



MANAGEMENT OF SHALLOW WATER AREAS

Natural Resources Conservation Service (NRCS) July 2002

INTRODUCTION

Shallow water areas can provide habitat for waterfowl resting and feeding, and can also support reptiles, amphibians, and insects that serve as important food sources for waterfowl, wading birds, and other wildlife. Seasonal water levels and vegetation in shallow water areas are usually actively managed to benefit wildlife, primarily waterfowl and wading birds.

Shallow water areas contain shallow surface water, typically from 1 to 18 inches deep, from at least late fall through early spring. They are usually drained or allowed to dry out naturally during late spring and summer. Small areas of permanent water may remain to provide reptile and amphibian habitat when water levels are low.

Proper management can increase and maintain desirable plants and other foods for waterfowl, wading birds, and other species of wildlife. Establishment of vegetation in the pool area is not required, but it is strongly encouraged in order to provide wildlife food and cover. Naturally occurring annual and perennial plants are the most beneficial for wildlife.

Seeds and rootstocks of plants are important waterfowl foods. Their germination, growth, and availability for food are dependent on the water regime on the site. Plants also serve as a food source for many smaller members of the animal community. When plants and plant debris are flooded and begin to deteriorate, they provide nutrients for many small aquatic animals. These small animals, such as snails, insects (especially caddis flies, beetles, true flies, and midges/bloodworms), crustaceans (fairy shrimp, clam shrimp, water fleas, scuds), and earthworms, provide a major food source for waterfowl and wading birds. They are an especially important food during protein-demanding periods such as egg-laying or molting.



Shallow water areas must be designed and managed to provide water depths that are suitable for the desired wildlife species. Wildlife utilize an area based on how deep the water is, when and how long the water remains on the site, and the food that is available.

After seed producing plants have matured, and during the fall waterfowl migration, shallow water areas should be allowed to flood to a depth of 1 inch to 18 inches of water. The actual depth and timing of flooding should be based on the species of waterfowl you want to attract (see Table 4 in this Job Sheet for more information). Flooded plants provide excellent resting and feeding areas for "puddle ducks" that "tip" to feed, such as mallard, widgeon, pintail, and teal. The optimum feeding depth for most of these ducks is 3 to 8 inches of water. In the spring during a slow drawdown, shallow water areas (mud flats to 3 inches deep) are especially beneficial for shorebirds, such as plovers and sandpipers, on their northward migration. Canada geese will also feed in these shallow depths.



## MANAGEMENT OF WATER AND PLANTS

Water levels and plants can be managed in various combinations to provide resting and feeding habitat for waterfowl, wading birds, frogs, turtles, and other wildlife. The specific management plan you choose for your site will depend primarily on the type of wildlife you want to attract, the location of your site, its water supply, how much time and/or money you are willing to spend, and any regulatory requirements or constraints of cost-sharing programs.

### Water Considerations

Water levels can be managed by human actions, such as by adding or removing boards in a water control structure, or they can be allowed to vary naturally in response to seasonal changes in rainfall, groundwater levels, and evaporation rates. Many shallow water sites are completely dry in the summer, due to a managed drawdown or lack of a permanent water supply.

Providing permanently or semi-permanently wet "frog holes" on at least 20% of the site will especially benefit resident wildlife such as ducks, geese, herons, frogs, toads, salamanders, and turtles that need a long-term water supply. Most amphibians, for example, need semi-permanent water (at least until July) for egg-laying and tadpole development, while some need water year-round. Depending on the species, adult amphibians may spend most of their lives in shallow water or in adjacent upland forests and wet meadows.

Most aquatic wildlife need to spend some time resting, preening, or basking out of the water. Consider placing a few large tree branches and logs in the shallow water area to provide this type of habitat.

### Providing Wildlife Foods

There are two basic ways to provide quality wildlife foods on a CRP shallow water site. They are:

- Periodic manipulation of water and soil to encourage the growth of natural moist-soil plants; or,
- Minimal management to support mostly perennial (and some annual) moist-soil plants.

