Giving-up Density: Do ducks ever really give up on foraging?

Heath M. Hagy, Ph.D.

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University of Tennessee – Knoxville

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“Giving-up” Density

- GUD: A density threshold of foods at which animals cease foraging or abandon habitats because:
  1) the energy expended searching for and processing foods exceeds that gained from consuming them or
  2) the food resources in a patch are depleted below the levels in other, nearby patches
GUD – Evidence

1. Abandonment

2. Use without foraging effort

3. Foraging with little or no depletion
GUD – Importance

1. Basic component of foraging ecology

2. Habitat quality

3. Habitat conservation
Moist-soil Wetlands
Experiment 1
Dabbling Ducks

Experiment 1

Dabbling Ducks/ha/site
Control
Disk
Mow

November December January February

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Dabbling Ducks/ha/site
Experiment 1

Seeds and Tubers

Kg / ha

260 kg/ha
Experiment 1

Energy

![Graph showing Energy DED/ha for Control, Disk, and Mow treatments in November-December, January, and February]
Dabbling Ducks

experiment 1

Dabbling Ducks/ha/site

Control  Disk  Mow

November  December  January  February

Dabbling Ducks/ha/site

0  50  100  150  200  250

0  50  100  150  200  250

1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17

November  December  January  February
Giving-up Density

• Large-scale experiment to test for dabbling duck response to differing food densities during winter

• Reduce variables in Experiment 2
  – # seed taxa
  – vegetation differences
  – substrate and burial depth

• Is there a site selection (use) threshold

• Replicated experiment by Greer et al. (2009)
Design

50 kg/ha
Buffer
550 kg/ha
Buffer
250 kg/ha
Design
Dabbling Duck Abundance
December – February

[Graph showing abundances]
Dabbling Duck Abundance
December – Early January
Dabbling Duck Abundance

Experiment 2

Dabbling ducks / ha / site

- Red: 50
- Blue: 250
- Green: 550

December January February

1 2 3 4 5 6 7 8 9 10

Dabbling ducks / ha / site

1 2 3 4 5 6 7 8 9 10

Dabbling ducks / ha / site
Millet Abundance

Initial December January February

Kg / ha

~10 kg/ha
Natural Seed and Tuber Abundance

Kg / ha

Experiment 2

180 kg/ha

Initial December January February

50 250 550

Kg / ha

180 kg/ha
Experiment 2

Dabbling Duck Abundance

Percent Dabbling Ducks Feeding

Seed and Tuber Density

1 2 3 4 5 6 7 8 9 10
December January February

Feeding Seed Abundance

0% 10% 20% 30% 40% 50% 60% 70%
0 100 200 300 400 500 600
Conclusions

• Ducks did not “give up” foraging

• Mean Food Availability Threshold = 10 kg/ha – 180 kg/ha

• FAT was similar across treatments at each location, but variable among sites
  • food taxa
  • winter severity
  • habitat quantity and quality

• Increased Food Availability Threshold may indicate lower moist-soil food availability and increased habitat needs
Synthesis

1. Residual seed and tuber abundance in control, disked, and mowed plots (~260 kg/ha)

2. FAT in experimental plots (~180 kg/ha)

3. Median = 220 kg/ha \(\rightarrow\) 40% reduction in food availability

4. Additional 30% seeds & tubers not consumed by waterfowl \(\rightarrow\) 70% decrease in food availability

5. 600 kg/ha \(\rightarrow\) 210 kg/ha

6. Spatial models may better-predict carrying capacities than daily ration models