does not have sufficient full-time faculty to effectively offer all the courses needed for the MATH B.S. and B.A. as well as the graduate programs and all the 100- and 200-level service courses. However, we can minimally meet the objectives of the program with our current use of contingent faculty. Please recall that adjunct faculty taught 65% of the 100-level sections offered during the period of review, and almost 52% of the Calculus sections (Math 200, 201, 202) that serve the B.A. and B.S. in mathematics.

The hiring of adjunct faculty takes up a significant amount of time for the Chair of the department, and this workload has been increased by the inclusion of eLearning in DMS beginning in fall 2013.

While DMS is excited about the potential for making distance offerings more effective and more in line with the on-ground courses offered by the department,

the inclusion of these distance courses means that DMS is supervising many additional adjunct instructors who teach courses that serve the B.A./B.S. degree. For the health of the undergraduate program (that is, the MATH B.A. and B.S.), it is important that we cycle "research" math faculty through at least the Calculus sequence on a regular basis (and ideally, down to Math 107X). Unfortunately, we do not have the staff to do this.

Departmental space in Chapman is severely limited, and it remains unclear how this will be addressed. Currently the Math Bridge program has been allocated some space in Eielson, while we use two converted seminar rooms and a temporarily-vacated office "borrowed" from CS for graduate student and adjunct office space. Other graduate students and faculty are in windowless offices with no ventilation systems. With two additional full-time instructor positions coming on board in Spring 2015, there is no private office space available for them on a long-term basis. Various space consultants have visited Chapman, but none has seen any easy solution to our problems. The Chapman floorplan has led to a number of pockets of wasted space, but making that usable would require physical changes to the building. Finally, space for a computer laboratory remains even more elusive.

4) Describe the productivity of the program faculty in publication, scholarship, teaching, funded research and service. Mention specific Unit Criteria if they will help the committee to assess the level of scholarly productivity. List any grant funding associated with the program faculty during the review period.

The make-up of faculty in DMS is ten mathematicians (Allman, Avdonin, Bueler (75% in DMS), Berman, Faudree, Gimbel, Maxwell, Rhodes, Rybkin, Williams), one mathematics educator (Rickard 50% in DMS), three statisticians (Barry, McIntyre, Short), and two instructors without research responsibilities; that is, there are **14** members of DMS with research appointments and we restrict our answer to this question to these fourteen individuals. Please note that the data supplied by PAIR is inaccurate; see annotated last page of PAIR-generated pdf file for corrections.

Research

Our research faculty is highly productive, both in terms of number of papers published over the review period and grant funding. We note that the **culture of mathematics is very different** than that of the physical and natural sciences. Indeed, the main professional organization of research Mathematicians in the United States, the American Mathematical Society (AMS) each year publishes a "culture statement" to make known more broadly the norms for productivity and grant funding in mathematics. According to the AMS (see culture statement 2006 on publication rates included in the appendix), the publication rate in mathematics is

modest in comparison with other sciences. To highlight this point, this document examined the publication rates during five years preceding the awards of Sloan and Guggenheim Fellowships and found that 70% of the Sloan awardees and fewer than 50% of the Guggenheim awardees published more than two articles annually. The culture statement goes on to explain that in mathematics *quality* not *quantity* is the measure of productivity.

The approved DMS unit criteria reflect this cultural norm, and states that it "expects faculty with a 30% research load to be publishing at a rate of approximately one paper per year. At a 50% level or above there should be approximately two. However, it should be emphasized that this is only an approximate goal. The more important goal is quality research."

Research faculty with appointments in DMS have been extremely productive: over the 5 years of this review, a total of 122 papers have been published, along with 158 research presentations. Without even accounting for partial appointments in DMS, this works out to ⅕(122/14) ≈ 1.74 papers published per faculty member per year. DMS research faculty is exceedingly productive, particularly when measured using the publication norms in the Mathematical Sciences.

External Funding

In regard to grant funding, DMS research faculty is also highly successful. We note first that grant funding in mathematics is very limited in comparison to other sciences, and that individual grants are typically of smaller value. Moreover, some sub-areas of mathematics are not funded at all by federal funding agencies. To substantiate this assertion, we quote from the 2006 "culture statement" of the AMS devoted grant funding (see appendix),

> "… In 2006, across all fields of science, 46.9%of those employed in academia received Federal support for their research: 56.3%of physical scientists, 43.9%of computer scientists and 57.9% of life scientists, as compared to 34.8% of mathematicians.
>
> As compared to other natural sciences, there is also a large disparity in the per capita level of funding available to mathematicians. In FY2006, across all fields of science and engineering, the Federal government provided about $260,000 per academic researcher. By field, this breaks down to $360,000 per academic researcher in Computer Science, $140,500 per academic researcher in the Physical Sciences, and $430,000 per academic researcher in the Life Sciences. By contrast, in 2006 the Federal government provided about $47,000 per academic researcher in Mathematics.1
>
> When compared to other fields of science and engineering, opportunities for external funding in mathematical sciences are very limited. The vast majority of mathematicians receiving Federal support have just one, single investigator, NSF grant."

The DMS Unit Criteria also reflect this reality:

> "Certain disciplines found in mathematical sciences have little opportunity in the way of external funding. Accordingly, the ability to find funding speaks well for a candidate at any level. However, absence of funding may not necessarily speak against the candidate. DMS does not consider the funding of grant proposals to be the goal of any research project. Rather, we focus on what is achieved with or without research funding."

We next report the numbers, that is, how DMS research faculty measure up in terms of grant productivity:

Over the review period, research faculty in DMS applied for 41 grants of various types, ranging from small travel grants of a few thousand dollars to massive grants from the NSF for hundreds of thousands of dollars. See table below for data on funded grants. Remarkably, when restricting to grants over $100,000, we see that six faculty members (some repeatedly) were funded by NSF or NASA during the last five years. Moreover, 6/14 ≈ 43% of the faculty were funded by large federally-funded research grants. This should be considered in light of the fact that nationally less than 35% of mathematicians are supported by federal grants.

Funded grants:

Allman	**NSF** "Enhancing Phylogenetic Methods and Theory via Algebraic Perspectives" 2007-2012 with co-PI J. Rhodes ($486,450)
	NSF "Participant Support: 2011 Mittag-Leffler Institute" ($48,515)
	Erskine Fellowship, University of Canterbury 2013
	NIMBioS short-term visitor grant
	AIM SQuaRE grant (2011-2013)
	NIMBioS working group grant
	GCAT Workshop on synthetic biology
	Mittag Leffler Institute Research Fellowship
	University of Tasmania Visiting Scholar
	SAMSI Research Fellow
Avdonin	**NSF** grant 2014--2017, "Control and Inverse Problems for Differential Equations on Graphs" ($147,000)
	Australian Research Council grant, ``Interrogation and Estimation of Differential Equation Networks'' (with W. Moran and M. Morelande) 2013--2015
	NSF grant 2007--2011, "Boundary Inverse Problems in Glaciology" with M. Truffer and D. Maxwell ($385,000)
Barry	**U.S. Fish and Wildlife**, support for a graduate student for two years. (Study of the

