

DRAFT
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Matching the Land Grant University to a Global Mission: Addressing Internationalization of Water Programs at Colorado State University

Executive Summary

Colorado State University has a rich legacy of visionary leadership for international water programs dating back to the 1950s and culminating with the large USAID funded projects in Pakistan and Egypt in the 1980s. While these projects are long since completed, they created an enduring network of CSU graduates that are now highly placed in water and natural resource ministries around the globe. Renewing these international relationships, along with cultivating a strengthened network of CSU water faculty, will enable CSU to reinvigorate its international water presence to address the global water resources problems of the 21st Century.

The global issues related to water scarcity are only expected to increase, with transboundary conflicts, climate change and resource degradation further stressing ecosystems and limiting our collective economic well being. These new and increasingly complex problems require a renewed vision for international water research, education and outreach that can activate CSU faculty to engage in these increasingly urgent issues. At the heart of this vision is:

- 1) Creating an innovative educational program and enhanced effectiveness of outreach programs through distance learning,
- 2) Forming internal and external partnerships with international and federal agencies, and the private sector,
- 3) Facilitating research and education that influences both the scientific understanding of the resources and how they are managed, and the decision-making processes used to address competing societal values,
- 4) Encouraging faculty hires across programs/departments to meet critical programmatic needs,
- 5) Educating students to effectively address global water resource issues of the 21st Century,
- 6) Supporting existing faculty led activities and help facilitate greater entrepreneurship by CSU water faculty, and
- 7) Creating new mechanisms to meet the educational and professional needs of international water professionals, scholars and alumni.

One result of our past international water activities is a network of Colorado State alumni well positioned in water ministries and agencies around the world. Consequently, we maintain an outstanding reputation in international water professional circles as a

provider of basic and applied research, education, training and outreach. At present, Colorado State has a window of opportunity to leverage the international good will and faculty expertise created through these programs. However, many of the faculty experts and highly-placed alumni are nearing retirement age and we will lose the advantage this legacy affords CSU within the next five years if steps are not taken to reinvigorate our international water programs.

Given the urgency of global water problems and the need to leverage senior faculty and alumni before they retire from service, it is recommended that CSU immediately enact a program to reclaim our leadership role in water resources. This strategic plan outlines a series of programmatic steps that will take several years to implement and will build momentum over time. To get started, a couple of options appear feasible. The preferred option is to create the CSU International Water Institute and hire a regular or special faculty member on a part-time appointment to lead the Institute. That individual's task is to be the face of international water at Colorado State. One potential model is to provide partial salary support for a well-connected and energetic player in the international arena with the expectation that they will generate the remainder of their salary coverage through grants and contracts.

To immediately increase Colorado State's international water presence, we propose to host an International Water Symposium in the late spring or early summer of 2008, in conjunction with CSU Hydrology Days. The new Director and a reorganized faculty network would immediately launch an effort to attract funding for the event. A second, but less desirable option to launch the reinvigoration strategy as other funding components are sought, would require approximately \$35K and use existing resources and part-time help to conduct the 2008 International Water Symposium. We will use the Symposium as the initial mechanism to rally the faculty networks, launch a development campaign and renew alumni relations.

The goal of the proposed strategy is to enable CSU faculty to re-engage in international water research, teaching and outreach in a way that builds on our legacy and leverages the limited funding resources that are currently available. A major benefit will be the opportunity for undergraduate and graduate students to have a role in addressing complex problems while gaining a global view of natural resources management. CSU has a primary mission of developing the human and intellectual capital represented in the next generation of water resources scientists, engineers, managers and decision makers. Coupling our educational mission with a strong international research and outreach program increases our relevance and potential to command the attention of funding agencies and donors. Additionally, our international water efforts will primarily focus on the water resources problems of arid regions that are rapidly urbanizing – a situation similar to what we face in Colorado, thereby allowing us to better serve the needs of the State as we develop and test solutions for global 21st Century water resources conflicts and needs.

Key Recommendations for CSU's International Water Strategy

Short Term / Immediate

1. Convene the proposed International Water Faculty Network (IWFN) with an initial charge of developing a complete list of international water alumni and making contact with key influentials in foreign ministries and international funding agencies. Develop a strategy to aggressively pursue externally funded grants for international water projects and education.
2. Immediately begin working with the Alumni Association and the Office of International Programs to host a CSU faculty-led International Water conference in the spring or early summer of 2008, in conjunction with Hydrology Days.
3. Begin a development campaign to endow a Water Chair at CSU with emphasis on attracting an up-and-coming internationally recognized water expert to guide the International Water Institute. Prepare a proposal to appeal to a major donor based upon a redesign of CSU's water education and training programs to meet current and future critical issues in water management.
4. Appoint a faculty member to serve as the part-time Interim Director of the International Water Institute.
5. Prepare a brief prospectus describing CSU capabilities in international water research and training.
6. Organize an interdisciplinary seminar on international water issues and concerns for the Spring Semester 2008. The seminar can also be organized around invited speakers, including a number of key CSU 'water' alums. Webcast these seminars and other key CSU events to international audiences to begin marketing CSU to agencies and key global stakeholders and create interest in the 2008 International Water Symposium.

