

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE SPECIFICATION**  
**IRRIGATION WATER MANAGEMENT**  
**CODE 449**

**SCOPE**

This practice shall consist of improving the application efficiency of irrigation water to the field(s) as shown on the conservation plan(s) or drawing(s).

**IRRIGATOR SKILLS AND CAPABILITIES**

The irrigator or decision maker shall possess the knowledge and capability to achieve the management objectives of this practice. Proper irrigation scheduling in both timing and amount, control of runoff, and uniform application of water across the field are primary concerns.

**SYSTEM PERFORMANCE**

Irrigation systems must be capable of applying water in a uniform manner and provide the irrigator with adequate control over water application. The uniformity shall be that which is economically achievable for a given irrigation method and area.

**IMPLEMENTATION**

The implementation of this practice should be by incremental application of recommended changes in the management system. The cooperators may not acquire all of the needed skills from a few technical assistance visits. Management changes in the system generally require a long-term relationship during which new methods can be demonstrated.

Follow-up visits should be made to provide further assistance and to verify the implementation of management improvements. The goal is to have an acceptable irrigation management system in place and an irrigator that applies efficient water management skills on a routine basis. Progress shall be reported to the current agency progress reporting system as soon as practical after certification of the practice.

**RECORDKEEPING**

Record keeping by the producer is an integral component of moving the irrigator incrementally to a higher level of IWM. Refer to the scenarios below for specific recordkeeping requirements.

**BASIS OF ACCEPTANCE**

The practice shall be considered acceptable based on the following criteria:

**General Criteria applicable to all BASIC Irrigation Water Management (IWM) Scenarios:**

The intent of this scenario is to guide an irrigator to a higher level of irrigation expertise than they are currently operating at. This scenario is a low intensity or no technology based irrigation water management system. Soil moisture conditions are determined by the feel method on a regular and consistent basis; soil moisture readings are noted prior to irrigation and used to make irrigation decisions.

1. Due to agency computer upgrades/changes, the functionality of IWM Toolbox (CO449\_JS\_1) can no longer be guaranteed. Therefore, it is at the discretion of the planner to complete the IWM Toolbox (CO449\_JS\_1). If CO449\_JS\_1 is not used, another appropriate AWC/MAD worksheet such as the CO Available Water Holding Capacity (AWC) and Management Allowed Depletion (AWC) Worksheet, must be completed.

2. Complete FIRI\_v2014\_1\_Colorado\_FEB2015.xlsm for the present and planned conditions. Place a copy of the detailed report and summary report from FIRI into the case file.
3. Complete a [Colorado Nutrient Management 590 Job Sheet](#) if nutrients will be applied to the field
4. Recordkeeping Requirements for **BASIC** Irrigation Water Management Scenarios:
  - a. Soil moisture conditions determined by the feel method, are noted prior to irrigation and used to assist with irrigation decisions.
  - b. Dates of irrigation: start/stop dates.
  - c. Volume or flow rate of water applied.
  - d. Duration of irrigations.
  - e. If practical, flow rates should be determined as close to the individual field as possible.
  - f. Note growth stages of the crop throughout the irrigation season.
  - g. Record rainfall events.
5. Utilize the framework and guidance of the CSU Irrigation Guidebook or similar template for record keeping and documentation requirements. Provide the CSU Irrigation Guidebook to the producer as needed or applicable. This guidebook is available at EFOTG/Section IV/Standards and Specifications/Irrigation Water Management (449).
6. Perform onsite inspection, discuss and review irrigation records/results with producer and determine if principles of the practice have been adhered to.
7. Review recordkeeping documents and place copies in the case file.

**General Criteria applicable to all INTERMEDIATE Irrigation Water Management Scenarios:**

The intent of this scenario is to guide an irrigator to a higher level of irrigation expertise than they are currently operating at. The irrigator is presently not doing IWM or is at the Basic IWM level. The intent of this scenario is to improve their irrigation water management by utilizing soil moisture monitoring equipment. Soil moisture is determined by in field moisture sensors (gypsum blocks, tensiometers, etc.) with manual downloads or by readings conducted in the field. The information attained is used to make irrigation decisions. Records are manually input into an irrigation scheduling computer program.

1. Due to agency computer upgrades/changes, the functionality of IWM Toolbox (CO449\_JS\_1) can no longer be guaranteed. Therefore, it is at the discretion of the planner to complete the IWM Toolbox (CO449\_JS\_1). If CO449\_JS\_1 is not used, another appropriate AWC/MAD worksheet such as the CO Available Water Holding Capacity (AWC) and Management Allowed Depletion (AWC) Worksheet, must be completed.
2. Complete FIRI\_v2014\_1\_Colorado\_FEB2015.xlsm for the present and planned conditions. Place a copy of the detailed report and summary report from FIRI into the case file.
3. Complete a [Colorado Nutrient Management 590 Job Sheet](#) if nutrients will be applied to the field.
4. Recordkeeping Requirements for **INTERMEDIATE** Irrigation Water Management Scenarios:
  - a. Soil moisture conditions determined by in field moisture sensors. The information provided by the sensors will be noted and used to guide irrigation decisions.

