Chapter 3

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Impact of Invasive Aquatic Plants on Waterfowl

Introduction

Studies that evaluate the relationship between waterfowl and aquatic plants (native or nonnative) usually focus on the food habits and feeding ecology of waterfowl. Therefore, the purpose of this chapter is to describe the dynamics of waterfowl feeding in relation to aquatic plants. The habitats used by waterfowl for breeding, wintering and foraging are diverse and change based on the annual life cycle of the waterfowl and seasonal conditions of the habitat. For example, waterfowl require large amounts of protein during migration, nesting and molting and they fulfill this requirement by consuming aquatic invertebrates. A strong relationship exists between high numbers of aquatic invertebrates and diverse aquatic plant communities, so diverse plant communities play an important role in waterfowl health by hosting the invertebrates needed to subsidize waterfowl migration, nesting and molting. After all, waterfowl native to the US have evolved alongside diverse plant communities that are likewise native to the US and utilize these plants to meet their energy needs. Metabolic energy demands of waterfowl are high during the winter months, so waterfowl need foods that are high in carbohydrates such as plant seeds, tubers and rhizomes during winter. Many ducks will sometimes abandon aquatic plant foraging while on their wintering grounds and feed instead on high-energy agricultural crops such as wheat, corn, rice and soybeans.

The nutritional requirements of waterfowl have historically been met in shallow lakes and wetlands where diverse aquatic plant growth is abundant. It is therefore important to understand the interactions between waterfowl and aquatic plants in order to provide quality habitat throughout migration corridors. The abundance and availability of quality habitat with adequate food, cover and water is the most important ecological component affecting waterfowl populations. In order to support waterfowl health, breeding and survival, the maintenance of quality habitats is crucial so that waterfowl have access to foods they prefer instead of having to feed on what is available.

The preferred food habitats and feeding ecology of waterfowl differ based on the group of waterfowl (i.e., dabbling ducks, diving ducks, or geese and swans). For example, dabbling ducks (also called puddle ducks) vary greatly in size and "tip up" during feeding. Their feeding is constrained by how far their necks can reach into the water column (12 to 18") and depth of the water, so dabbling ducks prefer habitats with shallow water and/or moist soil. Diving ducks typically dive (as their name

implies) to feed on benthic organisms such as clams and snails or to forage in sediments for tubers and rhizomes of aquatic plants. Geese and swans are the largest of the waterfowl and typically consume more plant material than dabbling ducks and divers; however, as the availability of natural habitats is diminished, geese and swans have shifted from primarily feeding in wetlands to extensive grazing in agricultural areas.

Dabbling (puddle) ducks

Dabbling waterfowl include such species as the mallard (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), green-winged teal (*Anas crecca*), wood duck (*Aix sponsa*), gadwall (*Anas strepera*), northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*) and American widgeon (*Anas americana*). Most dabbling species are non-selective in their feeding habits and feed primarily on aquatic or moist-soil vegetation that is abundant in a given location. Dabblers will alter their diets as necessary to take advantage of food resources that are available and abundant. Food selection by dabbling ducks often changes based on the season and energy requirements of the waterfowl. Protein is important during spring and summer to ensure breeding success, so invertebrates are critical components in the diet of dabbling waterfowl during these seasons. In late fall and winter, dabblers consume plant material that is high in carbohydrates so they can maintain energy levels and generate body heat throughout the winter months. Dabbling waterfowl utilize submersed plant species as carbohydrate sources to fulfill their energetic demand. Most consume seeds as their primary food source, but some species (mainly widgeon and gadwall) use vegetative parts of plants as well. Also, the specialized bill structure of the shoveler, or spoonbill, allows for sifting and consumption of planktonic algae, which are high in carbohydrates.

Submersed plant communities play important roles in the annual life cycle of dabbling waterfowl. These communities are a direct source of food and also serve as an environment that supports a diversity of aquatic invertebrates. The primary submersed aquatic plants consumed by dabblers are the native pondweeds (*Potamogeton* spp. and *Stuckenia* spp.). The fruits, seeds, starchy rhizomes and winter buds of these species are favored carbohydrate sources for dabbling waterfowl, and sago pondweed (*Stuckenia pectinata*) is reportedly one of the food plants most sought after by these waterfowl. Sago pondweed is likely the single most important waterfowl food plant in the US and often accounts for a significant proportion of the food consumed by fall staging waterfowl, pre-molting waterfowl, flightless molting waterfowl and ducklings.