	geospatial estimator for moose populations when densities are low).
Berman	Simons Foundation Collaboration Grant for Mathematicians 7/1/2011 – 8/31/2016 ($35,000)
Bueler	Ed Bueler (PI), Mark Fahnestock (Co-I), Andy Aschwanden (Co-I), and Constantine Khroulev (senior personnel), Understanding measured variability in the Greenland ice sheet using the Parallel Ice Sheet Model (PISM), **NASA** Modeling Analysis and Prediction, NNX13AM16G, funding period June 2013--June 2017 ($737,000)
	Ed Bueler (PI), Regine Hock (Co-I), David Maxwell (Co-I), and Martin Truffer (Co-I), A high resolution Parallel Ice Sheet Model including fast, sliding flow: advanced development and application, **NASA** Modeling Analysis and Prediction, 2009--2013. ($994,000)
Gimbel	Czech National Science Foundation Scholarship
	Charles University Research Fellowship
Maxwell	**NSF** FRG: Collaborative Research: Analysis of the Einstein Constraint Equations, 2013-2014, ($150,000)
	Ed Bueler (PI), Regine Hock (Co-I), **David Maxwell** (Co-I), and Martin Truffer (Co-I), A high resolution Parallel Ice Sheet Model including fast, sliding flow: advanced development and application, **NASA** Modeling Analysis and Prediction, 2009--2013. ($994,000)
	NSF grant 2007--2011, "Boundary Inverse Problems in Glaciology" S. Avdonin with M. Truffer and **D. Maxwell** ($385,000)
Rhodes	**NSF** Grant #0714830: Enhancing Phylogenetic Methods and Theory via Algebraic Perspectives, Division of Mathematical Sciences, Program in Mathematical Biology; with co-PI Elizabeth Allman 2007-12 (partially in this period, but awarded earlier) ($486,450)
	AIM SQuaRE grant (2011-2013)
	Mittag Leffler Institute Research Fellowship and other fellowships
	NIMBioS short-term visitor grant
	Erskine Fellowship, University of Canterbury 2009
	University of Tasmania Visiting Scholar
Rybkin	**NSF** DMS-1411560, Integrable PDEs and Hankel operators, 09/01/14-08/30/17 ($213,000)
	NSF DMS 1126006, REU supplement; 06/10/11-06/30/14 ($36,126)
	NSF DMS 1009673, Inverse Scattering Transform and non-decaying solutions of completely integrable nonlinear PDE's, 07/01/10-06/30/14 ($200,000)
	NSF DMS 0907801, REU supplement, 06/10/09-08/31/10 ($45,000)
	NSF DMS 0707476, Titchmarsh-Weyl m-function and integrable nonlinear PDE's; 09/01/07-08/31/10 ($115,000)
Williams	Fields Institute Travel Grant

Teaching:
As described in detail above, DMS contributes to teaching at all levels; it provides an important part of the baccalaureate core, it provides quantitative training for engineers and other technical disciplines, it provides quality graduate education. Research faculty typically teach 2 courses each semester, while lecturers taught 3 courses each semester during the period under review.

Service:
Members of DMS contribute to service in all its forms: department, university, professional, and public service. In addition to many departmental committees, DMS frequently has representatives serving on college-wide and university-wide committees. During the time of review, this included Faculty Senate, Program Review, University-wide Promotion and Tenure, Curriculum Review (both college- and university-wide), General Education Revitalization, Curricular Affairs, Unit Criteria and Faculty Affairs.

There are several university-wide committees that have required DMS participation, including Core Review (which was chaired by the DMS representative for several years during the period under review) and Student Academic Development and Achievement.

Members of DMS have also served on various ad-hoc committees, such as the 2009-2010 Chancellor's Committee on the Integration of Research and Teaching in the Sciences (CIRTS), the *Educate* Subcommittee of the Strategic Planning Committee at UAF, the UAF Life Sciences Informatics Advising committee, and the system-wide General Education Learning Objectives committee. In addition, DMS faculty served on the Joint Health Care Committee and on the Honors Faculty Advisory committee, and one DMS faculty member served as the Chief Negotiator for the current Collective Bargaining Agreement.

DMS faculty members regularly serve as judges at local science fairs, and one person recently was the plenary speaker for the New Mexico High School State Mathematics contest. Research faculty are also highly involved with service to the discipline. Members of DMS regularly serve as peer reviewers for professional journals, and some faculty are associate editors and editors of peer-reviewed mathematics journals. They also write reviews of conferences and published papers.

We note in closing that, after analyzing student success rates in lower-division MATH and DEVM courses, DMS initiated a Subcommittee on Math Placement which suggested using a new mechanism (the ALEKS placement test) for placing students into their MATH and DEVM (and STAT 200) courses in fall 2014. Roll-out of this new placement scheme involved faculty and staff across all areas of the university.

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DEPARTMENT: Mathematics & Statistics, CNSM
PROGRAM: Mathematics
DEGREE: BA and BS

II. NEED FOR PROGRAM

1) UAF'S mission and Core Themes are attached. How does this program contribute to that mission and those themes? Is this program uniquely central to the mission?

Mathematical and Statistical training are an integral part of UAF's mission and fit well into UAF's core themes. Thinking at a very high level, part of the university's responsibility is to provide for adequate quantitative training of its citizens; to prepare Alaska's future workforce (*e.g.* highly-qualified engineers, statisticians for jobs in Fish and Wildlife and other state interests, mathematics teachers, etc.) and to advance the boundaries of mathematical and statistical knowledge.

Specifically, the Mission Statement of the University of Alaska Fairbanks says that the university "…advances and disseminates knowledge through teaching, research and public service…". The Department of Mathematics and Statistics directly contributes to this clause of the Mission Statement, by providing quality teaching to a majority of students in the university (through the required core mathematics requirement or through program requirements such as the calculus sequence), by frequently publishing articles on new research in mathematics and statistics in respected, peer-reviewed journals, and by contributing to the discipline and the general public as referees, members of editorial boards, local science fair judges, statistical consultants, organizers of math contests, as well as serving on local boards and being involved in the local community in ways less directly-connected to mathematics and statistics.

The B.A. and B.S. in mathematics directly contribute to all of UAF's Core Themes, namely **Educate**, **Discover**, **Connect, Prepare**, and **Engage.**

Educate: Courses used to fulfill requirements for the Math B.S. and B.A. are taken by students across the UAF campuses, in a variety of disciplines. Within the program, we provide a high-quality degree in mathematics, with various tracks to appeal to many different students, including those interested in pure mathematics and graduate school, those interested in a career in secondary teaching of mathematics, and those interested in working in the public sector or in industry.

Discover: The department has researchers who are highly productive, in a variety of mathematical and statistical disciplines. Departmental researchers frequently present at national and international conferences and are involved in collaborations

around the world. They also mentor students, both at the undergraduate and graduate levels, to discover their own paths to mathematical research.

Prepare: Courses that satisfy requirements for the Math B.S. and B.A. are used to prepare students at all levels of the university, including serving as a significant mathematical core for many of Alaska's budding engineers. The program also contributes to preparing future teachers of Alaska; many students go on to gain secondary certification in mathematics via the post-baccalaureate certification program. We anticipate that in the future, more students will pursue certification through the new B.A. in Secondary Education with an emphasis in mathematics.

Connect: Through eLearning and the offering of MATH and STAT courses at rural campuses, DMS connects students all over Alaska with undergraduate mathematics and statistics instruction and training.

Engage: MATH and STAT courses are taken by students of all age demographics in Alaska (advanced high school students, home-schooled students, college students, vocational students, returning non-traditional students, retired citizens, military personnel, etc.) and the courses offered through the B.A. and B.S. degree programs appeal to (and therefore engage) Alaskans in lifelong learning. In addition, as many job qualifications now require significant quantitative training (statistics, engineering), the role of DMS in offering its undergraduate courses is a boost to the economic development of Alaska.

2) List any active academic, community, or industry partnerships associated with this program, and briefly explain what the partner contributes (including but not limited to monetary and in-kind contributions).

Baccalaureate Requirements

Mathematics—as an important part of the liberal arts—is a required part of the UAF baccalaureate curriculum; every baccalaureate student is required to take one course to satisfy general education requirements and most students are required to take a second course to satisfy their degree requirements. A proportion of these courses are from courses that satisfy requirements for the Math B.A. and B.S.