Intermediate to Longer Term

1. Establish a program of seed grants to support faculty for set periods of time as they seek international funding to stimulate greater participation, on the part of CSU, in international research and capacity building projects.
2. Provide funding for the Division of Continuing Education to launch a distance and continuing education initiative to build and deliver a global Internet based education and outreach program including: 1) water related curriculum at both the undergraduate and graduate levels, and 2) short courses and individual lectures.
3. Inventory and track all international faculty research, education and development projects at CSU, as well as all funding opportunities.

4. Set aside funding to engage more faculty in international water activities. In particular, travel funds to allow participation in ongoing and new international projects where there is opportunity to allow faculty and students to accompany PIs on trips abroad to participate in project work and international meetings.
5. Develop and implement a long term strategy to aggressively pursue international and federally funded grants for international water projects and education.
6. Create long-term partnerships and formal relationships with universities, research institutes, non-governmental organizations, private sector firms and other water oriented agencies to address key water resource problems and create educational linkages.

Matching the Land Grant University to a Global Mission: Addressing Internationalization of Water Programs at Colorado State University

Introduction

Global water issues reflect those of Colorado—rapid development, limited supplies, competition between human and natural needs, transboundary disputes, and the search for workable paradigms for water management. In Colorado these issues have unfolded for over a century, and the state has depended on CSU for knowledge-based solutions delivered through the Land Grant model. Today, across the state, many water quantity and quality issues are under study and need solutions, including those associated with growth and development, domestic supply, agricultural use, forest harvest, mining, and aquatic habitat. Colorado provides a unique real world classroom showcasing a wide range of water issues and solutions for semi-arid, water stressed environments.

In a report prepared for the United Nations titled *No Water, No Future*, the case is made that the entire world is in a “water crisis.” Global demand, climate change and resource degradation are expected to increase, stressing ecosystems and requiring long-term, innovative, and interdisciplinary solutions. According to UNESCO estimates, more than one billion people currently lack access to clean water and 2.6 billion lack access to basic sanitation. Water related extreme events, such as floods and droughts kill more people than any other natural disaster and water-borne diseases continue to cause the death of thousands of children each day. Transboundary disputes, the threat of terrorism and the potential impact of climate change underscore the fragile relationship between safe water supplies and global prosperity. Clearly, the capabilities of the next generation of water resources scientists, engineers, policy makers and water organizations are vital to the world economy, ecosystems, human health and well-being.

The issues revolve around sustainability, scarcity, conflict and vulnerability. The solution requires integrated water management in an uncertain future while maintaining the environmental quality that underlies economic prosperity. Sustainability requires balanced water supplies for humans and the environment, protection of water sources, and resolution of water conflicts at scales from local to global. Water scarcity requires new technologies and institutions for water sharing and efficiency, while conflict is best mitigated by knowledge of shared benefits. Vulnerability requires improved security against natural and human caused threats. *Colorado State University currently has the institutional capacity and the faculty expertise to recreate a world-class presence in integrated water resources management, but to achieve this stature we must make and implement strategic choices within the next few years.*

This proposal for an International Water Program offers a framework to focus the university’s interdisciplinary competencies in water-related scholarship and outreach, utilize its unique real world classroom—the state of Colorado—and build on its legacy to deliver valuable water knowledge for a sustainable future. The target audiences are

undergraduate and graduate students at CSU, national and international water professionals needing additional education to keep their skills current and water user organizations needing new skills to address future water issues.

The International Water Program strategy includes:

- Providing a visionary leadership structure to support faculty and department collaborations and innovative programming,
- Building disciplinary depth in concert with multidisciplinary breadth to understand focused problems and communicate across disciplines.
- Creating an innovative educational program and enhanced effectiveness of outreach programs
- Forming internal and external partnerships with international and federal agencies, and the private sector
- Facilitating research and education that influences both the scientific understanding of the resources and how they are managed, and the decision-making processes used to address competing societal values.
- Encouraging faculty hires across programs/departments to meet critical programmatic needs;
- Educating students to effectively address global water resource issues of the 21st Century
- Support existing faculty led activities and help facilitate greater entrepreneurship by CSU water faculty
- Creating mechanisms to meet the educational and professional needs of international water professionals, scholars and alumni.

