

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WATERING FACILITY

(No.)

CODE 614

DEFINITION

A watering facility is a means of providing drinking water to livestock or wildlife.

PURPOSE

To store or provide designated access to drinking water for livestock or wildlife to:

- supply daily water requirements
- improve animal distribution
- provide a water source that is an alternative to a sensitive resource

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where there is a need for a watering facility for livestock or wildlife, where there is a source of water that is adequate in quantity and quality for the purpose, and where soils and topography are suitable for a facility.

CRITERIA

General Criteria Applicable To All Purposes

For purposes of this standard, watering facilities include storage facilities, drinking facilities, combination drinking and storage facilities, and watering ramps. Dependable water supplies include pumping systems powered by electricity, systems served by rural water districts or other public water systems, and ponds and streams that are accessible to livestock that typically do not go dry (Ref. EFH Chapter 11, Table 11-3).

Watering Facility Definitions. “Storage facilities” are tanks that hold water and serve other facilities via pipelines. These are usually taller structures and no animals drink from them.

“Drinking facilities” are small troughs or tanks that have no significant storage and provide drinking space for a limited number of animals. These

facilities are dependent on quick recharge. Flow rates must be adequate to supply 2.0 GPM / Drinking Head for large livestock. Flow rates for small livestock such as sheep, pigs and goats are to be based on 0.5 GPM / Drinking Head. The number of drinking head is limited by the drinking space around the facility. The system shall be designed to water all the livestock in the grazing unit within two hours. Freeze-proof tanks and energy-free fountains are also considered to be drinking facilities. When an energy free fountain is used, it shall be the primary source of water for the pasture in order to make the fountain function without freezing.

“Combination drinking and storage facilities” are tanks or troughs with a wall height such that animals drink from it; however, it shall be large enough to store the drinking water required by the design.

“Portable watering facilities” are watering facilities that have the ability to be moved to different locations. These facilities work best in situations for distributing grazing, intensive rotational systems and offsite water to minimize use of ponds and streams without the use of a fence to exclude access. These facilities generally are not designed, but shall be selected with adequate capacity to meet the livestock purpose.

“Wildlife watering facilities” typically include concrete lined watering basins, tanks or troughs, and guzzlers.

“Watering Ramps” are livestock or wildlife erosion resistant ramps installed along the shoreline of fenced ponds or along fenced stream banks in order to provide a stabilized access to water.

User Needs. Design the watering facility so that access is adequate to accommodate the number of animals that will be drinking at the same time. Include design elements to meet the specific needs of the primary user(s). Examples of specific design needs would include accommodation for antler size, species, and ingress and egress requirements.

Erosion Control. Vegetate or stabilize areas disturbed by construction and otherwise unprotected from erosion around the facility in accordance with the planned use of the facility. Use the criteria in Oklahoma NRCS Conservation Practice Standard (CPS), *Critical Area Planting (342)* to establish vegetation. If establishment of vegetation is precluded by site conditions, use the criteria in Oklahoma NRCS CPS, *Mulching (484)*, as appropriate.

Criteria Applicable to Livestock and Wildlife Troughs or Tanks

Foundation and Anchoring. Install drinking facilities, combination drinking and storage facilities, and storage facilities on a firm, level foundation that will not settle differentially. Examples of suitable foundation materials are bedrock, concrete, compacted gravel and stable, well-compacted soils. Where necessary, prepare the foundation by removal and disposal of materials that are not adequate to support the design loads.

Analyze the foundation conditions and provide a design that will ensure the stability of storage facilities. For a vertical storage facility with a tank height greater than the tank diameter, also analyze the potential for overturning and identify the anchoring requirements.

Design and install watering facilities to prevent overturning by wind and animals.

Use NRCS design procedures or manufacturer's guidelines to ensure that buried tanks will withstand all earth and vehicle loads anticipated for the site.

Materials. All materials shall have a life expectancy that meets or exceeds the planned useful life of the installation. Common construction materials are reinforced concrete, steel, fiberglass, brass, plastic and wood. Precast (freeze proof) concrete tanks and factory fabricated fiberglass tanks may be used. All designs shall meet the industry standards for the

material being used. Tanks may also be constructed from heavy equipment tires. Used steel tanks (oil, gasoline, etc.) can be used provided the supplier certifies the tank's use for livestock and/or wildlife.