Quantitative fields at UAF

DMS is in an implicit partnership with a huge number of majors and disciplines, which rely on the program to provide a solid mathematical background to students in quantitative fields. As discussed above, physics and all the engineering degrees require four math courses, and some of them (electrical engineering, petroleum

engineering, computer engineering, computer science and some physics concentrations) require 5 or even 6 math courses.

Partnerships with Alaska Department of Fish and Game

The statistics faculty in DMS have a long association with the Alaska Department of Fish and Game (ADF&G). Faculty have received funding for collaborative work with department researchers. Moreover, in the past ADF&G has provided support for graduate students in statistics through internships and RA positions. Indeed, a number of students have based their M.S. research projects on questions posed by researchers at ADF&G's regarding the management of Alaska's fish and game resources. Moreover, employees of ADF&G routinely enroll in applied statistics

courses offered by the department. This includes employees outside of Fairbanks taking courses via distance delivery.

Partnerships with Department of Institutional Research

The Department of Institutional Research at UAF typically provides funding for one statistics MS student each year through a research assistantship. Students help support department staff and work on database management and analysis problems. A significant number of graduates from the MS statistics program who held these research assistantships found permanent employment at Institutional Research after graduation, both in Alaska at UAF and outside Alaska at other universities.

Parallel Ice Sheet Model Project

The Parallel Ice Sheet Model (PISM; www.pism-docs.org) is an open-source scientific software project based on a partnership of UAF with several other institutions. The PI of this project is Bueler (DMS), Maxwell (DMS) was a recent Co-I, and four M.S. Mathematics students from DMS have worked on PISM-related projects and theses.

While UAF researchers account for about 85% of the code base of PISM, the most important PISM co-developer is the Potsdam Institute for Climate Impact Research (PIK), Potsdam, Germany, whose researchers account for key physics developments which form about 10% of the code base. PIK-based lead authors have published 13 peer-reviewed articles using PISM since 2011, including three in Nature, all based on close collaboration and consultation with UAF researchers; for comparison there are 6 PISM-based publications with a UAF-based lead author since 2007.

In addition to PIK, the UAF PISM group has active collaboration with researchers at the following institutions

* Danish Meteorology Institute, Copenhagen, Denmark
* Centre for Ice and Climate, U. Copenhagen, Denmark
* Max Planck Institute for Meteorology, Hamburg, Germany
* Institute for Marine and Atmospheric Research, Utrecht, Netherlands
* Victoria University, Wellington, New Zealand
* Stockholm University, Stockholm, Sweden
* NASA Goddard Institute of Space Studies, USA

which use PISM. Collectively these additional collaborations have yielded 14 more peer-reviewed publications since 2011. Clearly, these collaborations imply a high degree of international visibility for UAF-based ice sheet modeling, as an area of research in glaciology, climate science, and mathematical modeling.

The PISM project also represents a strong intra-UA partnership between DMS, GI, and ARSC. Each of the four NASA grants supporting PISM, totaling $2.4M for the 2001-2017 period, have at least one DMS and at least one GI investigator, and each is based on resources from ARSC (i.e. computer resources, postdoc support, REU support, and consultation).

Research Experience for Undergraduates
For the review period (2009-2014), Prof. Alexei Rybkin has raised over $100,000 (mostly through REU supplements, with some contributions from GI and URSA) to support REU activity of 17 undergraduate students. The students participated in 8 distinct projects on math modeling (6 on nonlinear water wave phenomena and 2 on some other applied math topics). This activity has resulted in 1 published research paper, 1 submitted, 1 in final stage of preparation, and 1 in preparation, 16 talks (in colloquium series, domestic and international professional meetings). Besides Dr. Rybkin, Dmitry Nicolsky of GI was actively involved in 5 projects, and Efim Pelinovsky of Institute of Applied Physics, Russia (world-renowned authority on tsunami waves and a major international award recipient) was actively involved in 2 projects (none of which had monetary compensation).

Joint MATH-CS Graph Theory Research Group
Members of the DMS and the Computer Science department meet weekly to discuss research problems in graph theory. During the period under review, this collaboration has resulted in 2 papers, which are currently in review.

Partnerships with Biology and Wildlife

Faculty members Rhodes and Allman collaborate with faculty in Biology & Wildlife to help increase the quantitative knowledge of students and faculty in biology. They both have "Research Faculty" appointments with IAB, and have served as informal and formal advisors on biology Ph.D. committees. They have also developed an interdisciplinary undergraduate course MATH/BIOL 393 in synthetic biology, and a graduate course in "Theory of Phylogenetics" that attracts students and faculty in biology and fisheries in addition to those in mathematics and statistics. The last time the "Theory of Phylogenetics" course was offered, students and faculty from UAA and UAS enrolled remotely.

3) Is this program duplicated within the UA system? If there is another program within the system, does this one have any important differences from the other program(s)?

Both UAS and UAA offer a B.S. in Mathematics, and UAA has a B.A. in mathematics. However, the degrees offered by UAF differ in some significant ways from those offered by the other two campuses. UAF offers a broad array of math courses at the upper-division level, and UAA offers a few more upper-division statistics courses than UAF.

One feature of UAF's baccalaureate degrees in mathematics is that the design of the degree allows students to focus on taking courses in the area of mathematics that interests them, subject to a core set of courses that are required of every major; thus, students interested in working in industry can focus almost half their degree on courses in applied mathematics; students interested in graduate school can take a broad array of pure and applied courses, with the ability to focus on either discrete or continuous areas as they like; and students interested in secondary certification can take courses that satisfy the mathematics requirements of the State of Alaska. The degrees at UAA and UAS do not allow their students as much flexibility.

UAF's B.S. and B.A. degrees in Mathematics offer a concentration in Statistics (as well as a concentration in Mathematics), which does not seem to be an explicit option at UAA or UAS. Both UAF and UAA offer a minor in Statistics; UAS does not.

Given that quantitative training is so important to obtaining a high-paying job these technologically-advanced days, permitting students to earn a Mathematics degree locally clearly helps in job training and economic development.

4) Describe the demand for the program by students and the prospective job market for program graduates. (For assessing the job market, you may find the following publication useful (http://labor.alaska.gov/trends/), particularly their annual employment forecast. The national Bureau of Labor Statistics also has potentially applicable information (http://www.bls.gov/ooh/).
If your program tracks actual job placement of its graduates, please provide that information. However, it's recognized that not all degrees qualify recipients for specific occupations, so in some cases, you may need to address this question in broader terms, e.g., what skill set does the degree represent? What kinds of jobs are graduates obtaining?

Our graduates seem to be successful at finding jobs or being successful in post-graduate study.

In the past two years, 18 students graduated from the program with a B.A. or B.S. in Mathematics. Of those, eight are currently enrolled in or have completed a graduate degree program in a mathematics or teaching related field, with one more pursuing a degree in veterinary science at one of the top vet schools in the USA. Two more have plans to pursue a graduate degree in the near future, one of which is in a math-related area. One student is employed as a teacher in the Denali Borough School District. Four more have been hired to work in math-related areas in industry. One is working at the UAF library, and one as a fishing boat captain.

In general, MATH and STAT majors fare very well on the job market, although they may not use the specifics of their mathematical training in their future careers. Our emphasis on communication skills and logical and quantitative thinking prepares them for a variety of professions.

III. MISSION FULFILLMENT

Attach the most current Student Learning Outcomes (SLOA) plan and most recent SLOA summary.

DMS' SLOA Plan is included in the appendix.

Here is the most recent SLOA summary, written in spring 2014.

