Water Resources Research Institute

Annual Technical Report

FY 2000

Introduction

ABSTRACT This was the first year as the Center for Water and Environmental Sustainability (CWESt). This shift took place on July 1, 2000 and focused water resource efforts into five programs:

1) The Water Resources Program administrates interdisciplinary and multi-agency watershed education and water resources research programs in Oregon and the Pacific Northwest.

2) The Western Region Hazardous Substance Research Center (WRHSRC) develops alternatives and processes for treatment of hazardous substances in the surface and subsurface environments and disseminates the results of research. 3) Technical Outreach Services to Communities (TOSC) serves community needs regarding potential health effects and cleanup technologies for hazardous waste sites 4) The Technical Assistance for Brownfields Communities Program (TAB) assists communities in redeveloping brownfields sites. 5) The Sustainable University Program promotes and facilitates a wide range of interdisciplinary research, information dissemination, and project and agency coordination related to natural resources and environmental sustainability.

WATER PROBLEMS AND ISSUES OF OREGON

Major water-related problems in Oregon are related to use exceeding availability in numerous watersheds, flooding during winter storm events, water quality degradation of both surface and groundwater, and impacted streams resulting in reduced salmonid populations. By the end of Fiscal Year 2000, Oregon was also entering a drought. Both water quality and quantity are of concern to the State of Oregon; during most of 2000, water quality problems prevailed, but toward the end of the fiscal year, water quantity became the topic of utmost concern. This is particularly important because watersheds with salmon and related species listed as threatened or endangered under the Endangered Species Act cover 50 percent of Oregon and there are competing interests for water. Several hundred streams in Oregon are water quality limited because of high summertime temperatures, a problem that is exacerbated by the drought. Water quality degradation also results primarily from non-point sources and increased temperature resulting from inadequate riparian zones. There are increasing water quality problems associated with agricultural and forestry chemicals. As noted, a major issue in competition among water users during the past few years has been the allocation of increased streamflows and watershed enhancement efforts to reverse the declining salmon stocks in Pacific Northwest streams. A major issue relates to the listing of coastal Coho salmon as endangered species by the US National Marine Fisheries Service. A wide variety of management tools and recovery projects are being conducted to increase stocks so as to avoid listing of species under the Endangered Species Act. Water supply throughout the State is regulated by an extensive network of storage reservoirs primarily built for flood control. Dams on the Columbia and Snake Rivers are major generators of electrical power and support a rapidly growing population and economy. However, the impacts of the dam/reservoir system upon salmon populations have become increasingly visible. Many natural resource experts are beginning to challenge the compatibility of the dam/reservoir systems and natural salmon populations. During 2000, there was continued dialog about the removal of dams from streams in Oregon and the Columbia and Snake River systems. Since access to salmon harvests is protected by treaties between

the US government and various tribes, many water use issues will be controlled by outcomes of complex legal battles. The current electricity problems in California are generating controversy regarding power interests versus habitat interests. Water resource management activities such as water rights adjudication, groundwater resources assessment, contaminated water and soil remediation, and interdisciplinary multi-focus planning are continuing. However, these efforts both within the State and through CWESt do not meet all the demands placed on the States water resources. Inadequate information is available on both quantity and quality of water resources, and the use of water resources to meet various demands. Better management will require a more complete base of information and greater public involvement. Several imaginative processes have been adopted in Oregon to meet these needs. The Oregon Watershed Enhancement Board (OWEB) has mobilized considerable local activity directed to specific watershed improvements for communities. CWESt is helping supporting the public efforts by hosting workshops and developing proposals to address water information needs in Oregon and supporting watershed councils with technical expertise and information. Surface and groundwater withdrawals and total water consumption are rising steadily driven by Oregons population and economic growth. Water competition and threats to environmental quality have become increasing critical. Increased efforts need to be made to protect, conserve, recycle, and develop production systems with fewer negative externalities. The need for expanded municipal water supplies has become a major political issue. Beyond the high-public-attention areas of water policy and management, important unsolved technical questions related to water resource management remain unanswered. The main problem areas and specific problems identified by the CWESt include: - Inadequate seasonal instream flows (adverse effects on aquatic habitat, waste dilution and assimilation, recreation, downstream needs); - Contamination of ground and surface waters (sources, control, cleanup, protection of drinking water supplies); - Declining groundwater levels (poor knowledge of aquifer conditions, excessive withdrawals, need for management); - Management for grazing to protect streams in rangelands; - Inefficiency of water use (agriculture, industry, municipal and domestic systems); - Inter-connectivity of surface waters and groundwater (inter-connectedness, joint management, water yield, interstate use); - Deterioration and loss of aquatic/riparian habitat, especially wetlands; - High summer temperatures in streams that are habitat for cold water fish; - Management for protection of forested streams; - Protection of bay, estuarine and wetland resources (processes, impacts of nearby development); - Structural and non-structural options for water management (reservoir impacts, alternatives, seasonal and geographic problems, floods, water shortages, land use, management); - Competition for available water (shifting priorities, alternative sources, valuation);

- Planning and management for water-related resources (implementation of state-of-the-art technologies and methodologies); - Effect of long term global weather patterns on water resource management in Oregon; - Water institutions and institutional arrangements (laws, rights, pricing, reuse, competition); and - Technology/information transfer to effectively disseminate information from researchers to users.