Appurtenances. Use the criteria in Oklahoma NRCS CPS *Livestock Pipeline (516)* to select the components needed to attach the water supply to the trough or tank. Shut-off valves shall be installed, where needed, to control and/or cut off flow to repair or protect the pipeline associated with the watering facility and to preserve the supply in case of pipeline failure. Include backflow prevention devices on facilities connected to wells or to domestic, rural, or municipal water systems.

In watering troughs and storage tanks, proper instrumentation and controls must be installed to regulate inflow and water level. With the exception of facilities serviced by windmills or systems that operate on a timer, floats or other automatic shut off valves will be required in order to maintain the water level at 1 ½ inches below the top of the facility in order to reduce energy use and conserve water. Floats and valves must be designed in a manner to prevent unnecessary restrictions of flows or changes to the system's ability to deliver the flow as designed. All valves and controls must be protected from livestock and/or wildlife and from freezing. Freeze protection may be accomplished by heat tape, earth sheltering, combination insulation and heat sink, an ice prevention valve, or other approved means.

Watering troughs and storage tanks served by windmills or systems that operate on a timer shall use an overflow pipe to maintain the water level at 1 ½ inches below the top of the facility. The minimum diameter shall be 1 ½ inches. The overflow pipe shall extend a minimum of 12 feet from the outer rim of the facility or to the edge of the heavy use area protection apron, whichever is more, and be marked or otherwise protected from damage. Provide a stable outlet for the overflow pipe when an overflow pipe is included in the design. Direct overflow from the facility to another beneficial use or to the original watercourse, where possible.

Watering facilities shall be equipped with a suitable drainage outlet.

If a roof is placed over the facility to provide shade, the roof shall meet design requirements for appropriate snow and wind loads and shall be durable to withstand anticipated livestock and wildlife activities.

Site Selection. The location of a water facility is influenced by many factors and considerations, such as water supply location, access for construction, operation and maintenance, and utilization.

Establish water facilities in locations that will minimize adverse impacts on the land. The location should be relatively level.

Locate water in underutilized portions of the grazing unit to reduce grazing pressure on sensitive areas.

The site shall be well drained; if not, drainage measures shall be provided. Areas adjacent to the watering facility or apron, if applicable, that will be trampled by livestock or wildlife shall be stable. Use Oklahoma NRCS CPS, *Heavy Use Area Protection (561)* to install added protection where needed. Plan for the excavation required for the installation of this Heavy Use Area Protection.

Watering facilities may be located to facilitate and control stock movement and generally should be located near the middle of a pasture.

When possible, locate the watering facility away from streams, ponds, or riparian areas to minimize chance of contamination from fecal contamination or surface pollution.

When a watering facility is installed adjacent to a well, provide positive drainage away from the well head.

Flow Rate. Pipelines serving a watering facility shall be adequate to meet the requirements of the watering facility. The type of facility served by the pipeline will influence the pipeline requirements.

The flow rate to a watering facility is governed by the water source and recharge rate. The recharge rate for all systems except wind and solar powered systems shall be 2.0 times the daily use in a 24 hour period. The recharge rate for wind and solar powered systems shall be such that it delivers 1.5 times the daily livestock or wildlife need in a 24 hour period. See the Oklahoma NRCS CPS, *Livestock Pipeline (516)* for further pipeline criteria.

Drinking Space. For “combination drinking and storage facilities”, size requirements are governed by the water demand for the herd and not by drinking space.

For “drinking facilities” the perimeter of the facility shall be a minimum of 1 inch per head in the herd. This requirement is waived for freeze-proof tanks and energy-free fountains. Table 1 is to be used as a guide to animal space requirements (Divide the facility perimeter by the Drinking Space/Head).

Table 1. Drinking Space Requirements

Animal	Drinking Space per Head (inches)
Beef	20
Dairy	24
Goats	12
Horses	20
Sheep	12
Swine	12
Poultry	3
Elk	20
Deer	12
Antelope	12
Bison	24

Storage Capacity. A complete watering system includes both the storage part and the drinking part of the facility. Storage and drinking facilities can be provided in combination or they can be provided separately by connecting the components with pipelines to meet the livestock and/or wildlife demand.