SLOA Summary
Department of Mathematics and Statistics; UAF
Annual Student Learning Outcomes Assessment
Academic Years: 2012-13, 2013-14
Degrees: B.A./B.S. Mathematics

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Every two years the Department of Mathematics and Statistics (DMS) evaluates student learning outcomes and, more generally, the effectiveness of the undergraduate degree program in mathematics. The objectives and procedures are outlined in the attached Assessment Plan. During the current cycle we have implemented (1) ETS Major Field Test for all Senior Seminar students; (2) Exit surveys given to all Senior Seminar students and reviewed by the Assessment Committee; (3) Transcript check of recent graduates by the department chair and assessment committee.

Intended Objective/Outcome	Assessment Criterion/ Procedure	Implementation
Our students will attain mastery of core mathematical concepts at the baccalaureate-level comparable to those at other institutions.	We will give the ETS Major Fields Test in Mathematics to majors, preferably close to graduation.	Every spring the instructors of Math 490 and Stat 454 will require all students to take the Major Field Test in Mathematics. The Assessment Committee will review test results and discuss any needed changes.

Status:
Twelve students enrolled in Senior Seminar in Spring of 2013 took the Major Fields Test in Mathematics. Comparisons with students taking the test nationally yield the following data: In 2013 two students scored in the top 5% of students nationwide–, five more in the top 20%, and all of our students scored in the top 50%. Our institutional mean score was in the top 8%. The University also receives an institutional mean percent correct in each of five categories: Calculus, Algebra, Routine, Nonroutine and Applied. Our students scored in the top 10% in each of Calculus, Algebra and Routine problems, we scored in the top 15% in Nonroutine problems and in the top 25% in Applied problems.

Six students enrolled in Senior Seminar in Spring of 2014 took the Major Fields Test in Mathematics. One of our students scored in the top 4%, with a total of two students in the top 10%. Two more students scored in the top 30% and five of the six students scored in the top 50% when compared to students nationwide. Our institutional mean score places our students in the top 5% nationwide. Our institutional mean scores in the topic areas placed our students in the top 3% in of Algebra, 4% in Routine Areas, 1% in Nonroutine areas, in the top 10% in Calculus and in the top 15% in Applied problems.

These scores confirm that our program is successful and operating at or above national standards.

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DEPARTMENT: Mathematics & Statistics, CNSM
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DEGREE: BA and BS

Intended Objective/Outcome	Assessment Criterion/ Procedure	Implementation
Our students will have opportunities to develop the necessary skills to achieve their career goals in mathematics.	A) Exit survey. B) Tracking of recent graduates.	Every spring the instructors of Math 490 and Stat 454 will require all students to take the DMS Exit Survey. The Assessment Committee will review the results and discuss any needed changes. Faculty will be surveyed annually regarding recent graduates. A list of graduates will be maintained.

Status:
Students enrolled in Senior Seminar in Spring of 2013 and 2014 were given the DMS Exit Survey. Copies of the 2013 surveys have been lost, so better document management systems for the DMS Exit Survey needs to be implemented.

Results of the Spring 2014 Exit Surveys

We had four respondents. All four have jobs lined up post graduation in math related fields. One each at Conoco Philips, Amazon, Microsoft and Terrasound. Half of the students reported having regular advising in the department with a particular faculty member in the department. This suggests additional work should be done to make sure all majors are receiving consistent advising. Several students expressed a desire to have taken an undergraduate graph theory course. While we offer that topic as part of our undergraduate combinatorics course it does suggest providing a suitable option at that level might find an audience.

Students surveyed rated their preparation in Calculus, Proofs, Abstract Algebra, Linear Algebra and Real Analysis in terms of their confidence that they are adequately prepared in those subject areas from Neutral to Strongly Agree (no statements of disagreement were recorded). They were similarly polled about their satisfaction with Advising, Availability of Math Elective Courses, Course Scheduling and Instructional Quality. Students who had reported being engaged with regular department advising rated it highly, with the remainder being non-committal (typical of this was the student who wasn't planning on obtaining a math degree until the 2012-2013 academic year and so hadn't been actively involved in the program as a degree seeking student until the 2013-2014 academic year). Instructional quality was generally highly rated, however there was some concern about course scheduling. In particular, that Numerical Analysis conflicts with many required engineering courses.

In general, the survey results reflect a high degree of satisfaction with the program.

Tracking of recent Graduates

Faculty and staff were surveyed about recent graduates. During the review period 18 students graduated from the program. Of those, eight are currently enrolled in or have completed a graduate degree program in a mathematics or teaching related field, with one more pursuing a degree in veterinary science. Two more have plans to pursue a graduate degree in the near future, one of which is in a math related area.

One is employed as a teacher in the Denali Borough School Disctrict. Four more have been hired to work in math related areas in industry as mentioned in the results of this spring's exit surveys. One is working at the UAF library, and one as a fishing boat captain. At the time of this report's preparation, information was unavailable on the status of six of our alumni.

Intended Objective/Outcome	Assessment Criterion/ Procedure	Implementation
We will monitor the effectiveness and implementation of our program requirements.	Transcript check of recent graduates.	The Assessment Committee will annually review transcripts of recent graduates to determine if students are able to complete their degrees in a timely manner and address any problems.

Status:
The Assessment Committee carried out a review of the transcripts of the students who graduated in the last two years. Five of the students completed a standard undergraduate program in four years; however, one of those students obtained his first degree in Computer Science and came B.A.ck four years later to complete the single additional course necessary to obtain a B.S. in mathematics while pursuing studies in accounting. Four more students took an additional 1-2 years to complete their programs, but either completed two or more majors or degrees. We had three transfer students who completed their degrees in three or fewer years. The remaining three students took longer to complete than one might expect; these included a transfer student who struggled to pass some required courses and so took three years to complete a degree that would have been otherwise possible to complete in two, a traditional student who struggled academically and took five years, and a student who changed major late in his career to mathematics resulting in a five year path to his initial degree, and has since spent two more years obtaining a Computer Science degree.

In reviewing these transcripts, our opinion is that thirteen (72%) finished in the expected timeline given their academic goals, two more (11%) completed in a reasonable timeline given their late decisions to declare a math major. Three students (16%) took longer than expected because they struggled with MATH 215 (Introduction to Proofs) or one of the two required courses that require MATH 215 as a prerequisite. These are the most difficult courses in our curriculum, so it is not surprising to see some students falter when taking them. We note, however, that these three students were able to complete their degrees with only one additional year in the program.

Overall, it is our opinion that the mathematics and statistics majors as currently implemented are working well for our students and do not provide any unnecessary impediments to completion.

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DEPARTMENT: Mathematics & Statistics, CNSM
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ATTACHMENTS:

1. PAIR data
2. Budget summary
3. American Mathematical Society's Culture Statement on publication rates
4. American Mathematical Society's Culture Statement on grant support
5. SLOA plan BA Mathematics
6. SLOA plan BS Mathematics

CNSM Mathematical Sciences

Student Credit Hours, by Subject and Level

Subject and level	FY10	FY11	FY12	FY13	FY14
MATH - Lower	4,539	4,596	5,142	5,826	6,674
MATH - Prof	124	72	128	0	0
MATH - Upper	796	896	922	890	1,004
MATH -Grad	106	115	155	125	191
MATH -Outside	3,605	3,436	3,683	3,484	3,127
STAT - Lower	537	519	606	678	810
STAT - Upper	433	390	446	402	458
STAT -Grad	189	91	89	123	149
STAT -Outside	375	369	342	240	204

Courses taught by the department during the regular fall and spring terms are listed on the "developmental", "lower", "upper", and "grad" lines.
Courses taught by Summer Sessions, the Center for Distance Education, and rural campuses are pooled and reported on the "Outside" line. Only departmentally produced credit hours are considered when evaluating service teaching effort and faculty productivity.
All data in this section taken from Banner closing freezes.

