Ecological Monitoring & Assessment (EMA) Program & Foundation

EMA’s Mission:

To affect a land ethic so that private and public land managers have science-based knowledge and technologies to support the sound stewardship and conservation of their lands and natural resources.

EMA’s Foundational Principles:

• The highest quality ecological, social and conservation science is needed to guide wise stewardship of the natural resources on all lands.

• Wise stewardship is needed to mitigate threats to the integrity of environmental systems from land use change, habitat loss and fragmentation, contaminants, climate change, and the invasion of non-indigenous species.

• Accurate, comprehensive and timely information on populations, communities and habitats is crucial to understanding and minimizing threats to ecological and natural resources.

“A land ethic . . . reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land. Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity.”

- Aldo Leopold
A Sand County Almanac
What We Do

The Ecological Monitoring & Assessment Program & Foundation fosters collaborative research partnerships between public and private resource managers, researchers, students, and the public in order to understand and sustain the lands of the Colorado Plateau. The EMA Program is dedicated to creating relationships between the diversity of stakeholders in the southwest to support informed public policy.

Ecosystems are defined by their complexity—vast webs of interconnectedness define the biosystems of the planet. Societies - the entities which create the policies that govern land usage - are just as multi-faceted and extend far beyond the narrow focus of delineated academic fields. Therefore, environmental issues are doubly complex. They exist at the interface of the social and natural sciences and humanities. EMA is committed to an interdisciplinary research approach which takes into account the intricate relationships that exist between humanity and the natural world.

Each program functions on the basis of the writing of the great conservation Aldo Leopold, a visionary scientist who promoted ethical land stewardship and sustainable natural resource policies.
The Ecological Monitoring & Assessment Program was very successful in 2006. Numerous projects and publications were completed and we established important collaborations between a diversity of partners.

The implementation of the Slide Rock State Park Program became a model partnership between an academic institution and an Arizona state park. The development of the project involved numerous students and provided much needed support to one of the state’s most popular parks. Project highlights included student-based service projects, an oral history of homesteader Thomas Pendley, orchard restoration, and a water systems evaluation. The efforts at Slide Rock State Park necessitated multidisciplinary participation from across Northern Arizona University.

The San Juan Science and Recreation Program has flourished. EMA provided valuable river experiences to NAU faculty, students, staff, alumni and other groups. We implemented our first annual thematic research project in 2006 to inventory the invasive Camelthorn plant along the river corridor. The study unified academic, research, and recreational users in pursuit of a common goal. Educational river adventures were provided by the Grand Canyon Youth Foundation.

The publication of Navigating the Green Road was a great achievement. This comprehensive guide to NAU’s environmental resources embodies the strength of the University’s environmental cornerstone.

The variety of people representing a wide array of interests who have generously contributed to EMA reflects the value of collaboration in a complex world. We continue to search for resources and funding to increase student involvement in research projects, internships, and scholarships. Student participation is crucial to the mission of our Program.

Our successes are dedicated the vision of the EMA Board of Directors, the continuing support of President John Haeger and NAU, and the passion and commitment of EMA’s staff and students. We look forward to the next year as we continue to embody the vision of Aldo Leopold’s land ethic and the EMA Program Mission Statement.

Thank you for your support, and your involvement as part of the EMA Program Team.

Karan English
October 2006
You can assist the Ecological Monitoring & Assessment (EMA) Program achieve its goal of fostering collaborative partnerships to implement responsible land stewardship policies for a more sustainable future in a variety of different ways:

• Make a donation. EMA is grant-based project supported primarily through Northern Arizona University and revenue generated by research projects and scholarships, so general funds are always appreciated.

• Contribute to the ongoing dialogue of defining research goals and discovering possible collaborative partnerships. EMA encourages stakeholders, including the interested public, to get involved in the creation and implementation of new projects.

• Provide a student research scholarship or internship. Students are Northern Arizona University’s greatest asset and largest base of extraordinary talent. Undergraduate and graduate students in every field across campus are looking for new ways to get involved in their community.

• Participate in a research project.