Given the current funding realities in the international setting, a strategy based upon building capacity of human capital and developing organizational capacity (social capacity) is at the core of CSU's strengths, and this strategic plan.

Background

The state of Colorado continues to be a successful model for development of water resources in a semi-arid, water stressed environment. In the 19th century, techniques for water development were spurred by the mining industry and agriculture. The engineering of such development was quickly followed by the development of the necessary legal, organizational structure and knowledge base to make the system function effectively. The Colorado model was so successful that by the early 20th century it helped spawn the Reclamation Act and the creation of irrigated agriculture research, education and outreach through the land grant university system. Water development needs are still a priority today as Colorado faces the 21st century water challenges of water quality, environmental conservation and the water needs of an urbanizing society.

Colorado State University continues to be a major contributor to this ongoing development and utilization of the water resources in the state. From the beginning, Colorado State has contributed through research, education and outreach: 1) engineering expertise in design of systems (creation of the USDA Hydraulics Lab, 1912 and used to

design Hoover Dam) and accurate measurement of water (the Parshall flume in the 1920's); 2) development and dissemination of irrigated agriculture technology-an irrigation engineering curriculum was initiated in the late 1880's; 3) training of irrigation management systems personnel; 4) education of students who have gone on to successful careers in water and natural resources management.

Colorado State has a legacy of visionary leadership for international water programs. Our international water programs began in the mid-1950s, when Colorado State faculty helped develop graduate-level water programs at the University of Peshawar in Pakistan and in Afghanistan. In 1959, Colorado State helped establish the Asian Institute of Technology. Colorado State became active in international training and in 1967 established the International School for Water Resources. Colorado State faculty led several irrigation management projects in Egypt's Nile Valley including a \$25 million contract awarded by the Egyptian government.

However, today the era of large technical assistance water projects implemented by universities such as CSU appears to be over. Donors are moving away from large scale water development projects such as were funded by USAID in the past. CSU previously used this form of soft money to build institutional capacity but could not sustain international water capacity with base funding upon project completion. Today, private firms are successfully completing for water technical assistance projects and hiring CSU faculty as consultants when needed. Such an arrangement provides little in the way of benefit to the institution aside from short term budget gains when such faculty buy out their teaching responsibilities and limits exposure of students to some of our most talented faculty.

Today, CSU employs over 100 faculty in 22 separate departments that apply their disciplines to water and water-related topics. CSU 'water' faculty continue to work at the leading edge of water management science and technology, including specific topics as irrigation water conservation, institutional arrangements for sustainable water management, water quality management, sociology of water utilization, transboundary water management, salinity mitigation practices, decision support systems, and defining water requirements for healthy ecosystem maintenance. Colorado State University provides one of the most, if not the most, water 'rich' research and educational settings available anywhere in the world. The faculty teach over 150 water-related courses at the senior and graduate levels. Fort Collins and Colorado State are the home to six major Federal natural resource research laboratories including the USDA-ARS Water Management Unit.

One result of our past international water activities is Colorado State alumni well positioned in water ministries and agencies around the world. Consequently, we maintain an outstanding reputation in international water professional circles as a provider of basic and applied research, education, training and outreach. At present, Colorado State has a window of opportunity to leverage the international good will and faculty expertise created through these programs. However, most of the faculty experts and highly-placed alumni are at or nearing retirement age and we will lose the advantage this legacy affords

CSU within the next five years if steps are not taken to reinvigorate our international water programs.

Programming Focus

Internationalization of water programs at CSU should build on our strengths and focus on parts of the world where we can provide unique resources to address problems. Interdisciplinary assessment of water resource sustainability is an area of strength at CSU and we should build on the theme of enhancing human and organizational capacity. Presently, CSU’s actively funded international water programs that come through Sponsored Programs are quite limited. They include:

Sponsor Name	PI Name	Title	Project End	Total
University of Nottingham, England	Watson,C.	Flood Research Management Research Assistance	May-06	\$18,686
KOWACO-Korean Water Resources Corp.	Labadie,J.	Advanced Application of K-MODSIM Model for Basin-Wide Optimal Water Allocation and System Evaluation	Jun-07	\$186,408
World Wildlife Fund	Myrick,C.	Potential Impacts of Global Climate Change on Freshwater Fisheries	Mar-04	\$38,000
KOWACO-Korean Water Resources Corp.	Fontane,D.	Development of Real Time Water Resources Management System	Dec-04	\$239,360
Agencia Colombiana de Cooperacion Intl	Grigg,N,	Technical Assistance for Colombian Water Law	Oct-04	\$160,000
Horseshoe Bend Hydroelectric Company	Thornton,C.	Horseshoe Bend Model Study	Jun-05	\$139,827

To effectively compete and rebuild our international presence, CSU must by necessity focus on our competitive advantages, a few key issues and certain geographic areas to recreate the strategic position needed to attract the attention of public and private donors.