Service Teaching

Enrollee's major	FY10	FY11	FY12	FY13	FY14
In department	587	608	670	668	783
In unit, outside department	1,324	1,172	1,557	1,699	1,806
Outside unit	4,992	5,052	5,419	5,864	6,895

"Service Teaching" is defined here as the number of credit hours a department delivers to students who are not seeking a degree from that same department.

Headcount of Majors

Degree and major sought	FY10	FY11	FY12	FY13	FY14
BA Mathematics	12	11	15	9	15
BI Premajor - Mathematics	3	4	6	1	1
BS Mathematics	52	46	50	56	50
BS Statistics	5	3	4	2	2
GCRT Statistics	1	2	1	0	0
MS Mathematics	10	7	9	12	12
MS Statistics	11	5	5	9	9
PHD Mathematics	2	3	1	0	0
Unduplicated headcount	91	81	88	89	88

A student seeking more than one degree, or changing major during a fiscal year, is counted more than once, except on the "unduplicated headcount" line.
The unduplicated headcount is further broken down in the next table.

Majors by Race and Gender

	FY10	FY11	FY12	FY13	FY14
Native female	8	5	6	4	6
Native male	9	5	8	6	7
Non-native female	36	31	30	30	28
Non-native male	38	40	44	49	47
Total minorities	28	17	22	19	18

CNSM Mathematical Sciences

Degrees Awarded

Degree and major	FY10	FY11	FY12	FY13	FY14
BA Mathematics	0	0	2	0	0
BS Mathematics	7	6	8	8	10
BS Statistics	0	1	1	0	0
GCRT Statistics	0	1	1	1	0
MS Mathematics	0	1	1	2	4
MS Statistics	4	3	0	1	4
PHD Mathematics	2	0	0	0	0
Total # awards	13	11	13	12	18

Ratio of Degrees Awarded to Majors Enrolled

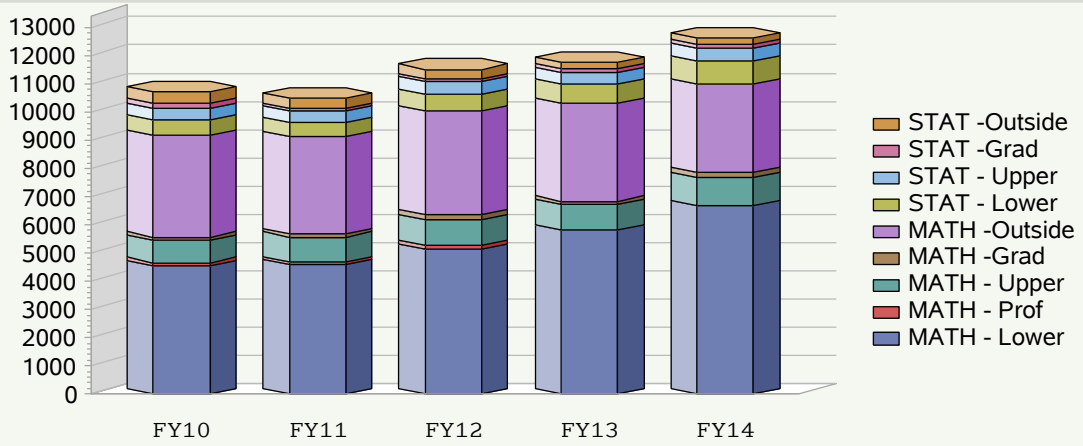
	FY10-14
BA Mathematics	0.03
BI Premajor - Mathematics	.
BS Mathematics	0.15
BS Statistics	0.13
GCRT Statistics	0.75
MS Mathematics	0.16
MS Statistics	0.31
PHD Mathematics	0.33

The average number of awards per degree, major, and year over the five-year period (as reported in the previous table), divided by the average count of majors over those same years.

Reported only for programs with at least one major in the respective years.

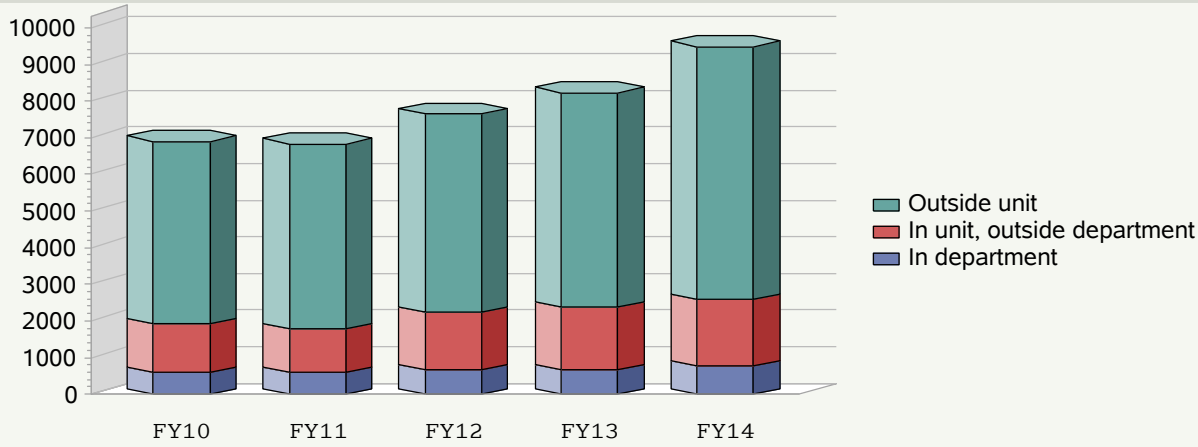
CNSM Mathematical Sciences

Student Credit Hours, by Subject and Level



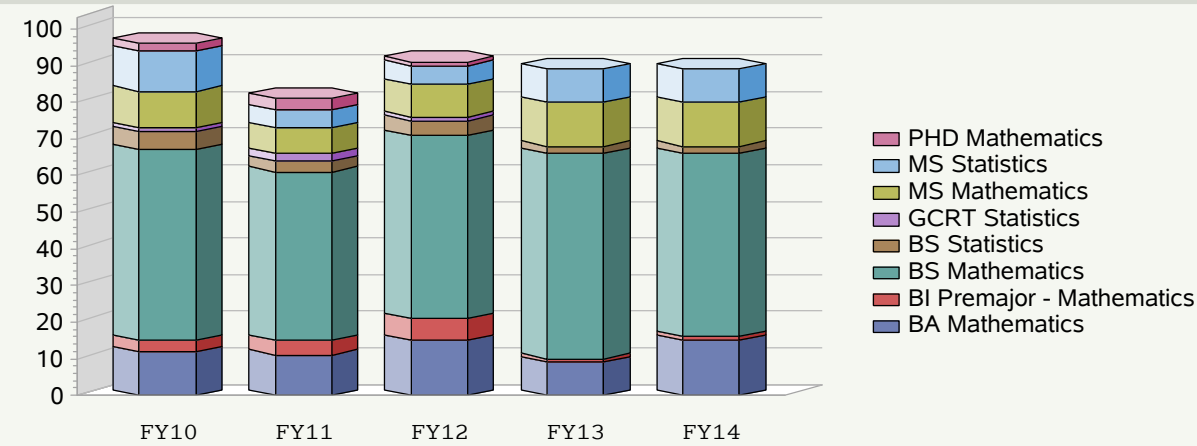
Courses taught by the department during the regular fall and spring terms are listed on the "developmental", "lower", "upper", and "grad" lines.
Courses taught by Summer Sessions, the Center for Distance Education,and rural campuses are pooled and reported on the "Outside" line. Only departmentally produced credit hours are considered when evaluating service teaching effort and faculty productivity.
All data in this section taken from Banner closing freezes.