• Support the Wild Bill Ecological Center. The Center will offer thousands of students, educators, and researchers the opportunity to experience the natural world and will embody EMA’s achievement far into the future. A donation will make you part of the legacy.
The San Juan River permit, gifted to EMA in spring 2005, has been a catalyst that has generated numerous environmental research, education, and recreation programs. University students and faculty, local and regional community members and organizations have utilized the opportunities that the permit has granted.

HIGHLIGHTS:

• Awarded 8 NAU undergraduate students with a San Juan River Scholarship, giving them the opportunity to participate in a variety of river trips offered through environmental and recreational courses.

• Provided river trips through NAU Outdoors for NAU students and community groups including:
  • the NAU Rock Art class (ANT 355H) and Environmental Science of San Juan Basin class (ENV399)
  • the NAU Star Program (first generation and minority freshmen)
  • Friends of EMA (faculty, staff, students, and community members)
  • Grand Canyon Youth (local and regional school groups, Hopi cultural trip, River Rampage-Phoenix children with disabilities group).

• Established a partnership with the Bureau of Land Management in Southeastern Utah. Through this partnership we have developed science and recreation based programs that enhance the educational and research programs at NAU while assisting the BLM with improving the health and productivity of the natural resources of the Colorado Plateau.
San Juan River Science & Recreation Program

- Engaged the interest of 19 members of NAU faculty and staff in partnership with BLM from 12 different departments and programs including: Anthropology; Geology; Geography, Planning and Recreation Management; Environmental Sciences; the College of Arts and Letters; Research Greenhouse and Arboretum; Center for Environmental Sciences and Education; Environmental Education Outreach Program; Institute for Tribal Environmental Professionals; Hopi Cultural Preservation; Colorado Plateau Cooperative Ecosystem Studies Unit; and the Center for Science Teaching and Learning.

- Developed and prepared proposals for student research projects along the San Juan River corridor, the Indian Creek Climbing Area and the Cedar Mesa / Grand Gulch Recreation Area, all located within San Juan County in southeastern Utah.

- Implemented an annual thematic river program for the San Juan River corridor. During 2006 EMA focused on the inventory and mapping of Camelthorn, an invasive weed that is spreading throughout in the Southwest. This program involves the participation of groups using the San Juan River permit and provides students from NAU and surrounding communities with hands-on natural resource management and research experience.
In the spring of 2005, the EMA Foundation Science Advisory Panel identified conducting ecologically focused oral histories with residents of northern Arizona as a high priority. In the fall of 2005, EMA partnered with the Master of Liberal Studies Program (MLS) and Cline Library and offered an “Ecological Oral Histories” graduate seminar.

The seminar trained a diverse cadre of graduate students in ideas about land-use changes in northern Arizona. Each of the students conducted a detailed oral history with a long-time resident of northern Arizona.

- Eighteen interviews have been conducted to date. Interviewees include wildlife biologists, ranchers, foresters, and Native Americans from the Verde Valley to Page and from Peebles Valley to the Hopi Mesas.

- The interviewees relate observations from the 1930s to the present day and document ecological change in such variables as wildlife populations, vegetation patterns, water availability, weather patterns, and human interactions with the land.
Why Collecting Ecological Oral Histories is Important

- Oral histories complement traditional means of assessing ecological change, such as repeat photography and dendrochronology.
- Oral histories effectively integrate first-hand observations of long-time residents into the historical record, often in places not regularly visited by trained scientists.
- Oral Histories collectively provide an overview of broad-scale trends.
- Oral histories catalog the changes in human interaction with the environment through much of the 20th century.
- Oral histories answer questions not yet conceived of today.
- Oral histories provide future ecologists and historians an invaluable window into mid-20th century Arizona.

- The interviews are available to the public via Cline Library’s Colorado Plateau Digital Archives (www.nau.edu/library/speccoll). EMA plans to continue this project by collecting more oral histories from northern Arizona, making the edited transcripts available in published form, and, if funding can be found, working with the MLS Program to offer the “Ecological Oral Histories” seminar again.

- Funding for this project was provided by the NAU ERDENE Program, Master of Liberal Studies Program, and the Program in Community, Culture and the Environment, with support from Cline Library.

