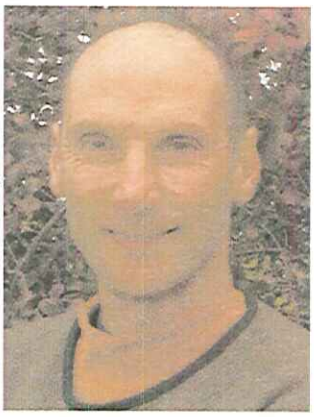
Colorado State University

Western PhytoWorks

Western Colorado Research Center

Spring 2014

MANAGERS MESSAGE



The yearly Experiment Station Technical Report is an excellent gauge of the ongoing function of the facilities and equipment that support the various research projects conducted by faculty at our research centers. Consistent with the factual nature of this technical report, there is no need to embellish the state of our facilities. Simply stated, in 2013 the buildings at both Orchard Mesa and Fruita minimally met the requirements necessary for conducting research. Issues with building function, age and maintenance have received low priority over the previous few years. Although, these deficiencies have not altered our focus on research, they have required ingenuity and perseverance by the research staff. Similarly, researchers and their associates have worked many hours to properly maintain and repair aging field equipment that is instrumental to their projects. This is especially true for the Fruita Station where research on crop production is closely tied to mechanization.

Researchers at both facilities will continue to get the most out of the existing buildings and equipment. That is the established culture here. However, in the fall of 2013 a renewed focus was embraced that will begin prioritizing building maintenance. A contract was signed to paint and repair minor damage at the Fruita office and one of the outbuildings. That work will be conducted in 2014 along with similar maintenance at the Orchard Mesa Station. Although exterior paint may not be directly connected to research, maintenance of the facilities will assure that the buildings will continue to meet those minimum standards into the foreseeable future. These small examples reflect our goal to provide facilities and equipment that are sufficient to conduct research. Ideally, the standard we wish to achieve will allow the researchers and their associates to focus solely on their projects without having to factor in any constraints posed by our facilities or equipment.

When reviewing the work presented in this issue of Western PhytoWorks consider the hard work, ingenuity and resilience that isn't written into the project reports. Behind those results is the concerted effort of all supporting staff who strive to maintain the facilities so that faculty at the Western Colorado Research Center can continue to support growers throughout western Colorado with quality research.

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Subsurface Drip Irrigation in Alfalfa in Western Colorado

Increasing competition for water resources and demands for irrigation practices that are environmentally friendly are motivating factors to use agricultural irrigation water more efficiently. Additionally, sustainable crop production systems require more efficient irrigation water applications. This dictates the use of improved management by irrigators to avoid overwatering to reduce deep percolation and salt and selenium loading and other contaminants into water supplies that affect downstream users.

Based on the data collected in 2013, there are a range of soil moistures that are acceptable to obtain high efficiency irrigations using SDI that result in the production of high alfalfa yields without causing soil moisture losses to evaporation or deep percolation.

In 2013, detailed yield data were obtained from four cuttings. There were no significant differences in alfalfa forage yields between irrigation treatments in the first, third, fourth, and total 2013 forage yields. The forage yield in the furrow irrigation treatment in the second cutting was 13% lower than the alfalfa yield in the 8-inch drip line depth and 10% lower in the 16-inch drop line depth.

Subsurface drip irrigation (SDI) is a low pressure, high efficiency irrigation system that uses buried drip lines (tube or tape) to meet crop water needs. SDI technology has been commercially available since the 1960s, but in recent times has gained in popularity primarily because of increasing scarcity of water resources and advancements in SDI technologies.

With SDI, water is applied below the soil surface at a depth to meet crop water needs while allowing for crop production using mechanization. Optimum management and performance of SDI systems can reduce soil crusting, use less water, eliminate surface water and evaporation, eliminate deep percolation, eliminate irrigation water runoff, and reduce weeds and diseases. Furthermore, high fertilizer application efficiencies are possible when fertilizers are applied through SDI systems.