Water Quality. Water should be of adequate quality for wildlife and/or livestock consumption. Refer to the Oklahoma NRCS CPS, *Well Water Testing (355)* or the National Range and Pasture Handbook, 600.0603(e) (5) and Table 6 - 8, Water Quality Standards for Livestock.

Escape Features. For a site west of the 100th meridian (panhandle), escape features for wildlife shall be incorporated into the design of an open-surface watering facility. For a site east of the 100th meridian, consideration should be given to install escape ramps to

protect wildlife and water quality from drowning events.

An effective escape device must:

- Meet the inside wall of the tank or trough
- Reach to the bottom of the trough or tank
- Be firmly secured to the trough rim
- Be built of durable material with a rough surface animals can grip
- Have a slope no steeper than 45 degrees
- Be located to cause minimal interference with livestock

Provide one escape device for every 30 linear feet of rim.

Refer to *Water for Wildlife – A Handbook for Ranchers and Range Managers*, Bat Conservation International, for additional information on escape features.

Criteria Applicable to Livestock Troughs or Tanks

Watering systems and facilities for livestock shall be planned to include the needed storage, delivery rates, and spacing requirements for the anticipated herd size for the grazing unit, the projected carrying capacity (based on a grazing plan and forage inventory), and/or the highest anticipated demand. In general, livestock water twice a day and drink half of their daily requirement at each watering. Each animal will drink for approximately 5 minutes. It is recommended that a herd take no longer than 2 hours to complete a watering.

Heavy Use Area Protection Aprons. Watering facilities shall withstand heavy use. Current research indicates that the protected area around facilities where livestock concentrations cause resource concerns is 12 feet wide or greater. Designers may use less than 12 feet based on local knowledge of soil conditions, herd size and management, or other operational measures. If the facility is located in naturally rocky or gravelly areas, an apron may be eliminated completely unless such is a structural component of the watering facility. When applied, the protected area around watering facilities where livestock congregate to drink shall be a minimum of 8 feet wide from the outer edge of the facility. Where the type of facility requires a concrete floor extension as part of the design of the facility, the

width of such an extension can be included in the total protected area. The minimum width shall apply to all areas around the watering facility where livestock have access. Use Oklahoma NRCS CPS and Specification, *Heavy Use Area Protection (561)* for surfacing material, thickness, and other design criteria for aprons.

Facility Height. The facility outside height, measured from the top of the apron to the top of the facility, may vary from 18 to 24 inches for beef and dairy cattle, 22 to 36 inches for horses, and 8 to 22 inches for sheep and goats. When Heavy Use Area Protection (HUAP) is used, ensure the finished heights are measured from the finished HUAP.

Storage Capacity. Livestock watering needs shall be based on the guidelines in Table 2. For both “combination drinking and storage facilities” and “drinking facilities”, the water in a facility shall be accessible to livestock. Any storage volume in the these facility types that is more than 6 inches below the top of the apron elevation shall be considered inaccessible to livestock and deducted from the available storage capacity in the facility.

Table 2. Livestock Watering Requirements

Animal	Gallons / 1000 lbs. Live Animal Weight
Beef Cattle	15
Dairy Cattle	20
Goats	25
Horses	15
Sheep	25
Swine	20
Poultry	120
Bison	15

The water system shall provide a total system capacity for a 5-day storage if the supply is dependent upon a windmill or solar system.

A minimum of a 2-day storage shall be provided for systems powered by electricity, by rural water districts or other public water systems.

In order to attain additional distribution of grazing within a single grazing unit and within the confines of the spacing established in Table 3 of this standard, the 2-day storage

requirement may be met by more than one facility. However, “combination drinking and storage facilities” used with multiple facilities shall be designed for no less than a 1-day storage.

“Drinking facilities” installed where a system malfunction or interruption in service is immediately evident and are checked for proper

Species	Number of Animals	Gallons of Water per Day
Antelope	Each	1-2
Deer	Each	1-2
Elk	Each	5-8
Quail	Covey	1-2
Turkey	Flock	2-3
Pheasant	Local Population	2-5
Dove	Local Population	2-5
Songbirds	Local Population	1-2

functionality a minimum of once a day (i.e. house wells or pipelines tied to livestock feeding operations for poultry, swine, dairy, etc.) are not required to meet the 2 days of storage, however a minimum tank capacity of 100 gallons shall be provided. This 100 gallon storage requirement is waived for freeze-proof tanks and energy-free fountains.