John Hays, rancher, Peebles Valley
One of the most important accomplishments that any environmental organization can achieve is educating future generations with the knowledge that they can make a difference and instilling within them a sense of responsibility, respect, and empowerment. EMA has embraced this duty and committed itself to student involvement with the understanding that we are ultimately working for their future. Fortunately, Northern Arizona University’s strong and diverse environmental programs, Flagstaff’s breathtaking natural beauty, and the endless opportunities for outdoor recreation attract an unusually high number of students dedicated to conservation and restoration. In 2005, EMA had the opportunity to involve students in several programs that provided various types of experiences depending on the individual’s interests, priorities, and goals.

NAU students [left to right] Ben Williams, Gina Robinson, and Ashley Mott relax along the San Juan River during the Environmental Science of the San Juan Basin (ENV399) course.
HIGHLIGHTS:

• In conjunction with NAU Outdoors, students had the opportunity to explore the San Juan River, either recreationally or as part of numerous academic and research-oriented classes, utilizing EMA’s river permit donated to NAU by Arizona Raft Adventures.

• To help offset the financial burden of hands-on field experiences, EMA established a need-based, competitive scholarship program. In 2005, eight students needing financial assistance were awarded with a San Juan River Scholarship. A second research-based scholarship is offered through the NAU Foundation.

• Students participated in several different service projects throughout the year. In 2005 and 2006, students assisted rangers at a clean-up day at Slide Rock State Park. EMA also partnered Outward Bound students with Flagstaff’s FireWise Program to restore fire damaged land in the Coconino National Forest.

• EMA provided internships for a number of different students. Colleen Morrison and Tracy Olmstead prepared a Feasibility Study for the Wild Bill Ecological Center. Matt Butters has worked extensively with EMA’s web design, and Art Simpson has been an integral part of a GIS-based photo history project of the Babbitt Ranches.

Catherine Woodwell is a first year master’s student at Northern Arizona University in the Liberal Studies Program. She recently graduated from NAU summa cum laude with a B.A. in Religious Studies. Her academic interest primarily focuses on the environmental ethics that have influenced the policies of the Colorado Plateau region.

Art Simpson is an undergraduate senior Forestry major at NAU with an emphasis in Forest Health. Art’s work experience includes positions with the Oregon Department of Forestry and the USGS LANDFIRE program, and as a computer programmer. He is a recipient of the NAU Academic Scholarship and the National Science Foundation Academic Scholarship.

Matt Butters is an undergraduate senior in Computer Information Systems with certificates in Web Development and Database Systems. He enjoys soccer, paintball, and camping. Matt plans on utilizing his skills to become the CEO of a Web Development Company.

Kyrie Thompson received her MA in Applied Sociocultural Anthropology at NAU in May 2006 focusing on environmental and educational anthropology. Kyrie completed the Ecological Oral History interview with Tom Pendley, Slide Rock State Park homesteader.
Partnerships

Slide Rock State Park is one of the crown jewels of the Arizona State Park system. With some of the highest summer visitation levels in the system, the park staff must contend with visitor management as well as with maintaining a water supply for irrigation of the heirloom orchards, preserving historic buildings, and maintaining access to scenic Oak Creek which is visited by recreationists, photographers, birders and hikers.

Over the past year, EMA has worked with Slide Rock State Park staff to develop a unique partnership. This partnership has focused on the following:

- **Water Systems Evaluation.** EMA is working with Charlie Schlinger from NAU's Civil and Environmental Engineering Department to develop a Water Systems Evaluation for the Park. Components of the Evaluation include completing a Water Budget, an Irrigation Water Supply Analysis, an Irrigation Water Distribution Analysis, and a Storm Water Plan. EMA and Dr. Schlinger are currently working to secure funding for this project.
**Heritage Orchard Restoration.** NAU’s Center for Sustainable Environments (CSE) and EMA recently received an Arizona State Parks Historic Preservation Heritage Fund grant for the restoration of the Slide Rock State Park’s heirloom orchards. The grant is being used to fund the preservation of the cultivated fruit and nut tree heritage and genetic diversity through mapping, identifying and tagging trees, determining their health, taking cuttings and grafting them on rootstock to preserve the varieties; the grafted trees will be planted in historical locations.