Purchase and installation costs for SDI systems are higher than those for furrow irrigation. The cost of the SDI equipment and associated installation costs vary from $1,000 to $2,000 per acre depending on various factors specific to the farm and field situation. The life of an SDI system is expected to range from 12 to 15 years.

The objective of our study currently underway at the Western Colorado Research Center at Fruita is to compare irrigation performance, forage yields, and forage quality of SDI with traditional furrow irrigation. SDI drip lines were installed at 8-inch and 16-inch depths to compare the performance of these two drip lines. Drip lines at a 16-inch depth are preferred for agronomic applications in many cases over 8-inch deep drip lines to allow for tillage operations without damaging the buried drip lines.

Installing drip tape on May 11, 2012 at the CSU WCRC- Fruita.

The alfalfa plant stands in the SDI treatments and the furrow irrigation block in 2013 were thick, uniform, and vigorous. All alfalfa was free of weeds.

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In 2013, 18.6 inches of water were applied to both SDI treatments, and under furrow irrigation 71.0 inches of water was applied to the field with 39.8 inches of tailwater (runoff) and 31.2 inches of infiltration water. Thus, the furrow irrigation used 1.68 times more water than the SDI to produce the same amount of alfalfa hay. In other words, compared to furrow irrigation, 12.6 inches less water was required under SDI to produce the same amount of alfalfa hay. (Cont Pg 7)

CSU Extension Small Acreage Program Teams Up with Research Station for Grass Demonstration Project

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The spring season is an ideal time to get out in the fields and implement those land plans that you came up with while sipping your hot coffee on those cold winter mornings. As soon as the weather warms up in the valley, we inevitably start chomping at the bit to work the soil, treat our weeds, and get ready for the irrigation water that arrives before we can blink an eye!

This year the CSU Extension small acreage program teamed up with the agronomic experts at the research station to implement a demonstration seeding project that has been in the makings for the last few years. The objective of this recently seeded grass demonstration at the Delta County Fairgrounds in Hotchkiss, CO is to help landowners learn more about the grasses, both dryland and irrigated, that work well in the area. The idea is that planting a wide variety of species (17 dryland and 17 irrigated) will give us a visual representation of what these grasses will look like growing in our environment. This in turn will help us design seed mixes that will be most effective at meeting individual land management goals and maintaining the health of the land. It is especially important to consider what it will take to preserve your pastures in case of continued drought and reflect on what it took to operate and maintain these systems over the last year. If updates or alterations to your management approach are needed, this site can be used as a primer to help steer future decisions. We also will have information related to the challenges of seeding and potential establishment concerns related to individual species at the site.

This project was implemented with help from the resources housed at the Western Colorado Research Center in Fruita. Without the expertise offered by Dr. Calvin Pearson and Fred Judson and the specialized equipment they have available, this project would likely have not been able to get off the ground. Partnerships with our sister organizations and others in the local community are the strongest tool we can use to implement the high quality programming we strive to provide.

Whether you have domestic animals or need suggestions about attracting or deterring wildlife, the CSU Extension service has the tools to help you make effective decisions to meet your management needs. We offer publications, fact sheets, demonstration sites, and landowner site visits to ensure a deeper understanding of what is best for your property. Formulating a plan and using the best available local expertise can help you maintain healthy pastures, have fewer weeds, understand ways to reduce soil erosion, promote healthier water quality in rivers due

to less runoff and leaching, and manage livestock more effectively on your property. All this planning and observing will go a long way to promote the stewardship of our limited resources.

We are holding a Farm Tour at the Delta County Fairgrounds on May 17th. If you need help making a plan, or would like more information on attending and viewing the demonstration plot in Hotchkiss, visit our website, www.ext.colostate.edu/sam, or contact me-John Rizza-at 970-243-5068 x 128 or jrizza@colostate.edu for more information.

