2004 Water Use Efficiency Proposal Solicitation Package

APPENDIX A: Project Information Form

Applying for: ☐ Urban ☑ Agricultural

1. (Section A) **Urban or Agricultural Water Use Efficiency Implementation Project**
   - ☐ (a) implementation of Urban Best Management Practice, #_____
   - ☐ (b) implementation of Agricultural Efficient Water Management Practice, #_____
   - ☐ (c) implementation of other projects to meet California Bay-Delta Program objectives, Targeted Benefit # or Quantifiable Objective #, if applicable _____
   - ☐ (d) Specify other: _____

2. (Section B) **Urban or Agricultural Research and Development; Feasibility Studies, Pilot, or Demonstration Projects; Training, Education or Public Information; Technical Assistance**
   - ☐ (e) research and development, feasibility studies, pilot, or demonstration projects
   - ☑ (f) training, education or public information programs with statewide application
   - ☐ (g) technical assistance
   - ☐ (h) other

3. Principal applicant (Organization or affiliation): **Water Education Foundation**

4. Project Title: **Project Wet (Agricultural Focus)**

5. Person authorized to sign and submit proposal and contract:

Name, title	Rita Schmidt Sudman, Executive Director
Mailing address	717 K Street, Suite 317 Sacramento, CA 95814
Telephone	916-444-6240
Fax.	916-448-7699
E-mail	rsudman@watereducation.org

6. Contact person (if different): Name, title.

Mailing address.

Telephone

Fax.

E-mail

7. Grant funds requested (dollar amount): **$469,704**

(from Table C-1, column VI)

8. Applicant funds pledged (dollar amount):

9. Total project costs (dollar amount): **$469,704**

(from Table C-1, column IV, row n)

10. Percent of State share requested (%) 100%

(from Table C-1)

11. Percent of local share as match (%) N/A

(from Table C-1)

12. Is your project locally cost effective?

Locally cost effective means that the benefits to an entity (in dollar terms) of implementing a program exceed the costs of that program within the boundaries of that entity.

(If yes, provide information that the project in addition to Bay-Delta benefit meets one of the following conditions: broad transferable benefits, overcome implementation barriers, or accelerate implementation.)

☑ (a) yes

☐ (b) no

See Benefit & Cost Analysis

11. Is your project required by regulation, law or contract? If no, your project is eligible.

If yes, your project may be eligible only if there will be accelerated implementation to fulfill a future requirement and is not currently required.

Provide a description of the regulation, law or contract and an explanation of why the project is not currently required.

- ☐ (a) yes
- ☑ (b) no

12. Duration of project (month/year to month/year): **December 1, 2005 – November 30, 2008**

13. State Assembly District where the project is to be conducted **CALFED Target Area**

14. State Senate District where the project is to be conducted: **CALFED Target Area**

15. Congressional district(s) where the project is to be conducted **CALFED Target Area**

16. County where the project is to be conducted: CALFED Target Area

17. Location of project (longitude and latitude) **CALFED Target Area**

18. How many service connections in your service area (urban)? N/A

19. How many acre-feet of water per year does your agency serve? N/A

20. Type of applicant (select one):

- ☐ (a) City
- ☐ (b) County
- ☐ (c) City and County
- ☐ (d) Joint Powers Authority
- ☐ (e) Public Water District
- ☐ (f) Tribe
- ☑ (g) Non Profit Organization
- ☐ (h) University, College
- ☐ (i) State Agency

- ❑ (j) Federal Agency
- ❑ (k) Other
  - ❑ (i) Investor-Owned Utility
  - ❑ (ii) Incorporated Mutual Water Co.
  - ❑ (iii) Specify _____

21. Is applicant a disadvantaged community? If 'yes' include annual median household income.

    (Provide supporting documentation.)

- ❑ (a) yes, median household income
- ☑ (b) no

2004 Water Use Efficiency Proposal Solicitation Package
APPENDIX B: Signature Page

By signing below, the official declares the following:

The truthfulness of all representations in the proposal;

The individual signing the form has the legal authority to submit the proposal on behalf of the applicant;

There is no pending litigation that may impact the financial condition of the applicant or its ability to complete the proposed project;

The individual signing the form read and understood the conflict of interest and confidentiality section and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant;

The applicant will comply with all terms and conditions identified in this PSP if selected for funding; and

The applicant has legal authority to enter into a contract with the State.

Rita Schmidt Sudman
Signature

Rita Schmidt Sudman, Exec. Dir.
Name and title

1/11/05
Date

opportunities for children and their families to learn more about water conservation, as well as create a viable program that could be continued in future years.

There are three organizations that are actively working with young people in the rural communities of California: University of California Cooperative Extension's 4-H program, the California Foundation for Ag in the Classroom, and the California Resource Conservation Districts. All three of these groups have outstanding educational materials, but none have water conservation education materials. The Water Education Foundation will partner with these three groups to provide Project WET and Watershed Manager workshops to their contact groups of formal and nonformal educators, focusing on water conservation and watershed protection lessons.

The Water Education Foundation and Project WET can help these organizations fulfill their water education goals. The California Foundation for Ag in the Classroom (AITC), 4-H and the California Association of Resource Conservation Districts recognize Project WET as an outstanding program with the elements necessary for water conservation education that will meet their needs. (See letters of support.)

In addition to the needs of the designated entities to educate their constituents about water conservation, the State of California educational system has begun testing students' achievement in science education. Now science achievement will be measured in 5th and 8th grade, and teachers are looking for ways to incorporate meaningful science lessons into their curriculum. Fifth grade science curriculum includes the hydrologic cycle and weather patterns and eighth grade includes basic chemistry, including molecular structure, pH, density and buoyancy. Besides this State Department of Education requirement, "No Child Left Behind" (NCLB) is a national mandate that requires schools to provide quality professional development to educators. The Water Education Foundation's education programs, including Project WET, meet the NCLB standards.

In conclusion, California's water shortages, the need for nonformal as well as formal rural educators to institute water conservation education, a focus in formal education to increase science related education, and the need for quality professional development for educators, all support the successful integration of the Project WET model into the CALFED region's need for water conservation education.

B-15d. Statement of Work, Section 2: Technical/Scientific Merit, Feasibility

The Water Education Foundation proposes to offer a targeted school education program that will have three distinct components:

1. Teacher workshops in partnership with the California Foundation for Ag in the Classroom (AITC).
2. Conference presentations and professional development workshops in partnership with the University of California Cooperative Extension (UCCE) 4-H program.
3. Conference presentations and professional development workshops in partnership with the California Resource Conservation Districts.

The proposed project period will be from December 1, 2005 through November 30, 2008.

Ag In the Classroom /Project WET workshops
December 1, 2005 – November 30, 2008
$102,370 over 3 years

The Water Education Foundation will present a familiarization workshop at the Foundation for Ag In the Classroom's annual summer Ag Institute prior to the start of the contract. The AITC will then set up five regional Project WET trainings each year. The Water Education Foundation will provide a facilitator for each workshop and Project WET Guides for each participant, and the AITC staff will also present their educational materials.

We have found that if you just give educators curriculum materials they may or may not use them, regardless of the quality of the lessons. However, if you train educators directly, or through facilitators, and actually show them how to work the lessons into what they are already teaching, they are likely to incorporate and education program and use it year after year. Since our materials are correlated to the California State Subject Standards, this increases the likelihood of continued use even more. In addition, because of the competing demands and budgetary constraints faced by educators, we have found that it is very important to offer incentives and free materials to facilitators and teachers who participate in the trainings.

We anticipate that we will train 25 educators in each of the five workshops each year for three years for a total of 375 educators. Each educator will be asked to present a minimum of two water conservation lessons, and then return an evaluation form. Teachers will receive a class set of AITC materials as a premium when their evaluation form is returned.

It has been our experience that about two-thirds of the teachers attending AITC workshops are elementary teachers, and one-third are secondary teachers. Therefore, in the first year, 125 elementary educators will each see an average of 30 students each year, meaning the **2,550 students and their families** will receive educational materials on water conservation. Each of the 40 secondary teachers see about 150 students per year, so the total of middle and high school

students receiving water conservation lessons will be approximately 6,000. **The total number of students would then be 8,550** for the first year only.

In actuality, many of the Project WET workshop attendees will continue to use the lessons in subsequent years, resulting in far greater numbers. Once teachers see how effective Project WET lessons are, and how well they fit into their curriculum, they use then over and over. The total number of students for year 2 would be 17,100, for year 3 would be 25,650, for a **three year total of 51,300.**

UCCE/4-H workshops
December 1, 2005 – November 30, 2008
$89,735 over 3 years

The Water Education Foundation will present Project WET familiarization workshops at two annual conferences, the California 4-H State Leadership Conference for 4-H leaders and students, and the California Leaders Forum for volunteer adult leaders. The Foundation will present at the conferences before the contract begins the first year, and during August and November of the following two years. The professional development for 4-H leaders is organized by the UCCE Science, Technology and Environmental Literacy Workgroup. The Chair of this workgroup will help the Water Education Foundation organize three regional Project WET workshops for 4-H staff and volunteer leaders. (See George letter of support.) The Workgroup looks for high quality programs to offer to their volunteer leaders. Project WET has partnered with 4-H programs in many other states and has been correlated to the 4-H standards and goals.

