The College of Natural and Applied Sciences is committed to a systematic assessment of student learning outcomes. Over the years we have consistently collected data and reviewed it on a regular basis. These reviews were part of departmental annual reports, seen in curricular change recommendations, and strengths listed for various departments. This report summarizes our work over the past year to include program learning outcomes and curricular maps for each program.

CNAS Vision - The College of Natural and Applied Sciences at Missouri State University seeks to be recognized regionally and nationally for teaching, scholarly productivity, professional and community service, and our outstanding students and alumni.

CNAS Mission - The College of Natural and Applied Sciences develops educated persons who, upon graduation, are prepared to make sound decisions relative to the natural and applied sciences and society and to be productive and successful in their careers – our commitment to public affairs. We are committed to excellence in teaching, research and scholarly activities, and community and professional service.

CNAS Shared Values - We value our students and their success; hands-on learning (applied and practical); academic rigor and critical thinking; faculty, staff and administrators; excellence in teaching, research and service; ethical behavior; our research endeavors; our community, alumni and friends; and continuous improvement.

As of June of 2012 every department has a comprehensive assessment plan. Following an August 31, 2012 CNAS Assessment Retreat – all comprehensive plans and their annual reports will be posted on the CNAS website. The comprehensive assessment plans were defined as including: department (program) vision/mission statement; public affairs student learning outcomes for programs (typically the same for all programs in the department -one for ethical leadership, one for cultural competence and one for community engagement); discipline specific student learning outcomes for each program; curricular maps for each student learning outcomes (SLO)
showing where each SLO is introduced (I), reinforced (R), and emphasized (E); lists of direct and indirect measures to assess each SLO; report of measures from previous year. What was learned from the assessment? What changes, if any were made in the curriculum, based on the data?; and action plan for the coming year? Which SLO’s will be measured in the current year? Each program should pick one public affairs SLO and at least three discipline specific SLO’s each year. Do not measure all SLO’s each year!

Since all departmental assessment plans will be posted in September of 2012, I will just report on their lists of learning outcomes in this document.

**Biology**

General Student Learning Outcomes for all biology majors -

- Describe living systems, including their nature, organization and evolution
- Apply methods of scientific inquiry in biology
- Describe how human activities affect the living world and the physical environment (note: related to public affairs)
- Describe the flow of energy and matter within and among organisms
- Explain the historical context of biological discoveries
- Evaluate information by discriminating between science and non-science
- Evaluate & interpret quantitative data using the scientific method
- Practice safety and proper techniques in the laboratory
- Write accurately and clearly about biology topics
- Explain why science is an integral activity for addressing social and environmental problems (note: related to public affairs)

Unique SLO’s for Comprehensive major in Microbiology and Biotechnology

- Explain the flow of genetic information
- Perform dimensional analyses (dilutions etc.)

Unique SLO for Comprehensive major in Environmental Biology and Evolution

- Explain how resource limitation influences populations.
Unique SLO for Comprehensive majors in Wildlife Biology and Wildlife Conservation & Management (interdisciplinary major with Agriculture)

- Explain how organisms are interdependent
- Describe the diversity of life

Chemistry

General Student Learning Outcomes for all chemistry majors -

- Students will demonstrate an understanding of major concepts in all five major disciplines of chemistry: analytical, biochemistry, inorganic, organic and physical.
- Students will employ critical thinking and the scientific method to design, carry out, record and analyze the results of chemical experiments.
- Students will demonstrate proficiency in the use of appropriate instrumentation to collect and record data from chemical experiments.
- Students will demonstrate proficiency in the use of appropriate library searching and retrieval methods to obtain information about a topic, chemical, chemical technique, or an issue relating to chemistry.
- [Public Affairs] Students will demonstrate proficiency in writing and speaking about chemistry topics in a clear and concise manner to both chemists and non-chemists according to professional standards.
- Students will know and follow proper procedures and regulations for safe handling, use, and disposal of chemicals.
- Students will demonstrate an awareness of the impact of chemistry on the environment, society, and other cultures outside the scientific community.
- Students will effectively and respectfully communicate and collaborate with colleagues.
- [Public Affairs] Students will contribute their own knowledge and experiences to their community and the broader society by participating in professional and/or community activities.

Unique SLO for B.S. in Chemistry Education

- Students will demonstrate an understanding of the important aspects of managing a high school chemistry laboratory, including chemical hygiene plans, preparation of materials, and maintenance of chemical stores and equipment.
Students will demonstrate the ability to effectively utilize a variety of teaching techniques and strategies in the classroom in order to positively influence student learning.

