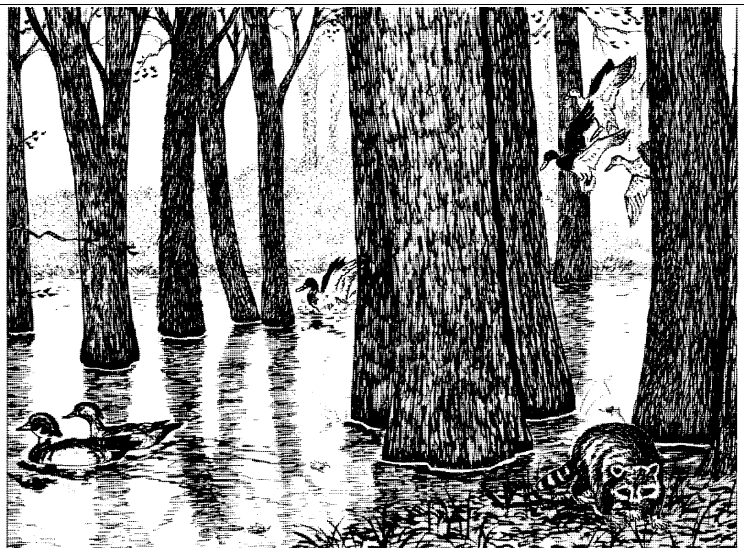

13.4.3. Managing Agricultural Foods for Waterfowl

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Agriculture, more than any other human activity, has had a profound influence on North American waterfowl. Most agricultural effects have been detrimental, such as the conversion of grassland nesting cover to cropland, the widespread drainage of wetlands, and the use of pesticides that may poison waterfowl or their food. However, some by-products of agriculture have been beneficial, particularly grain or other foods left as residue after harvest. Many waterfowl are opportunistic feeders, and some species such as Canada geese (*Branta canadensis*), snow geese (*Chen caerulescens*), mallard (*Anas platyrhynchos*), northern pintails (*A. acuta*), and green-winged teal (*A. crecca*) have learned to capitalize on the abundant foods produced by agriculture. During the last century, migration routes and wintering areas have changed in response to these foods. Some species have developed such strong traditions to northern wintering areas that many populations are now dependent on agricultural foods for their winter survival.

Their relatively large body size enables waterfowl to store fat, protein, and minerals for later use. These reserves can then be mobilized for egg formation, migration, molt, or in times of food shortage. Although strategies for depositing and using nutrient reserves differ among species, and are necessarily dependent upon seasonal availability of foods, waste grains are among the most extensively exploited food resources. Arctic-nesting snow geese, for example, feed extensively in agricultural fields during their northward migration. Their ability to exploit croplands has been largely responsible for dramatic population increases in this species. Clutch size and perhaps nesting dates of mallards and other early-nesting ducks are thought to be directly related to the amount of reserves obtained on their wintering grounds.

During breeding and molting periods, waterfowl require a balanced diet with a high protein content. Agricultural foods, most of which are neither nutritionally balanced nor high in protein, are seldom used during these periods. However, during fall, winter, and early spring, when vegetative foods make up a large part of the diet, agricultural foods are preferred forage except in arctic and subarctic environments. Waterfowl management during these periods is often directed at small grain and row crops. Corn, wheat, rice, barley, oats, peas, sorghum, rye, millet, soybeans, and buckwheat are commonly planted as waterfowl foods. The species and varieties suitable for a particular area, as well as the seeding and cultivation techniques necessary for a good yield, are dependent on soil conditions, growing season, moisture regimes, irrigation, the availability of farm implements, and other considerations. My purpose is therefore not to recommend crops or describe planting techniques, because these are site-specific considerations. Instead, I present guidelines that discuss the quality and quantity of agricultural foods needed by waterfowl, and techniques to enhance the availability of these foods.