Three regional workshops will be conducted each of three years; one in the Sacramento Valley, one in the San Joaquin Valley and one in southern California, for a total of nine workshops. The Foundation will offer a $100 stipend to any adult 4-H volunteer who attends the workshop. We anticipate that 20 volunteers will attend each workshop. Each participant will receive a Project WET Guide. Each volunteer typically works with 10 young people. Therefore the workshops will train 60 volunteers each year who will reach approximately 600 young people.

Successful programs tend to be used repeatedly, so we anticipate that the first 60 volunteers trained will use the activities with another 600 children the second year. We will train an additional 60 volunteers who will reach another 600 4-H youth, for a total the second year of 1,200. The process repeats the third year, with a third year total of 1,800. **The three year total of 4-H youth exposed to high quality water conservation lessons will be 3,600.**

California Association of Resource Conservation Districts (CARCD)
December 1, 2005 – November 30, 2008
$242,179

The Water Education Foundation will form a training partnership with the RCDs to conduct two annual Project WET and Watershed Manager educator workshops. Wise land use and water use efficiency has been a theme of watershed education for many of the 103 California Resource Conservation Districts (RCDs). But few of these districts have many educational materials or trained personnel to aid them in their work with teachers and children in their regions.

The Project WET coordinator will attend the state conference for the 10 biogeographical RCD regions and present an introduction to Project WET and the "Discover a Watershed: The Watershed Manager" programs. A letter from the Chair of the CARCD Education Committee and a questionnaire will be sent to all 103 RCDs to determine interest in water conservation and watershed education.

The Water Education Foundation will then conduct two facilitator workshops for each of the three years of the project, one in southern California and one in central or northern California. The focus of the workshops will be on water conservation and watershed management, with guidance from the results of the questionnaire. The "train the trainers" workshops are a very effective way to multiply the educational outcomes of a program.

The Water Education Foundation proposes to offer a targeted school education program that will train 40 facilitators each of the three years in the program in two regional facilitator workshops per year. Each Resource Conservation District sending a participant to the facilitator workshop will receive a $1,000 stipend to defray the time costs for implementing the Project WET or Discover A Watershed teacher training program as part of their educational outreach. These 40 facilitators will, in turn, each train 20 educators who teach children in grades K-12 in rural or agricultural areas throughout the state, concentrating in the CALFED solution area. Facilitators will be provided with free educator guides (either WET or Discover A Watershed) for their participants the first year.

This would result in 800 teachers trained in the first year to include Project WET, and specific lessons in water conservation, in their curricula. Each of the 800 teachers will then provide a minimum of two lessons in their classrooms related to water conservation. Each teacher will reach an average of 30 children, so that approximately **24,000 children and their families** will receive information about water conservation and watershed protection **in the first year** of the program.

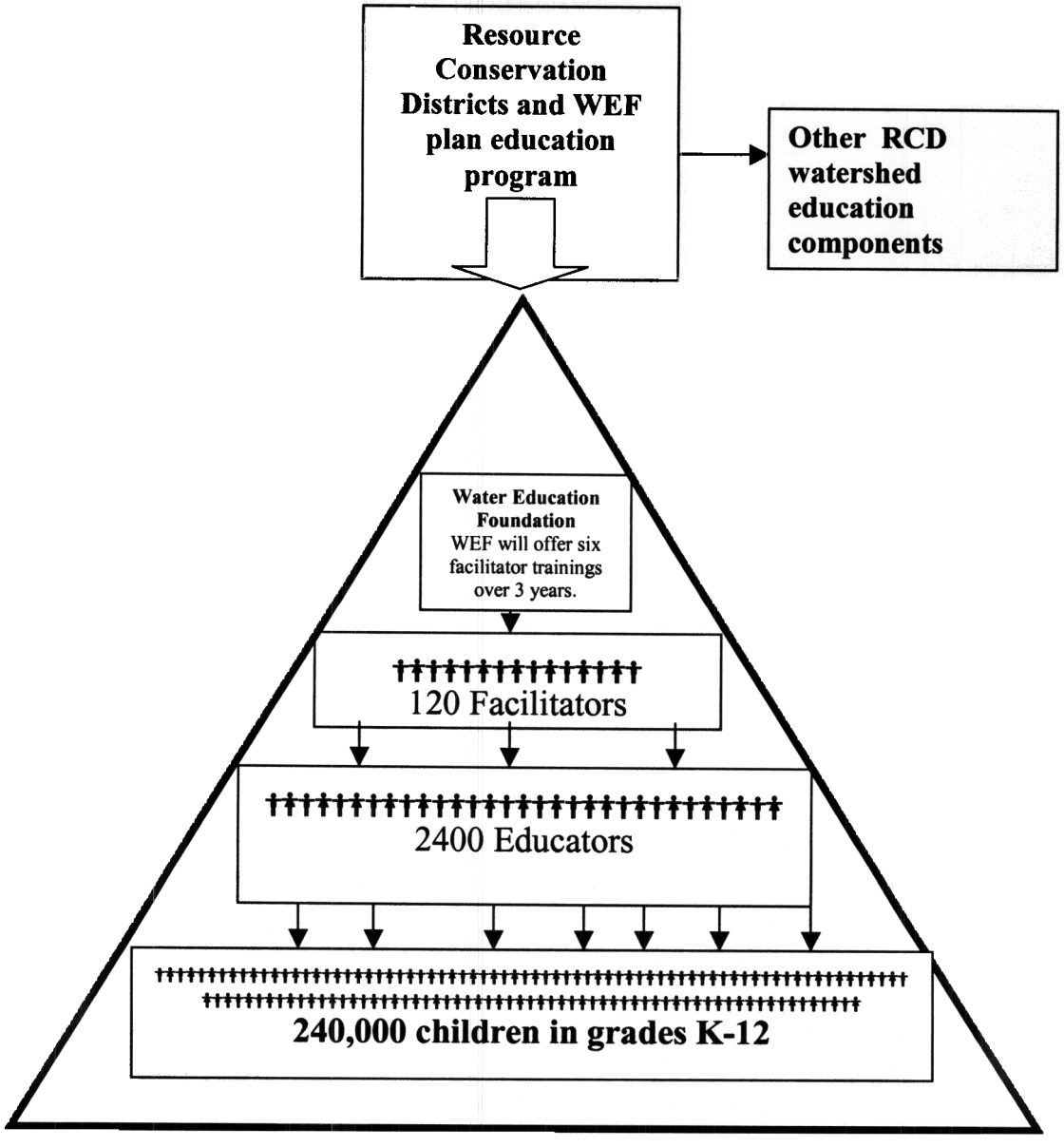
In actuality, many of the Project WET workshop attendees are secondary teachers who see approximately 150 students per day. Park rangers, zoo and aquarium educators, and school district science coordinators also attend workshops; these professional educators see thousands of children each year, so the total number of children could actually be much higher.

RCD staff members whose job assignment includes community outreach within their watershed would be invited to attend the Project WET facilitator workshop. Funds from the WUE grant would be used to pay for time and travel for RCD personnel as well as to purchase *Project WET Activity Guides* or *Discover A Watershed: Watershed Manager Educator's Guides* for the RCD outreach personnel participating in the workshops. As an incentive to the RCD to participate the first year, some funds from the WUE grant would be used to purchase Project WET Activity Guides for the educators participating in their workshops. The main obligation of the RCD the first year would be to sponsor the workshop, provide lunch for the participants and distribute their own water conservation materials.

Our experience is that once a workshop sponsor experiences the positive response of the educators in their community, they will commit resources (approximate cost/workshop is $600) to continuing a successful Project WET program. The Project WET program will be an educational tool that will enable the resource conservation districts to continue to conduct water conservation and watershed workshops long past the conclusion of the grant time period. (See attached letters of support.)

The total numbers of teachers trained by the first group of facilitators trained would double in year 2 and triple in year three, resulting in a total in the third year of 2,400 educators and 72,000 children and their families becoming more aware of water conservation actions they can take in their homes, or about watershed protection. In addition, teachers tend to continue to use lessons that are effective and enjoyable. Assuming all teachers trained continue to use the materials for the following years, the total of students trained from just the first group of facilitators would be 24K + 48K + 72K = 144,000 students. If 40 more facilitators are trained in year 2 and then year 3, **the ultimate total would be over 240,000 student and family contacts**. The structure of this program is commonly referred to as the "train the trainer model". It is one of the most cost-effective ways to develop a targeted education program, as it works on a pyramid model.

The Water Education Foundation and Project WET have been using the train-the-trainer model for over nine years and have trained over 6,000 educators who report to us that they have annual contact with over three and a half million students. Our successes come from partnering with water districts and other agencies all over the state which use Project WET as part of their outreach effort. Because all Project WET activities are correlated to the California Department of Education's state subject area standards, they are very popular with California educators. The Water Education Compendium jointly published by the State Departments of Water Resources and Education ranked Project WET as an "A+" program.



