

Bog Turtle (*Clemmys muhlenbergii*) Habitat Maintenance Grazing

Guidance Sheet

November 2011

PURPOSE

For any assistance provided to cooperators by NRCS when the practice may affect listed species, informal or formal consultation, or use of a biological opinion are required. This document provides guidelines, based on an inter-service biological opinion (BO) developed for NRCS and supporting documents, for *maintenance grazing* in bog turtle habitat. Maintenance grazing as described here and in the inter-service BO for NRCS has been determined as *not likely to adversely affect* bog turtles. *Restoration grazing* is not covered in this document because it requires additional criteria and coordination, and may include practices that although beneficial, have the potential for adverse effects on bog turtles.

INTRODUCTION

The northern population of the bog turtle (*Clemmys muhlenbergii*), which ranges from Massachusetts to Maryland, was listed as a federally-threatened species in 1997, and its current state listing in Maryland as a threatened species was established in 1994. Primary threats to the bog turtle are loss, fragmentation, and degradation of its early successional wetland habitat, and illegal collection and trade. Based on documented losses, the northern population has declined by at least 50 percent over the past 20 years. Evidence suggests that grazing has been instrumental in maintaining bog turtle habitat, and that in the absence of grazers (or active habitat management), bog turtle habitat will often decline to the point where it can no longer support viable populations.

Bog turtles are semi-aquatic, and are typically active from April to mid-October, hibernating below the surface of wetlands or near streams the rest of the year. Female bog turtles reach sexual maturity between 5 and 8 years of age, and mating occurs in May and June. Eggs are laid in sedge tussocks or sphagnum moss in May, June, or July, and the young emerge in August or early September. The relatively long life expectancy of bog turtles (40 years or more) can be misleading when attempting to assess population viability, because adults may survive in

degraded habitat, but reproduction may not be successful.

Bog turtles typically inhabit spring-fed wetlands that are dominated by emergent plant species. Critical habitat elements include shallow water, soft mucky bottoms, relatively low grasses and sedges, and an open canopy. Soft mucky bottoms are important for anti-predator defense and hibernation. Open canopy and low grasses and sedges support nesting and basking requirements. For more information on bog turtle life history and conservation, an overview can be found in Smith 2006.



DEFINITIONS

Bog turtle sites – Any site identified by Maryland Department of Natural Resources Natural Heritage Program as known sites, whether currently or historically occupied. Can also include additional previously unidentified sites that contain suitable habitat, and in which bog turtle surveys have revealed that the site is occupied.

Maintenance grazing – Objective is to maintain habitat quality using grazers in a prescribed manner that controls invasion of woody and undesirable plants and maintains desired plant heights, while avoiding adverse impacts to bog turtles and their nest sites. Maintenance grazing may be prescribed after habitat is restored, or on existing habitat that is in good condition.

Restoration grazing – Objective is to restore habitat in a way that utilizes appropriate livestock to remove undesirable species. This type of grazing may be prescribed over a period of 1 to 5 years, depending on the type of livestock, plant species targeted for removal, and existing habitat quality.

GRAZING REGIMES

Continuous Grazing. When livestock are continuously grazed, they are given access to an area for an extended period of time. Extended access to pasture allows livestock to be selective in their forage consumption in terms of both forage type and location. Livestock will typically graze cool season forage in upland areas during spring and fall, and move to lowland areas in summer when upland forage goes dormant and lowland vegetation remains lush. Continuous grazing is the most inefficient method of grazing with respect to livestock use of available forage. In practice, livestock may be obtaining minimal amounts of their nutritional requirements from grazing in a continuous regime, so a large proportion of their requirements are provided by supplemental feed.

Flash Grazing. Flash grazing methods provide livestock access to an area for relatively short periods (usually less than 4 days) on an infrequent basis. In typical practice, a flash grazing prescription requires a high herd density (e.g. 20 AU/ac on 1 paddock) to efficiently and quickly utilize available forage.

Rotational Grazing. In a rotational grazing regime, livestock are rotated amongst paddocks (3 or more) on a regular schedule (usually 1 week or less on a paddock) that is designed and adaptively managed to maintain vegetative cover and promote efficient use and re-growth of forage. Rotational grazing is the most commonly prescribed grazing regime or operations that depend upon pasture forage for production.

Grazing Regimes and Bog Turtles. Historically, most occupied bog turtle sites have been grazed under a continuous grazing regime, suggesting that the inefficiencies of the method are at least partly responsible for maintaining the necessary habitat conditions. Seasonal selection of pasture by livestock when provided continuous access is also suggestive of similarities with flash grazing. Both continuous and flash grazing have been utilized to manage bog turtle



habitat. Rotational grazing can provide important benefits to bog turtle wetlands by reducing pollutants from upland pasture and maintaining

areas of varying vegetation heights. Hence, all three types of grazing may be applied individually or in combination for the benefit of bog turtles. However, prescriptions for flash and rotational grazing for the purpose of bog turtle habitat maintenance differ from those for normal grazing, which emphasize efficient forage use and livestock production.

The grazing prescription criteria in the next section are variations on the typical methods (described above), provided specifically for the needs of the bog turtle. Major differences include herd densities and grazing efficiencies.

