

**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

Laws and Regulations. The investigation, design, and installation of the conservation practice must comply with all applicable governmental regulations, laws, permits, licenses, and registrations. The landowner is responsible for obtaining all permits and rights.

Capacity. Identify the type of livestock or wildlife that will be the primary user(s) of the facility. If the watering facility will supply water to different species of animals, provide sufficient water to meet the sum of the seasonal high daily water requirements of all the animals.

Include the storage volume necessary to provide water between periods of

replenishment. Refer to the National Range and Pasture Handbook (Chapter 6), State guidance, or university publications for information on livestock water quantity and quality requirements. For wildlife, base water quantity and quality requirements on targeted species needs.

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.

Materials and Appurtenances. Construct the watering facility from durable materials that meet or exceed the lifespan of the practice. Follow NRCS design procedures for the selected materials. Use industry standards where NRCS standards do not exist.

Concrete. Type II cement and 3,500 pounds per square inch (PSI) concrete minimum 28-day compressive strength shall be specified for concrete structures containing more than 20 cubic yards of concrete.

All reinforced concrete floors for steel rim tanks shall extend a minimum of two feet beyond the periphery of the tank and shall be set on a gravel base at least 2 inches thick.

Metal. Metal tanks shall be constructed of galvanized corrugated metal with reinforced rims. Metal rims set in concrete must be coated with plastic or asphalt based sealant to protect the metal at all concrete/metal contact points. Metal rims used with synthetic liners shall be sealed with bentonite or another approved method at the contact areas around the perimeter.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#), or visit the [Field Office Technical Guide](#).

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Tanks with the largest dimension less than 10 feet must be constructed from 20-gauge or heavier metal. Larger tanks must be 18-gauge or heavier. Tanks with metal bottoms shall be set on a well-drained gravel base. Gravel base shall be at least 2 inches thick.

Fiberglass. Fiberglass tanks shall have a minimum thickness of 3/16 inch. Fiberglass tanks shall be made of ultraviolet resistant materials or shall have a durable coating to protect the structure from deterioration due to sunlight. Fiberglass tanks shall be set on a gravel base at least 2 inches thick.

Polyethylene. Polyethylene tanks must be manufactured from high density polyethylene. Tanks must be manufactured with ultraviolet resistant materials and have a reinforced rim. They are to be used as part of an above ground pipeline system.

Other Materials. Other materials may be used where long service life will be provided. Use of manufactured materials must follow the manufacturer's recommendations or a design prepared by an engineer.

Stabilization of Disturbed Areas. Vegetate or stabilize areas disturbed by construction in accordance with the planned use of the facility. Use the criteria in NRCS Conservation Practice Standard (CPS) *Critical Area Planting (Code 342)* to establish vegetation. If establishment of vegetation is precluded by site conditions, use the criteria in NRCS CPS *Mulching (Code 484)*, as appropriate.

Troughs and Tanks

Capacity. Design the watering facility with the storage volume necessary to provide water between periods of replenishment. Base the additional storage volume on the availability of water, replenishment rate, location, and planned operation.

Location. Locate the watering facility to meet the needs of the managed livestock or wildlife species. Select a site that will promote even grazing distribution and reduce grazing pressure on sensitive areas. Where multiple watering facilities are planned, place the watering facilities at distances that are appropriate for the species that will be managed.

Stock watering facilities should be located so travel distance between forage and dependable water is no more than three quarters of a mile. Location of the facilities shall be planned in conjunction with the prescribed grazing plan.

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.

Foundation. Install the watering trough or water storage tank 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.

Anchor or brace the watering facility to prevent overturning by wind and animals, if needed.

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

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

Stabilization. For a fixed tank, protect the area around the watering facility where animal concentrations or overflow from the watering facility will cause resource concerns. Use NRCS CPS *Heavy Use Area Protection (Code 561)* to design the protection.

The site shall be well drained. Drainage measures shall be provided as needed. Areas adjacent to the watering facility that will be trampled by livestock and other large animals must provide firm footing and provide adequate drainage. An apron area around the tank perimeter must be concrete or must receive regular maintenance using compacted

earth, pit run sand/gravel/rock, or other appropriate nonpolluting, durable materials.

For a portable facility, move the trough frequently to prevent damage from animal concentrations.