We have found that if you just give educators curriculum materials they may or may not use them, regardless of the quality of the lessons. However, if you train educators directly, or through facilitators, and actually show them how to work the lessons into what they are already teaching, they are likely to incorporate and education program and use it year after year. Since our materials are correlated to the California State Subject Standards, this increases the likelihood of continued use even more. In addition, because of the competing demands and

budgetary constraints faced by educators, we have found that it is very important to offer incentives and free materials to facilitators and teachers who participate in the trainings.

We believe the "train the trainer" mode works the best when you can train facilitators that work in the local community. This empowers them to present water education materials as well as information about local watershed resources.

Task list and schedule:

Task 1: Offer a targeted school education program in partnership with the California Foundation for Ag in the Classroom (AITC), the University of California Cooperative Extension (UCCE) 4-H program and with the California Association of Resource Conservation Districts (CARCD).

December 1, 2005 – November 30, 2008
$434,284 over 3 years

Prior to beginning of contract, WEF begins outreach and familiarization workshops at the AITC Summer AG Institute, the UCCE 4-H Leadership Conferences and California Association of Resource Conservation Districts Conference. Interest questionnaires distributed to 103 Resource Conservation Districts (RCDs). These activities are not included in the budget; the costs associated with these activities will be covered by WEF.

		End Date
.1	Two regional workshops held in conjunction with Ag In The Classroom	06/30/06
1.2	Letters, a Project WET Sampler, a packet of information explaining the water conservation education program and an invitation to attend the Project WET facilitator training sent to RCDs indicating an interest in watershed and water conservation education materials.	6/30/06
1.3	Letters, a Project WET Sampler, a packet of information explaining the water conservation education program and an invitation to attend the Project WET workshops sent to all 4-H Volunteer and Youth Leaders.	6/30/06
1.4	Attend UCCE Leadership Conference and Summer Ag Institute	9/30/06

The Facilitator Training:

The Water Education Foundation's proposed program would provide a trainer and copies of the *Project WET Curriculum and Activities Guide* or *Discover A Watershed: Watershed Manager Educator's Guide* to each RCD facilitator workshop participant. The Foundation's educators will take the lead in the handling of the logistics of setting up

the facilitator training. The training would be six to eight hours in length and provide training in the Project WET program as well as in facilitation skills.

Two regional Project WET workshops will be held in conjunction with Ag In The Classroom program. 9/30/06

Two regional Project WET workshops will be held for 4-H Adult and Youth Leaders 9/30/06

At the end of each workshop, participants will fill out evaluation sheets, which will be returned to the Water Education Foundation for tabulation and data entry. Quality of workshops will be monitored by these evaluations. All workshop participants will become part of the Project WET list serve and receive four seasonal emailed Project WET Gazette newsletters each year. (See attached sample.) Newsletters contain information about water issues, education, professional development opportunities for teachers and educational opportunities for students. This on-going contact and education is one of the hallmarks of an excellent teacher education program (as cited in NCLB).

.5 Attend UCCE Conference and RCD Conference 12/10/06

.6 Fifth regional AITC Project WET workshop takes place. 12/10/06

1.7 Third Project WET workshop takes place for 4-H Leaders. 12/10/06

1.8 Second regional facilitator workshop will be conducted for RCDs. 12/10/06

1.9 First set of teacher trainings by RCD personnel take place. 12/10/06

Teacher Trainings:

Each of the 40 facilitators would arrange to directly educate 20 teachers in their district over the following year. These trainings would take six hours and require a fair amount of up front coordination on the part of the facilitator. Each of the 40 facilitators would provide a copy of the Project WET Activity Guide (paid for by CALFED WUE grant) and an evaluation sheet (sample attached) to each teacher participating in the workshop. The teachers would agree to teach two

water conservation lessons to a minimum of 30 students each.

10 Student training begins in classrooms. 12/10/06

Student Trainings:

Each teacher will incorporate a minimum of two water conservation lessons from Project WET into their curriculum with a minimum of 30 students.

11 The Water Education Foundation will produce an annual report summarizing the number of workshops conducted, sponsoring agencies, number of educators trained and their grade levels and the number of annual student contacts. (See sample report for 2004.) 1/31/07

Teachers who are trained to use these water education materials tend to continue to use them year after year. (See teacher comments.) Since the Project WET Guide remains in the teachers' curriculum library, this means the investment in trainings is multiplied over subsequent years.

1.12 Five regional Project WET workshops in cooperation with AITC. 12/10/07

1.13 Three regional Project WET workshops for 4-H leaders. 12/10/07

1.14 Two facilitator Discover A Watershed or Project WET workshops for RCD education personnel. 12/10/07

15 The facilitators trained will conduct another 40 workshops, each with 20 teachers. Again, each district will be supplied with Project WET Guides for their first year of workshops, as an incentive to become involved in school water education outreach. The schedule will be identical to year one. 12/10/07

1.16 Five regional Project WET workshops in cooperation with AITC. 11/01/08

Three regional Project WET workshops for 4-H leaders. 11/01/08

1.18 Two facilitator Discover A Watershed or Project WET workshops for RCD education personnel. 11/01/08

The facilitators trained will conduct another 40 workshops, each with 20 teachers. Again, each district will be supplied with Project WET Guides for their first year of workshops, as an incentive to

	become involved in school water education outreach. The schedule will be identical to year one and two.	11/01/08
1.20	Contact trained facilitators to offer suggestions on implementation and additional in-depth training in other water education topics like groundwater, water quality, watersheds, wetlands, etc.	Annually
1.21	Distribute newsletters to trained teachers.	Quarterly
1.22	Collect contact information on all workshop participants and will produce annual reports summarizing workshop sponsors, numbers of participants and numbers of annual student contacts. (See sample annual Workshop Summary Report from 2004.)	Annually

Task 2: Project Monitoring & Assessment
December 1, 2005 – November 30, 2008
$15,850 over 3 years

2.1	Monitoring of project progress and deliverables	Ongoing

Task 3: Report Preparation
December 1, 2005 – November 30, 2008
$19,570 over 3 years

3.1	Preparation of all progress reports.	Quarterly
3.2	Preparation of all financial reports/invoices	Quarterly
3.3	Preparation of final report.	11/30/08

B-15e. Statement of Work, Section 3: Monitoring and Assessment

Each participant who attends a Project WET or Discover A Watershed workshop will complete a workshop evaluation form. Statistics from evaluation forms will be tabulated and reported in standard Excel format. (See Workshop Summary sample from 2004)

Each facilitator planning a workshop will submit a Workshop Proposal (See sample) and an agenda for the workshop (See sample).

At the conclusion of each workshop, including the facilitator workshops, each participant will fill out an evaluation form. (See sample.) The Water Education Foundation will monitor these evaluations for quality of the workshops and to make sure that they are meeting the standards set out for all workshops. (See "Implementation Standards" sheet.)

Each facilitator will also submit a Workshop Report to the Water Education Foundation (See sample.)

From the evaluations and reports the Water Education Foundation will compile information into an Excel file on the sponsor of the workshop, the facilitator, location of the workshop, number of participants, grade level taught, and annual student contact numbers. This will be formatted into an annual Workshop Summary Report. (See 2004 sample.)

This format of reporting ensures that the Water Education Foundation will oversee the quality of the workshops and compile data on the number of teacher participants and student contacts. We have been using this format successfully for over nine years.

B-15f. Qualifications of the Applications and Cooperators

Background -The Water Education Foundation

The Water Education Foundation was founded in 1977 with the mission to create a better understanding of water issues and help resolve water problems. The Foundation has developed outreach programs that include briefings, classroom programs, written materials, public television programs, and water tours. The goal of each of these activities is to educate the public and decision makers, while encouraging involvement, support, and interest in discovering long term solutions to water problems.

A volunteer board of directors includes the representation of the agricultural community, environmental groups, water law, municipal agencies, and Native American tribes
The Water Education Foundation is managed by a very committed staff. Rita Schmidt Sudman, executive director, has been with the Foundation since 1979 and is widely recognized as an expert on water policy and management. Due to this strong leadership, the Foundation has received many prestigious awards for its work, including the Governor's Award for Environmental and Economic Leadership, the national Chevron Conservation Award, the Bureau of Reclamation's highest award in the Water Conservation Awards Program, many Emmy nominations for documentaries and the receipt of two Emmy awards. (See resume.)

The Foundation's Education Director, Judy Maben, has coordinated the school education program for the Water Education Foundation since 1986 and has served as the State Coordinator

for California Project WET (Water Education for Teachers) since its inception in 1993. (See resume.) She holds a lifetime credential in science education.

Brian Brown, the assistant Project WET Coordinator, has been an environmental educator for 11 years. Brian is also a credentialed teacher. (See resume.)

An additional educator would be hired to be the second assistant coordinator on this project.

Project WET Background Information:
Project WET (Water Education for Teachers) is a high quality, effective K-12 inter-disciplinary program for formal and non-formal educators. Project WET began in 1984 in North Dakota. With the involvement of the US Bureau of Reclamation, the effort was soon begun to replicate this model program for other states. Today, Project WET is a highly respected and utilized education tool in 50 states, Canada, Mexico, the Philippines and through the Peace Corps science education program.