Diverse plant communities with a wide variety of submersed, floating and emergent plants have more architectural structure and habitat for invertebrates, which results in a greater selection of food sources for dabbling waterfowl. Water bodies that are infested with nonnative species such as hydrilla (Chapter 13.1), Eurasian watermilfoil (Chapter 13.2) and curlyleaf pondweed (Chapter 13.7) lack the habitat complexity required to support diverse invertebrate communities and are not preferred feeding areas for dabbling waterfowl. These nonnative species form dense canopies at the surface of the water, reduce native plant diversity and reduce the carrying capacity of the ecosystem. Also, if large portions of the littoral zones of several water bodies within an area are infested with nonnative plants, waterfowl may be required to continually move in search of adequate forage and resting areas. This constant movement results in poor body condition since high expenditures of energy impact wintering, migration and/or breeding fitness. Birds that are in poor body condition when returning to northern breeding grounds may have reduced nesting success or may not nest at all. Some dabbling ducks such as the wood duck nest in tree cavities, whereas other dabbling waterfowl nest in upland prairie habitat, so nonnative emergent plant species such as purple loosestrife (Chapter 13.6) and

phragmites (Chapter 13.9) would not impact nest site selection for dabblers as it does for some diving species of waterfowl. However, if shallow wetlands and moist-soil areas become infested with invasive emergent weeds, the quality of food and refuge habitat for ducklings and molting waterfowl could be diminished during summer months and could ultimately reduce survival. For example, ducklings and smaller species of dabbling waterfowl such as blue and green-winged teal feed in moist soil and in areas where water depths do not exceed 8 to 12 inches. As a result, dense infestations or monotypic stands of invasive weeds can limit foraging efficiency and food quality for these ducks.

Diving ducks

Common diving ducks in North America include canvasback (*Aythya valisineria*), redhead (*Aythya americana*), lesser scaup (*Aythya affinis*), greater scaup (*Aythya marila*), ring-necked duck (*Aythya collaris*), bufflehead (*Bucephala albeola*) and common goldeneye (*Bucephala clangula*). Sea ducks and mergansers will not be discussed because sea ducks are rarely observed on inland waters and mergansers mainly consume fish.

The diet structure of diving ducks is similar to that of dabbling waterfowl because diving ducks also rely on aquatic plants, their diet alternates with the annual life cycle of the birds and food selection is influenced by gender. Female diving ducks typically consume more invertebrates during nesting, incubation and brood rearing to maintain the protein and fat stores that result in good body condition. In contrast, male diving ducks (particularly older juvenile and adults) tend to consume more plant material. Canvasback ducks feed primarily on seeds and tubers of pondweeds and the native submersed plant vallisneria (*Vallisneria americana*), from which the bird takes part of its Latin name. Vallisneria is widely distributed and is considered the most important food source for canvasback ducks. Displacement of native vallisneria by invasive plants such as Eurasian watermilfoil or hydrilla will impact canvasback foraging behavior and can lead to annual fluctuations in canvasback populations. Canvasback numbers could decline or expand depending on the quality and abundance of vallisneria-dominated communities, which is linked to competition with invasive plants. Pondweeds are also very important food sources for redhead and ring-necked ducks, but these two species forage in shallow-water areas more frequently than other types of diving waterfowl and therefore consume a diversity of plant material. Ring-necked ducks feed heavily on wild rice (*Zizania palustris*), coontail (*Ceratophyllum demersum*), sedges (*Carex* spp.), rushes (*Scirpus* spp.) and the seeds and tender submersed shoots of the floating plant watershield (*Brasenia schreberi*). However, divers such as ring-necks are highly adaptive foragers and will reportedly feed on hydrilla tubers if hydrilla populations are abundant on their wintering grounds, particularly in large inland water

bodies in Florida. The two species of scaup generally consume more invertebrates than plant matter, but plants do become important to scaup during fall and winter. With the exception of the ring-necked duck, all diving waterfowl will readily switch to feeding on mussels and clams in southern wintering grounds if plant material is limited.

