

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

IRRIGATION RESERVOIR

(Ac-Ft)
Code 436



DEFINITION

An irrigation water storage structure made by constructing a dam, embankment, pit or tank.

PURPOSE

This practice may be applied as part of a resource conservation system to achieve one or more of the following:

- Store water to provide a reliable irrigation water supply or regulate available irrigation flows.
- Improve water use efficiency on irrigated land.
- Provide storage for tailwater recovery and reuse.
- Provide irrigation runoff retention time to increase breakdown of chemical contaminants.
- Reduce energy use.
- Develop renewable energy systems (i.e., hydropower).

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to irrigation water storage structures that meet one or more of the following conditions:

1. The existing available water supply is insufficient to meet irrigation requirements during part or all of the irrigation season.
2. Water is available for storage from surface runoff, streamflow, or a subsurface source.
3. A suitable site is available for the construction of a storage reservoir.

This standard applies to the planning and functional design of storage capacity, and inflow/outflow capacity requirements for irrigation storage reservoirs. Storage reservoirs shall be planned and located to serve as an integral part of an irrigation system.

This practice applies to reservoirs created by embankment structures or excavated pits to store diverted surface water, ground water, or irrigation tailwater for later use, or reuse.

This practice also applies to reservoirs created by embankment structures or excavated pits and tanks constructed of concrete, steel, or other suitable materials used collect and regulate available irrigation water supplies to accomplish the intended purpose.

CRITERIA

Impact to cultural resources, wetlands and Federal and state protected species shall be evaluated and avoided or minimized to the extent practicable during planning, design and implementation of this conservation practice in accordance with established National and Florida policy, General Manual (GM) Title 420-Part 401; Title 450-Part 401, Title 190-Parts 410.22 and 410.26, National Planning Procedures Handbook (NPPH) Florida

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Supplements to Parts 600.1 and 600.6, National Cultural Resources Procedures Handbook (NCRPH), National Food Security Act Manual (NFSAM), and the National Environmental Compliance Handbook (NECH).

Plan the installation and operation of an irrigation reservoir to comply with all federal, state and local laws, rules and regulations.

The criteria for the design of components not addressed in NRCS conservation practice standards shall be consistent with sound engineering principles.

Irrigation. Determine the amount of water required to meet variations in water demand within the growing season to calculate storage requirements.

Storage capacity. Design capacity computations shall be based on planned inflow volumes and rates over the storage period, and outflow volumes and rates over the storage period, and outflow volumes and rates required to meet planned irrigation system needs.

Structure storage capacity must provide sufficient volume to meet variations in water demand within the irrigation period.

Compute all demand hydrographs from the consumptive use-time relationship using anticipated irrigation efficiency, conveyance losses, and other uses such as leaching or frost control, seepage, and evaporation.

Design irrigation storage reservoirs to satisfy irrigation requirements in the design area, unless limited by reservoir site characteristics, available watershed yield, or limitations imposed by water rights.

Water releases shall be those increments of the water demand hydrograph that exceed the available direct flows from other sources.

If storage capacity is limited, evaluate benefits on the basis of the more frequent availability of water to satisfy irrigation demands for the design area.

Irrigation storage reservoirs planned primarily to regulate irrigation flows shall have adequate capacity to provide design irrigation application flow rates.

Structure capacity shall provide adequate storage for inflow while maintaining sufficient water levels to insure proper operation of outlet

works and provide uniform outflow rate during planned irrigation events.

Provide additional capacity as needed for sediment storage.

Type of structures. Base the type of dam, embankment, pit or tank and appurtenant structures on site-specific hydrologic studies, engineering, geologic investigations, and construction materials.

Foundation, embankment, and spillway. Design earthen dams, embankments, pits and appurtenant structures to meet the appropriate criteria in Florida NRCS conservation practice standard for Dam, Code 402, Pond, Code 378 or in Technical Release No. 60 Earth Dams and Reservoirs.

Overflow protection. Overflow protection shall be provided if overflow of the irrigation storage reservoir is possible.

Inlet and Outlet works. Design drop spillways, chute spillways, and box spillways according to the principles of the Engineering Field Handbook and the National Engineering Handbook (NEH), Section 5 - Hydraulics; Section 11 - Drop Spillways; or Section 14 - Chute Spillways, as appropriate.

Provide inlet works when needed to prevent erosion or control flows into the irrigation storage reservoir. Inlet works may consist of a direct pumping system, conduit, grassed channel, lined channel, chute, head gates, valves, or other appurtenances necessary to safely convey and control water entering the structure.

Outlet works shall be provided for controlled withdrawal, transfer, or release of irrigation water. Outlet works may consist of a direct pumping system, or a conduit from the storage reservoir to an area of use. The capacity of the outlet works shall be adequate to provide the outflow rate needed to meet irrigation system demands.

Design and install specialized inlet or outlet works when needed to avoid entraining or impinging aquatic organisms.

The capacity of the outlet works shall be sufficient to meet peak period irrigation system demands.

Tailwater storage requirements shall, as a minimum, include a volume adequate to store all tailwater runoff from a single irrigation set.

ADDITIONAL CRITERIA APPLICABLE TO IRRIGATION RUNOFF RETENTION TIME TO INCREASE BREAKDOWN OF CHEMICAL CONTAMINANTS

Capacity. Where additional storage or flow regulation are required to provide adequate retention time for breakdown of chemicals in runoff waters, storage facilities shall be sized accordingly. Allowable retention times shall be site specific to the particular chemical of concern.