PROGRAM GOALS AND PRIORITIES Goals and Objectives The Centers overall long-range goal is to assist in the sound management, sustained use, and protection of the States waters and water-dependent resources. Specific long-range goals of CWESt are to analyze and clarify the major water resources problems and issues in the state, and help to solve these problems through research, education, and technology transfer activities.

The objectives of the Center for Water and Environmental Sustainability, similar to those originally formulated in 1959, are to:

- understand Oregons current and future water resource needs; - identify areas where research, education, and technology transfer are required; - set priorities for CWESt programs; - assure recognition of capabilities of water resources research and education; - initiate multidisciplinary

research in areas of need; - provide information on water resources to decision makers through reports and workshops; and - promote and support multi-disciplinary graduate education programs in water resources. Water resources problems in Oregon have quantity, quality, ecological, economic, institutional and social aspects. Therefore, the physical, biological, socio-economic and related sciences are all viewed as essential contributors to solutions of these problems. The Center activities emphasize multi-disciplinary, problem-oriented research and encourage interdisciplinary activities in support of that research.

Priorities CWESt periodically establishes research priorities for solving critical water-related problems. Research priorities are set for both State and regional needs and have served to guide the development of the FY 2000 program. The FY 2000 Center for Water and Environmental Sustainability Program has focused on protection of surface water and groundwater. The Water Resources program focused on research, education, and outreach related to protecting streams and wetlands for aquatic habitat interests. The Western Region Hazardous Substance Research Center, the Technical Outreach Services to Communities, and the Technical Assistance for Brownfields Communities Program focused upon research, education, and technical outreach regarding groundwater protection and remediation. The Sustainable University program focused on providing an inventory of Oregon State Universitys resource use and environmental impact. It also provided advise to the State of Oregon government on sustainability issues. The projects included in the FY 2000 CWESt Program all addressed issues related to the Oregon and Pacific Northwest CWESt technical transfer plans. Several are high-public attention issues and relate to problems that continue to receive legislative attention.

The USDI Water Resources Research Center program has been of utmost importance in maintaining an active multi-disciplinary, problem-solving water research program in Oregon. The USDI program is also an important catalyst for initial contacts for water research by federal and state agencies, and for bringing research to the university campuses and the academic departments. Use of FY 2000 Grant to Develop and Implement Program

In an effort to meet CWESts goals and objectives, and improve upon process, the Centers activities focused on three areas: 1) Developing the new Center for Water and Environmental Sustainability (CWESt) to accommodate funding shifts and better serve diverse water needs, 2) Building partnerships with the science community, and 3) Continuing and improving upon Technology Transfer and Education.

1. Due to funding shifts and a need to diversify water interests, much of the year was spent promoting and fine-tuning CWESt as the new Center for Water and Environmental Sustainability. This shift took place on July 1, 2000 and focused water resource efforts into five areas:

a) The Water Resources Program has over thirty years of experience in administrating interdisciplinary and multi-agency watershed education and water resources research programs in Oregon and the Pacific Northwest. The Water Resources Program is an educational and research resource for educational institutions, water-related agencies, watershed councils, and the public.

b) The Western Region Hazardous Substance Research Center (WRHSRC) develops alternatives and processes for treatment of hazardous substances in the surface and subsurface environments and disseminates the results of research to industrial and regulatory communities, fosters exchange of information with these communities, and promotes a better understanding of the scientific capability to detect, assess, and mitigate risks associated with hazardous substance usage and disposal. c) Technical Outreach Services to Communities (TOSC) serves community needs regarding potential health effects and cleanup technologies for hazardous waste sites. TOSC assists communities to become active

participants in the decision-making process, holds community workshops and provides educational materials regarding human health, environmental risks, and regulatory concerns. d) The Technical Assistance for Brownfields Communities Program (TAB) assists communities in redeveloping brownfields sites. The TAB program provides technical assistance, education and training to stakeholders. Stakeholders may include municipal officials, community groups, local leaders and other audiences such as developers and lenders. Facilitating stakeholder involvement often helps to speed up the redevelopment process and produce outcomes of greater benefit to the community and the environment. e) The Sustainable University Program promotes and facilitates a wide range of interdisciplinary research, information dissemination, and project and agency coordination related to natural resources and environmental sustainability. The Sustainable University Program is committed to helping students, faculty, agencies, other organizations, and the public understand the implications of our practices and beliefs about how natural resources are used.

