Project Information Form

2004-037

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): Tehama County Resource Conservation District

4. Project Title: Northern Sacramento Valley Mobile Irrigation Lab

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

Name, title	Ernest White, President Board of Directors
Mailing address	2 Sutter Street, Suite D
	Red Bluff CA 96080
Telephone	530-527-3013 x3
Fax.	530-527-7451
E-mail	tcrcd@tehamacountyrcd.org

6. Contact person (if different):

Name, title.	Vicky Dawley, District Manager
Mailing address.	2 Sutter Street, Suite D
	Red Bluff CA 96080

Telephone	530-527-3013 x114
Fax.	530-527-7451
E-mail	vicky@tehamacountyrcd.org

7. Grant funds requested (dollar amount): **$421,312**
   (from Table C-1, column VI)

8. Applicant funds pledged (dollar amount): $74,348

9. Total project costs (dollar amount): $472,057
   (from Table C-1, column IV, row n)

10. Percent of State share requested (%) 85%
    (from Table C-1)

11. Percent of local share as match (%) 15%
    (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.

    ☐ (a) yes
    ✓ (b) no

    (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.)

11. Is your project required by regulation, law or contract?
    ☐ (a) yes
    ✓ (b) no

    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.

12. Duration of project (month/year to month/year): 12/05 – 12/08

13. State Assembly District where the project is to be conducted: 2nd Assembly District

14. State Senate District where the project is to be conducted: 4th Senate District

15. Congressional district(s) where the project is to be conducted: 2nd Congressional District

16. County where the project is to be conducted: Tehama, Butte, Glenn and Shasta Counties

17. Location of project (longitude and latitude) Latitude: 40.027N Longitude: -122.122W (Tehama County)

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: Resource Conservation District

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

(Provide supporting documentation.)

- ☐ (a) yes, **$31,206** median household income
- ☐ (b) no

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.

[signature]	Ernest White, President	1/10/05
Signature	Name and title	Date

Describe how this project will contribute toward or support California Bay-Delta Program goals.

This project proposes support to continue a Mobile Irrigation Lab (MIL) in the northern Sacramento Valley. The Northern Sacramento Valley MIL, by serving Butte, Glenn, Shasta and Tehama Counties, will provide the benefits of irrigation system evaluation to 36% of the Bay-Delta Sacramento Valley Region. These counties constitute 6.3 million acres of the 17.4 million acre Sacramento River watershed.

The MIL supports efficient agricultural water management at the farm level and will contribute to a balanced, integrated and comprehensive management approach of California's limited water supplies. The project satisfies three of the four California Bay-Delta Program Goals: 1) Water supply and reliability; 2) Ecosystem restoration; and 3) Water quality. In addition, the project specifically addresses nine of the eleven California Bay-Delta Program elements.

The discussion below highlights how this project addresses these program goals and elements.

- ***Water supply reliability*** – By investing in the MIL and its related educational efforts, agricultural water users will have a bolstered source of local technical support and information to assist them with practicing efficient irrigation. The MIL will specifically support the conversion of gravity flow irrigation systems to microsprinkler and drip irrigation. This often results in a shift from reliance upon surface water from stream and river diversions to use of groundwater in order to supply water for irrigation on demand and to supply a clean source of water requiring less filtration of sediments and algae. The shift to more reliance on groundwater for irrigation reduces surface water diversion and contributes to more reliable stream and river flows for other down stream water uses. As water users rely more on the groundwater resource it may enable water districts more flexibility to consider water transfer programs that may be linked to the Environmental Water Account and other needs. The increased use of groundwater for summer irrigation also contributes to more storage capacity in the aquifer systems to capture more winter and spring surface runoff thereby enhancing groundwater storage. As the shift to groundwater for irrigation increases, local groundwater management programs (already in place and supported by AB 303 funding) will serve to document the limits of the groundwater resource and will provide insight about the need for additional surface water storage.

  The MIL seeks to provide technical and educational support beyond conversion from gravity to low volume irrigation systems. The lab intends to support long-term management and maintenance of the systems. Specifically, the MIL seeks to optimize the distribution uniformity and water application efficiency of low volume irrigation systems by providing regular irrigation system design and maintenance evaluations. Also, the MIL intends to promote a higher level of awareness of irrigation scheduling techniques, and where appropriate, educate and demonstrate concepts of Regulated Deficit Irrigation (RDI), an approach where water is purposely withheld from crops to enhance performance while lessening the evaporative demand of the crop. The MIL could potentially contribute to the "Science" element particularly by furthering the understanding of RDI concepts in orchard crops. Within the past two years, it has been hypothesized, if a vast majority of orchard crop acreage is irrigated near historically established levels of crop evapotranspiration (ETc), nearly 1 million acre-feet of water can potentially be saved and re-directed to other water needs by broad implementation of RDI concepts on eleven orchard and vine crops representing 1.75 million acres primarily located in the central valley and encompassing the northern Sacramento Valley. (CLARIFY) However, it is questioned but not well documented whether orchard crop irrigators are already, inherently, and somewhat unknowingly practicing RDI concepts and the potential to realize water saving from RDI and redirect it to other needs is considerably less than speculated. The MIL has the opportunity to accumulate a database using on-farm monitoring and individual grower surveys from a representative sample population of orchard crop irrigators to document the level of deficit irrigation already in practice and the potential for broad adoption of RDI concepts. This information would contribute to the California Bay-Delta Program "Science" element by assisting with establishing a baseline describing the existing level of deficit irrigation in orchard crops already in use at the farm level.

- ***Ecosystem restoration*** – as outlined above, on-farm irrigation management is linked directly to stream and river flows for environmental uses. The objective of the MIL is consistent with local Watershed Restoration programs. For example, the Deer Creek Water Exchange program (historically supported by Calfed) seeks to augment spring and summer flows in Deer Creek to provide safe fish passage of native Chinook salmon. In 2003, one deep well was constructed in the Deer Creek Irrigation District to substitute for surface water diversions from Deer Creek that has traditionally been used for irrigation. Orchard crops make up a significant portion of the irrigated acreage in the water district and the MIL can assist in achieving efficient use of the new groundwater resource. In so doing, the MIL can assist with the success of the water exchange and restoration program.

- ***Water Quality*** – the fundamental principle underlying the MIL is to optimize the water used for irrigation by applying it to crops uniformly and to apply only what is needed by crops. Within this principle is the intent to minimize the quantity of water and constituents in the water that leave the field site as either runoff or deep percolation. By providing technical support and information to water users on irrigation efficiency and irrigation scheduling, the MIL is focused on source control and directly addressing water quality issues associated with non-point source pollution.

The table below summarizes which of the eleven elements of California Bay-Delta Program support for the MIL will address.

Bay-Delta Program Element	Mobile Lab Addresses?
Water Management	✓
Storage	✓
Water Use Efficiency	✓
Conveyance	
Water Transfers	✓
Environmental Water Account	✓
Drinking Water Quality	✓
Watershed Management	✓
Levee System Integrity	
Ecosystem Restoration	✓
Science	✓

In addition, the operation of a MIL is easily transferred to other parts of the state. There are already at least 12 Mobile Labs in California, although there are only 3 (including Tehama County) operating in the north state. The general operation of the labs is similar, but each area has its own unique crops, irrigation methods and soils that make each Mobile Lab also unique. TCRCD has already assisted in the formation of two mobile lab programs and will always be available in the future to provide further assistance.

Provide estimates of total expected water savings for proposals that are designed to lead to quantifiable water savings. Provide an explanation for all assumptions, methodologies, and computations used to arrive at the values.

The direct water savings from conducting this project for three years is estimated to be a minimum of 3,890 acre-feet. The rationale for this estimate is given below:

- Perform 180 evaluations
- Of the 180 evaluations, 80 growers participate in improving system uniformities by an average of 20% (on average from 65% DU to 85% DU)
- For the major tree crops grown in the northern Sacramento Valley (Walnuts, Almonds, Prunes, Olives) an increase in uniformity of 20% can conserve just over an acre-foot of water per irrigated acre (1.083 ac-ft/acre)
- 80 fields participate @ 45 acres/field (average field size from past three seasons) = 3,600 acres affected
- 3,600 acres * 1.083 ac-ft/acre = 3,890 ac-ft of water saved
- Value of savings to water users (reduced irrigation costs largely from reduced energy costs for pumping) = 3,890 ac-ft * $25/ac-ft (USBR CVP average water cost for the Northern Sacramento Valley) = $97,250
- Minimum value of savings to downstream water users (if water were available for use in other areas for either irrigation, environmental water, or drinking water) = 3,890 ac-ft x $75 per ac-ft (minimum – based upon values of water transferred in 2002 and 2004 from other areas of the Sacramento Valley to other areas of the central valley and southern California, value may be as high as $150 per ac-ft) = $291,750

The indirect value of the three-year project has potential to far exceed the direct value. The number of irrigation systems evaluated is limited by constraints on MIL personnel and time. Most of the irrigation managers receiving the MIL service manage additional lands. For example, the 3,600 acres actually evaluated represent only 8.5 percent of the irrigated orchards in Tehama County and only about 2 percent in the four-county area of Tehama, Glenn, Butte, and Shasta Counties. The benefit and knowledge provided to these irrigation managers is transferable to their other landholdings. Furthermore, additional water savings may be realized, if RDI concepts have application on some of the croplands. Also, one water district located in southern Shasta and northern Tehama county that provides water primarily for irrigated pasture is undertaking a major change in policy that promotes the conversion from flood irrigation to solid set sprinkler irrigation. The change in policy is related to contract renewal with the US Bureau of Reclamation. The district estimates an annual reduction of about 10,000 ac-ft in water diversions from the Sacramento River. Support for the MIL would position the lab well to serve water users in this water district.

STATEMENT OF WORK

Relevance and Importance

Goals and Objectives

The primary goal of this project is to improve water use efficiency by growers in the Northern Sacramento Valley. This will be accomplished through on-farm irrigation system evaluations, one-on-one and grower workshop education, and improved irrigation water management assistance. This project will be the continuation and expansion of a project that has been in place for three growing seasons. In 2001, TCRCD began the operation of a MIL with funding from Department of Water Resources and the Bureau of Reclamation. In the last 3 seasons the program has expanded from the Tehama County RCD to include Butte, Glenn and Western Shasta RCDs (See Attachment A for Memoranda of Understanding (MOU)) with various RCDs). The MIL has even done a few evaluations in Lassen and Modoc Counties and is developing MOUs with RCDs in those counties.

Objectives –

A. Provide irrigation system evaluations and specific recommendations to improve water application efficiency. The irrigation system evaluations the growers receive will provide part of the technical resources necessary to access funding sources, such as the USDA, NRCS Environmental Quality Incentive Program to implement changes to irrigation infrastructure.

- Conduct irrigation system evaluations to determine uniformity of water application for pressurized systems.
- Provide technical assistance to the individual grower based on the results of their system's performance and recommend changes in maintenance, irrigation scheduling or other cultural practices. With numerous growers upgrading their irrigation systems from gravity fed surface systems to pressurized micro-irrigation systems, there is a need to provide technical education to these new system operators.
- Conduct follow-up system evaluations in an attempt to quantify the benefit of alterations made based on the previous system evaluation, and assist with irrigation and fertilizer scheduling.
- Conduct water quality testing for Nitrogen levels, in an attempt to reduce the amount fertilizer applied.
- Give the grower a map of the irrigation system with a soil map overlay, ranch map and discuss possible points of discharge for runoff. This information is something most north state growers do not already have.

B. Cooperate with supporting agencies, institutions and water districts to improve availability of technical support and education for local growers on irrigation scheduling.

- Assess the extent of irrigation scheduling currently practiced in orchard production.
- Promote use of water budgets, plant-based indicators of crop water needs, and soil moisture monitoring designed to assist growers to determine when and how much to apply to their crops for optimum crop performance.

- Overcome constraints and perceptions that limit the adoption of irrigation scheduling technology.
- Investigate the potential for implementing RDI concepts in orchard and vine crops.
- Conduct off-season workshops related to on-farm water management and mobile laboratory activities.
- Distribute information to growers, which describes the work of the mobile laboratory and how to receive services.

C. Assist cooperating agencies, institutions, water districts, and private citizens in coordinating farm level water management issues and needs with county and regional water management issues and needs

- Summarize results of system evaluations and irrigation scheduling assessments each season for qualitative and quantitative review and make results available to supporting agencies, institutions, water districts, and agricultural organizations.
- Meet with supporting agencies, institutions and water districts to discuss issues determined pertinent by growers at the farm level and according to MIL results. Strengthen the connection between water policy affecting growers and groups and individuals in policy decision-making roles.

Need for Project as Related to Critical Water Issues

The culture of irrigated agriculture is changing rapidly in the northern Sacramento Valley and many growers are scrambling to keep up. With change forced by economics, changing cropping patterns, and water use restrictions growers need support to implement these changes. There are many small growers in the north state that do not have the resources to privately fund the necessary technical support to assist them with meeting this need for change. If the technical resources for evaluation are not provided they will probably will not happen. In order to avoid future conflict over effective water use of limited water supplies in the northern Sacramento Valley, it makes sense for the MIL to intervene and provide assistance to lessen the demand for water for irrigated agriculture in the northern Sacramento Valley by improving irrigation efficiency yet at the same time sustaining the irrigated agriculture industry.

Part of the culture change is driven by consolidation of holdings that may have different water delivery systems and are at present cobbled together resulting in inefficient water delivery systems. As farmland is converted from gravity irrigated annual crops to pressurized irrigated permanent crops the growers need support to design and operate these systems efficiently. Changing irrigation methods requires a leap of faith that many growers are uncertain how or unwilling to do on their own. Changes in life long farming practices requires changes in irrigation practices that are grounded in tradition require a lot of technical support.

Over the past three growing seasons, this program has grown from assisting growers in two counties, to the surrounding four counties. Over 100 system evaluations have been performed. This program has had the effect of getting growers involved with the RCD and the Natural Resources Conservation Service (NRCS). Through this introduction, growers have become more aware of technical support and financial programs such as EQIP to make irrigation system improvements, and the Agricultural Pump Test Efficiency program, to have their pump tested, and repaired if necessary.

The Mobile Lab has also been successful at assisting growers with better irrigation scheduling, introducing growers to new technologies, and getting growers more active in local education and outreach events. Through cooperation, this program has added to the UC Cooperative Extension Irrigation and Water Resources program that has engaged the irrigated agricultural industry in Tehama County since the 1980's and also serves Glenn and western Shasta Counties. The MIL currently has resources and the design to provide personal follow-up to the same irrigated landowner clientele that is served by the extension research and education programs. The extension program provides problem solving research and education and is not designed to perform services such as those provided by the MIL. Support for the MIL is a sensible way to improve transfer of local, science-based knowledge gained from problem solving irrigation research conducted by extension to irrigated landowner and operators. By offering one-on-one assistance and being able to address individual grower's situations and concerns, the mobile lab is in the unique position to offer personalized field specific assistance to growers.

After three seasons of operation, word of mouth grower referrals are showing that the MIL has achieved grower confidence and is perceived to provide a benefit to the grower. At present the MIL has prescheduled a substantial number of evaluations for next season without the publicity and grower meetings that will occur prior to the irrigation season.

In early 2003, a series of meetings were organized throughout the CALFED region to "elicit ideas on the form and substance of the on-farm component of the CALFED Agricultural Water Use Efficiency (WUE) element."
One of these meetings was held in Tehama County with UCCE and TCRCD playing key roles in the organization of the meeting. Results of the meetings were assembled into a report: Key Findings From Regional Meeting Discussions on Development of CALFED WUE On-farm Component. In the *Summary of Key Findings* section of the report, the finding on Technical Support makes clear the need for local technical support for growers:

> It was clear from what was said at the regional meetings that where there is a "field presence" of irrigation technical expertise and assistance (i.e. Mobile Labs, farm advisors, etc.), producer adoption of new technology and improved water management practices was significantly greater. In addition, success of on-farm activities depends on selection and application of measures that are well suited to specific locations and that are correctly installed and operated. Technical assistance helps make the connection between irrigation information and technology on the shelf and the producer's busy schedule.

Consistency of Project with local or regional water management plans or other integrated resource management plans

This program will be consistent with local and regional resource concerns. The Tehama County RCD in its Long Range Plan 2003-2008 has identified promoting and supporting activities that enhance Soil Health and Quality and improve Water Quality and Quantity as top priorities. These priorities will be achieved by offering technical assistance in cooperation with other technical partners, providing educational opportunities such as workshops, field tours, and seminars, and collecting, analyzing and disseminating data. All of these activities are consistent with the activities of the MIL.

The Resource Conservation Districts that are cooperating with TCRCD in this project, Western Shasta RCD, Butte County RCD and Glenn County RCD, have all also identified water quality/quantity as important issues in their long range plans and they have each signed a Memorandum of Understanding authorizing and encouraging the MIL program within their districts (See Attachment A).

The NRCS locally developed ranking criteria for their Environmental Quality Incentives Program (EQIP) listed Water Quantity/Water Quality as the number one concern in Tehama County. Water Quality/Water Management is the third highest ranked resource concern in Glenn County, and water conservation is listed as the fourth most important resource concern in Shasta County. The District Conservationist in each county developed this ranking criterion with input from Local Work Groups and stakeholders.

The benefits of a Mobile Lab will also enhance implementation of the Tehama County Flood Control and Water Conservation District's adopted AB3030 Groundwater Management Plan. The Countywide Plan encourages and endorses water use efficiency, protection of water quality, and the development of best management practices.

As stated in the Plan, "The economy of Tehama County is directly tied to the use of water, since the primary economic driving force is agriculture." The Mobile Lab will enable agricultural producers to increase efficiency, yields, profits, and improve water quality while decreasing the amount of applied water, energy used, nutrient leaching, and tail water runoff.

Finally, the Central Valley Project Improvement Act (CVPIA) of 1992 committed the Bureau of Reclamation to providing substantial amounts of water for environmental management, with stipulations from Congress that this supply should be assured through greater efficiencies in farm and urban use. Irrigation System Review is one of the Best Management Practices found in the CVPIA Water Conservation Plans, making the Northern Sacramento Valley MIL consistent with CVPIA plans.

Technical/Scientific Merit, Feasibility

Methods, Procedures, Equipment and Facilities

Irrigation System Evaluations, Recommendations, and Follow-up

Methods and Procedures: The Irrigation Mobile Lab Program utilizes irrigation system evaluation protocol and software developed by California Polytechnic State University's Irrigation Training and Research Center (Irrigation Evaluation 2000), for determining the uniformity of water application of pressurized irrigation systems. Through pressure and flow measurements in the field, this evaluation process is able to determine how much and how evenly water is being applied to the field during an irrigation event, potential problems with the system, and the necessary information to set up an efficient irrigation schedule. Starting in the 2005 season, TCRCD will be piloting a new procedure to produce an immediate report that can be handed to the grower within an hour of the evaluation. This will be followed by the full report after the irrigation season.

Facilities: The TCRCD will provide an office to house the position and provide supporting infrastructure such as computer, copier, telephone, etc. The primary need is financial support for salaries and benefits for MIL staff. Refer to budget section of this proposal.

Equipment: Minor supplies will need to be replenished as they are used. Need for major equipment is not anticipated. Refer to budget section of this proposal.

Irrigation Scheduling Assessment, Adoption, and RDI Evaluation

Methods and Procedures: A survey of questions will be conducted with each landowner who receives an irrigation system evaluation. The survey will inquire about how the grower decides when to begin the irrigation, how the frequency and irrigation set time is determined, and how the termination of the irrigation season is decided. The MIL technician will obtain information from each grower to describe the operation of the irrigation system throughout the growing season. This information will be coupled with the information attained from the irrigation system and orchard site evaluation to estimate the seasonal applied water and stored water component for each orchard. This estimate of seasonal applied water and stored water component will be compared to historical estimates of crop evapotranspiration (ETc) for the appropriate crop to determine the presence or absence of deficit irrigation and to describe the extent of deficit irrigation, if apparent. Results of the each survey will be accumulated in a database and summarized at the end of each irrigation season to characterize the extent of deficit irrigation occurring among this sample population of orchards. Each recipient of an irrigation system evaluation will also be provided information on the historically established estimates of crop evapotranspiration (ETc) for their orchard and management recommendations will be discussed. If applicable to their crop and specific situation, information on RDI concepts will be provided and discussed.

