13.4.4. Habitat Management for Molting Waterfowl

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The ecology, behavior, and life history strategies of waterfowl are inseparably linked to that unique avian attribute, feathers. Waterfowl rely on flight capabilities to migrate, to fully exploit the resources of wetland and upland communities, and to escape life-threatening events. The insulation provided by contour and down feathers allows waterfowl to use a wide range of habitats and protects them from temperature extremes. Plumage is important not only for species recognition during courtship, but also for cryptic coloration of females during incubation. However, feathers become worn and must be periodically replaced. The process of feather renewal, or molt, is a critical event in the lives of birds. Despite the obvious importance of the molt, relatively little attention has been devoted to managing waterfowl during this period.

Unlike most birds, ducks, geese, and swans share the unusual trait of a complete, simultaneous wing molt that renders them flightless for 3 to 5 weeks during the postbreeding period. Concurrently, these waterfowl also renew their tail and body feathers. In addition to this postbreeding molt, ducks undergo a second yearly molt to renew all but their flight feathers. Here, I describe the nutrition, energetics, and management of molting adult ducks and geese, with emphasis on the period of molt when birds are flightless.

Nutrition and Energetics

Dry waterfowl feathers are about 86% protein. Large amounts of sulfur amino acids, mainly cystine, are required for the production of keratin, the protein constituent of feathers. In addition, the net energetic efficiency of feather synthesis is only 6.4%. This combination of low conversion efficiency, overall high protein demand, and specific amino acid requirements causes molt to be nutritionally and energetically costly.

The source of protein used in feather synthesis has important implications for habitat management. Most waterfowl lose weight during the flightless period and also experience changes in digestive organ and muscle masses. Such changes are attributable to diet and conversion of muscle protein to amino acids used in feather synthesis. It is now believed that waterfowl use a mixed strategy of muscle protein reserves and high protein foods for feather synthesis. Although there is a primary dependence on foods, internal reserves provide a buffer against periods of high protein demand or food shortage. Proper habitat management for molting waterfowl must therefore focus on providing sufficient high-protein, green forage for geese and herbivorous ducks, as well as providing aquatic invertebrates for most dabbling and diving ducks.

Molting Habitat: When and Where?

Molt chronology varies among species (Fig. 1) and is ultimately regulated by the number of daylight hours and hormonal changes. Geese and