Service Teaching



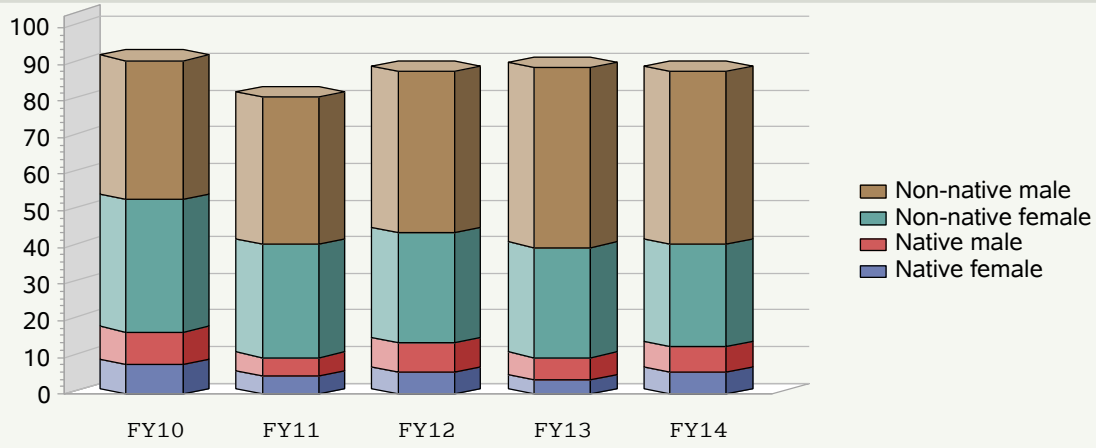
"Service Teaching" is defined here as the number of credit hours a department delivers to students who are not seeking a degree from that same department.

Headcount of Majors

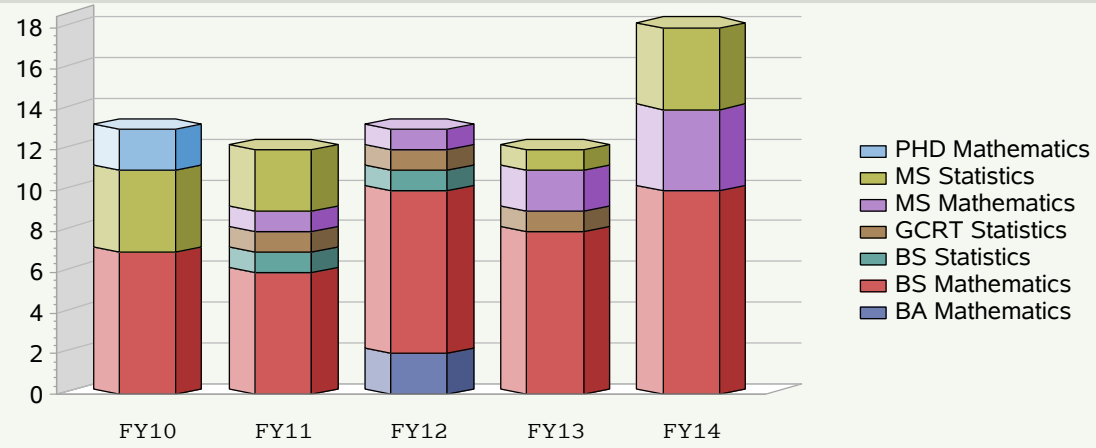


A student seeking more than one degree, or changing major during a fiscal year, is counted more than once, except on the "unduplicated headcount" line.
The unduplicated headcount is further broken down in the next table.

Majors by Race and Gender



Degrees Awarded



CNSM Mathematical Sciences

Tuition Revenue Generated

	FY10	FY11	FY12	FY13	FY14
Tuition generated	$1,004,347	$1,040,153	$1,231,776	$1,426,544	$1,688,500

Calculated from departmental credit hour production (as shown on page 1) and the published lower-division, upper-division, and graduate tuition rates. Out-of-state surcharges, tuition waivers, and fee-in-lieu-of-tuition adjustments are NOT applied.

Departmental FTEs by Job Class

Job class	FY10	FY11	FY12	FY13	FY14
Adjunct FTEs	2.48	2.23	1.98	1.68	3.53
Faculty FTEs	11.33	10.86	11.35	9.96	11.13
Staff FTEs	1.00	1.00	1.03	0.92	1.85
Student FTEs	3.06	4.96	5.61	7.58	8.56

For the faculty, staff, and student job classes, this table is based on the actual number of days each employee is in active status in each fiscal year, and on the organization code(s) responsible for paying each person's salary. Note that full-time faculty on 9-month contracts will be counted as only 0.75 FTEs each.

Adjunct FTE has been approximated by counting the number of course hours taught by people who have adjunct contracts with each department and dividing by 40 (15 each for fall and spring; 10 for summer).

Names of Affiliated Faculty and Grants Status

Faculty name	FY10	FY11	FY12	FY13	FY14	
Allman Elizabeth S	~~No~~ Yes	Yes	Yes	No	No	
Avdonin Sergei A	~~No~~ Yes	~~No~~ Yes	~~No~~ Yes	~~No~~ Yes	~~No~~ Yes	
~~Barnsley Amy E~~				~~No~~	~~No~~	Adjunct
Barry Ronald P	Yes	No	No	No	No	
~~Bastille Odile R~~					~~No~~	Adjunct
Berman Williams Leah W	No	No	Yes	Yes	Yes	
~~Bowman Latrice N~~	~~No~~	~~No~~	~~No~~	~~No~~	~~No~~	Instructor
Bueler Edward L	Yes	Yes	Yes	Yes	Yes	
Faudree Jill R	No	No	No	No	No	
~~Ghenciu Eugen A~~	~~No~~					Temporary math faculty
Gimbel John G	No	No	No	No	No	
~~Hay Brian~~	~~Yes~~					In CS dept
~~Kulchitskiy Anton V~~				~~Yes~~		Adjunct
~~Massa James R~~					~~No~~	Adjunct
Maxwell David A	~~No~~ Yes	~~No~~ Yes	~~No~~ Yes	~~No~~ Yes	Yes	
McIntyre Julie P	No	No	No	No	No	
Rhodes John A	Yes	Yes	Yes	~~Yes~~ No	No	
Rickard Anthony D	No	No	No	No	No	
Rybkin Alexei	Yes	Yes	Yes	Yes	Yes	
Short Margaret	Yes	No	No	No	No	
~~Sorensen Kathleen A~~	~~No~~	~~No~~	~~No~~	~~No~~	~~No~~	Instructor
Williams Gordon I	No	No	No	No	No	
~~Zhang Zepu~~	~~No~~	~~No~~	~~No~~			Temporary stats faculty
~~Zinger Victor A~~					~~No~~	Adjunct

All faculty who have received any support from the department in the last 5 years are listed. For each year that a faculty member received support from a department, a NO or YES flag indicates whether that faculty member was listed as a Principal Investigator for a research grant active during that year. A blank indicates that the faculty member did not receive funding from the department during that particular FY.

Many faculty receive support from more than one department. This table does not specify how much of a faculty member's support came from this department, and does not specify whether their research grants were administered through this department.

The inclusion of Hay, Kulchitskiy, and Zinger on this list perhaps is explained by the fact that MATH 307 and MATH 611/612 are service courses for CS and Physics respectively and regularly have instructors from those departments. Again, this illustrates the difficulty in breaking down data to understand the exclusive role of DMS.