A subset of all of the orchards receiving irrigation system evaluations will be involved in a detailed irrigation scheduling assessments. The intent would be to develop benchmark locations of locally developed, real-time management guidelines that would be transferable to the surrounding local area with little additional effort or expense. The assessments will be conducted in orchards where the owner/operator has volunteered access and shown interest to adopt advanced methods of irrigation scheduling. Orchards will be selected that represent broader areas of production (i.e. predominant soils, orchard varieties and designs, etc…). They will be strategically located to facilitate interests by water districts. It may be feasible to conduct these assessments in about 30 to 60 orchards over three years (approximately 10 to 20 orchards per year). MIL staff will employ Pressure Chamber Instruments to collect weekly measurements of midday Stem Water Potential (SWP), a plant-based indicator of irrigation needs that determine the actual water status of orchards and correlate well with orchard performance. MIL staff will also employ automated soil moisture monitoring equipment, either resistance blocks with dataloggers or automated capacitance sensors to characterize orchard water status. The MIL will work to calibrate moisture sensors with SWP on differing soil and crop types. Moisture sensors are less labor intensive than pressure chambers and may gain better grower acceptance as an irrigation management tool, but they require calibration to interpret the soil moisture data and corresponding effect on crop performance with confidence. These orchards and data sets would also serve as demonstration sites utilizing new irrigation scheduling technology and provide representative data sets illustrating adequacy or inadequacy of current levels of irrigation scheduling. The results from this detailed irrigation scheduling assessment would also be used to confirm the presence or absence of deficit irrigation, and the extent of deficit irrigation in orchards where it is apparent.

Facilities: No special facilities are required to perform this facet of the MIL project. Again, funding to support MIL staff is the primary need.

Equipment: Sufficient pressure chamber instruments are available through the RCD and UC Cooperative Extension in Tehama County to support the monitoring of orchard water status using midday SWP as a plant-based indicator of orchard water status. Funds would be needed to purchase soil moisture monitoring equipment and dataloggers. In total, approximately 60 resistance blocks and 20 dataloggers would be required to support the collection of real-time soil moisture data. The resistance blocks could be mounted at the end of PVC insertion pipes so they could be installed temporarily and retrieved and moved to different locations between growing seasons. The approximate cost for the equipment is estimated to be $15,400 ($40 per resistance block and $650 per datalogger).

Coordination between irrigated landowner/operators and water policy decision makers

Methods and Procedures: Since the MIL has established MOU's with other agencies in Shasta, Glenn, and Butte Counties with interests in water resource management. It is would be sensible for the MIL to communicate and coordinate its efforts to advance water use efficiency at the farm level with other organizations, agencies, and institutions. The MIL will pursue routine meetings with and presentations to a variety of groups ranging from the RCD's, Water Advisory Committees, Farm Bureaus, Water Districts, and County Departments of Flood Control and Water Conservation.

Facilities: No special facilities are required.

Equipment: No special equipment is required.

Task List, Deliverables, Start/End Dates, Projected Cost/Task

Task	Deliverable	Start/End Date	****Projected Cost
*Workshops/Presentations	Workshop/meeting agendas, sign-in sheets	1/1/06 – 4/30/06 11/1/06 – 4/30/07 11/1/07 – 4/30/08	$69,580
**Evaluations	Annual list of completed evaluations	4/1/06 – 11/1/06 4/1/07 – 11/1/07 4/1/08 – 11/1/08	$267,989
***Irrigation Scheduling Assessment	Results of Assessment (to be included in End of Season Report	4/1/06 – 11/1/06 4/1/07 – 11/1/07 4/1/08 – 11/1/08	$95,068
***End of Season Report	End of Irrigation Season Summary Report, to include Monitoring and Assessment of the Project for the Season and results of irrigation scheduling assessment	11/1/06 – 12/15/06 11/1/07 – 12/15/07 11/1/08 – 11/30/08	$63,023

*Workshops will include workshops hosted or co-hosted by TCRCD. Presentations will be made at various meetings or workshops hosted by other organizations. TCRCD will host or co-host at least 2 workshops and make presentations at 4 or more meetings/year.

**Evaluations include in-field system evaluation, preparation of a comprehensive report for each evaluation, presentation of the report to the grower and any follow-up questions or advice requested by the grower. (See Attachment B for a sample evaluation report)

***The End of Season Report will include a summary of the season's evaluations, the results of the irrigation scheduling assessment and a report of the success of the project for the year following the procedure outlined in "Monitoring and Assessment." (See Attachment C for the TCRCD 2004 Report)

****The projected cost/task includes matching funds **and** contingency.

This is not a "project" as defined by CEQA. Therefore, there is no environmental documentation necessary for this project.

Monitoring and Assessment

The scientific methods and procedures outlined in the above section on scientific merit and feasibility essentially describe monitoring and assessment techniques appropriate to gain knowledge in on-farm irrigation management in the northern Sacramento Valley and to motivate, support, and implement appropriate changes. The monitoring and assessment proposed for this project serves multiple purposes:

- Pre-project conditions and baselines will be determined from two previous years of evaluations in Tehama, Butte, Shasta and Glenn Counties so that the benefits of three more years of MIL can be quantified. This assumes that the irrigation systems evaluated to date are representative of other systems in surrounding counties. The accuracy of the data produced from these evaluations will be of the same quality as the irrigation system evaluations being performed across California.

- Any change made by a grower whether it is a system improvement, a change in irrigation scheduling, or investment in improved on-farm irrigation infrastructure will be documented and used to demonstrate achievement of the project goals and objectives.

- RDI estimates, soil moisture monitoring and pressure chamber measurements will occur frequently throughout the growing season. Soil moisture monitoring will also occur as needed during the winter months. Analysis and assessment of the information obtained will be documented in a "Detailed Irrigation Scheduling Assessment". Results will be shared with growers at meetings and workshops for feedback on how information has aided their operations and what additional information could be useful.

- The data will be maintained by the Tehama County RCD. These reports will be kept anonymous to protect the participating growers. The documents will be stored digitally, as well as hard copies. The results will be summarized yearly into a comprehensive report to DWR on the findings of the Mobile Irrigation Lab. This information will be available via e-mail, hard copy, and on the TCRCD's website (http://tehamacountyrcd.org/).

Qualifications of the Applicants and Cooperators

1. **Include resume(s) of project manager(s). Resumes may be attached to the end of the proposal and shall not exceed two pages.**

TCRCD's project manager for the MIL is no longer with the district. He was hired to manage the project in July 2002 and left in December 2004. He did an excellent job of building momentum in the program. TCRCD will hire a new MIL Project Manager in the spring of 2005 and will continue to build the program in the 2005 irrigation season with funding from the Corning Water District through the Bureau of Reclamation.

TCRCD is well positioned to continue the momentum of the program and to train a new Project Manager. TCRCD's Irrigation Technician, Lisa Miller, has worked for TCRCD since July 2001, and with the MIL program for the last two irrigation seasons. She holds an AA degree in General Education from Shasta College with a certificate in Natural Resources. She was trained at the Cal Poly Irrigation Training and Research Center in Irrigation System Evaluations in June 2003 and received a certificate to perform Landscape Irrigation Audits in September 2003. She will be a tremendous asset to the new Project Manager as she is very familiar with the program and with many local growers.

Another asset to the program is RaeAnn Dubay, an employee of the Natural Resources Conservation Service with whom TCRCD shares office space. She holds a master's degree in soil, water and environmental science from the University of Arizona. She worked for TCRCD from April 2001 to October 2002. At that time, Ms. Dubay took the lead in the development of the MIL in Tehama County. Prior to joining TCRCD, she served as an irrigation specialist for the Pond Shafter Wasco RCD (Bakersfield, currently, Northwest Kern RCD) from May 1999 to March 2001. She will be available to assist in training the new Project Manager.

Vicky Dawley, who serves as the District Manager for TCRCD, will serve as the interim Project Manager. Ms. Dawley has more than 25 years experience in resource management and ranching. She has worked for TCRCD since April 1999. She has managed over $1 million dollars in projects and grants for TCRCD in the last five years. She holds a bachelor's degree in business from Simpson College. Her undergraduate work included three years of botanical studies at U.C. Davis. TCRCD's current annual budget is nearly $500,000. Her success at fundraising and project management demonstrate her skills in project organization and oversight.

2. Identify and describe the role of any external cooperators that will be used for this project.

- University of California Cooperative Extension – Allan Fulton, Rick Buchner - Will provide technical assistance, refer growers to the project, collaborate on workshops and educational meetings

- NRCS – Larry Branham, District Conservationist, RaeAnn Dubay, Soil Conservationist – Will provide technical assistance, work with growers in EQIP program with new irrigation system scheduling

- Butte County RCD, Glenn County RCD, Western Shasta RCD – Will provide grower referrals and co-host educational programs.

- Department of Water Resources – Tito Cervantes, DWR Northern District – Will provide continuing technical assistance.

- Bureau of Reclamation – Dennis Perkins – Will provide continuing technical assistance.

- Corning Water District – Jim Lowden, Manager – Will provide continuing technical assistance and will administer funds from Bureau of Reclamation.

3. Describe briefly any previous water use efficiency grant projects in which the applicant has participated

TCRCD has not participated in any water use efficiency grant projects in the past. However, the MIL program has been operating for the past three growing seasons with funding from the Department of Water Resources (DWR), the US Bureau of Reclamation (USBR), and the Natural Resources Conservation Service (NRCS).

4. If applicant is a disadvantaged community, provide the source of information documenting annual median household income.

1999 U.S. Census Bureau records indicate that Tehama County is a disadvantaged community with a median household money income of $31,206. Glenn, Shasta and Butte Counties also qualify as disadvantaged with median household incomes of $32,107, $34,335 and $31,924 respectively. See Attachment D for printout from U.S. Census Bureau

Innovation

Describe innovative technologies or methodologies to be employed in the project that could contribute to improved efficiencies in projects throughout the State.

The Irrigation Mobile Lab will employ Cal Poly ITRC protocol for performing system evaluations. Also, new technologies will be demonstrated and introduced to growers through workshops, and one-on-one discussions. RDI concepts using new plant-based techniques for determining irrigation needs, real-time weather information, and soil moisture devices, although widely used throughout the rest of California, are still relatively new technologies that are underutilized in the Northern Sacramento Valley. The MIL has the ability to influence on-farm changes in scheduling behavior, and is a useful tool in introducing these irrigation scheduling technologies.

Describe the scope and target recipients of the assistance and purpose for providing assistance to the proposed clients.

The MIL will provide service to growers in Shasta, Tehama, Glenn, and Butte counties. These areas are seeing more and more growers moving from gravity fed surface irrigation systems to pressurized micro-irrigation systems. With these new systems there is a significant learning curve to get over with regards to scheduling, maintenance, and troubleshooting these systems. The MIL is a valuable resource to assist growers with these questions and provide technical support on any other issues they may be having in the field.

In an effort to reach all members of the northern Sacramento Valley farming community, MIL materials have been translated into Spanish. The MIL staff has done system evaluations for Hispanic farmers and will continue to reach out to all ethnicities within the farming community. The benefit and knowledge provided to these irrigation managers and landowners is transferable to others.

Outreach, Community Involvement and Acceptance

Although not required to respond to this item of the PSP because this is a hands-on technical assistance program, TCRCD feels this is an important component of the MIL. MIL staff attend meetings and make presentations at events that growers attend; they participate in the local farm show; they provide articles about the program to the local newspapers; and most important, they spend time with growers to help them understand their system evaluation and the changes they can make to improve their irrigation systems. This community presence over the last three years is what has made this program a success, and it will continue to build the program into the future.

As noted in the section on the need for the project as related to critical water issues, after three seasons of operation, word of mouth grower referrals are showing that the MIL has achieved grower confidence and is perceived to provide a benefit to the grower. At present the MIL has prescheduled a substantial number of evaluations for next season without the publicity and grower meetings that will occur prior to the irrigation season. (See Attachment E for Letters of Support)

Benefits and Costs

Table C- 1: Project Implementation Costs (Fill in shaded areas of column I – VI only) **(Budget)**

APPENDIX C
PROJECT IMPLEMENTATION COSTS TABLE

APPLICANT: Tehama County Resource Conservation District
Project Title: Northern Sacramento Valley Mobile Irrigation Lab

Table C-1: Project Costs (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)	Annualized costs $
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)
	Administration (for initiation of project)								
	Salaries, wages	266,400	5%	279,720	39,000	240,720			
	Fringe benefits	89,784	5%	94,273	13,650	80,623			
	Supplies	10,500	5%	11,025	3,000	8,025			
	Equipment	21,300	5%	22,365		22,635			
	Consulting services								
	Travel	10,500	5%	11,025		11,025			
	Other	12,000	5%	12,600	9,000	3,600			
(a)	Total Administration Costs[1]	410,484		431,008	64,650	366,358			
(b)	Planning/Design/ Engineering								
(c)	Equipment Purchases/Rentals/Rebates/Vouchers								
(d)	Materials/Installation/ Implementation								
(e)	Implementation Verification								
(f)	Project Legal/License Fees								
(g)	Monitoring and Assessment								
(h)	Report Preparation								
(i)	Structures								
(j)	Land Purchase/Easement								
(k)	Environmental Compliance/Mitigation/ Enhancement								
(l)	Construction								
(m)	Other (Specify)								
	SUBTOTAL	410,484		431,008	64,650	366,358			
	Indirect (15%)	61,573		64,651	9,698	54,954			
(n)	TOTAL (=a+…+m)	472,057	NA	495,659	74,348	421,312	NA	NA	
(o)	Cost Share Percentage	NA	NA	NA	15	85	NA	NA	NA

1 (Excludes administration O & M costs)

Provide a brief explanation for labor costs (including consultants), equipment, supplies and travel included in the budget. Provide information about the amount of cost sharing for each element as well as direct and indirect costs.

See Attachment F for a more detailed 3-year budget. Attachment F shows just one annual budget as the budget is the same each year.

Labor Costs: The salaries for TCRCD personnel come directly from TCRCD's salary schedule. With the possibility of changes in staffing it is impossible to know exactly who will be working on the project, and placement on the salary schedule is based on education and experience. "High/middle" hourly rates were used to calculate the budget for this project to insure that there will be sufficient funds to cover salary costs. The large geographic area covered by the project necessitates more staff than other MILs might need as travel time greatly affects the time/evaluation. The irrigation system assessment part of the project will also add a great deal of staff time, beyond standard Mobile Lab needs.

Supplies: Supplies are the standard office supplies, including any necessary software – and field supplies of pressure gauges, goof plugs etc.

Equipment: Office equipment is included in this line item, particularly a laptop and printer for each mobile lab vehicle to produce the immediate reports to growers. Also included is any potential field equipment that might be necessary for the operation of the MIL and the resistance blocks and moisture sensors for the irrigation scheduling assessment.

Travel: Travel costs are for staff to attend trainings out of the area, to make presentations and for some lodging for evaluations done far from Tehama County. If the MIL staff can schedule a number of evaluations in one of the most distant locations, they will stay overnight and cut down on travel time. The Corning Water District (CWD) and NRCS provide vehicles for the MIL.

Other: This line item includes cell phones for the MIL staff, vehicle maintenance for the vehicles provided by NRCS and CWD along with position advertising to fill staff vacancies and other miscellaneous costs.

Cost share: The funding from Bureau of Reclamation and/or Natural Resources Conservation Service will share in the labor costs for the Project Manager and the Irrigation Technician, in the cost of supplies and in the cost of the "other" line item. TCRCD has received funding from both agencies for the last three years and expects this support to continue, but neither agency can guarantee future funds.

Indirect costs: TCRCD's standard indirect cost rate is 15%. We are able to afford this relatively low indirect rate because our partnership with NRCS offers help in the cost of rent and utilities.

Describe the potential benefits and information to be gained in terms of water use efficiency.

As discussed in the section "Describe how this project will contribute toward or support California Bay-Delta Program goals," the potential benefits of the MIL in terms of water savings are far greater than the direct water saving derived from each evaluation.

The indirect value of the three-year project has potential to far exceed the direct value. The number of irrigation systems evaluated is limited by constraints on MIL personnel and time. Most of the irrigation managers receiving the MIL service manage additional lands. For example, the 3,600 acres actually evaluated represent only 8.5 percent of the irrigated orchards in Tehama County and only about 2 percent in the four-county area of Tehama, Glenn, Butte, and Shasta Counties. The benefit and knowledge provided to these irrigation managers is transferable to their other landholdings. Furthermore, additional water savings may be realized, if RDI concepts have application on some of the croplands. Also, one water district located in southern Shasta and northern Tehama County that provides water primarily for irrigated pasture is undertaking a major change in policy that promotes the conversion from flood irrigation to solid set sprinkler irrigation. The change in policy is related to contract renewal with the US Bureau of Reclamation. The district estimates an annual reduction of about 10,000 ac-ft in water diversions from the Sacramento River. Support for the MIL would position the lab well to serve water users in this water district.

Compare the potential benefits and anticipated information to be gained to the anticipated costs.

As discussed in the section "Describe how this project will contribute toward or support California Bay-Delta Program goals," there is a tremendous potential for cost benefits with operation of the MIL.

The minimum value of savings to downstream water users (if water were available for use in other areas for either irrigation, environmental water, or drinking water) = 3,890 ac-ft/3yrs. x $75 per ac-ft (minimum – based upon values of water transferred in 2002 and 2004 from other areas of the Sacramento Valley to other areas of the central valley and southern California, value may be as high as $150 per ac-ft) = $291,750 - $583,500. This benefit, although it cannot be realized to fund the MIL operation, compares favorably to the 3-year cost to operate the lab of $495,659 because the water savings will continue into the future even if the MIL is no longer in operation.

Attachment A

AGREEMENT BETWEEN
THE GLENN COUNTY RESOURCE CONSERVATION DISTRICT AND THE TEHAMA COUNTY RESOURCE CONSERVATION DISTRICT

WHEREAS, the purpose of this agreement is to allow Tehama County Resource Conservation District (TCRCD) to coordinate landowner/grower assistance activities, via the operation of an Irrigation Mobile Lab, within the Glenn County Resource Conservation District (GCRCD);

WHEREAS, activities performed will be related to those listed in the IRRIGATION MOBILE LAB OBJECTIVES, as seen in ATTACHMENT A;

WHEREAS, TCRCD will operate within GCRCD boundaries according to the GCRCD's POLICY ON LANDOWNER CONTACT AND PROPERTY ENTRY, as seen in ATTACHMENT B;

WHEREAS, each District is independent and retains its own responsibilities, yet recognizes the need to establish a basis for cooperation to achieve common natural resource goals and objectives;

WHEREAS, this agreement may be modified or terminated at any time by mutual consent of both parties with a sixty (60) day written notice by either TCRCD or GCRCD;

THEREFORE, the Board of Directors of the Glenn County Resource Conservation District hereby agrees that the Tehama County Resource Conservation District may, with prior notice, conduct activities related to the services of an Irrigation Mobile Lab within the boundaries of the Glenn County Resource Conservation District.