The Water Education Foundation, under the sponsorship of the US Bureau of Reclamation: Mid-Pacific Region, is the coordinating agency for California Project WET. Under this beneficial partnership, more than 6,500 educators have been trained and more than three million students have been provided the information and lessons offered by the Project WET curriculum in the last nine years.

Project WET has created a strong reputation as a high quality, effective education program provided to educators who participate in workshops which train them to implement the program effectively. Project WET is correlated to California State Frameworks for Science and History/Social Science, and provides balanced lessons that reflect the variety of water users and issues. Project WET was given an A+ rating by the teachers reviewing materials in the Water Education Compendium. (See attached page.) Project WET is consistent with the realities of problem solving practices in water resources today and prepares students to think critically and work cooperatively.

The Project WET Curriculum and Activity Guide (Sample lessons attached)

The Project WET Curriculum and Activity Guide is a collection of over 90 science based, interdisciplinary activities and lesson plans that are teacher-tested and classroom ready for K-12 students. Designed with a commitment to meeting educational standards, Project WET activities cover diverse topics and disciplines. Teachers can select one or two activities to supplement an existing course, or plan three to four week blocks of in-depth water study.

The Project WET Curriculum and Activity Guide was designed:

- to create a guide that represents the thoughts, needs, and concerns of a vast cross section of grassroots educators and resource managers and is relevant and meaningful to young people.
- to accommodate diverse learning styles with activities that are not only practical but also thought-provoking and engaging.
- to address water from the widest possible angle with Project WET modules and existing regional water education programs bringing local issues into sharper focus.
- to provide educators with a large selection of creative teaching strategies.
- to promote the tenet of "water for all water users."
- to generate enthusiasm for further, more in-depth, study of topics introduced through the activities.

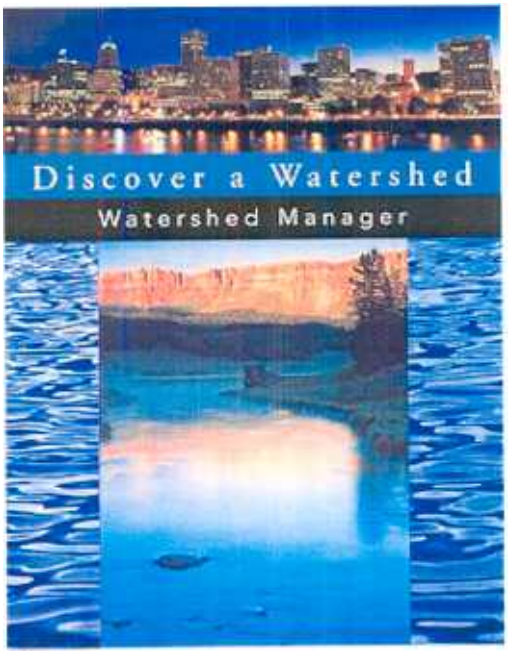
INSTRUCTIONAL APPROACH:
Project WET activities are designed to satisfy the goals of educational programs by complementing existing curricula rather than displacing or adding more concepts. Project WET activities provide many opportunities to address curriculum objectives and educational standards. These interdisciplinary activities designed for students in grades K-12 are perfect for use in formal and non-formal education settings.

The pedagogy of Project WET is so effective that university science methods professors of pre-service teachers use it to teach their students how to teach science. Project WET is used by over a dozen California universities as part of their teacher preparation program. (See attached letter.)

The Water Education Foundation is highly respected as a dependable source of information on complicated and important water issues, as well as a source of excellent school education materials. Here are some **quotes from teachers** who have taken Project WET workshops:

- "The book and content standards went directly together. I thought the strategies taught were wonderful and will be very helpful."
- "I thought it was excellent and I have many strategies to use now"
- "The book is terrific"
- "The workshop added to my personal development"
- "I loved the hands-on activities and how they made learning so much fun and comprehensible"

Discover A Watershed: Watershed Manager Educator's Guide:



Discover a Watershed: The Watershed Manager Educators Guide A 193-page guide that contains 19 science-based, multidisciplinary activities that teach what a watershed is, how it works, and why we must all consider ourselves watershed managers. An extensive background section introduces readers to fundamental watershed concepts. Each activity adapts to your local watershed, contains e-links for further internet research, and is correlated to the National Standards for Science. Published by The Watercourse. BONUS! Includes a 26"x38" Map of Selected North American Rivers and Watersheds.

Previous CALFED Water Use Efficiency grant projects:

The Water Education Foundation successfully fulfilled its contractual obligations for a CALFED Water Use Efficiency project (Contract #460000-1602) entitled "Water Use Efficiency: The Water Conservation and Recycling Awareness Initiative." This project was a comprehensive, multi-media public education campaign which raised the public's awareness and improved understanding of two water supply stretching strategies: water conservation and recycling. The three primary components of the project were to develop, disseminate and evaluate the following products: 1) Water radio minutes; 2) Layperson's Guide to Water Conservation; and 3) Conserve Water Educator's Guide.

Background - Agriculture In The Classroom

In 1981 the USDA established Agriculture in the Classroom, which has the endorsement of all living former Secretaries of Agriculture, the National Association of State Departments of Agriculture, the National Conference of States Legislatures, most of the Governors of the States, and the major agricultural organizations and commodity groups. Significant progress has been

made through these partnerships of agriculture, business, education, government and dedicated volunteers.

Each state organization addresses agriculture education in a way best suited to its own needs. In some cases, an all-volunteer network is responsible for teacher education and materials distribution. States have formed educational nonprofit organizations which have the benefit of a tax-deductible status. In some states leadership is provided through the departments of education, agriculture or other government agencies; in other states through agriculture organizations or commodity groups; some through universities or colleges; and in some cases through the dedicated efforts of one or two individuals.

Agriculture in the Classroom has advanced because of a cooperative spirit among the participants. There is an AITC presence in every state and territory. Representatives from Canada have attended many USDA sponsored AITC national conferences and have now hosted two national conferences in Canada. Requests for information about Ag in the Classroom come from many countries around the world and from other organizations wanting to learn how to deliver their programs with equal success.

The strength of Agriculture in the Classroom comes from its grassroots organization and the fact that educators are very much a part of the movement. Giant strides have been made since 1981. Agriculture in the Classroom is regarded as a refreshing and flexible educational program designed to supplement and enhance the teacher's existing curriculum.

Background – University of CA Cooperative Extension

University of California Cooperative Extension (UCCE), has farm, 4-H, and nutrition, family and consumer sciences advisors based in more than 50 county offices. In addition, Cooperative Extension specialists are headquartered at UC Berkeley, UC Davis, and UC Riverside, where they conduct research and coordinate advisors' activities. As a land-grant institution, the Cooperative Extension mandate is tied to the welfare, development, and protection of California agriculture, natural resources, and people.

The 4-H youth development program, with staff in each county office, provides meaningful, learn-by-doing educational activities to children in 4-H clubs and to children participating in school enrichment and after-school programs. The 4-H program includes traditional offerings – such as cooking, animal husbandry, and sewing – and an array of exciting new programs for today's youth – including rocketry, computer science, and leadership.

Background – California Association of Resource Conservation Districts

The California Association of Resource Conservation Districts (CARCD) is a voluntary association whose primary function is to provide a unified means for California Resource Conservation Districts (RCDs) to meet major conservation goals. CARCD is the umbrella

organization for 102 Resource Conservation Districts located throughout California. RCD staff work one-on-one with stakeholders in local watersheds to promote conservation of water and other natural resources. With their presence in both rural and urban areas across California, RCDs are uniquely positioned as grassroots organizations to deliver an educational message about agricultural water use efficiency. RCD efforts strive to balance economic realities with community needs for healthy, sustainable watersheds.

B-15g. Outreach, Community Involvement, and Acceptance

The Water Education Foundation is highly respected as a dependable source of information on complicated and important water issues and has a strong reputation for successful outreach to constituencies with a broad range of interests. The Foundation's Project WET program has been successfully implemented throughout the state since 1996, growing from 289 educators trained the first year to over 1,200 educators annually for the last two years. The Project WET lessons are well received by educators because they are correlated to the State Department of Education's Science and English/Language Arts and History/Social Science Standards.

The train-the-trainer modality is a highly effective and efficient way of disseminating educational materials. The growth of the program is geometric and once in place, water education lessons are used repeatedly year after year by educators.

Each of the three partners, Ag in the Classroom, 4-H, and the Resource Conservation Districts, has established credibility with educators in rural communities. All three have been working partners with the Foundation and Project WET in the past. This new partnership will create new education tools for the three partners to use in years to come.

B-15h. Innovation

The Water Education Foundation and Project WET have been using the train-the-trainer model for over nine years and have trained over 6,000 educators who report to us that they have annual contact with over three and a half million students. It is one of the most cost-effective ways to develop a targeted education program, as it works on a pyramid model.

We have found that if you just give educators curriculum materials they may or may not use them, regardless of the quality of the lessons. However, if you train educators directly, or through facilitators, and actually show them how to work the lessons into what they are already teaching, they are likely to incorporate and education program and use it year after year.

