

Formation of the Sino-U.S. Centers for Soil and Water Conservation and Environmental Protection

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The Sino-U.S. Centers for Soil and Water Conservation and Environmental Protection (“Centers”) (University of Arizona, 2002), co-located at the Northwest Sci-Tech University for Agriculture and Forestry (NWSUAF) and the University of Arizona (UA), were formally established in a May 20, 2002, ceremony at the NWSUAF in Yangling, Shaanxi Province, China. The Centers are also designated a World Laboratory International Centre for Scientific Culture (International Centre for Scientific Culture, 2002). Establishing the Centers culminated a 1.5-year effort that was initiated by the NWSUAF, the U.S. Department of Agriculture’s Agricultural Research Service (ARS), the U.S. Department of the Interior’s U.S. Geological Survey (USGS), and the UA. The operation of the Centers is evolving, and will likely require years to reach its full potential.

NEED: The ability to achieve and sustain a healthy and functional environment fortifies a country’s economy and social structure and its ability to share experience and wealth for worldwide benefit. Inadequate attention to environmental conditions and poor or deficient application of land- and water-management technologies, coupled with increasing demands to occupy, use, and reshape the land, produce food, and manage water resources are barriers to using and sustaining natural resources. Water- and land-management practices in one region can have unintended and often deleterious consequences there or elsewhere (Gray and others, 2002; Wang and others, 1997). In China and the U.S., government agencies, educational institutions, and the business sector are addressing these concerns.

The Centers represent a formal mechanism for cooperation between Chinese and American scientists to develop improved theoretical and applied scientific techniques for conserving soil and water while ensuring protection of the environment. Much of the Centers research will focus on – but will not be limited to – arid and semiarid regions of China and the U.S.

MISSION AND RESEARCH THEMES: The mission of the Centers is to conduct research and develop scientific tools and technologies to attain the following goals:

- develop a better understanding of the processes that affect soil and water conservation and environmental protection,
- identify and (or) develop better management practices to conserve soil and water and protect the environment, and
- disseminate information, educate, and inform those who may use or expand upon the Centers’ accomplishments.

Toward these ends, the Centers will assemble, manage, and publish data and information resources for research, education, and public service under the following five broad categories:

Sedimentation Processes: Understand and predict the processes of wind, water, and gravity erosion, sediment transport, and deposition as they affect landscape stability, water quantity, air and water quality, agriculture, and the environment. Scales will range from farm fields to entire river basins.

Climate: Analyze and evaluate the interactions among climate and plant responses, soil erosional processes, and environmental quality. Research will include local, regional, and global scales.

Soil, Water, and Environmental Conservation: Assess the social, economic, and environmental factors that influence effective management for sustaining soil, water, and environmental resources. Research will include use of decision-support tools to predict the potential consequences of various management options.

Watershed Ecosystems: Examine watershed ecosystems to: (a) identify and model selected physical, chemical, and biological attributes of ecosystems, (b) identify reliable indicators of watershed ecosystem health, and (c) determine the susceptibility of watersheds to climate variability.

Agriculture and Environment: Understand and predict watershed productivity and water-resource capacity affected by land use, vegetative cover, and climate—and develop farming practices for semiarid lands to maximize water-use efficiency and agricultural production while minimizing adverse local and off-site environmental impacts. Research will include demonstration projects—vegetation restoration, for example—that exploit adapted plant resources and emerging technology.

ORGANIZATION AND OPERATION: China and the U.S. maintain "virtual" Centers, principally for coordination of activities distributed in participating agencies and universities throughout the respective countries. A Director heads each Center. The management structures accommodate the tenets, programs, and goals outlined in the Centers' Terms of Reference (University of Arizona, 2002). Signature agencies (University of Arizona, 2002) are designated to represent the Centers, liaise with appropriate agencies, advocate and voice interagency views for the Centers, as well as provide institutional leadership. The lead agency responsibility for China is shared between the Ministries of Education (MOE) and Agriculture (MOA). The U.S. signature agency alternates among participants. Each country coordinates, manages, and staffs participation in the Sino-U.S. Centers, and each Center manages and funds projects and other endeavors in its respective country. Additionally, each Center:

- assists U.S. and Chinese researchers in identifying funding opportunities, new projects, and research collaborators,
- arranges meetings and workshops under the auspices of the bilateral agreement,
- develops annual reports and other documents as directed by the respective Oversight Committees and lead agencies,
- serves as a point of focus for information on each Center and its individual and collective activities,

- maintains an agreed-upon scope of work consistent with objectives and Joint Oversight Committee directives, and
- maintains high technical standards through scientific review.