CRITERIA FOR MAINTENANCE GRAZING OF BOG TURTLE HABITAT ON PASTURE

The following criteria can be applied to address grazing solely for management of a bog turtle site, or as part of a grazing plan for an operation that includes a bog turtle site. Utilize these criteria for the management units that contain bog turtle habitat and are accessible by livestock. Criteria for three types of grazing – continuous, flash, and rotational – are provided. *Criteria required by the biological opinion (BO) are noted.* Criteria are based on available science, and are subject to change.

Habitat objectives should be determined in coordination with U.S. Fish and Wildlife Service and/or Maryland Department of Natural Resources prior to development and implementation of a maintenance grazing plan. Managers should make assessments prior to implementing grazing to determine the duration and intensity required to attain habitat objectives. Once grazing has been initiated, managers should conduct site monitoring and utilize adaptive management techniques. Site visits should be scheduled to evaluate habitat conditions prior to the time at which site conditions may become degraded, and management decisions can be altered accordingly. Habitat objectives may need to be re-assessed during and after grazing.

The *Rotational Grazing Worksheet* provided as an attachment to this document can help managers assess grazing requirements. The worksheet can also be a useful tool for communicating to landowners and operators the grazing limitations (e.g. grazing rotation of 30 days on/30 days off) and operational changes (e.g. access control) that may be required as a result of agreeing to manage bog turtle habitat.

CRITERIA APPLICABLE TO ALL GRAZING METHODS

- Exclude large livestock (e.g. cattle, horses) from known and potential nesting sites during the bog turtle nesting season (June 1 to September 30). Controlled livestock access to the nesting site should be maintained via a gate or other such device for periodic maintenance. When nesting locations are known, the area of exclusion usually consists of a small fraction of the management unit (< ¼ ac). *Contact the Maryland Department of Natural Resources, Natural Heritage Program for nest location information. REQUIRED BY BO*
- Remove livestock from the management unit when forage heights meet a minimum threshold, and return livestock only after a specified amount of forage re-growth is attained. The minimum forage heights for the wetland vegetation are different than for typical forages due to the requirements of the bog turtle. Ideally, a pastured bog turtle wetland will consist of a mosaic of vegetation ranging from 10 to 36 inches. The majority of the vegetation should not be grazed below 12 inches. As a rule of thumb, livestock should be removed when 50 percent of the vegetation has been grazed to a height of 12 to 16 inches. The remaining vegetation may be grazed lower, but not to less than 6 inches. Vegetation should be allowed to reach a height of 18 inches or more before grazing resumes. Ideally, undesirable vegetation, such as reed canarygrass, would be grazed much lower than 12 inches, but this is generally not practical where a matrix of desirable and undesirable vegetation exists. (Tesauro, personal communication)
- For the calculation of available forage in the wetland area, consider the proportion of the wetland that the grazers will utilize for foraging. (e.g. Only include areas of herbaceous vegetation for cows, even though the wetland contains a mixture of herbaceous and woody vegetation.)
- When possible, exclude livestock from streams.
- Exclude livestock from known locations of rare, threatened and endangered plant species.
- If installing fence, site fence posts in uplands whenever possible. Within the wetland area, small diameter fence posts (≤ 1 inch), typically used for partitioning of paddocks, may be installed or

relocated by hand placement. Installation of larger fence posts in the wetland area requires a *monitoring biologist and coordination with the Endangered Species Program of the U.S. Fish and Wildlife Service. REQUIRED BY BO*

- Do not use heavy equipment in the wetland area. The use of heavy equipment for fence installation and other measures is considered to have the potential to adversely affect bog turtles, and as such requires additional avoidance and conservation measures as described in the BO.
- Document the grazing criteria in the conservation and/or management plan, and inform landowners and operators of the grazing density restrictions that are required to avoid adverse effects on bog turtles. **REQUIRED BY BO**

CRITERIA APPLICABLE TO CONTINUOUS GRAZING

- Limit grazing density on the management unit to 0.75 animal units (AU) per acre. **REQUIRED BY BO**
- During the bog turtle nesting season, provide livestock with access to upland pasture at a ratio of 2 acres of upland for every 1 acre of wetland. **REQUIRED BY BO**

CRITERIA APPLICABLE TO FLASH GRAZING

- Limit grazing density on the management unit to 1 animal unit (AU) per acre. **REQUIRED BY BO**
- Limit use of the pasture to periods during the growing season when upland pasture is typically stressed or dormant (i.e., July – September).
- Limit the number of rotations on any one management unit to 2 times during the growing season.
- Provide livestock with access to an upland pasture area of a minimum size equal to 10 percent of the wetland area.
- Provide a minimum of 30 days rest for wetland vegetation re-growth between rotations.
- Use the *Bog Turtle Habitat Maintenance Rotational Grazing Worksheet* (Attachment 1) to estimate the number of animals and days per rotation for the livestock type.