Appurtenances. Use the criteria in NRCS CPS *Livestock Pipeline (Code 516)* to select the components needed to attach the water supply to the tank. Include backflow prevention devices on facilities connected to wells or to domestic or municipal water systems.

Appurtenances to join sections to pipe or provide tank hook-ups must provide leak free seals and be structurally equivalent to the pipe used.

Provide a stable outlet for the overflow pipe and the outlet must be 2 inch nominal diameter or larger. . Protect the outlet from damage. Direct overflow from the tank to another beneficial use or to the original watercourse, where possible. Provisions to clean out or drain the facility such as siphon pipes, drain pipes, or manual drainage, shall be provided.

Where water is supplied under pressure to the watering facility, use an automatic water level control or float valve to control the flow of water to the facility in order to reduce energy use and prevent overflows.

As needed, install a float valve on a gravity-fed trough to avoid draining the water source.

Protect the watering facility and all plumbing including pipes, appurtenances, valves and controls from damage by livestock, wildlife, freezing, and ice.

Escape Features. Incorporate a wildlife escape feature into the watering facility design.

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.

Escape ladders similar to that shown in South Dakota (SD) Job Plan 13.1 will meet these minimum requirements.

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

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.

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 but not steeper than 3:1.

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 NRCS CPS *Heavy Use Area Protection (Code 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 3 feet, measured from the designed permanent water level, is recommended. Where the pond depth is greater than 3 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.

Criteria Applicable To Providing Livestock Drinking Water

Storage. Watering facilities must provide the daily water requirement of the livestock and provide access to the entire herd (including young animals) within a reasonable period of time.

The daily water requirement must be provided through a combination of watering facility storage and water source flow rate unless the flow rate is adequate to meet the demand.

The water supply system must provide at least the amount shown in Table 1.

Required water facility size is dependent upon water supply flow rate, travel distance, and access space requirements for the number of animals expected to use the facility at any given time. The watering facility shall be designed according to the following criteria:

No minimum amount of storage is required for the watering facility and the facility shall be designed according to access space for 5% of the herd if all of the following conditions are met:

1. A very reliable water supply source such as a rural water system or well with conventional power supply is used;
2. The water supply can deliver a minimum of 2 gallons per minute (gpm) for each drinking space available;

For reliable water supply sources not meeting the conditions above, size will be based upon a combination of flow rate, physical storage, and access space. The combination of tank storage and available flow rate must be able to deliver the daily water requirements of the animals in 12 hours. Water storage is limited to a maximum of 2 days. Access space is required for 10% of the herd for summer grazing.

For water sources not inspected daily, or sources with high maintenance requirements, or which have power requirements which are not dependable (solar, wind, etc.) a minimum of 3 and a maximum of 7 days of storage is required.

Refer to SD Design Technical Note No. 2006-1, Watering Facility Design Criteria for Cattle for additional guidance on sizing watering facilities.

Winter Watering Facilities. Winter watering facilities shall be part of a prescribed grazing plan. Winter watering facilities must be freeze-proof. Geothermal heat, insulation, flowing water, covered openings, or other methods may be used. Commercial automatic waterers shall be installed according to manufacturer's recommendations. Winter watering facilities may be designed without regard to travel distance, and may be designed without regard to storage if the water source can provide a minimum of 2 gpm per drinking space. Commercial waterers have a recommended number of head that the waterer will serve. For fabricated tanks, provide no less than one drinking space per 100 animals. Systems without the necessary flow rate to provide 2 gpm per drinking space may be designed using a combination of storage and pipeline flow. The daily water requirement for winter grazing cattle may be considered as 10 gallons per day.

Criteria Applicable to Providing Wildlife Drinking Water

Storage. The wildlife watering facility shall be sized to accommodate the expected consumptive rates of all the target and non-target species as indicated in Table 2. The minimum storage shall be 200 gallons.

Location. The recommended distribution and spacing of wildlife watering facilities shall be based upon Table 3.

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 facility to allow safe ingress and egress for area wildlife species. To protect species that access water by skimming across the surface, make fencing materials highly visible with appropriate openings. Add permanent streamers or coverings to wire fences that extend across a watering facility to make them more visible to skimmers.

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.