Departmental Revenue & Expenditures for Last 5 years

	FY10	FY11	FY12	FY13	FY14	AVG
Biology & Wildlife						
Labor	$ 2,321,244	$ 2,277,268	$ 2,404,742	$ 2,747,144	$ 2,594,496	$ 2,468,979
Travel	$ 3,377	$ 9,860	$ 21,886	$ 71,702	$ 23,785	$ 26,122
Contractual Services	$ 44,180	$ 70,124	$ 64,437	$ 75,049	$ 69,806	$ 64,719
Commodities	$ 75,804	$ 77,889	$ 160,943	$ 99,287	$ 116,018	$ 105,988
Equipment/Furnishings	$ 1,878	$ -	$ -	$ 17,815	$ -	$ 3,939
Fellowships/Grad Asst Waivers	$ -	$ -	$ -	$ 2,835	$ 1,172	$ 801
* Misc.	$ 12,368	$ 2,596	$ 22,227	$ (12,862)	$ (33,415)	$ (1,817)
Expenditures Total:	**$ 2,458,851**	**$ 2,437,736**	**$ 2,674,234**	**$ 3,000,970**	**$ 2,771,863**	**$ 2,668,731**
** Fees/Misc Receipts/Dept ICR	$ 46,380	$ 77,447	$ 185,421	$ 161,961	$ 102,374	$ 114,717
Foundation Refunds	$ -	$ 3,778	$ 750	$ 6,208	$ 35,340	$ 9,215
Revenue Total:	**$ 46,380**	**$ 81,225**	**$ 186,171**	**$ 168,169**	**$ 137,714**	**$ 123,932**
Chemistry & Biochemistry						
Labor	$ 1,589,086	$ 1,587,554	$ 1,495,407	$ 1,728,322	$ 1,729,134	$ 1,625,901
Travel	$ 16,371	$ 10,345	$ 21,882	$ 31,141	$ 28,651	$ 21,678
Contractual Services	$ 25,522	$ 37,272	$ 30,457	$ 74,963	$ 19,769	$ 37,597
Commodities	$ 86,601	$ 101,481	$ 121,543	$ 123,974	$ 94,553	$ 105,631
Equipment/Furnishings	$ 8,136	$ 41,136	$ 67,759	$ 21,673	$ 23,314	$ 32,404
Fellowships/Grad Asst Waivers	$ 8,397	$ -	$ 4,108	$ 1,979	$ 3,758	$ 3,648
* Misc.	$ (5,332)	$ (61,785)	$ 1,672	$ (54,559)	$ (20,209)	$ (28,042)
Expenditures Total:	**$ 1,728,782**	**$ 1,716,004**	**$ 1,742,827**	**$ 1,927,494**	**$ 1,878,970**	**$ 1,798,816**
** Fees/Misc Receipts/Dept ICR	$ 73,588	$ 106,162	$ 92,784	$ 138,350	$ 97,686	$ 101,714
Foundation Refunds	$ -	$ -	$ -	$ 550	$ 253	$ 161
Revenue Total:	**$ 73,588**	**$ 106,162**	**$ 92,784**	**$ 138,900**	**$ 97,938**	**$ 101,874**
Geology & Geophysics						
Labor	$ 1,482,847	$ 1,609,858	$ 1,644,594	$ 1,652,723	$ 1,778,194	$ 1,633,643
Travel	$ 4,479	$ 11,858	$ 15,025	$ 20,458	$ 2,202	$ 10,804
Contractual Services	$ 174,213	$ 177,603	$ 163,079	$ 182,796	$ 181,586	$ 175,855
Commodities	$ 43,360	$ 40,566	$ 45,791	$ 48,217	$ 50,241	$ 45,635
Equipment/Furnishings	$ 18,819	$ 8,454	$ 54,459	$ 64,603	$ 125,666	$ 54,400
Fellowships/Grad Asst Waivers	$ -	$ -	$ -	$ 4,062	$ 250	$ 862
* Misc.	$ 751	$ 97,544	$ 121,548	$ (9,875)	$ 25,558	$ 47,105
Expenditures Total:	**$ 1,724,468**	**$ 1,945,883**	**$ 2,044,497**	**$ 1,962,983**	**$ 2,163,697**	**$ 1,968,306**
** Fees/Misc Receipts/Dept ICR	$ 99,409	$ 92,087	$ 116,519	$ 151,249	$ 131,830	$ 118,219
Foundation Refunds	$ 422	$ 10,834	$ -	$ -	$ -	$ 2,251
Revenue Total:	**$ 99,831**	**$ 102,921**	**$ 116,519**	**$ 151,249**	**$ 131,830**	**$ 120,470**
Geography						
Labor	$ 484,139	$ 633,987	$ 681,825	$ 600,356	$ 532,498	$ 586,561
Travel	$ 11,907	$ 8,783	$ 15,120	$ 12,238	$ 23,126	$ 14,235
Contractual Services	$ 22,273	$ 6,232	$ 15,132	$ 17,631	$ 13,893	$ 15,032
Commodities	$ 9,267	$ 3,594	$ 18,280	$ 32,878	$ 17,452	$ 16,294
Equipment/Furnishings	$ -	$ -	$ -	$ -	$ -	$ -
Fellowships/Grad Asst Waivers	$ -	$ -	$ -	$ 1,603	$ -	$ 321
* Misc.	$ 2,070	$ (7,086)	$ -	$ 2,367	$ 500	$ (430)
Expenditures Total:	**$ 529,656**	**$ 645,509**	**$ 730,356**	**$ 667,074**	**$ 587,469**	**$ 632,013**
** Fees/Misc Receipts/Dept ICR	$ 2,185	$ 6,345	$ 5,647	$ 8,613	$ 6,324	$ 5,823
Foundation Refunds	$ -	$ -	$ -	$ -	$ -	$ -
Revenue Total:	**$ 2,185**	**$ 6,345**	**$ 5,647**	**$ 8,613**	**$ 6,324**	**$ 5,823**
Mathematics						
Labor	$ 1,687,367	$ 1,775,694	$ 1,888,516	$ 1,858,844	$ 2,260,467	$ 1,894,177
Travel	$ 25,803	$ 11,063	$ 7,470	$ 19,773	$ 14,935	$ 15,809
Contractual Services	$ 21,645	$ 21,717	$ 29,748	$ 26,941	$ 33,270	$ 26,664
Commodities	$ 18,546	$ 9,008	$ 59,269	$ 24,233	$ 18,226	$ 25,856
Equipment/Furnishings	$ -	$ -	$ -	$ 4,858	$ 9,440	$ 2,860
Fellowships/Grad Asst Waivers	$ 1,413	$ 588	$ 410	$ 7,820	$ 8,271	$ 3,700
* Misc.	$ (2,390)	$ (6,981)	$ (7,984)	$ (15,526)	$ (40,366)	$ (14,649)
Expenditures Total:	**$ 1,752,384**	**$ 1,811,088**	**$ 1,977,429**	**$ 1,926,941**	**$ 2,304,242**	**$ 1,954,417**
** Fees/Misc Receipts/Dept ICR	$ 41,323	$ 49,627	$ 46,946	$ 45,025	$ 49,457	$ 46,476
Foundation Refunds	$ -	$ -	$ -	$ -	$ -	$ -
Revenue Total:	**$ 41,323**	**$ 49,627**	**$ 46,946**	**$ 45,025**	**$ 49,457**	**$ 46,476**
Physics						
Labor	$ 1,104,554	$ 1,140,008	$ 1,148,927	$ 1,238,172	$ 1,257,391	$ 1,177,810
Travel	$ 4,519	$ 10,963	$ 2,371	$ 5,739	$ -	$ 4,718
Contractual Services	$ 9,805	$ 5,743	$ 13,059	$ 11,900	$ 11,232	$ 10,348
Commodities	$ 18,000	$ 22,396	$ 48,384	$ 15,115	$ 22,501	$ 25,279
Equipment/Furnishings	$ -	$ -	$ -	$ -	$ 5,460	$ 1,092
Fellowships/Grad Asst Waivers	$ -	$ -	$ 1,112	$ 3,490	$ -	$ 920
* Misc.	$ -	$ 228	$ (2,212)	$ (2,956)	$ 245	$ (939)
Expenditures Total:	**$ 1,136,878**	**$ 1,179,339**	**$ 1,211,641**	**$ 1,271,459**	**$ 1,296,829**	**$ 1,219,229**
** Fees/Misc Receipts/Dept ICR	$ 25,037	$ 41,250	$ 67,459	$ 35,705	$ 44,020	$ 42,694
Foundation Refunds	$ -	$ -	$ -	$ -	$ -	$ -
Revenue Total:	**$ 25,037**	**$ 41,250**	**$ 67,459**	**$ 35,705**	**$ 44,020**	**$ 42,694**

* May include partial workstudy labor, entertainment expenses, and fund transfers between units

** Tuition, state appropriations, and the majority of ICR are consolidated at the college level. The total college revenue for each category is listed in the below table. This data excludes Geography because it was consilidated with SNRE.