Our successes come from partnering with water districts and other agencies all over the state that use Project WET as part of their outreach effort. Because all Project WET activities are correlated to the California Department of Education's state subject area standards, they are very

popular with California educators. The Water Education Compendium jointly published by the State Departments of Water Resources and Education ranked Project WET as an "A+" program.

B-15i. Benefits and Costs

Benefits:

Project WET and Discover a Watershed will provide a high quality water education tool to resource conservation districts needing to reach out to their communities to improve water conservation and inform citizens about wise water use and watershed stewardship. In addition, 4-H leaders and classroom teachers in rural communities will receive lessons they can use over the years to teach young people about water conservation. It is cost effective to make use of a successful program of highly rated water conservation lessons that have already found acceptance in the education community.

There is no need for these three agricultural outreach groups to invest time and money into "re-inventing the wheel" and developing their own program when Project WET is such an effective tool. Even if the groups have existing materials specific to their own communities, WET will provide access to the educational community because of its reputation.

The "train-the-trainer" modality with its pyramid-like growth is a cost effective way to train educators and students. The Water Education Foundation trains the resource conservation district personnel, who train the teachers, who work with the children. Rather that paying water district personnel to try to teach in every classroom, why not train the teachers to include the water conservation lessons? They will continue to use them with each new group of students.

Finally, the money requested in this grant will be leveraged by the Water Education Foundation's investment to set up the statewide network of Project WET over the last nine years, with the help of grants from the U.S. Bureau of Reclamation and the U.S.G.S. This network will continue to provide on-going information about water to every Project WET workshop participant. **The cost of this $470,000 grant request is less than $1.57 per child.**

Costs (3-year project):

Salary ($48,917/year = $146,750)

The executive director will oversee the project's progress, as well as the assessment and reporting in monthly meetings with staff (30 hours per year = 90 hours)

The education director will be the coordinator of the project, attending the professional conferences, doing initial outreach to 4-H volunteers and RCDs, conducting planning of the facilitator and educator workshops, help with the facilitator and educator workshops and oversee the work of the assistant coordinators. (177 hours per year = 530 hours)

The two assistant coordinators will be in charge of communications to participants in all workshops, ordering materials, organizing workshops, helping with workshops, setting up and maintaining database, writing newsletters, and will also do the assessment and reporting. (220 hours per year each = 1320 hours)

The office manager will ship workshop materials to workshop sites and maintain inventory of Project WET Guides. All invoices and accounts receivable will be handled by the office manager. (60 hours per year = 180 hours)

The development director will write the required grant reports and administer grant funds. (67 hours per year = 200 hours)

Fringe Benefits ($16,143 per year = $48,429)
Calculated at 33% of salaries and includes all payroll taxes, health and retirement benefits.

Consultants ($6,500 per year = $19,500)
The coordination of the AITC workshops will be handled by that agency's personnel, who will also promote and participate in the workshops. Their cost estimate includes the following for each workshop: $250 for presenter, $500 for overhead, $350 for travel, $100 for supplies, and $100 for promotion flyers for a total of $1,300 per workshop x 15 workshops over three years = $19,500.

Supplies ($21, 696 per year = $65, 089)
Materials for workshop, letters and other communication will be photocopied for distribution.

Shipping costs are based on the cost of one box of 10 books at approximately $12.50; we anticipate shipping approximately 310 boxes. In addition, workshop supplies will need to be shipped to each location.

The Project WET Guide (516 pages, 91 activities for grades K-12) costs are $15 x 1815 books required for all workshops. The Discover A Watershed Guides (190 pages, 19 activities, 1 North American Watersheds Map) are $25 x 1260 books.

Facilitator binder cost is approximately $5 for each of the 180 facilitators. Project WET pamphlets (see sample) and sampler booklets will be purchased from the national Project WET office to publicize the workshops and programs.

Travel ($5,300 per year = $15,900)
Travel expenses are based on air or mileage figures of approximately $200 per trip, hotel at $100 per night, and per diem at $50. For facilitator workshops, two presenters are included in costs. There are 6 conferences, 6 facilitator workshops, and 30 regular workshops in this grant proposal.

APPENDIX C
PROJECT IMPLEMENTATION COSTS TABLE

APPLICANT: Water Education Foundation
Project Title: Agricultural Water Use Efficiency Booklet & Workshops

If using the excel tables on DWR website, complete shaded areas only.

Section A projects must complete Life of Investment, column VII and Capital Recovery Factor, column VIII. Do not use 0.

Table C-1: Project Costs (Budget) December 1, 2005 – November 30, 2006

	Category	Project Costs $	Contingency % (ex. 5 or 10)	Project Cost + Contingency $	Applicant Share $	State Share $	Life of investment (Years)	Capital Recovery Factor (Table C-4)	Annua cos $
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX
	PERSONNEL								
	Salaries/ wages	48,917		48,917		100%			
	Fringe benefits	16,143		16,143		100%			
	Total Personnel	65,060		65,060		100%			
	CONSULTANTS	6,500		6,500		100%			
	SUPPLIES	21,696		21,696		100%			
	TRAVEL	5,300		5,300		100%			
	OTHER								
	General Expense	10,762		10,762		100%			
	Stipends	46,000		46,000		100%			
	Workshop Costs	1,250		1,250		100%			
	Total Other	58,012		58,012		100%			
(n)	TOTAL (=a+…+m)	156,568	NA	156,568		100%	NA	NA	
(o)	Cost Share Percentage	NA	NA	NA	(row n, column V/ IV) x 100	(100 – row o, column V)	NA	NA	NA

1 (Excludes administration O & M costs)

APPENDIX C
PROJECT IMPLEMENTATION COSTS TABLE

APPLICANT: Water Education Foundation
Project Title: Agricultural Water Use Efficiency Booklet & Workshops

If using the excel tables on DWR website, complete shaded areas only.

Section A projects must complete Life of Investment, column VII and Capital Recovery Factor, column VIII. Do not use 0.

Table C-1: Project Costs (Budget) December 1, 2007 – November 30, 2008

	Category	Project Costs $	Contingency % (ex. 5 or 10)	Project Cost + Contingency $	Applicant Share $	State Share $	Life of investment (Years)	Capital Recovery Factor (Table C-4)	Annua cos $
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX
	PERSONNEL								
	Salaries/ wages	48,917		48,917		100%			
	Fringe benefits	16,143		16,143		100%			
	Total Personnel	65,060		65,060		100%			
	CONSULTANTS	6,500		6,500		100%			
	SUPPLIES	21,696		21,696		100%			
	TRAVEL	5,300		5,300		100%			
	OTHER								
	General Expense	10,762		10,762		100%			
	Stipends	46,000		46,000		100%			
	Workshop Costs	1,250		1,250		100%			
	Total Other	58,012		58,012		100%			
(n)	TOTAL (=a+...+m)	156,568	NA	156,568		100%	NA	NA	
(o)	Cost Share Percentage	NA	NA	NA	(row n, column V/ IV) x 100	(100 – row o, column V)	NA	NA	NA

1 (Excludes administration O & M costs)

PROJECT IMPLEMENTATION COSTS TABLE

APPLICANT: Water Education Foundation
Project Title: Agricultural Water Use Efficiency Booklet & Workshops

If using the excel tables on DWR website, complete shaded areas only.

Section A projects must complete Life of Investment, column VII and Capital Recovery Factor, column VIII. Do not use 0.

Table C-1: Project Costs (Budget) — **December 1, 2005 – November 30, 2008 3-Year Budget**

	Category	Project Costs $	Contingency % (ex. 5 or 10)	Project Cost + Contingency $	Applicant Share $	State Share $	Life of investment (Years)	Capital Recovery Factor (Table C-4)	Annua cos $
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX
	PERSONNEL								
	Salaries/ wages	146,750		146,750		100%			
	Fringe benefits	48,429		48,429		100%			
	Total Personnel	195,179		195,179		100%			
	CONSULTANTS	19,500		19,500		100%			
	SUPPLIES	65,089		65,089		100%			
	TRAVEL	15,900		15,900		100%			
	OTHER								
	General Expense	32,286		32,286		100%			
	Stipends	138,000		138,000		100%			
	Workshop Costs	3,750		3,750		100%			
	Total Other	174,036		174,036		100%			
(n)	TOTAL (=a+...+m)	469,704	NA	469,704		100%	NA	NA	
(o)	Cost Share Percentage	NA	NA	NA	(row n, column V/ IV) x 100	(100 – row o, column V)	NA	NA	NA

1 (Excludes administration O & M costs)

Rita Schmidt Sudman

Ms. Sudman is Executive Director of the Water Education, an impartial and nonprofit organization whose mission is to develop and implement education programs leading to a broader understanding of water issues and to resolution of water problems in the West. She directs the development of *Western Water* magazine, the *Layperson's Guide* series, the Foundation's Colorado River program, public television programs on water, poster maps, tours, press briefings and school programs. Ms. Sudman is a former radio and television reporter and producer and received her master's degree in telecommunications from San Diego State University. She has developed a television production team which has won two Emmys and several regional Emmy nominations for the Foundation's public television documentaries. She serves on numerous boards including the President's Advisory Commission on water for the University of California and the board of Water For People, an international program assisting people in developing countries to obtain safe drinking water. In 2003, she received the *Lifetime Achievement Award* from the Groundwater Resources Association of California in recognition of her efforts on groundwater education.

