

Research in the UA System

Presented to the University of Alaska Board of Regents

Academic and Student Affairs Committee

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UNIVERSITY
of ALASKA

Many Traditions One Alaska

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Strategic Directions in Research

Research is central to the SDI theme “Research and Development to Sustain Alaska’s Economic Growth and Enhance Communities.” As described in the **Intellectual Property and Commercialization** section of this document, both UAA and UAF have taken steps to facilitate the invention and disbursement of new technologies. Both institutions now supply improved consulting, contracting, and intellectual property protection functions to provide innovators with the resources they need. The offices that are working to commercialize intellectual property work with private companies and entrepreneurs looking to market and license the University’s research.

As shown in the **Research Funding** section, the majority of UA’s external research funding comes from federal sources, and a significant fraction from State agencies. UA funding sources are very similar to those of peers and not much different from those of the largest research universities. All rely predominantly on federal funding and garner only a small fraction of research funding from business or industry. Business and industry can provide key partnerships in certain areas, and UA is working to build relationships with resource industries in particular, but based on the experiences of other universities these are unlikely to replace government funding sources as the major underpinning of university research.

The proportion of institutional investment in UA research, 22-31%, is similar to that at peer institutions. As discussed under **Research Funding Impacts**, this investment is multiplied more than five-fold by external funding sources. Research is an economic enterprise that brings net income to the state and provides good jobs to state residents. Although competition for federal funding will be fierce in the coming decade, garnering as much possible needs to remain a high priority.

Research is also important in meeting state and community needs for information and analysis. While this report is focused on performance metrics, presentations to the Board will provide examples of how useful research is to Alaskans. UA researchers are working on a remarkable range of issues, from affordable energy for communities to predicting the ecological effects of climate change and assessing and mitigating natural hazards. Researchers are working to alleviate health disparities, preserve Alaska Native languages and culture, and improve mathematics teaching, among many other areas of study.

Research has an important role in the Strategic Direction of improving “Student Achievement and Attainment”, as described under **Students and Research**. Student participation in research and creative activity is integral to graduate education, especially in STEM fields, the social sciences, and the arts and humanities. Undergraduate research, an increasing area of focus across UA, offers students the opportunity to improve skills in critical thinking, problem solving and communication, thus enhancing their preparation for Alaska’s 21st century workforce and society. UA has several middle and high school bridging programs in the sciences (e.g., Alaska Summer Research Academy), Engineering (Alaska Native Science and Engineering Program), and the arts (e.g., Alaska Summer Visual Art Academy, Summer Music Academy) that engage students in research and creative activity, motivating them to succeed in school and to enter college.

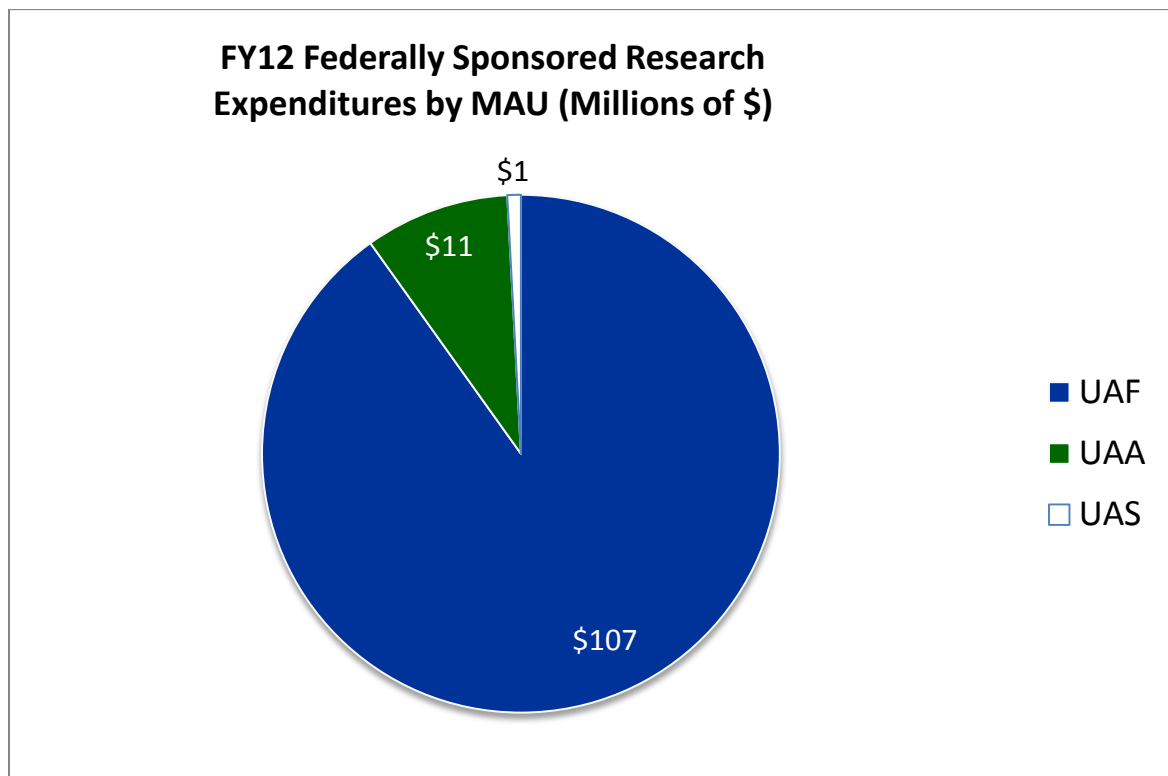
Research Productivity and Quality are high in the UA system. UAF is near the top of the range among its peers and (when performance measures are adjusted for size) is beginning to rival some of the leading research universities in the western U.S. The number of citations per publication, a measure of the quality of research, is high compared to peer institutions for all three of Alaska’s universities. UA

faculty and students contribute to the university, communities and the State through **Creative and Scholarly Activity**. UA, and particularly UAF, has extensive and in some cases unique **Research Facilities** and ready access to a vast natural laboratory of tundra, boreal and temperate forests, volcanoes and glaciers, coasts and bordering oceans and seas. Given these strengths, UA research is poised to make strong contributions to the goals of UA Strategic Directions.

Research Funding

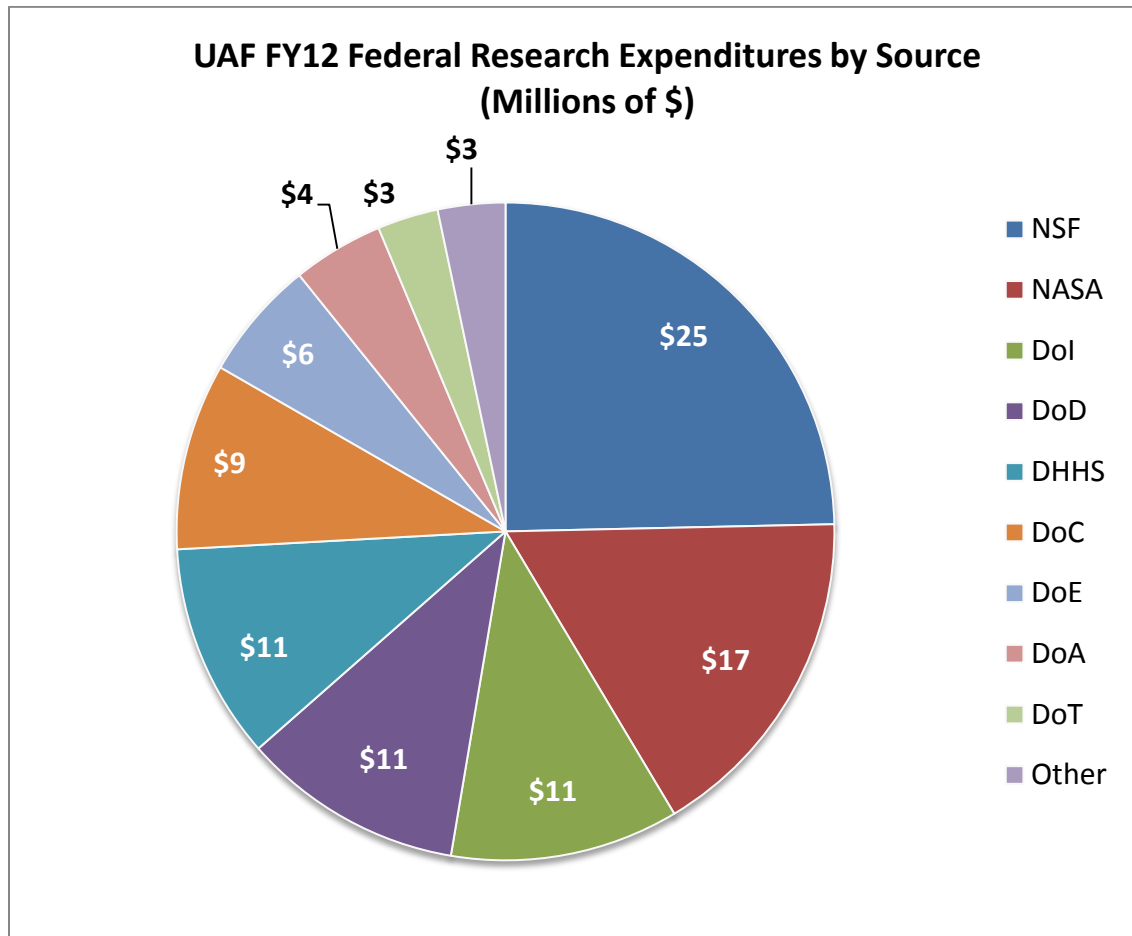
Total Research Expenditures

The UA system has long used sponsored research expenditures as a means of monitoring research activity, and this is a commonly used measure at other universities as well.



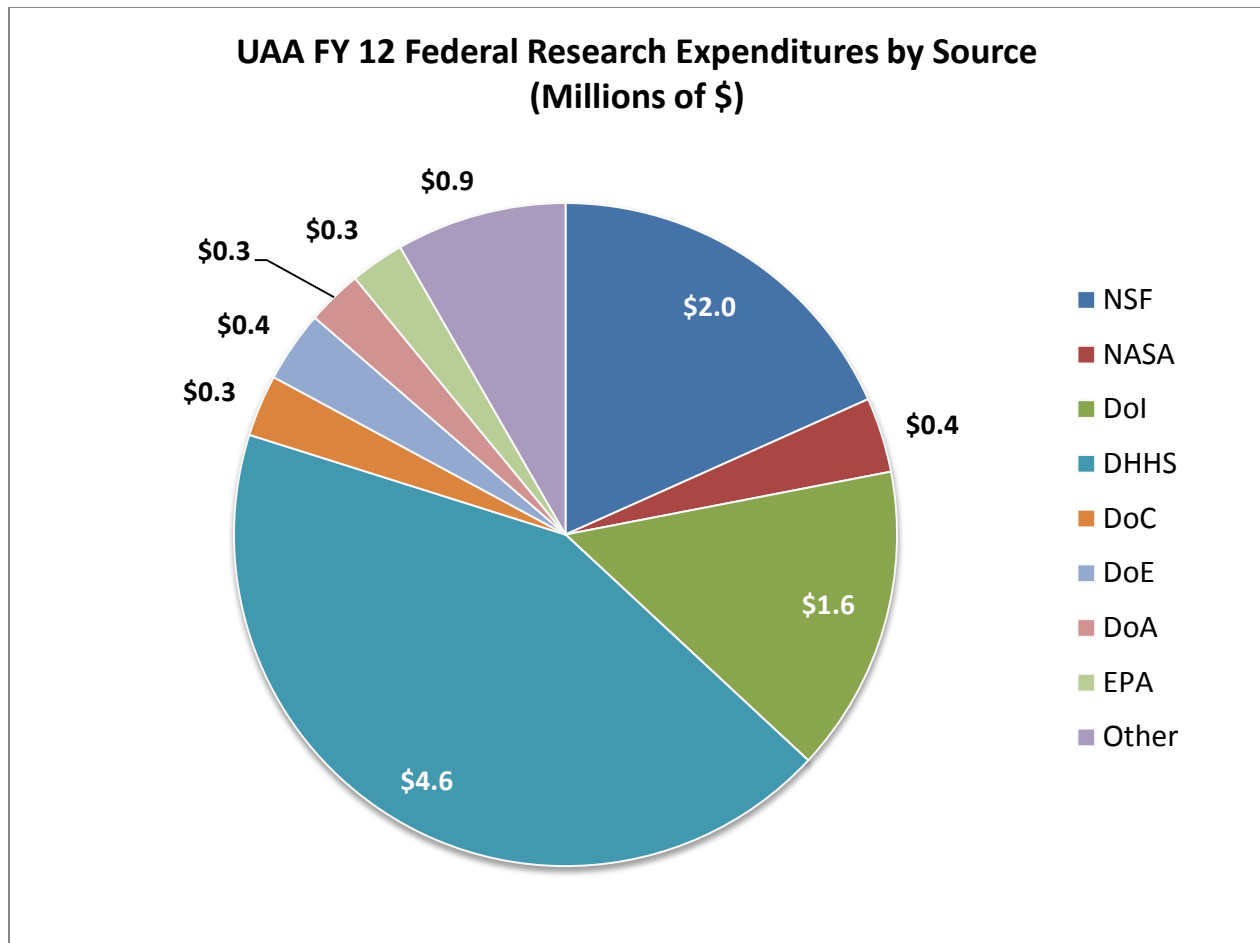
UAF has 90% of the federally sponsored research expenditures for the UA system. UAA has 9% and UAS 1%. UAF's FY12 figure includes \$7.6M in ARRA funds. The UA research expenditures report was prepared by the method used for the NSF Higher Education Research and Development Survey. *Information provided by UA Information Systems, Banner Extracts 2012.*