Range Research on the Western Slope Today: Learning from the Land

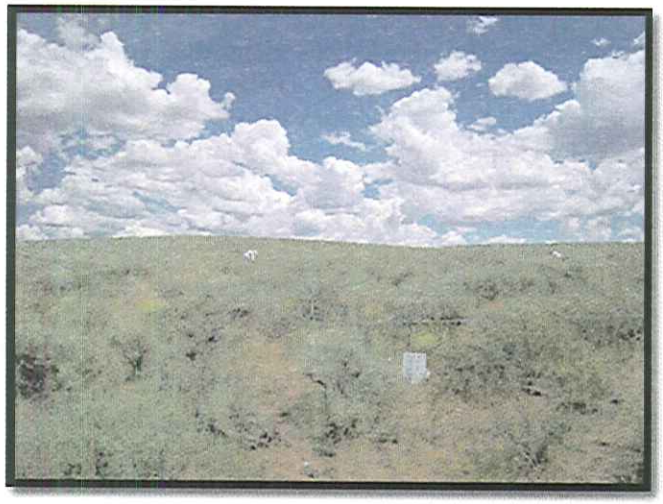
Ranchers, natural resource professionals and others in Western Colorado rangelands today must manage for change, including fire, drought, weeds, and changes in land-use. At the same time, we must also manage for the diverse benefits that rangelands provide, such as forage for livestock grazing, aesthetics in the form of open space, and wildlife habitat.

Given the many forces affecting rangelands, and the diversity of goods and services they provide, how do we generate the knowledge we need to manage rangelands sustainably for livestock, wildlife, and nature's other benefits into the future?

The Learning from the Land project is an outreach and demonstration project of Colorado State University's Warner College of Natural Resources that tackles this question through an innovative interdisciplinary approach to rangeland research. Funded by a Natural Resources Conservation Services Conservation Innovation Grant and the Colorado Agricultural Experiment Station, the project's goal is to promote the use of state-and-transition models (STMs) for adaptive management of sage-grouse habitat in northwestern Colorado. We do this in two main ways. First, we include wildlife use and habitat information in state-and -transition models, broadening the potential use of these tools. Second, we involve local ranchers, agency staff, and other interested stakeholders, as "co-researchers" and advisors in the process of creating STMs. By integrating diverse perspectives, this approach makes the models more robust and accessible to end-users.

What is a State-and-Transition Model?

State-and-transition models (STMs) are part of Ecological Site Descriptions, which describe the soils, plants and management influences on different types of rangeland, differentiated from each other by their soils, topography and climate. STMs represent our best available knowledge of how different types of land change over time in response to management (e.g. grazing), disturbances (e.g. fire), and weather (e.g. drought). The Natural Resources Conservation Service, Bureau of Land Management and Forest Service adopted Ecological Site Descriptions in 2010 as the basic framework for classifying, assessing and monitoring public and private rangelands throughout the U.S. In Colorado, work is still underway to develop Ecological Sites. Though perhaps new terminology, you are probably familiar with differences in vegetation communities that you observe on ridge tops, hillslopes and valley bottoms. These sometimes subtle differences in the slope of the



land, its exposure to sunlight, and the depth and texture of soil work together to influence the kind and amount of different plants that grow there. This mix of plants in turn affects the productivity of an ecological site for livestock grazing or its habitat structure for birds, deer and other wildlife.

Even though people may recognize different ecological sites, it is not always clear how management actions or disturbances will affect a site in the short and long term, especially in combination with other factors like a wet or dry growing season. For example, in our research in Moffat County, we are examining the question: how can land managers restore areas with dense, old growth sagebrush for livestock and wildlife? Additionally, recent wildfires in the area allow us to learn how areas seeded or not seeded following fire; recover over time. STMs help land managers understand where and when a vegetation treatment will likely have the most beneficial effect, how multiple kinds of disturbance and management actions may interact to affect the land, and help identify and evaluate potential hazards and opportunities in management.

(Cont from Page 5) Range Research…

Wildlife

Photo by Jennifer Timmer

Despite their potential for informing land management, most STMs do not currently include wildlife habitat. This limits their usefulness when managers have multiple goals, such as managing for sage-grouse habitat and livestock. Learning from the Land collects data on wildlife habit and use in order to help understand the trade-offs and opportunities for managing for multiple ecosystem values.