2. Partnerships: a. CWESt entered into partnership with the Pacific Northwest Cooperative Ecosystem Studies Unit (CESU), a cooperative and joint venture agreement between Department of the Interior, Bureau of Land Management, US Fish and Wildlife Service, USGS-BRD, NPS, USDA FS, University of Washington (host) and several other PNW universities. b. Initiated, facilitated and developed an Interdisciplinary NSF Library Proposal c. Initiated, facilitated and developed an interdisciplinary EPA Biocomplexity proposal d. Sponsored and hosted a Proper Functioning Condition riparian enhancement workshop led by the National Inter-agency PFC team

3. Technology Transfer and Education (detailed in Information Transfer activities) a. Delivered workshops, seminars, and conferences b. Maintained interactive web pages and sponsored IT research c. Providing a graduate minor in Water Resources in three subdisciplines 1. Hydrology 2. Water Resource Planning and Management 3. Water Quality d. Provided telephone outreach and referral on water related issues to Oregon citizens e. Wrote proposals to support watershed research and education needs

Water Resources Education Water resources minor students and students from across disciplines continue to be involved in CWESt to obtain information and grow academically. Students are attracted to the Center by its ongoing programs and the strong teaching and student advocacy skills of Water Resources faculty and staff. During the 2000 to 2001 year, CWESt:

· Sponsored a regularly scheduled, informal discussion hour with graduate students on water related topics incorporating systems theory. Dr. David Bella, Winter 2000-2001 · Continued to sponsor, advise and promote the graduate minor in Water Resources; with disciplines in Water Quality, Hydrology, and Water Planning and Management. FY2000-2001 efforts focused on increasing women and minority faculty for this program. · Sponsored several trips for the student water resources organization, Hydrophiles, including a field trip to a PFC workshop in Prineville, Oregon, and a trip to the Willamette River Conference in Vancouver, Washington.

Water Resources Education on the Web CWESt staff maintained two Water Resources Education websites and developed the CWESt website (http://www.osu.orst.edu/dept/cwest). The USGS funded research projects included web-based technology transfer. The NSF Library proposal focused on web-based education and the Sustainable University project was placed on the web.

COOPERATIVE ARRANGEMENTS

Program development activities include many contacts by the Center with water users and policy makers to stay abreast of statewide and local water problems. These contacts give direction to the centers program.

Cooperation with Universities in Oregon CWESt advertises a range of research opportunities to research personnel at all universities and colleges with water programs in Oregon. This is done by phone, by direct mailing, and by emailing to known individual researchers, and by additional mailings to administrative offices. The FY 2000 research program was developed after solicitation of proposals from 248 potential principal investigators at 14 universities and colleges in Oregon (Oregon State University, University of Oregon, Portland State University, Oregon Health Sciences University, Oregon Institute of Technology, Eastern Oregon State College, Southern Oregon State College, Western Oregon State College, Lewis and Clark College, Linfield College, Reed College, University of Portland, Willamette University, and the Oregon Graduate Institute). Members of the CWESt advisory board have included representatives from Oregon State University, the University of Oregon, and Portland State University.

Statewide Coordination Statewide coordination occurs through many of the Co-directors activities, including personal visits to state and federal agency offices, and service on various committees and task forces with members of local, state, and federal agencies. Telephone contacts offer another means of being aware of the activities of other groups and for coordinating Center activities with them. The Co-directors are aided in these efforts by members of the Centers Governing Board. The Center receives and reviews newsletters, minutes of meetings, and annual reports from the Oregon Water Resources Department, Water Resources Commission, Department of Environmental Quality, Environmental Quality Commission, Department of Fish and Wildlife, Environmental Quality Commission, Department of Agriculture, Governors Watershed Enhancement Board, Department of Energy, Bonneville Power Administration, Northwest Power Planning Council, and other state and federal agencies. These facilitate coordination of research activities to meet state needs and coordination of information dissemination to deal with problems and issues.

Regional Coordination Program development activities in FY 2000 included regional research development discussions with the other water research centers in the Pacific Northwest. Directors of the state water research Centers of Alaska, Idaho, Montana, Oregon, Washington, Hawaii, and Guam work together on water-resource matters that involve teaching, research, and public service. The Columbia River system is a common concern for four of the above states.

Center Membership Membership is open to all faculty members at universities and colleges in Oregon who are actively engaged in water-related research and education or who wish to keep informed about such activities. Center membership includes about 150 faculty members. The seven state institutions of higher education are Oregon State University, Portland State University, University of Oregon, Oregon Institute of Technology, Oregon Health Sciences University, Eastern Oregon State College, and Western Oregon State College. Faculty at six private colleges and universities also participate in Center programs (Lewis and Clark College, Linfield College, Oregon Graduate Institute, Reed College, University of Portland, and Willamette University).

Center Governing Board

Two advisory boards were formed and met: the CWESt Administrative Advisory Board and the CWESt Scientific Advisory Board.

Center Administrative Staff The Centers administrative staff during FY 2000 consisted of seven positions:

Director (0.25 FTE) Kenneth J. Williamson, PhD Co-Director (0.25 FTE) Denise Lach, PhD Program Coordinator (0.8 FTE) Stephanie Sanford, PhD Education, Research & Outreach (0.5 FTE) Stephanie L. Moret, PhD Program Assistant (0.5 FTE) Nancy Allen, MS Technical Outreach (1.0 FTE) Michael Fernandez, MS Technical Outreach (0.5 FTE) Terry Brock, MS

In addition, three professors are active CWESt team members: Dr. David Bella coordinates a program for water resources students at both the graduate and undergraduate level. The program involves seminars and workshops to discuss various current water issues. Dr. Anna Harding, Chair of Public Health, is CWESts Public Health Liaison. Dr. Lewis Semprini, co-directs the Western Region Hazardous Substance Research Center.