**Pendley Oral History.** In 2006, EMA conducted an oral history interview with Tom Pendley who lived on the homestead before it became a park. This oral history provided valuable information about the varieties and locations of the orchard trees, as well as other historical information.

**Original Homestead Cabins.** EMA is working with Tom Rogers of NAU’s Construction Management department to develop a student project for the design and restoration of the original tourist cabins at the Park.

**Student Volunteer Clean-up.** EMA organized student volunteers to help park staff beautify the Park prior to the Apple Festival. We provided approximately 20 energetic and enthusiastic volunteers to complete necessary tasks. Additional volunteer clean-up days will be organized as needed.

**Apple Festival.** EMA and CSE assisted at the Festival and helped to secure other NAU vendors for this event. The Festival is a wonderful opportunity to share information about the importance of the orchard, the value of oral histories, and the role of fire in ecosystems.
In Arizona today, native grasslands with low shrub cover are now found on less than seven million acres, comprising 31 percent of current and former grasslands in the state. More than 15 million acres of native grasslands have been lost to shrub and tree encroachment, erosion and invasive, non-native plants due to poor range management practices, fire suppression, and human development.

- EMA partnered with The Nature Conservancy and the Arizona Game and Fish Department to produce the publication “The Importance of Grasslands in Northern Arizona”. This document was made available in late 2005. It provides the public with information about the importance of northern Arizona’s diminishing grasslands and explores management strategies for conserving and restoring these magnificent landscapes.
The Importance of Grasslands in Northern Arizona

• EMA organized a panel discussion entitled “Creating Successful Partnerships for Rangeland Conservation” for the Biennial Conference on Research on the Colorado Plateau, held in Flagstaff in November 2005. The panel consisted of representatives from organizations that had on-the-ground experience with rangeland partnerships. Participants included Whitney Tilt from the Sonoran Institute, Craig Conley from the Rowe Mesa Grasslands (Quivira Coalition), Peter Warren from The Nature Conservancy, and Tisha Muñoz-Erickson from the Sisk Lab at Northern Arizona University.

• EMA has a manuscript in review for publication in the Proceedings for the Biennial Conference.
EMA is working with land owners and facilitating studies for wind energy developers to enhance our understanding of the wind resource and the impact of wind development on biological and other natural resources. These projects are designed to provide land owners with data to determine the viability of the wind resource, compatibility of wind energy development with traditional land uses, and the impact of wind development on biological resources.

HIGHLIGHTS:

• In partnership with Sustainable Energy Solutions (SES) and the Center for Data Insight at NAU, EMA has created high resolution wind resource maps readily available to land owners and the public. Much of the valuable data developed by the SES group is accessible to the public via the Southwest Ecological Data System at www.EMAProgram.com.

• An avian and bat biological baseline study is being coordinated by EMA at the location of the proposed Sunshine Wind Park. Winter and spring bird surveys have been completed, and bat migration monitoring will continue through the balance of the year. The biological study is designed to characterize avian and bat use of the site and estimate the potential impacts the project may have on these species. In addition to providing survey coordination, EMA has facilitated stakeholder briefings for the studies.

• EMA is also facilitating conversations with various land owners, researchers, and policy makers in the evaluation of wind energy development to provide economic diversification. The information will help land owners address resource and ecological issues, and offer options for economic diversification.

Matt Johnson (right) and Chris Calvo (left) conduct avian inventory at the site of the proposed Sunshine Wind Park.
The land donated to Northern Arizona University by Babbitt Ranches will be the location of the Wild Bill Ecological Center, a living laboratory and gathering place for public and private landowners, scientists, ranchers, teachers, and students. The Center will be located just west of Flagstaff on a 24-acre parcel of Wild Bill Ranch and will serve as a research, education, demonstration, and training venue focused on issues of ecology. The building design will incorporate historical elements of the land as well as modern sustainable building practices and technologies.

Students and faculty with the NAU College of Business have developed a draft feasibility study for the Center. It is estimated that $2.2 million will be needed to develop and endow the Wild Bill Ecological Center. Funding will be used for construction, program activities, and ongoing operations.

The Wild Bill Ecological Center will contain the following elements:

- **A Gathering Place** to facilitate collaboration among the various groups interested in the lands of the Southwest.