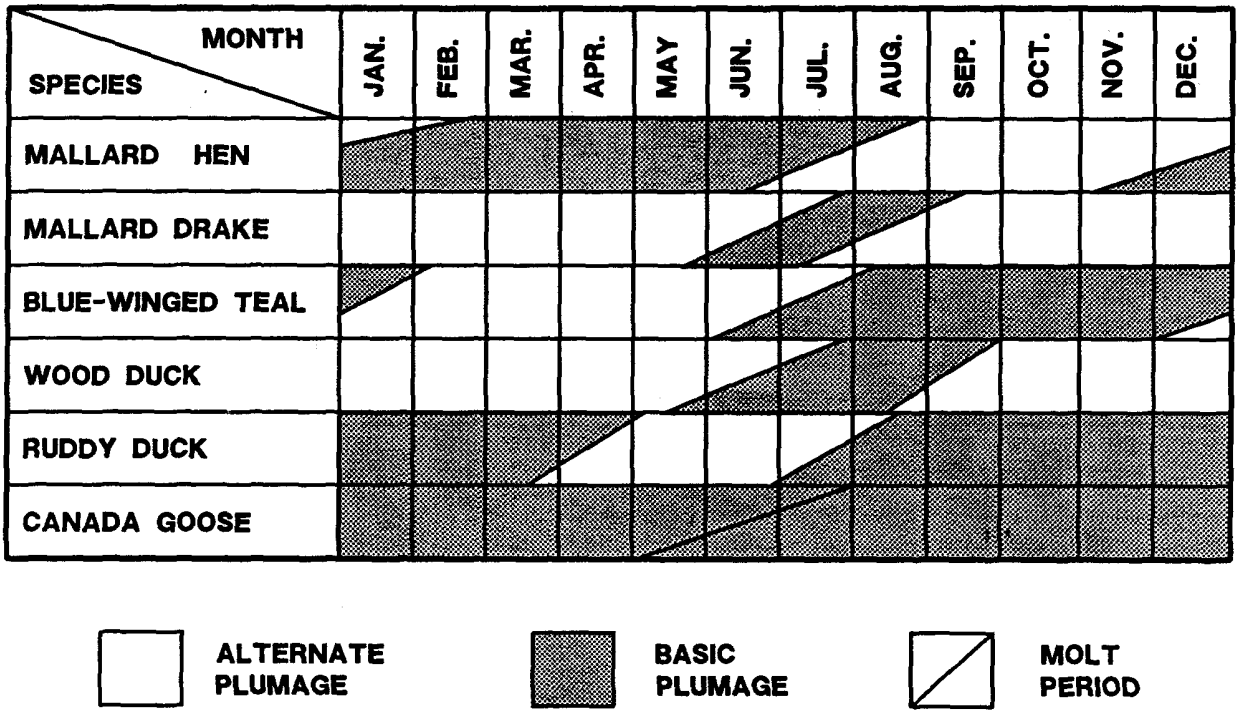

Fig. 1. Annual molt chronology of representative North American waterfowl (after Weller 1976). Molt patterns are for adult male waterfowl unless otherwise noted.

swans undergo a single, complete molt during the postbreeding period. Yearling birds and unsuccessful nesters make up the initial molting groups, followed shortly thereafter by adults with broods. Adults regain flight capabilities about the time goslings fledge. Duck plumages and molts are more complex than those of geese. Males acquire bright breeding ("alternate") plumage in fall and retain this plumage until after the breeding season. Thereafter, males molt into "basic" or "eclipse" plumage that is retained from midsummer into early fall. Most females begin postbreeding molt on northern breeding grounds and may complete this molt during migration or on wintering grounds. This plumage is worn until late winter or early spring, when they molt into basic plumage that is retained throughout the nesting period. The total duration of each molt is 6 to 7 weeks.

The timing of the flightless period for ducks depends on when a species nests and, for males, the length of time they remain with their hen before joining molting groups (Fig. 2). As with geese and swans, nonbreeding individuals or females that nested unsuccessfully molt early. Hens that nest successfully, or that unsuccessfully attempt to renest molt later. Unlike most males, late-molting females often do not join large molting groups but instead prefer to molt singly or in small groups. They also tend to use smaller wetlands near their breeding habitat. Thus, molt chronology and habitat use are partially regulated by phenological considerations such as an early spring versus a late spring, wetland abundance and permanency, and other conditions that influence nest success. Similarly, nutrient reserves and perhaps pairing status can affect the timing of prebasic molt on wintering grounds.

Individual ducks and geese often undergo postbreeding molt on wetlands used in previous years. Some of this traditional use may result from homing to nesting areas and subsequent use of nearby wetlands for molting. However, many waterfowl migrate hundreds of miles to traditional molting sites, suggesting that such wetlands possess unique attributes that make them ideal for molting birds. Although these attributes are largely unknown, some unique features are apparent, and generalized food and habitat requirements of some species have been described (Table). The common needs of all molting waterfowl are wetlands, adequate food resources, and security from predators and disturbance.

Geese and most ducks tend to concentrate on large, semipermanent or permanent wetlands during molt. These wetlands often provide large ex-