The semi-arid and water stressed regions of the world and emerging economies are the logical targets for CSU -- China, India, Brazil, and Vietnam, the Middle East and North Africa. Other strategic opportunities will develop as we focus on areas of strength. It would make sense to target a smaller number of strategic partnerships for CSU and funnel faculty efforts towards building those programs. Additionally, faculty need incentives to bring funding through CSU Sponsored Programs rather than as consulting agreements. This may require new, more entrepreneurial mechanisms to transfer international funds and negotiable indirect cost recovery rates.

Where appropriate and where the opportunity arises, CSU should develop international MOU's with universities and agencies in host countries. MOU's show linkage and are a way of building partnerships and relationships which could support educational and professional exchanges to enhance both partners and lead to funding opportunities. Additionally, these MOU's can help create PhD programs with hypothesis-driven research for the US PhD students that is coupled with international experiences at those places, and perhaps some "broad impacts" that include dissertation topics on important water issues or "problem-sheds" of those places as well.

Examples of proposed, current or recent MOU's include:

1) Asia:

South Korea – Collaborations with Dankook University in Seoul, South Korea and the Korea Water Corporation (KOWACO) have been very successful.

2) Europe:

Italy - Center for Environmental Research and Monitoring (CIMA) of the University of Genoa in Italy. This IMOU has been in place since 1999, and it has been quite successful. Several students and faculty from the University of Genoa have come to CSU and spent several months at a time working in Civil Engineering and Atmospheric Science. That IMOU has been renewed every three years since 1999.

Switzerland - Institute of Environmental Engineering at ETH-Zurich to establish an agreement of collaboration to exchange faculty, students, etc.

3) Latin America:

Colombia - School of Mines of the National University of Colombia in Medellín. Although that agreement expired several years ago, it would be relatively simple to restart it.

Puerto Rico - Currently, Jorge Ramirez is Co-PI on an NSF-funded biocomplexity grant for which the field sites are in the tropical rain forests of Puerto Rico. As a result of this project, we have a strong connection with the LTER site there, with the University of Puerto Rico, and with several Federal Agencies.

4) Middle East/Africa:

Egypt and Jordan – An agreement with the Centre for Environment & Development for the Arab Region & Europe (CEDARE) is currently being discussed with the Water Resources Program directorate.

Water Organizational Structure

A reinvigorated International Water Program at Colorado State should begin with a minor reorganization of water activities. A well functioning organizational structure will serve to achieve the larger University goals of multidisciplinary and interdisciplinary approaches as articulated in the University Strategic Plan. Further, it will facilitate the synergy, collaboration and cooperative efforts among scholars and professionals with

interests in common problems around water and promote this area of excellence at Colorado State as envisioned in the Supercluster concept. The goal is to make it easier for faculty to collaborate on international projects by providing support in obtaining grants and contracts, travel and international arrangements, short courses and other educational programs, providing office space and other arrangements for international visitors, and creating a network of scholars that can work together to reinvigorate our international water programs.

A water organizational structure at Colorado State can be crafted using the existing Water Center and Colorado Water Resources Research Institute (CWRRI) as building blocks. The Water Center, because of its broad overarching scope would be the most logical umbrella structure. The Water Center would eventually be led by an Executive Director who occupies the endowed Chair in Water envisioned by President Penley. This Executive Director would work in collaboration with the Center's Board of Directors. Under the Water Center, three units are proposed to address research, scholarship, outreach and international programs: 1) CWRRI, which serves as a model: a Director, overseen by a Board, with a clear mission and adequate funding; 2) a Water Extension and Outreach Unit, focusing on collaboration between faculty and Cooperative Extension; and 3) the International Water Institute, which is the focus of this paper.

The International Water Institute (IWI) would be led by a Director and advised by a Board consisting of representatives from each College at Colorado State with an interest in international water activities. Adequate support staff and budget should be provided, along with office space to house visiting scholars and alumni. The existing International School of Water Resources and the Sociology Water Lab could be folded into IWI to further enhance the supporting infrastructure. Additionally, strong linkages must be fostered with the Natural Resources Ecology Lab (NREL), Office of International Programs and *Engineers Without Borders*.