CNSM Revenue Type	FY10	FY11	FY12	FY13	FY14	AVG
Lower Level Tuition	$ 1,350,512	$ 1,353,369	$ 1,526,141	$ 1,609,351	$ 1,859,772	$ 1,539,829
Upper Level Tuition	$ 502,376	$ 507,807	$ 580,448	$ 638,880	$ 677,362	$ 581,375
Graduate Level Tuition	$ 901,643	$ 927,202	$ 1,021,475	$ 1,062,365	$ 1,009,015	$ 984,340
Tuition subtotal:	**$ 2,754,531**	**$ 2,788,378**	**$ 3,128,064**	**$ 3,310,596**	**$ 3,546,148**	**$ 3,105,544**
State Appropriation	$ 8,294,778	$ 7,596,185	$ 7,928,596	$ 7,803,529	$ 8,149,640	$ 7,954,545
Course and Lab Fees	$ 448,392	$ 485,106	$ 611,661	$ 591,448	$ 547,229	$ 536,767
Misc Receipts	$ 9,760	$ 19,912	$ 50,775	$ 69,018	$ 75,938	$ 45,080
ICR	$ 238,118	$ 217,912	$ 162,970	$ 152,828	$ 129,005	$ 180,167
Other	$ 1,121	$ 19,941	$ 8,296	$ 21,744	$ 39,339	$ 18,088
Grand Total:	**$ 11,746,702**	**$ 11,127,433**	**$ 11,890,362**	**$ 11,949,162**	**$ 12,487,299**	**$ 11,840,192**

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2006 Statement

The Culture of Research and Scholarship in Mathematics: Rates of Publication

Mathematics is often considered as part of the physical and natural sciences, but its publication practices differ from these other disciplines in several fundamental ways.

Mathematicians tend to publish at rates that are modest compared to some other sciences. The majority of mathematical research is published in refereed research journals rather than conference proceedings or books. The mathematical literature is spread among a wider collection of journals than in most related fields. And, since an article typically represents a mature treatise on a mathematical question, and since mathematics research is not considered time-sensitive, delays in publication are common.

Even some of the best young mathematicians publish relatively few papers. A study of the 40 mathematicians winning Sloan Fellowships in 2005-2006 shows that 70% published an average of two or fewer articles per year in the five years preceding their award. Even more senior mathematicians have modest publication rates. Of the 22 mathematicians receiving Guggenheim Fellowships from 2002-2006, half published an average of two or fewer articles per year in the five years preceding their award. These two groups represent an exceptional group of highly productive mathematicians.

Of the 274 publications by these Guggenheim Fellows, 75% were in refereed journals. Only three publications were books. In fact, of all items covered by Mathematical Reviews in the years 2001-2005, fully 80% were from refereed journals.

When judging the work of most mathematicians, the key measure of value for a research program is the quality of publications rather than rate. The information above about those who have won prestigious awards strongly supports this view.

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2008 Statement

The Culture of Federal Support for Academic Research in Mathematics

Academic research in mathematics, like research in engineering and the life, physical, and computer sciences, is financially supported by foundations, industry, and the Federal government. Approximately 70% of the external funding available for academic research in these fields comes from the Federal government, down somewhat from 80% thirty years ago. Most Federal funding for mathematical research comes from the National Science Foundation (NSF), the Department of Defense, the Department of Energy, and the National Institutes of Health. The NSF accounts for nearly 70% of the Federal support for academic research in the mathematics, and is the only agency that supports all branches of the mathematical sciences.

Amongst doctorate holders employed in academia, 66% of mathematicians describe research as a primary or secondary activity, quite like the 68% of physical scientists, and the 70%of computer and life scientists who make such a report. Nonetheless, a much smaller proportion of academic mathematicians are supported by the Federal government. In 2006, across all fields of science, 46.9%of those employed in academia received Federal support for their research: 56.3%of physical scientists, 43.9%of computer scientists and 57.9% of life scientists, as compared to 34.8% of mathematicians.

As compared to other natural sciences, there is also a large disparity in the per capita level of funding available to mathematicians. In FY2006, across all fields of science and engineering, the Federal government provided about $260,000 per academic researcher. By field, this breaks down to $360,000 per academic researcher in Computer Science, $140,500 per academic researcher in the Physical Sciences, and $430,000 per academic researcher in the Life Sciences. By contrast, in 2006 the Federal government provided about $47,000 per academic researcher in Mathematics.[1]

When compared to other fields of science and engineering, opportunities for external funding in mathematical sciences are very limited. The vast majority of mathematicians receiving Federal support have just one, single investigator, NSF grant. These grants typically provide salary support for one, or two summer months, and some funds for travel. Almost no support is available for course release time, and there is limited support for graduate students, post-docs or equipment. Many well respected, productive mathematicians receive little or no external support for their research.

In these calculations the numerator comes from Appendix table 5-4: **Expenditures for academic R & D, by field**, and the denominator from the "Research" section of Appendix table 5-26: **S&E doctorate holders employed in academia reporting teaching or research as primary or secondary work activity, by type of position and degree field: 1973–2006.** Both tables are found in the NSF report: Science and Engineering Indicators 2008, found online at http://nsf.gov/statistics/seind08/pdfstart.htm.

UNIVERSITY OF ALASKA FAIRBANKS

Student Learning Outcomes Assessment Plan

Mathematics Undergraduate B.A. Degree

Adopted May, 2014

Expanded Statement of Institutional Purpose	Intended Objectives/Outcomes	Assessment Criteria and Procedures	Implementation (what, when, who)
MISSION STATEMENT: We shall provide a high quality mathematics education responsive to the needs of individual students and the diverse population of Alaska	Our students will attain mastery of core mathematical concepts at the baccalaureate-level comparable to those at other institutions.	We will give the ETS Major Fields Test in Mathematics to all majors, preferably close to graduation.	Every spring the instructors of Math 490 and Stat 454 will require all students to take the Major Field Test in Mathematics. The Assessment Committee will review test results and recommend curricular changes if necessary.
GOAL STATEMENT: To assure that our graduates attain a solid understanding of mathematics and are adequately prepared to succeed in the job market or advanced study.	Our students will have opportunities to develop the necessary skills to achieve their career goals in mathematics.	A) Exit Survey B) Tracking of recent graduates	An annual written survey will be conducted of graduating seniors, to obtain student views on strengths and weaknesses of the program. The Assessment Committee will summarize results and recommend curricular changes if necessary. Faculty will be surveyed annually regarding recent graduates. A list of graduates will be maintained.
	We will monitor the effectiveness and implementation of our program requirements.	Transcript check of recent graduates.	The Assessment Committee will annually review transcripts of recent graduates to determine if students are able to complete their degrees in a timely manner and address any problems.

Submitted by: Jill Faudree

UNIVERSITY OF ALASKA FAIRBANKS

Student Learning Outcomes Assessment Plan

Mathematics Undergraduate B.S. Degree

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Submitted by: Jill Faudree