Unique SLO for B.S. in Chemistry – Comprehensive – Biochemistry
- Students will demonstrate understanding of structure, chemical properties, and reactions of the biomolecules and their biopolymers

B.S. in Chemistry – Comprehensive – Graduate School
- (met by core SLOs – no additional SLOs for this program)

B.S. in Chemistry – Comprehensive – Industrial
- (will be addressed in the future – no differentiated coursework at this time)

**Computer Science**
General Student Learning Outcomes for all computer science majors -
- Students will recognize techniques of leadership of small groups in technical activities and production, including time management, estimating, and risk mitigation as applied to software development.
- Students will interact effectively and respectfully with people from diverse backgrounds and cultures and will be able to work through conflicts with civility. Aspects will include communication styles and effectiveness, workplace and co-worker issues, etc.
- Students will recognize societal issues specific to the discipline of computer science, such as software correctness, availability and accessibility, and privacy.
- Students will attain an ability to apply knowledge of computing and mathematics appropriate to the discipline
- Students will attain an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
- Students will attain an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- Students will attain an ability to apply knowledge of computing and mathematics appropriate to the discipline
- Students will attain an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
- Students will attain an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- Students will attain an ability to function effectively on teams to accomplish a common goal
- Students will attain an understanding of professional, ethical, legal, security and social issues and responsibilities
- Students will attain an ability to communicate effectively with a range of audiences

**Mathematics**

General Student Learning Outcomes for all mathematics majors -

<table>
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<th>Outcomes</th>
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<tr>
<td>Public Affairs Ethical Leadership: Students will demonstrate the ability to think critically, research, and reason.</td>
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<td>Public Affairs Cultural Competency: Students will recognize and differentiate among diverse cultures through the history of mathematics.</td>
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<tr>
<td>Public Affairs Community Engagement: Students will engage in activities directly benefitting the broader community.</td>
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<tr>
<td>Undergrad degrees in MTH: Students will demonstrate an understanding of the common body of knowledge in mathematics.</td>
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<tr>
<td>Undergrad degrees in MTH: Students will demonstrate the ability to apply analytical and theoretical skills to model and solve mathematical problems.</td>
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<tr>
<td>Undergrad degrees in MTH: Students will demonstrate the ability to observe and model ethical leadership, interact with cultural and social diversity, and provide direct community engagement.</td>
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<tr>
<td>Undergrad degrees in MTH Education: Students will demonstrate the ability to effectively utilize a variety of teaching techniques and classroom strategies to positively influence student learning.</td>
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<tr>
<td>Graduate degrees in MTH: Students will have an in-depth understanding of at least one subfield of mathematics (applied math, analysis, algebra, or statistics).</td>
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<tr>
<td>Graduate degrees in MTH: Students will have experience in math research, writing, and presentation, either by completion of thesis or at least two seminars.</td>
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Graduate degrees in MTH Education: Students will demonstrate the ability to effectively utilize a variety of teaching techniques and classroom strategies to positively influence student learning.

Hospitality and Restaurant Administration
General Student Learning Outcomes for all HRA majors –
- Students will demonstrate an understanding of leadership theory and the relationship between ethical leadership, corporate culture, and performance.
- Students will interact effectively with people from diverse backgrounds and cultures.
- Students will engage in community activities directly benefitting the broader community.
- Students will acquire and demonstrate a comprehensive understanding of hospitality industry knowledge.
- Students will engage in learning activities that provide a foundation for the management of foodservice operations.
- Students will engage in learning activities that provide a foundation for the management of lodging operations.
- Students will acquire an understanding of the importance of tourism and the hospitality industry’s role in supporting this vital economic force.
- Students will acquire, integrate, and evaluate a core set of business skills necessary to successfully operate a hospitality organization.
- Students will demonstrate effective written and oral communication.
- Students will demonstrate quantitative reasoning and critical thinking skills needed to make sound business decisions.

HRA Student Learning Outcomes for Options
FBSLO:
- Students will engage in learning activities that provide an understanding of production flow, pricing, purchasing, inventory, and cost control strategies necessary for operating efficient, profitable food and beverage operations.
- Students will demonstrate appropriate planning, production, safety, and maintenance procedures in food and beverage operations.
- Students will acquire an understanding of legal and human resource concerns in food and beverage operations.
Students will utilize research and analytical skills to understand customer and market trends in the food and beverage industry.

**LSLO:**
- Students will recognize and analyze critical issue, current challenges, and customer and market trends the in lodging industry.
- Students will determine and execute managerial functions necessary to effectively and profitably manage lodging operations.
- Students will acquire, integrate, and evaluate yield, sales, revenue management, and cost control strategies necessary for operating efficient, profitable lodging operations.
- Students will engage in learning activities that provide an understanding of design, layout, and maintenance strategies of lodging facilities.