- **Scientific Research** to collect ecological data for the use of present and future conservationists.

- **Breadth of Study** to engage in studies ranging from social values to the environment to global ecological issues.

- **Restoration** to reinforce the presence of native plants within the area and to help ensure the seed bank for future plant growth.

- **Demonstrate Alternative Land Use** to exhibit the options that exist for alternative use of ranch lands.

- **Sustainable Teaching Facility** to provide for water, power, and sanitation needs on-site and demonstrate sustainable building practices and technologies for both passive and active learning.

- **Highlight Indigenous Knowledge** to demonstrate historic Native American wisdom.

- **Highlight 20th Century Historical Influence** to demonstrate the effect of the cultural aspects of the site including ranching, logging, railroads, and historic building styles and techniques.
In the fall of 2005, EMA began working on a comprehensive guide to the environmentally related programs and organizations located at the University. Printed in early fall, the Guide facilitates interdisciplinary partnerships between diverse stakeholders, including students and private and public institutions looking to benefit from NAU’s vast resources. The Guide will open the door to discovering the endless collaborations available at Northern Arizona University.

- The Guide showcases more than 90 programs, organizations, and academic departments representing a diversity of interests such as air and water quality, ecological restoration, and cultural resources.

- Students will find the Guide especially useful. Sections are dedicated to environmental student organizations, course listings and program offerings. Students can quickly and easily access information regarding employment and internship opportunities at NAU through the contact information provided on each program page.

- Because Arizona is home to over 20 Native American cultures, NAU has developed into a leading institution for Native American affairs. Numerous cultural programs and institutions in the Guide focus specifically on Native issues.

- The Resource Guide also highlights the “green” buildings currently in construction at NAU, which will include sustainable features and seek LEED certification.

- Navigating the Green Road can be found online at www.emaprogram.com.
William Cordasco, President of the EMA Foundation and Babbitt Ranches, is committed to a progressive management program at Babbitt Ranches that emphasizes the need for a new economic model of sound land stewardship. Influenced by Aldo Leopold, Bill has been instrumental in developing Babbitt Ranches “land use ethic”.

Karan English is the Director of the EMA Program and Foundation Vice President. She also serves on the Arizona State Parks Foundation Board. Her career focus has been on sustainable design and development and building environmental partnerships. Before her tenure at NAU, Ms. English held several elected governmental positions, including in the Arizona State Senate and U.S. Congress.

Carl Fox is Co-chair of EMA’s Science Advisory Panel and the Vice President for Graduate Education at Montana State University. Carl has served as a research advisor to the U.S. EPA, U.S. Forest Service, and Department of the Interior. His research interests focus on assessing the effects of natural and anthropogenic factors on terrestrial ecosystems in the western U.S.

John D. Haeger, an EMA Director and President of Northern Arizona University, is committed to undergraduate education and supportive of the University’s efforts in research, graduate education, and distance learning. He also serves on the Board of Directors for the Translational Genomics Research Institute and Chair of the Governor’s Task Force on Teacher Recruitment and Development.

Joe Sharber is Co-chair of EMA’s Science Advisory Panel and EMA’s Foundation President, as well as the Director of Babbitt Ranches, and President of Cygnus Consulting Group. Mr. Sharber believes that better land stewardship requires a deeper understanding of the interactions between the biotic, abiotic and social factors affecting southwestern ranch lands.

Michael ‘Bobby’ D’Mura is an EMA Director and a member of the Board of Directors of Babbitt Ranches. He received his doctorate in Dental Surgery from the University of Southern California before joining the U.S. Army Dental Corp. Michael currently supervises and treats patients at the Arizona State Prison Complex at Perryville.
EMA Staff

**William Auberle** is a Professor of Civil & Environmental Engineering at Northern Arizona University and Research Director for the EMA Program. Bill is a Diplomat of the American Academy of Environmental Engineers, Fellow Member of the Air & Waste Management Association and serves as a member of the EPA’s Clean Air Act Advisory Committee. His research interests focus on environmental policy, sustainable development, air quality management, and environmental protection on tribal lands.