Research Funding Sources

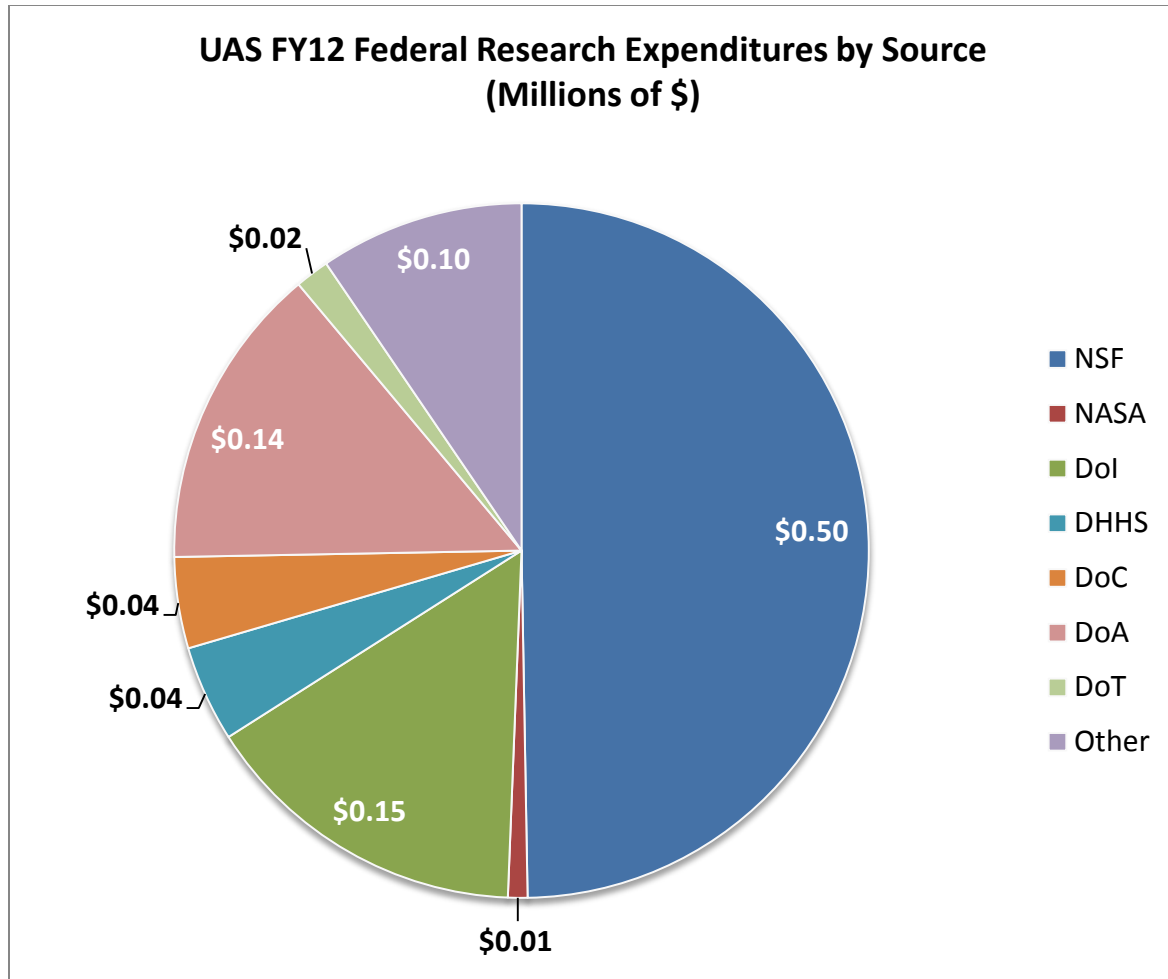


UAF secures its federal research funding from many agencies. In FY12 the National Science Foundation (NSF) and NASA were the leading sources, but accounted for only 42% of the total. Department of Interior (DoI), Department of Defense (DoD), Department of Health and Human Services (DHHS including NIH), and Department of Commerce (DoC, primarily NOAA) were also major contributors. The Department of Education (DoE), Department of Agriculture (DoA), Department of Transportation (DoT), and other agencies together provided a total of \$16M. The UA research expenditures report was prepared by the method used for the NSF Higher Education Research and Development Survey.

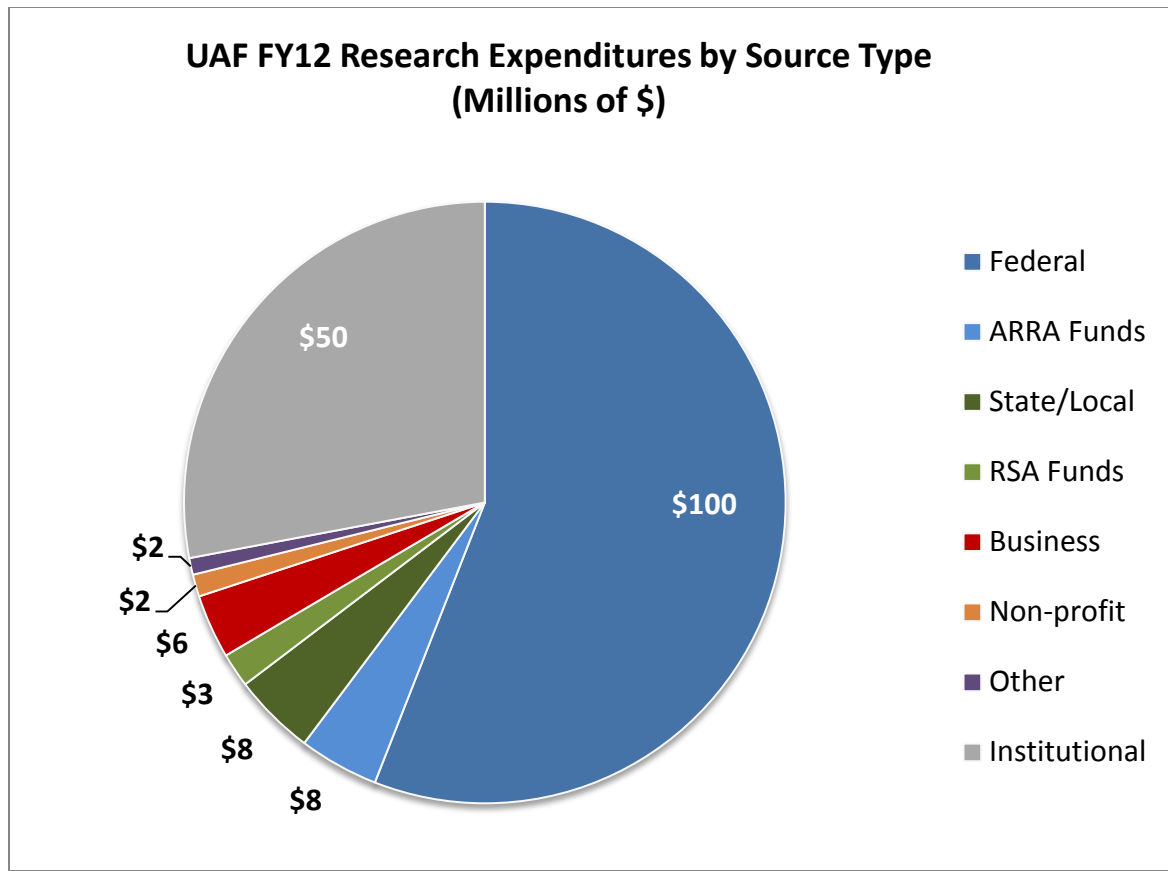
Information provided by UA Information Systems, Banner Extracts 2012.



UAA likewise secures its federal research funding from many agencies. In FY12, DHHS (including NIH) accounted for over 40% of the total. NSF and DoI funds were each greater than 10% of the total. The UA research expenditures report was prepared by the method used for the NSF Higher Education Research and Development Survey. *Information provided by UA Information Systems, Banner Extracts 2012.*

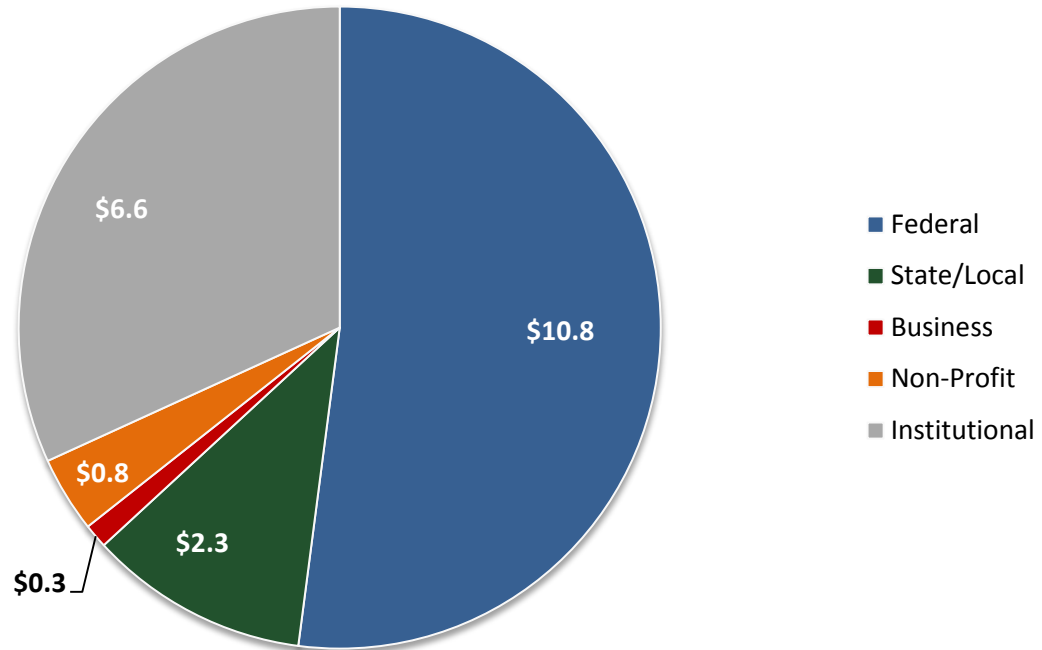


UAS secured about \$1M in federally sponsored research, and half of that was from NSF. The UA research expenditures report was prepared by the method used for the NSF Higher Education Research and Development Survey. *Information provided by UA Information Systems, Banner Extracts 2012.*

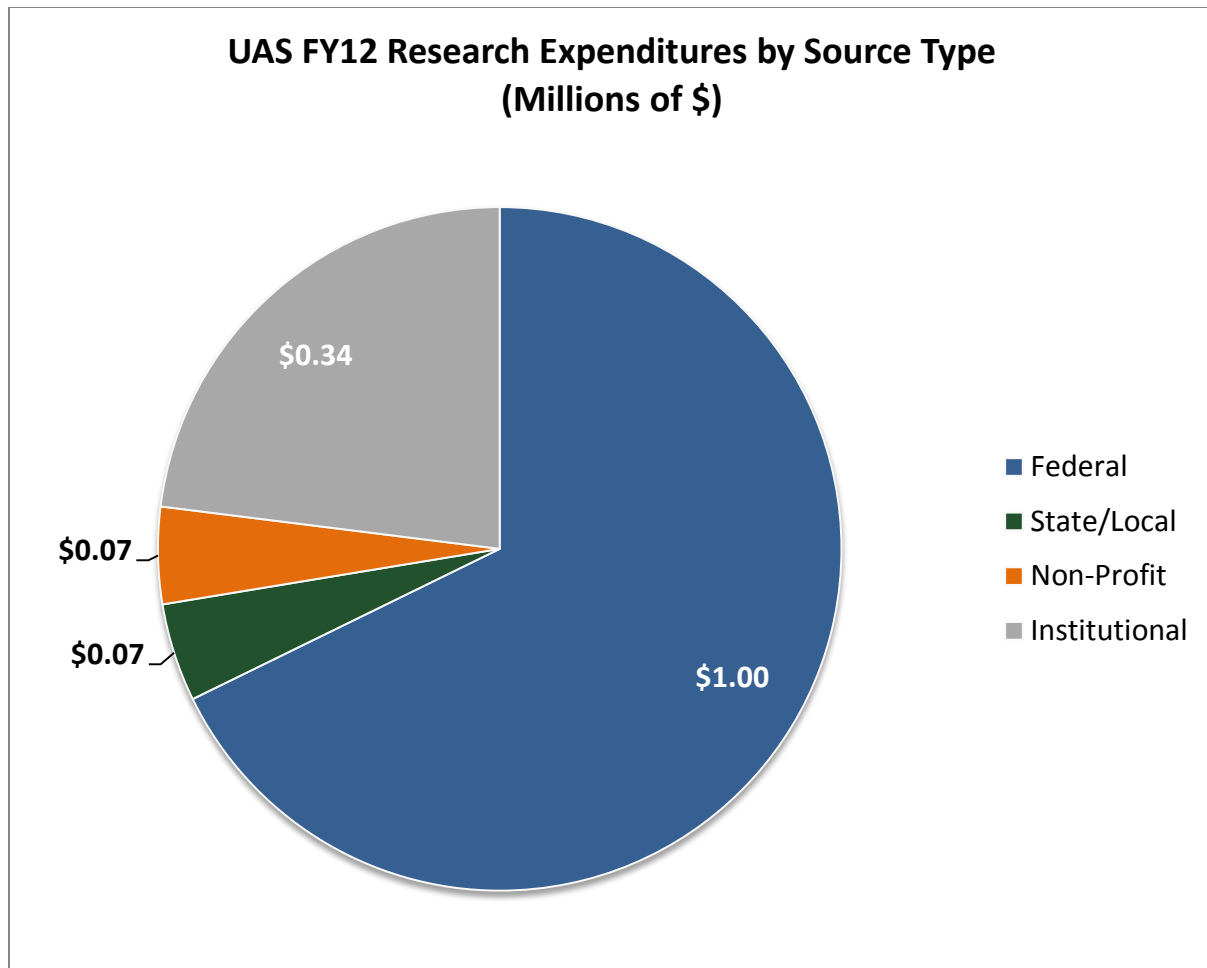


UAF research is supported predominantly by federal funds and by UA unrestricted funds. The State of Alaska provides about 10% of UAF's restricted research funding. The UA research expenditures report was prepared by the method used for the NSF Higher Education Research and Development Survey. *Information provided by UA Information Systems, Banner Extracts 2012.*

**UAA FY12 Research Expenditures by Source Type
(Millions of \$)**



UAA research is supported predominantly by federal funds and by UA unrestricted funds. The State of Alaska provides about 20% of UAA's restricted research funding. The UA research expenditures report was prepared by the method used for the NSF Higher Education Research and Development Survey. *Information provided by UA Information Systems, Banner Extracts 2012.*



UAS research is supported almost entirely by federal funds and by UA unrestricted funds. The UA research expenditures report was prepared by the method used for the NSF Higher Education Research and Development Survey. *Information provided by UA Information Systems, Banner Extracts 2012.*