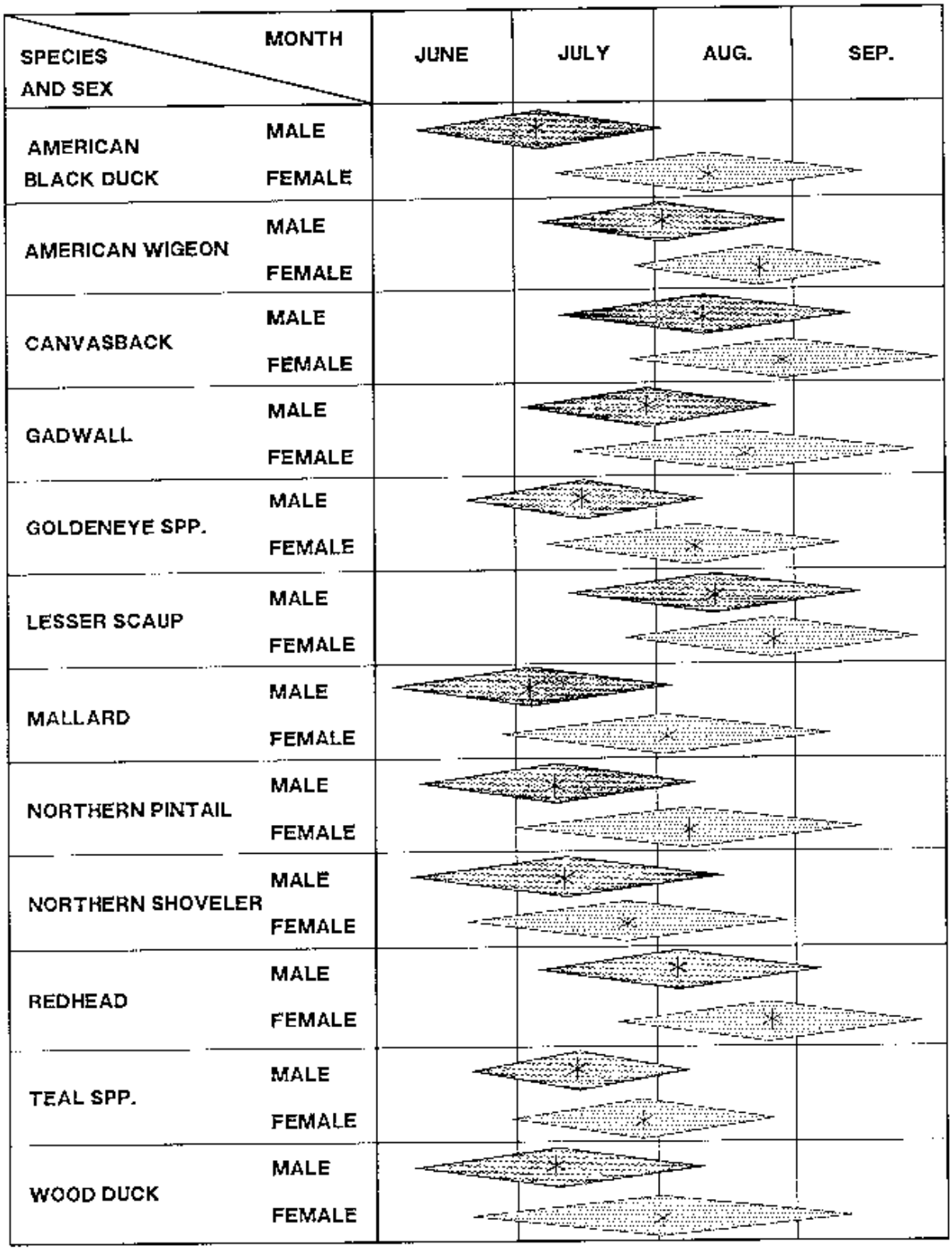

Fig. 2. Timing and duration of the flightless period for some North American ducks. Chronology is representative of individuals breeding at 45° north latitude and may vary according to location, phenology, and local nesting conditions. *Asterisks* denote the approximate time at which most birds are flightless.