TRAINING ACCOMPLISHMENTS The Center provides a range of educational and training opportunities for university students. Approximately fifty students at OSU and thirty-five students at University of Oregon participated in the seminar series.

The Center coordinates a graduate-level interdisciplinary minor program in water resources that is available to all M.S. and Ph.D. degree candidates at OSU. The Graduate School provides listing of faculty involved in the program to students. The Director and Stephanie Moret, MS (PhD Candidate) provided program advising and help students regarding career opportunities, graduate study, and selection of courses.

During the 2000-2001 academic year, the EPA-funded Cooperative Research Training Program in Terrestrial, Aquatic, and Coastal Ecosystem Research supported 6 OSU undergraduate students in internships at the EPA lab in Corvallis. In addition, we supported 3 graduate students in graduate research training programs. CWESt administered the internships.

Students also receive research training as a part of their M.S. and Ph.D. thesis requirements. Some students receive training directly on CWESt supported projects, but water resource research education extends beyond the directly funded projects.

Publications: Refereed Publications: Harding, A.K. A University-based community outreach program: The challenge of providing "neutral" assistance. Environmental Practice, 3(1),38-47.

Published abstracts: Degher, A., and A. Harding (2000). Health effects of a chemical fire on a local neighborhood. Abstracts of the APHA 128th Annual Meeting (p. 434), Boston, MASS.

Refereed Presentations: Degher, A., and A. Harding (2000). Health effects of a chemical fire on a local neighborhood. Paper presented at the 128th APHA Annual Meeting, Boston, MASS.

A. Harding and M. Fernandez (2000). Benefits of third party outreach and continuous community involvement. Paper presented at the USEPA Community Involvement Conference, San Francisco, CA.

K. Williamson, M. Masters, M. Fernandez, A. Harding, D. Lach, and B. O'Malley (2000). Current TOSC Activities. Paper presented at the Hazardous Substance Research Centers Research Symposium, Pacific Grove, CA.

Grants: Harding, A. (Principal Investigator) (2000-2002). Discrimination and Characterization of Stream Bacterial Communities Using Physiological Diversity Measures. Funded at $84,140 by the Environmental Protection Agency through the Center for Analysis of Environmental Change.

Grant Proposals: December 2000. Received grant to the U.S. Department of Energy, Office of Science, to study "Public Perception of Bioremediation Strategies and Long-Term Stewardship at Department of Energy Sites." Funds were granted for the period October 1, 2001-September 30, 2003.

CWESt served as the catalyst for both a NSF Biocomplexity proposal and a NSF Digital Watershed Library Clearinghouse proposal.

Research Program

Basic Information

Title:	Web-based Data Analysis and Distribution Technology for Watershed Datasets
Project Number:	01
Start Date:	3/1/2000
End Date:	2/28/2000
Research Category:	Water Quality
Focus Category:	Non Point Pollution, Surface Water, None
Descriptors:	watersheds, datasets, world wide web, data access, water quality, TMDL planning, point source and non-point source pollution
Lead Institute:	Oregon State University
Principal Investigators:	John Bolte, John Bolte

Publication

Problem and research objectives:

As watershed planning is becoming increasingly important for implementation of the Oregon Plan for salmon recovery, the Willamette Restoration Initiative, response to endangered species listing, Clean Water Act requirements and other activities. Science-based planning requires access to data, in a way that presents that data in a format that is both readily accessible and in forms that are readily utilized by policymakers and stakeholders. Various watershed-scale datasets are also integral to the development of watershed assessments developed by watershed councils using the Oregon Watershed Enhancement Board's (OWEB) Watershed Assessment manual, which prescribes specific datasets and reporting requirements necessary for completion of a watershed assessment.

Technology has progressed to the point where the development of dataset storage and delivery mechanism is feasible. The Internet provides the necessary access and delivery mechanism, and is generally available to a wide audience. Additionally server-based software has made the presentation and download of datasets on the web realistic. There is a need to develop this technology specifically for the delivery of watershed council-oriented dataset access.

Methodology:

Web-based data analysis and distribution require the following components:

A data server and associated disc storage;
Server software providing access to and display of non-spatial datasets;
Server software providing access to and display of spatial (GIS) datasets.
Data server: We host the datasets and associated web pages on biosys.bre.orst.edu, a machine physically located with the Bioengineering Department at Oregon State University. It is a Windows 2000 server machine with 30 GB of data storage and the usual backup/power protection, etc. capabilities. Data is backed up daily on tape and to a redundant remote storage unit. The server hosts spatial and non-spatial data servers.

Server Software for non-spatial datasets: We have extensively reviewed Web-based server software for nonspatial databases, and have found Allaire's Cold Fusion Application server to be an effective, capable, and robust server. Cold Fusion is cross platform, running on both on NT Server and Unix OS's. An additional advantage of Cold Fusion is that Cold Fusion applications currently can run on OSU's main web server (osu.orst.edu), so applications are portable between NT and Unix hosts. Additionally, over the past several years we have written a large body of data access code employing Cold Fusion that has been leveraged into this effort.

Server Software for spatial datasets: Many of the datasets useful for watershed analysis are GIS-based. Depending on the form of the data (shape file, Arc Coverages, etc.) a data access server like Cold Fusion may or may not be appropriate. Cold Fusion does not provide map display or browsing capabilities, so we use ESRI's Internet Map Server to host map-based data.