Roll Call was as follows:

AYES:
NOES:
ABSTAIN:
ABSENT:

[signature] 7-15-2002
Glenn County RCD, Board President Date

[signature] 7-3-02
Tehama County RCD, Board President Date

ATTACHMENT A

IRRIGATION MOBILE LAB OBJECTIVES

Updated April 22, 2002

Provide irrigation water management assistance for growers in Tehama and Glenn County through the operation of an Irrigation Mobile Lab

- Conduct irrigation system evaluations to determine uniformity of water application for pressurized systems
- Provide technical assistance to the individual grower based on the results of their system's performance
- Conduct follow-up system evaluations upon request in an attempt to quantify the benefit of alterations made based on the previous system evaluation

Cooperate with supporting agencies, institutions and water districts to improve availability of technical support and education for local growers on irrigation water management

- Conduct off-season workshops related to on-farm water management and mobile lab activities
- Distribute information to growers, which describes the work of the mobile lab and how to receive services

Assist private citizen's, cooperating agencies, institutions, and water districts in understanding local water management issues and needs

- Summarize system evaluations each season for qualitative and quantitative review and make results available to landowners, supporting agencies, institutions and water districts
- Meet with supporting agencies, institutions and water districts to discuss issues determined pertinent by local growers and mobile lab evaluation results

RESOLUTION 04-01 MEMORANDUM OF UNDERSTANDING BETWEEN THE WESTERN SHASTA RESOURCE CONSERVATION DISTRICT AND THE TEHAMA COUNTY RESOURCE CONSERVATION DISTRICT FOR MAKING AVAILABLE THE TEHAMA COUNTY RCD IRRIGATION MOBILE LAB SERVICES TO LANDOWNERS AND GROWERS IN WESTERN SHASTA COUNTY

WHEREAS, Western Shasta Resource Conservation District (WSRCD) desires to assist willing landowners in the conservation and ecological use of their land within the District;

WHEREAS, WSRCD and the Tehama County Resource Conservation District (TCRCD) agree to work cooperatively to serve the landowners in the WSRCD;

WHEREAS, TCRCD has the capacity to provide and coordinate landowner/grower assistance activities regarding the operation and use of an Irrigation Mobile Lab, within the WSRCD;

WHEREAS, the activities performed by TCRCD will be related to those listed in the IRRIGATION MOBILE LAB OBJECTIVES, as seen in ATTACHMENT A;

WHEREAS, each District is independent and retains its own responsibilities, yet recognizes the need to establish a basis for cooperation to achieve common natural resource goals and objectives;

WHEREAS, this resolution may be modified or terminated at any time by mutual consent of both parties with a sixty (60) day written notice of modification or termination by either to the other;

NOW THEREFORE, BE IT RESOLVED that the Board of Directors of WSRCD hereby agrees to allow TCRCD to conduct activities related to the services of the TCRCD Irrigation Mobile Lab within the boundaries of the WSRCD, effective March 23, 2004.

I hereby certify that the above is a true and correct copy of Resolution 04-01, adopted on the motion of Director Engstrom, seconded by Director Soho, and duly passed at the public meeting held by the Board of Directors at 9:00 A.M. on Tuesday, March 23, 2004, at the Western Shasta Resource Conservation District office, 6270 Parallel Road, Anderson, CA.

Roll Call was as follows:
AYES: Engstrom, Soho, Wendt, Drennan, Gray
NOES:
ABSTAIN:
ABSENT: Allen, Schoefer

Mary Schroeder (signature) — 3/23/04
Mary Schroeder, District Manager — Date

Ernie White (signature) — 3-29-04
Ernie White, TCRCD President — Date

ATTACHMENT A

ATTACHMENT TO RESOLUTION 04-01 BY THE WSRCD TO ALLOW TCRCD TO IRRIGATION MOBILE LAB SERVICES TO LANDOWNERS AND GROWERS IN WESTERN SHASTA COUNTY

IRRIGATION MOBILE LAB OBJECTIVES

Provide irrigation water management assistance for growers in Tehama and Shasta Counties through the operation of an Irrigation Mobile Lab to:

- Conduct irrigation system evaluations to determine uniformity of water application for pressurized systems;
- Provide technical assistance to the individual grower based on the results of their system's performance; and
- Conduct follow-up system evaluations upon request in an attempt to quantify the benefit of alterations made based on the previous system evaluation.

Cooperate with supporting agencies, institutions and water districts to improve availability of technical support and education for local growers on irrigation water management to:

- Conduct off-season workshops related to on-farm water management and mobile lab activities; and
- Distribute information to growers that describes the work of the mobile lab and how to receive services.

Assist private citizen's, cooperating agencies, institutions, and water districts in understanding local water management issues and needs to:

- Summarize system evaluations each season for qualitative and quantitative review and make results available to landowners, supporting agencies, institutions and water districts; and
- Meet with supporting agencies, institutions and water districts to discuss issues determined pertinent by local growers and mobile lab evaluation results.

AGENDA ITEM
16

AGREEMENT BETWEEN
THE BUTTE COUNTY RESOURCE CONSERVATION DISTRICT AND THE TEHAMA COUNTY RESOURCE CONSERVATION DISTRICT

WHEREAS, the purpose of this agreement is to allow Tehama County Resource Conservation District (TCRCD) to coordinate landowner/grower assistance activities, via the operation of an Irrigation Mobile Lab, within the Butte County Resource Conservation District (BCRCD);

WHEREAS, activities performed will be related to those listed in the IRRIGATION MOBILE LAB OBJECTIVES, as seen in ATTACHMENT A;

WHEREAS, TCRCD will operate within BCRCD boundaries;

WHEREAS, each District is independent and retains its own responsibilities, yet recognizes the need to establish a basis for cooperation to achieve common natural resource goals and objectives;

WHEREAS, this agreement may be modified or terminated at any time by mutual consent of both parties with a sixty (60) day written notice by either TCRCD or BCRCD;

THEREFORE, the Board of Directors of the Butte County Resource Conservation District hereby agrees that the Tehama County Resource Conservation District may, with prior notice, conduct activities related to the services of an Irrigation Mobile Lab within the boundaries of the Butte County Resource Conservation District.

Roll Call was as follows:

AYES:
NOES:
ABSTAIN:
ABSENT:

Butte County RCD, Board President — Date 2/19/04

Tehama County RCD, Board President — Date

ATTACHMENT A

IRRIGATION MOBILE LAB OBJECTIVES

Provide irrigation water management assistance for growers in Tehama and Butte County through the operation of an Irrigation Mobile Lab

- Conduct irrigation system evaluations to determine uniformity of water application for pressurized systems
- Provide technical assistance to the individual grower based on the results of their system's performance
- Conduct follow-up system evaluations upon request in an attempt to quantify the benefit of alterations made based on the previous system evaluation

Cooperate with supporting agencies, institutions and water districts to improve availability of technical support and education for local growers on irrigation water management

- Conduct off-season workshops related to on-farm water management and mobile lab activities
- Distribute information to growers that describes the work of the mobile lab and how to receive services

Assist private citizen's, cooperating agencies, institutions, and water districts in understanding local water management issues and needs

- Summarize system evaluations each season for qualitative and quantitative review and make results available to landowners, supporting agencies, institutions and water districts
- Meet with supporting agencies, institutions and water districts to discuss issues determined pertinent by local growers and mobile lab evaluation results

Attachment B

Drip Evaluation

Prepared By:
Scott Spinner
Tehama County Resource Conservation District
2 Sutter St. Suite D
Red Bluff, CA 96080
(530) 527- 3013 x119
scott-spinner@ca.nacdnet.org

IRRIGATION EVALUATION SUMMARY

Grower:
Date: 8-29-03
Author: Scott Spinner
Field: 55 acres of Olives

Evaluation Summary

The Distribution Uniformity (DU) represents how evenly the applied water is being distributed over the entire field. The higher the DU, the more uniformly the water is being applied. For example, a DU of 100% would mean that every plant is receiving exactly the same amount of water. A DU of 50% would mean that the plants that receive the least amount of water are, on average, receiving only half as much as the average plant in the field.

Distribution Uniformity.. 91%

A DU of 91 % is excellent for this type of system. It does not consider scheduling information or variations in soil type. For all practical purposes, 100% is not possible; however, micro-irrigation systems can be close with DUs often above 90%. The Distribution Uniformity is calculated by combining flow rate data, system pressures, irregular spacing, and any leaks that may be present.

Flow distribution uniformity is the most important component of the overall system DU. The flow DU is obtained by comparing flow rates from emitters throughout the system. The overall system flow DU was 96%.

Data collected, indicates that pressure differences throughout the field are the primary cause of non-uniformity for this system. Pressure throughout the system ranged from 11 to 19 psi. Pressure at the inlets ranged from 15.5 to 19 psi. The average flow rate at 15 psi was 1.04 gph, at 17.5 psi it was 1.05 gph. The pressure variance from the inlet to the end of the hose was rarely in excess of 1.5 psi. According to flow measurements taken in the field and plant spacing supplied by the grower, during a 18-hour irrigation, this system applies approximately 0.359 gross inches of water. It is possible that the south end of the hose where flow test #2 was performed had an obstruction in the line. The pressure loss in this line was considerably greater than that seen across the rest of the field. If not for that hose, the DU for this system could easily be in the mid 90's.

Hose Flushing and System Maintenance

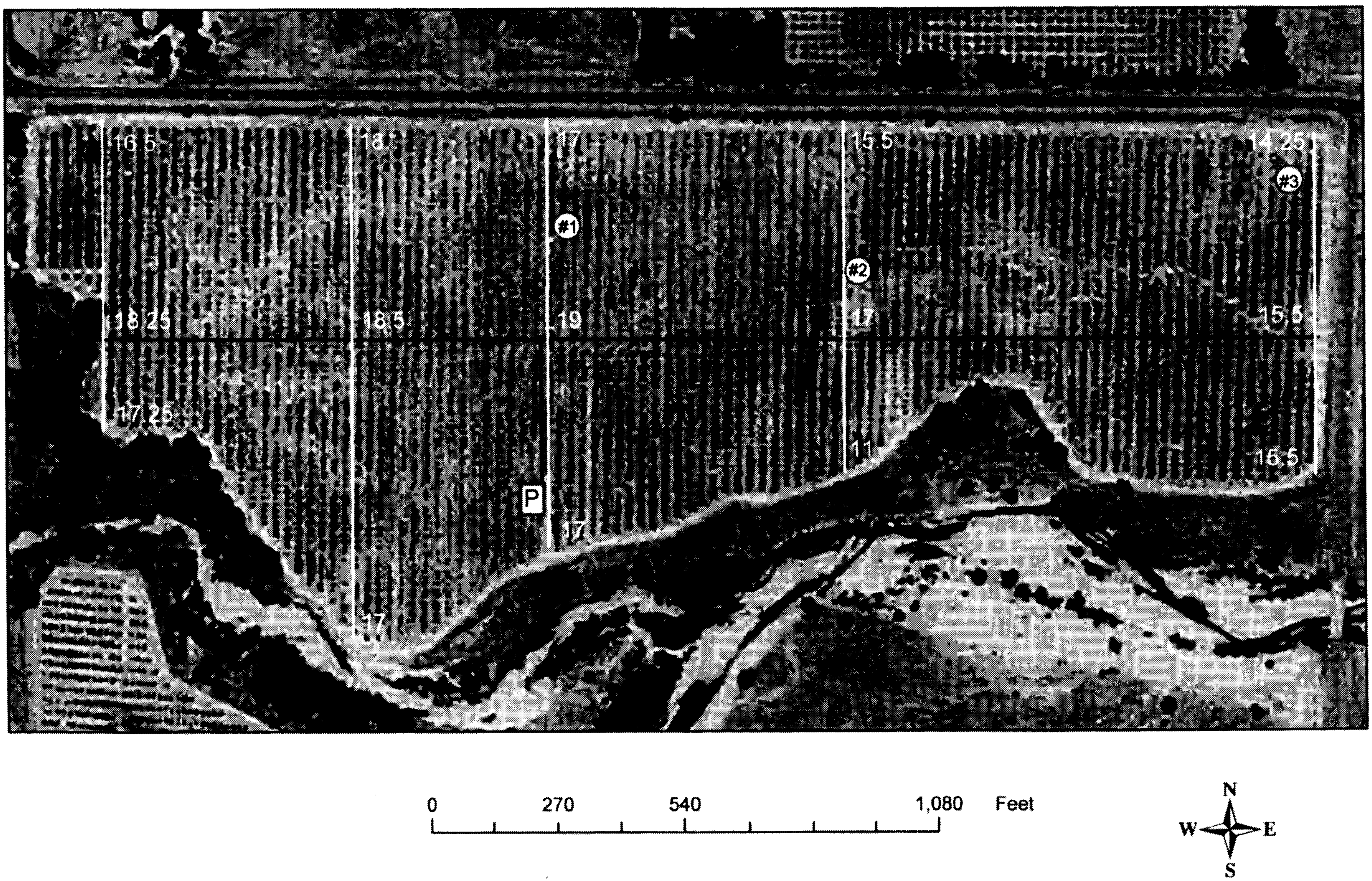
There was a significant amount of debris in the hoses. It took approximately 5 minutes for the water to run clear when flushing the hose furthest from the pump. The majority of debris flushed from the hose was algae and clay, with some sand. Hoses should be routinely flushed for several minutes approximately once a month, or more often if needed, to prevent accumulation of sediment in the last half of the hoses.

Hose Flushing

Chlorine is typically used to inhibit bacterial plugging of micro sprinkler systems. For recommended dosages and timing of chlorine injections, your local farm advisory contact should be consulted. In addition, during the last irrigation of the season, the lines should be thoroughly cleaned. Sometimes this is also necessary during the first irrigation.

Chemical injection should typically be done upstream of the filter system. Some injected chemicals, including chlorine, can react with the irrigation water to form insoluble compounds. By injecting upstream of the filter, these compounds filtered out of the system, avoiding plugged emitters.

Field Pressure and Flow Test Locations



catch time (min):	2.0
# of emitters per plant:	4
space between rows:	26
space along rows:	13
Length of irrigation (hrs)	18

Location # 1

Enter ml's caught: Pressure= 17.5 psi

125	The flow rate for emitter #	1	was	0.99	gph.	The application rate was	0.019	in/hr.
130	The flow rate for emitter #	2	was	1.03	gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	3	was	1.03	gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	4	was	1.03	gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	5	was	1.03	gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	6	was	1.03	gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	7	was	1.03	gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	8	was	1.03	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	9	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	10	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	11	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	12	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	13	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	14	was	1.07	gph.	The application rate was	0.020	in/hr.
140	The flow rate for emitter #	15	was	1.11	gph.	The application rate was	0.021	in/hr.
140	The flow rate for emitter #	16	was	1.11	gph.	The application rate was	0.021	in/hr.

The average flow rate was	1.05	gph.
The average application rate was	0.020	in/hr.
The Flow DU for this location was	96.94	%

Location # 2

Enter ml's caught: Pressure= 16.25 psi

125	The flow rate for emitter #	1	was	0.99	gph.	The application rate was	0.019	in/hr.
130	The flow rate for emitter #	2	was	1.03	gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	3	was	1.03	gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	4	was	1.03	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	5	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	6	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	7	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	8	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	9	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	10	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	11	was	1.07	gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	12	was	1.07	gph.	The application rate was	0.020	in/hr.
140	The flow rate for emitter #	13	was	1.11	gph.	The application rate was	0.021	in/hr.
140	The flow rate for emitter #	14	was	1.11	gph.	The application rate was	0.021	in/hr.
140	The flow rate for emitter #	15	was	1.11	gph.	The application rate was	0.021	in/hr.
140	The flow rate for emitter #	16	was	1.11	gph.	The application rate was	0.021	in/hr.

The average flow rate was	1.07	gph.
The average application rate was	0.020	in/hr.
The Flow DU for this location was	95.59	%

Location # 3

Enter ml's caught: Pressure= 15 psi

120	The flow rate for emitter #	1	was	0.95 gph.	The application rate was	0.018	in/hr.
120	The flow rate for emitter #	2	was	0.95 gph.	The application rate was	0.018	in/hr.
120	The flow rate for emitter #	3	was	0.95 gph.	The application rate was	0.018	in/hr.
125	The flow rate for emitter #	4	was	0.99 gph.	The application rate was	0.019	in/hr.
125	The flow rate for emitter #	5	was	0.99 gph.	The application rate was	0.019	in/hr.
130	The flow rate for emitter #	6	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	7	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	8	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	9	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	10	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	11	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	12	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	13	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	14	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	15	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	16	was	1.03 gph.	The application rate was	0.020	in/hr.
130	The flow rate for emitter #	17	was	1.03 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	18	was	1.07 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	19	was	1.07 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	20	was	1.07 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	21	was	1.07 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	22	was	1.07 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	23	was	1.07 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	24	was	1.07 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	25	was	1.07 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	26	was	1.07 gph.	The application rate was	0.020	in/hr.
135	The flow rate for emitter #	27	was	1.07 gph.	The application rate was	0.020	in/hr.
140	The flow rate for emitter #	28	was	1.11 gph.	The application rate was	0.021	in/hr.

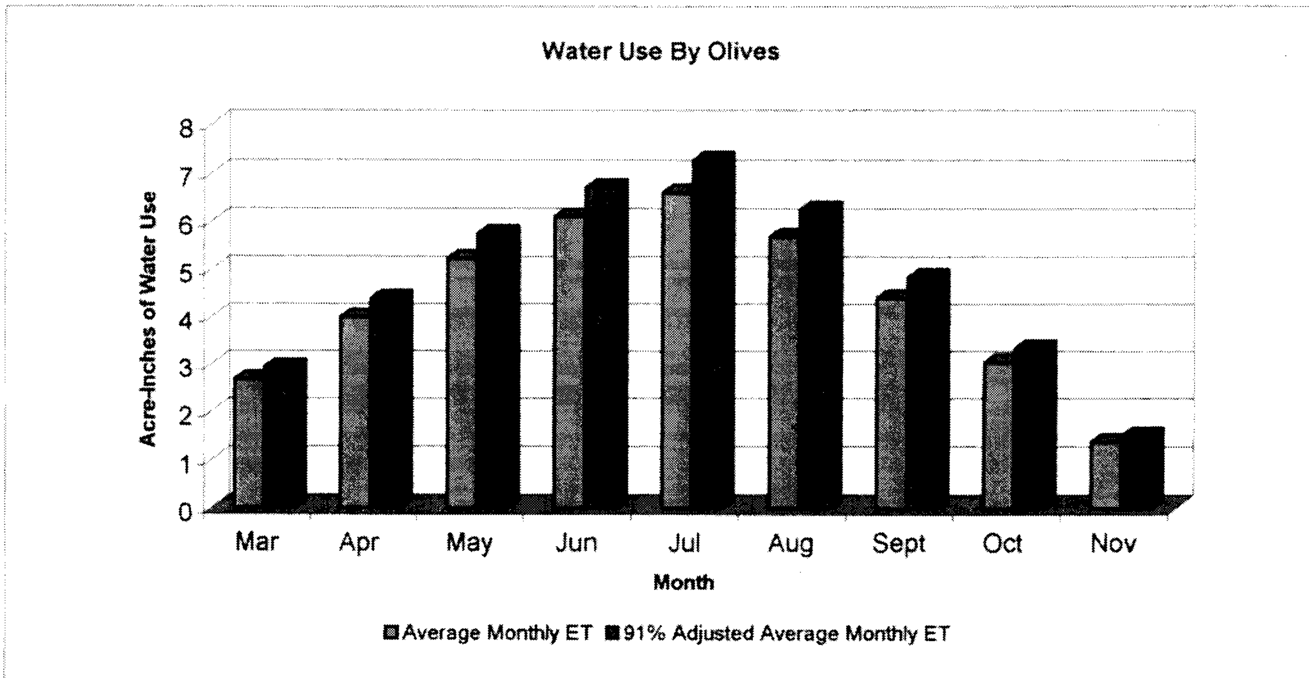
The average flow rate was 1.04 gph.
The average application rate was 0.020 in/hr.

The Flow DU for this location was 95.08 %

The average flow rate for the entire system was 1.05 gph.
The average application rate for the system was 0.020 in/hr.

The Overall System Flow DU was 96.22 %.

