Patuxent Wildlife Research Center

MEMORANDUM

FROM: Ken Reinecke and Rick Kaminski, LMVJV Waterfowl Working Group

SUBJECT: Draft revision and update of Table 5 (Duck use-days)

TO: Randy Wilson, Leader, LMVJV Waterfowl Working Group

DATE: 2 November 2005

Attached is the draft table of duck-use days by habitat that we agreed to revise at the recent meeting of the LMVJV Waterfowl Working Group.

We would appreciate your comments or those from any other members of the Working Group with whom you choose to share the draft.

As before, DUDs are based on the energy requirements of mallards because we have not yet made decisions about using duck species of other sizes to calculate objectives for foraging habitat.

Table 5. Carrying capacity of selected foraging habitats (expressed as duck-use days/ac [DUDs/ac]) for mallards wintering in the Lower Mississippi Valley Joint Venture area.

Habitat	Food available (kg/ha) [a]	True metabolizable energy (TME; kcal/g) [b]	DUDs/ac [c]
Moist-soil	600 [d]	2.47 [e]	1,883
Harvested crops			
Rice	80 [f]	3.34 [g]	139
Soybean	60 [h]	2.65 [g]	37
Unharvested crops			
Rice	5,240 [i]	3.34 [g]	24,025
Soybean	1,334 [i]	2.65 [g]	4,716
Milo	3,811 [i]	3.49 [j]	18,192
Corn	5,716 [i]	3.67 [k]	28,820
Japanese millet	1,500 [l]	2.61 [m]	5,245
Bottomland hardwoods			
30% red oak	81 [n]	2.67 [o]	115
40% red oak	93 [n]	2.67 [o]	161
50% red oak	106 [n]	2.67 [o]	207
60% red oak	118 [n]	2.67 [o]	253
70% red oak	131 [n]	2.67 [o]	299
80% red oak	143 [n]	2.67 [o]	345
90% red oak	156 [n]	2.67 [o]	391
100% red oak	168 [n]	2.67 [o]	436

[a] To convert food available in kg/ha to lbs/ac, multiple kg/ha times 0.8922.

[b] TME in units of kilocalories per gram (kcal/g) is determined by feeding different foods to captive ducks and determining how much energy they retain and use to meet daily energy requirements.

[c] DUDs represent the number of ducks that can obtain daily energy requirements from an acre (ac) of foraging habitat for a day. The simplest way to calculate DUDs/ac is to first calculate DUDs/ha, then transform the result from DUDs/ha to DUDs/ac. The following text describes the necessary steps. To calculate DUDs/ha, first subtract 50 kg/ha from the average number of kg/ha of food available in a foraging habitat. We do this because ducks apparently ‘give up’ feeding in habitats when finding food becomes inefficient but before all the food is gone. Then, multiply the result of the preceding subtraction times 1,000, which is the number of grams per kilogram (g/kg). The result is

grams per hectare (g/ha) of available food. Then, multiple the g/ha of available food times the average TME available per gram of food (kcal/g). The result is kcal/ha. Next, divide the number of kcal/ha by the average number of kilocalories required daily by the appropriate species of duck. In the case of mallards, we have assumed a published value of 292 kilocalories per day (kcal/day) is a good approximation. Then, calculate duck use-days per hectare (DUDs/ha) by dividing the kcal/ha of energy in a foraging habitat by the daily energy requirement per bird (292 kcal/day for mallards). In this example, the result is mallard use-days per hectare, which we have used in previous analyses as a general estimate of DUDs/ha for all species. Written as a formula, the calculation of DUDs/ha is

$$\frac{(kg\ \ food/ha - 50\ kg/ha) \times (1{,}000\ g/kg) \times (kcal\ TME/g)}{(kcal\ TME\ required/duck-day\ )} = \frac{kcal/ha}{kcal/duck-day} = DUDs/ha$$

Multiplying DUDs/ha times 0.4047 converts DUDs/ha to DUDs/ac. In cases where more than one food is available in a foraging habitat, DUDs are calculated as a sum of DUDs for the different foods. For example, bottomland hardwoods provide acorns, invertebrates, and some moist-soil seeds, and all are included in estimates of available food and DUDs.

[d] Preliminary estimate based on data from Reinecke and Hartke (2005), Penny (2004), and J. Kross, R. M. Kaminski, and K. J. Reinecke (unpublished data).

[e] Mean for moist-soil seeds eaten by mallards (Kaminski et al. 2003).

[f] Based primarily on Stafford et al. (2005).

[g] Based on data for mallards (Reinecke et al. 1989).

[h] No data are available; we assumed about a 5% seed loss during harvest (Mayeaux et al. 1980).

[i] Estimates of food available in unharvested crops are from E. J. Larson (Grain Crops Specialist, Mississippi State University, unpublished data) (corn = 6,000 lbs/ac, milo = 4,000 lbs/ac, soybean = 1,400 lbs/ac, rice = 5,500 lbs/ac) and assume that grain in the field contains about 15% moisture and unharvested crops provide about 20% less grain in winter than fields harvested earlier because decomposition and wildlife depredation occur before waterfowl arrive.

[j] Data for blue-winged teal from Sherfy et al. (2001).

[k] Data for mallards from Reinecke et al. (1989).

[l] Data in the literature are limited; this value is the best personal assessment of K. J. Reinecke and R. M. Kaminski.

[m] Mean based on data for mallards (Reinecke et al. 1989, Checkett et al. 2003) and blue-winged teal (Sherfy et al. 2001).

[n] Hardwood bottomlands presumably provide 3 food sources: invertebrates, moist-soil seeds in forest openings, and acorns. We assumed food availability in hardwood bottomlands included 13.7 kg/ha (dry) of invertebrates (White 1985), 30.0 kg/ha of moist-soil seeds (i.e., 5% of hardwood bottomlands are openings with food availability similar to moist-soil habitat, and an amount of acorns proportional to the percentage of red oaks in the forest canopy. To estimate availability of acorns, we used data from a long-term study in Missouri, where a forest with 80% of its basal area in red oaks produced an average 142 kg/ha (wet) of acorns. Because acorns contain about 30% water and TME for acorns was determined on a dry matter basis (Kaminski et al. 2003), we used 99.4 kg/ha for acorn availability in areas with 80% red oaks. For forests with other percentages of red oaks, we calculated availability of acorns proportional to availability in forest stands with 80% red oaks.

[o] Acorns are the predominant food in bottomland hardwoods and the mean TME of 4 species of acorns fed to mallards and wood ducks (Kaminski et al. 2003, K. J. Reinecke, unpublished data) was used to represent the average TME of all foods in bottomland hardwoods.