Spacing. Slope, barrier, and pasture design and travel distance are to be included in the design and layout to address grazing distribution.

Spacing requirements in a grazing unit shall be based on the following guidelines:

- Other dependable drinking facilities within the grazing unit,
- The need for water in a given location, and
- Terrain, as described in Table 3.

Table 3. Livestock Watering Facility Spacing

Type of Terrain	Water spacing (miles)
Rough (slopes > 15%)	1/4 - 1/2
Rolling (8 - 15%)	3/8 - 3/4
Level (<8%)	3/4 - 1

Criteria Applicable to Wildlife Troughs or Tanks

For wildlife purposes, design watering facilities with adequate capacity and supply to meet the daily water requirements of wildlife planned to use

the facility. Include the storage volume necessary to provide water between periods of replenishment. Because each facility is unique to species, habitat, topography, and climate; watering facilities must be planned and installed according to a wildlife management plan and adapted to the specific site.

Storage Capacity. The effective water storage capacity for any wildlife watering facilities will be no less than 82.5 gallons, the minimum designed storage specified by Oklahoma Standard Engineering Drawing 518b. With the exception of meeting the minimum storage requirements described above, the design shall be sized to accommodate the expected and/or anticipated consumptive rates of target and non-target species as described in Table 2a.

Table 2a. Wildlife Watering Requirements

Spacing. The distribution and spacing of facilities serving wildlife shall be based on the required travel distance to water, proximity to other required habitat components, and the home range, territory size, and distribution of the target species as indicated in Table 3a.

Table 3a. Wildlife Watering Facility Spacing

Species	Distribution of Facilities
Antelope	1 per 1-2 square miles
Deer	1 per square mile
Elk	1 per 2-4 square miles
Quail	1 within 0.25 mile of food and cover areas
Turkey	1 within 1 mile of roost areas
Pheasant	1 within 0.5 miles of feeding areas
Dove	1 within 2 miles of feeding areas
Songbirds	1 within 0.25 miles of feeding areas

Other. The storage reservoir(s) associated with wildlife watering facilities that are dependent on normal precipitation as the primary water source shall be filled with water immediately after installation.

Wildlife watering facilities that are dependent on normal precipitation as the primary water source shall require a precipitation collecting structure that empties into the facility reservoir and has a minimum area of 144 square feet. This criterion applies to prefabricated facilities, as well.

Concrete lined watering basins require permanent water supplied by a spring, pipeline, or well. The outside dimensions of concrete lined watering basins will be no less than 6 feet by 6 feet and no greater than 12 feet by 12 feet. Designed water depths will be between 1 foot and 2 feet. Slopes will be 3 horizontal to 1 vertical or flatter. Concrete will be 4 inches in thickness and textured to provide solid footing for hooved wildlife species. Use the criteria in the Oklahoma NRCS CPS, *Lined Waterway or Outlet (468)* for the materials criteria and installation requirements.

Criteria Applicable to Watering Ramps

Where livestock or wildlife will drink directly from a pond or stream, use a watering ramp to provide a stabilized access to the water. Evaluate the existing and proposed fences, grazing patterns, shoreline slope, and water depth when choosing the optimum location for the ramp.

Width. Make the ramp wide enough to accommodate the expected usage and maintenance. The minimum width of a ramp shall be 8 feet. The requirements for width shall be a minimum of 1.0 foot of width for each 10 animal units.

Length. Extend the ramp into the stream or pond far enough to achieve the desired depth.

Surface drainage. Divert surface runoff from the approach to the ramp.

Slope. Make the slope of the watering ramp consistent with planned animal usage. The slope of the ramp shall match as close as practical the slope of the pond shoreline or stream bank to aid in construction. However, in no case shall the slope of the ramp be steeper than 3:1 (horizontal to vertical) or flatter than 5:1.