The charge to IWI is partially articulated in the University Strategic Plan:

- “international research and scholarship, institutional partnerships, the presence of more international scholars on campus,...events with global themes”
- “multidisciplinary approaches which link basic and applied research in new ways.”
- “bringing together disciplines in an interdisciplinary fashion to address critical issues”
- “innovative strategic partnerships in the United States and abroad, including agreements with international scholars and research institutes.”
- “Retired faculty and staff represent an increasingly important constituency for the university”
- “Engage alumni in meaningful ways in the university...establish and maintain lasting relationships with alumni that are mutually beneficial”

Success in attracting major donors and international funding in strategic areas that increase the overall effectiveness of CSU faculty and educational mission will require

more depth and some difficult strategic choices. To achieve this goal, the IWI would develop the following programs and thrusts, categorized under four broad categories:

Educational Innovation

- Maintain and develop Colorado State's scientific capabilities in the following broad areas, with emphasis on interdisciplinary approaches:
 - Integrated water resources management and water sustainability;
 - Institutional arrangements that support stable, fair and equitable development and use of water resources;
 - Irrigation water management and Agricultural systems;
 - Potable water, sanitation, infectious disease and related environmental health issues;
 - Accountability measures (indicators) that report on the performance of a water management system;
 - Means of balancing the allocation of water to human and ecosystem uses; and
 - Organizational development focused on reducing water crises and conflicts in urban areas and between countries through the use of sound science.

- Enrich classroom teaching at CSU by identifying junior teaching faculty, graduate students and post-docs with interest in global issues and create opportunities for international experience with senior faculty.

- Work closely with the Division of Continuing Education to launch a distance and continuing education initiative to build and deliver a global Internet based education and outreach program including: 1) water related curriculum at both the undergraduate and graduate levels, and 2) short courses and individual lectures. This initiative will build upon the existing successes of the Civil & Environmental Engineering Department's Master of Engineering distance degree program in Water Resources.

- Organize an annual periodic semester-long interdisciplinary seminar on international water issues and concerns. When a number of leading international water visitors will be at CSU during a semester, the seminar could be organized to enhance their visit while sharing their knowledge with CSU students and faculty. The seminar can also be organized around invited speakers, including a number of key CSU 'water' alums.

- Develop a certification program for semester or year long courses of study on international, interdisciplinary water topics. Target audience would be mid-career professionals wishing to update their skill and knowledge.

Engaging and Developing Human Resources

- Assemble an interdisciplinary team of faculty through strategic and opportunistic hires.
- Engage “science attachés” at US and international funding agencies and invite them to campus for programs highlighting CSU water projects.
- Create the International Senior Water Scholars (ISWS) program which would engage retired faculty, senior water professionals and international alumni in key positions in universities, government agencies and institutes. ISWS would create opportunities for such scholars to interact and work together-through meetings, serving as consultants on programs, serving as resources for campus events with global themes.
- Promote teaming arrangements with the private sector that are mutually beneficial and which enhance CSU’s institutional capability to remain a leader in international water management science, technology, and institutional arrangements.
- Work with the Alumni Association and the Office of International Programs to host a CSU faculty-led International Water conference in March 2008, in conjunction with Hydrology Days. CSU has water graduates spread across the globe in positions of authority that would be invited to contribute to the conference and attend the event.
- Develop two new international water awards. One would be for international water work by a current CSU faculty member. A second award would be for an alumnus making outstanding contributions to water at the international level.
- Establish an International Water Fellows Program for graduate students and a Global Water Fellows Program for international visitors. These Fellows could meet separately or together once or twice a semester, perhaps with distinguished CSU faculty members working on international research. President Penley or the Provost might meet with the groups once a semester. These programs can improve international student recruiting and should be coordinated through the Office of International Programs, the Admissions Office, and the Graduate School.

Leveraging Resources

- Promote the activation of interdisciplinary teams to respond to international water project proposal requests and funding opportunities in line with CSU’s strategic interests.
- Set aside funding to engage more faculty in international water activities. In particular, travel funds to allow participation in ongoing and new international projects where there is opportunity to allow faculty colleagues accompany PIs on trips abroad to participate in project work and international meetings.

- Establish a program of seed grants to support faculty for set periods of time as they seek international funding to stimulate greater participation, on the part of CSU, in international research and capacity building projects.
- Inventory and track all international faculty research, education and development projects at CSU.
- Cultivate opportunities for junior CSU faculty to engage with the international water community on a regular, sustainable, and career/institution enhancing basis.
- Create partnerships with universities, research institutes, non-governmental organizations, private sector firms and other water oriented agencies to pool and synergize resources.
- Utilize the state of Colorado with its wide range of water issues, problems and solutions as a classroom to educate students and visiting scholars.

University Advancement and Grant Funding

- Prepare a brief prospectus describing CSU capabilities in international water research and training.
- Target the contracts and funding arrangements that include support of continuing development of leading edge water science and policy – science and policy that will be relevant to, and applied in, the international arena in the next five to ten years.
- Develop a strategy to pursue federally funded grants for international water projects and education more aggressively (e.g., FIPSE, Title VI, USAID, World Bank, FAO, Fulbright).
- Prepare a proposal to appeal to a major donor based upon a redesign of CSU’s water education and training programs to meet current and future critical issues in water management (e.g. in the areas of capacity building, homeland security, integrated water resource management, potable water, sanitation and infectious diseases). The proposal will also be ‘shopped’ to foundations, U.S. funding agencies, and highly placed CSU alumni.