The Participatory Approach

The Learning from the Land project, led by a team of CSU professors, staff, students and Extension, involves ranchers and other stakeholders on the western slope in a participatory approach to research. Local stakeholders participate as "co-researchers" and advisors in the process of creating state-and-transition models, facilitated by the project team. Through participatory workshops, stakeholders have contributed observations of ecological change in a particular area, identified past disturbances and their effects, and recommended opportunities for locally-relevant research. The engagement of many diverse local and scientific perspectives makes models more robust, credible and relevant to end users.

Range scientists face the challenge of adapting our discipline to the complexity of today's rangelands, from soil dynamics to human values and choices, on a time-scale that allows us to manage proactively, rather than reactively. Learning from the Land pilots a collaborative and participatory approach to research that increases our ability as scientists, ranchers, and natural resource professionals to create the knowledge we need to manage western rangelands in a forward-looking and sustainable way.

More Information?

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Funded by:
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Crystal Tipton, MS in Range Ecology
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Christopher Dickey, MS in Range Ecology

Collaborators:
Participating ranchers in the project areas, CSU and University of Wyoming Extension, Natural Resource Conservation Service (NRCS), Bureau of Land Management (BLM), Colorado Parks and Wildlife (CPW), USDA- Agricultural Research Service and United States Forest Service.

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Colorado State University

Colorado State University Extension

Corn Miticide Trials

Banks grass and two spotted spider mites are a perennial problem in field corn grown in the Tri River Area for grain or silage. Mite outbreaks can cause loss of leaf tissue leading to reduced yield and grain quality. Spider mites thrive under hot and dry conditions which are the norm in the furrow irrigated lower altitude desert climates of western Colorado.

Spider mites are typically managed with a combination of biological control from natural enemies and/or timely applications of miticides. Minute pirate bugs, mite-destroyer lady beetles, green lacewings and predatory mites are among the natural enemies that often keep spider mites in check in corn fields. However, when conditions are right spider mite populations can increase faster than that of the natural enemies, and crop damage can occur.

Most modern miticides are beneficial insect friendly, selectively controlling harmful spider mites while conserving predators. The combination of knockdown of spider mite populations with a miticide and conservation of natural enemies keeps spider mite populations below economic damage levels during the mid to late season growth period when the grain crop is growing.

Deciding whether to apply a miticide to corn can be a difficult decision because fields must be treated early, before mite populations reach damaging levels. Miticides are typically applied by ground during late whorl growth stage, or by air in late whorl through pollen shed growth stage. Rescue treatments, applied after mite populations are out of control must be applied by air, are hard on beneficial insects and are often applied after irreversible damage to the corn has occurred.

Miticides using the active ingredient propargite have been used since the early 1980's, but they have been losing effectiveness over the past decade. Miticide performance trials sponsored by several manufacturers have been conducted by the Tri River Area Extension Entomology program, at WCRC-Fruita and with local grower cooperators over the past decade. This research has identified three chemically unrelated active ingredients that provide excellent control of our corn spider mite populations. They are hexythiazox, spiromesifen and etoxazole, and all are available in labeled products for our western Colorado corn growers to use to protect their crop if necessary.

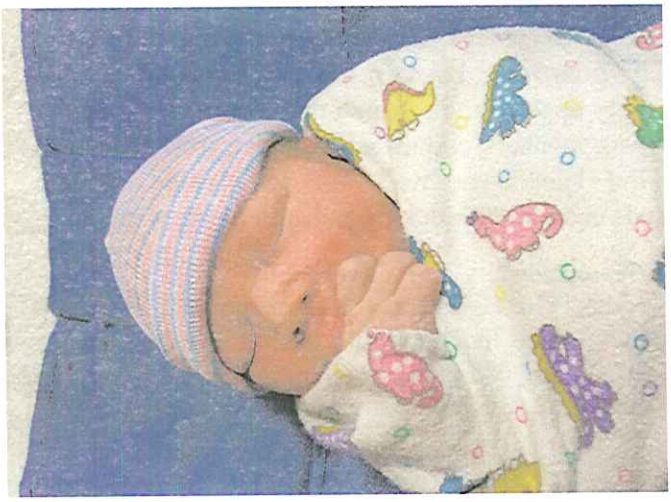
The university/industry/grower partnership is a win/win/win situation for all involved. The manufacturers get real world performance data on their products, researchers are well compensated for their efforts and locally tested materials are labeled and made available to growers because of these projects. Other 2014 pesticide screening trials are being conducted on spider mites in alfalfa, thrips in onions, and powdery mildew in cantaloupe.