Table. *Generalized habitat use, behavior, and food habits of selected duck species during the flightless period.*

Species	General habitat use and behavior	Food habits
American black duck	Flooded shrubs and emergents in inland habitats; tidal marshes and estuaries in coastal habitats. Rarely observed when flightless on inland areas	Omnivorous
American wigeon	Open water of large or medium-sized wetlands. Feeds in open water on submergent plants; loafs on shorelines	Herbivorous
Blue-winged teal	Extensive beds of cattail, bulrush, and other emergents	Omnivorous
Canvasback	Open-water portions of large lakes. Attracted to Sago pondweed. Seeks resting sites and security in open water	Omnivorous
Common goldeneye	Open water of large lakes	Mostly carnivorous
Gadwall	Same as American wigeon	Herbivorous
Lesser scaup	Same as canvasback	Mostly carnivorous
Mallard	Marshes with concealing cover, such as cattail, bulrush, or shrubs. Rarely observed during flightless period	Omnivorous
Northern pintail	Same as mallard. Often occurs in association with mallards	Omnivorous
Northern shoveler	Similar to teal and other dabbling ducks	Carnivorous—zooplankton
Redhead	Open-water portions of large lakes. Seeks resting sites and security in open water	Herbivorous—submergent vegetation
Wood duck	Swamps, wooded ponds, and marshes with abundant, dense cover	Omnivorous

panses of open water as well as emergent vegetation such as cattail and bulrush. Although open water and vegetative cover would seem to address different habitat needs, both may provide molting waterfowl with a sense of security. When rendered flightless, diving ducks seek escape from predators in open water. Geese, which traditionally prefer open nesting sites that enable them to quickly detect predators, may select open-water molting areas for the same reason. Mallards and most other carnivorous or omnivorous dabbling ducks seem to prefer thick, emergent vegetation for hiding. Wetlands used for molting also commonly possess islands or shorelines devoid of vegetation. Such areas enable waterfowl to rest out of water, yet provide open visibility to detect approaching predators.

Vegetation Management

Aquatic vegetation provides shelter, habitat for aquatic invertebrates, and green forage for molting waterfowl. Flooded, robust emergent species such as cattail, bulrush, or tall sedges are most desirable; however, any patch of flooded emergent vegetation may be used by molting birds. Most permanent wetlands contain bands of emergents around their periphery or in patches in shallow areas. Because seed banks usually contain an abundance of emergent plant seeds, spring and summer drawdowns may be used to encourage germination of robust emergents and moist-soil plants. If drawdowns are not possible and water depth exceeds 3 feet, fill may be added to create shallow areas necessary to establish and propagate emergent plants. In some instances, fish may compete with molting waterfowl for aquatic invertebrate foods, or rough fish such as carp may increase water turbidity, thereby reducing the abundance of submerged vegetation. Control of fish populations may be needed to correct such conditions.

Large wetlands often contain flooded emergents that occupy too much of the wetland basin. In such cases, control measures should be initiated to increase the open water to vegetation ratio to between 50:50 and 70:30, which are proportions attractive to many molting waterfowl. Canada geese are attracted to wetlands that have an open water to vegetation ratio of 90:10 or higher. Vegetation control is often achieved by drawdowns, followed by cutting or other mechanical or chemical control of vegetation, then subsequent reflooding during the growing season.

Many aquatic invertebrates are dependent on the microscopic organisms (periphyton) that attach to underwater substrates. To thrive, periphyton must have a rich nutrient base. Periodic drawdowns, every 3–5 years in most wetland systems, delay natural wetland succession, release nutrients through aerobic decay, allow seed

germination, and promote the establishment of emergent vegetation by compacting the bottom substrate. Periphyton and allied invertebrate populations often increase markedly after drawdowns, thereby increasing the availability of high protein foods needed by many molting ducks.

Sedges, rushes, grasses, and other herbaceous plants all provide natural green forage for molting geese. Increasingly, geese also rely on Kentucky bluegrass, alfalfa, and other cultivated plants as a source of protein. Because geese extract only the readily soluble compounds from green forage, and often feed selectively on new shoots or other highly nutritious parts of plants, large quantities of forage are needed to provide the nutrients necessary for feather synthesis. Moreover, molting adults and goslings often compete for the same food resources, further increasing the demand for forage. Insufficient forage may result in gosling mortality, because young birds are at a disadvantage when competing with adults. Food plots of alfalfa, wheat, rye, or other forage should be established in instances where wetlands used for molting do not have sufficient forage within 200 yards.