Establishing Networks

An important element in the internationalization of the CSU water program is the creation of networks to tap into the expertise of CSU water faculty, international alumni working in water programs in their country and other water professionals with whom we may collaborate. Such networks provide a vehicle for global communication, coordination and collaboration.

The International Senior Water Scholars Network (ISWSN) is one such network. This network would link CSU international alumni working in senior positions in water in their country, retired CSU water faculty and senior water professionals with junior CSU faculty. ISWSN would be guided by a steering committee. ISWSN would be a vehicle for communicating water activities to our larger audience of water professionals, as well as providing additional human capacity for various programs. It would include an:

- 1) ISWSN website;
- 2) email list of ISWSN with limited posting privileges to serve as a bulletin board;
- 3) open email list which would serve as a chat room.

The overall goal of this network is trading information and mentoring. Other uses include providing lectures, short courses and updates. A very important objective of ISWSN is to capitalize on the international reputation, linkages and goodwill built up over the years by our senior water faculty in order to “brand” and legitimize younger water faculty at CSU.

A parallel network will be established to provide communication, collaboration and coordination among CSU faculty currently engaged in water programs and Associate Deans -- the International Water Faculty Network (IWFN). This network would be internal to CSU and include:

- internal email list would keep all in contact;
- website that serves as a clearinghouse for CSU international water programming;
- electronic newsletter and web page that describe current projects and activities;
- chat room would allow quick communication when new opportunities occur (RFP, meeting, etc) where feedback is needed.

The two networks would be synergistically linked. Each serves an important role in the International Water Institute (IWI) and together they create a powerful global presence and ability to quickly respond to requests and program opportunities. In addition, both networks will seek to engage strategic partners from the private and public sector as appropriate to achieve project goals.

Staffing and Funding the International Water Program and IWI

The leader of the International Water Institute should be a regular or special faculty member on a part-time appointment to the Institute. That individual's task is to be the face of the International Water Program at Colorado State. The director will be a clearinghouse, focal point and go to person at CSU. One potential model is to provide partial salary support for a well-connected and energetic player in the international arena with the expectation that they will generate the remainder of their salary coverage through grants and contracts. The task is to truly maintain a global view of water issues and strategically align our resources to address opportunities to facilitate the development of human and social capital around water issues. A significant task of the director is to create connections in the community of global water professionals. Many international projects are conceptualized and targeted through informal networking and we must have

a presence in the international water community to better position CSU. The director would be supported by a program coordinator whose task would be to operationalize and implement elements of the International Water Program. This would include developing and maintaining electronic assets (email lists, websites) and coordinating the presentation of campus based and distance learning programs. Additional staff support would be provided by CWRRI/Water Center.

To increase Colorado State’s international water presence, the University will need to direct some human and financial resources to the priorities that the University selects to pursue. Two options appear feasible to launch the effort: The preferred Option 1 would be fund a part-time Director and provide start up costs to implement the 2008 International Water Symposium in conjunction with CSU Hydrology Days. This would conservatively require \$50K in faculty support plus an additional \$25K in conference costs. The Director would immediately launch an effort to attract funding for the event. Option 2 is less desirable, but would serve to launch the reinvigoration strategy as other funding components are sought. This option would require \$35K to use existing resources and part-time help to conduct the 2008 International Water Symposium in conjunction with CSU Hydrology Days. We will use the Symposium as the initial mechanism to implement the faculty networks, development campaign and renewed alumni relations.

The budget below estimates the funding needed from various sources to begin implementation of the priorities outlined in this strategic plan. This does not include either the cost of developing new faculty lines or of supporting additional graduate student tuition premiums. The initial projected cost of the initiatives is \$200,000 annually with an expectation that within 5 years the International Water Program would generate well over \$1 million annually to fund a majority of the program expenses. Some of the initial annual budget may be acquired through grants and contracts; alternatively, CSU may choose to implement these recommendations incrementally as funding is available.