Food Quality of Grains

Waste grain is a locally abundant, high-energy food that can be quickly consumed by waterfowl. The best indication of the nutritional quality of foods is given by an analysis of their chemical composition. The amount of gross energy, crude protein, fat, ash, fiber, and digestible carbohydrates (NFE) are indices to food value. However, since waterfowl use grains primarily as a high-energy food and supplement their diet with natural foods to compensate for nutritional deficiencies, the energy content of grains is the most commonly used basis for comparison. Unfortunately, energy content varies among varieties of the same grain, as well as by soil and environmental conditions. Moreover, waterfowl cannot digest different grains with similar efficiencies. In recognition of this digestive efficiency, metabolizable energy, which is indicative of the energy actually derived from a food, is a better comparative measure than gross energy content.

Agricultural foods (with the exception of soybeans) provide high levels of metabolizable energy (Table 1). Energy values, while indicative of fresh seeds, are not representative of grains underwater or exposed outdoors for an extended period. Under these conditions, energy value may decline rapidly. For example, rice will lose only 19% of its energy value after 90 days of flooding, but milo and corn will lose 42 and 50%, respectively, and soybeans will lose 86% of their energy content. Such losses underscore the need for well-timed harvests and manipulations to maintain food quality. Harvesting fields at intervals will help ensure a constant supply of fresh feed. When fields are flooded, water should be applied gradually so that a "flooding front" is created that progressively inundates new grain. Soybeans should be avoided as a waterfowl food crop. They not only decompose rapidly in water, but may also cause food impaction in the esophagus, which can be fatal. Additionally, legumes such as soybeans are undesirable because they often contain digestive inhibitors that reduce the availability of protein and other nutrients.

How Much to Plant?

Even though modern implements harvest about 95% of a ripened grain crop, most harvested fields still contain 50–310 pounds/acre of residual grain (Table 2). Waterfowl are efficient feeders, and will continue to use agricultural foods long after residual food density has been reduced. Waste corn, at typical postharvest densities of 100–500 pounds/acre, has to be reduced to a density of 90 pounds/acre before mallard feeding rates begin to decrease. Generally, waterfowl feeding on land will reduce densities to 13 pounds/acre before switching to alternate food sites, whereas waterfowl using foods underwater may abandon fields after densities decline to 45 pounds/acre. Daily food consumption varies among species, individuals within species, and with energetic demands related to behavior and thermoregulation. As a rule of thumb, average-sized geese will consume about 150–200 g/day, whereas large ducks need about half this amount. Although waterfowl will fly 20 miles or more to obtain grain, it is best to provide food no farther than a 10-mile radius from waterfowl concentrations.

Cost is always a consideration when planting food crops. Species that can be grown without irrigation will always be less expensive than water-demanding grains. Some crops, such as millets, are closely related to wild plants used by waterfowl. Millets are advantageous because they can be either

Table 1. *Energy content and chemical composition of common agriculture foods planted for waterfowl.*

	Metabolizable energy[a]		Percent (dry weight)				
Crop	Mallard	Canada goose	Protein	Fiber	NFE[c]	Fat	Ash
Barley	2.98[b]	3.32	14	5	—	2	2
Milo	—	3.85	12	3	80	3	2
Rice	3.34	—	9	1	—	2	1
Rye	3.14	2.74	14	4	68	2	2
Soybeans	2.65	3.20	42	6	28	19	5
Wheat	3.32[b]	3.35	26	19	34	4	17
Yellow corn	3.60	4.01	10	5	80	5	2

[a] Apparent metabolizable energy in kcal/g.
[b] Estimated as 6% less than the true metabolizable energy value.
[c] Nitrogen-free extract.