An irrigation of 18 hrs will apply 0.359 gross inches of water.



	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	**Total**
Average Monthly ET* (acre-in) =	2.7	4.0	5.2	6.1	6.6	5.7	4.4	3.1	1.4	39.2
DU Adjusted Monthly ET (acre-in) =	2.9	4.4	5.8	6.7	7.3	6.3	4.8	3.4	1.5	43.1
Theoretical Run Times (100% DU)										
Hourly Run Time Per Month (hrs) =	134	200	262	306	331	285	221	153	69	1960
Hourly Run Time Per Week (hrs) =	34	50	66	76	83	71	55	38	17	
Hourly Run Time Per Day (hrs)=	4	6	8	10	11	9	7	5	2	
Actual Run Times**										
Hourly Run Time Per Month (hrs) =	147	220	288	336	364	313	242	168	76	2153
Hourly Run Time Per Week (hrs) =	37	55	72	84	91	78	61	42	19	
Hourly Run Time Per Day (hrs)=	5	7	9	11	12	10	8	5	2	

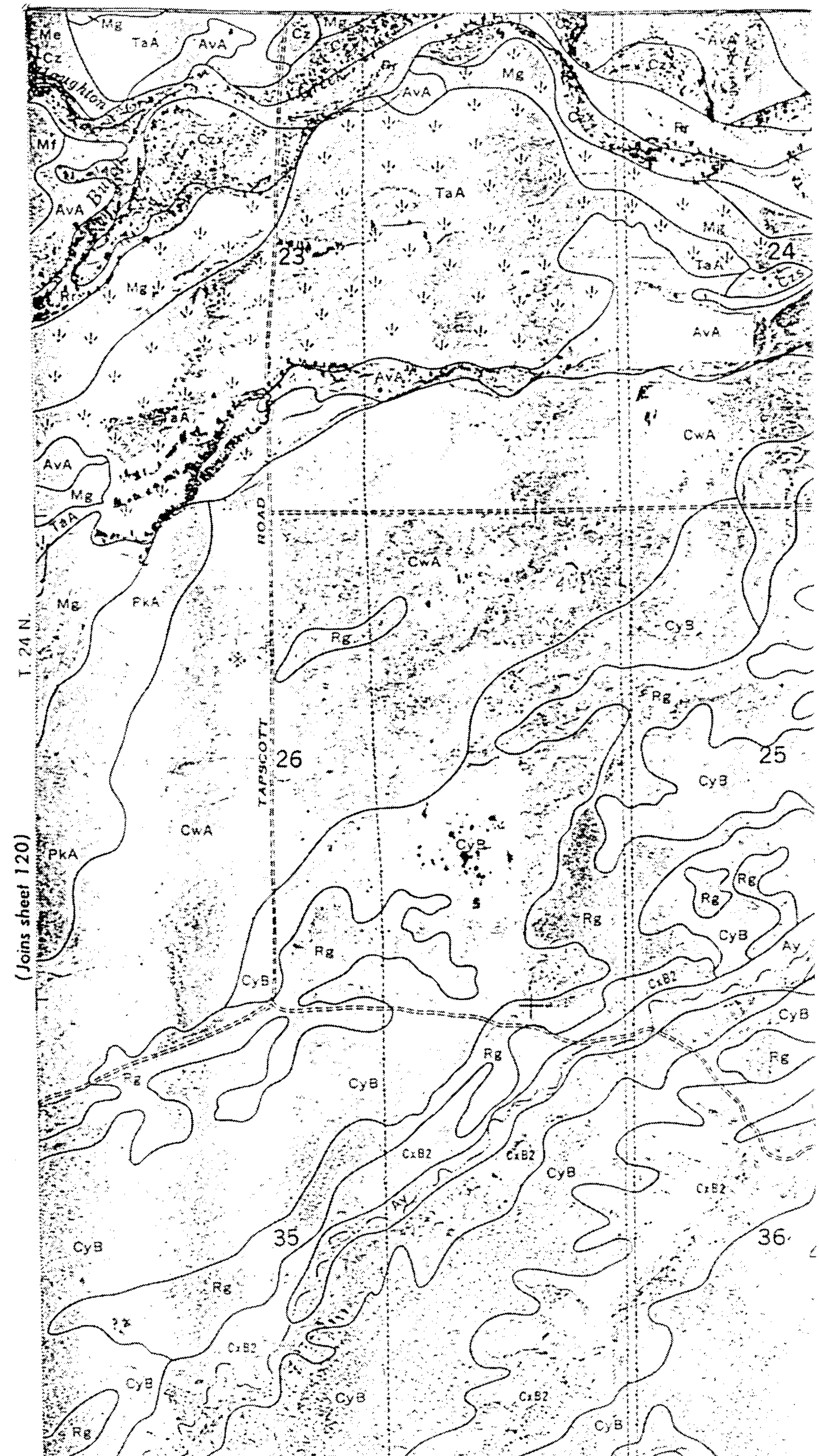
DU = 91 %
Average Flow Rate 0.02 in/hour

* Average monthly ET is calculated by averaging the historical CIMIS monthly ET data for the Gerber and Durham weather stations, multiplied by the historical average monthly crop coefficient for the crop.

** Actual run times are calculated by dividing the adjusted monthly ET by the average emitter flow measured in the field.

These numbers are presented as a reference or guideline **only.** Actual ET, in conjuction with soil or plant based moisture monitoring should be considered when scheduling irrigations.

Soils Information


TAPSCOTT ROAD
T. 24 N.
(Joins sheet 120)
23
24
26
25
35
36
TaA
AvA
Mg
CwA
PkA
CyB
Rg
CxB2
Ay
Czx
Rr
Cz
Me
Mf

thick, platy structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many very fine roots and pores; slightly acid; abrupt, smooth boundary. 0 to 3 inches thick.

A3—1 to 15 inches, brown (7.5YR 4/3) loam, dark reddish brown (5YR 3/3) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many fine roots and pores; slightly acid; clear, wavy boundary. 6 to 15 inches thick.

B1t—15 to 20 inches, brown (7.5YR 4/3) clay loam, dark reddish brown (5YR 3/3) when moist; moderate, medium to coarse, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few very fine to medium roots; many very fine pores; a few subrounded cobblestones and pebbles; a few, thin, discontinuous clay films; slightly acid; clear, irregular boundary. 5 to 15 inches thick.

B2t—20 to 37 inches, brown (7.5YR 4/3) clay, dark reddish brown (5YR 3/3) when moist; moderate, medium, subangular blocky structure; hard to very hard when dry, very firm when moist, sticky and plastic when wet; a few fine to medium roots; a few very fine pores; thick, continuous clay films, mainly in pores; number of subrounded cobblestones increases with depth; neutral; gradual, irregular boundary. 10 to 20 inches thick.

B3t—37 to 46 inches, brown (7.5YR 4/4) clay loam, dark reddish brown (5YR 3/3) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few roots; a few very fine pores; thin, continuous clay films in some pores; many partly weathered fragments of rock; neutral; abrupt, irregular boundary. 6 to 20 inches thick.

R—46 inches +, partly weathered but hard volcanic breccia that has a few, widely spaced, narrow, nearly vertical cracks.

The A horizon is brown or dark-brown loam or gravelly loam. It is massive or has platy or weak granular structure. The A1 horizon grades to the B2 horizon through an A3 or B1 horizon or both. The B2 horizon is clay or clay loam and is generally the same color as the A horizon. The B3 horizon is the same color as the B2 horizon, but it contains less clay and is less porous. These soils test near slightly acid throughout, but in places the subsoil is neutral to medium acid. Depth is generally 36 to 48 inches.

Supan stony loam, 10 to 30 percent slopes (SuD).[12]—This soil is in long, narrow areas on fairly broad ridgetops in the upper foothills in the eastern part of the county. Some areas are more than 500 acres in size. The surface is gently undulating. Partly rounded rocks 1 to 3 feet in diameter are on 1 to 10 percent of the surface.

This soil is well drained. Permeability is slow; fertility and available water holding capacity are moderate. Runoff is medium, and the erosion hazard is moderate.

Included with this soil in mapping are areas of Cohasset and Toomes soils.

Most areas of this Supan soil have a dense cover of shrubs, but some areas are used for pasture and range. Yields of forage are about moderate, and the quality is fair. Buckbrush, birchleaf mountain-mahogany, flannelbush, redbud, poison oak, blue oak, black oak, and interior live oak are the dominant shrubs. These shrubs protect the watershed and provide browse and cover for wildlife. Capability unit VIs-8.

[12] This soil includes some soils shown as Stover stony gravelly loam on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953-59.

Supan stony loam, 30 to 50 percent slopes (SuE).[13]—Most of this soil is in long, narrow areas that are abo on the contour of the slopes. Runoff is rapid, and the er sion hazard is severe. Capability unit VIs-8.

Tehama Series

In the Tehama series are nearly level, well-drained so formed in mixed alluvium, chiefly from sedimentary roc The surface soil is pale-brown, slightly acid loam or s The subsoil is brown or yellowish-brown, neutr loam, and the subsoil is brown or yellowish-brown, neutr clay loam. These soils are on low terraces, mostly w of the Sacramento River, at elevations of 200 to 1,000 fe Most areas have been cultivated.

Profile of Tehama silt loam in a nearly level area f merly under dryfarmed barley, elevation of 280 feet mile north and 0.25 mile west of the depot of the Southe Pacific Railroad at Corning, 1,200 feet west of the nor east corner of sec. 15, T. 24 N., R. 3 W.):

A1—0 to 19 inches, pale-brown (10YR 6/3) silt loam, bro (10YR 5/3) when moist; massive; uppermost 4 t inches has been cultivated; hard when dry, fria when moist, slightly sticky when wet; abundant v fine roots; many fine pores; slightly acid; grad smooth boundary. 12 to 24 inches thick.

B2t—19 to 42 inches, light yellowish-brown (2.5Y 6/3) loam, olive brown (2.5Y 4/3) when moist; massi very hard when dry, firm when moist, sticky plastic when wet; many very fine pores; a few roots; thin, continuous clay films in places; staining in seams and on sand grains; slightly aci neutral; gradual, smooth boundary. 10 to 25 in thick.

B3t—42 to 60 inches +, light yellowish-brown (2.5Y heavy loam that in places has gravel in the lower olive brown (2.5Y 4/3) when moist; massive; fine pores; thin continuous clay films; neutral.

The surface layer is pale-brown or light yellowish-bro loam or silt loam. It contains gravel in places. In a that are not cultivated, the uppermost 1 or 2 inches of layer is grayish brown. Texture of the subsoil is clay l or silty clay loam. The color of the subsoil and substra is pale brown, light yellowish brown, light brown brownish yellow. In places the substratum contains s lime. These soils are generally slightly acid in the sur soil. They are slightly acid to neutral or mildly alka in the subsoil.

Tehama silt loam, 0 to 3 percent slopes (Tc).—Mo this soil is on low terraces west of the Sacramento R but a small acreage is east of the river in areas near I and Red Bluff. The areas vary considerably in size shape, and some are more than 500 acres in size. The face is smooth.

This soil is well drained. Permeability is slow. available water holding capacity and fertility are erate. Runoff is slow, and there is no erosion hazard

Included with this soil in mapping are areas of Arbu Maywood, and Hillgate soils.

If this Tehama soil is irrigated, pasture plants, al milo, corn, and olives are grown. Other areas are use dryfarmed grain and for pasture and range. Leveli

[13] This soil includes some soils shown as Stover stony gr loam on advance sheets published by the University of Cal Agricultural Extension Service and the California Divis Forestry during the years 1953-59.

Anita clay (Ad).—This soil ranges from 10 to 20 inches in depth. Consequently forage on this soil dries a little sooner than on the deeper Anita soils. Capability unit IVw-5.

Anita cobbly clay (Ar).—This soil is in small basins near the Tuscan soils. Rounded cobblestones of volcanic rock that range from 3 to 10 inches in diameter cover from 5 to 20 percent of the surface. Depth of the soil ranges from 10 to 22 inches.

Included with this soil in mapping are small areas of the Tuscan and Keefers soils.

All areas of Anita cobbly clay are used for pasture and range, and the quality of the forage is poor. Capability unit IVw-5.

Anita cobbly clay, moderately deep (Ac).—This soil has rounded cobblestones of volcanic rock on the surface. The cobblestones range from 3 to 10 inches in diameter and cover from 5 to 15 percent of the surface. Very few cobblestones are within the soil profile.

Included with this soil in mapping are small areas of Keefers and Tuscan soils.

Unless the cobblestones are removed from the surface, it is impractical to cultivate this Anita soil. In a few areas the cobblestones have been pushed aside into ridges and the areas are used for irrigated pasture. Most areas, however, are used for pasture and range. Capability unit IIIw-5.

Anita gravelly clay, moderately deep (Ap).—This soil is 10 to 20 percent of rounded gravel. Irrigated pasture is grown on some areas, but other areas are used for pasture and range. The pebbles and fine texture make this difficult to cultivate. Capability unit IIIw-5.

Anita stony clay, 0 to 8 percent slopes (AsB).—This soil is on slopes below seep areas on the upper edges of old fans. Rounded fragments of volcanic rock 6 to 20 inches in diameter cover from 10 to 20 percent of the surface. Depth of the soil ranges from 10 to 22 inches.

Included in mapping are small areas of Toomes and Tuscan soils, which in many places adjoin areas of this soil.

This Anita soil is used for pasture and range. The quality of the forage is poor. Capability unit IVw-5.

Anita-Keefers complex, 0 to 3 percent slopes (At).—This complex consists of Anita clay, moderately deep, and of Keefers loam, moderately deep, 0 to 3 percent slopes. The individual soils occur in small areas in so complex a pattern that they cannot be mapped separately. Either soil may occupy from 20 to 80 percent of any one area. Anita part, capability unit IIIw-5; Keefers part, capability unit IIIs-3.

Arbuckle Series

Soils of the Arbuckle series are nearly level to gently sloping, well drained, and gravelly. They formed in gravelly alluvium derived from sedimentary and metamorphic rocks. The alluvium contains many, light-colored pebbles of quartzite and chert.

These soils have a surface soil of brown, slightly acid gravelly loam or fine sandy loam. The subsoil is brown, neutral gravelly clay loam or loam. It generally grades to a substratum of very gravelly sandy loam, but in places the substratum is dense and slowly permeable.

Arbuckle soils are along most of the streams west of the Sacramento River at elevations between 200 and 1,000 feet. Grass and oak make up the vegetation.

Row crops, field crops, and orchard crops are grown successfully on the Arbuckle soils. Many areas along narrow flood plains are used for range.

Profile of Arbuckle gravelly loam in a nearly level field that has been used for grazing sheep; elevation of about 300 feet (1.5 miles south and 1 mile west of the airport near Red Bluff, in the southeast corner of the SW¼SW¼ of sec. 1, T. 26 N., R. 4 W.):

A11—0 to 2 inches, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; weak, platy structure, hard when dry, friable when moist, nonsticky when wet; many fine roots; many fine pores; slightly acid; abrupt, smooth boundary. 1 to 3 inches thick.

A12—2 to 14 inches, yellowish-brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 3/4) when moist; massive; hard when dry, friable when moist, nonsticky when wet; many fine roots; many fine and medium pores; slightly acid; clear, smooth boundary. 10 to 20 inches thick.

B1—14 to 25 inches, yellowish-brown (10YR 5/4) gravelly loam, dark yellowish brown (10 YR 3/4) when moist; massive; hard when dry, friable when moist, nonsticky when wet; in places thin clay films are in the pores and on the pebbles; slightly acid; gradual, irregular boundary. 10 to 15 inches thick.

B2t—25 to 59 inches, yellowish-brown (10YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 3/4) when moist; massive; hard when dry, friable when moist, sticky when wet; many large, irregular pores; clay films around the pebbles and on the walls of the pores; a few fine roots; neutral; gradual, irregular boundary. 20 to 40 inches thick.

C—59 to 72 inches +, yellowish-brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 3/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many large pores; thin clay films around the pebbles and inside of the pores; a few fine roots; neutral.

The A horizon in many places is yellowish brown or pale brown. In a few areas it has a reddish cast, and along Thomes Creek it is nearly grayish brown in color. In areas that have not been cultivated, the A11 horizon is thin and dark brown and has weak, platy structure. The texture of the surface soil ranges from gravelly loam to gravelly fine sandy loam. The B2t horizon is the same color or is slightly redder than the A horizon; it is gravelly fine sandy loam, gravelly loam, or gravelly sandy clay loam. The soils range from slightly acid to neutral.

Arbuckle gravelly loam, 0 to 3 percent slopes (AvA).—This soil is along streams west of the Sacramento River. Some of the areas are more than 500 acres in size, and many areas are long and narrow. Drainage is good, runoff is slow, and permeability is moderate to moderately rapid. The available water holding capacity is moderate, and fertility is also moderate. There is no erosion hazard. The gravel in the soil interferes with preparation of the seedbed and causes the implements used in cultivating the soil to wear excessively. This soil does not hold as much water as soils that are not gravelly, and it therefore requires more frequent irrigation.

Included with this soil in mapping are small areas of Cortina, Hillgate, Maywood, and Tehama soils.

Alfalfa, corn, beans, milo, irrigated pasture plants, olives, prunes, grain, and similar crops can be grown successfully on this Arbuckle soil. Tests show that plants growing in a greenhouse in material from the surface layer lar fragments of quartzite; slightly acid; clear, irregular boundary. 3 to 8 inches thick.

B2t—3 to 19 inches, brown (7.5YR 4/4) gravelly loam, dark brown when moist; moderate, medium, subangular blocky structure that breaks to strong, fine, granular; slightly hard when dry, friable when moist; nonsticky when wet; many roots; very porous; strongly acid; clear, irregular boundary. 8 to 20 inches thick.

C1—19 to 37 inches, light yellowish-brown (10YR 6/4) very gravelly loam, yellowish brown (10YR 5/6) when moist; strongly acid; moderate, medium, subangular blocky structure that breaks to strong, fine, granular; slightly hard when dry; friable when moist; nonsticky when wet; a few roots; very porous; strongly acid; abrupt, very irregular boundary. 12 to 30 inches thick.

R—37 inches +, broken, partly weathered, light-colored, hard schist; in places roots of medium size penetrate the rock to a depth of many feet.

The surface layer is brown or dark brown. The upper part of the subsoil is brown or yellowish brown, and the lower part is brownish yellow or light yellowish brown. Texture of the surface layer is sandy loam or loam, and that of the subsoil is loam or loam near clay loam. The soils are gravelly or very gravelly and have cobblestones in places. The surface soil is slightly acid or medium acid, and the subsoil is medium acid or strongly acid. Depth to partly weathered rock ranges from 20 to 48 inches.

Masterson gravelly loam, 10 to 30 percent slopes (MbD).—This is the only Masterson soil mapped in the county. It is on the more nearly level ridges on top of the Coast Range Mountains in the western part of the county. The ridgetops are partly rounded and have an uneven surface because of drainageways that cut through the areas. Depth to broken and weathered schist is 20 to 40 inches.

This soil is well drained. Runoff is slow to medium, and permeability is moderately rapid. The available water holding capacity and fertility are moderate to low, depending on the soil depth. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Sheetiron and Yollabolly soils.

This Masterson soil is used for timber. White fir is dominant, but a few sugar pine and Douglas-fir trees grow in the area. In a few places at elevations of more than 6,000 feet, red fir is dominant. Christmas trees are harvested from a few areas. Campsites and homesites are located in several gently sloping areas because springs flow along the lower edges of this soil. Capability unit IVe-4.

Maymen Series

The Maymen series consists of steep to very steep, shallow, somewhat excessively drained soils. These soils formed in material from such sedimentary and metamorphic rocks as hard sandstone, shale, and mica schist. The soils are brown, medium textured, and slightly acid throughout.