### *Natural plants vs. planted crops--which are best?*

You may have heard that planting and flooding annual crops ("food plots") is the best way to provide waterfowl food. While annual crops such as corn, soybeans, sorghum, buckwheat, and Japanese millet may provide a greater volume of food in a "good" crop year, they lack many of the advantages of natural moist-soil plants.

Some advantages of using natural moist-soil plants vs. planting annual crops are:

- Moist soil plants have greater nutrient value for waterfowl than row crops, and don't deteriorate as quickly as row crops when flooded (see Table 1);
- Moist soil plants are more diverse and attract a greater diversity of wildlife;
- Management costs are usually lower. Natural seed is "free" and you don't have to plant it;
- Moist soil management is well-suited for marginal row crop sites;
- Production of natural moist-soil plants is less dependent on the weather.

Please be aware that on a CRP shallow water site, you are not allowed to plant annual food plots. CRP is intended to minimize soil disturbance, protect water quality, and provide habitat for a wide range of wildlife species.

*Table 1. Deterioration of plant seeds after 90 days of inundation on a shallow water site (adapted from the Waterfowl Management Handbook, Fish and Wildlife Leaflet 13.1.1, 1988).*

Plant Name	Percentage of Seeds Decomposed after 90 Days
Soybeans	86
Japanese millet	57
Corn	50
Buckwheat	45
Sorghum	42
Pennsylvania smartweed	21
Water oak (acorns)	4
Sesbania	4
Horned beakrush	2
Salt marsh bulrush	1

**Seasonal management for natural moist-soil plants.**

Wild millet, rice cutgrass, smartweeds, beggarticks, sedges, rushes, and many other desirable plants can be encouraged through water level manipulations to germinate from existing seed sources in the soil, and produce an abundant source of high quality food for waterfowl.

Drawdown (de-watering) of the area is necessary for germination of moist-soil plants. Annual plants produce the most seeds and provide an abundance of waterfowl food. Therefore, to maintain the site in early successional species (mostly annuals), and to control unwanted species, it is best to de-water and lightly disk the site every 3 years.

Consider the plant seeds that are likely to exist in the soil when determining whether you can manage for the plants you want. What plants have you seen growing on the site in years when you didn't plant a grain crop? Seeds of those plants are probably still viable in the soil. The plant seeds available in the soil, and the timing and rate of the drawdown, will determine which plant species will grow in a particular shallow water site. See Table 3 for the response of common moist-soil plants to the timing of drawdown.

Slow drawdowns, over a period of 2 to 3 weeks, are usually more desirable for plant establishment and wildlife use, and will reduce the amount of nutrients leaving the site (see Table 2). If you have a flashboard riser, pull one board and let the water drain down. After a few days, pull another board. Or, if you have a PVC standpipe with an elbow, tip it slightly to let just a few inches of water escape at a time. Slow drawdowns provide optimum conditions for germination of moist-soil plants, and result in the greatest quantity of seeds produced by those plants in late summer. In general, early slow drawdowns during April result in germination of smartweeds and sedges, while midseason drawdowns during May produce millets and beggarticks.

Shorebirds, such as plovers and sandpipers, feed on mud flats and in very shallow water (up to 3 inches) during the time of an early to midseason drawdown. Therefore, managed shallow water areas can be a very important source of food for shorebirds during their spring migration.

After the moist-soil plants have produced seed in late summer or fall, re-flood the site slowly to coincide with the arrival of fall migrant waterfowl, usually September through November. Flooding the site slowly over a period of 2 to 3 weeks allows new areas of food to become available every day at the preferred

water depth as the water is rising. Refer to Table 4 for the water depths preferred by various waterfowl and wading birds.

Do not fertilize the moist-soil area. Natural moist-soil plants have low nutrient requirements, and do not need additional fertilizer. To the extent possible, do not use pesticides on the site to avoid harming wildlife that use the shallow water area. See page 6 for more information about controlling undesirable plants on shallow water sites.