Joint Oversight Committee: A Joint Oversight Committee consisting of six members – three from each country – provides independent scientific review and guidance for the Centers. The Joint Oversight Committee meets annually, alternating between countries. The Chair position alternates yearly between China and the U.S., with a Vice-Chair from the U.S. when China holds the Chair and vice versa.

The Joint Oversight Committee:

- maintains cognizance of the activities of the Centers,
- develops long-range plans and scopes of work,
- maintains procedures for proposal and project review and for visiting scientist and student exchange programs,
- assesses and prepares annual reports of progress and plans,
- conducts 5-year reviews of the Centers, and
- administers the bilateral agreement between the two countries, and collaborates in joint press releases, public relations, and activities to promote the Centers, including publication and open access to data and information.

Periodic critical program review and guidance are obtained from independent scientific panels appointed by the Joint Oversight Committee. The panels advise and report to the Joint Oversight Committee on such matters as:

- the Centers' scientific plans and overall scientific integrity,
- new research themes,
- participation in international research programs,
- strategies to publish results in peer-reviewed, widely accessed technical journals, and
- proposal review and approval

Proposals for research undergo technical peer review in a process endorsed and monitored by the Joint Oversight Committee. The process generally follows those of the respective National Science Foundations, including at least three technical reviews for each proposal.

Scientific Steering Group: To assist in the above functions each Center maintains a Scientific Steering Group to advise the Centers Directors and the Joint Oversight Committee. The Scientific Steering Groups, comprised of scientists knowledgeable of the principal research themes of the Centers but who do not participate in Centers-related research, are a resource for technical review and guidance. The Scientific Steering Group is consulted by the Directors of the Centers for specific review and for advisory and representational purposes. Members are nominated by the Directors of the U.S. and China Centers and are appointed by their respective Oversight Committees.

Formal Programs: Three formal programs designed to enhance collaboration through the Centers are proposed. The Visiting Scientist Program facilitates exchanges of scientists who may be guest lecturers, project participants, invitees to conferences and workshops, or members

of technical review teams. The Student Exchange Program provides competitive foreign travel opportunities for students to participate in college-level course work, joint research, writing of joint papers and proposals, preparing and sharing working databases, and other activities considered appropriate and desirable under the Centers. The Private Sector Training Program provides a mechanism for private industry, agriculture, and commerce to participate in and benefit from the research of the Centers. The Joint Oversight Committee seeks opportunities for training in the private sector for students and participating researchers who wish to obtain practical experience and a better understanding of the communities that apply research results. Private-sector personnel are encouraged to develop cooperative-research and product-development agreements with the scientific community.

Information Access and Publication: Publication and open access to data and information are fundamental to the Centers' credibility and function. All data produced under the auspices of the Centers are available to the research community at large for free, or where appropriate, for the cost of reproduction and transmittal. Both U.S. and China Centers maintain websites posting ongoing projects and plans, project highlights, data holdings, and the means by which they may be accessed. Each website contains directories of data and contact points for participating laboratories, agencies, educational institutions, projects, and other potential sources of information and resources. Both Centers encourage publication of data and information, organization of technical sessions in national and international meetings, and responses to information needs.

The Centers also collaborate in maintaining a Centers' Website with specified standards for presentation of the individual and joint websites. The joint website provides a common entry for public access to general information, program plans, and key research results.