- b. Dates of irrigation: start/stop dates.
  - c. Volume or flow rate of water applied.
  - d. Duration of irrigations.
  - e. If practical, flow rates should be determined as close to the individual field as possible, with a measuring device.
  - f. Note growth stages of the crop throughout the irrigation season.
  - g. Record rainfall events.
5. Utilize a computer software program that tracks crop water requirements, irrigation inputs, crop growth stages, and management allowed depletion (MAD), and available water holding capacity over the course of the growing season. Utilize the framework and guidance of the CSU eRAMS-Water Irrigation Scheduler for Efficiency (WISE) program or similar program for record keeping and documentation requirements. Guidance for eRAMS-WISE use is contained in (CO449\_eRAMS\_WISE\_Guidance) which can be found in EFOTG/Section IV/Standards and Specifications/Irrigation Water Management/449. The use of the CSU-eRAMS-WISE program, eliminates the need to complete the IWM Toolbox (CO449\_JS\_1). **IF** the planner utilizes (CO449\_JS\_1) and does **NOT** use eRAMS-WISE, then complete the graphing portion in (CO449\_JS\_1).
  6. Perform onsite inspection, discuss and review irrigation records/results with producer and determine if principles of the practice have been adhered to.
  7. Review recordkeeping documents and place copies in the case file.

**General Criteria applicable to all ADVANCED Irrigation Water Management Scenarios:**

The intent of this scenario is to guide an irrigator to a higher level of irrigation expertise than they are currently operating at. The intent is to improve their irrigation water management by utilizing a higher intensity/high technology irrigation water management system with advanced methods of determining irrigation water applied, estimating crop evapotranspiration, and monitoring field soil moisture, and/or monitoring crop temperature stress. Typical methods include flow measurement, daily record keeping, and use of real-time evapotranspiration estimates (such as those provided by dedicated weather stations) and soil moisture sensors with automated data logging to monitor field soil moisture content and/or crop temperature. For this scenario, soil moisture is determined by automated soil moisture monitoring stations equipped with telemetry data. Telemetry data is automatically sent to a computer with irrigation software. The irrigator may also receive real time data via mobile phone applications.

1. Due to agency computer upgrades/changes, the functionality of IWM Toolbox (CO449\_JS\_1) can no longer be guaranteed. Therefore, it is at the discretion of the planner to complete the IWM Toolbox (CO449\_JS\_1). If CO449\_JS\_1 is not used, another appropriate AWC/MAD worksheet may be used.
2. Complete FIRI\_v2014\_1\_Colorado\_FEB2015.xlsm for the present and planned conditions. Place a copy of the detailed report and summary report from FIRI into the case file.
3. Complete a [Colorado Nutrient Management 590 Job Sheet](#) if nutrients will be applied to the field
4. Recordkeeping requirements for ADVANCED Irrigation Water Management Scenarios:

- a. Irrigation decisions are made by utilizing a combination of available information, provided by various tools and sources, including soil moisture, ET, crop temperature stress, crop and soil appearance. The information provided will be used to guide irrigation decisions.
  - b. Dates of Irrigation: start/stop dates.
  - c. Volume or flow rate of water applied.
  - d. Duration of irrigations.
  - e. If practical, flow rates should be determined as close to the individual field as possible, with a measuring device.
  - f. Note growth stages of the crop throughout the irrigation season.
  - g. Record rainfall events.
  - h. Utilize a computer software program that tracks crop water requirements, irrigation inputs, crop growth stages, and management allowed depletion (MAD), and available water holding capacity over the course of the growing season. Utilize the framework and guidance of the CSU eRAMS-Water Irrigation Scheduler for Efficiency (WISE) program or similar program for record keeping and documentation requirements. Guidance for eRAMS-WISE use is contained in (CO449\_ eRAMS\_WISE\_Guidance) which can be found in EFOTG/Section IV/Standards and Specifications/Irrigation Water Management (449). The use of the CSU-eRAMS-WISE program, eliminates the need to complete the IWM Toolbox (CO449\_JS\_1). **IF** the planner utilizes (CO449\_JS\_1) and does **NOT** use eRams-WISE, then complete the graphing portion in (CO449\_JS\_1).
5. Perform onsite inspection, discuss and review irrigation records/results with producer and determine if principles of the practice have been adhered to.
  6. Review recordkeeping documents and place copies in the case file.

#### **Additional Criteria for Mountain Meadow Irrigation Systems**

1. Mountain meadow systems are defined as uncontrolled flood irrigation systems having a water bearing gravel or cobble substratum that is hydrologically connected to a stream channel.
2. IWM is not required and shall not be applied to any mountain meadow irrigation system.
3. Irrigation system improvements, with the exception of a Structure for Water Control (Code 587), that result in a controlled flood, sprinkler, or micro-irrigation system being applied on a mountain meadow field, removes the IWM exemption for the mountain meadow irrigation system.

#### **Additional Criteria for the Ogallala Aquifer Initiative (OAI) Limited Root Zone Pilot and Drought Resilience Improvement Project (DRIP)**

1. Advanced Irrigation Water Management shall be applied including the use of continuous in-situ soil moisture monitoring.
2. The managed depth in the soil profile shall not exceed eighteen (18) inches in depth.
3. All tillage operations shall comply with the Residue and Tillage Management, No-Till (Code 329) Standard.

4. Irrigation Systems shall comply with the Irrigation System, Micro irrigation (Code 441) or Sprinkler System (Code 442) standards. Irrigation systems shall be designed to operate or be capable of being upgraded to operate under full automation, including water delivery, using data from installed soil moisture monitors.

#### **OPERATION AND MAINTENANCE**

The operation and maintenance (O&M) aspects applicable to this standard consist of evaluating available field soil moisture, changes in crop evapotranspiration rates and changes in soil intake rates and adjusting the volume, application rate, or frequency of water application to achieve the intended purpose(s). Other necessary O&M items are addressed in the physical component standards considered companions to this standard.

The owner/user should participate in the development of the items listed in the Operation and Maintenance plan prepared and provided for guidance in managing the operations for this practice.