**Michele James** is the Research Program Coordinator for the EMA Program. Michele has worked for federal agencies including the U.S. Fish and Wildlife Service in Arizona where she was an endangered species biologist. She worked for the Grand Canyon Trust, a regional conservation group, where she ran the imperiled species program. Michele holds a B.S. degree in wildlife biology from Colorado State University and an interdisciplinary Masters degree from Northern Arizona University.

**Janet Lynn** is the Research Project Coordinator for the EMA Program and leads the San Juan Science and Recreation Program. A returned Peace Corps volunteer, Janet has worked with a diversity of cultures and organizations including public and private wildlife and land management entities in Arizona, New Mexico, California, Colorado, El Salvador, Panama, and Mexico. She holds a B.S. degree in wildlife biology from Colorado State University and M.S. degree in Forestry from Northern Arizona University.

**Pat Ponce** is the newest EMA employee, bringing with her over 20 years of office management experience. Pat has substantial knowledge of organizational management as well as time management. Pat has worked for the State of Arizona D.E.S., the City of Tucson, and NAU. She received an A.A.S. degree with an emphasis in office management from Lamson Business College. Pat is an avid quilter and motorcycle rider.
Robert Breunig has been the director of the Museum of Northern Arizona (MNA) in Flagstaff since 2004. Dr. Breunig worked at the Museum of Northern Arizona from 1975–1982 as the museum’s educator, curator, and head of the department of anthropology. Before returning to MNA, Breunig worked as the Chief Curator and Deputy Director at the Heard Museum, Executive Director of the Desert Botanical Garden in Phoenix, Executive Director of the Santa Barbara Museum of Natural History in California, as executive director of the Lady Bird Johnson Wildflower Center.

Wallace Covington is Director of NAU’s Ecological Restoration Institute and a Regents’ professor in Forestry. He has served as professor of Forest Ecology in the School of Forestry at NAU since 1984. He has received national and international recognition for his work in forest ecosystem health, restoration ecology, and fire effects on forest ecosystems. He was recognized as Outstanding Teaching Scholar by NAU in 1990 for his dedication to involving undergraduates in his research projects and bringing research results into the classroom.

Gary Nabhan is the Director of the Center for Sustainable Environments (CSE) at NAU. In his position, Nabhan is responsible for coordinating an array of environmentally oriented programs and initiatives which bridge the NAU campus with the surrounding region. He is also a tenured professor in Applied Indigenous Studies and the Center for Environmental Sciences and Education, and helps to oversee the Graduate Certificate program in Conservation Ecology.

Tom Sisk is an Associate Professor of Ecology at NAU. He received his Ph.D. in Biological Sciences from Stanford University in 1992. Dr. Sisk has also taught at Stanford University. In 2001, he was awarded the Aldo Leopard Leadership Program Fellowship. He runs the Sisk Lab of Landscape Ecology and Conservation Biology at NAU. The lab addresses conservation issues through basic and applied research in ecology.
Larry Stevens is an independent consulting ecologist and an adjunct faculty member of Prescott College and the Department of Biological Sciences at NAU. Stevens works closely with Grand Canyon Wildlands Council and is an Honorary Curator of Ecology and Conservation Collection at the Museum of Northern Arizona. He is an avid natural historian and river runner, and has spent the past 30 years engaged in ecological research on rivers in the American Southwest.

Tom Whitham is the Director of the Merriam-Powell Center for Environmental Research and a Regents’ professor in biology at Northern Arizona University. His research interests are population and community ecology, ecological genetics and plant-herbivore interactions. His recent work has focused on cottonwood riparian communities and pinyon-juniper woodlands.

Carl Fox: Additional information about Carl can be found in the Board section of this report.

Joe Sharber: Additional information about Joe can be found in the Board section of this report.

During this year, EMA has worked with the following agencies and organizations:
Master of Liberal Studies Program
Program in Community, Culture and the Environment
NAU Outdoors
Center for Sustainable Environments
Center for Environmental Sciences and Education
Sustainable Energy Solutions
Cline Library
College of Business
College of Engineering and Natural Science
School of Forestry
Bilby Research Center
NAU Greenhouse
Ecological Monitoring & Assessment Program & Foundation
P.O. Box 5845, Flagstaff, Arizona 86001
www.emaprogram.com (928) 523-0716