Principal findings and significance:
The project has been successful at creating a prototype site hosting a number of different types of watershed-related data. The basic technology approach combining basic HTML-based web interfaces, Cold Fusion-based database access, and Internet Map Server-based map serving, has been successful at providing this data on the web. Additionally development ois needed before the site can be fully functional, but the prototype site has been useful as a vehicle for providing basic database access and map serving methodologies.

We have developed a number of watershed datasets that area available through the web site. These include roads, streams, vegetation, hydrology, sediment transport capabilities, and many others (see

http://waterconnection.orst.edu for a complete list of coverages.). Additional, spatial and non-spatial datasets coming out of the two watershed council's watershed assessment are being hosted.

A second source of data is being hosted as well. We have gathering photos of various watershed "problem areas" and restoration options. These are general in digital format, in anticipation of making them available on the web. A database framework for storing photo related information, with keywords, for retrieval and display on the web, is included in the technology package delivered in this project, populated initially with these restoration-oriented photos.

Our primary target is stakeholder groups, particularly watershed councils, and we have worked with two councils to develop user interfaces and analysis requirements. However, because all data is public and downloadable, any user has access to the datasets.

Training and publications:

A graduate student has been involved in this project at the masters degree level.

Basic Information

Title:	On-line hosting of water law and policy research studies
Project Number:	02
Start Date:	6/1/2000
End Date:	2/28/2001
Research Category:	Social Sciences
Focus Category:	Law, Institutions, and Policy, Water Quality, None
Descriptors:	Water Law, Water Quality, Columbia River, Water Policy
Lead Institute:	Lewis and Clark College
Principal Investigators:	John McDonald, John McDonald

Publication

1. Training and Publications: The website for the NW Water Law and Policy Project is www.lclark.edu/dept/water. From the main page, a user can branch to the publications page for a list of the studies, along with descriptions of each study. Selection of a study will lead to prompting for the users name and contact information. Upon completion of the information, the study is downloaded as a PDF file using Adobe Acrobat. Acrobat is widely used for web transfer of documents, and the Water Project web site supports the user by providing information on how to download Acrobat. The Water Project web site also informs the user of the Water Projects privacy policy, that we will not share the information with other groups. The website also supports the user through the use of a frequently asked questions link and a link for the user to email questions to the Water Project.

Problem and Research Objectives:

The NW Water Law & Policy Project has produced a series of law and policy papers relating to water issues in the Columbia River Basin over the last seven years. These papers have been available for a small ($10) fee through the Water Project office. Our primary means of disseminating the information about our studies has been through our newsletter, with a circulation of over 3000. By placing these studies on-line the studies will be available to all, including those searching for information through web search programs. The studies will be available during research sessions and the barrier of the fee and the delay in processing a request for a study has been removed by hosting a study on the web. As our studies have been grant-funded, it is important to the Water Project to be able to evaluate the effect our studies have on shaping the region's policy and practices. Therefore, an additional goal in hosting the studies on the web is to be able to know who is downloading our studies, just as we know who is ordering copies of our studies through conventional mail.

Methodology:

The studies are currently hosted on-line on the Water Project website. Not all of the Water Project's studies are currently available for download however. Many of the studies published by the Water Project are also published in law journals, and over the years, the Water Project has worked out copyright agreements with law journals to distribute copies through our office. However, previous agreements did not clarify the right to publish the studies on-line. The Water Project is working with law journals to ensure that there are no copyright conflicts. Currently 24 of the 44 studies published by the Water Project are available for download on line, with more to come, as copyright permission is clarified. All studies are listed on the website, along with descriptions and information on how to order through conventional mail.

The Water Project studies, in Word or Word Perfect format, have been converted to PDF format for hosting on our website. PDF is a widely used format for exchanging documents on the web. Users can download the document and print it out as formatted. Our website supports a link to the Adobe Acrobat website to download the necessary software to use a PDF file.

The website uses a page format established by Lewis & Clark College, and used through most of the Northwestern School of Law of Lewis & Clark College web pages. By using the college's page format and underlying HTML code, the college will help maintain the website so that future web development does not render the current design obsolete. The Water Project will be responsible to changes in and addition to content, but the college's information technology group supports the base HTML code.

The website contains a user-information page, where the user must identify him/herself along with some basic contact information. This information is used to track the impact that the studies are having. The information is minimal and a privacy policy is published on the website. The system administrator can periodically check computer generated status reports to see who has downloaded what studies.

Principle Findings and Significance:

Studies that are available for download are now immediately accessible to anyone with web access. Information on all studies are also available to all, though those not yet available for download will need to be ordered by mail. A researcher seeking information on a particular topic can locate our studies through web searches. Those that know of our organization can immediately access available studies through a download and learn about all of our studies through the study descriptions on the web.

The Water Project is able to track who orders our studies and is therefore able to gauge the scope of our reach, as well as follow-up with study users to analyze the impact of our studies.