These soils are moderately permeable. The available water holding capacity and fertility are low. Runoff is medium to rapid, and the erosion hazard is moderate. Depth to broken and partly weathered rock ranges from 6 to 20 inches, but some areas of gravelly loam, where the slope ranges from 10 to 30 percent, are likely to be deeper in places. The rock is hard and relatively dense, and roots and water penetrate it slowly.

Maymen soils are under a dense cover of shrubs in narrow, mountainous areas in the western part of the county at elevations of 1,000 to 4,000 feet. Most of the areas vary considerably in size and shape, and some areas of gravelly loam, where the slope ranges from 30 to 65 percent, are more than 500 acres in size. The areas are cut by streams. Deep canyons have formed, and the surface is therefore uneven. In places rocks outcrop. In places small areas of Los Gatos and Parrish soils and of Rock land are within areas of Maymen soils.

Soils of the Maymen series are mapped only as undifferentiated units with the Lodo soils or as complexes with the Los Gatos soils. The Lodo and Los Gatos soils are described under their respective series.

Profile of Maymen gravelly loam on a slope of 30 percent that faces south; under a dense stand of shrubs; elevation of 2,100 feet (2½ miles south and 1 mile west of Cold Fork, near the center of the SE¼ sec. 31, T. 27 N., R. 7 W.):

A11—0 to 1 inch, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; weak, thick, platy structure; slightly hard when dry, very friable when moist, nonsticky when wet; many fine roots and pores; a few angular fragments of shale; slightly acid; abrupt, smooth boundary. 1 to 2 inches thick.

A12—1 to 7 inches, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; medium, subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky when wet; slightly acid; abrupt, irregular boundary. 5 to 18 inches thick.

R—7 inches +, partly weathered, fractured, hard, gray shale.

In color the soils are brown, pale brown, light brownish gray, or light gray throughout, but in places the surface horizon is thin and darker colored. The soils range from slightly acid to medium acid. The texture ranges from loam to sandy loam and in places is gravelly, shaly, or stony.

Maymen and Lodo gravelly loams, 30 to 65 percent slopes (MbgE).—This mapping unit consists of Maymen gravelly loam, 30 to 65 percent slopes, and of Lodo shaly loam, 30 to 65 percent slopes, eroded. Either soil may make up from 20 to 80 percent of any one area. These soils are in mountainous areas in the western part of the county.

The erosion hazard is severe to very severe. Depth to broken and partly weathered rock ranges from 6 to 20 inches in the Maymen soil but is 6 to 10 inches in the Lodo. Roots and water penetrate the hard, fairly dense rock underlying the Maymen soil very slowly. Penetration of the shale underlying the Lodo soil is limited, except along cracks in the shale.

Chamise, wedgeleaf ceanothus, and common manzanita are dominant on the Maymen soil. These shrubs protect the watershed and provide cover and browse for wildlife. Except in areas where the soil is deeper, yields of annual grasses and forbs on the Lodo soil are very low. Both parts, capability unit VIIIs-8.

Maywood Series

The Maywood series consists of nearly level, well-drained soils formed in recent alluvium. The alluvium was derived mainly from softly consolidated sedimentary rocks. Maywood soils are pale brown, medium textured, and neutral or slightly acid throughout. They are on flood plains west of the Sacramento River at elevations that range from 200 to 500 feet. Nearly all of the acreage is cultivated.

Profile of Maywood silt loam, on the railroad right-of-way on a nearly level, narrow flood plain along an active stream; under annual grasses and forbs; elevation of 250 feet (0.7 mile south of the Corning Depot of the Southern Pacific Railroad, 800 feet north of the southwest corner of sec. 23, T. 24 N., R. 3 W.):

A1—0 to 14 inches, pale-brown (10YR 6/3) silt loam, dark brown (10YR 4/3) when moist; massive; slightly hard when dry, friable when moist, nonplastic and nonsticky when wet; many fine roots and pores; slightly acid; diffuse boundary. 5 to 15 inches thick.

C—14 to 62 inches, pale-brown (10YR 6/3) loam, dark brown (10YR 4/3) when moist; massive; slightly hard when dry, friable when moist, nonplastic and nonsticky when wet; many fine roots to a depth of about 40 inches, but few below that depth; many fine pores; strata of silt loam, fine sandy loam, and very gravelly sandy loam occur; gravel consists of quartzite and chert; a few fine and medium, faint, reddish-brown mottles are in the layers of silt loam; slightly acid; several feet thick.

These soils range from pale brown to light yellowish brown in color. In many places they contain stratified material that ranges from loam to silt loam or fine sandy loam in texture or is gravelly in the lower part. Maywood soils range from slightly acid to neutral.

Maywood loam, 0 to 3 percent slopes (Me).—This soil is on recent flood plains along fairly short streams west of the Sacramento River. The surface is smooth. Most areas are long and narrow, are less than 100 acres in size, and generally are parallel to active streams. In some areas there is a layer of gravel at a depth of 4 feet or more.

This soil is well drained. Permeability is moderate, and runoff is slow. The available water holding capacity is high, and fertility is moderate. There is no erosion hazard, except in some places near active streams where streambanks are eroding. Some areas are flooded for short periods during the winter.

Included with this soil in mapping are small areas of Cortina and Yolo soils.

Alfalfa, pasture, milo, corn, beans, sugarbeets, almonds, walnuts, peaches, and olives grow well on this Maywood soil if irrigation water is available. Dryfarmed grain and pasture and range are grown in a few areas. Capability unit I–1.

Maywood fine sandy loam, 0 to 3 percent slopes (Mc).—This soil is mainly fine sandy loam throughout but is otherwise similar to Maywood loam, 0 to 3 percent slopes. Permeability is moderately rapid, and the available water holding capacity is moderate. It is easier to prepare a seedbed in this Maywood soil than in Maywood loam, but the crops on this soil need more frequent irrigation. Capability unit I–1.

Maywood fine sandy loam, moderately deep, 0 to 3 percent slopes (Md).—This soil is mainly fine sandy loam to a depth of 20 to 48 inches. Below this depth it is gravelly sand. The gravelly subsoil holds less water and makes the soil somewhat droughty. Consequently, crops on this soil require more frequent irrigation than crops on Maywood loam. Capability unit IIs–0.

Maywood silt loam, 0 to 3 percent slopes (Mh).—This soil has a surface soil of silt loam but is otherwise similar to Maywood loam, 0 to 3 percent slopes. Most areas are silt loam to a depth of at least 5 feet, but in a few places gravel is at a depth below 4 feet. Water penetrates this soil more slowly than the Maywood loam. The surface tends to seal over if water splashes on it or flows the surface. Adding organic matter or returning cro dues to this soil every year helds to keep the surfac sealing. Capability unit I–1.

MAYWOOD LOAMS, HIGH TERRACE

The Maywood loam, high terrace, soils are on level flood plains west of the Sacramento River at tions of 200 to 500 feet. They are well-drained, m textured soils formed in alluvium from sedimentar mostly from the softly consolidated Tehama forn The Newville, Dibble, and related soils also for material from this formation.

These soils have a pale-brown, slightly acid surfa The subsoil contains slightly more clay than the s soil, is neutral, and in places has reddish-brown n Nearly all of the acreage is cultivated.

Profile of Maywood loam, high terrace, in a nearl area formerly used for dryfarmed grain; elevat about 300 feet (2 miles west of Gerber near the ce the NE¼NW¼ sec. 15, T. 25 N., R. 3 W.):[10]

Ap—0 to 10 inches, pale-brown (10YR 6/3) loam, dar (10 YR 4/3) when moist; massive but breaks angular blocky structure; very hard when dry when moist, nonsticky when wet; many fin many fine medium pores; slightly acid; clear, boundary. 4 to 10 inches thick.

C1—10 to 25 inches, similar to the Ap horizon, except it porous and has a few, thin, patchy clay films; smooth boundary. 10 to 20 inches thick.

C2—25 to 46 inches, light yellowish-brown (10YR 6 sandy loam, nearly a sandy clay loam, dark y brown (10YR 4/4) when moist; massive; ve when dry, friable when moist; sticky when a few fine roots; pores are fewer and finer the C1 horizon; thin, patchy clay films more n than in the C1 horizon; neutral; gradual, boundary. 15 to 25 inches thick.

C3—46 to 58 inches +, light yellowish-brown (10YR sandy loam, nearly a sandy clay loam, dark y brown (10YR 4/4) when moist; massive; ha dry, friable when moist, slightly sticky whe few fine roots and pores; thin, patchy cla neutral.

These soils range from pale brown to light ye brown in color throughout. In areas that have ne cultivated or that have not been cultivated for years, the first inch or more of the A horizon is and the structure is weak, thin, platy. In places brown mottles are in the subsoil. The mottles i that here drainage was formerly poor. In place ever, for short periods during years of high rainfall age is poor. In these places the substratum, whic depth of 8 to 15 feet, is dense and softly consolida temporarily causes poor drainage. The surface soi from medium acid to slightly acid, and the subso slightly acid to neutral. In most places the soils gravelly, but in some areas they are slightly grave ticularly where they are near the Arbuckle soils.

Maywood loam, high terrace, 0 to 3 percent (Mi).—This soil is along many of the shorter strea of the Sacramento River. Many of the areas are l 100 acres in size and are long and narrow.

[10] This high terrace soil was shown as McClure loam and on advance sheets published by the University of Califor cultural Extension Service and the California Division of during the years 1953–59.

Drainage is good. Runoff is very slow, and permeability and fertility are moderate. Greenhouse plants growing on soil respond if fertilizer that contains nitrogen and phosphate is added.

Included with this soil in mapping are areas of Arbuckle, Hillgate, and Tehama soils.

Alfalfa, corn, beans, milo, olives, prunes, and walnuts are grown on this Maywood soil if irrigation water is available. Other areas are used for dryfarmed grain and for pasture and range. Capability unit I–1.

Maywood loam, moderately well drained, 0 to 3 percent slopes (Mg).[11]—Except that it is moderately well drained, this soil is similar to Maywood loam, high terrace, 0 to 3 percent slopes. It has soft but very slowly permeable siltstone at a depth of 8 to 15 feet, which retards drainage.

A perched water table forms in this soil during winters of high rainfall and during the summer in areas where excessive irrigation water accumulates. In places, therefore, deep-rooted crops are injured. Most crops grow well on this soil if it is properly irrigated. Capability unit I–1.

McCarthy Series

In the McCarthy series are moderately steep to very steep, well-drained soils. These soils formed in material from volcanic breccia, which is composed of rocks of basalt and andesite cemented with tuffaceous material. The soils are moderately deep, moderately coarse textured, slightly acid to medium acid, and granular throughout. The surface soil is dark brown, and the subsoil is brown and rests on weathered breccia. McCarthy soils are in mountainous areas in the eastern part of the county. Elevations range from 2,000 to 6,000 feet. Various kinds of conifers grow on these soils.

Profile of McCarthy sandy loam on a slope of 40 percent that faces east; under a dense stand of mixed conifers; elevation of 3,800 feet (2 miles south of Mill Creek on Ponderosa Way in the NW¼ sec. 29, T. 27 N., R. 3 E.):

O1 & O2—1 inch to 0, forest litter consisting of needles, leaves, and small twigs that are more matted and decomposed in the lower part than in the upper part; abrupt, smooth boundary. 1 to 2 inches thick.

A11—0 to 3 inches, dark-brown (7.5YR 3/4) sandy loam, dark brown (7.5YR 3/2) when moist; strong, medium, granular structure; soft when dry, friable when moist; many very fine roots; very porous; many, brown, rounded, hard concretions; slightly acid; clear, smooth boundary. 2 to 4 inches thick.

A12—3 to 16 inches, brown (7.5YR 4/4) gritty and somewhat gravelly sandy loam, dark brown (7.5YR 3/4) when moist; strong, medium, granular structure; soft when dry, very friable when moist; many roots; very porous; many concretions; medium acid; gradual, smooth boundary. 6 to 16 inches thick.

B2—16 to 28 inches, strong-brown (7.5YR 5/6) very gravelly sandy loam, dark brown (7.5YR 3/5) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, friable when moist; many roots; very porous; a few iron concretions; coarse rock fragments in places; gravel content increases with increasing depth; medium acid; gradual, smooth boundary. 6 to 16 inches thick.

R—28 inches +, pale-brown (10YR 6/3) volcanic breccia that is weathered enough to absorb water and to be penetrated by coarse roots to a depth of several feet.

The A horizon ranges from dark grayish brown to brown or reddish brown in color. The B2 horizon is brown, strong brown, or reddish brown. Throughout the profile the texture is sandy loam. The amount of gravel in the profile varies, but it generally increases with increasing depth. These soils are neutral or slightly acid in the A horizon, and they are slightly acid or medium acid below.

McCarthy sandy loam, 30 to 50 percent slopes (MkE).—This soil is on slopes of canyons in mountainous areas in the eastern part of the county. Many of the areas are fairly large, and the surface is uneven in many places because of rock outcrops and short drainageways. Depth to partly weathered rock is 20 to 40 inches.

This soil is well drained. Runoff is medium to rapid, and permeability is moderately rapid. The available water holding capacity is low, and fertility is moderate. The underlying rock is porous and fractured; roots and water can therefore penetrate it to a depth of many feet. Under present cover there is no erosion hazard.

Included with this soil in mapping are small areas of Cohasset, Jiggs, and Iron Mountain soils.

This McCarthy soil is used for timber. Most areas are on north-facing slopes where the dominant conifers are Douglas-fir and white fir but include some sugar pine. In addition to these conifers, ponderosa pine grows in areas near the top of ridges and on south-facing slopes. Deerbrush ceanothus, squawcarpet, dogwood, greenleaf manzanita, black oak, and canyon live oak are the chief shrubs and hardwoods. Capability unit VIe–4.

McCarthy sandy loam, 10 to 30 percent slopes (MkD).—This soil is less steep but is otherwise similar to McCarthy sandy loam, 30 to 50 percent slopes. It is therfore easier to harvest timber from this soil. Small areas have rocks 10 to 30 inches in diameter on 5 to 50 percent of the surface. Capability unit IVe–4.

McCarthy sandy loam, 50 to 65 percent slopes (MkF).—This soil is steeper but is otherwise similar to McCarthy sandy loam, 30 to 50 percent slopes. Because of the very steep slopes, it is difficult to harvest timber from this soil. Capability unit VIIe–4.

McCarthy stony sandy loam, 30 to 50 percent slopes (MmE).—This soil has stones 3 to 60 inches in diameter on 5 to 50 percent of the surface but is otherwise similar to McCarthy sandy loam, 30 to 50 percent slopes. The stones interfere with logging because they slow equipment moving over the area and damage falling trees. Capability unit VIs–7.

McCarthy stony sandy loam, 50 to 65 percent slopes (MmF).—This soil is steeper and has more stones on the surface but is otherwise similar to McCarthy sandy loam, 30 to 50 percent slopes. Stones 3 to 60 inches in diameter cover 5 to 50 percent of the surface. The stones interfere with logging because they slow equipment moving over the area and damage falling trees. In addition, the very steep slopes make it very difficult to harvest trees from this soil. Capability unit VIIs–1.

McCarthy-Iron Mountain complex, 30 to 50 percent slopes (MnE).—This complex consists of McCarthy stony sandy loam, 30 to 50 percent slopes, and Iron Mountain rocky sandy loam, 30 to 50 percent slopes. Either soil

[11] This soil was shown as McClure loam, imperfectly drained, on ad… sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

Corning Series

In the Corning series are nearly level to gently sloping, well-drained, reddish, gravelly soils that formed in old alluvium. The alluvium was derived from sedimentary and metamorphic rocks of the Coast Range Mountains. The surface soil is yellowish-red gravelly loam, and the subsoil is red gravelly clay.

Corning soils are on high terraces west of the Sacramento River at elevations from 200 to 1,500 feet. A hummocky, or hogwallow, microrelief is characteristic of most areas. The vegetation is annual forbs and grasses.

Most areas of these soils are used for pasture and range or for dryfarmed grain. Because of a claypan in the subsoil, low fertility, and lack of water for irrigation, little intensive farming is done.

Profile of Corning gravelly loam formerly in dryfarmed grain but now used for grazing sheep; under annual forbs and grasses; elevation of 270 feet (about 3 miles south of Corning on the east side of U.S. Highway No. 99W, 0.6 mile north of the southwest corner of sec. 22, T. 23 N., R. 3 W.):

Ap—0 to 8 inches, yellowish-red (5YR 5/6) gravelly loam, yellowish red (5YR 4/6) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many very fine roots; many very fine pores; strongly acid; gradual, smooth boundary.

A11—8 to 15 inches, yellowish-red (5YR 5/6) gravelly loam, red (2.5YR 4/6) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; medium acid; gradual, smooth boundary.

A12—15 to 21 inches, yellowish-red (5YR 5/6) gravelly loam, red (2.5YR 4/6) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; strongly acid; a very thin, bleached layer is immediately above the B2t horizon; abrupt, slightly wavy boundary.

B2t—21 to 29 inches, red (2.5YR 5/6) gravelly clay, red (2.5YR 5/6) when moist; massive; extremely hard when dry, extremely firm when moist, sticky and very plastic when wet; a few very fine roots and pores; moderately thick, continuous clay films on ped faces and in pores; very dense; strongly acid; clear, wavy boundary. 6 to 15 inches thick.

B3t—29 to 36 inches, yellowish-red (5YR 5/6) gravelly clay loam, red (2.5YR 4/6) when moist; massive; very hard when dry, very firm when moist, sticky and plastic when wet; a few very fine roots; a few very fine pores; moderately thick, continuous clay films in pores; strongly acid; clear, wavy boundary. 4 to 10 inches thick.

C1—36 to 45 inches, yellowish-red (5YR 5/6) gravelly sandy clay loam, red (2.5YR 4/6) when moist; massive; hard when dry, firm when moist, slightly sticky and plastic when wet; a few fine roots; a few very fine pores; thin, continuous clay films in pores; strongly acid; diffuse, smooth boundary. 6 inches to many feet thick.

C2—45 to 50 inches +, yellowish-red (5YR 5/6) gravelly sandy clay loam, red (2.5YR 4/6) when moist; slightly sticky and plastic when wet; a few fine roots; a few very fine pores; thin, continuous clay films in pores; strongly acid.

The A horizon is yellowish red, reddish yellow, or reddish brown. It is generally gravelly, but it ranges from sandy loam to loam in texture. The A11 and A12 horizons combined are 10 to 27 inches thick. The B2t horizon is red or yellowish-red, very dense clay that contains some gravel. Because of the hummocky microrelief, depth to the B2t horizon varies from place to place. In places a very thin, bleached layer lies between the A12 and the B2t horizons. The underlying C horizon is generally gravelly than the B3t horizon. The soils are mediun to strongly acid.

Corning gravelly loam, 0 to 3 percent slopes (Cv This soil is in fairly large areas that have long (slopes. The largest areas are on the tops of old te west of the Sacramento River. Because of the humm microrelief, the surface is generally uneven. The m are 5 to 20 feet in diameter, and they rise about 2 feet the depressions.

Drainage is good, runoff is slow, and permeability i slow. The available water holding capacity and fe are low. The erosion hazard is moderate. Sheet e is slight to moderate in most areas. Most of the drainageways have been cut by gullies; however, m the gullies can be crossed with equipment used fo tivating.

Included with this soil in mapping are small ar Redding, Red Bluff, and Newville soils.

Most areas of this Corning soil are in pasture and used for grazing sheep, or they are rotated between g land and dryfarmed grain. Yields of dryfarmed are low under present management. Except for a dryfarmed grain, this soil has not been used inten for agriculture, mainly because irrigation water available. The dense clay subsoil and fairly low fe also limit the use of this soil for agriculture. If th is irrigated and is otherwise well managed, a num crops can be grown successfully. Capability unit I

Corning gravelly loam, 3 to 8 percent slopes (C This soil has an uneven surface because of small dra ways that cut through most of the areas. Most of the drainageways are cut by gullies, which generally crossed with equipment used for cultivation. erosion is slight to moderate in most areas.