Table 2. *Average preharvest and postharvest densities of common agricultural crops planted for waterfowl.*

Crop	Density (pounds/acre) Preharvest	Postharvest	Location
Barley	2,613	105	Colorado
Corn (for grain)	5,580	320	Iowa, Illinois, Nebraska, Texas
Grain sorghum	3,678	258	Texas
Japanese millet	2,227	89	Colorado
Rice	5,205	160	Mississippi Valley
Soybeans	1,093	53	Mississippi Valley
Wheat	1,768	106	Colorado

drilled or broadcast, are inexpensive, grow quickly, and are less susceptible to wildlife depredations than other crops. Japanese millet tolerates shallow flooding and saturated soils, and produces high yields of seed. Other species, such as white proso millet, achieve a low growth form with no loss in seed production if grown under low moisture conditions. Carefully planned crop rotations may eliminate the need for inorganic nitrogen or insecticide applications, thereby reducing costs. One common rotation used in midwestern States is a mixture of sweet clover and oats the first year, followed by corn in the second year and soybeans in the third year. Winter wheat is planted in the fall of the third year, with clover and oats repeated in the summer of the fourth year.

Enhancing Food Availability

Before grain crops are selected, managers should consider not only the energy value of grains but also the physical characteristics of the seed head. Large seeds, such as corn kernels, are more quickly located and consumed by waterfowl than smaller seeds. Seed head structure is also important. For example, even though barley has a lower metabolizable energy, it is preferred over hard spring wheat because ducks are able to remove seeds more quickly from the heads.

Abundant grain crops are worthless if they are not presented in a manner that makes them available to birds. The amount of residual food remaining after harvest is affected by harvester efficiency and operation, slope of the field, insects, disease, cultivar, and moisture content of the grain. Reductions in surface grain density result from all postharvest, cultivation treatments (Table 3). In some instances, postharvest treatments may be beneficial, even if aboveground residues are decreased, because reduced ground litter increases the foraging efficiency of waterfowl. However, such benefits are often difficult to quantify; therefore, the best strategy is to present unharvested or freshly harvested crops in ways that have proven attractive to waterfowl (Table 4). Such practices regulate secondary availability, or the accessibility of grain residues after harvest.

In mild winter climates, precipitation or flooding from runoff usually enhances grain availability by making food more available to waterfowl. In cold

Table 3. *Estimated waste corn residues resulting from different tillage systems. See text for other variables affecting harvest residues.*

Tillage system	Grain density (pounds/acre) Middle range	Lower range
Untilled	320	76
Disk (tandem)	233	56
Chisel (straight shank)	148	35
Chisel (twisted shank)	27	5
Chisel (straight shank—disk (tandem)	22	4
Chisel (straight shank)—disk (offset)	8	1
Chisel (twisted shank)—disk (tandem)	5	<1
Chisel (twisted shank)—disk (offset)	3	0
Moldboard plow	2	0

Table 4. *Recommended treatments to enhance food availability for waterfowl.*

Crop	Treatment
Barley, wheat	Leave low-growing varieties standing, since their seed heads are easily fed upon by ducks and geese.
Corn, milo	Harvest when grain moisture is <21%. Burn corn stubble, then leave field dry—do not flood. Graze cattle if snow cover is persistent.
Soybeans	Do not flood fields. Beware of potential impaction problems if dry beans are consumed by birds.
Millets	Best if unharvested. Flood gradually to a depth of 8 inches.
Rice	Disk harvested fields to loosen and mix soil with grain and straw, or roll with a water-filled drum to create openings in stubble. Flood to a depth of 8 inches.

climates, however, food usually becomes less available after precipitation. In these regions, snowfall and cattle grazing are the most important components of secondary availability. After heavy snowfall, mallard and other ducks often use standing grain crops, since these are the only foods above snow. Cattle, turned loose to graze in harvested cornfields, create openings in the snow and break up corn ears, thereby increasing kernel availability.

The physical layout of fields may also affect food availability. In severe winter climates, wide swaths of harvested crops should be separated by several rows of unharvested plants, thereby providing a "snow fence" to enhance the availability of grain on the ground as well as provide a reserve of food that will remain above even the deepest snow. It may be advantageous to plant crops in blocks of rows running perpendicular to one another. This helps ensure that the tops of some rows will be exposed by the prevailing winds during heavy snow.

Suggested Reading

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