Expected Annual Costs to Implement Proposed Activities

\$50,000	Half-time salary support for Director of the International Water Institute
\$50,000	Project Coordinator to implement web training, distance education and program delivery
\$40,000	Faculty seed grants (summer salary and support to sponsor international conferences and research travel)
\$25,000	Travel and operating support for Director and faculty
\$10,000	CSU International Water Conference (provide an incentive for partners and CSU colleges to work together)
\$25,000	Fund the Division of Continuing Education to launch a distance and continuing education initiative to build and deliver a global Internet based water education and outreach program.
\$200,000	TOTAL

The Faculty/Student Seed Grants in the budget would include:

Interdisciplinary International Institutional Partnership Grants

This all-University grant program will support the establishment and strengthening of innovative and sustainable international interdisciplinary partnerships between units at Colorado State University and those at universities and/or related institutions located at one or more international sites. International partnerships should foster deep, sustained, interdisciplinary scholarly and/or creative activities in research, teaching, and/or related educational programs and must be characterized by a genuinely collaborative participation by all partners. Proposals from the broadest possible range of disciplines and academic units are encouraged. Grants will be awarded to support year-long initiatives and international sabbaticals. Smaller grants and summer salary coverage will be awarded to faculty in the earliest stages of international partnership start-up activities.

International Pre-Dissertation and Small Grants Competition

This all-University international pre-dissertation and small grants competition will support current Colorado State University graduate and professional degree students and are intended to support short-term activities that enhance the student's scholarly project and/or professional preparation. Proposed activities must involve international travel.

International Internship Awards

This all-University international internship competition will support current Colorado State University graduate and professional degree students undertaking international internships. Awards are intended to underwrite travel and living expenses incurred in internships abroad.

Appendices

History of Water Research and Education at CSU

Colorado State University (CSU) has a long and rich tradition in leading water education, research and outreach developments and application in Colorado, the western U.S. and the world. From the 1883 arrival of Prof. Elwood Mead on the CSU campus, there was active involvement in creating and transmitting new knowledge about water resource development and management practices, in general, and irrigation science and technology, specifically. CSU initiated an irrigation engineering curriculum in the late 1880s, but lack of texts, in English, led a number of CSU educators to study irrigation practices in Spain, northern Italy and Mexico and the translate irrigation texts, from around the world, into English.

The water resources and irrigation expertise at CSU expanded greatly in the early 1900s as the USDA established an Irrigation Investigations Unit on campus, under the leadership of Victor Cone. Ralph Parshall, who joined the CSU irrigation engineering faculty in 1907, joined the USDA Irrigation Investigations Unit in 1913 and developed his Parshall Flume in the 1920s. In 1912, Cone and Parshall designed and directed construction of the USDA Hydraulics Lab, which was located where the Lory Student Center is located today. This facility was used by the Bureau of Reclamation to design the Boulder Canyon Project (today's Hoover Dam). In 1953, the Agricultural Research Service was created and included what, today, is called the USDA-ARS Water Management Unit. The Water Management Unit recently moved into new facilities on the CSU south campus. The new ARS facilities are part of the new Natural Resources Research Center – home to some 800 federally supported natural resource scientists.

Water resources expertise greatly expanded at CSU after WWII. Faculty were hired in hydrology, watershed science, and aquatic ecology. Faculty in sociology, political science, history, economics, forestry, range science, and geology began to apply their disciplines to water-related topics. In many cases, the new disciplines mesh extremely well with the traditional engineering and agricultural approaches, resulting in a highly integrated approach to water management. Under the direction of Maury Albertson, CSU developed a wide range of international water management expertise – taking the research results from campus to applications around the world, including such countries as Pakistan and Thailand.

CSU Water Research Qualifications

Today, CSU employs over 100 faculty in 22 separate departments that apply their disciplines to water and water-related topics. CSU 'water' faculty continue to work at the leading edge of water management science and technology, including specific topics as irrigation water conservation, institutional arrangements for sustainable water management, water quality management, sociology of water utilization, transboundary water management, salinity mitigation practices, decision support systems, and defining water requirements for healthy ecosystem maintenance. Colorado State University

provides one of the most, if not the most, water ‘rich’ research and educational settings available anywhere in the world. The faculty teach over 150 water-related courses at the senior and graduate levels. Current areas of research strength at CSU include:

Aquatic Ecology
Climatological Processes
Water Economics, Policy and Sociology
Groundwater modeling
River geomorphology and restoration
Hydrology
Irrigation and Drainage
Water Management and Planning
Non-Point Source Pollution Control
Development and management of Recreational Resources
Sediment Transport
Snow Hydrology
Safe Drinking Water / Toxicology
Water Quality Management/ Monitoring/ Statistics
Water and Wastewater Treatment

The CSU Water Center facilitates development of interdisciplinary water research and teaching activities on campus while insuring the CSU maintains and enhances its strengths in water research, education and outreach. The CSU Water Center houses an NSF REU program in water (Jorge Ramirez is project director) and a USDA Water and Environment Science Fellows program (Jim Loftis is project director).

There exist a number of interdisciplinary water activities in which the Water Center assists in enriching water education and research on the CSU campus.