Paul Risser, president of Oregon State University, wrote a recent editorial in the *Oregonian*, calling for improved analysis of short- and long-term impacts of proposed legislation and policy to counter the often contentious and visionless nature of the current processes in lawmaking, ballot initiatives, and litigation. Mr. Risser called for the organization of thoughtful neutral forums where decision-makers carefully consider visions, choices, and even compromise to transcend the short-sighted processes that currently set law and policy. The Water Project's vision mirrors that of OSU President Risser, and our studies provide the exact kind of analysis that he calls for. The generous grant from OWRRI, helps propagate the information and analysis in our studies to help combat the short-sighted and contentious arguments that often drive regional water policy.

Training and Publications:

The website for the NW Water Law and Policy Project is www.lclark.edu/dept/water. From the main page, a user can branch to the "publications" page for a list of the studies, along with descriptions of each study. Selection of a study will lead to prompting for the user's name and contact information. Upon completion of the information, the study is downloaded as a PDF file using Adobe Acrobat. Acrobat is widely used for web transfer of documents, and the Water Project web site supports the user by providing information on how to download Acrobat. The Water Project web site also informs the user of the Water Project's privacy policy, that we will not share the information with other groups. The website also supports the user through the use of a "frequently asked questions" link and a link for the user to email questions to the Water Project.

Basic Information

Title:	Using GIS Databases to Estimate Stormwater Runoff
Project Number:	04
Start Date:	3/1/2000
End Date:	2/28/2001
Research Category:	Water Quality
Focus Category:	Management and Planning, Water Quality, Water Quantity
Descriptors:	Water Quantity, Water Quality, Columbia River, Water Policy
Lead Institute:	Oregon State University
Principal Investigators:	Wayne Huber

Publication

1. ¨ The Center for Housing Innovation Neighborhoods Lab website shows the full report of this study: http://neighborhood.uoregon.edu (updated version available June 30, 2001)

Problem and Research Objectives:

The goal of the project is to integrate hydrologic modeling into the process of urban planning to allow minimization of stormwater impacts.

The objectives are:

- Survey various hydrologic methods that could be used to couple GIS datasets with predictions of stormwater quality and quantity
- Determine the effectiveness of such models to predict runoff for a specific site in Corvallis, OR in cooperation with Project 04; and
- If applicable, develop a web-based site to assist urban planners with predictions of stormwater quality and quantity under various development scenarios.

Methods, Procedures, and Facilities:

The most significant considerations for this stormwater modeling study were: the nature (topography, amount of impervious surface, development density, etc.) of the three development sites, the character of the stormwater system in those sites, and the precipitation. The details of these considerations interact to produce runoff and influence water quality. The model framework that houses these details organizes and calculates the amount of runoff and peak flow for subcatchments and the entire site.

1. Survey of Stormwater Modeling Software

The survey was conducted on the internet by searching for stormwater modeling software that utilizes ArcView GIS data. This software combination would hopefully offer an efficient and systematic way to analyze developments for stormwater impacts. The ideal modeling software would address both runoff quantity and quality issues. It should be accessible to a broad range of people, approximately less than $400 and relatively easy to learn and use. The parameters should be flexible enough to accommodate geographic and climatic differences.

2. Establish Subcatchment Characteristics

ArcView GIS was the primary tool used to define the subcatchments within the larger site. These drainage subcatchments were defined by topography and street paving patterns (except for the Open Space plan). The conduit and node system on existing land use maps of the three Development Alternatives, were modified to simplify the subcatchment designation process. Attributes of land use were categorized according to each subcatchment. Lastly, area estimates for each land use case within a specified subcatchment from each neighborhood development were isolated and calculated. Tabular data was exported to a spreadsheet for two primary tasks. First, an Excel database calculated the extent of impervious and pervious values for each subcatchment using the area of each land use case per subcatchment. Second, all of the data was consolidated into a single 'workbook' in order to interface with the PCSWMM import 'Wizard'.

3. Determine Model Parameters

PCSWMM imports data into a tabular and graphical interface (PCSWMM GIS object) where the stormwater system (graphic) and associated tabular data can be viewed simultaneously. A Runoff Module object (an ASCI text file framework known as SWMM) is then created and linked with the PCSWMM GIS file so that data may be shared between the two objects. A combination of all previously mentioned values and precipitation data work together as the model calculates and formats results. Each neighborhood development was subjected to the same 10-year, 24-hour storm event.

4. Run Model and Interpret Peak Flow Results

Peak flow was graphed for each of the models to compare the rates of runoff convergence in each subcatchment and for the entire site.

Principal Findings and Significance:

A review of 12 ArcView GIS stormwater modeling software packages, and application of 6, showed a lack of software that met most of the criteria. The greatest challenges for finding appropriate software for urban planners remains usability (user-friendliness, time to learn), true compatibility with GIS, and cost. PCSWMM, which was tested for this project, imports tabular data from GIS, but is not truly interactive with the GIS software.

Comparisons of three development plans (Neighborhood Village, Status Quo, and Open Space) and modifications to the Open Space plan revealed noteworthy differences. Evidence that distribution, not density, is a more important contributor to higher peak flows was confirmed. Modifications to the Open Space plan, the development with the lowest peak flow, showed that disconnection of single family home roofs and residential paving from a typical piped stormwater system makes the greatest contribution towards reducing peak flows.

These findings suggest that dense land use development is compatible with runoff and peak flow reduction, however attention must be given to both the distribution of development and the total amount of effective impervious surface.