**SLSLO:**
- Students will acquire the ability to develop and implement strategic and operational initiatives for continuing care retirement communities.
- Students will develop an understanding of the larger effects that aging has on extended families.
- Students will acquire an understanding of the physical, social, and economic concerns and challenges faced by an aging population.
- Students will demonstrate appropriate planning, production, safety, and maintenance procedures in food and beverage operations.

**CMSLO:**
- Students will acquire the ability to develop and implement strategic and operational initiatives for private clubs.
- Students will develop an understanding of the structure, organization, financial strategies and customer trends in multiple components of private club operations.
- Students will acquire an understanding of legal and human resource challenges in the private club segment.
- Students will demonstrate appropriate planning, production, safety, and maintenance procedures in food and beverage operations.

**TSLO:**
- Students will gain an understanding of the social, economic, environmental, and political forces that influence the tourism industry.
Students will engage in learning activities that focus on the role, significance, and impact of sustainable tourism.

Students will utilize research and analytical skills to understand the interdependence of hospitality businesses and destination development.

**GOSLO:**
- Students will acquire the ability to analyze managerial and operational challenges involved in planning and deploying functions in the hospitality industry.
- Students will engage in learning activities that focus on strategic and operational issues in the hospitality industry.
- Students will utilize research and analytical skills to understand the interdependence of hospitality businesses and destination development.

**Physics, Astronomy and Materials Science**
General Student Learning Outcomes for all physics majors –

- Students will be able to identify and apply ethical principles within the fields of physics, astronomy and materials science.
- Students will analyze the role of culture in the application of science to societal problems.
- Students will demonstrate community engagement for the promotion of science.
- Students will demonstrate an understanding of core knowledge in physics, including the major premises of classical mechanics, Electricity and Magnetism, and Modern Physics.
- Students will demonstrate written and oral communication skills in presenting physics-related topics.
- Students will design and/or conduct an experiment (or series of experiments) demonstrating their understanding of the scientific methods and processes. Students will demonstrate an understanding of the analytical methods required to interpret and analyze results and draw conclusions as supported by their data.
- Students will demonstrate proficiency using a variety of laboratory instruments in the acquisition, analysis, and interpretation of the data.
- Students will utilize a wide range of printed, electronic, and information technologies to support their research on physical systems and present
those results in the context of the current understanding of physical phenomena.

- Students will demonstrate understanding of analytical/numerical techniques and their applicability for modeling physical systems.

**Geography, Geology and Planning**

General Student Learning Outcomes for all geology majors –

- Acquire an understanding of and appreciation for the relationship between geology and cultural competence
- Acquire an understanding of and appreciation for the role that geology can play in community engagement
- Develop the ethical aptitudes and dispositions necessary to acquire and hold leadership positions in industry, government, and professional organizations.
- Acquire a solid base of knowledge in the science of geology as a whole
- Acquire a solid base of knowledge in the area of Earth Materials
- Acquire a solid base of knowledge in the area of Earth History
- Acquire a solid base of knowledge in the area of Sedimentation and Stratigraphy
- Acquire a solid base of knowledge in the area of Deformational Processes and Structural Features
- Acquire a solid base of knowledge in the area of Geomorphic Processes and Landforms
- Develop proficiency in the higher-order skill of conveying complex geologic concepts in clear, technically correct writing.
- Develop proficiency in the higher-order skill of orally expressing complex geologic concepts.
- (FOR COMPREHENSIVE GEOLOGY MAJORS ONLY) Develop proficiency in the use of analytical tools used in the practice of geology.
- Develop the aptitudes and dispositions necessary to help democratize society by obtaining and maintaining employment as a professional geologist

General Student Learning Outcomes for all planning majors –

The Planning program is accredited by the Planning Accreditation Board and all learning outcomes are defined by the PAB.

- Public Affairs Learning Outcome #1. Acquire an understanding of and appreciation for the relationship between planning and culture.
- Public Affairs Learning Outcome #2. Acquire an understanding of and appreciation for the role that planning can play in community engagement.
Public Affairs Learning Outcome #3. Acquire an understanding of and appreciation for the role that planning can play in ethical leadership.

General Student Learning Outcomes for all geography majors –

- Read, interpret, and generate maps and other geographic representations as well as extract, analyze, and present information from a spatial perspective.
- Understand through lectures but also local, regional, and/or international travel the interconnection between people and places and have a general comprehension of how variations in culture and personal experiences may affect our perception and management of places and regions.
- Have a general understanding of physical geographic processes, the global distribution of landforms and ecosystems, and the role of the physical environment on human populations.
- Have a general understanding of cultural geographic processes, the global distribution of cultural mosaics, and the history and types of interaction between people within and among these mosaics.
- Have a general understanding of global human population patterns, factors influencing the distribution and mobilities of human populations including settlement and economic activities and networks, and human impacts on the physical environment.
- Be able to think in spatial terms to explain what has occurred in the past as well as using geographic principles to understand the present and plan for the future.
- Have a general understanding of how the physical environment, human societies, and local and global economic systems are integral to the principles of sustainable development.
- Have a general understanding of the various theoretical and methodological approaches in both physical and human geography and be able to develop research questions and critically analyze both qualitative and quantitative data to answer those questions.
- Be able to present completed research, including an explanation of methodology and scholarly discussion, both orally and in written form and, wherever possible, utilize cartographic tools and other visual formats.