*Table 2. Effects of fast vs. slow drawdowns on selected resource concerns (adapted from the Waterfowl Management Handbook, Fish and Wildlife Leaflet 13.4.6, 1991).*

Resource Concern	Duration of Drawdown	
	Less than 4 days	More than 2 weeks
Time available for seed germination of moist-soil plants	Short	Long
Growth and seed production by moist-soil plants after April drawdown	Good	Excellent
Growth and seed production by moist-soil plants after May or June drawdown	Poor	Excellent
Cocklebur problems	High potential	Lower potential
Availability of snails, soil insects, and earthworms for waterfowl food	Low	High
Waterfowl use of the site during April drawdown	Good	Excellent
Waterfowl use of the site during May or June drawdown	Poor	Good
Nutrients leaving the site	High	Low

**Minimal management for natural moist-soil plants.**

If you do not want to actively manage water levels or plants on a regular basis, then nature will do it for you. The site will have a natural water regime in which water levels rise and fall seasonally in response to varying natural conditions, such as rainfall, groundwater levels, evaporation rates, etc. The water level may be managed occasionally if needed to control noxious weeds or invasive species, or to make repairs.

Plants on less managed sites will tend to be perennials such as sedges, rushes, and many of the grasses. Perennial plants usually produce fewer seeds than annuals, but they can provide good year-round cover for wildlife resting, nesting, and rearing young. In addition to seeds, the foliage and rootstocks of these

plants can be eaten by waterfowl, wading birds, marsh birds, beavers, and muskrats.

After the moist-soil plants have produced seed in late summer or fall, allow the site to re-flood slowly, usually September through November. Flooding the site slowly over a period of 2 to 3 weeks allows new areas of food to become available every day at the preferred water depth as the water is rising. Refer to Table 4 for the water depths preferred by various waterfowl and wading birds.

Do not fertilize the moist-soil area. Natural moist-soil plants have low nutrient requirements, and do not need additional fertilizer. To the extent possible, do not use pesticides on the site to avoid harming wildlife that use the shallow water area. See page 6 for more information about controlling undesirable plants on shallow water sites.

Table 3. Response of common moist-soil plants to drawdown dates (adapted from the Waterfowl Management Handbook, Fish and Wildlife Leaflet 13.4.6, 1991).

Moist-Soil Plants				Drawdown between		
Plant Family	Common Name	Scientific Name	Annual or Perennial Plant	April 1 - April 30	May 1 - May 31	June 1 - June 30
Grass	Swamp timothy	<i>Crypsis schoenoides</i>	Annual	+	+++	+
	Rice cutgrass	<i>Leersia oryzoides</i>	Perennial	+++	+	
	Sprangletops	<i>Leptochloa</i> spp.	Annuals		+	+++
	Crabgrasses	<i>Digitaria</i> spp.	Annuals		+++	+++
	Panic grasses	<i>Panicum</i> spp.	Annuals & perennials		+++	++
	Wild millet	<i>Echinochloa crusgalli</i> var. <i>frumentacea</i>	Annual	+++	+	+
	Wild millet	<i>Echinochloa walteri</i>	Annual	+	+++	++
	Wild millet	<i>Echinochloa muricata</i>	Annual	+	+++	+
Sedge	Red-rooted sedge	<i>Cyperus erythrorhizos</i>	Annual or perennial		++	
	Chufa (Yellow nutsedge)	<i>Cyperus esculentus</i>	Perennial	+++	+	
	Spikerushes	<i>Eleocharis</i> spp.	Mostly perennials	+++	+	+
Buckwheat	Pennsylvania smartweed	<i>Polygonum pensylvanicum</i>	Annual	+++		
	Curltop ladysthumb	<i>Polygonum lapathifolium</i>	Annual	+++		
	Docks and sorrels	<i>Rumex</i> spp.	Mostly perennials		+++	+
Pea	Sweetclovers	<i>Melilotus</i> spp.	Annuals	+++		
	Sesbania	<i>Sesbania exaltata</i>	Annual	+	++	
Composite	Cocklebur	<i>Xanthium strumarium</i>	Annual	++	+++	++
	Beggarticks	<i>Bidens</i> spp.	Annuals	+	+++	+++
	Asters	<i>Aster</i> spp.	Perennials	+++	++	+
Loosestrife <sup>2/</sup>	Purple loosestrife <sup>2/</sup>	<i>Lythrum salicaria</i>	Perennial	++	++	+
	Toothcup	<i>Ammannia coccinea</i>	Annual	+	++	++
Morning glory	Morning glories	<i>Ipomoea</i> spp.	Annuals	++	++	
Goosefoot	Saltbushes	<i>Atriplex</i> spp.	Annuals	+++	++	