Side slopes. Make all side slope cuts and fills stable for the soil materials on the site. Make the side slopes of cuts or fills in soil materials no steeper than 2 horizontal to 1 vertical (2:1). Make rock cuts or fills no steeper than 1.5 horizontal to 1 vertical (1.5:1).

Foundation. Where necessary, prepare the foundation by removal and disposal of material that are not adequate to support the design loads.

Surface material. Use the criteria in Oklahoma NRCS CPS and Specification, *Heavy Use Area Protection (561)* to design the ramp surface. The selected material must be of adequate quality to withstand underwater conditions.

Access. Use fencing or other barriers to delineate the boundaries of the ramp. Use NRCS CPS, *Fence (Code 382)* for the design and construction of a fence. Barriers must be of sufficient size, strength, and quality to meet the intended use of the facility.

Ramps in Streams. Use the criteria in NRCS CPS, *Stream Crossing (Code 578)* for the design and construction of a ford crossing except as noted above.

Locate the watering ramp so that it does not impede the movement of aquatic organisms in the stream.

Ramps in Ponds. A minimum water depth of 5 feet, measured from the designed permanent water level, is recommended. Where the pond depth is greater than 5 feet at the ramp location, it may be necessary to excavate the ramp into the pond bank to provide a stable base at the lower end. Extend the ramp a minimum of 0.5 feet above the designed permanent water level.

CONSIDERATIONS

Not all species need or benefit from supplemental water. Consider impacts to both target and non-target wildlife species before installation of a watering facility. Observed or documented use of a facility by wildlife does not necessarily indicate net benefits. Introducing a new water source within an ecosystem can have effects such as the concentration of grazing, predation, entrapment, drowning, disease transmission, and expansion of the wildlife populations beyond the carrying capacity of the available habitat. Providing a water source for wildlife could enhance the habitat for species that compete with or prey on at-risk species.

Design fences associated with the watering facilities to allow safe access and exit for area

wildlife species. To protect bats and other species that access water by skimming across the surface, fencing material should not extend across the water surface. If fencing across the water is necessary it should be made of or encompassed within material that is greater than 1 inch wide to increase visibility..

Wildlife populations within desert or arid regions of the country can become dependent on supplemental watering facilities. Consideration should be given to maintaining year-round water even if livestock is not present.

Consideration should also be given to prevention of disease transmission at watering facilities. Suitable controls/treatments for water-transmissible diseases and parasites should be considered if they are a problem locally.

If there is the potential for small livestock, such as lambs or kids, to fall into the trough, provide a ledge or similar structure in the trough to provide an escape route or provide a second trough that has a shorter height.

This practice may adversely affect cultural resources and must comply with GM 420, Part 401.

Topography should be evaluated to minimize trail erosion and flooding erosion from tank overflow.

A removable overflow pipe may be installed on watering facilities using floats or other automatic shut off valves as a primary level control device to function in case the float fails and to provide a method of draining the facility by its removal when maintenance needs to be performed.

During freezing weather, adequate protection for livestock and alternative water supplies should be considered. Systems should be checked regularly to ensure proper operation.

Wildlife watering facilities should be installed so that a wide range of wildlife species may benefit from its installation.

Water collected within the storage reservoir of a wildlife watering facility should be protected from evaporation.

Watering facilities often collect debris and algae and should be cleaned on a regular basis. Covers that shade the facility and reduce debris from falling into the facility, while still allowing animal

access, will keep the water cooler, cleaner, and more palatable to animals.

When a roof is placed over the trough to provide shade, design the roof for appropriate snow and wind loads and ensure that it will be durable to withstand anticipated livestock and wildlife activities. Use the criteria in Oklahoma NRCS CPS, *Roofs and Covers* (367) to design the roof.

Where debris or algae is a problem, reduce the chances of clogging by increasing pipe sizes for inlets and outlets or by installing a feature such as an inverted elbow at the inlet to the overflow pipe. Maintenance of a watering facility can be made easier by providing a method to completely drain the watering facility. Protect the outlet of a drain from erosion.

Consider installation of a permanent means of ingress and egress for maintenance of a storage tank, if needed.

A watering facility located on a steep slope can have erosion problems from the animal traffic. The steep slopes may also cause problems with piping and valves from excess pressure. Choose the location of the watering facility to minimize problems caused by steep topography.