Included with this soil in mapping are areas of Ne and Redding soils.

This Corning soil is used as pasture and range fo or for dryfarmed grain. Capability unit IVe-3.

Corning-Newville gravelly loams, 3 to 10 p slopes, eroded (CxB2).—This complex consists of C gravelly loam, 3 to 8 percent slopes, and Newville g loam, 3 to 10 percent slopes, eroded. Either soil m cupy from 20 to 80 percent of any one area. Both capability unit IVe-3.

Corning-Redding gravelly loams, 0 to 5 p slopes (CyB).—This complex consists of Corning g loam, 3 to 8 percent slopes, and Redding gravelly 0 to 3 percent slopes. Either soil may occupy fro 80 percent of any area. Corning part, capabilit IVe-3; Redding part, capability unit IVs-8.

Cortina Series

The Cortina series consists of nearly level, son excessively drained to excessively drained soils. soils formed in recent gravelly alluvium derive sedimentary and metamorphic rocks. The rocks many pebbles of chert and quartzite. Cortina so brown to yellowish brown throughout. The surfa is gravelly fine sandy loam, and the subsoil is ext gravelly sand. The soils range from medium acid surface layer to neutral in the subsoil and substra

Name	Depth	Permeability	Capacity	Reaction	Sal.	Sh/Sw Pot.	Un. steel	Concrete	K	T
Sheetiron: SnD, SnE, SnF-------	0 - 19	0.6 - 2.0	0.11 - 0.14	5.1 - 6.0	-	Low	Low	Moderate	0.28	1
	19									
SrE, SrF------------	0 - 19	0.6 - 2.0	0.11 - 0.14	5.1 - 6.0	-	Low	Low	Moderate	0.24	1
	19									
Stonyford: StE, StF------------	0 - 5	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.24	2
	5 - 21	0.2 - 0.6	0.13 - 0.15	6.1 - 6.5	-	Low	Low	Low	0.28	
	21									
Supan: SuD, SuE------------	0 - 15	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.37	3
	15 - 20	0.2 - 0.6	0.16 - 0.18	6.1 - 6.5	-	Moderate	Moderate	Low	0.28	
	20 - 37	<0.06	0.11 - 0.15	6.6 - 7.3	-	High	High	Low	0.28	
	35 - 46	0.2 - 0.6	0.16 - 0.18	6.6 - 7.3	-	Moderate	Moderate	Low	0.28	
	46									
Tehama: TaA, TaB------------	0 - 19	0.6 - 2.0	0.13 - 0.16	6.1 - 6.5	-	Low	Low	Low	0.43	5
	19 - 42	0.2 - 0.6	0.17 - 0.18	6.1 - 7.3	-	Moderate	Moderate	Low	0.37	
	42 - 60	0.6 - 2.0	0.14 - 0.16	6.6 - 7.3	-	Moderate	Low	Low	0.37	
Tb------------------	0 - 19	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.43	5
	19 - 42	0.2 - 0.6	0.16 - 0.18	6.1 - 7.3	-	Moderate	Moderate	Low	0.37	
	42 - 60	0.6 - 2.0	0.14 - 0.16	6.6 - 7.3	-	Moderate	Low	Low	0.37	
Tc------------------	0 - 19	0.6 - 2.0	0.14 - 0.17	6.1 - 6.5	-	Low	Low	Low	0.43	5
	19 - 42	0.2 - 0.6	0.17 - 0.18	6.1 - 7.3	-	Moderate	Moderate	Low	0.37	
	42 - 60	0.6 - 2.0	0.14 - 0.16	6.6 - 7.3	-	Moderate	Low	Low	0.37	
Terrace Escarpments: TeF										
Toomes: TfD, TfE------------	0 - 12	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.37	
	12									
TgD, TgE------------	0 - 12	0.6 - 2.0	0.09 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.37	
	12									
ThE------------------	0 - 12	0.6 - 2.0	0.08 - 0.12	6.1 - 6.5	-	Low	Low	Low	0.37	
	12									
TkB, TkD------------	0 - 12	0.2 - 0.6	0.10 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.43	
	12									
TmD, TmE: Toomes part:------	0 - 12	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.37	
	12									
Supan part:-------	0 - 15	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.37	
	15 - 20	0.2 - 0.6	0.16 - 0.18	6.1 - 6.5	-	Moderate	Moderate	Low	0.28	
	20 - 37	<0.06	0.11 - 0.15	6.6 - 7.3	-	High	High	Low	0.28	
	35 - 46	0.2 - 0.6	0.16 - 0.18	6.6 - 7.3	-	Moderate	Moderate	Low	0.28	
	46									
TnD, TnE: Toomes part:------	0 - 12	0.6 - 2.0	0.09 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.37	
	12									
Supan part:-------	0 - 15	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.37	
	15 - 20	0.2 - 0.6	0.16 - 0.18	6.1 - 6.5	-	Moderate	Moderate	Low	0.28	
	20 - 37	<0.06	0.11 - 0.15	6.6 - 7.3	-	High	High	Low	0.28	
	35 - 46	0.2 - 0.6	0.16 - 0.18	6.6 - 7.3	-	Moderate	Moderate	Low	0.28	
	46									

TABLE J.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

(Dashes indicate data were not available. The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not estimated).

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH	Mmhos/cm					
Aiken:										
AaD	0 - 17	0.6 - 2.0	0.12 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.37	5
	17 - 25	0.2 - 0.6	0.15 - 0.18	6.1 - 6.5	-	Moderate	Moderate	Low	0.32	
	25 - 62	<0.06	0.12 - 0.15	5.6 - 6.0	-	High	High	Moderate	0.28	
Altamont:										
AbD, AbE	0 - 24	<0.06	0.12 - 0.15	6.6 - 8.4	-	High	High	Low	0.28	2
	24 - 35	0.06 - 0.02	0.10 - 0.14	7.9 - 8.4	-	High	High	Low	0.28	
	35									
AcA, AcB, AcD, XAcE	0 - 18	<0.06	0.12 - 0.15	6.1 - 6.5	-	High	High	Low	0.28	5
	18 - 36	<0.06	0.12 - 0.15	7.4 - 8.4	-	High	High	Low	0.28	
	36 - 50	0.2 - 0.6	0.15 - 0.18	7.9 - 8.4	-	Moderate	Moderate	Low	0.32	
Anita:										
Ad, Af, Ag	0 - 20	<0.06	0.12 - 0.15	6.1 - 6.5	-	High	High	Low	0.28	1
	20									
An, Ao, Ap, AsB	0 - 15	<0.06	0.09 - 0.13	6.1 - 6.5	-	High	High	Low	0.28	1
	15									
At:										
Anita part:	0 - 20	<0.06	0.12 - 0.15	6.1 - 6.5	-	High	High	Low	0.28	1
	20									
Keefers part:	0 - 3	0.6 - 2.0	0.12 - 0.14	5.6 - 6.0	-	Low	Low	Moderate	0.37	2
	3 - 16	0.6 - 2.0	0.09 - 0.12	6.1 - 6.5	-	Low	Low	Low	0.32	
	16 - 24	0.2 - 0.6	0.11 - 0.14	6.1 - 6.5	-	Moderate	Moderate	Low	0.24	
	24 - 36	<0.06	0.04 - 0.10	6.1 - 7.3	-	High	High	Low	0.10	
	36									
Arbuckle:										
Au	0 - 14	2.0 - 6.0	0.07 - 0.10	6.1 - 6.5	-	Low	Low	Moderate	0.28	5
	14 - 25	0.6 - 2.0	0.09 - 0.13	6.1 - 6.5	-	Low	Low	Low	0.15	
	25 - 59	0.2 - 0.6	0.11 - 0.15	6.6 - 7.3	-	Moderate	Moderate	Low	0.10	
	59 - 72	0.6 - 2.0	0.06 - 0.10	6.6 - 7.3	-	Low	Low	Low	0.17	
Arbuckle:										
AvA, AvB	0 - 25	0.6 - 2.0	0.09 - 0.13	6.1 - 6.5	-	Low	Low	Low	0.15	5
	25 - 59	0.2 - 0.6	0.11 - 0.15	6.6 - 7.3	-	Moderate	Moderate	Low	0.10	
	59 - 72	0.6 - 2.0	0.06 - 0.10	6.6 - 7.3	-	Low	Low	Low	0.17	
Aw, Ay	0 - 25	0.6 - 2.0	0.09 - 0.13	6.1 - 6.5	-	Low	Low	Low	0.15	4
	25 - 40	0.2 - 0.6	0.11 - 0.15	6.6 - 7.3	-	Moderate	Moderate	Low	0.10	
	40 - 72	<0.06	0.12 - 0.15	6.6 - 7.3	-	High	High	Low	0.28	
Az:										
Arbuckle part:	0 - 25	0.6 - 2.0	0.09 - 0.13	6.1 - 6.5	-	Low	Low	Low	0.15	5
	25 - 59	0.2 - 0.6	0.11 - 0.15	6.6 - 7.3	-	Moderate	Moderate	Low	0.10	
	59 - 72	0.6 - 2.0	0.06 - 0.10	6.6 - 7.3	-	Low	Low	Low	0.17	
Tehama part:	0 - 19	0.6 - 2.0	0.13 - 0.16	6.1 - 6.5	-	Low	Low	Low	0.37	5
	19 - 42	0.2 - 0.6	0.17 - 0.18	6.1 - 7.3	-	Moderate	Moderate	Low	0.37	
	42 - 60	0.6 - 2.0	0.14 - 0.16	6.6 - 7.3	-	Moderate	Low	Low	0.37	

Name	Depth	Permeability	Capacity	Reaction	Sal.	Sh/Sw Pot.	Un. steel	Concrete	K
Jiggs part:-------	0 - 6	2.0 - 6.0	0.07 - 0.09	5.6 - 6.0	-	Low	Low	Moderate	0.32
	6 - 20	2.0 - 6.0	0.07 - 0.09	5.6 - 6.0	-	Low	Low	Moderate	0.32
	20								
Manton:									
MaD----------------	0 - 22	2.0 - 6.0	0.08 - 0.11	5.6 - 6.0	-	Low	Low	Moderate	0.28
	22 - 56	0.6 - 2.0	0.13 - 0.16	5.6 - 6.0	-	Low	Low	Moderate	0.37
	56								
Masterson:									
MbD----------------	0 - 19	0.6 - 2.0	0.11 - 0.14	5.1 - 6.5	-	Low	Low	Moderate	0.28
	19 - 37	0.6 - 2.0	0.08 - 0.12	5.1 - 5.5	-	Low	Low	Moderate	0.32
	37								
Maymen:									
MbgE:									
Maymen part:------	0 - 13	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.37
	13								
Lodo part:--------	0 - 7	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.28
	7								
Maywood:									
Mc-----------------	0 - 62	2.0 - 6.0	0.09 - 0.12	6.1 - 6.5	-	Low	Low	Moderate	0.17
Md-----------------	0 - 36	2.0 - 6.0	0.09 - 0.12	6.1 - 6.5	-	Low	Low	Moderate	0.17
	36	6.0 - 20.0	0.04 - 0.06	6.1 - 6.5	-	Low	Low	Moderate	0.10
Me-----------------	0 - 62	0.6 - 2.0	0.13 - 0.16	6.1 - 6.5	-	Low	Low	Low	0.37
Mf, Mg-------------	0 - 25	0.6 - 2.0	0.13 - 0.16	6.1 - 6.5	-	Low	Low	Low	0.37
	25 - 58	2.0 - 6.0	0.09 - 0.12	6.6 - 7.3	-	Low	Low	Low	0.17
Mh-----------------	0 - 14	0.6 - 2.0	0.14 - 0.17	6.1 - 6.5	-	Low	Low	Low	0.43
	14 - 62	0.6 - 2.0	0.13 - 0.16	6.1 - 6.5	-	Low	Low	Low	0.37
McCarthy:									
MkD, MkE, MkF-------	0 - 16	2.0 - 6.0	0.08 - 0.11	5.6 - 6.5	-	Low	Low	Moderate	0.20
	16 - 28	2.0 - 6.0	0.05 - 0.07	5.6 - 6.0	-	Low	Low	Moderate	0.20
	28								
MmE, MmF------------	0 - 16	2.0 - 6.0	0.07 - 0.09	5.6 - 6.5	-	Low	Low	Moderate	0.20
	16 - 28	2.0 - 6.0	0.05 - 0.07	5.6 - 6.0	-	Low	Low	Moderate	0.20
	28								
MnE:									
McCarthy part:----	0 - 16	2.0 - 6.0	0.07 - 0.09	5.6 - 6.5	-	Low	Low	Moderate	0.20
	16 - 28	2.0 - 6.0	0.05 - 0.07	5.6 - 6.0	-	Low	Low	Moderate	0.20
	28								
Iron Mountain part:	0 - 9	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.28
	9								
Millrace:									
Mo-----------------	0 - 6	2.0 - 6.0	0.08 - 0.10	6.6 - 7.3	-	Low	Low	Low	0.32
	6 - 22	2.0 - 6.0	0.05 - 0.08	6.6 - 7.3	-	Low	Low	Low	0.20
	22 - 60	6.0 - 20.0	0.03 - 0.06	6.6 - 7.3	-	Low	Low	Low	0.17
Mp-----------------	0 - 8	2.0 - 6.0	0.08 - 0.10	6.6 - 7.3	-	Low	Low	Low	0.32
	8 - 22	2.0 - 6.0	0.05 - 0.08	6.6 - 7.3	-	Low	Low	Low	0.20
	22 - 60	6.0 - 20.0	0.03 - 0.06	6.6 - 7.3	-	Low	Low	Low	0.17
Mr:									
Millrace part:----	0 - 8	2.0 - 6.0	0.08 - 0.10	6.6 - 7.3	-	Low	Low	Low	0.32
	8 - 22	2.0 - 6.0	0.05 - 0.08	6.6 - 7.3	-	Low	Low	Low	0.20
	22 - 60	6.0 - 20.0	0.03 - 0.06	6.6 - 7.3	-	Low	Low	Low	0.17
Channeled part:									

Name	Depth In	Permeability In/hr	Capacity	Reaction	Sal.	Sh/Sw Pot.	Un. steel	Concrete	K	T
CpB-----------------	0 - 26	6.0 - 20.0	0.08 - 0.10	6.1 - 7.3	-	Low	Low	Moderate	0.15	5
	26 - 72	2.0 - 6.0	0.10 - 0.12	6.6 - 7.8	-	Low	Low	Low	0.24	
CsA, CsB------------	0 - 26	0.6 - 2.0	0.14 - 0.17	6.1 - 7.3	-	Low	Low	Low	0.43	5
	26 - 72	2.0 - 6.0	0.10 - 0.12	6.6 - 7.8	-	Low	Low	Low	0.24	
Ct------------------	0 - 36	0.6 - 2.0	0.14 - 0.17	6.1 - 7.3	-	Low	Low	Low	0.43	5
	36 - 60	<20.0	0.03 - 0.06	6.6 - 7.8	-	Low	Low	Low	0.10	
Columbia:										
Cu------------------	0 - 72	0.6 - 6.0	0.10 - 0.17	6.1 - 7.8	-	Low	Low	Moderate	0.37	5
Cone:										
CvD, CvE------------	0 - 70	2.0 - 6.0	0.03 - 0.05	6.1 - 7.3	-	Low	Low	Moderate	0.37	5
Corning:										
CwA, CwB------------	0 - 21	0.6 - 2.0	0.11 - 0.14	5.1 - 6.5	-	Low	Low	Moderate	0.32	5
	21 - 29	<0.06	0.09 - 0.13	5.1 - 5.5	-	High	High	Moderate	0.28	
	29 - 36	0.2 - 0.6	0.13 - 0.15	5.1 - 5.5	-	Moderate	Moderate	Moderate	0.32	
	36 - 50	0.2 - 0.6	0.13 - 0.15	5.1 - 5.5	-	Moderate	Moderate	Moderate	0.24	
CxB2:										
Corning part:------	0 - 21	0.6 - 2.0	0.11 - 0.14	5.1 - 6.5	-	Low	Low	Moderate	0.32	5
	21 - 29	<0.06	0.09 - 0.13	5.1 - 5.5	-	High	High	Moderate	0.28	
	29 - 36	0.2 - 0.6	0.13 - 0.15	5.1 - 5.5	-	Moderate	Moderate	Moderate	0.32	
	36 - 50	0.2 - 0.6	0.13 - 0.15	5.1 - 5.5	-	Moderate	Moderate	Moderate	0.24	
Newville part:----	0 - 13	0.6 - 2.0	0.11 - 0.14	6.1 - 6.5	-	Low	Low	Low	0.7	5
	13 - 20	<0.06	0.08 - 0.11	6.1 - 6.5	-	High	High	Low	0.17	
	20 - 56	0.2 - 0.6	0.09 - 0.13	6.6 - 7.3	-	Moderate	Moderate	Low	0.17	
CyB:										
Corning part:------	0 - 21	0.6 - 2.0	0.11 - 0.14	5.1 - 6.5	-	Low	Low	Moderate	0.32	5
	21 - 29	<0.06	0.09 - 0.13	5.1 - 5.5	-	High	High	Moderate	0.28	
	29 - 36	0.2 - 0.6	0.13 - 0.15	5.1 - 5.5	-	Moderate	Moderate	Moderate	0.32	
	36 - 50	0.2 - 0.6	0.13 - 0.15	5.1 - 5.5	-	Moderate	Moderate	Moderate	0.24	
Redding part:------	0 - 13	0.6 - 2.0	0.11 - 0.14	5.1 - 6.0	-	Low	Low	Moderate	0.20	2
	13 - 23	<0.06	0.11 - 0.15	5.1 - 5.5	-	High	High	Moderate	0.24	
	23 - 35									
	35									
Cortina:										
Cz, CzM-------------	0 - 3	2.0 - 6.0	0.07 - 0.09	5.6 - 6.0	-	Low	Low	Moderate	0.17	5
	3 - 15	2.0 - 6.0	0.04 - 0.07	6.1 - 6.5	-	Low	Low	Moderate	0.17	
	15 - 72	<20.0	0.03 - 0.06	6.1 - 7.3	-	Low	Low	Moderate	0.10	
Czs-----------------	0 - 15	2.0 - 6.0	0.04 - 0.07	5.6 - 6.5	-	Low	Low	Moderate	0.17	5
	15 - 72	<20.0	0.03 - 0.06	6.1 - 7.3	-	Low	Low	Moderate	0.10	
Czx-----------------	0 - 15	2.0 - 6.0	0.04 - 0.09	5.6 - 6.5	-	Low	Low	Moderate	0.15	5
	15 - 72	<20.0	0.03 - 0.06	6.1 - 7.3	-	Low	Low	Moderate	0.10	
Dibble:										
DbD, DbE------------	0 - 6	0.2 - 0.6	0.17 - 0.19	5.6 - 6.0	-	Moderate	Moderate	Moderate	0.37	2
	6 - 34	0.2 - 0.6	0.16 - 0.18	5.6 - 6.0	-	Moderate	Moderate	Moderate	0.28	
	34									
DgD, DgE:										
Dibble part:-------	0 - 6	0.2 - 0.6	0.17 - 0.19	5.6 - 6.0	-	Moderate	Moderate	Moderate	0.37	2
	6 - 34	0.2 - 0.6	0.16 - 0.18	5.6 - 6.0	-	Moderate	Moderate	Moderate	0.28	
	34									
Gullied land part:										
DnD, DnE:										
Dibble part:-------	0 - 6	0.2 - 0.6	0.17 - 0.19	5.6 - 6.0	-	Moderate	Moderate	Moderate	0.37	2
	6 - 34	0.2 - 0.6	0.16 - 0.18	5.6 - 6.0	-	Moderate	Moderate	Moderate	0.28	
	34									

Cal Poly

ITRC

Data and Results

Information in this portion of the report was produced using the ITRC
Irrigation Evaluation program furnished by
Calif. Polytechnic State University
San Luis Obispo, California

DRIP/MICRO EVALUATION RESULTS

FIELD IDENTIFICATION

Name...
Field ID...
Address..