Nonnative submersed weeds such as hydrilla, Eurasian watermilfoil and curlyleaf pondweed would also have an impact on feeding activities of diving waterfowl. Since native pondweeds comprise a considerable portion of the food consumed by diving waterfowl, any reduction in the abundance or richness of these native plant species would have an adverse impact on waterfowl in that area. Diving waterfowl will reportedly consume the seeds of Eurasian watermilfoil and tubers of hydrilla; however, these observations were reported in areas heavily infested with these weeds and waterfowl were forced to forage on dense stands of these exotic plants, as their preferred native species were unavailable. It should also be noted that some propagules such as seeds can pass through the digestive tract of waterfowl and still be viable. Even if waterfowl utilize nonnative plants as food sources, this may result in long-distance dispersal and spread of aquatic weeds to other areas of the country. Water bodies should be managed to promote the growth of a diversity of native aquatic plants because these are most utilized by diving waterfowl and they provide habitat for greater numbers and species of invertebrates.

Diving species of waterfowl also require emergent aquatic plants for nesting habitat. Canvasbacks and redheads nest almost exclusively above the water in specific types of vegetation. Hardstem bulrush (*Scirpus acutus*), cattails (*Typha* spp.), bur-reed (*Sparganium* spp.) and sedges that extend 1 to 3 feet above the water surface are preferred habitat for nesting. These plant species generally have more succulent and flexible stems that waterfowl can manipulate for nest construction. Nonnative plant species such as purple loosestrife and phragmites have hardened, woody stems that do not support waterfowl nesting. Purple loosestrife and phragmites will also outcompete native plants preferred for nesting, which further reduces breeding habitat that is becoming scarce due to pressure from human development and agricultural practices.

Geese and swans

Geese (Canada, snow and white-fronted) are primarily vegetarian and have shifted their feeding ecology toward agricultural grains and/or green-fields, including golf courses and parks. For example, corn and wheat have provided the majority of food for migrating and wintering Canada geese in recent decades and rice is frequently consumed by geese in the southern US. When agricultural grains become scarce in late winter, geese will feed on the green tissue of native moist-soil plants such as millets (*Echinochloa* spp.), smartweeds (*Polygonum* spp.), cut-grasses (*Leersia* spp.) and spike rushes (*Eleocharis* spp.). This switch in food sources also corresponds to times when crude protein is needed

for migration and nesting. Swans are also primarily vegetarian but feed on aquatic plants more than do geese. The diets of swans are based primarily on wigeongrass (*Ruppia maritima*), pondweeds and vallisneria during the winter months, but swans will forage in agricultural fields, golf courses or urban lawns when populations of aquatic plants are depleted.

Summary

Dabbling ducks, diving ducks, geese and swans are generalists and will consume the food sources available in a given area. Waterfowl prefer to forage and rest in shallow-water habitats that support diverse communities of submersed plants, including nonnative species. However, waterfowl usually prefer native species of aquatic and moist-soil plants to nonnative, invasive vegetation. Dabbling waterfowl prefer seeds of smartweed, millet, pondweeds, sedges and rushes, as well as invertebrates that typically thrive in association with these plants. Although waterfowl will utilize nonnative plants, these species are generally not preferred and are consumed only because they are locally abundant. Diving ducks such as canvasbacks and redheads rely heavily on pondweeds and vallisneria, but nonnative aquatic weeds such as Eurasian watermilfoil, hydrilla and curlyleaf pondweed can outcompete and reduce the presence of these valuable and desirable native plants. Furthermore, dense infestations of nonnative emergent species such as purple loosestrife and phragmites reduce the already-dwindling nesting habitat for many waterfowl species. North American waterfowl have evolved and thrive in habitats that support a variety of diverse native aquatic plants and management should focus on removing monotypic stands of nonnative plants to promote native plant growth.

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