CRITERIA APPLICABLE TO ROTATIONAL GRAZING

- Limit grazing density on the management unit to 0.75 animal units (AU) per acre. **REQUIRED BY BO**
- Provide livestock with access to an upland pasture area of a minimum size equal to 10 percent of the wetland area.
- Provide a minimum of 30 days rest for wetland vegetation re-growth between rotations.
- Use the *Bog Turtle Habitat Maintenance Rotational Grazing Worksheet* (Attachment 1) to estimate the number of animals and days per rotation for the livestock type.

REFERENCES

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Prepared by Steve Strano, NRCS Maryland State Biologist, and reviewed by Julie Slacum, USFWS, Scott Smith, MDNR-NHP, and Jason Tesauro. This guidance document was developed for use by NRCS Maryland and its partners. Legal authority by NRCS for *Clemmys muhlenbergii* is neither intended nor should be inferred. The status of *Clemmys muhlenbergii* as a threatened species under the Endangered Species Act and Maryland state law extends legal responsibility for protection of the species to the U.S. Fish and Wildlife Service and the Maryland Department of Natural Resources.

BOG TURTLE HABITAT MAINTENANCE ROTATIONAL GRAZING WORKSHEET

Calculation: Determine days per rotation.

1. Determine available acres for grazing in bog turtle management unit. Mgmt Unit Size = _____ ac (including associated upland area in the management unit)
2. Calculate equivalent number of animals that can be grazed on management unit:
 - a. From the grazing criteria, select the number of animal units per acre. AU/ac = _____ (1 AU/ac for flash grazing; 0.75 AU/ac for rotational grazing)
 - b. From table 2, select the animal unit equivalent for the type of livestock. AUE = _____
 - c. Calculate number of animals: No. of Animals = (Mgmt Unit Size x AU/ac) / AUE = _____
 - d. Round number of animals to nearest integer. No. of Animals = _____ (integer)
3. Convert number of animals (rounded to nearest integer) to animal units:
Total AU's = No. of Animals x AUE = _____ AU's
4. From table 3, determine forage availability per rotation. Available Forage = _____ lb/ac/rotation
5. Using table 1, determine daily forage intake rate. Forage Intake Rate = _____ lb/AU/day
6. Assume a grazing efficiency of 0.30. This efficiency rate has been adjusted down from typical rates (0.35 – 0.55) to maintain necessary habitat elements and vegetative structure.
7. Calculate days per rotation using the following equation:

$\text{Days per Rotation} = \frac{\text{Available Forage (lb/ac/rotation)} \times \text{Mgmt Unit Size (ac)} \times \frac{0.30}{\text{Grazing Efficiency}}}{\frac{\text{Forage Intake Rate (lb/AU/day)} \times \text{Total AU's}}{\text{AU}}} = \text{_____ days}$
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Example Calculation

Livestock type = dairy heifers, average annual hay yield = 3.0 tons/ac/yr, grazing regime = rotational

1. Mgmt Unit Size = **5 ac** (includes 10% upland)
2. Number of animals that can be grazed:
 - a. For rotational grazing, use 0.75 AU/ac
 - b. AUE = 0.92
 - c. No. of Animals = (5 ac x 0.75 AU/ac) / 0.92 AUE = 4.07 animals
 - d. Rounded(4.07) = **4 animals**
3. Total AU's = 4 animals x 0.92 AUE = **3.7 AU's**

4. Available Forage = **1,200 lb/ac/rotation**
5. Forage Intake Rate = **30 lb/AU**
6. Grazing Efficiency = **0.30** (assumed)
7. Calculation:

$$\text{Days per Rotation} = \frac{\frac{1,200 \text{ lb/ac/rotation}}{\text{Available Forage}} \times \frac{5.0 \text{ ac}}{\text{Mgmt Unit Size}} \times \frac{0.30}{\text{Grazing Efficiency}}}{\frac{30 \text{ lb/AU/day}}{\text{Forage Intake Rate}} \times \frac{3.7 \text{ AU}}{\text{Total AU's}}} = \underline{16.2 \text{ days}}$$

Table 1. Average Daily Forage Intake for Typical Livestock

Livestock Type	Forage Intake Rate (lb/AU/day)
Lactating Dairy Cow	35
Stocker Cattle, Dairy Heifers	30
Beef Cow/Calf, Swine, Horses	26
Sheep, Goats	37

Table 2. Average Animal Unit Equivalents (1 AU = 1000 lb)

Animal Type	AUE	Animal Type	AUE
Heifer/Dry Cow	0.92	Sheep, mature	0.20
Lactating Holstein	1.50	Lamb, 1-yr old	0.15
Lactating Jersey	0.90	Goat, mature	0.15
Beef Cow/Calf	1.00	Kid, 1-yr old	0.10
Bull, Mature	1.35	Deer	0.15
Cattle, 1-yr old	0.60	Elk, mature	0.60
Cattle, 2-yr old	0.80	Bison, mature	1.00
Horse, Mature	1.25		

Table 3. Estimated Forage Production per Rotation.

Based on average annual hay yield. For wetland vegetation, can assume 3.0 tons/ac/yr, if not otherwise known.

Hay Yield (tons/ac/yr)	Forage (lb/ac/rotation)
4.0	1600
3.5	1400
3.0	1200
2.5	1000
2.0	800