Notes: 1. + = fair response; ++ = moderate response; +++ = excellent response.

2. Purple loosestrife is an invasive plant. Manage the shallow water area to exclude it.

Table 4. Timing and depths of water needed by migrating birds (○ - fall/spring migrants and winter residents), summer resident birds (●), and resident amphibians and turtles (●).

Wildlife Species	Preferred Surface Water Depths	Time of Year When Surface Water is Needed:												Remarks				
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul					
Shorebirds (Yellowlegs, Sandpipers, and Plovers)	0* - 3 inches	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	Shorebirds are late summer, fall and spring migrants; winter residents. Statewide during migration; wintering mostly on the Coastal Plain. Very few species nest in Maryland.
Marshbirds (Rails and Snipe)	0* - 3 inches		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Marshbirds are fall & spring migrants; winter residents. Statewide during migration; wintering mostly on the Coastal Plain. Some rails nest in Maryland, but snipe do not.
Geese	0* - 3 inches		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Geese are fall & spring migrants; winter residents. Statewide during migration; wintering mostly on the Coastal Plain. Populations of permanent resident Canada geese also occur statewide.
Hérons (Little Blue, Green, Great Blue, and Night Herons)	1 - 4 inches	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Hérons are fall & late spring migrants; some are winter residents. Statewide during migration; wintering mostly on the on the Coastal Plain. A few species nest in Maryland, in localized colonies. The Great Blue Heron can easily feed in water up to 12 inches deep.
Amphibians (Frogs, Toads, and Salamanders)	1 - 8 inches	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Frogs and toads, and some salamanders, need areas of permanent shallow water for egg-laying and tadpole development, and to escape from predators. Eggs are usually laid in late winter to mid-summer. Tadpoles of most species develop into adults in less than 6 months (sometimes as little as one month), but other species need at least two years. Adults may live in the water or in adjacent upland buffers.
Turtles	1 - 20 inches	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Aquatic turtles need areas of permanent shallow water for feeding and to escape from predators. Turtles lay their eggs in nearby uplands, and the young return to the water after hatching.
Dabbling Ducks (Wood Ducks, Mallards, Pintails, Gadwalls, Widgeon, Teal)	3 - 8 inches		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	These ducks are fall & spring migrants; some are winter residents. Wood ducks and mallards are found statewide, and nest in Maryland. Pintails, gadwalls, widgeon, and teal are found statewide during migration; wintering mostly on the Coastal Plain. They generally do not nest in Maryland.
Diving Ducks (Mergansers and Ruddy Ducks) and Coots	8 inches or more			●	●	●	●	●	●	●	●							These ducks and coots are fall & spring migrants; some are winter residents. Statewide during migration; wintering mostly on the Coastal Plain. Small populations of coots have reportedly nested on the lower Eastern Shore.

Note: \*When there is 0 inches of surface water, then the soil needs to be saturated to the surface (mudflat) to provide suitable feeding habitat.