INITIATION OF PROJECTS UNDER THE AUSPICES OF THE CENTERS

The formal mechanism for selecting and supporting Chinese-U.S. joint research projects under the auspices of the Centers is in development. A Scientific Steering Committee consisting of John R. Gray (USGS, Reston, Virginia), Chi-hua Huang (ARS, West Lafayette, Indiana), William Sprigg (UA, Tucson, Arizona) and others to be nominated will solicit proposals that can be listed as charter projects under the U.S. Center. In addition to forming the basis for determining the technical merits of the proposed research project, the proposals represent a source of information on Centers activities and serve as links to participants, programs and resources. They will also be used as a basis for development of a project directory. The project directory will serve researchers, administrators, and the public alike and be used by the Centers' for planning, identifying partners, and reporting. Statistics based on support provided to principal investigators will be used as a guide for determining levels of support across key research themes and objectives, and used to evaluate future funding requirements.

More information on the proposal process and other progress associated with establishment of the Centers will be added to the Centers' Website (<http://www.ispe.arizona.edu/sino/>) when available.

A PROPOSED CENTERS' PROJECT – An International Watershed Research Network:

Because research, education, management, and outreach for activities within the earth sciences require reliable landscape data, an initial objective of the Joint Oversight Committee is to establish the concept for an “International Watershed Research Network”. The primary goal of the Network is to provide consistent, quality-assured hydrologic, geomorphic, agronomic, climatological, and biological data, both archived and actively collected, to staffs of the Centers and to serve the research community at large. Additionally, the Network should provide valuable information for ameliorating physical, chemical, and biological sediment damages worldwide; such damages are estimated to total \$16 x 10⁹ annually in North America alone (Osterkamp and others, 1998).

The Network will be patterned largely after the Vigil Network, hosted by the USGS (Leopold, 1962; Osterkamp and Emmett, 1992). The Vigil Network is a system of sites and small drainage basins where long-term geomorphic, hydrologic, and biological data are collected periodically, the information being added as an update to the accumulating data file. The Network likely will include characteristics envisioned by Osterkamp and others (1992; 1998), Trimble and Crosson (2000), and Gray (2002) for fluvial-sediment monitoring and research in the U.S.

The International Watershed Research Network will initially be comprised of gauged (instrumented) sites on watercourses in water-deficient areas at which relatively long-term records of reliable (validated) data have been collected. Initial preference will be placed on established research sites and watersheds in China and the U.S. The establishment of the Network initially requires agreement among Chinese and American representatives for criteria of watershed selection, protocols and responsibility for data collection, network construction, and testing of protocols at selected watersheds. These criteria and protocols would then be available to experts worldwide for review. Descriptions of principal global data sets relevant to the Centers' interests will be compiled, partly to aid in selection of watersheds for the Network, and partly to add resources for the Centers' research. A conference to establish these prerequisites for a gauged-watershed network has been proposed, and the spring 2003 meeting of the American Geophysical Union is slated to hold a special session, “An International Watershed Research Network”.

The Network, initially conceived to be comprised of watersheds up to approximately 1000 km² in area, will assist in developing standards for observation systems, data management, and information access that will allow intercomparisons of watershed processes worldwide. Prior to the formal establishment of the Network, it is considered essential to (a) identify and select candidate watersheds for the Network, (b) identify acceptable, and preferably, consistent techniques for the collection and dissemination of data, and (c) specify other data sources on erosion, sediment transport, hydrology, climate, vegetation, and other information of probable interest to and use through the Centers. Preparations identified as mandatory before an International Watershed Research Network is implemented include:

- establishing of selection criteria for watersheds that are either presently gauged or are to be gauged by representatives of the Centers and their designated points of contact,
- determining of standards for the types and quality of instrumentation to be maintained or installed at the various gauged watersheds,
- determining of protocols for data assembly, management, and access, and for

- designations of responsibility,
- selecting of a small number of charter watersheds to be included in the Network,
- identifying of reliable, quality-assured data sets that may contain erosion, sediment-transport, hydrologic, and related information useful to Centers researchers, and that may help guide selection of additional watersheds for the network, and
- planning for the testing of protocols at selected watersheds and the development of a consistent means for storage and dissemination of watershed data.

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