For information on this article contact Bob Hammon at the Tri-River Area Extension, 2775 Highway 50, Grand Junction, 970-244-1834, or Bob.Hammon@mesacounty.us.

Banks grass mites live in colonies that can include thousands of individuals on underside of corn leaves. There is a secondary fauna of beneficial insects that feed on spider mites, often regulating the pest population.

Addition to Dr. Atucha's Family

Dr. Amaya Atucha and husband Guillaume welcomed a little boy into their family on Friday, May 9. Julian and Amaya are both doing well. Big brother Antonio is very excited. Dr. Atucha will be out of the office until August but will be available by email.



(Cont from Page 2) Subsurface Drip...

Two subsurface drip zones with flush values and drip lines exiting the main lines at the Colorado State University Western Colorado Research Center at Fruita.

Forage quality of alfalfa is important to producers and buyers. Forage quality of the alfalfa grown under the three irrigation treatments was excellent for all four cuttings in 2013. There were no significant differences among the three irrigation treatments for any of the forage quality factors evaluated.

Clearly, SDI uses irrigation water more efficiently than furrow irrigation and our data indicate SDI can significantly reduce the amount of water needed to produce high alfalfa yields and high quality hay. Subsurface drip irrigation has been used successfully to produce alfalfa at other locations around the country.

SDI offers advantages over furrow irrigation including increased efficiency, potentially fewer weeds, less disease, improved downstream water flow and quality, and more flexibility for field operations because the soil surface is not wetted. However, SDI has some disadvantages. It is an expensive irrigation system and maintenance costs may also be higher. Irrigation water must be clean and thus water with sediment must be filtered. Pumps may be needed to provide the pressure required to operate an SDI system, thus, operating costs may be higher than furrow irrigation. Germinating shallow-planted seeds with SDI can be problematic and an additional irrigation system may be needed to provide surface moisture for a germination irrigation .

This study will be continuing in 2014. In 2015 we plan to rotate the alfalfa crop to corn.

For more information about this article contact Dr. Calvin Pearson at calvin.pearson@colostate.edu.

SUMMER STAFF

Anne Kearney a CSU graduate student and Horticulture intern in the Viticulture and Enology concentration will be working at WCRC-Orchard Mesa this summer. Anne's Master's project in the Orchard Mesa vineyard is to study the effects of cover crop and sprinkler irrigation on the soil health and grape quality in the vineyard.

Ben Steele begins summer employment at WCRC-Fruita with Dr. Calvin Pearson on agronomic research projects. Ben's responsibilities will include an array of tasks including weighing and grinding biomass samples, corn stand counts, assisting with plot harvests, cleaning and weighing harvested grain samples, regular reading of the atmometer in the subsurface drip irrigation study, and data entry and management. Ben will also help with routine tasks at the research center; irrigating, weed control, washing and cleaning vehicles and farm equipment, and patrolling the perimeter of the research center for debris discarded along our fence lines.

Danielle Sterle has started working for the Western Colorado Research Center after a serendipitous chain of contacts. Jessica Davis is leading a research project on cyanobacteria with local Hotchkiss fruit growers that included Jessica's graduate student, David Sterle. David and wife, Danielle, needed housing for the summer, so we offered the Rogers Mesa Research Station residence, thus filling that gap in their transition to CSU for the fall semester in Fort Collins. After a short conversion with Danielle it was obvious that we lucked into the perfect relationship. Danielle will help with irrigation, weed control and many other projects.