Consider designing the facility to benefit wildlife. Such designs would include providing ground-level access to water for species that cannot use raised structures such as troughs. Ground-level access can be provided through creation of an overflow collection area or a secondary ground-level water source. Depending on the target species, planners may want to consider protecting these areas through the use of suitable fencing (marked as needed) that excludes livestock and larger wildlife species while allowing access of the site to small ground-dwelling species.

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.

Consider the effects of water development on the balance or budget of water resources in the area of the new project. In some settings, this could be important and may result in effects to adjacent or associated habitats and species.

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.

Debris and algae can collect in watering facilities resulting in the need for frequent cleaning. 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 NRCS CPS Roofs and Covers (Code 367) to design the roof.

Table 1. - Minimum Water Supply Per Animal	
Animal	Water, Gal./Day
Beef Cattle:	
Cows lactating with calves	18
Bred, Dry Cows and Heifers	15
400 lb. Growing Cattle	10
600 lb. Growing Cattle	13
800 lb. Growing Cattle	15
Bulls	19
600 lb. Finishing Cattle	15
800 lb. Finishing Cattle	18
1,000 lb. Finishing Cattle	21
1,200 lb. Finishing Cattle	23
Dairy Cattle:	
1,400 lb. Dry Cow	16
1,700 lb. Dry Cow	17
Lactating, 20 lb. Milk	18
Lactating, 60 lb. Milk	25
Lactating, 80 lb. Milk	28
Lactating, 100 lb. Milk	33
200 lb. Heifer	3
400 lb. Heifer	6
800 lb. Heifer	11
1,200 lb. Heifer	15
Swine:	
Boars & Gestating Sows	3
Lactating Sows	5
15 – 50 lb. Feeder	0.75
50 – 120 lb. Feeder	1
120 lb. to Market	2
Horses:	
Mature	18
Weanling	8
Sheep & Goats:	
Rams & Dry Ewes	2
Ewes with lambs	3
Feeder Lambs	1.5
Suckling Lambs	0.3
Birds:	
100 Chickens	9
100 Turkeys	15

Table 2. - Minimum Wildlife Water Supply	
Animal	Water, Gal./Day
Larger Mammals:	
*Elk	5 - 8 per animal
*Deer	1 - 2 per animal
*Antelope	1 - 2 per animal
Birds:	
Sharp Tail Grouse	2 - 5 per facility
Prairie Chicken	2 - 5 per facility
*Ring-necked Pheasant	2 - 5 per facility
*Mourning Dove	2 - 5 per facility
Bobwhite Quail	2 - 5 per facility
Gray (Hungarian) Partridge	2 - 5 per facility
*Turkey	6 - 9 per facility
*Songbirds	1 - 2 per facility
Waterfowl and Shorebirds	NA

*Species that are known to benefit from water developments provided cover is adequate and water is scarce or unavailable.

Table 3. – Suggested Optimum Spacing of Watering Facilities	
Animal	Miles
Larger Mammals:	
Elk	1.0
Deer	0.5
Antelope	1.0
Birds:	
Sharp Tail Grouse	1.0
Prairie Chicken	1.0
Ring-necked Pheasant	0.5
Mourning Dove	0.5
Bobwhite Quail	0.25
Gray (Hungarian) Partridge	0.25
Turkey	0.5
Songbirds	0.25
Waterfowl and Shorebirds	NA

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.

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.

The slope of the ramp can influence animal behavior. Steeper slopes tend to discourage loitering in the ramp area.

Select a surface material for the ramp that will discourage loitering but still provide a stable footing. The larger stone will make the hoof contact slightly uncomfortable.

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

Provide plans and specifications that describe the requirements for applying this practice to achieve its intended purpose. As a minimum, include:

- A map or aerial photograph showing the location of the facility and any associated pipelines
- 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

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan 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. 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 performance of the automatic water level device, if present.
- Ensure that the outlet pipe is freely operating and is not causing erosion.
- Regularly clean the facility.
- Maintain the facility to ensure that there is adequate inflow and outflow.
- Prepare the facility for winter as dictated by the climate. This may include draining supply pipes, emptying tanks, or ensuring that float valves will not be damaged by ice.
- For a portable facility, include the plan for moving the facility and for monitoring/repair of the areas around the facility.

REFERENCES

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

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SD Engineering Standard Drawings
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