## OTHER MANAGEMENT CONCERNS

### Embankments and Water Control Structures

Inspect the condition of all inlet and outlet pipes and related structures. Remove trash or other obstructions that reduce the flow of water. Inspect berms and ditch plugs for evidence of erosion, burrowing by muskrats, or other structural problems. Repair or replace any damaged structures (e.g., berms, pipes, etc.). At a minimum, inspect the site at least once per year and after each major storm.

### Buffers

Permanent vegetative buffers of grasses, wildflowers, shrubs, or trees can reduce the amount of sediment entering a shallow water site, and also provide additional food and cover for wildlife.

For grass buffers, you may need to spot mow or burn them infrequently (not more than once every two to three years) to reduce encroachment of trees and shrubs. To protect nesting wildlife, do not disturb buffers during the primary nesting season (April 15 to August 15).

### Control of Undesirable Plants

Plants that are considered "undesirable" are those that tend to "take over" a site, to the exclusion of other plants. Undesirable plants in Maryland include cocklebur, reed canarygrass, phragmites (common reed), cattails, and all noxious weeds. These plants should be controlled by spot treatment, using mechanical methods or approved herbicides. Control of noxious weeds (specifically, Johnsongrass, shattercane, and various thistles) is required by state law.

The best approach for dealing with undesirable plants is to inspect your site periodically during the growing season and control undesirable invaders before they colonize a large area. Be especially alert if you have undesirable plants nearby that can readily seed into your shallow water site.

Once well-established, most undesirable plants are difficult to control. Cutting, burning, and herbicide applications can work, but you risk damaging desirable wetland plants, too. Removal by hand is a possible solution if the undesirable plants occupy only a small portion of the site. However, plants such as phragmites and cattails have extensive root systems, so digging out more than a few of these plants is difficult.

Water management techniques can sometimes be used to reduce problems with nuisance plants. Seeds of reed canarygrass, phragmites, and cattails germinate best on

moist soils, but not under several inches of water. Maintaining high water levels in the spring will help to discourage seed germination of these undesirable plants. If cocklebur volunteers on a moist-soil site, it usually can be controlled by a brief period of re-flooding. Most other herbaceous plants that volunteer will be readily utilized by waterfowl.

If woody vegetation is nearby, it may be necessary to spot mow or burn the site infrequently (not more than once every two to three years) if you want to discourage the growth of trees and shrubs.

For more information about controlling specific weeds, contact your local office of Maryland Cooperative Extension, or your local Maryland Department of Agriculture Weed Control Specialist.

### Control of Undesirable Animals

Shallow water sites are intended to attract wildlife, but some wildlife are less welcome than others. Beavers can significantly change a site's water regime and vegetation, and can cause structural failure by raising water levels above the intended design. They are difficult to discourage, and may need to be removed in accordance with state hunting and trapping regulations.

Muskrats can be beneficial because they control cattails and help maintain open water areas. However, muskrats can also cause structural failures by burrowing into berms. Burying chain link material into the berm immediately above and below the waterline can help to discourage their burrowing. Damage can also be minimized by designing berms with gentle slopes to the waterline (5:1), and with a shallow bench adjacent to the berm at the waterline. Muskrats seem to prefer steep banks to burrow in, with an approach that is safely under water. A few steep-bank islands in the water will provide habitat where muskrats can safely burrow. If necessary, muskrats may need to be removed from a site in accordance with state hunting and trapping regulations.

Geese can be discouraged by making the shallow water area and buffer less attractive to them. Geese generally prefer areas of open water and low vegetation for easy access into and out of the site. To discourage geese, manage the shallow water area to minimize open water and favor the growth of tall, dense herbaceous vegetation. In the buffer, tall grasses, shrubs, and trees will be much less attractive to geese than a well-manicured lawn.

For more information about controlling nuisance animals, contact your local office of the Maryland Department of Natural Resources, Wildlife and Heritage Service.

## Disturbances

Human activities in and around the shallow water area can have a significant impact on the behavior of wildlife. Disturbances cause water birds to move to other feeding grounds, and may lower productivity of nesting or brooding.