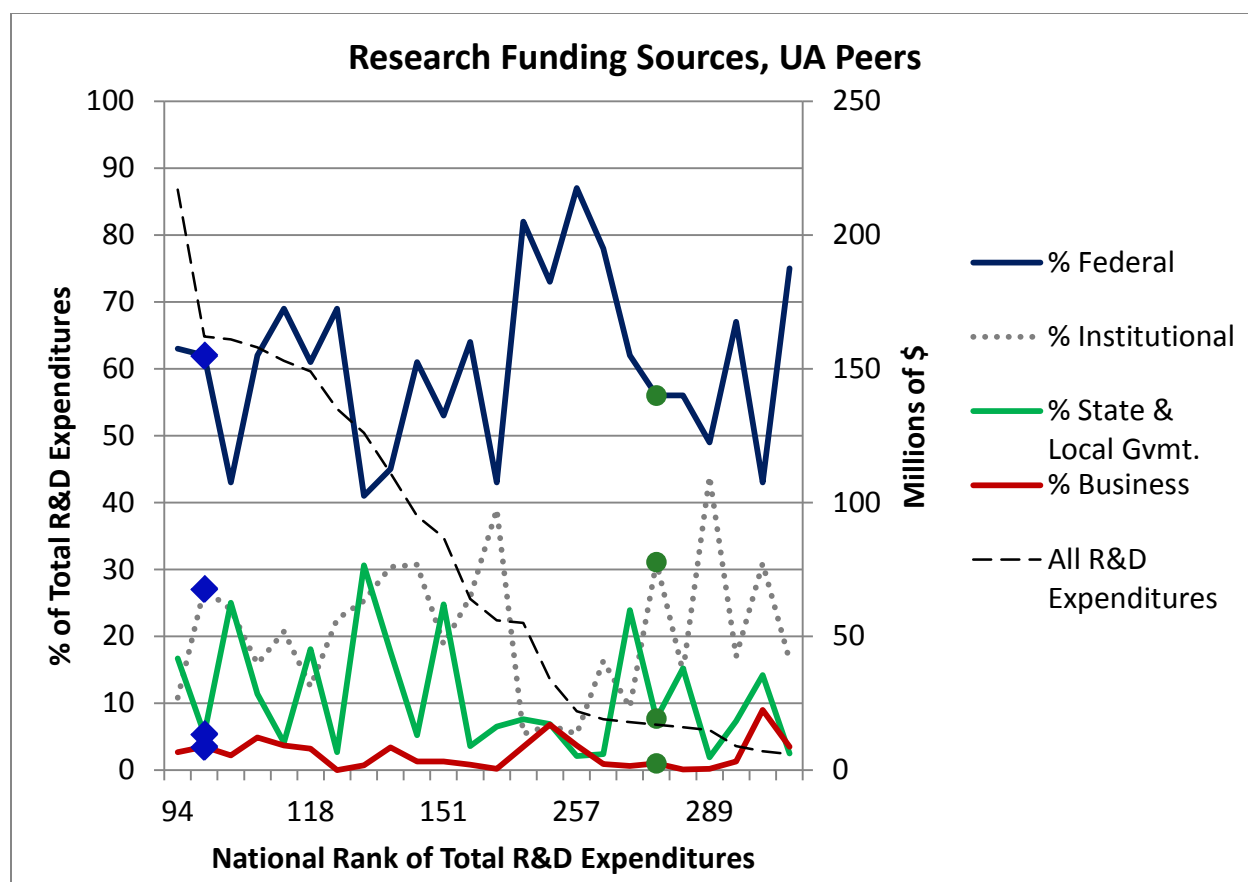


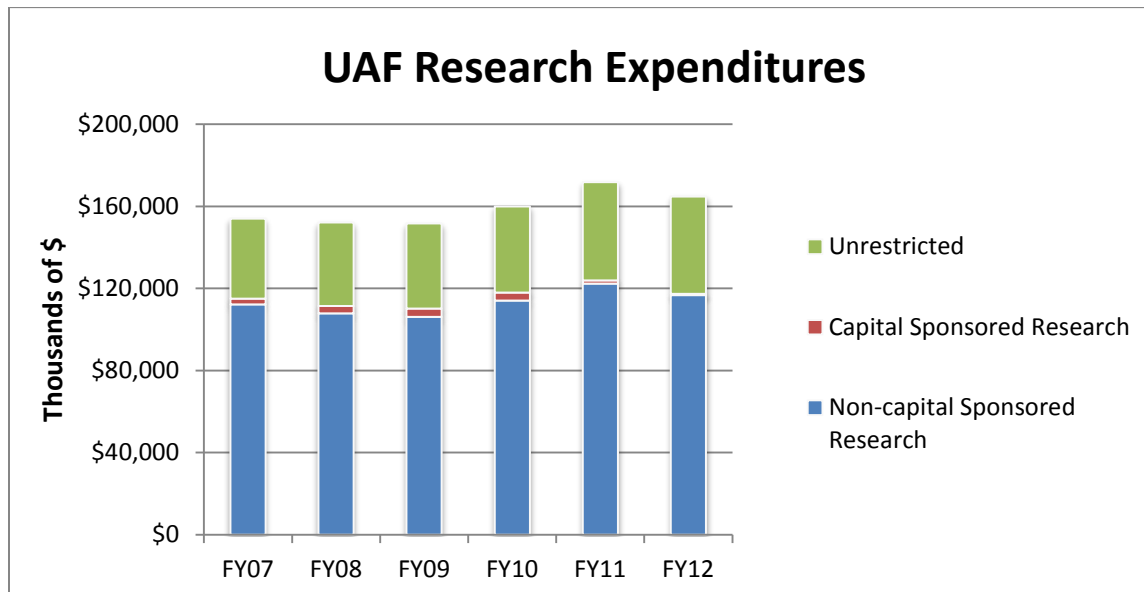
Table 1. Research Expenditure Sources for UAF and UAA Peers

	Federal %	State %	Institutional %	Business %
UAF Peer Average	60%	13%	21%	3%
UAA Peer Average	63%	8%	20%	3%
Leading Research Universities in the West Average	62%	7%	16%	6%

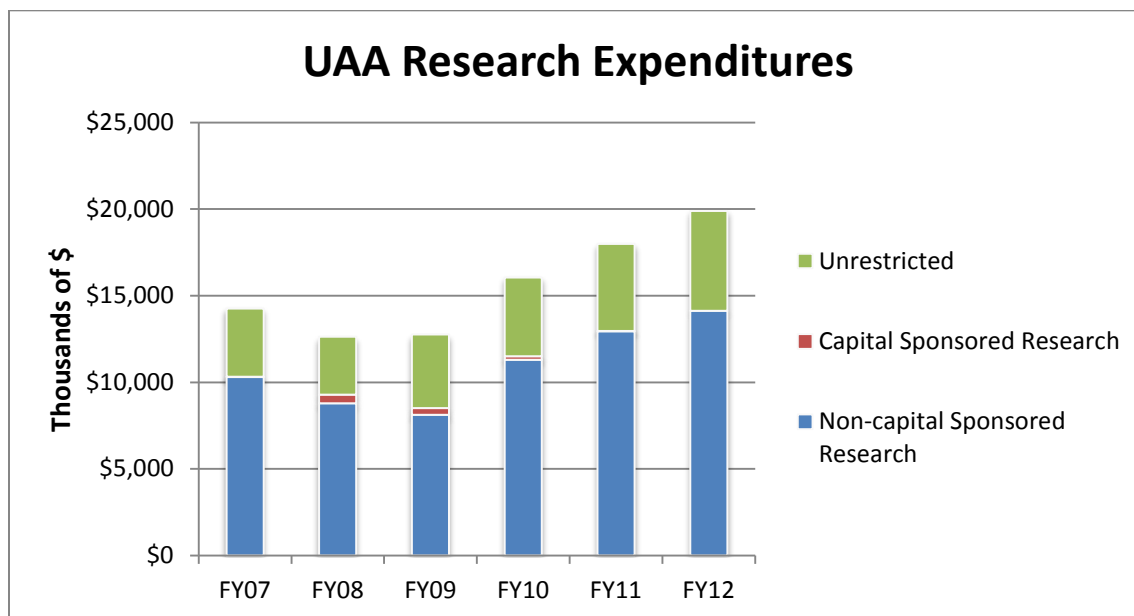
Data are from the NSF Higher Education Research and Development Survey results (<http://www.nsf.gov/statistics/nsf12330/>). Foundation and other funding sources are not shown.

UA research funding sources are very similar to those of peer institutions, as shown above. UAA peers are on the right half of the graph, and UAF peers on the left. UAA and UAF are marked by green circles and blue diamonds, respectively. No matter the size of the institution, federal funding is dominant. Institutions with a lower proportion of federal support generally have higher levels of institutional and state support for research. Business and industry provide less than 10%, and for UAF peers, less than 5%, of total funding. UAA and UAF fall within the range of peers on state/local and institutional support of research. For larger research institutions, the proportion of federal support averages about the same as for UA peers, while institutional support is a slightly smaller percentage.

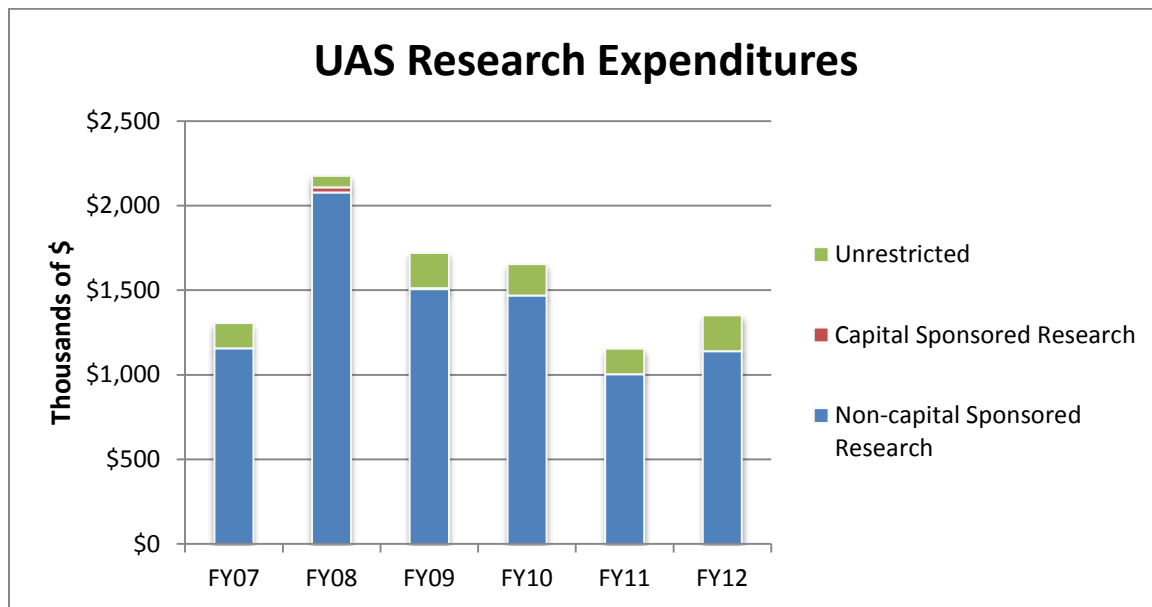
Trends in Research Expenditures



UAF's sponsored research expenditures grew by \$13.8M from FY09 to FY11. Due to the loss of \$7M in DoD funding for the Arctic Region Supercomputing Center, sponsored research was down by \$6.7M in FY12 compared with FY11. Unrestricted funds are UAF General Fund. *Information provided by UA Information Systems, Banner Extracts 2012.*



UAA's sponsored research expenditures grew by \$5.6 M from FY09 to FY12. The College of Arts and Sciences is responsible for more than \$8M of the FY12 total and the College of Health, nearly \$3M. Unrestricted funds are UAA General Fund. *Information provided by UA Information Systems, Banner Extracts 2012.*



UAS' sponsored research total is small enough so that just one or two grants can cause a large relative change in research expenditures. Unrestricted funds are UAS General Fund. *Information provided by UA Information Systems, Banner Extracts 2012.*

Research Funding Impacts

The information in this section is taken from the report "University of Alaska Research: An Economic Enterprise", by Scott Goldsmith, Professor of Economics, Institute of Social and Economic Research (ISER), University of Alaska Anchorage, which was published in March 2007. He discusses the term research multiplier, defined as the ratio of total research dollars to internal (institutional) university funding. Nationally the multiplier is between 5 and 6. As reported in UA in Review 2012 (Fig. 49, based on FY 11 figures), the NGF:GF (non General Fund to General Fund) ratio is 5.5 for UAF, 2.4 for UAA, and 13.1 for UAS, which limits its General Fund expenditures on research. These ratios differ somewhat from what the "Research Expenditures by Source Type" graphs would indicate, because the multiplier calculation does not include some institutional contributions such as under-recovered indirect cost recovery.

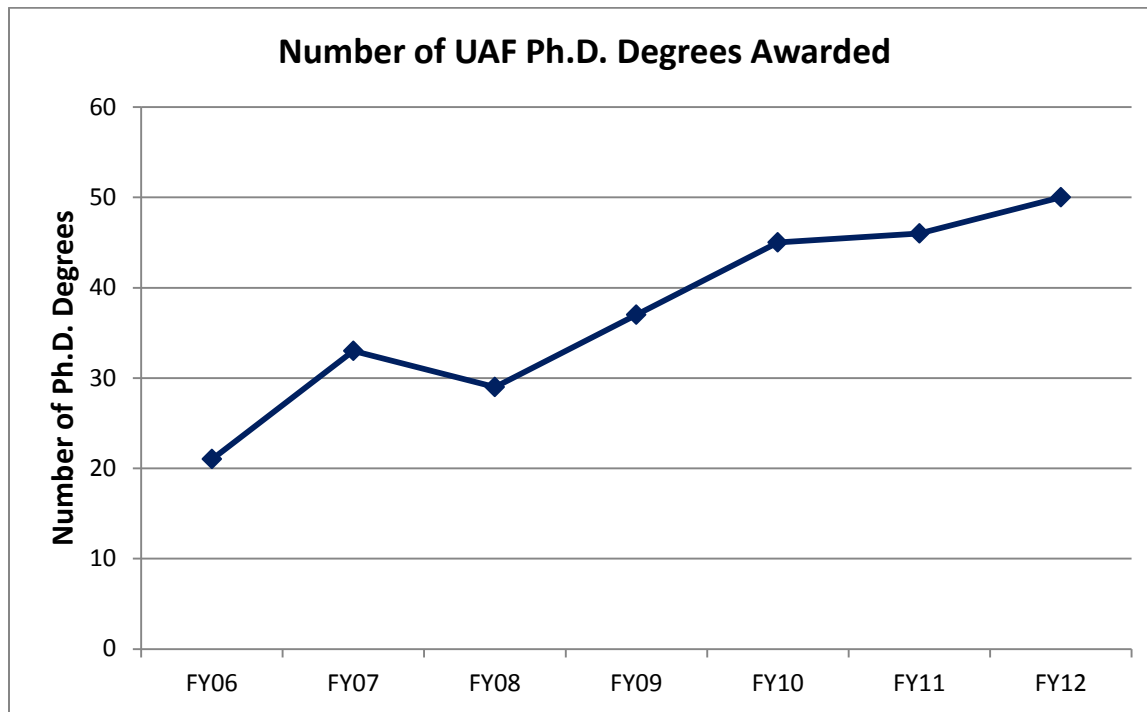
Goldsmith (2007) points out that most of the research expenditures, totaling close to \$190 million in FY12 including the institutional funding of research, are salary and wages for faculty and staff. Those individuals, in turn, spend a large portion of this money on goods, services, and housing in their home communities. The impact is proportionally largest in Fairbanks, because UAF has the largest research expenditures and Fairbanks is a smaller community than Anchorage. Fairbanks Economic Development Corporation (<http://www.investfairbanks.com/sites/default/files/documents/Economic%20Model%202-23-10.pdf>) reports that UA pays \$219M in annual payroll in the FNSB, wherein the total payroll is \$2760M. So if research is responsible for half of UA wages in FNSB, this is about 4% of all wages paid. UA is the second largest payroll, after the military. Goldsmith (2007) estimated that for every 100 University jobs, 85 additional jobs are generated through UA employee spending. UA employs over 3000 people in the FNSB, and so is responsible for about 5550 jobs total.