Training and publications:

- A graduate student has been involved in this project at the masters degree level. She will be publishing these and additional results in her masters project fall 2001 and presenting findings at her defense in October.
- The Center for Housing Innovation Neighborhoods Lab website shows the full report of this study: http://neighborhood.uoregon.edu (updated version available June 30, 2001)

Basic Information

Title:	Measuring Stormwater Impacts of Different Neighborhood Development Patterns
Project Number:	03
Start Date:	3/1/2000
End Date:	2/28/2001
Research Category:	Water Quality
Focus Category:	Management and Planning, Floods, Waste Water
Descriptors:	Water Planning and Management, Water Quality, Water Quantity
Lead Institute:	Oregon State University
Principal Investigators:	Ronald Kellett, Cynthia Girling

Publication

1. The Center for Housing Innovation Neighborhoods Lab website shows the full report of this study: http://neighborhood.uoregon.edu

Problem and Research Objectives:

This proposal undertook stormwater modeling on three different proposed neighborhood plans for one site in Corvallis, Oregon. Results will be used to develop a visual and interactive web site that demonstrates how land planning and design decisions impact runoff characteristics.

This project is meant to educate the diverse constituency who initiate, regulate or influence neighborhood scale planning and design in their communities. Through this work, we intend to improve the awareness of landowners, neighbors, developers, planners, designers, elected officials and members of the public about runoff implications and opportunities embedded in many of the planning and design decisions they will be called upon to make. Hopefully this information and awareness will lead to decisions that have a positive impact on stormwater runoff.

1. Find and evaluate more reliable and robust modeling tools that would allow us to check and refine our prior findings and estimate the potential contribution of different BMP's to overall performance.

2. Re-measure the alternative plans using the selected tool(s) and exactly the same data and assumptions we used with CITYgreen and SUNOM.

3. Use the more sophisticated modeling tool to learn more about how and how much different neighborhood planning and design strategies impact stormwater.

4. Create the web-ready content that will communicate these findings to the planning and development community (including regulators) in Oregon.

Methods, Procedures, and Facilities:

The most significant considerations for this stormwater modeling study were: the nature (topography, amount of impervious surface, development density, etc.) of the three development sites, the character of the stormwater system in those sites, and the precipitation. The details of these considerations interact to produce runoff and influence water quality. The model framework that houses these details organizes and calculates the amount of runoff and peak flow for sub-catchments and the entire site.

1. Survey of Stormwater Modeling Software
The survey was conducted on the internet by searching for stormwater modeling software that utilizes ArcView GIS data. This software combination would hopefully offer an efficient and systematic way to analyze developments for stormwater impacts. The ideal modeling software would address both runoff quantity and quality issues. It should be accessible to a broad range of people, approximately less than $400 and relatively easy to learn and use. The parameters should be flexible enough to accommodate geographic and climatic differences.

2. Establish Subcatchment Characteristics
ArcView GIS was the primary tool used to define the sub-catchments within the larger site. These drainage sub-catchments were defined by topography and street paving patterns (except for the Open Space plan). The conduit and node system on existing land use maps of the three Development Alternatives, were modified to simplify the subcatchment designation process. Attributes of land use were categorized according to each subcatchment. Lastly, area estimates for each land use case within a specified subcatchment from each neighborhood development were isolated and calculated. Tabular data was exported to a spreadsheet for two primary tasks. First, an Excel database calculated the extent of impervious and pervious values for each subcatchment using the area of each land use case per subcatchment. Second, all of the data was consolidated into a single 'workbook' in order to interface with the PCSWMM import 'Wizard'.

3. Determine Model Parameters

PCSWMM imports data into a tabular and graphical interface (PCSWMM GIS object) where the stormwater system (graphic) and associated tabular data can be viewed simultaneously. A Runoff Module object (an ASCI text file framework known as SWMM) is then created and linked with the PCSWMM GIS file so that data may be shared between the two objects. A combination of all previously mentioned values and precipitation data work together as the model calculates and formats results. Each neighborhood development was subjected to the same 10-year, 24-hour storm event.

4. Run Model and Interpret Peak Flow Results
Peak flow was graphed for each of the models to compare the rates of runoff convergence in each subcatchment and for the entire site.

Principal Findings and Significance:

A review of 12 ArcView GIS stormwater modeling software packages, and application of 6, showed a lack of software that met most of the criteria. The greatest challenges for finding appropriate software for urban planners remains usability (user-friendliness, time to learn), true compatibility with GIS, and cost. PCSWMM, which was tested for this project, imports tabular data from GIS, but is not truly interactive with the GIS software.

Comparisons of three development plans (Neighborhood Village, Status Quo, and Open Space) and modifications to the Open Space plan revealed noteworthy differences. Evidence that distribution, not density, is a more important contributor to higher peak flows was confirmed. Modifications to the Open Space plan, the development with the lowest peak flow, showed that disconnection of single family home roofs and residential paving from a typical piped stormwater system makes the greatest contribution towards reducing peak flows.

These findings suggest that dense land use development is compatible with runoff and peak flow reduction, however attention must be given to both the distribution of development and the total amount of effective impervious surface.