ADDITIONAL CRITERIA APPLICABLE TO REDUCE ENERGY USE

Provide analysis to demonstrate reduction of energy use from practice implementation.

Reduction of energy use is calculated as average annual or seasonal energy reduction compared to previous operating conditions.

ADDITIONAL CRITERIA APPLICABLE TO DEVELOP RENEWABLE ENERGY SYSTEMS

Renewable energy systems shall meet applicable design criteria in NRCS and/or industry standards, and shall be in accordance with manufacturer's recommendations. Hydropower systems shall be designed, operated, and maintained in accordance with the Microhydropower Handbook, Sections 4 and 5, as appropriate.

CONSIDERATIONS

When planning this practice, the following items should be considered where applicable:

- Potential energy savings resulting from regulation of irrigation flows, tailwater reuse, improved pumping plant efficiency, or management changes.
- Planting of critical areas at the completion of construction to protect the structure and borrow areas, and prevent erosion.
- Effects of physical properties as well as potential soil limitations, relating to embankment construction, compaction, stability, bearing strength, pool area seepage, and soil corrosivity. Refer to soil survey data as a preliminary planning tool for assessment of pool and borrow areas and conduct on-site investigations during the final planning stage.

- Perimeter fences to prevent human and animal access, and emergency escape facilities to minimize human safety hazards.
- Construction-related effects on air quality and on water quality of downstream water courses.
- Potential for earth moving construction to uncover or redistribute toxic materials or on-site invasive species.
- Development of water budgets, to quantify sources of inflow (precipitation and withdrawals), and outflow (evapotranspiration and losses).
- Impacts on downstream flows or aquifers that would affect other water uses or users.
- Impacts on the quantity of downstream flows, which could have undesirable environmental, social, or economic effects.
- Impacts of erosion, sediment, soluble contaminants, seeds or vegetative materials of invasive species, and contaminants attached to sediment in runoff.
- The movement of dissolved substances to ground water.
- Effects of water temperature changes on aquatic and wildlife communities.
- Timing of vegetation-disturbing maintenance activities, to avoid grassland bird nesting seasons.
- Impacts on wetlands or water-related wildlife habitats.
- Impacts on the visual quality of water resources and the landscape.
- Impacts on cultural resources.
- Performing periodic water quality analysis to evaluate salinity, nutrients, pesticides, and pathogens.
- Opportunities to include variety in vegetation for embankment stabilization or revegetation maintenance, that would provide pollinator forage from early spring to late fall.

PLANS AND SPECIFICATIONS

Keep plans and specifications for constructing irrigation storage reservoirs with this standard and include a description of the requirements for

applying the practice to achieve its intended purposes.

Plans and specifications for constructing earthen irrigation reservoirs shall be based on criteria found in Florida NRCS conservation practice standards, Pond, Code 378, or Dam, Code 402.

Plans and specifications for tanks constructed of non earthen materials shall be based on construction materials specifications for Florida NRCS conservation practice standard, Watering Facility, Code 614.

As a minimum, the plans and specifications shall include:

- Plan view showing site location and location of all structures.
- Typical cross-section(s) of the reservoir, embankments, excavations, etc.
- Details of all structures and components
- Construction specifications for excavation, earthfill, structures, etc.
- Vegetative treatment requirements.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance (O&M) plan for use by the landowner or operator responsible for each irrigation reservoir installed. Provide specific instructions in the O&M plan for operating and maintaining facilities to ensure they function properly. The O&M plan shall document needed actions to ensure that practices perform adequately throughout their expected life.

O&M requirements shall be included as an identifiable part of the design. Depending on the scope of the project, this may be accomplished by brief statements in the plans and specifications, the conservation plan narrative, or as a separate O&M plan.

The O&M plan shall include, but not limited to, the following provisions:

- Periodic cleaning and regrading of water storage facilities to maintain functionality.

- Periodic inspection, removal of debris and repair if needed of trash racks and inlet and outlet structures to assure proper operation.
- Periodic removal of sediment from traps or storage facilities to maintain design capacity and efficiency.
- Routine maintenance of mechanical components in accordance with manufacturer recommendations.
- Periodic inspection of all slopes, embankments, and other critical areas such as earth spillway to repair damage or control erosion and undesirable vegetation. Revegetate damaged areas in accordance with Florida NRCS conservation practice standard Critical Area Planting, Code 342.
- Mow and fertilize vegetation as needed to maintain vegetative growth.
- Periodic water quality analysis as necessary to evaluate nutrients, pesticides, and pathogens.
- Periodic inspection or testing of all pipelines and pumping plant components and appurtenances, as applicable.
- Inspect site to ensure safety precautions are taken to protect people or animals using the area near the structure.

REFERENCES

Florida NRCS Conservation Practice Standards
Critical Area Planting, Code 342
Dam, Code 402
Pond, Code 378
Pumping Plant, Code 533
Watering Facility, Code 614
NRCS Engineering Field Handbook
NRCS National Engineering Handbook:
Section 5 - Hydraulics
Section 11 - Drop Spillways
Section 14 - Chute Spillways
Technical Release No. 60 Earth Dams and Reservoirs