David Straw is a Horticulture undergraduate student in our Viticulture and Enology concentration. He is doing a for-credit viticulture internship for Summer 2014. He is caring for and collecting data at our hybrid grape variety research plot. This plot is set up within a private vineyard in Ft. Collins, generously provided by our cooperator Abe Barghelame.

Susan Voris joined us in April as a part-time research associate to assist with the research programs conducted by Amaya Atucha. Susan was a graphic artist for 25 years working in the aerospace industry, local nurseries and as a consultant. She became a master gardener eight years ago and has a real aptitude for horticulture. Her summer and fall will be filled with the collection of data on various ongoing research projects, assisting other faculty and researcher associates as needed and helping to complete overdue maintenance around the Orchard Mesa facility.

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We're on the Web!
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Water Resource on the West Slope

DR. PERRY E. CABOT

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Although I have only been on my new job for a few months, the start of the water year has been so busy and exciting that it feels like I have been here quite a bit longer. The Western Slope is in a very exciting time related to water management in Colorado. There are major projects in various states of development that will affect all of Colorado, such as the Western Slope Water Bank and the various Basin Implementation Plans to support the overall Colorado Water Plan. Much of the work with which I have been involved in the past is tied to the Colorado Water Plan, which I would invite everyone to learn more about at the main website to inform the public (www.coloradowaterplan.com). As I continue to learn rapidly about major Western Slope issues, I am sure that the statewide planning process for water will be a component of my work.

Although I've spent many years of my career outside of Colorado, I have always considered this my home state in spirit. Adding to this, water has always played a central role in my career. I completed my PhD at the University of Wisconsin-Madison in 2005, as a joint major in Agricultural Engineering and Land Resources. I was fortunate to have a diverse committee of advisors who impressed upon me the value of open-minded perspectives on complex problems. For my PhD research, I threaded a shifting balance between controlled experimentation and on-farm research. I've always enjoyed working in the realm of farmers, producers and growers. No matter how many growing seasons I witness, I am still amazed at the endeavor of agriculture that feeds our population. The following quote holds a lot of weight for me:

"At least once in your life you'll need a doctor, a lawyer, a policeman and a preacher, but three times a day, everyday, you need a farmer or rancher."

Before I moved to Grand Junction, I spent six years in southern Colorado working primarily with water users throughout the Arkansas River and the Rio Grande Basins. The work I did there was fairly diverse, including studies of transition cropland into native vegetation for CREP, water quality studies of groundwater in areas where hydraulic fracturing was being researched, irrigation scheduling using mobile devices and cropland fallowing. Here on the Western Slope, many of these same issues will have relevance, but they tend to be impacted by the overwhelming dominance of water supplies that exist here, relative to the state.

I have already been fortunate in that farmers in the Gunnison Basin have invited me to design several research projects aimed at documenting irrigation efficiencies related to improved irrigation technology and scheduling. One of my central goals is to play a role in the adoption of telemetric technology that supports greater convenience and insight for agricultural water users. Additionally, my dominant appointment is through CSU Extension as the water specialist assigned to the Western Slope. In this capacity, and at this scale, a core component of my outreach platform will focus on irrigation technologies that can be helpfully integrated within the context of Colorado's Prior Appropriation System. Other activities I will pursue are to continue my involvement as Vice-Chair of Colorado Foundation for Water Education, where I maintain a consistent voice to focus on agriculture.

I consider myself a willing learner and always excited to expand my breadth of knowledge. As an adjunct faculty member with the Colorado Water Institute and Department of Civil Engineering at CSU, I have found that water really crosses the gamut of projects and goals, always giving me the opportunity to expand my understanding. As an Extension Specialist, I always invite the same opportunity to apply my engineering background to new issues and topics. I look forward to hearing from you, and I hope that readers will help me get quickly oriented to the adventurous world of Western Slope water.