Favorable Characteristics of Research as an Economic Enterprise (quoted from Goldsmith, 2007)

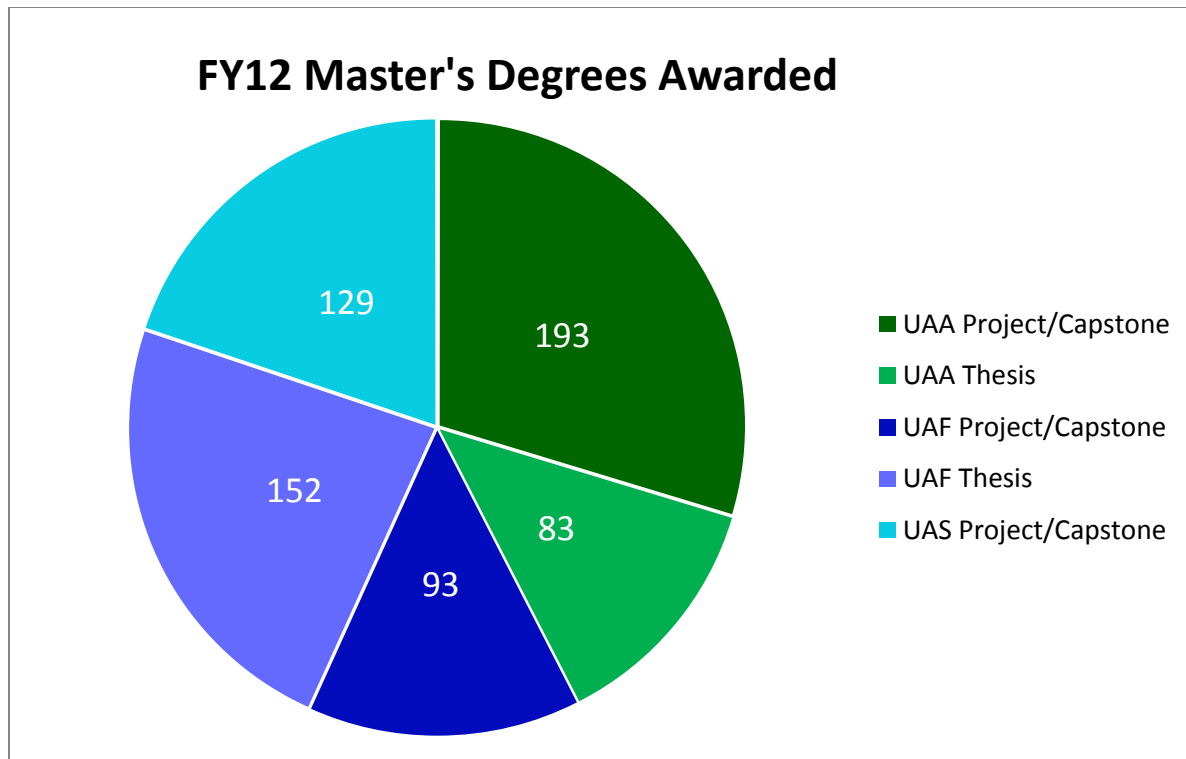
- Labor Intensive—Over 1/3 of the revenues from this industry (38 percent) went directly into payroll.
- High Wage—The average wage is higher than the economy-wide average.
- Quality Jobs—Most jobs come with a full benefits package that adds considerable value over and above the wage.
- Year-Round Employment—Although some jobs are seasonal or only for the academic year, most are year-round, and may offset the summer seasonal decline in teaching activity at the university.
- Diverse Job Mix—The variety of research activities generates a diverse mix among the private sector jobs that depend on research spending.
- High Resident Job Share—Residents hold most of the jobs in university research.
- Stable—Spending on university research nationally has increased each year for at least the last 50 years and for at least the last 10 within Alaska.
- Footloose—Research can be conducted wherever there is a decent laboratory with support for the scientists. It need not be located in proximity to resource deposits, as is the case for our natural resource industries, or close to markets, as is the case for most services.
- Environmentally Benign—University research is a clean industry with minimal effects on the quality of the environment.
- Non-Competitive with Other Industry—University research does not generate conflicts over appropriate and conflicting uses of the environment and natural resources.
- Stable Potential Tax Base—Although it does not directly create a product that is taxable, the large payroll and in-state procurement per dollar of spending on research create potential tax bases of personal and business income.
- Backward Linkages—Unlike some industries (like oil and gas and rural tourism) that are “enclaves” physically located in Alaska but not linked to the rest of the economy through purchases of local inputs, the large procurement budget and urban location for most research activities result in strong backward linkages that foster economic activity in support industries.
- Forward Linkages—There are no direct forward linkages in the form of sales to other sectors of the economy from university research, but most of Alaska’s resource industries also lack forward linkages.

Students and Research

Graduate Students

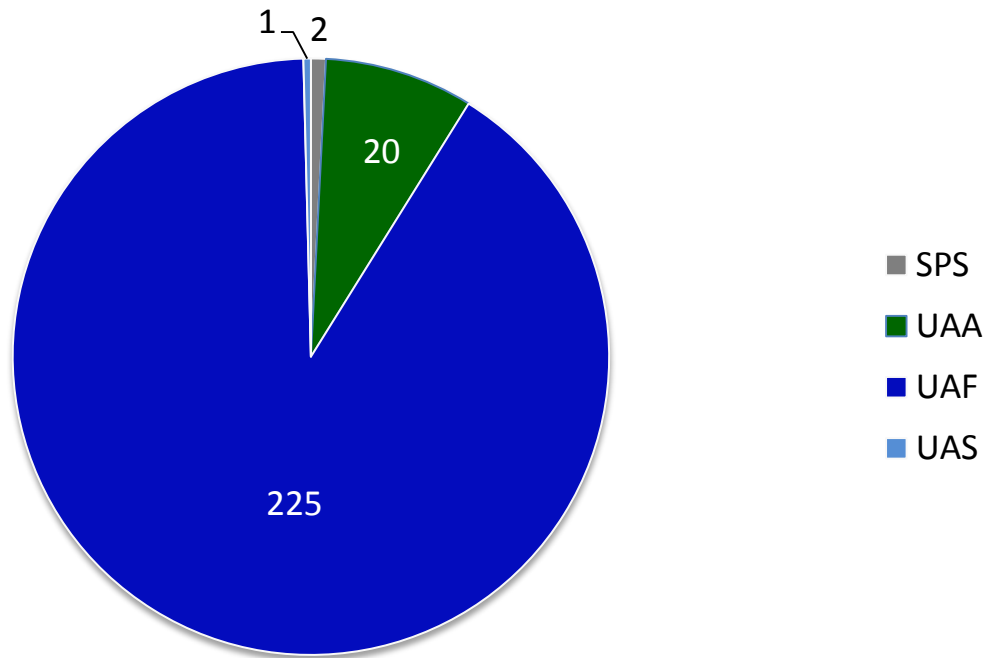


UAF has achieved a doubling of the number of Ph.D. degrees awarded annually since 2006. Three of the Ph.D.s awarded in FY12 and one of those awarded in FY11 were supervised by UAA faculty via the collaboration on the Clinical Community Psychology Ph.D. program. The Ph.D. is a research degree and a major requirement is original research presented in a dissertation. Ph.D. students are important contributors to the research productivity of all research universities. *Information provided by UA Information Systems, Banner Extracts 2006-2012.*

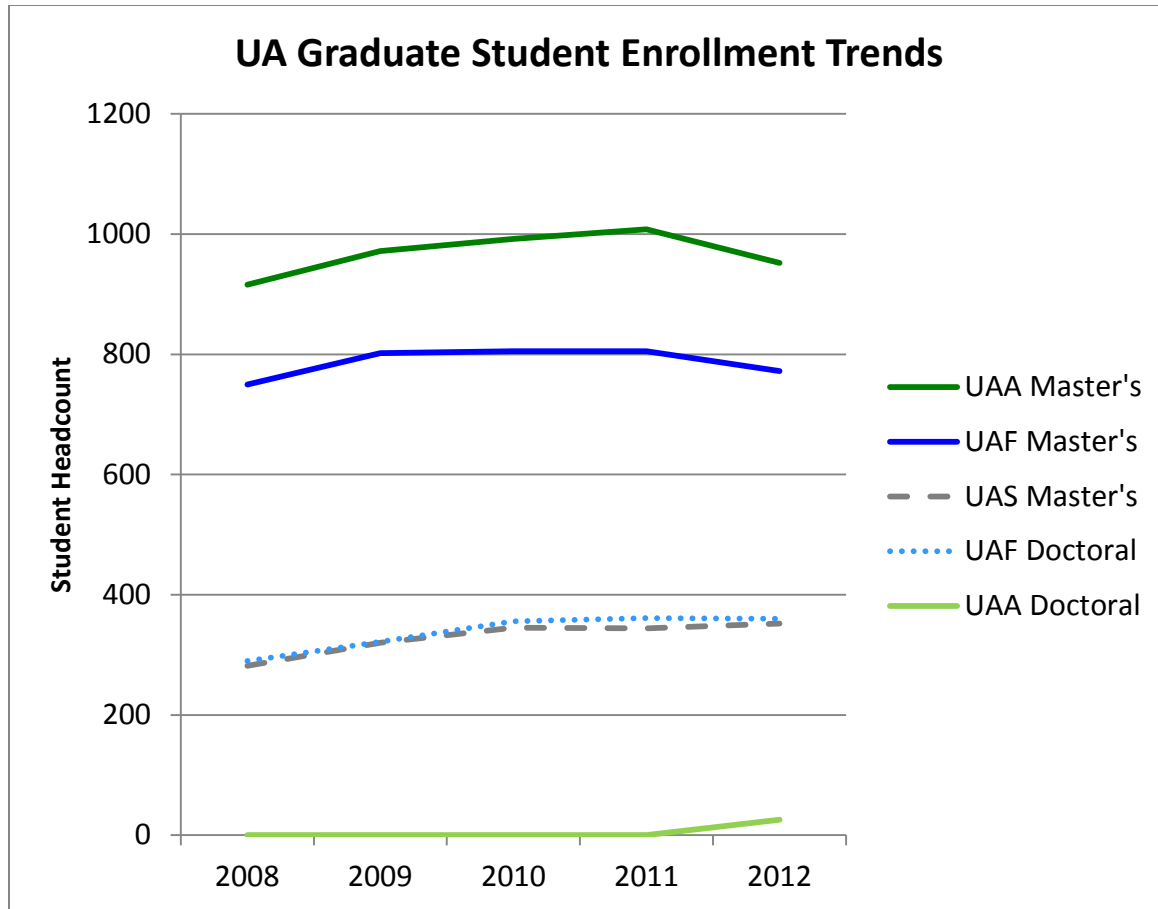


There are two broad categories of Master's degrees: research Master's (such as the MA, MS and MFA), for which research and a thesis are usually required, and professional Master's (such as the MBA and MEd), which usually require a project or capstone course rather than a thesis. UAF awards mainly research Master's, while UAA awards mainly professional Master's, although each of these institutions awards a substantial number of both types of degrees. UAS awards only professional Master's degrees, and is quite productive in those degrees per capita faculty. For simplicity all MA, MS, and MFA degrees were classified as "thesis", although a small minority require only a project. Similarly, all MEd degrees are classified as "project/capstone", although a few MEd students complete a thesis. *Information provided by UA Information Systems, Banner Extracts 2012.*

Number of Graduate Student Research Assistants in FY12

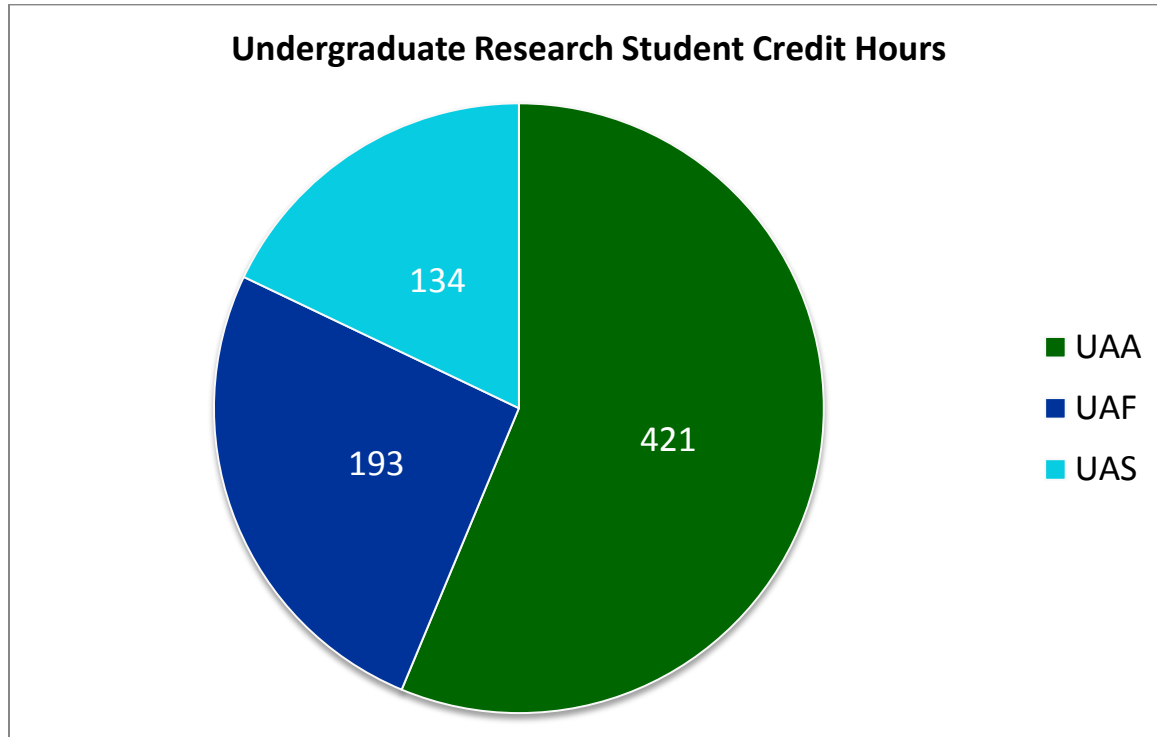


UAF has most of the graduate student research assistants in the UA system. In this chart, only full time graduate students who were supported with a stipend and tuition paid from a grant or contract or unrestricted funds are counted. Fellowship recipients and teaching assistants are not included, nor are other categories of UA employees (such as adjunct faculty) who may also be graduate students. UAF graduate research assistants are all funded from external grants and contracts. *Information provided by UA Information Systems, Banner Extracts 2012.*



Data are drawn from the Fall Semester Opening Enrollment Summary published by UA Statewide. In this report UAA students enrolled in the joint UAA-UAF Clinical-Community Psychology Ph.D. program were counted in UAA's Master's category. Since UAA was recently accredited to offer doctoral programs, in this graph the students are moved to the doctoral category for Fall 12, and that accounts for part of the decrease in UAA Master's enrollment. Licensure students (of which there have been ≤ 40 /year at all MAUs together) are included in the Master's student category.