Phone..

JOB IDENTIFICATION

Evaluator..: S.Spinner, L.Miller
Date...: 8-29-03
File drive:\path\name..: E:\IE\053.MDU

GLOBAL SYSTEM DU(LQ)
("LQ Minimum" Infiltrated / Ave. Infiltrated).........: 0.91

DISTRIBUTION UNIFORMITY PROBLEMS - PERCENT OF TOTAL NON-UNIFORMITY DUE TO EACH PROBLEM

Pressure differences.........: 78
- Difference between hose inlet pressures = 4 psi
- Maximum pressure difference within a hose = 6 psi

Other causes of flow variation.........: 22
- Minor plugging problems
- Possible causes of plugging are:
  - Infrequent chemical injection for bacterial controls
  - Filters not removing sand, or pipe breaks have allowed sand to enter hoses

ESTIMATE OF EXCESS PRESSURE (psi).........: 0.0

ESTIMATE OF RUNOFF (percent of applied water).........: 0

OTHER PROBLEMS NOTED
- No flow meter

DRIP/MICRO EVALUATION RESULTS

ESTIMATE OF MAXIMUM DURATION OF IRRIGATION SETS

NOTES

This is based upon the input data of flow rates, soils, and evapotranspiration. Calculations of net application rate assume that any non-uniformity due to "spacing and timing" has been eliminated. However, they do include other non-uniformities and runoff losses.

BASIC DATA

AREA NUMBER:	#1	#2	#3
Available Water Holding Capacity (AWHC, inches)......:	6.70		
AWHC adjusted for percent wetted area (inches)......:	5.55		
Gross Application Rate (in/hr)......:	0.020		
Net Application Rate (in/hr)......:	0.018		

MANAGEMENT INFORMATION

AREA NUMBER:	#1	#2	#3
Gross hours of irrigation required at a point to fill up 50 % of the wetted soil reservoir (hours)......:	153.6		
Hours needed for plant to deplete 50 % of the wetted soil reservoir during the peak water use period. This assumes the emitters are not operating right then at that location (hours)......:	302.7		

DRIP/MICRO EVALUATION RESULTS

FLOW METER

Flow meters are indispensible management tools. Meters should indicate both flow rate (usually in GPM) and total water used (usually in acre-feet).

The GPM should be checked frequently to detect system problems. For example, a steady decline in flow rate may indicate pump wear or a drop in the water level of a well. A slight decline in flow rate can indicate emitter plugging.

The reading of acre-feet pumped allows a grower to know how much water has been applied weekly and annually.

SAND

Sand (centrifugal) separators are widely used to remove sand (not silt, clay, or algae) from irrigation water. They can be installed down in a well to protect both the well pump and drip system, or above ground to protect the drip system. In order to operate properly, they usually require a constant pressure differential of 5 to 10 psi. If they are sized too large (with a low pressure drop) there is not enough centrifugal action to remove the sand.

INJECTION TO PREVENT PLUGGING

Chlorine is typically used to inhibit bacterial plugging of drip systems. Recommended dosages vary from 0.5 to 10 ppm. Timing of injections usually range from continuous injection to once per week. The dosage and timing will depend upon the water quality. Chlorine activity is enhanced by reducing the water pH (ie, making the water more acid).

Plugging problems due to bacteria growth often do not show up the first year or two of drip system operation, and then may reach suddenly catastrophic proportions unless chemicals are injected on a routine basis.

During the last irrigation of the season, the lines should be thoroughly cleaned. Sometimes this is also necessary during the first irrigation.

Chemical precipitation (usually calcium deposits) can plug emitters. This only occurs with certain waters, and can be treated by injection with an acid. SO_2 gas, sulfuric acid, and some special fertilizer compounds are designed to prevent this problem. If sulfuric acid is used, extreme caution must be used to prevent human and equipment damage.

DRIP/MICRO EVALUATION DATA

FIELD IDENTIFICATION

Name...
Field ID.....................................
Address......................................

Phone..

JOB IDENTIFICATION

Evaluator...: S.Spinner, L.Miller
Date...: 8-29-03
File drive:\path\name...: E:\IE\053.MDU

DRIP/MICRO EVALUATION DATA

EMITTER

Manufacturer......................:	Toro
Model......................:	E-2
Units of nominal flow rate (1 - 2)......................: 1 = gph, 2 = lph	gph (1)
Nominal flow per emitter (gph or lph)......................:	1.00
Emitter path type (1 - 8)......................:	(4)

1 = Long, smooth path
2 = Pressure compensating
3 = Vortex
4 = Orifice
5 = Tortuous path
6 = Mult. flexible orifice
7 = Spinning micro-sprinkler
8 = Non-rotating micro-sprayer

EMITTER SPACING

If there is only one spacing, only fill out one column:

AREA NUMBER:	#1	#2	#3
Area with this combination (acres)......................:	55.0	N/A	N/A
Area per plant (sq ft)......................:	338.0	N/A	N/A
Number of emitters per plant......................:	4.00	N/A	N/A
Units of flow rate (1 - 2)......................: 1 = gph, 2 = lph	gph (1)	N/A	N/A
Average flow per emitter (gph or lph)......................:	1.05	N/A	N/A
Wetted area per emitter (sq ft)......................:	70.0	N/A	N/A
Root zone available water holding capacity (in)......................:	6.7	N/A	N/A
Set duration during peak ET (hrs)......................:	18.0	N/A	N/A
Irrigation frequency at peak ET (days)......................:	2.0	N/A	N/A
Crop ET during peak ET period (in/day)......................:	0.22	N/A	N/A

VALVING

Number of automatic pressure control valves near the filter and pump (0 for none)......................:	0
Is there a throttled manual valve at the pump?......................:	No
Are manifold pressures regulated individually?......................:	Yes
Are hose pressures regulated individually?......................:	No
Is there a flow meter?......................:	No

DRIP/MICRO EVALUATION DATA

PUMP STATION MEASUREMENTS

Pump discharge pressure (psi)	30.0
Pressure downstream of filters and control valves (psi)	25.0
Optional pressure values:	
Total filter loss (psi)	5.0
Total pump control valve loss (psi)	0.0
Loss from throttled manual valves (psi)	0.0

FILTRATION

Automatic flush on the primary filter?	Yes
Type of filter (select all that apply):	
Tubular screen?	Yes
Overflow screen?	No
Media filter?	No
Sand (centrifugal) separator?	No
Disc filter?	Yes
"Vacuum cleaned" tubular screen?	No

CHEMICAL INJECTION SYSTEM

Location of injector with respect to filter (1 - 3)	(3)

1 = No injection system, 2 = Downstream, 3 = Upstream

If no injection system, skip the next two (2) questions.	
Does the injection system use a throttling valve on the main line?	No
Is injection possible at a constant flow rate?	Yes
Frequency of chlorine, acid, etc. injection (1 - 4)	(2)
Frequency of hose lateral flushing (1 - 4)	(3)

1 = Never 2 = Annually 3 = Monthly
4 = Weekly or more

DRIP/MICRO EVALUATION DATA

UNEQUAL DRAINAGE

Time some emitters run after most emitters stop (min)	10.0
Percentage of emitters that do this (%)	5

CONTAMINANTS AND PLUGGING/LEAKS

Flushing time to get clear water from the lowest, most distant hose end (sec)	300

Use the following scale for the next questions:
1 = None, 2 = Slight, 3 = Medium, 4 = Major

Rate the amount of material caught in nylon sock when flushing hoses.	
Sand	Slight (2)
Clay	Medium (3)
Bacteria/algae	Medium (3)
Rate the following causes of emitter plugging. (For this question, remove five emitters at distant hose ends. Take them apart to inspect for clogging.)	
Sand	None (1)
Precipitate (bubbles with acid drop)	None (1)
Bacteria	None (1)
Insects	None (1)
Plastic parts	None (1)
Rate the visible signs of abnormal emitter flow, due to cracked hoses, barb leaks, etc	None (1)

SYSTEM DESCRIPTION

Age of the system (years)	12
Is there a water penetration problem?	No
Is there undulating topography?	No
Percentage of applied water which runs off the field (%)	0
Number of models or emitter designs used in the system	1
Type of water source (1 - 3)	(1)

1 = Well, 2 = Surface, 3 = Both

EMITTER FLOW MEASUREMENTS (all values are in milliliters)

Test # 1. Location - Middle of one of the closest hoses (hydraulically) to the pump.

Collection time (min)...: 2.00
Average emitter pressure (psi)...: 17.5

#1.........:	140	#5.........:	135	#9.........:	140	#13.........:	130
#2.........:	135	#6.........:	135	#10.........:	135	#14.........:	130
#3.........:	130	#7.........:	125	#11.........:	130	#15.........:	130
#4.........:	130	#8.........:	135	#12.........:	135	#16.........:	130

Test # 2. Location - Same emitters as Test #1, but adjust hose pressure so that the average emitter pressure is 25% lower or greater than for Test #1.

Collection time (min)...: 2.00
Average emitter pressure (psi)...: 13.2

#1.........:	120	#5.........:	115	#9.........:	120	#13.........:	115
#2.........:	115	#6.........:	115	#10.........:	115	#14.........:	115
#3.........:	115	#7.........:	110	#11.........:	110	#15.........:	110
#4.........:	115	#8.........:	115	#12.........:	120	#16.........:	115

Test # 3. Location - Middle of an average hose on an average submain.

Collection time (min)...: 2.00
Average emitter pressure (psi)...: 16.2

#1.........:	135	#5.........:	135	#9.........:	130	#13.........:	135
#2.........:	140	#6.........:	140	#10.........:	130	#14.........:	140
#3.........:	135	#7.........:	135	#11.........:	135	#15.........:	135
#4.........:	130	#8.........:	140	#12.........:	135	#16.........:	125

Test # 4. Location - From end of the hose most distant from the pump.

Collection time (min)...: 2.00
Average emitter pressure (psi)...: 15.0

#1.........:	125	#8.........:	130	#15.........:	135	#22.........:	130
#2.........:	130	#9.........:	135	#16.........:	135	#23.........:	130
#3.........:	130	#10.........:	135	#17.........:	120	#24.........:	130
#4.........:	120	#11.........:	120	#18.........:	135	#25.........:	130
#5.........:	130	#12.........:	130	#19.........:	130	#26.........:	135
#6.........:	130	#13.........:	135	#20.........:	135	#27.........:	140
#7.........:	130	#14.........:	135	#21.........:	125	#28.........:	135

DRIP/MICRO EVALUATION DATA

FIELD PRESSURE MEASUREMENTS - Water must be flowing through the hoses when the measurements are made.

Location # 1 - Submain or regulated manifold closest to the pump.

Closest hose to the inlet of the submain (or regulated manifold).	19.0
Hose inlet pressure (psi)	17.0
Downstream end pressure uphill (psi)	17.0
Middle pressure uphill (psi)	17.0
Downstream end pressure downhill (psi)	17.0
Middle pressure downhill (psi)	
Most distant hose from the inlet of the submain (or regulated manifold).	18.2
Hose inlet pressure (psi)	16.5
Downstream end pressure uphill (psi)	16.5
Middle pressure uphill (psi)	17.2
Downstream end pressure downhill (psi)	17.5
Middle pressure downhill (psi)	

Location # 2 - Submain or regulated manifold most distant from the pump, or where the pressure is the lowest.

Closest hose to the inlet of the submain (or regulated manifold).	17.0
Hose inlet pressure (psi)	11.0
Downstream end pressure uphill (psi)	13.2
Middle pressure uphill (psi)	15.5
Downstream end pressure downhill (psi)	15.5
Middle pressure downhill (psi)	
Most distant hose from the inlet of the submain (or regulated manifold).	15.5
Hose inlet pressure (psi)	14.2
Downstream end pressure uphill (psi)	14.5
Middle pressure uphill (psi)	15.5
Downstream end pressure downhill (psi)	15.5
Middle pressure downhill (psi)	

Location # 3 - Intermediate submain or regulated manifold.

Closest hose to the inlet of the submain (or regulated manifold).	18.5
Hose inlet pressure (psi)	17.0
Downstream end pressure uphill (psi)	17.5
Middle pressure uphill (psi)	18.0
Downstream end pressure downhill (psi)	18.2
Middle pressure downhill (psi)	
Most distant hose from the inlet of the submain (or regulated manifold).	18.2
Hose inlet pressure (psi)	16.5
Downstream end pressure uphill (psi)	16.5
Middle pressure uphill (psi)	17.2
Downstream end pressure downhill (psi)	17.5
Middle pressure downhill (psi)	

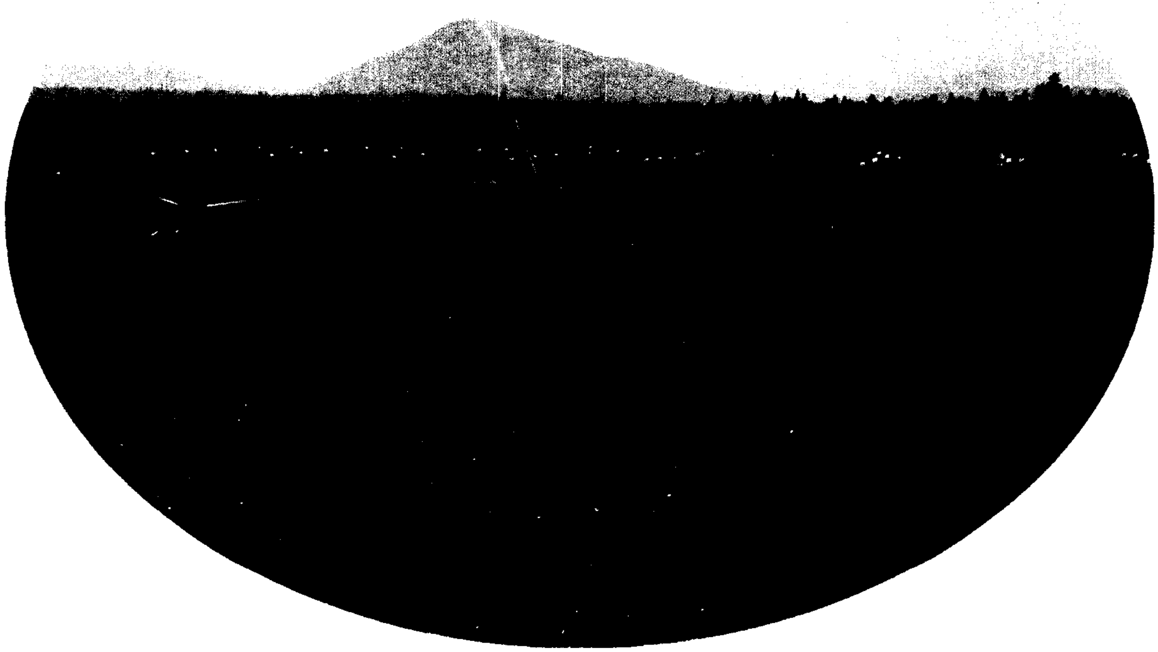
DRIP/MICRO EVALUATION DATA

FIELD PRESSURE MEASUREMENTS - The measurements at locations 4 - 6 are optional on small systems but are recommended on larger systems.

Location # 4 - Intermediate location near the pump.	
Closest hose to the inlet of the submain (or regulated manifold).	0.0
Hose inlet pressure (psi)	0.0
Downstream end pressure uphill (psi)	0.0
Middle pressure uphill (psi)	0.0
Downstream end pressure downhill (psi)	0.0
Middle pressure downhill (psi)	
Most distant hose from the inlet of the submain (or regulated manifold).	0.0
Hose inlet pressure (psi)	0.0
Downstream end pressure uphill (psi)	0.0
Middle pressure uphill (psi)	0.0
Downstream end pressure downhill (psi)	0.0
Middle pressure downhill (psi)	
Location # 5 - Intermediate location distant from the pump.	
Closest hose to the inlet of the submain (or regulated manifold).	0.0
Hose inlet pressure (psi)	0.0
Downstream end pressure uphill (psi)	0.0
Middle pressure uphill (psi)	0.0
Downstream end pressure downhill (psi)	0.0
Middle pressure downhill (psi)	
Most distant hose from the inlet of the submain (or regulated manifold).	0.0
Hose inlet pressure (psi)	0.0
Downstream end pressure uphill (psi)	0.0
Middle pressure uphill (psi)	0.0
Downstream end pressure downhill (psi)	0.0
Middle pressure downhill (psi)	
Location # 6 - Intermediate location.	
Closest hose to the inlet of the submain (or regulated manifold).	0.0
Hose inlet pressure (psi)	0.0
Downstream end pressure uphill (psi)	0.0
Middle pressure uphill (psi)	0.0
Downstream end pressure downhill (psi)	0.0
Middle pressure downhill (psi)	
Most distant hose from the inlet of the submain (or regulated manifold).	0.0
Hose inlet pressure (psi)	0.0
Downstream end pressure uphill (psi)	0.0
Middle pressure uphill (psi)	0.0
Downstream end pressure downhill (psi)	0.0
Middle pressure downhill (psi)	
Average pressure loss across hose entrance screens in the field (psi)	0.0

Attachment C

Tehama County Resource Conservation District
Irrigation Mobile Lab
Irrigation System Evaluation Summary
2003-2004



Prepared By:
Scott Spinner
September 29, 2004
Tehama County Resource Conservation District
2 Sutter St. Suite D
Red Bluff, CA 96080

Tehama County Resource Conservation District
Irrigation Mobile Lab
Irrigation System Evaluation Summary

By Scott Spinner

Background

The Tehama County Irrigation Mobile Lab (TCIML) was developed to utilize an agricultural evaluation team to help growers improve on-farm water use efficiency, reduce runoff of fertilizers and pesticides, reduce soil erosion, and reduce energy use. This pilot project represents a joint effort between the California Department of Water Resources (DWR), the United States Bureau of Reclamation (USBR), Corning Water District (CWD), the Natural Resources Conservation Service (NRCS), and the Tehama County Resource Conservation District (TCRCD). The data from these on farm evaluations will be used to dramatically improve reference resources for analyzing changes to the Sacramento Valley irrigation practices.

Goals

This project was developed to identify and promote efficient water management practices to improve water and energy use efficiency. This would be accomplished through irrigation system evaluations, and offering results and recommendations for improving the uniformity and efficiency of applied water as well as methods to increase energy efficiency. The successful water management measures and educational measures developed through the TCIML could then potentially be adopted by other mobile labs serving Glenn, Colusa, Butte and Shasta counties.

Methodology

The TCIML was developed to perform irrigation system evaluations to determine uniformity of water application for pressurized systems, provide technical assistance to the individual grower based on the results of their system's performance, and conduct follow-up system evaluations upon request in an attempt to quantify the benefit of alterations made based on the previous system evaluation.

Agricultural irrigation system evaluations were performed and analyzed using Cal Poly ITRC's irrigation evaluation protocol and software for determining global Distribution Uniformity (DU). DU is defined as a measure of the uniformity with which irrigation water is distributed to the different areas in a field. It is comprised of four DU components: $DU_{pressure}$, $DU_{unequal\ drainage}$, DU_{blocks}, and DU_{other}. $DU_{pressure}$ accounts for pressure variation between the emitters/sprayers. $DU_{unequal\ drainage}$ accounts for the percentage and duration of drippers/sprayers that drain after the system is shut off. DU_{block} addresses improper irrigation scheduling of different blocks. DU_{other} quantifies manufacturing variations, plugging, material wear, and worn nozzles. In cases where DU was unable to be calculated (very small system, etc.) flow DU was calculated. Flow DU is obtained by comparing flow rates from emitters throughout the system, and is the most important component of global DU. Landscape Water Audits were performed using the Irrigation Association's (IA) protocol and software. Before every evaluation, the grower was interviewed for 10-15 minutes to answer questions needed to run the Cal Poly program, and to voice any concerns about their crops or irrigation system.