JUDY MABEN
EDUCATION/TOUR DIRECTOR
WATER EDUCATION FOUNDATION
STATE COORDINATOR, CALIFORNIA PROJECT WET

Judy Maben has coordinated the school education program for the Water Education Foundation since 1986 and has served as the State Coordinator for California Project WET (Water Education for Teachers) since its inception in 1993.

Judy holds a lifetime California teaching credential, a Bachelors Degree in Biological Sciences and a Masters in Science Education from Stanford University. She taught science and math at the middle and high school levels for over 12 years and served as a master teacher for California State University at Sacramento's teacher education program. She served as trustee for the El Dorado Union High School District for eight years.

Judy has received grants from the California Departments of Education and Water Resources, U.S. EPA, the California State Water Resources Control Board, *National Geographic's* Teachers' Alliance, the National Water Research Institute and the U.S. Bureau of Reclamation to write and distribute water education programs. The materials she has developed for the Foundation include lesson plan units on the geography of California water resources, water science, role playing scenarios to explore water issues, games on pollution prevention, computer software on specific watersheds, and the California groundwater model and lesson module.

Mrs. Maben has conducted teacher training sessions throughout the state for 18 years. Judy is frequently asked to be a presenter at science and environmental conferences throughout California, as well as national and international water education conferences. She is a member of the University of Wisconsin's National Best Education Practices Advisory Committee, California Department of Water Resources Education Advisory Committee, the Golden State Environmental Education Consortium, the California Ag in the Classroom Resource Committee, the California Aquatic Science Education Consortium and has served on the advisory committee for the California Water Awareness Campaign since its inception. Judy also served for five years on the National Coordinator's Council for Project WET.

jwmbio 5/01

California Foundation for
Agriculture in the Classroom

December 29, 2004

To Whom It May Concern:

On behalf of the California Foundation for Agriculture in the Classroom (CFAITC), I am pleased to support the Water Education Foundation and Project WET in their efforts to educate California teachers and students about water. This organization benefits both the agricultural and education communities by providing a multitude of resources to California educators, youth, and the public.

The following list describes several ways in which the Water Education Foundation and Project WET and CFAITC have partnered on agricultural literacy and water education efforts.

- The Water Education Foundation and Project WET continually develop current water education resources. These items are listed in CFAITC's Teacher Resource Guide which is updated annually. The educational materials are reviewed by CFAITC's Resource Review Committee for technical accuracy, relevance to students, and balance. All materials have been approved for inclusion in our resource listings. CFAITC is pleased to see that current methodologies are used in the materials and that varying learning styles are incorporated.

- The Water Education Foundation and Project WET continually support, through in-kind contributions, exhibits, and presentations, numerous educator programs including annual AITC conferences and regional meetings.

  The Water Education Foundation serves as a source of technical information and technical references during CFAITC's development of water-related instructional materials.

- CFAITC participates in the Water Education's SPLASH annual festival where agriculture and water information reaches over 200 students annually.

CFAITC would like to partner with the Water Education Foundation in organizing and co-presenting five Project WET workshops annually. I urge you to support the expanded partnership, which will enable Project WET/agricultural literacy workshops to be conducted throughout California.

Sincerely,

Pamela M Emery

Pamela Emery
Curriculum Specialist

cc: Judy Culbertson

2300 River Plaza Drive · Sacramento, CA 95833 · 916-561-5625 · Fax 916-561-5697 · cfaitc@cfbf.com · www.cfaitc.org

California Association Of Resource Conservation Districts

SOLUTIONS FROM THE ROOTS UP

January 10, 2005

To Whom It May Concern:

RE: WUE grant application from the Water Education Foundation

I am writing this letter to urge you to support the grant application of the Water Education Foundation for a WUE ag grant to conduct teacher workshops on water conservation and watershed protection in cooperation with the Resource Conservation Districts.

As Executive Director of the California Association of Resource Conservation Districts, I look forward to working with the Water Education Foundation. We will be pleased to host a presentation about Project WET and the Watershed Manager teacher programs at our annual conference.

These programs will be useful tools for RCD education outreach personnel and our federal partner, NRCS, to work with teachers and students in their districts. Facilitator workshops throughout the agricultural regions of the state will offer valuable professional development opportunities for the RCDs as well as the materials they need to work successfully within the formal and nonformal education world.

encourage you to support the Water Education Foundation grant proposal.

Sincerely

Brian Leahy

Brian Leahy
Executive Director

3823 V Street, Suite 3 • Sacramento, CA 95817 • Phone: (916) 457-7904 • Fax: (916) 457-7934 • www.carcd.org

North Sacramento School District

670 Dixieanne Avenue, Sacramento, CA 95815
Telephone (916) 263-8300 - Fax (916) 263-8226
Web Site – www.nssd.k12.ca.us

January 29, 2003

Water Education Foundation
717 K Street, Ste. 317
Sacramento, CA 95814

To Whom It May Concern:

This letter is in support of Project Wet. Last year, fifteen teachers from our district had the opportunity to participate in Project Wet. They received six hours of training, a guide and a number of free items all geared towards enhancing their knowledge of water as a resource. The final piece, and perhaps the teachers' favorite was a field trip for the teachers and their classes to the American River Water Education Center.

I had the opportunity to talk with many of the teachers who took part in this training. Without exception they praised the project. A couple of them said it was the best training they ever had!

Obviously, Project Wet is very worthwhile. Our district was very fortunate to be selected to participate in it

Sincerely

Phyllis Young, Director of Instruction
North Sacramento School District

PY/Memos02-03/ProjWetLetter 2/03

California Project WET Training Workshop

Nov. 6, 2004

Sponsored by the Sonoma County Water Agency

Let's Get WET!

9:30 – 9:45	Registration and Introductions
9:45 – 10:00	Icebreaker – Raining Cats and Dogs (page 435)
10:00 – 10:15	Workshop overview and Project WET goals, Environmental Education and the California State Standards Correlations
10:15 – 12:00	WET Activities • Incredible Journey (page 161) • Pass the Jug (page 392) • Dilemma Derby (page 377) • Get the Groundwater Picture (page 136) Groundwater Video and Groundwater Model • Water Address (page 122)
12:00 –12:15	Lunch Assignment given: Project WET participants will present an overview of a Project WET activity
12:15 – 1:00	Lunch
1:00 – 1:15	"Take a Splash into the WET World!" A Book Walk with prizes!
1:15 – 1:45	Presentations – Your finds
1:45 – 3:15	More WET Activities: • Sum of the Parts (page 267) • Water Crossings (page 421)
3:15 – 3:30	Other Resources, Evaluations, and Good-bye!

Evaluation Form

Thank you for your interest in Project WET! Your responses to the following questions will help us improve the quality of Project WET workshops and services. Please take your time to answer all the questions. Thank you.

Your Name (optional) _____

1. Select only one of the following: Are you currently a teacher of
   K-5 ___ 6-8 ___ 9-12 ___ or a Preservice Teacher ___ Non-formal Educator ___
   Other ___ (explain) _____
2. Number of students you reach per year: _____ (only leave blank if you see no students at all).
3. How did you hear about this workshop? _____
4. Date and location of this workshop: _____
5. Were the contents of this workshop appropriate for the grade level you teach?
   YES ___ NO ___
6. Were the objectives of the workshop clearly stated?
   YES ___ NO .
7. Were the objectives of the workshop accomplished?
   YES ___ NO .
   Please explain if you replied "no" to either #6 or #7.

8.

10. Please provide us with your overall comments about the *Project WET Activity and Curriculum Guide* (include strengths, limitations, comments about specific activities, etc)

11. The best features of this workshop were:

12. This workshop would have been better if:

13. Any other comments, suggestions, requests, and/or concerns (use back if necessary):

Irrigation Interpretation

Grade Level:
Upper Elementary, Middle School

Subject Areas:
Environmental Science, Anthropology, Geography

Duration:
Preparation time:
Part I: 30 minutes
Part II: 30 minutes
Part III: 10 minutes

Activity time:
Part I: 50 minutes
Part II: extended
Part III: 30 minutes

Setting:
Part I: Outdoors
Parts II and III: Indoors

Skills:
Applying (restructuring, designing); Evaluating (observing, organizing, interpreting, analyzing)

Charting the Course
Prior to this activity, students could learn how plants absorb and transport water ("Thirsty Plants" and "Let's Even Things Out"). In "Sum of the Parts," students investigate problems with runoff and nonpoint source pollution. Soil and water relations are further addressed in "Get the Ground Water Picture."

Vocabulary
irrigation, salinization

What could cause a people to leave their homeland of a thousand years?

Summary

By conducting simulations, building models, and solving a mini-mystery, students compare the economic and ecological costs of different irrigation systems.

Objectives

Students will:

- identify reasons people irrigate.
- construct a classroom irrigation system and monitor crop growth.
- describe different irrigation methods and evaluate the costs and benefits of each.
- propose explanations for an ancient culture abandoning its homeland.