Training and publications:

- A graduate student has been involved in this project at the masters degree level. She will be publishing these and additional results in her masters project fall 2001 and presenting findings at her defense in October.
- The Center for Housing Innovation Neighborhoods Lab website shows the full report of this study: http://neighborhood.uoregon.edu (updated version available June 30, 2001)

Information Transfer Program

INFORMATION TRANSFER ACTIVITIES Defining the Objectives The 2000 to 2001 year was unique in that it was the first year of CWESts new and expanded programs. This year was dedicated to promoting CWESt as a resource to address current water issues of concern to Oregonians. To this end, and in spite of a limited budget and staff, CWESt sponsored, attended, and presented at several seminar series and workshops, maintained two water resource education websites, and promoted several water resource education programs.

Implementing the Program CWESt increased visibility by participating in and sponsoring several conferences, workshops, and planning meetings at local, statewide, regional, and national levels and sending a newsletter (Appendix 1). These activities were a joint effort by the Director, Ken Williamson; Co-Director, Denise Lach; Program Coordinator, Stephanie Sanford; the Water Education, Research and Technical Outreach Coordinator, Stephanie Moret; Program Assistant, Nancy Allen; Public Health Liaison, Anna Harding; Technical Outreach Specialists, Michael Fernandez and Terry Brock, in addition to cooperation from other faculty members. CWESt successfully sponsored and co-sponsored the following conferences, seminars and workshops (Appendix 2).

Basic Information

Title:	James Vomocil Water Quality Conference
Start Date:	11/1/2000
End Date:	11/1/2000
Descriptors:	Water quality, management and Research
Lead Institute:	Oregon State University
Principal Investigators:	John Bolte

Publication

Co-sponsor, James Vomocil Water Quality Conference, November 1, 2000. The annual Vomocil Water Quality Conference at OSU is designed to bring scientists, regulators, agricultural producers, landowners and concerned citizens into conversation about water quality management and research in Oregon. This years conference topics focused on current government policy on water quality protection and how it interacts with the Endangered Species Act. A special feature of the conference this year was a session devoted to helping people who are new to water quality issues understand the language and deliberations of watershed councils and other water related citizen groups. It was attended by approximately 150 people representing state and local agencies, universities, private sector, students, and land owners. The conference is sponsored by CWESt and the OSU Extension Service.

Basic Information

Title:	Horton Award Winning Hydrology
Start Date:	3/15/2000
End Date:	6/15/2000
Descriptors:	hydrology seminar, Horton Award
Lead Institute:	Oregon State University
Principal Investigators:	John Bolte

Publication

“Horton Award Winning Hydrology.” Oregon State University, Corvallis, OR, Hydrology spring quarter series. Speakers included six Horton award winners, a Birdsall Lecturer, and a Darcy Lecturer. Co-sponsored by CWESt.

Basic Information

Title:	Wetlands
Start Date:	9/28/2000
End Date:	12/6/2000
Descriptors:	wetlands
Lead Institute:	Oregon State University
Principal Investigators:	Kenneth Williamson, Stephanie Moret

Publication

‘Wetlands”. Oregon State University, Corvallis, OR, Water Resources fall quarter series. Topics included wetland restoration, wetland structure and function, water quality, urban greenspaces, and constructed wetlands. Approximately 55 people attended this seminar series. Sponsored by CWESt.

Basic Information

Title:	Proper Functioning Condition (PFC) riparian health workshop
Start Date:	8/23/2000
End Date:	8/26/2000
Descriptors:	Riparian Health, proper functioning condition
Lead Institute:	Oregon State University
Principal Investigators:	Stephanie Moret

Publication

Proper Functioning Condition (PFC) riparian health workshop. Corvallis area, Oregon. PFC is a methodology for assessing the physical functioning of riparian and wetland areas. This two-day workshop focused on two areas: 1) Assessing the physical functioning of riparian-wetland areas through consideration of hydrology, vegetation, and soil/landform attributes. And 2) Determining the on-the-ground PFC condition, which refers to how well the physical processes are functioning. This field-intensive workshop was attended by approximately 25 people from agencies, universities, landowners, and consulting companies. Sponsored by CWESt.

Basic Information

Title:	Oregon Rural Brownfields Conference- ’Let’s Make it Happen’
Start Date:	9/25/2000
End Date:	9/26/2000
Descriptors:	Brownfields, contamination cleanup, assessment, remediation
Lead Institute:	Oregon State University
Principal Investigators:	Michael Fernandez

Publication

Brownfields are properties where redevelopment is complicated by actual or perceived contamination. This conference brought together economic development professionals, local government officials, environmental consultants, attorneys, and federal and state government representatives to discuss issues related to the assessment, cleanup, and redevelopment of brownfields. Approximately 120 people participated in this CWESt sponsored conference.

USGS Summer Intern Program

Student Support

Student Support					
Category	**Section 104 Base Grant**	**Section 104 RCGP Award**	**NIWR-USGS Internship**	**Supplemental Awards**	**Total**
Undergraduate	0	0	0	0	0
Masters	2	3	0	0	5
Ph.D.	2	0	0	0	2
Post-Doc.	0	0	0	0	0
Total	4	3	0	0	7

Notable Awards and Achievements

None

Publications from Prior Projects