Where applicable, plan for the use of overflow water for wildlife or other beneficial use.

When using tall Storage Facilities, consider a closed top system to eliminate the need for escape ramps and prevent drownings.

Watering ramps. Where livestock exclusion from a stream is part of the planned installation, consider installing a watering ramp that can be used if emergency access to water is needed. Use a gate to restrict access to the ramp.

Avoid locating watering ramps in shady places where possible.

It is difficult to put a fence in the middle of a stream. Where possible, extend the fence completely across the stream. Swinging gates can be used to restrict animal movement.

PLANS AND SPECIFICATIONS

Plans and specifications for watering facilities shall provide the information necessary to

install the facility. As a minimum this shall include the following:

- A map or aerial photograph showing the location of the facility and any associated pipelines.
- Detail drawings showing the facility, necessary appurtenances (such as foundations, pipes and valves, escape features, anchoring, etc.) and stabilization of any areas disturbed by the installation of the facility
- Type and number of animals expected to use the facility.
- Special conditions for access, as needed
- Foundation stability requirements.
- Site-specific detail drawings showing the facility and necessary appurtenances (foundations, pipes and valves, escape features, anchoring, etc.)
- Requirements for stabilization of any areas disturbed by the installation of the facility
- Fencing, as needed
- Materials and quantities
- Construction specifications describing the installation of the facility

If the facility is a component of a system that includes additional conservation practices, the information necessary to construct these additional practices will be a part of the conservation plan.

Development of plans will be guided by Engineering Field Handbook, Chapter 5, and shall be in accordance with National Engineering Manual, Parts 541 and 542.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance and review it with the operator. The plan will describe the actions that must be taken to ensure that the facility functions properly for its design life. Maintenance items should be performed within 5 days from the time they are noticed. As a minimum, include the following items:

- Regularly check for damage to the facility. Check for leaks, site erosion, and damage to fences, heavy use areas, and appurtenances

associated with the watering facility. Repair or replace damaged components, as needed.

- Check the automatic water level device to ensure proper operation.
- Check to ensure that adjacent areas are well protected against erosion.
- Check to ensure the outlet pipe is freely operating and not causing erosion problems.
- Check for debris, algae, sludge or other materials in the facility which may restrict the inflow or outflow system.
- Regularly clean the facility.
- Prepare the facility for winter weather, as dictated by the climate. This can include adding material in the storage area to allow for ice expansion without damage. This may also include draining supply pipes, emptying tanks, or ensuring that float valves will not be damaged by ice.

REFERENCES

Manual of Steel Construction, American Institute of Steel Construction

Timber, National Design Specification for Wood, American Forest and Paper Association

Concrete, ACI 318, American Concrete Institute

Masonry, Building Code Requirement for Masonry Structures, ACI 530, American Concrete Institute

Facilities for Watering Livestock and Wildlife, USFS, BLM January 1989 2400-Range, MTDC 89-1.

Brigham, William and Stevenson, Craig, 1997, Wildlife Water Catchment Construction in Nevada, Technical Note 397.

Tsukamoto, George and Stiver, San Juan, 1990, Wildlife water Development, Proceedings of the Wildlife Water Development Symposium, Las Vegas, NV, USDI Bureau of Land Management.

Yoakum, J. and W.P. Dasmann. 1971. Habitat manipulation practices. Ch. 14 in Wildlife Management Techniques, Third Edition. Ed.

Robert H. Giles, Jr. Pub. The Wildlife Society. 633 pp.

National Engineering Handbook, Part 650 Engineering Field Handbook, Chapters 5, 11 & 12, USDA Natural Resources Conservation Service.

National Range and Pasture Handbook, Chapter 6, Page 6-12, Table 6-7 & 6-8, USDA-Natural Resources Conservation Service.

National Research Council, 1996 Nutrient Requirements of Domestic Animals, National Academy Press.

Prescribed Grazing and Feeding Management for Lactating Dairy Cows", New York State Grazing lands and USDA NRCS, January 2000).

Taylor, Daniel A. R. and Merlin D. Tuttle. Water for Wildlife, A Handbook for Ranchers and Range Managers. Bat Conservation International. 2012.