Materials

- *Raincoats and shoes that can get wet*
- *Absorbent cloth or paper towels*
- *Hose attached to running water or buckets of water*
- *Used plastic trays from fast-food restaurants with small holes punched in the bottom for drainage*
- *Plastic straws, some with flexible sections*
- *Clay or wood glue*
- *Sand*
- *Potting soil*
- *Grass or bean seeds*
- *Plant food*
- *Sprinkling can*
- *Small funnels*
- *Paper cups*
- *Poster board*
- *World map*

Making Connections

The fruits and vegetables you consume likely were grown on irrigated cropland. Without irrigated agriculture, crops such as lettuce, pineapples, oranges, soybeans, and others grown in arid parts of the world would be available in lesser quantities and at higher prices. Students may live in areas that have irrigated agriculture or may have seen it on television. Learning about different irrigation systems helps students consider the demands growing food places on water resources.

Background

People have been growing crops for a long time. In fact, some 10,000 to 12,000 years ago a cultural shift known as the agricultural revolution began in several regions of the world. This food-producing revolution involved a gradual move from a lifestyle based on nomadic hunting and gathering to one of settled agricultural communities; people learned how to domesticate wild animals and cultivate wild plants. Early growers practiced subsistence farming; that is, they grew only enough for themselves.

About 7,000 years ago the invention of the plow allowed farmers to cultivate larger areas. In some arid regions, early farmers increased crop output by diverting water from nearby streams into ditches and canals, dug by hand, to irrigate crops. This gradual shift from hunting and gathering to farming had several significant effects. Population increased as a result of greater food supplies, better living standards, and longer life spans. And people built increasingly larger irrigation systems, cleared larger fields, and organized villages.

Today, irrigated agriculture plays a critical role in providing large quantities of low-cost food for the United States and other parts of the world. Worldwide, almost 20 percent of the land farmed for crops is irrigated and produces about

envelops the roots of plants and kills them.

A look at the past reveals evidence of cultures devastated by the salinization of their soil. The Hohokam people lived in the Gila and Salt River valleys (in the American Southwest) in A.D. 1300. The Salt River was named Rio Salado by the early Spanish and Jesuit explorers because of its high salt content, caused by the heavy salt formation through which the river passes about 100 miles (160 km) north of Phoenix.

The Hohokam people lived in this location for more than 1,000 years. They built complex cities and had an advanced irrigation system, consisting of ditches running from their water source, the Salt River, to their crops.

The Hohokams suddenly disappeared from the area around A.D. 1400. Some scientists think a widespread epidemic might have occurred. The people could have become frightened and fled, but no evidence supports this hypothesis. Other scientists think the area was hit by a severe drought. Perhaps the mountains received little or no rain for many years and the rivers dried up, eliminating the Hohokams' water source. Evidence exists of a drought from A.D. 1277 to 1299. Tree ring studies from both river valleys indicate little growth during these years. This may be an indication of limited rainfall. However, scientists have found that only people from the villages near the small canals moved at that time; the people living on the river, streams, and large canals remained.

Scientists believe Hohokam irrigation practices may have severely damaged the land. After years of irrigation, the soil became less absorbent and the water did not run off as quickly. The soil became waterlogged at the surface. The high salt content of the Gila and Salt Rivers caused the roots of plants to die. Finally, the salt content was so high plants could not grow.

Irrigated lands in some areas around the world are prone to having problems with salinization today. In areas where these problems exist, landowners can reduce salinization by flushing fields or leaving fields fallow for a few years.

Procedure

▼ *Warm Up*

Ask students to list the essential elements that plants require for growth. One of these is water. Discuss rainfall patterns of the United States; show the map, *Average Annual Rainfall*. Have students identify the drier regions of the country. How do they think crops there get water? Have students describe agricultural lands they have seen. What irrigation methods have they seen or do they know?

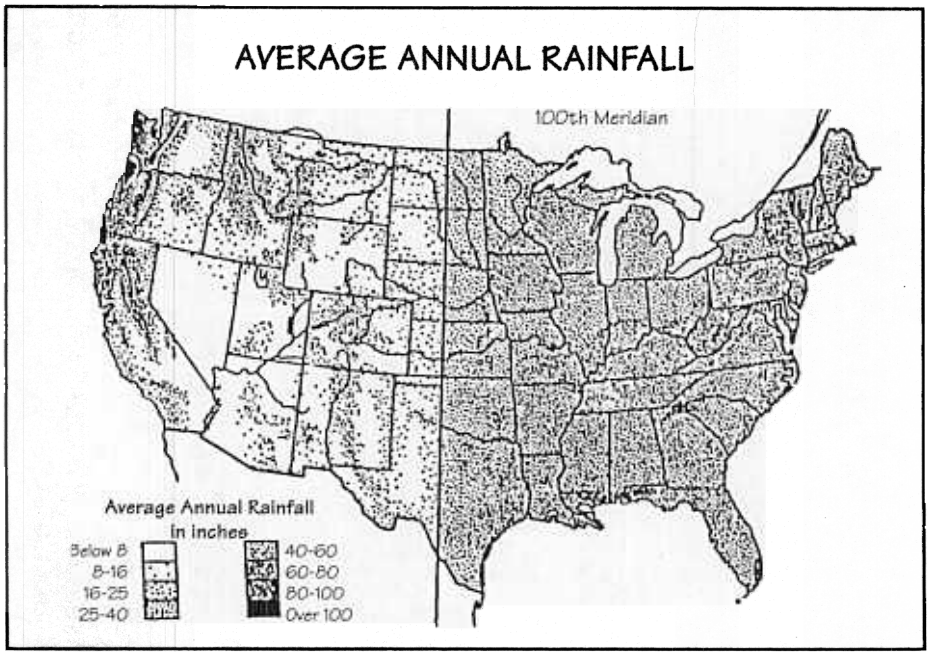
▼ *The Activity*

Part I

1. **Take the class outside and tell students they are going to demonstrate some basic irrigation practices. Warn them that they will be getting wet.**

2. **Have students stand in rows to represent planted crops. Give each student a paper towel or an absorbent cloth. Tell them it represents soil around their roots.** They should lay the paper towel by their feet. Roots need to be surrounded by wet soil to absorb nutrients; this is represented when the cloth or towel becomes saturated.

3. **One or two students will simulate the irrigation practices. Explain that one method of irrigation is ditch irrigation, involving gravity flow systems.** Have the irrigating students allow the hose to run (or have them pour bucketfuls of water) in front of each row of students. Students representing crops



soon soaked.

4. **Move the crop students to a new location where the ground is dry. Have them lay a new set of cloths or towels at their feet.**

5. **The second irrigation method represents a center-pivot sprinkler system. Have the irrigating students partially block the flow of water from the hose, so that it sprays out.** They should point the hose upward so that water sprinkles over the crop students, continuing until the paper towels are saturated.

6. **Have the crop students move again to a dry location and lay down new towels.** This time the irrigating students take the hose and water each towel. They should block the flow between waterings, so that no water is lost. This represents a drip irrigation system.

Part II

1. **Students can build separate models to demonstrate each irrigation system.** For the ditch irrigation method, instruct them to plant rows of grass seed or beans in a long planter and create a furrow beside each planted row. To irrigate the plants, water is poured into the ditches (furrows) in the long planter. To simulate the center-pivot irrigation system, students should use a sprinkling water can. For the drip irrigation system, distribute plastic trays, straws, clay, sand, potting soil, plant food, a small funnel, and grass seed to small groups of students. Have the students design and build a grass farm irrigation system in a plastic dish (see *Design a Drip Irrigation System*).

2. **Discuss the three irrigation systems.** Which used the most and least water? How might evaporation affect each system? Which do students think would be the most expensive to build and maintain? Discuss the cost of water loss compared to the cost of construction.

Part III

1. **Read or have students read the mini-mystery, *Lost Homeland*. They are allowed 20 questions to find the answer.** They may only ask questions that can be answered with a "yes," "no," or "not relevant."

2. **If students are not close to the answer after 15 questions, provide additional information about the location and the water source of these people (the Salt River).**

3. **After students have guessed or been told the solution, ask if they think modern cultures could have these problems. Discuss the benefits of and problems facing current irrigation practices.**

4. **To demonstrate how salt collects in soil, have students do the following:** Saturate some water with salt, carefully measuring the amount of salt added to the water. Poke a number of small holes in the bottom of a paper cup and fill the cup two-thirds full of soil. Pour the salt solution through the soil. Collect the water that runs through the soil; then allow it to evaporate. Compare the salt left after evaporation to the measured amount added to the water. Dry the soil and look for evidence of salt in the soil particles.

▼ *Wrap Up*

Discuss modern irrigation strategies with students. What types of irrigation can they identify? What technologies are used today? Have the class make a chart summarizing agricultural techniques and assessing ecological and economic benefits and costs. The chart could be posted in the hallway.

Have students:

- demonstrate and identify irrigation systems (***Part I***, steps 3–6).
- construct classroom irrigation models, demonstrating and comparing different irrigation systems (***Part II***, steps 1 and 2).
- develop a questioning strategy to determine why a culture would abandon its homeland (***Part III***, steps 1–3).
- create a chart summarizing irrigation techniques and assessing ecological and economic benefits and costs (***Wrap Up***).