Loud activities conducted in or over the water cause the most disturbance, while quiet shoreline activities cause the least. Do not allow mechanized vehicles (e.g., mowing equipment or recreational vehicles) to enter the water or buffer area while water birds are present. Consider establishing screened buffer zones to separate unavoidable disturbances (e.g., busy roads) from the site.

Do not allow livestock, dogs, or cats access to the site.

Promptly remove any trash, debris, or other materials which have entered the area. To the extent possible, do not allow sediment, chemical contaminants, or nutrients to enter the site.

## Disease

Mass die-offs of waterfowl can occur at a particular site due to disease. A common disease that occurs around shallow water areas is avian botulism. It can be

rapidly transmitted from dead birds to healthy birds by infected maggots. Prompt removal and disposal of dead birds and fish can control the spread of the disease. Flooding sites that have been dry for a long time, in summer when temperatures are high, is generally not recommended except for shorebird management. Under these conditions the bacterium that causes botulism can flourish.

## SUGGESTED ADDITIONAL READING

U.S. Fish and Wildlife Service, *Waterfowl Management Handbook*. This is a collection of fact sheets with detailed information about various waterfowl management topics. It was written primarily for the mid-western states, but much of the information is also applicable for the mid-Atlantic. Available free on the Internet at: <http://www.mesc.usgs.gov/>

University of Maryland, Cooperative Extension, *Wildlife Management Fact Sheet Series*. This is a collection of fact sheets not only about managing for waterfowl, but also for rabbits, quail, pheasants, squirrels, songbirds, and other wildlife. Available at a nominal cost from county offices of Maryland Cooperative Extension.



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## SHALLOW WATER AREA MANAGEMENT SCHEDULE

Name:	Farm/Tract:
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Field:	Shallow Water Unit:	Assisted by:	Date:
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The shallow water area will be managed to provide habitat for the following wildlife: (check all that apply)

Dabbling ducks    Geese    Sandpipers, plovers, etc.    Herons    Others \_\_\_\_\_

### Management Activities Needed on All Sites

- Inspect all embankments and structures at least once per year and after every major storm. Promptly remove trash and obstructions, fix leaks, and make other repairs as needed.
- On grassy buffers and embankments, spot mow or burn infrequently (not more than once every two to three years) if needed to reduce encroachment of trees and shrubs. Do not mow or burn between April 15 and August 15, to protect ground-nesting wildlife.
- Control noxious weeds and other invasive plants by spot treatment, using mechanical methods or approved herbicides. Control of noxious weeds (specifically, Johnsongrass, Shattercane, Canada Thistle, Bull Thistle, Plumeless Thistle, and Musk Thistle) is required by state law.
- Nuisance animals such as beavers and muskrats may be removed in accordance with state game regulations.
- Planting of annual food plots is not permitted.

**Moist-Soil Management**    Will be used    Is optional    Will not be used

- Slow drawdown (2 -3 weeks, or longer) starting on or about: \_\_\_\_\_
- Drawdown should end approximately: \_\_\_\_\_
- OR Allow the site to naturally de-water as rainfall decreases over the summer.
- Leave most of the site drained over the summer for natural moist soil plants to grow.
- Allow the shallow water area to gradually refill as waterfowl begin to migrate, starting: \_\_\_\_\_
- Maintain the active feeding area \_\_\_\_\_ inches deep while waterfowl are using the site. Leave the site flooded through the winter.
- Every three years, lightly disk the pool area at the start of the growing season (after drawdown) to encourage growth of annual naturally-occurring moist-soil plants. If undesirable plants become established, disk 2 or 3 times by mid-summer, then immediately flood (if possible) until the following spring.
- If perennial grasses, sedges, and rushes are preferred, then do not disk the site. If needed, spot mow or burn occasionally to reduce encroachment of trees and shrubs, as described above.
- Do not fertilize the moist-soil area. Natural moist-soil plants have low nutrient requirements, and do not need additional fertilizer.

**Additional Recommendations:**