Undergraduate Students



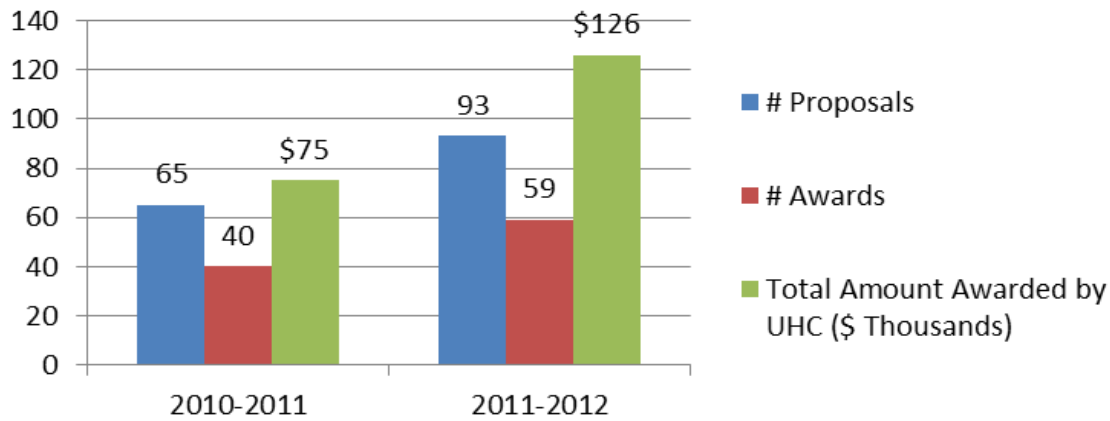
The chart reports undergraduate student credit hours in courses numbered 498 or 499, which are course numbers generally used for research or thesis. Not all undergraduate students engaged in research register for such credits. Also, some degree programs have different course numbers for senior thesis or other research-based courses. *Information provided by UA Information Systems, Banner Extracts 2012.*

Undergraduate Students – UAA

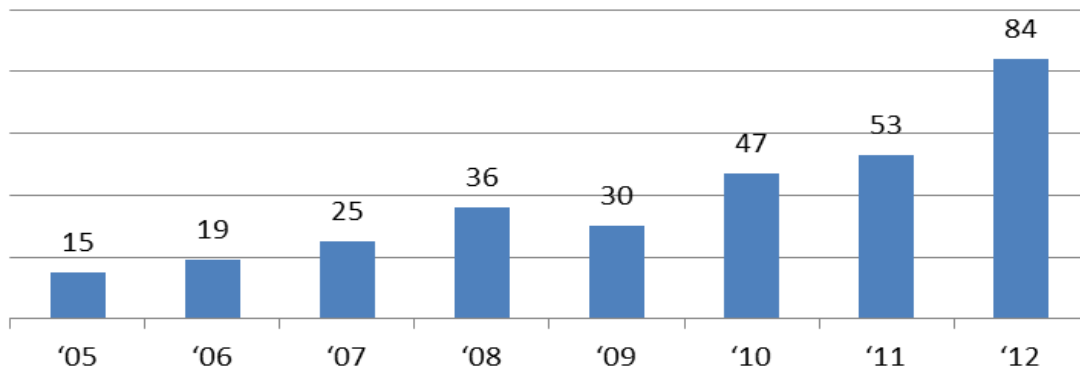
The UAA Office of Undergraduate Research and Scholarship (OURS), housed within the University Honors College, bridges learning and discovery. OURS advances the involvement of UAA undergraduates in research and creative activities—whether they be independent or working in collaboration with UAA faculty. OURS supports a wide variety of opportunities for UAA undergraduates, including several campus-wide award programs, an annual Undergraduate Research Symposium and the University Honors College.

The University Honors College has been increasing its financial support of undergraduate research. During FY12 59 students were awarded support for their research activities. Another indicator of increasing undergraduate research activity is the number of participants in the Undergraduate Research and Discovery Symposium, which has increased from only 15 in FY05 to 84 in FY12.

UHC Proposals, Awards, and Amount Awarded Toward Student Research



Students Presenting at the Undergraduate Research & Discovery Symposium



Undergraduate Students - UAF

Because of increasing UAF emphasis on undergraduate research, in July 2011 the Office of Undergraduate Research and Scholarly Activity (URSA) was established. URSA has a mission to support, develop and institutionalize UAF's diverse and robust programs of undergraduate research and scholarly activity. The primary means by which URSA fulfills its mission are: funding undergraduate students and faculty who collaborate on research and creative projects; serving as a clearinghouse for projects that

offer undergraduate students and faculty opportunities to collaborate in research or creative projects; assisting UAF faculty and staff who strive to create or maintain undergraduate research programs; creating regular events that serve as venues for students to present their research and creative projects; and cataloging and archiving UAF undergraduate student participation in research and creative projects, as well as the outcomes and products of those projects.

At all levels, URSA aims to improve skills in critical thinking, problem solving and communication and to engender a culture of life-long learning among all students, as well as enhance preparation and education of students who will fill the needs of Alaska's 21st century workforce and society. Building on existing efforts and capacities, URSA enables UAF students to pursue varying levels of research engagement from a single credit of first-year seminar to independent scholarly investigations or a senior thesis, including a BFA exhibit or music senior recital.

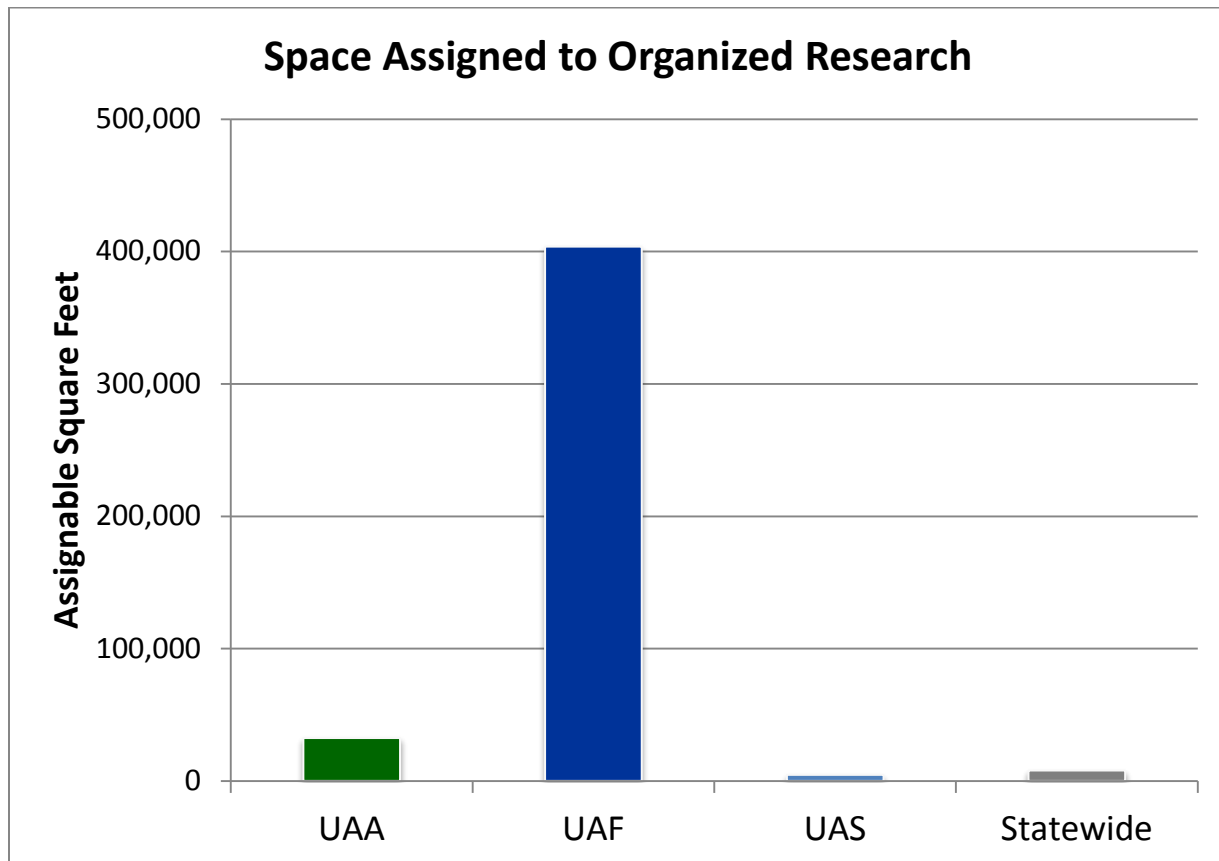
- The number of undergraduate students that URSA funded in FY12 was 33.
- The number of undergraduate students that URSA matched with projects in FY12 was 66.
- The total number UAF students participating in undergraduate research in FY12 was 303.
- UAF Research Day 2012 included presentation of 87 posters, 57 by undergraduate and 30 by graduate students.
- Some highlights of undergraduate participation in national and international conferences and competitions in FY12 include:
 - Mindona Krzykowski presented at the International Astronautical Federation Congress, Oct 3-7, 2011 in Cape Town, South Africa.
 - Lyle Axelarris presented at the Western Alaska Interdisciplinary Science Conference, March 29-30, 2012 in Dillingham, Alaska.
 - Charles Allison and Matt Robinson presented at the Pacific Northwest Phi Alpha Theta [History] Conference, April 12-14, 2012 in Spokane, Washington.
 - Andrew Paxson competed in the NASA University Student Launch Initiative [national rocket competition], April 17-20, 2012 in Huntsville, Alabama.
 - Jessica Pugh presented at American Society for Biochemistry & Molecular Biology, April 21-25, 2012 in San Diego, California.

Undergraduate Students - UAS

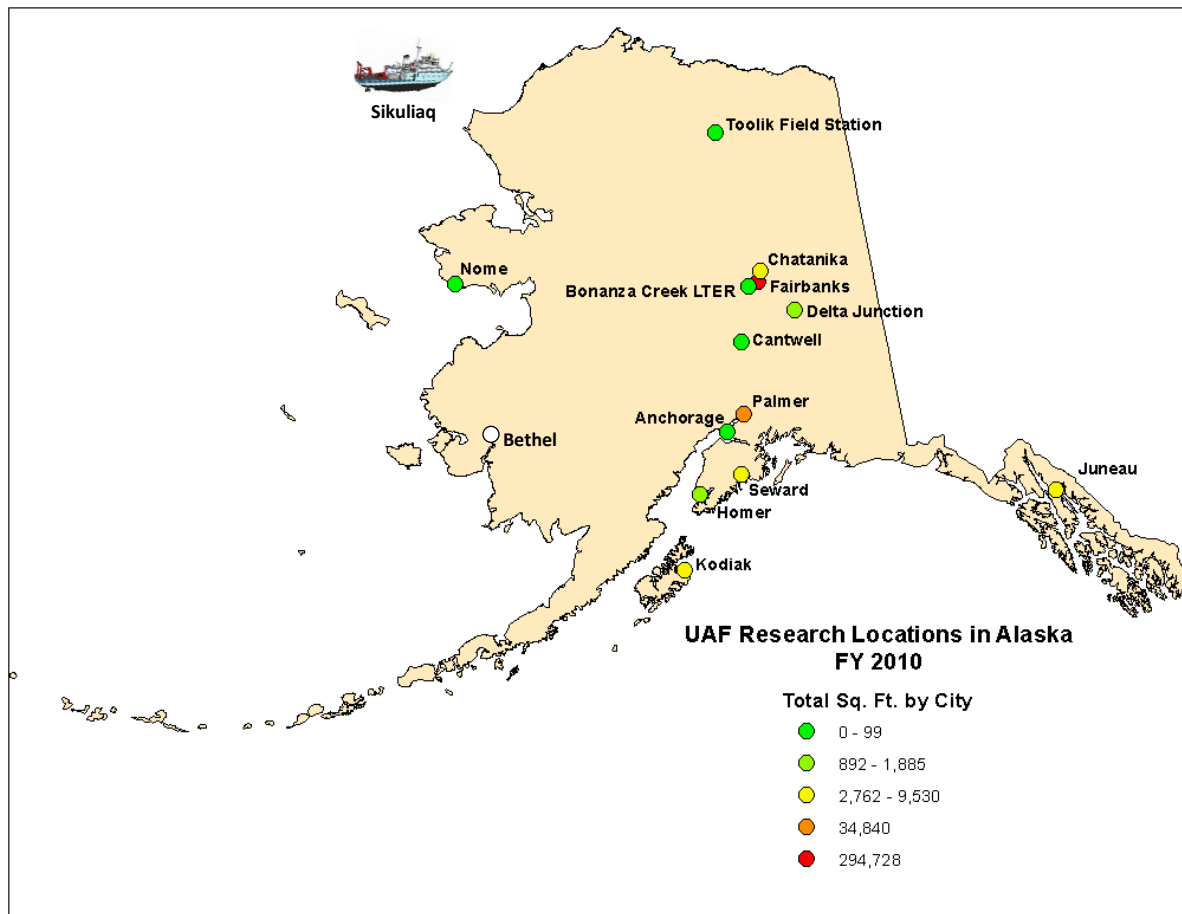
The UAS mission statement includes the recognition that student learning is “enhanced by....undergraduate research and creative activity....” While UAS has always had a strong focus on providing undergraduate students with research experiences in the rich physical and cultural environment of Southeast Alaska, the mission statement, along with the new strategic and assessment plan, prompted the faculty to create URECA, the **Undergraduate Research and Creative Activity** program. With internally reallocated funding, the annual URECA awards have provided opportunities to students to apply competitively for up to \$2500 to pursue a research question or creative activity of their choice with support from a faculty mentor. In its first two years, URECA supported 21 students in conducting independent research or creative activities. Each spring at the URECA symposium, these students and others who have conducted research or creative activities present their work to the public. Students have conducted studies on topics as diverse as the best bait for catching crabs of legal market weight to the construction of a biofuel-fired pottery kiln, from an examination of the metabolic rates of starry flounder to the impacts of temperature and precipitation changes on harvesting red and yellow cedar for Haida basketry, from the use of iPads to enhance the life of senior citizens to the genetic makeup of coast range sculpin. Of the seven URECA awardees who have graduated, three are in graduate programs at other universities including one at UAA.