Goals specific to the BA in Geography Program:

- Develop a solid understanding of the concepts of “space”, “place”, and “region” and their importance in explaining world affairs
- Understand general demographic principles and their patterns at regional and global scales
Be able to locate on a map major physical features, cultural regions, and individual states and urban centers

Understand global and regional patterns of cultural, political and economic institutions, and their effects on the preservation, use and exploitation of natural resources and landscapes

Goals specific to the cultural and regional geography emphasis:

Develop a solid understanding of the concepts of “space”, “place”, and “region” and their importance in explaining world affairs

Understand general demographic principles and their patterns at regional and global scales

Be able to locate on a map major physical features, cultural regions, and individual states and urban centers

Understand global and regional patterns of cultural, political and economic institutions, and their effects on the preservation, use and exploitation of natural resources and landscapes

Goals specific to the geotourism emphasis:

Be able to demonstrate an understanding of the fundamental principles, concepts and knowledge of Geotourism from the perspective of the National Geographic Society’s guidelines

Be able to identify the principles, practices, and philosophies, which affect the economic, social, cultural, psychological, and marketing aspects of human travel and the tourism industry

Be able to articulate the key concepts and methods used to investigate and make sense of the role, significance and impact of tourism that sustains or enhances the geographical character of a place—its environment, culture, aesthetics, heritage, and the well-being of its residents

Be able to demonstrate an understanding of the asset theory, cost-benefit analysis, tax policy impacts, and other economic and statistical aspects of tourism, approached from the elements in the Geotourism perspective

Be able to examine research designed to determine economic impacts of the Geotourism industry

Be able to evaluate the conflicting agenda of society’s various stakeholders and the need to reconcile environmental, economic and sociocultural concerns

Be able to critically examine community Geotourism issues and develop coherent solutions

Be able to demonstrate effective written, oral and visual communication skills to present these solutions
Be able to apply the principles of Geotourism to a local, regional or national community to develop a tourism policy and plan based on Geotourism parameters

Goals specific to the Environmental and Natural Resources Emphasis

- Understand the key concepts in physical geography of environmental systems, process linkages, variable scale, and “cause and effect” and how they relate to the influence of climate, geology, and human activities in shaping the earth surface.
- Be able to use accepted field, laboratory, geospatial, and statistical techniques to quantify the quantity, characteristics, and history of physical phenomena for geographic research and natural resources management.
- Be able to use the scientific method including critical thinking, sampling, hypothesis formulation and testing, and controlled experimentation to assess environmental problems, and be able to effectively communicate research objectives, methodology, results, interpretations, and conclusions in oral and written formats.
- Be able to synthesize geographic knowledge and apply innovative research strategies to solve problems in resource conservation, environmental change, and sustainable development within the community, region, and world.

Goals specific to the Geospatial Sciences Program

- Students will acquire knowledge of the foundations and theories of digital cartography, geographic information systems (GIS), and remote sensing.
- Students will acquire skills of applying spatial data analysis, feature extraction, and thematic mapping techniques to analyze biophysical or socioeconomic geographic information.
- Students will acquire the ability of working individually and as a team to develop and present a client-driven geospatial solution.

**Engineering** – The degrees for this program are granted by Missouri S&T and they are accredited by ABET. We help to support the assessment plans at Missouri S&T for these two programs to show that they are equivalent.

Primarily the student learning outcomes shown above are for undergraduate programs. We focused on those this year. Next year we will focus on the
SLO’s for each of our graduate programs. The SLO’s for all secondary education programs in the college are clearly articulated as part of the PEU program review process and have not been included in this report. The CNAS assessment goals for 2012-2013 include:

- CNAS Sharing Assessment Retreat – August 31, 2012 from 2-4 PM
  - All programs will share data and outcomes from the previous year.
- December 2012 – First drafts of SLO’s and curricular maps for graduate programs are due
- January 2013 – Sharing retreat of graduate program SLO’s and curricular maps
- March 2013 – Final drafts of graduate program comprehensive assessment plans.

All programs are required to submit an annual report choosing 3-5 SLO’s to collect data on for the coming year and reporting on the SLO’s that they collected data on during the previous year. In addition SLO’s and measures will be reviewed annually, with changes included in departmental annual reports.