Controlling Disturbance

Postbreeding Molt

Tolerance to human disturbance varies by species and exposure to human activities. Although no species of waterfowl is oblivious to disturbance, molting Canada geese can coexist with people provided that close approaches and direct harassment are avoided. Molting ducks, however, are less tolerant. Boaters and anglers may be particularly disruptive, causing birds to become more alert and evasive, thereby reducing foraging time and efficiency while increasing energy devoted to swimming and escape. Disturbance may also relegate flocks to suboptimal habitats where they are less secure from predators. Fortunately, many waterfowl seem to confine their activities to portions of large wetlands during the flightless period. Once such areas are delineated through field observations, human effects can be minimized through area closures that are delineated by buoy markers or landmarks. The behavior of molting birds and annual trends in molting populations are good measures of the success of such closures. Excessive alert or avoidance behavior, or annual declines in the population of molting birds are indications of adverse reactions to disturbance.

The timing of protection from disturbance depends partly on the time needed to grow new flight feathers. The growth rate of flight feathers increases with body size, generally at a rate of 0.08 inches per day per pound of body weight. However, because wing length increases with body mass, the duration of the flightless period ranges from 25 to 32 days for all waterfowl. Most waterfowl are able to fly when their primary feathers are 75 to 85% of their final length. However, because species and sexes molt asynchronously, protection from disturbance should extend from the time that the earliest species begins incubation (assuming that breeding birds molt locally) until 3 weeks after the young of the latest-nesting species begin flying (Fig. 2). When geese and ducks are present in a mixed population, this period of protection would extend over 3.5 months.

Prebasic Molt

Unlike northern wintering populations, in which species such as mallards undergo prebasic molt during January–March, ducks in southern populations begin molt in early winter, with paired birds appearing to molt earlier than unpaired individuals. When habitat conditions are favorable and food resources plentiful, prebasic molt occurs in early winter. Disturbance to ducks during prebasic molt has caused some southern States to consider restructuring hunting seasons to reduce the effects on paired and molting birds. The concern, which has not been substantiated, is that hunting disturbance may disrupt the formation of pairs, retard molt, and reduce foraging efficiency. In turn, these effects may delay the acquisition of nutrient reserves needed for migration and reproduction, and generally retard the biological timetable of affected individuals. In addition to manipulating hunting seasons and area closures, the strategies for minimizing disturbance during prebasic molt are similar to those described for the postbreeding molt.

The Need for Habitat Preservation

Knowledge of the habitat requirements and nutritional demands of molting waterfowl is far from complete. We do recognize that during the flightless period, waterfowl are completely dependent on the resources of a single wetland for about 1 month. The fact that some waterfowl undertake molt migrations of hundreds of miles, while bypassing myriad other seemingly “suitable” wetlands along the way,

suggests that wetlands used by molting waterfowl possess unique qualities that we do not yet recognize. Until we better understand the features that make such areas suitable for molting birds, such habitats should be protected or managed with care.

Suggested Reading

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Appendix. List of Common and Scientific Names of Plants and Animals Named in Text.

Plants	
Sedges	*Carex* spp.
Rushes	*Juncus* spp.
Alfalfa	*Medicago sativa*
Kentucky bluegrass	*Poa pratensis*
Sago pondweed	*Potamogeton pectinatus*
Bulrush	*Scirpus* spp.
Rye	*Secale cereale*
Wheat	*Triticum* spp.
Cattail	*Typha* spp.
Animals	
Wood duck	*Aix sponsa*
Northern pintail	*Anas acuta*
American wigeon	*Anas americana*
Northern shoveler	*Anas clypeata*
Blue-winged teal	*Anas discors*
Mallard	*Anas platyrhynchos*
American black duck	*Anas rubripes*
Gadwall	*Anas strepera*
Lesser scaup	*Aythya affinis*
Redhead	*Aythya americana*
Canvasback	*Aythya valisineria*
Canada goose	*Branta canadensis*
Common goldeneye	*Bucephala clangula*
Ruddy duck	*Oxyura jamaicensis*

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