Results

From March 2004 to September 2004 a total of 48 irrigation systems in six counties, totaling 2053 acres were examined by the TCIML (Table 1).

Table 1.Number and Acreage of Evaluations per County

County	# of evaluations	Acres
Tehama	35	1390
Glenn	3	164
Shasta	4	290
Lassen	2	120
Butte	3	69
Modoc	1	20
Total	48	2053

The majority (35) of the systems were located within Tehama County, with three in Glenn, four in Shasta, two in Lassen, three in Butte, and one in Modoc County. The majority (49%) of these systems were microsprinkler systems. Drip systems were the second most evaluated type (19%). Permanent undertree and wheel line systems each accounted for 10% of the systems evaluated. We also examined 1 landscape irrigation system (2%), as well as two hand move systems (4%) and three center pivot systems (6%) (Figure 1).

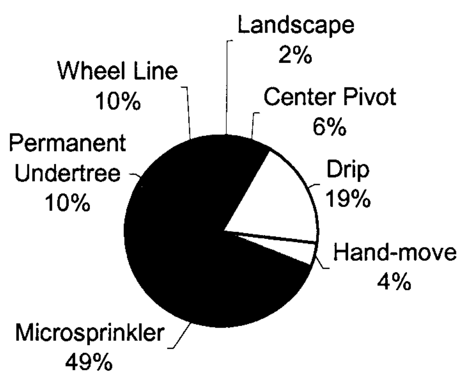


Figure 1. Percentage of Irrigation System Types Evaluated

The majority of acreage evaluated was planted with walnuts (20%), followed by almonds and prunes (19%), olives (17%), pasture (16%), peppermint (6%), and blueberries (1%) (Table 2).

Table 2. Acreage and Percentage of Crops Evaluated

	Walnuts	Olives	Almonds	Prunes	Peppermint	Blueberries	Pasture
Acres	404	358	385	385	120	8	325
Percent	20%	17%	19%	19%	6%	1%	16%

Microsprinklers were the water delivery method of choice for row crops except olives, which were under drip irrigation (Figure 2). The pasture systems examined were wheel line and center pivot systems.

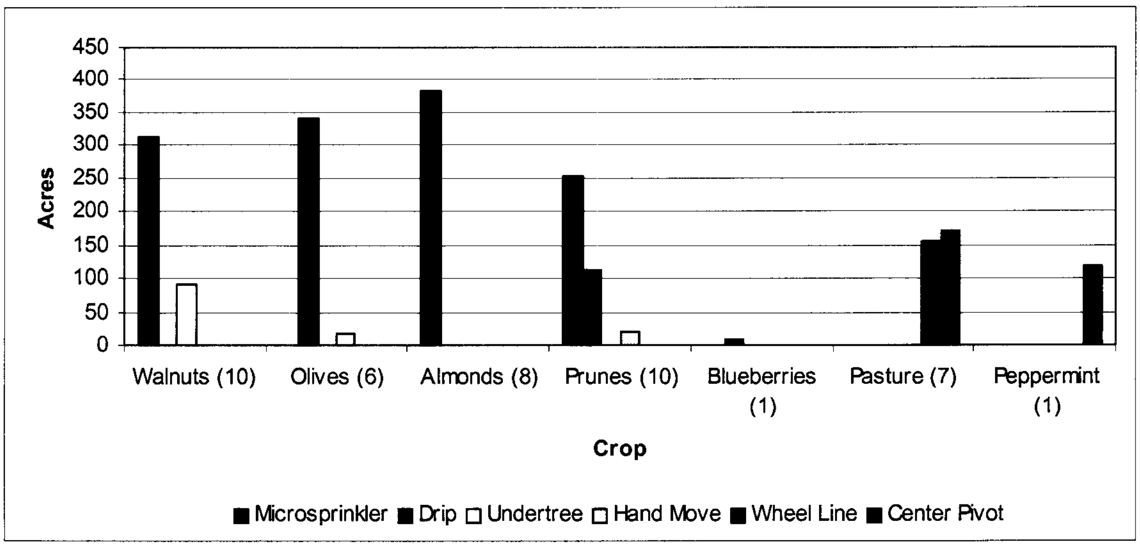


Figure 2. Acreage of Irrigation System Types Evaluated per Crop and Number of Evaluations Performed per Crop

The majority of systems (81%) were supplied by private wells, powered by electric or diesel pumps, followed by surface water from local districts and rivers (19%) (Figure 3).

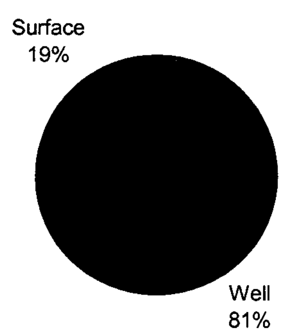


Figure 3. Water Sources of Evaluated Systems

DU was calculated for 43 of the 48 systems examined. Some of the reasons DU could not be calculated include: pumps overheating during the evaluation process, not enough submains in the field to run the Cal Poly program, and system filters plugging during the evaluation. However, Flow DU was calculated for all systems. Flow DU is obtained by comparing flow rates from emitters throughout the irrigation system (Table 3).

Table 3. Average DU and Flow DU for Different System Types Evaluated

System Type	Average DU	Average Flow DU
Microsprinkler	79%	81%
Drip	81%	78%
Center Pivot	84%	84%
Permanent Undertree	93%	94%
Wheel Line	61%	82%
Hand Move	61%	61%

Permanent undertree systems had the highest average DU (93%), followed by center pivots (84%), drip (81%), microsprinkler (79%) and finally wheel line and hand move systems (61%).

For each system evaluated, the Cal Poly program computes these values based on field measurements. Figure 4 shows the primary causes for system non-uniformities and the rate of occurrence.

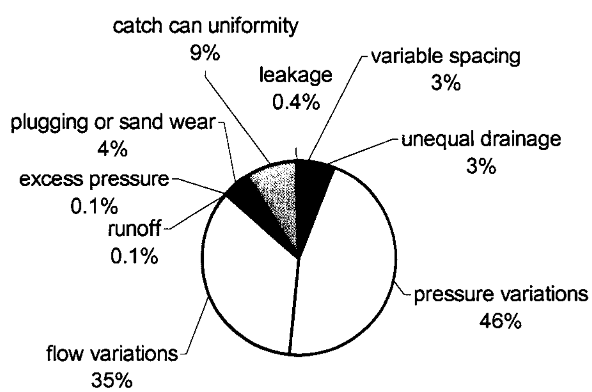


Figure 4. Causes for system non-uniformity

Pressure variations represented the largest cause for system non-uniformity (46%), with flow variations being the second largest cause (35%). Pressure regulator variations, friction, elevation changes, and clogged hose screens are causes of pressure variations. Flow variations are the result of variability in emitter component or design variability, clogging, different emitter types in the same field, or emitter wear and aging.

Future

Based on the last three seasons of evaluations, certain topics of concern need to be addressed. Time and effort should be spent explaining evapotranspiration (ET), what it means, and how to use it. It has become apparent after working with many growers that most have been introduced to ET, and have even sat through more than one seminar covering the topic. After talking with some growers, it also has become apparent that many still do not understand how to use ET (historic or real-time) to schedule irrigations. Working on base schedules using ET seems to be an appropriate way to introduce these growers to climate based irrigation scheduling.

Chemigation and fertigation are subjects that came up quite frequently during grower discussions. This again is a subject that most growers have been broadly introduced to, but many still do not have a firm grasp on how it applies specifically to their orchard. There is room here for the TCIML to help determine proper amounts of chemical, injection rates, and timing, to insure proper concentrations of these chemicals.

Soil and water testing is another service that the TCIML could potentially offer to grower. Some basic tests for nitrogen, pH, ect. could easily be performed and would be beneficial to the grower. High levels of nitrogen in the soil could be sufficient to reduce fertilizer application for a particular season for example.

Expanding the mobile lab service beyond pressurized systems and into gravity systems seems to be a logical move. The TCIML would then be equipped to provide assistance to any grower regardless of system. Also, many growers are undergoing system conversions (furrow to drip etc.) and it would be beneficial to quantify the system improvement by performing evaluations before and after the new system is installed.

Other services that have been discussed are offering some design assistance to growers who are retrofitting systems or adding on to existing systems. These would be small-scale improvements that the growers would typically perform themselves. Assistance would be in the form of calculating adequate pipe sizes and hose lengths for the system.

The grower response to the program so far has been excellent. The expansion into other counties this last season has introduced another group of growers to the benefits of the TCIML. Although only a handful of growers have made system improvements, the groundwork has been laid for good grower/TCIML relationships. The one on one approach to returning reports has been particularly well received. By meeting with the growers privately, answers to their system questions can be addressed and answered. Ideas and theories they have previously been exposed to can be explained in more detail. Many growers do not hesitate to call when they have a particular question, or an idea they are considering. Emphasis on scheduling will be addressed with growers who wish to have their systems re-evaluated. As this program grows, it will adapt to growers needs and provide reliable technical assistance.

Attachment D

U.S. Census Bureau

United States Department of Commerce

California Median household money income, 1999	$47,493
Tehama County Median household money income, 1999	$31,206
Glenn County Median household money income, 1999	$32,107
Shasta County Median household money income, 1999	$34,335
Butte County Median household money income, 1999	$31,924

Attachment E

TEHAMA COUNTY FARM BUREAU

January 10, 2005

Tehama County Resource Conservation District
2 Sutter St. Ste. D
Red Bluff, CA 96080
ATTN: Ernest White, President

Dear Mr. White,

The Tehama County Farm Bureau wishes to indorse the Tehama County Recourse Conservation District Mobile Irrigation Lab Grant application.

Over the past two years a number of our members have benefited from the service of the Irrigation Mobile Lab. The results have been more accurate irrigation applications, and a savings of water and energy.

As farmers, we cannot control the price we are paid for our commodities. We can, however, control the input to grow those commodities. Matching the water needs of the crops without over irrigating is easier if the system is working correctly. The Irrigation Mobile Lab assistance to farmers in our county can make it easier to grow crops without wasting resources.

The Irrigation Mobile Lab has shown to be a benefit to local irrigators who understand that if they are not accurately applying water to the crops the potential for regulation in the future is great. It is better to correct poor irrigation systems or practices now rather than being told to do it in the future.

Cordially,

Bruce Lindauer

Bruce Lindauer by [initials]
President

Bus: (530) 527-7882
Fax: (530) 527-6028

645 Antelope Blvd., Suite 15
Red Bluff, California 96080

Butte County Resource Conservation District
150 Chuck Yeager Way, Suite A
Oroville, CA 95965
(530) 534-0112, Ext 122
www.buttecounty.net/rcd/

The mission of the Butte County Resource Conservation District is to conserve the resources of Butte County for the benefit of its citizens, its environment, and its economy.
our motto is cooperation, not regulation

January 10, 2005

Ernie White
President
Tehama County Resource Conservation District
2 Sutter Street, Suite D
Red Bluff, CA 96080

Dear Ernie,

This letter is for support of the Tehama County RCD's Mobile Irrigation Lab program.

The Butte County RCD is in full support of the Tehama County RCD Mobile Irrigation Lab Program. In 2003, the Butte County RCD signed a Memorandum of Understanding with the Tehama County RCD for use of the Mobile Irrigation Lab within Butte County. This program was used by several growers in Butte County and an increasing number of growers were being educated as to the services provided by the Mobile Lab.

In November of 2004, the Butte County RCD hosted an Irrigation Efficiency Workshop highlighting the Tehama Mobile Irrigation Lab; approximately 50 growers attended the workshop.

Promotion of the Tehama County RCD Mobile Irrigation Lab is a specifically named task for the four Department of Conservation Watershed Coordinators funded in Butte County through the Butte County RCD. Big Chico Creek, Little Chico Creek, Butte Creek and the Cherokee watersheds each have a huge percentage of irrigated acreage. The watershed coordinators through their stakeholder groups are to recruit an increasing number of growers for irrigation evaluations each growing season.

The Butte County RCD considers the Tehama County RCD Mobile Irrigation Lab a true success not only in terms of a successful service to growers but also as a collaborative program among neighboring RCD's that promotes conservation work on a regional basis.

Sincerely,

Pia Sevelius
District Manager

COUNTY OF TEHAMA
DEPARTMENT OF PUBLIC WORKS
9380 San Benito Avenue
Gerber, CA 96035-9701
Bus: (530) 385-1462
Fax: (530) 385-1189

Road Commissioner
Surveyor
Engineer
Public Transit
Flood Control and
Water Conservation District
Sanitation District No. 1

January 10, 2005

F-05-100

Vickie Dawley, District Manager
Tehama County Resource Conservation District
2 Sutter Street, Suite D
Red Bluff CA 96080

Dear Ms. Dawley:

As Water Resources Manager for the Tehama County Flood Control and Water Conservation District, I would like to express our support for your Water Use Efficiency Grant Application to continue and expand the Northern Sacramento Valley Mobile Irrigation Lab.

The existing Mobile Irrigation Lab Project has a proven track record of success in promoting on-farm irrigation system evaluation and one-on-one grower workshop education, which has enhanced water use efficience, while contributing to the California Bay-Delta Program Goals and Objectives.

The benefits of the Mobile Irrigation Lab will also contribute towards implementation of the Tehama County Flood Control and Water Conservation Districts adopted AB3030 Groundwater Management Plan.

Sincerely,

Ernie Ohlin, Water Resources Manager
Tehama County Flood Control and
Water Conservation District

UNIVERSITY of CALIFORNIA
Agriculture & Natural Resources
COOPERATIVE EXTENSION • TEHAMA COUNTY
1754 Walnut Street, Red Bluff, CA 96080 Phone: (530)527-3101 Fax: (530)527-0917 http://cetehama.ucdavis.edu

December 7, 2005

Vicky Dawley, District Manager
Tehama County Resource Conservation District (TCRCD)
2 Sutter Street, Suite D
Red Bluff, CA 96080

Dear Vickie:

I am writing in support of the CALFED Water Use Efficiency grant application for the fiscal years 2006-08 that you are submitting on behalf of the Tehama County Resource Conservation District and on behalf of agricultural water users in Tehama County and neighboring counties.

This proposal outlines a locally managed Mobile Irrigation Lab (MIL) program that will provide much needed technical support to local water users and assist them with achieving efficient on-farm water management. In your proposal, you have outlined established methodologies that are feasible to complete and have a proven history of working. This project will help the agricultural community manage their limited and costly water and energy resources and sustain viable farm production and revenues. The project also aligns well with local and regional efforts to implement a comprehensive plan to manage California's limited water resources and to manage conflicts between competitive interests. The project is also consistent with the objectives of the Tehama County Flood Control and Water Conservation District and of local water districts.

I also believe that funding of this project can bolster the ability of TCRCD and the University of California Cooperative Extension to work jointly. There is a natural link between the mission of our two agencies. UCCE historically has provided locally developed and adaptive irrigation research on pertinent irrigation problems and issues. Continuation of the MIL provides a mechanism to enhance transfer of science-based knowledge to water users, a process that is most effectively done through one-on-one consultation and routine education.

I support your efforts to compete for these grant funds and I am willing to commit in-kind, professional resources to help make this project a success. Bolstering the presence of technical support and education for agricultural water users on critical farm level water management issues is in the best interests of rural counties in the northern Sacramento Valley. Progress with on-farm water management will be greatly advanced, if this project is funded.

Sincerely,

Allan Fulton

Allan Fulton
UC Irrigation and Water Resources Advisor
Tehama, Glenn, Shasta, and Colusa Counties

MAR 02 2004

February 28, 2004

NRCS
2 Sutter St., Suite D
Red Bluff, CA 96080

Attention: Scott Spinner

We wanted you to know what an excellent job you did when you came out and checked our irrigation system last summer. The report you completed for us was outstanding and so valuable in the continued operation of our irrigation. Your report was so complete as to even include all the flow rates and the average application rates for the system. The flow characteristic chart was very beneficial.

This report also included the soil information and an aerial view to scale. The explanation for the soil was also included, so we could plan on future irrigation systems when needed.

Scott and Lisa Miller also provided us with the Cal Poly ITCR Data and Results, which is very beneficial in deciding to correct and problems we encounter.

The completed report was so detailed and so thorough, it was outstanding and we were so pleased with their efforts. They spent a lot of time at the ranch to obtain the information necessary in order to prepare the report and it was great.

Thank you also Scott for recommending we get a pump test. We had purchased a used unit and did not know if the pump was working correctly.

We had Durham pump do the test, which came out working correct

Thank you Scott for the great report (even including colored picture) and the time and effort you and Lisa put into preparing the report.

Thank You

Loretta Taylor

Loretta Taylor

cc: Lisa Miller

Sale Family Orchards
425 Brearcliffe Drive
Red Bluff, CA 96080-4332
ryanrsale@sbcglobal.net

10 January 2005

Ernest White
President of the Board
Tehama County Resource Conservation District
2 Sutter Street, Suite D
Red Bluff, CA 96080

Ernest,

I am writing in support of the grant application for the Irrigation Mobile lab operated by your agency. Two years ago the staff come to my ranch and evaluated my drip irrigation system in the prunes. I thought I really new what was going on with my system and was surprised to find that there were several areas of concern. I took some immediate corrective action and during the off-season made some main line and sub-main corrections that improved the overall efficiency of water application on my ranch.

This past irrigation season I was able to irrigate less frequently and still keep the trees in good health. In a bad prune year I had a near record crop and I credit the system changes for a good part of that crop. I look foreword to working with your staff on water use monitoring and irrigation scheduling.

I have been farming since 1978 and thought I had a good grasp of the inputs needed to grow a quality crop. Sometimes an outside evaluation of farming inputs gives us a blinding flash of the obvious that we had ignored. According to other growers this service is really paying off for those of us who use pressurized low volume irrigation. As I change more fields to this method of irrigation I will certainly be using your services.

Thank You,

Ryan R. Sale

Attachment F

Yearly Irrigation Mobile Lab Budget

Tehama County Resource Conservation District

	Total Cost		Contingency	Total Cost + Contingency	*Matching Share		State Share
Project Manager Annual Salary ($22/hr x 2080 hrs)	45,760.00				7,000.00		
Irrigation Technician Salary ($17/hr x 2080 hrs)	35,360.00				6,000.00		
Summer Intern ($12/hr x 640 hrs)	7,680.00						
Total Salary		88,800.00	5%	93,240.00		13,000.00	80,240.00
Project Manager Fringe 35%	16,016.00				2,450.00		
Irrigation Technician Fringe 35.00%	12,376.00				2,100.00		
Summer Intern Fringe 20.00%	1,536.00						
Total Fringe		29,928.00	5%	31,424.40		4,550.00	26,874.40
Supplies office supplies, software pressure gauges, goof plugs		3,500.00	5%	3,675.00		1,000.00	2,675.00
Equipment laptop computer, printer moisture sensors, resistance blocks		7,100.00	5%	7,455.00			7,455.00
Travel conferences, hotels, per diem, mileage		3,500.00	5%	3,675.00			3,675.00
Other cell phone, vehicle maintenance, position advertisement		4,000.00	5%	4,200.00		3,000.00	1,200.00
Subtotal (Direct Expenses)		136,828.00		143,669.40		21,550.00	122,119.40
Indirect Expenses (15% of Direct Expenses)		20,524.20		21,550.41		3,232.50	18,317.91
ANNUAL TOTAL		157,352.20		165,219.81		24,782.50	140,437.31
THREE YEAR TOTAL		472,056.60		495,659.43		74,347.50	421,311.93

*Matching Contributions will come from Bureau of Reclamation and/or Natural Resources Conservation Service