1. **Fort Collins is home to six major Federal natural resource research laboratories/centers.** The National Park Service, the U.S. Forest Service, the Agricultural Research Service, the U.S. Geological Survey, the U.S. Fish and Wildlife Service, and the Natural Resources Conservation Service employ approximately 800 professionals, many of whom work in water-related fields. Access to such an extensive amount of expertise greatly fosters the synthesis of data and information surrounding the field of hydrologic sciences.
2. **CSU’s Civil Engineering Department’s leadership in hydrology/water research and education.** Many of the worlds’ leading water scientists and international and national water leaders are graduates of CSU’s Civil Engineering Department. CSU’s Civil Engineering Department received the 2001 American Water Resources Association’s Sandor C. Csallany Institutional Award for Exemplary Contributions to Water Resources Management. The CSU Department has demonstrated, for over years, its leadership in water resources management by achieving an unmatched level of eminence in water education, research and service. Prof. Elwood Mead taught at CSU in the 1880s and went on to become Commissioner of the Bureau of

Reclamation in the 1920-30s. Much of the early hydraulics research, that permitted construction of large western reservoirs, was conducted at CSU in the 1930s.

3. CSU's Civil Engineering Department and Watershed Sciences Program, together, were designed a Colorado Commission on Higher Education **Program of Excellence** in 1991. In January 2004, Civil Engineering was designed a CSU **Program of Research and Scholarly Excellence**, recognizing the over 100 years of excellence in water resources research as well as its current strength in water and environmental research.
4. **CSU supports an extremely strong connection with water managers and users in Colorado, across the U.S. and around the world.** To illustrate, Cooperative Extension water programs (led by Reagan Waskom in the Soil and Crop Sciences Department and housed in the Colorado Water Resources Research Institute) serve an important role in linking the university's synthesis of water knowledge with the practitioner community – Colorado's water managers and users. Furthermore, CWRRI's connections with its 53 sister water institutes (through the National Institutes for Water Resources) and Colorado water leaders serving on its advisory committee; the International School for Water Resources' international connections, and CSU's long and rich tradition in educating outstanding world water leaders, further demonstrates the ability of CSU's water programs to support a well connected National Center for Hydrologic Synthesis.
5. **Hydrology Days** – a joint professional and student celebration of hydrology held each spring semester. The objective of Hydrology Days is to blend outstanding hydrologists with students studying hydrology and related water sciences in a four- day meeting. Students are encouraged to present research findings. The professionals not only discuss their current research, but also the history of hydrology that relates to their particular field of study. Hydrologists from all over the world participate in these excellent conversations about hydrology and CSU students are encouraged to take advantage of the opportunity to network into the broad field of hydrology. For more information, access the Hydrology Days home page: <http://hydrologydays.colostate.edu>
6. **GS 592 Water Resources Seminar** – This one-credit fall semester seminar addresses broad-based water policy issues particularly pertinent to western water management. The goal of the seminar is to introduce graduate students, in all majors, to the water policy issues that surround modern water management applications of particular disciplines.
7. **Annual water conferences/workshops held around Colorado** – Each year a number of water conferences are held in Colorado in which CSU graduate

students participate. Students often are permitted to attend free or for just the cost of food. Students enjoy the opportunity to meet water management professionals, discuss the practical application of their research, and explore job opportunities. They also present papers or provide computer software demonstrations related to their research. Examples of the Colorado annual water meetings are the:

- (1) Colorado Water Congress annual convention held in Denver each January;
- (2) The Ogallala Aquifer Symposium and the Lower South Platte Symposium alternate each February;
- (3) South Platte Forum held each October;
- (4) Arkansas River Basin Water Forum held each spring;
- (5) AWRA Colorado Section Meeting held in March each year;
- (6) Colorado Water Workshop held in Gunnison, Colorado, each May.

8. **Weekly Water-related Seminars Offered by Departments:** With many water related graduate programs on campus, there are a number of seminar series that attract ‘water’ students and faculty from across campus, as well as off campus. For example, the weekly seminars in Water Resources/Hydrology, Watershed Sciences, Fishery and Wildlife Biology, Environmental Engineering, Agricultural and Resource Economics, and Environmental Health often have seminar speakers of interest to students studying water resources. The CSU Water Center web page maintains a list of the water-related seminar series speakers and topics.

9. **Home Pages for CSU Water Related Information:** The following webpages provide additional information into CSU’s extensive water expertise.

CWRRI – <http://cwri.colostate.edu>

Colorado Water Knowledge – <http://waterknowledge.edu>

Water Center – <http://watercenter.colostate.edu>

Aquatic Ecology –

<http://www.cnr.colostate.edu/FWB/aquatic/aqhome.htm>