In addition to our URECA awardees, many other students participate in directed studies in research with various faculty members. Numerous others are hired as research assistants on externally-funded projects and many conduct independent studies along with a faculty mentor in areas of their choice.

Research Facilities



The information for this graph was taken from the University of Alaska 2011 Facilities Survey, Statewide Planning and Budget, which was based on the FY09 Functional Use Survey. Hence it does not include facilities completed after FY09. UAF has more than 90% of the space assigned to organized research in the UA system.



Locations of UAF Research Facilities

The map includes only physical facilities, and not the many other research locations around the state, with the exception of the Long Term Ecological Research sites at Bonanza Creek and Toolik Lake. Both represent a long term commitment of research funding by NSF and other agencies, of more than 30 years standing (although the LTER designation is more recent). Toolik Field Station has considerable facilities managed by UAF but owned by NSF. The Bethel facility, for the Center for Alaska Native Health Research, is under construction, as is the *R/V Sikuliaq*. The *Sikuliaq* is owned by NSF but will be operated by UAF, from its home port in Seward. Fairbanks has extensive research facilities for agriculture, marine and freshwater sciences, high performance computing, biology, chemistry, geology and geophysics, remote sensing, engineering, and other fields. Chatanika is the location of the Poker Flat Research Range, the largest land-based rocket research range in the world, the only high-latitude rocket range in the United States, and the only research range owned by a university. Palmer, Nome, Delta Junction host agricultural research facilities, Homer has a field station for the Alaska Volcano Observatory, and Seward, Kodiak, and Juneau have marine science research facilities. Except for the Bethel research facility and the *Sikuliaq*, the information for this map was taken from the University of Alaska 2011 Facilities Survey, Statewide Planning and Budget, which was based on the FY09 Functional Use Survey.

Research Productivity and Quality

Method

The following graphs present some information on research productivity and quality. The data used to produce these graphs were taken from the following sources: tenured and tenure track faculty numbers in FY10 from IPEDS (<http://nces.ed.gov/ipeds/>); research expenditures in FY10 from NSF Higher Education Research and Development Survey results (<http://www.nsf.gov/statistics/nsf12330/>); and publication and citation information from the *Web of Science* (description at <http://wokinfo.com/>). The method of the peer comparisons for publications and citations was to use the advanced search function and search for all types of publications in both the Science Citation Index and the Social Sciences Citation Index for the period January 1, 2006 to December 31, 2011. Publications for each institution were found by searching OG=[Institution Name]¹ and (if needed) CI=[City]² or AD=[Address]³. A citation report (for January 1, 2006-present) was then generated for each institution based on its publication list. The method for comparison of UAF to leading western research universities was the same, except publications were searched for only one year, calendar year 2011, because of the very large number of publications for some of these institutions. Citations were from January 1, 2011 to present for this comparison.

The peers used for each institution (Tables 2.-4.) were from the list of peer institutions posted at http://www.alaska.edu/swbir/ir/PeerUpdate_2012.pdf. UAF has designated research peers and those were used with the addition of two of the UAF Academic Peers, the University of Montana and North Dakota State University. UAF's research peers were chosen on the following criteria: research expenditures between about \$50 and \$200M annually; Land Grant University (designated LG in Table 2.); low population density state; and no medical school/teaching hospital. The partial exceptions to these criteria are U Delaware and Oregon State (not low population density states, but do have marine science research as does UAF); U Nevada Reno (has a medical school jointly with UNLV); and U Montana (not a Land Grant). Some UAF peers are in a higher Carnegie research classification; those are labeled "RUVH" in the table. Those institutions have, on average, more sponsored research and larger doctoral programs than institutions in UAF's RUH category. UAA lists many peers, and some were either much more active in research or much less active in research than UAA. So, the 10 peers closest to UAA in

¹ The institution name was abbreviated according to the format used by Web of Science. Highly cited publications in the resulting list were checked to ensure that the search criteria yielded only publications from the target institution.

² For UAA, the OG=Univ Alaska and CI=Anchorage search result included some publications that had no UAA authors, but rather UAF and USGS or other Anchorage-resident agency authors. These were manually eliminated from the publication list. UAS search criteria included Sitka. For UAS, each publication was checked because there was considerable admixture of publications from the University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Fisheries Division in Juneau; those were removed. The SFOS Juneau publications that were not already included in the UAF total were added to that list, as were UAF publications by faculty located in Kodiak and Seward. Some publications are double-counted among UAF, UAA, and UAS because there are authors from more than one MAU.

³ For the University of Nebraska and University of Massachusetts – Boston (both UAA peers) the AD=[City, State ZipCode] search criterion was used to exclude the University of Nebraska Medical Center and the University of Massachusetts School of Medicine, respectively, since both of those are large research organizations not comparable to UAA. The AD search criterion was also used for University of Michigan – Dearborn, to exclude Ford Motor Company and other Dearborn research organizations. The University of Maine search criteria included "not AD=France" to exclude the University of Maine in France.

annual sponsored research expenditures (by ratio) were used for the peer comparison. UAA's peer group averages somewhat more in annual research funding than UAA, while UAF's peer group averages somewhat less funding than UAF. The peers used are shown in the tables below.

Table 2. UAF Research Peers		
Institution Type**	U Alaska Fairbanks Peers	FY10 Sponsored Research in Million \$
LG, RUH	U Alaska Fairbanks	\$118
LG, RUH	Kansas State U	\$122
LG, RUVH	Montana State	\$105
LG, RUH	New Mexico State Las Cruces	\$133
LG, RUVH	North Dakota State	\$71
LG, RUVH	Oregon State	\$193
LG, RUVH	U Delaware	\$122
LG, RUH	U Idaho	\$71
LG, RUH	U Maine	\$77
RUH	U Montana	\$47
LG, RUH*	U Nevada Reno	\$66
LG, RUH	U Wyoming	\$52
LG, RUH	Utah State	\$130

*Has medical school

**LG = Land Grant University; RUVH = Carnegie Basic Classification of Research University, Very High Research Activity; RUH = Research University, High Research Activity; DRU = Doctoral Research University. Master's L = Master's Institution Larger Programs. (The most recent Carnegie classification was done before UAA was accredited to offer Ph.D.s). The Carnegie Classifications are based on research funding and number of doctoral degrees awarded, among several other factors. In terms of this assessment of total research activity, RUVH > RUH > DRU > Master's. See <http://classifications.carnegiefoundation.org/> for explanation of these classifications.

Table 3. UAA Research Peers		
Institution Type**	U Alaska Anchorage Peers	FY10 Sponsored Research in Million \$
Master's L	U Alaska Anchorage	\$12
Master's L	Boise State U	\$16
RUH	Cleveland State U	\$32
DRU	Lamar U	\$4.9
RUH	U Massachusetts Boston	\$34
Master's L	U Michigan Dearborn	\$4.7
RUH	U Missouri St Louis	\$8.2
DRU	U Nebraska Omaha	\$7.4
RUH	U North Carolina Greensboro	\$21
Master's L	U Southern Maine	\$14
DRU	U West Florida	\$16

Results and Analysis

Although sponsored research funding comes in advance of the actual research, it is widely used as a measure of research productivity in the sciences and engineering, because most research in those fields is costly and must have external support to be successful. Also, competition for most research grants is fierce, and only the best researchers secure funding. Publications are the output of research and also a

Table 4. UAS Peers	
U Alaska Southeast Peers	FY10 Sponsored Research in Million \$
U Alaska Southeast	\$1.5
Adams State College	- ***
Bemidji State	-
Eastern Oregon U (La Grande)	-
Georgia Southwestern State U	-
Lewis-Clark State College	-
Longwood U	\$0.1
SUNY College at Purchase	-
U Texas Permian Basin	\$1.3
U Maine Machias	-
U Maine Presque Isle	-
Western Oregon U	\$2.0

***None reported

Table 5. Leading Western Research Universities		
Institution Type	University	FY10 Sponsored Research in Million \$
LG, RUVH	Oregon State	\$193
RUVH*	Stanford U	\$760
LG, RUVH*	U Arizona	\$410
RUVH	UC Berkeley	\$832
RUVH*	UC San Diego	\$832
RUVH	U Oregon	\$83
RUVH*	U Washington	\$979
LG, RUVH	Washington State	\$192

*Has medical school

standard measure of research productivity. Because institutions vary greatly in size and this impacts the *total* dollars and publications, these measures have been divided by the number of tenured and tenure track faculty. Although tenured and tenure track faculty number is not perfect for this purpose, the number is readily available for all of the peers. The number of tenure line faculty is a proxy for institution size, and using that ratio is not meant to imply that only those faculty do research, nor that all of those faculty do research. That is particularly true in the case of UAA, UAF, and UAS, where some faculty (extension and most UAFT faculty) have no research workload.

The Web of Science search yields predominantly peer-reviewed journal articles in the sciences, social sciences, and engineering. Although *some* of the other types of publications, such as chapters in books, books, or abstracts in conference proceedings, are found, coverage is spotty. For example, the search uncovered only six book chapters for UA in the time frame, far less than were actually published. So, in interpreting the results it is important to know that in some fields (anthropology would be an example) books and book chapters are a very common mode of publication, while in others (the physical and biological sciences) most faculty would have less than 10% of their publications as book chapters. Many of these differences average out at the institution level, but some will remain due to varying institutional focus, especially for smaller institutions where research is less diversified. Also, as indicated by the name, *Web of Science* does not cover the humanities or arts.

Citations/publication is a measure of the impact of research publications. Each citation means that a researcher read the paper, and found information or interpretation in that paper that was used or

recognized in his or her own publication. Citations are a common measure of research quality, although there are clear differences among fields. As one example, ecology is a large field with many practitioners, and so papers in that field have the opportunity to garner many citations. On the other hand, physical oceanography is a rather small field in terms of the number of scientists engaged in it, and consequently, citations are fewer. Again, many but not all of these differences average out at the institution level.

Compared with its peer institutions, UAF is near the top of the range for both citations/publication (3rd of 13) and sponsored research \$/faculty member; in fact UAF is the highest of all on the latter measure. UAF is in the middle of the range for publications/faculty member and is tied for 3rd out of 13 peers, but note that the peer institutions generally do not have tenure line faculty who have no research effort.

UAF was also compared to leading research universities in Washington, Oregon, and California and to the University of Arizona. In this group UAF performance is comparable to Oregon State (which is one of our chosen peers), Washington State, and University of Oregon. UAF also secures as much external research funding/faculty member as the University of Arizona. UAF's performance is not as good as that of University of Washington, Stanford, UC San Diego, and UC Berkeley, but note that these are "top twenty" universities nationally and secure more than six times as much external research funding as UAF. Also, U Washington, UC San Diego, Stanford and U Arizona have medical schools and teaching hospitals, a characteristic that leads to increased research funding and research output, other factors being equal.

UAA is 3rd in its group of 11 peers in terms of citations per publication. UAA ranks lower on publications/faculty and sponsored research \$/faculty, but note that its tenure line faculty without research responsibilities may be affecting the result. As expected based on the smaller size of UAA's research programs, its peer group's average performance is somewhat below that of UAF, as summarized below:

Peer Group	Citations/Publication (2006-2011)	Publications (2006-2011)/Faculty*	Research Expenditures**, Thousand \$/Faculty*
UAA Peers	6.0 ± 1.4	3.4 ± 1.3	\$48 ± 35
UAF Peers	8.8 ± 1.4	8.0 ± 2.2	\$167 ± 61
UAS Peers	3.6 ± 2.5	0.7 ± 0.5	\$4.2 ± 7.4

*Tenured and tenure-track faculty.

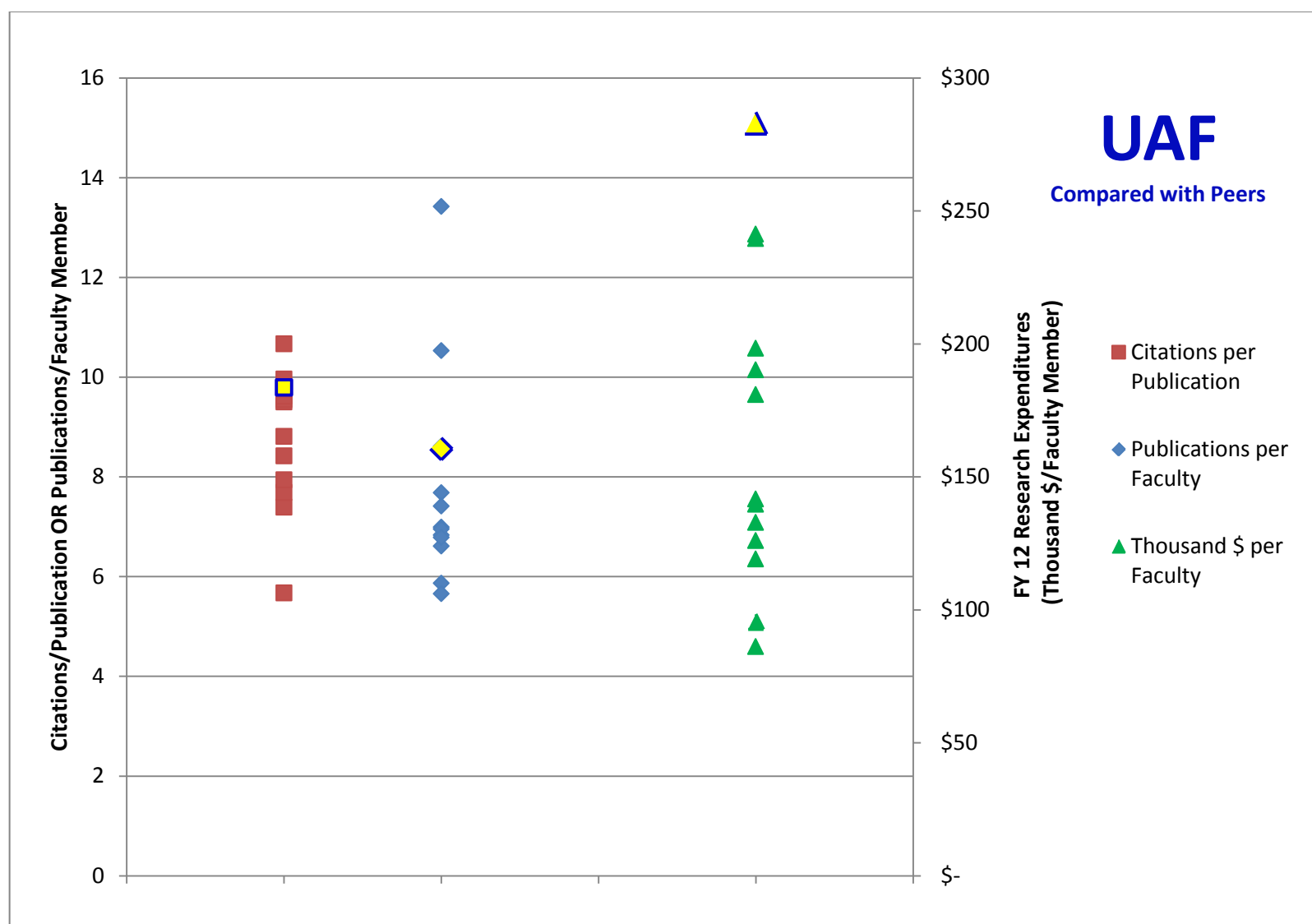
**From external sources only, FY10.