Upon completing the activity, for further assessment have students:

- research and identify on a world map locations with salinization problems.
- investigate and report what is being done to overcome salinization problems.

Extensions

Have students modify their irrigation models to demonstrate the problems of waterlogging in irrigation practices.

K-2 Option

"Too Little, Too Much, Just Right"

Have students conduct an experiment using three empty milk cartons, potting soil, and three bean seeds. Fill each carton with an equal amount of soil and plant seeds according to directions on the package. (Make sure all cartons are exposed to the same amount of sunlight and temperatures.) Tell students this experiment relates to identifying the best conditions for growing crops. The first carton represents conditions with too much water. The soil in this carton should be continually saturated. The bean should not grow because of lack of air (oxygen) and because it is waterlogged. The second

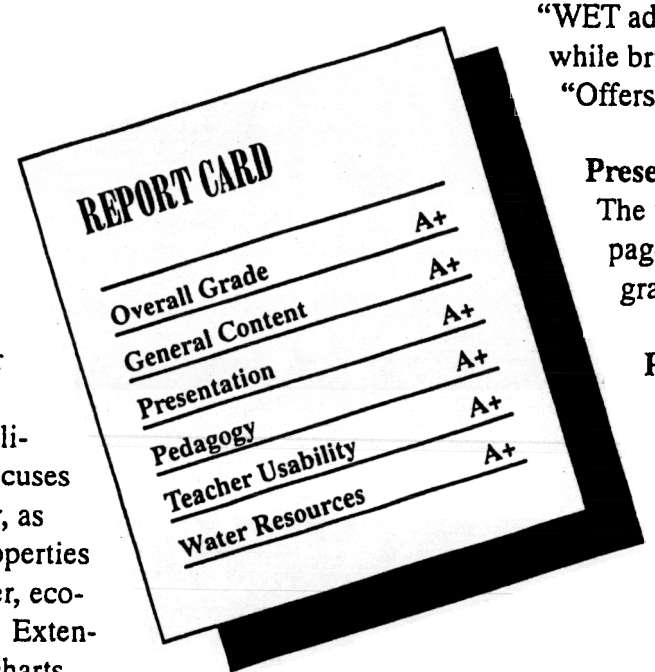
Design a Drip Irrigation Sys

Project WET Curriculum and Activity Guide

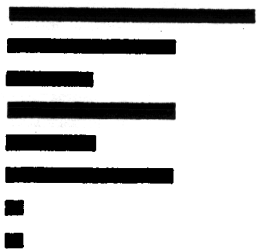
The Watercourse and Council for
Environmental Education
c/o Montana State University
201 Culbertson Hall
Bozeman, MT 59717-0570
(406) 994-5392

Only available through training workshop. 1995. 516 p.

Project WET is a national water education program designed to promote awareness, appreciation, knowledge, and stewardship of water resources. This guide reflects these goals in a collection of 91 interdisciplinary activities for K - 12. Content focuses on the human relationship with water, as well as the chemical and physical properties of water, quantity and quality of water, ecosystems, and management strategies. Extensive cross-referencing and planning charts, supplemental resource guide, and glossary are provided.



DISCIPLINE EMPHASIS 0 1 2 3



COMMENTS

General Content

"Comprehensive, thorough background information for teachers." "WET addresses water resources from the widest angle possible, while bringing local issues into sharper focus for students." "Offers strong cultural connections."

Presentation

The text is well laid out with clear, reproducible student pages. "Exceptionally well put together" and "augmented by graphics."

Pedagogy

"Objectives are clearly written in behavioral terms." "Activities are flexible and well designed ..." "relevant and meaningful." "Assessment strategies are diverse and tied to each lesson." "A constructivist approach."

Teacher Usability

Extremely teacher-friendly! "Materials are easily obtainable, procedures are clear, and the 'Charting the Course' section is invaluable."

Specific Content on Water Resources

Exceedingly comprehensive coverage.

Summary of workshops and Activities -- 2004

Date	Facilitator	Sponsor(s)	Place of Workshop or Event	# of Participants	# of Non-formal educators	K-5	6-8	9-12	University	Pre-Service	# of students reached
	Pam Brigandi & Tish Daly (Donna Bennett)	MWD of OC, NPDES Public Education sub-comm. Cities & Cou. Of Orange	Irvine City Hall, Irvine	24	24						300
01/05/04	Heidi LaMoreaux	Calfed Grant	Sonoma State Univ., Hutchins School	13	1			1		11	500
01/01/04	Darleen Stoner		CSU, San Bernardino	13	3	2	3	1		4	1,980
01/24/04	Teri Engbring	Yolo Basin Foundation	Yolo Bypass DFG Hdgqtrs, Davis	13	3	8	2				752
Jan 26 & Feb 2	Jeanine Sidran	Lindsay Wildlife Museum	Lindsay Wildlife Museum, Walnut Creek	15	6	4	1				1,614
01/30/04	Cam Wolff	East Bay Muni. Utility	EBMUD offices, Orinda	17	2	6	2	5			978
02/01/04	Raleigh Philp	Calfed Grant	Pepperdine University	26	3	10	1			12	2,024
02/10/04	Darcy Aston	Santa Barbara Co. Water Agency	Santa Barbara Zoo	10	2	5	2				6,332
02/15/04-02/18/04	**Bruce Fisher**	**Department of Water Resources**	**Humboldt State University**								
02/17/04	Donna Henderson	City of Riverside	Granite Hill Elementary, Riverside	85						85	4,738
02/21/04	Judy Knott	Teach the River	CART, Clovis	20	10	4	4			1	40,422
02/25/04	Pam Brigandi & Tish Daly (Donna Bennett)	Calfed Grant	CSU, Fullerton El Toro Campus	27						22	500
	Kathy Machado	Santa Clara Valley Water District	Santa Clara Valley Water Dist.	15	7	7					7,692
03/03/04	Vai Campbell & Tami Stolzenthaler	Soquel Creek Water District	Santa Cruz County Office of Education	22	4	6	2	1			1,544
03/03/04	Pam Brigandi & Tish Daly (Donna Bennett)	Calfed Grant	CSU, Fullerton El Toro Campus	27						24	1,645
03/06/04	David Stronck	*	Math & Science Spring Conf.	12							
03/20/04	David Stronck	Project Pipeline	Alameda Adult Center, Alameda	15		10	5			15	300
03/20/04	Kathy Machado	Calfed Grant	Santa Clara Valley Water Dist.	8		2	1			5	507
03/27/04	Kathy Machado	Calfed Grant	Santa Clara Valley Water Dist.	18						18	528
04/03/04	Kate Breece	Helix WD, Otay WD, Padre Dam WD	Water Conservation Garden, El Cajon	11	1	4	3	3			883
			TOTALS AS OF 12/1/04	1,106	132	272	97	41	16	455	213,178

California Project WET Gazette

A project of the Water Education Foundation
Funded by grants from the U.S. Bureau of Reclamation, Mid-Pacific Region and the U. S. Geological Survey, California Water Programs
Volume X, Issue I Winter 2005

ARTICLES

A Great Journey...

Jack Frost has returned to the Sierra Nevada foothills, making his seasonal artistry evident in the thin white rime highlighting the oak limbs out my window, the delicate crunch of grass under my feet on a quick trek to the mailbox and the glassy crystals I see painted upon the roadside puddles. I take for granted my warm, dry clothes and the heated home I'm able to duck back into to enjoy the show from a comfortable climate. Such are the wonders of life in the 21st Century. But, with New Year's at hand, it's a good time of year to look back and reflect on history and get an appreciation for what we have in the present.

Two hundred years ago to the day that I'm writing this, another American had quite a different perception of his wintry surroundings, as he noted in his diary,

> ***December 11th. 21 degrees below zero... and getting colder. The Sun Shows and reflects two imigies, the ice floating in the atmospear being So thick that the appearnance is like a fog Despurceing.***

Water played a major role in his journey. A journey that had already led him and his 35 companions 1,500 miles up the Missouri River to this frozen land on the plains of present day North Dakota... barely a quarter of the trek ahead! They had already met a thriving diversity of Native people who did not view these lands as uncharted wilderness; to them it was home. The new year would bring sweltering thunderstorms on the prairie, a near snowy death in the Bitterroot Mountains and months of depressing mists on the Oregon coast They would follow the waterways through a landscape like nothing any of them had ever seen before- encountering huge bears, herds of bison by the thousands- and enough salmon to make them sick! Its no wonder our rugged frontiersman would be so overcome with emotion that he would write in his diary one year later,

> ***'Ocean in view! O ! the joy... We are in view of the Ocean, this great Pacific Ocean which we [have] been so long anxious to see...'***

And later carve the following into a nearby tree,

> ***'William Clark, December 3rd, 1805. By Land. From the U States..."***

The journey of Meriwether Lewis and William Clark is a timeless tale of adventure and just one of those highlighted the Project WET activity 'Great Water Journeys' (pgs: 246-253). But what appear as mere guessing games on a quick glance of this activity, are individual springboards teachers may use to