UAS peers are generally inactive in sponsored research, and so no comparison graph was done for UAS. However, UAS does quite well on the size-adjusted measures used in the peer comparisons, as shown in Table 7. These ratios fall in the range of UAA peers, and well above the averages for UAS peers shown in Table 6. UAS is in the top two on all three performance measures in its peer group.

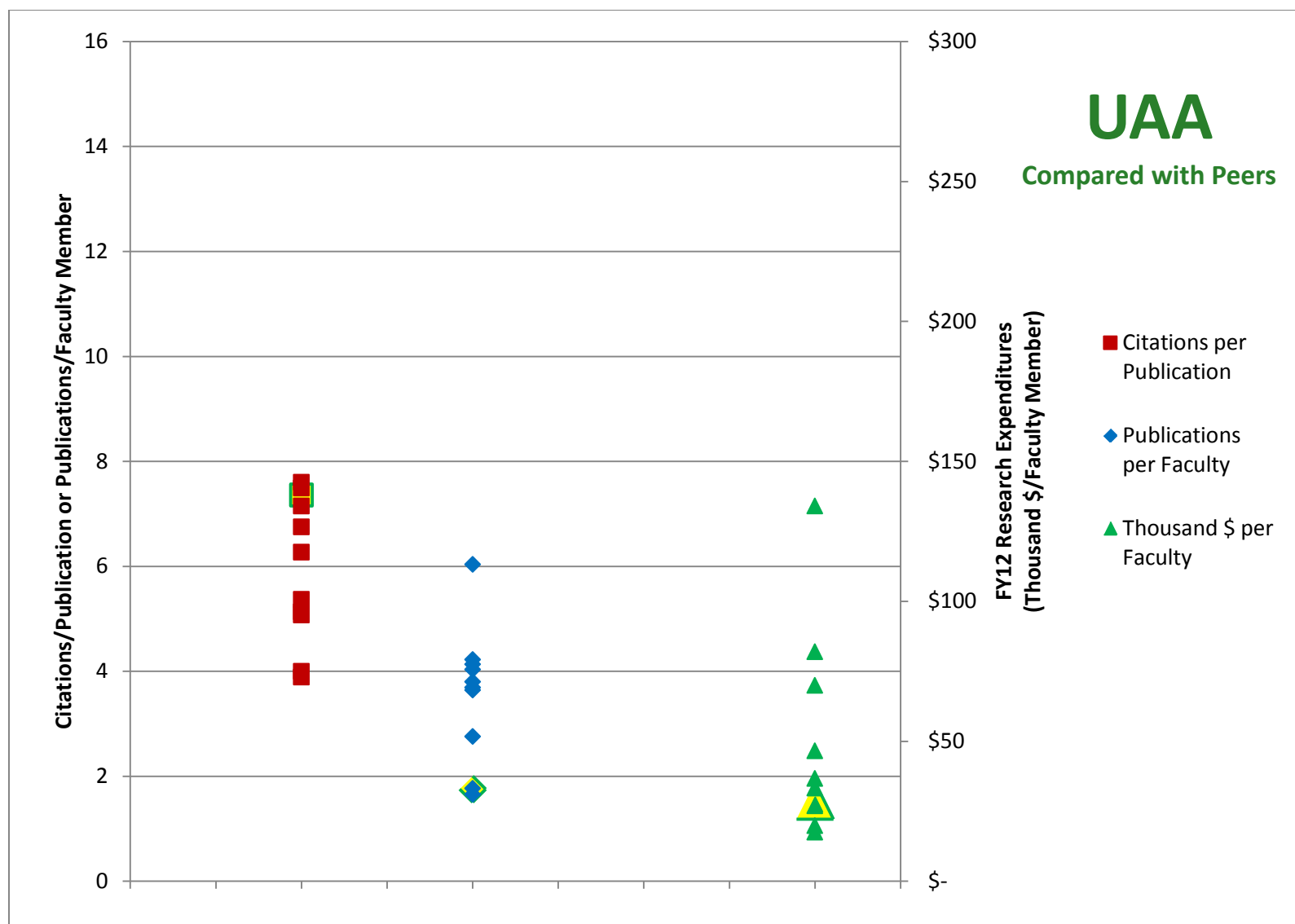
Table 7. Research Performance of UAA, UAF, and UAS			
Institution	Citations/Publication (2006-2011)	Publications (2006- 2011)/Faculty*	Research Expenditures**, Thousand \$/Faculty*
UAA	7.4	1.8	\$29
UAF	9.8	8.6	\$283
UAS	7.2	1.7	\$20

*Tenured and tenure-track faculty.

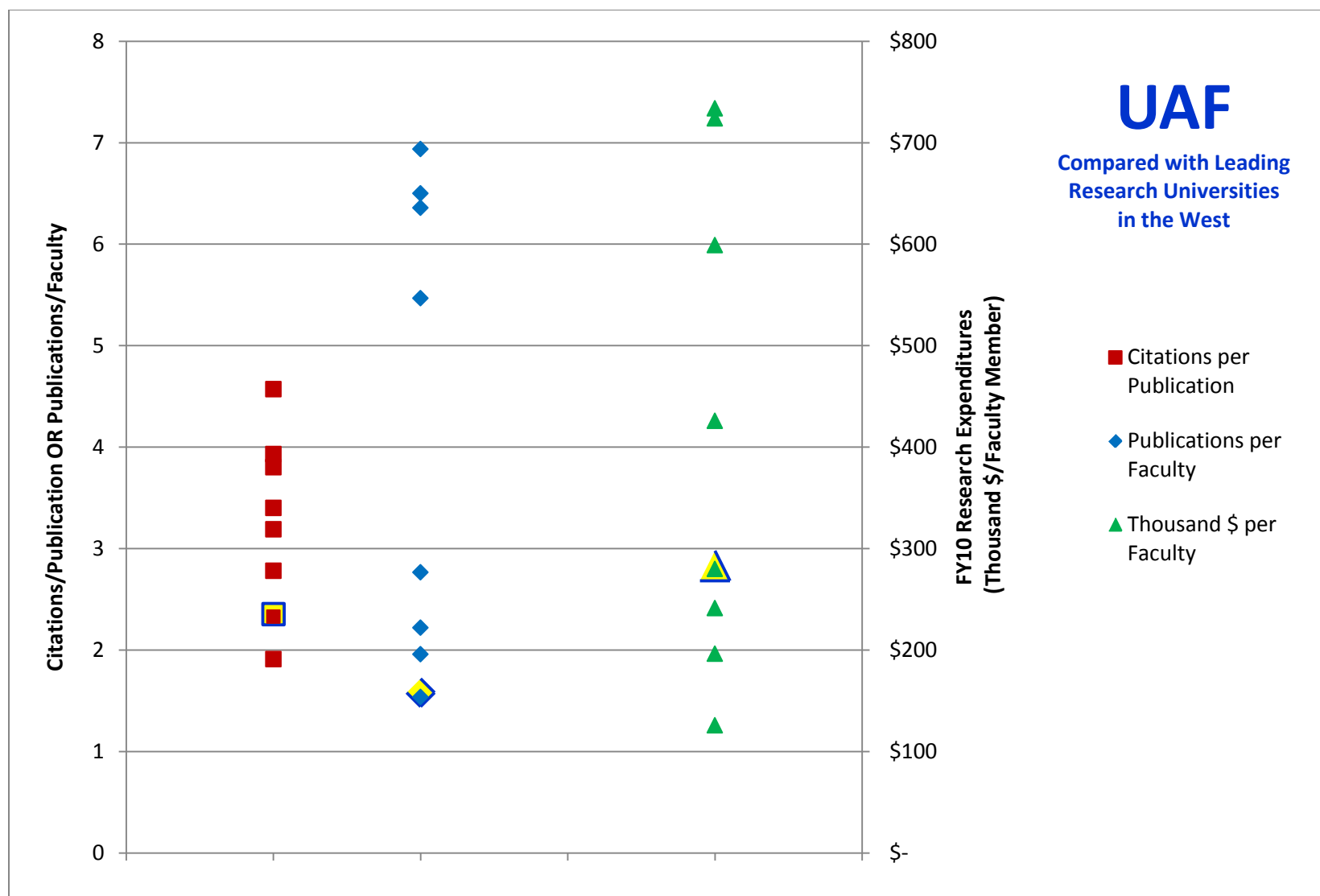
**From external sources only, FY10.



UAF's performance is shown as a yellow symbol. The research peers used in this chart are listed in Table 2., above. This chart is based on publications from a six-year period, January 1, 2006 to December 31, 2011.



UAA's performance is shown as a yellow symbol. The research peers used in this chart are listed in Table 3., above. This chart is based on publications from a six-year period, January 1, 2006 to December 31, 2011.



UAF's performance is shown as a yellow symbol. The research universities used in this chart are listed in Table 4., above. This chart is based on publications from just one year, January 1, 2011 to December 31, 2011.

Creative and Scholarly Activity

The arts and scholarly activity are a vital part of Alaska's universities, and are one of our strongest connections to the communities we serve. However, there is no institutional, UA-wide standard for measuring productivity in these areas. Unlike the sciences and engineering, most of this work is not supported by external grants. The results of the creative or scholarly activity may appear in a variety of forms, including books, film (or digital equivalents), sound recordings, exhibitions and performances as well as journal articles. In this section, each of the universities presents the information on productivity that it has available, but there is no way to compare this information within UA or with external peers.

UAA

UAA has numerous publications that were probably not captured in the Web of Science search discussed later in this document, and those are also enumerated in Table 8. The table includes all fields, i.e., the sciences and engineering as well as the social sciences, arts, humanities, business, and education.

Table 8. UAA Publications and Creative Arts 2007-2012

Year	Articles in Refereed Journals*	Articles in Conference Proceedings	Books	Book Chapters	Creative Arts
2007	100	121	8	91	105
2008	239	151	9	60	166
2009	209	214	13	61	164
2010	181	134	11	68	177
2011	181	220	14	57	175
2012	311	163	22	88	179

*Many of these are included in the Web of Science analysis above. Publications from all schools and colleges are included, as reported by faculty in their annual activity reports.

UAA offers BA and BFA degrees in Art; BA and BM degrees in Music; a BA in Theatre (with a dance emphasis available); and an MFA in Creative Writing. The BFA, the BM, the BA in Theatre, and the MFA in Creative Writing require a capstone performance or creative works by the students. The faculty generate numerous creative works and performances as well, summarized in Table 8 under "Creative Arts".

UAA's arts programs enrich the Anchorage community with exhibitions and performances. UAA has three art galleries, the Kimura Gallery, the ARC Gallery at the Consortium Library, and the Student Union Gallery. These exhibit works by students, faculty, and guest artists.

Each season UAA theatre produces four plays on its convertible thrust Mainstage, and many one act or full-length plays in the student directed second stage program. The plays are cast at open auditions, and more than 100 majors, non-majors, and members of the community are involved each year. The dance program also maintains an active performance role within the community.

During FY12 the UAA Music department hosted or performed at a dozen events including a fall tour of regional high schools by the University Wind Ensemble and performances by the Sinfonia, Guitar Ensemble, Percussion Ensemble, and the University Singers, among other faculty and staff

performances. Jazz Week 2012 featured guest artist Howie Smith. Renowned tenor John Nuzzo has been featured at several performances in recent years.

UAF

UAF offers BA, BFA, and MFA degrees in Art; BA, BM, and MA degrees in Music; a BA in Theatre; and a MFA in creative writing. The BFA and MFA programs, the BM, and the BA in Theatre require a capstone performance or creative works by the students. Several students have incorporated creative activities into doctoral studies. Some recent examples include Maryanne Allen (Indigenous Studies Ph.D.), “Young Native Fiddlers: A Case Study on Cultural Resilience in Interior Alaska”; Theresa John (Indigenous Studies Ph.D.), “Yuraryaraput Kangiit-Illu: Our Ways of Dance and their Meanings”; Paul Krejci (Anthropology and Music Interdisciplinary Ph.D.), “Skin Drums, Squeeze Boxes, Fiddles, and Phonographs: Musical Interaction in the Western Arctic, Late 18th through Early 20th Centuries”; and Nathaniel Mohatt (Creative Writing and Community Psychology Interdisciplinary Ph.D.), “Shudder: Poems and Essay on Cancer, Care, and Healing”.

Art, Music, and Theatre all have strong interactions with the Fairbanks area communities. UAF Professor Eduard Zilberkant conducts the Fairbanks Symphony, and many of the faculty and students in the music department perform with the Symphony. Other UAF ensembles that offer public performances include the Arctic Chamber Orchestra, the Alaska Camerata, Alaska Trio, the Borealis Brass, the Choir of the North, Ensemble 64.8 (percussion), the Northern Lights String Orchestra, the University Chorus, and the Wind Symphony. The Art Department houses the University Art Gallery an exhibition space for UAF Art students, faculty, staff and visiting artists. Both faculty and students are frequent participants in community art exhibitions as well. The UAF Theatre program usually offers one public mainstage production per semester, as well as “Winter Shorts” each fall. The new BA-Film degree program was approved in 2011, and *The Messenger* (UAF professor Kade Mendelowitz) premiered as first film created under the new program, incorporating students at every stage of production. December will see the Alaska premiere of *alaskaLand*, a film by Chinonye Chukwu (Writer/Director/ Producer). UAF professor Maya Salganek was Alaska producer and many UAF Film students participated.

UAF arts programs are also notable for offering summer opportunities for creative activities by children. The Summer Visual Art Academy for students from grades 6–12 offers animation, cartooning, ceramics, computer art, costume and fashion design, digital photography, drawing and design, metalsmithing, painting, printmaking, sculpture, and 3D design. The UAF Summer Music Academy, a collaboration between the Music Department and the Fairbanks Symphony, is an intensive two week program of musical education for students from grades 6 through 12.

Arts and writing faculty received several significant awards during FY10-12. Art professor, David Mollett, received the Juror’s Award and a purchase award of Primary Landscape from the Rasmuson Foundation for the Anchorage Museum. He was also awarded a large commission for a painting that was installed in the Ted Stevens International Airport in Anchorage in 2011. English professor Derick Burleson received Richard Hugo Prize for Best Poem (“Certain Frequencies”) from Poetry Northwest. English professor David Crouse was the runner-up in the Miami University annual novella competition, for “Continuity”. In January 2012 Eduard Zilberkant was guest conductor of the Orchestra of Teatro Di San Carlo in Naples, Italy.

UAF compiled information on Creative Performances and Exhibitions for its Fall, 2011 Accreditation Self-Study, submitted to the Northwest Commission on Colleges and Universities. These figures include faculty in art, English (poetry readings), film, journalism (documentary film and photography), music, and theatre (Table 9.)

Table 9. Creative Performances and Exhibitions per FTE Faculty 2007-2009 (calendar years)

		2007	2008	2009
Total Performances and Exhibitions		103	85	85
FTE Faculty		36	36	36
Categorization of Performances and Exhibitions				
International	Solo	10	11	8
	Group	4	3	6
National	Solo	27	21	22
	Group	18	16	10
State	Solo	32	22	32
	Group	12	11	7

For the past two years UAF has also compiled a complete list of refereed publications⁴. Many of those are refereed journal articles included in the Web of Science analysis earlier in this document. However, publications from the College of Liberal Arts, which encompasses the arts, social sciences, and humanities, are mostly not included in the Web of Science database and so are enumerated in Table 10. These data are derived from faculty annual activity reports, but publications with multiple UAF authors are counted only once.

Table 10. UAF College of Liberal Arts Reviewed Publications 2009-2010 (calendar years)

Field	Year	Journal Article*	Conference Proceeding Article	Book Chapter	Book	Film
Social Science**	2009	32	-	18	4	-
	2010	34	3	14	11	-
Humanities	2009	5	-	5	-	-
	2010	15	-	4	2	-
Arts***	2009	3	-	-	-	-
	2010	2	-	1	-	1

*Some of the social science journal publications were also counted in the Web of Science analysis.

**Linguistics publications were classified as social science, but this field straddles the social sciences and humanities.

***UAF's arts faculty focus on performance rather than publication.

⁴ To insure completeness, because physical publication of books is often delayed until long after they are completed, UAF compiles publication information 20 mos. after the end of the targeted calendar year, so the most recently completed list is for 2010.

UAS

UAS offers the BA in Art, and a BA in English with an emphasis in creative writing. Students participate in theater classes and productions through a cooperative agreement with the Alaska's only professional theater, Perseverance Theater, and private music lessons are offered through arrangements with local instructors, although neither theater nor music degrees are offered. Highlights of some creative activities of the past two years are listed below.

Faculty productivity:

- All three art faculty participated in local, statewide, and national exhibitions and workshops.
- One faculty member published book of poetry.
- One faculty member published the first children's book in both Tlingit and English.
- One faculty member produced a play in both Ketchikan and Juneau as part of the UAS Humanities Forum.

Student successes:

- Bonnilyn Parker won national awards for ceramics in both her junior and senior years.
- Ishmael Hope produced a play, Naatsilanei, in the Tlingit language at Perseverance Theater .
- Joel Mundy was selected for, and produced, a solo exhibition of his photography.
- Students produce weekly UAS radio show on public radio.
- Students organize community poetry slams regularly.
- Alaskapella, a student-organized and student-lead *a capella* vocal group, performs widely.
- Six of the 21 URECA grants awarded were in creative activities.

Community engagement:

- Tidal Echoes, a regional literary journal, is produced by UAS faculty and students.
- The Art of Place, a series of demonstrations and discussions focusing on arts and culture of the Tlingit people, was developed by faculty member Ernestine Hayes and has run each spring for the past two years.
- Perseverance Theater teaches theater classes and produces plays on campus.
- UAS hosts Perseverance Theater's STAR theater performance camp for youth each summer.
- Artist in residence, Dr. Alexander Tutunov of Southern Oregon University, taught master classes in classical piano.
- UAS co-sponsors the Juneau Symphony.
- UAS partners with the Juneau Arts and Humanities Council to produce Community Arts Day on campus.

Intellectual Property and Commercialization

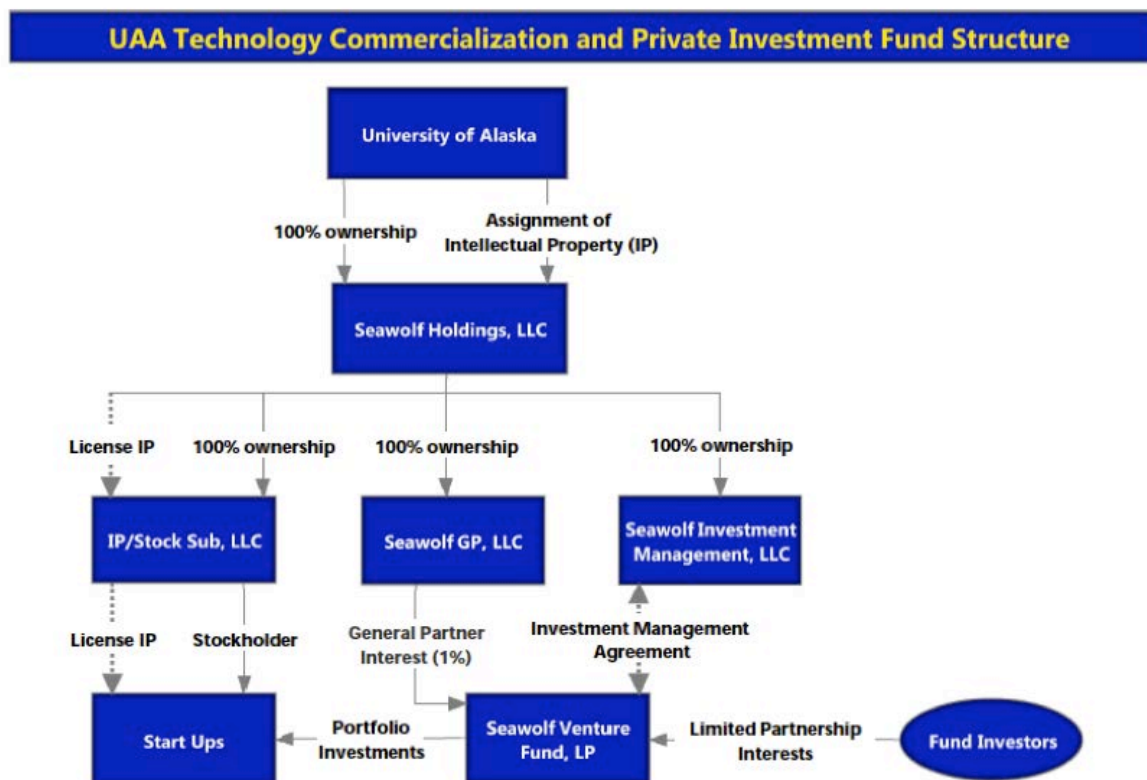
UAA

The Office of Research and Graduate Studies (ORGS) recently created an agile business infrastructure (see figure below) to commercialize technology based on faculty and student research. ORGS obtained UA Board of Regents approval on July 27, 2012. This infrastructure includes the Seawolf Venture Fund, LP, a for profit private equity fund, to provide early stage investment in technology companies created from advanced research, emanating from UAA's patent portfolio of innovative technologies and the

community, that will grow new business and attract investments to the region. These companies will generally be Alaskan companies based in Anchorage, and their technology areas include: biomedical devices, remote monitoring and surveillance, large distributed wireless sensor networks, therapeutic pharmaceuticals, and biometrics. Seawolf Venture Fund has already received a “letter of intent” for a \$1.5 million investment, and the target fund size is between \$10M and \$15M, with investors from venture capital investment firms, angel groups, individuals, and corporations.

The purpose of Seawolf Holdings, LLC, is to provide a corporate interface between UAA and its enterprise companies, to protect the university – limit its liabilities, license IP, and manage the subsidiaries. The president is Dr. Helena Wisniewski, and its Board of Directors consists of experienced senior level executives, members of board of directors of publicly traded companies, and managing partners of venture firms.

To recognize and incentivize faculty, ORGS established the “Patent Wall of Fame,” with its first inductees in December 2011. Since January 2012, the number of Invention Disclosures from faculty and students increased to 16, in contrast to 3 the previous year. Many of these invention disclosures have evolved into patents pending. The disclosures and patents pending are in biomedical devices, remote monitoring and surveillance, large distributed wireless sensor networks, potential therapeutic pharmaceuticals, and biometrics.



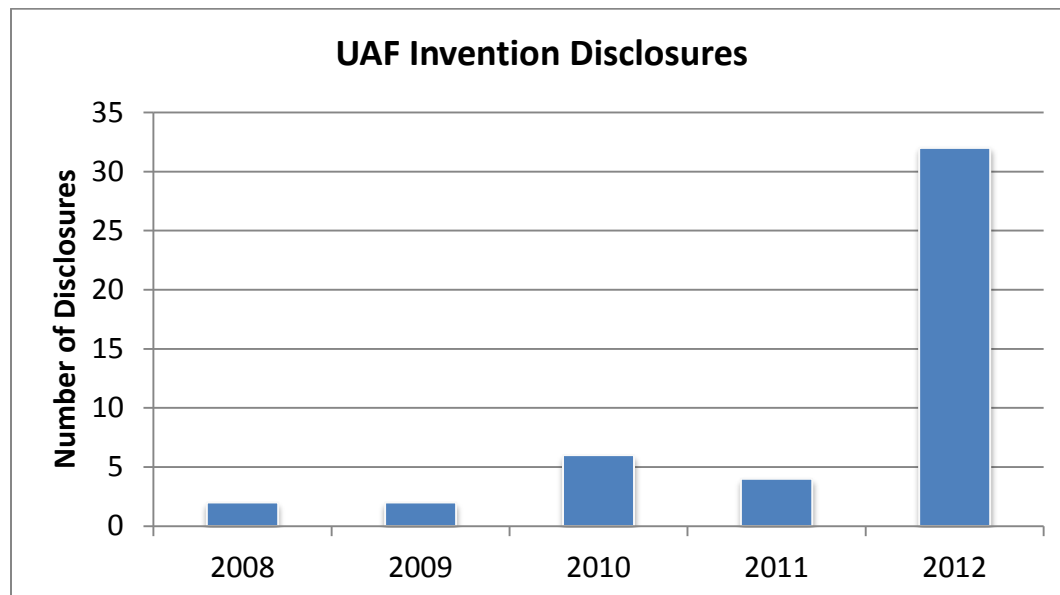
UAF

The UAF Office of Intellectual Property and Commercialization (OIPC) protects inventions created by faculty, staff, and students. To begin OIPC's first full year of operation during Fiscal Year 2012, OIPC implemented a strong inventor engagement strategy. As a result, UAF inventors disclosed 32 new inventions to the office, a four-fold increase over previous years on record.

OIPC strives to create an environment conducive to the creation and protection of intellectual property. OIPC assists with the execution of a variety of intellectual property agreements in order to grow the amount of university-owned intellectual assets. In Fiscal year 2012, OIPC reviewed 48 contracts and proposals for intellectual property language. Further, OIPC executed 19 non-disclosure agreements, one collaborative research agreement, and one material transfer agreement. OIPC filed three provisional patents and prepared three provisional patents in that year.

OIPC markets UAF inventions, and licenses these inventions to businesses. In its first full year of operation, OIPC executed four open source licensing agreements and one proprietary license agreement. The University of Alaska Fairbanks recently signed a commercial licensing agreement that gives the California-based software company SeaSpace exclusive use of SwathViewer, software developed at UAF's Geographic Information Network of Alaska by student Dan Stahlke.

In September 2012 the UA Board of Regents approved the creation of a UAF Research Foundation, a vehicle that will help streamline the process of commercialization by enabling the creation of startup companies.



The Future of UA Research

As illustrated in the report, UA research is thriving. However, there are significant challenges ahead. UAF, UAA, and UAS will strive to contribute to the UA Strategic Directions Initiative, but because about 60% of the research at all three institutions is supported by federal grants and contracts, the expected

cuts in federal spending will have a significant negative impact. The Association of Public and Land Grant Universities (APLU) has assessed the total impact of Sequestration (as it is currently designed) on university research funding (<http://www.scienceworksforus.org/>). For Alaska the projected funding loss in the first year is \$8.3M, nearly all of which would fall on the University of Alaska.

At present it is impossible to accurately predict how much or when research funding will be cut by specific agencies, and whether the across-the board Sequestration will be implemented or more targeted cuts will be enacted by Congress. Further, the funding cut taken by an agency is only part of the story; some agencies may cut grants more in order to preserve their own core programs. So, only a broad outline of mitigating strategies can be provided.

- Monitor funding changes to agencies and specific programs within agencies. Provide advice to researchers on where the best opportunities may exist, recognizing that researchers are specialized and cannot dramatically change their lines of inquiry.
- Foster interdisciplinary research, as that is a focus of major federal programs.
- Submit the best proposals possible. Provide PIs with assistance to improve proposals, especially for large, multi-investigator proposals.
- Partner with other universities for large grants.
- Submit funding requests to international and non-traditional funding agencies.
- Strive to hire and retain the best possible faculty researchers; only the best will be successful competitors for federal funding.
- Increase the focus on applied and translational research, to the extent that new funding streams (or increasing funding streams) for such research can be developed.
- Continue to work with the State to identify areas where UA can meet state needs, with State support.
- Continue to build our portfolio of commercially viable research.
- Focus on partnerships and grants from industry.