







Habitat Use and Availability of Wintering Waterfowl in Western Tennessee



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Waterfowl and Conservation

Declines:

- Overharvesting (market hunting)
- Habitat loss

Wetland Losses:

- >50% in the US
- Direct loss
- Alteration
- Degradation



Dahl and Allard 1997, Mitsch and Gosselink 2007

USFWS, Year Unknown

The North American Waterfowl Management Plan (NAWMP) 1986-2012



Research:

- Understand ecology
- Identify limiting factors

Planning:

- Population/Habitat Goals (Joint Ventures)

Implement:

- Collaborate with managers
- Outreach interests

Flyway Management


Historic breeding focus

Winter is important!

- Cross-seasonal effects

Mississippi Flyway:

- Important wintering area
- **40%** of North America's waterfowl



Waterfowl
 Central Flyway
 Mississippi Flyway
 Pacific Flyway
 Atlantic Flyway

USFWS, Year Unknown

Kaminski and Gluesing 1987, Reinecke et al. 1989, Baldassarre and Bolen 2006, Audubon Society 2012

The Lower Tennessee-Cumberland Ecosystem (LTCE)

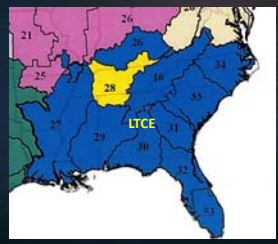
LTCE important area for waterfowl

Extensive Human Use:

- Damming/Reservoirs
- Public influence
- TVA/USACE

LTCE Waterfowl Management:

- American black duck focus
- Other species poorly understood



USFWS 2009

USFWS 2009, 2010, Ducks Unlimited, Year Unknown

Research Justification

- **Waterfowl habitat use/selection poorly understood in LTCE**
 - Identify important habitats for conservation
 - Understand functional roles of habitats (insights on selection)
 - Direct management to priority areas
- **Assist NAWMP Joint Ventures**
 - New info on an important wintering region
 - Refine conservation goals

Research Objectives

- Estimate use of 6 wetland types by waterfowl communities in two national wildlife refuges in western Tennessee during winter, and make inferences on selection based on availability
- Investigate functional roles of habitats based on behavioral observations
- Relate dabbling duck use to trends in food availability
- Investigate effects of summer disking and millet planting on habitat quality and waterfowl use in winter (side study)



Study Areas



Research Methods: Habitat Use, Selection, & Availability

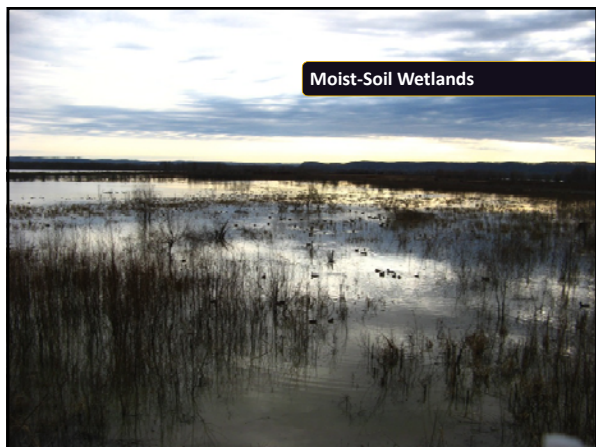
Waterfowl Sampling Sites

- 6 Habitat types
- 4 sites/habitat (24/refuge)
- Patch size ≥ 0.5 ha
- >200 m apart



Kaminski et al. 1993

Moist-Soil Wetlands



Flooded Croplands

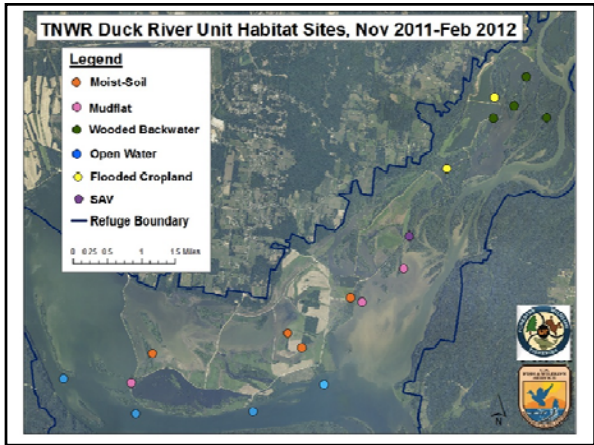

















Waterfowl Surveys

- Late Nov 2011-Feb 2012
- Late Nov 2012-Feb 2013
- Survey 1x/week
- Sunrise-10am
- Concealed tree stands/ground blinds




Dabbling Ducks (Anatini)

 Mallard <i>Anas platyrhynchos</i>	 Gadwall <i>A. strepera</i>	 Green-winged Teal <i>A. carolinensis</i>	 Northern Pintail <i>A. acuta</i>
 American Wigeon <i>A. americana</i>	 American Black Duck <i>A. rubripes</i>	 Northern Shoveler <i>A. clypeata</i>	

Cornell Lab of Ornithology 2011

Diving Ducks (Aythyini)



Ring-necked Duck
Aythya collaris

Abundant species on both refuges

Cornell Lab of Ornithology 2011

Scan/Distance Sampling

Counts:

- Species
- Instantaneous behavior

Distance:

- PVC markers
- 200 m

Behaviors:

- Foraging
- Locomotion
- Inactive
- Maintenance
- Antagonistic
- Courtship
- Alert

Smith et al. 1995, Buckland et al. 2001, Bolduc and Afton 2004, Hagy and Kaminski 2012a

Use/Selection

Bird Density Estimates (Distance 6.0)

- Factors abundance and distance
- Probability of detectability density function (area)
- Birds/ha end result
- Monthly estimates per habitat/refuge

Distance Output (Example)

Buckland et al. 2001

Habitat Availability/Selection

Habitat Availability (ArcGIS 10)

- Habitat shapefiles
- Aerial imagery
- Wetted areas

Selection Inference:


- Scale bird densities (infer selection)

Image taken from ArcGIS 10, ESRI International, Inc., 2012


Research Methods: Food Availability

Food Sampling

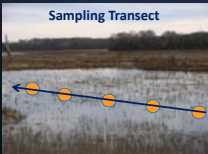
- 5 samples/site
- 1 x/month
- 70% ethanol added
- Stored/frozen



10 cm Core Sampler



Sweep Net
University of Tennessee 2011







Sampling Transect

Kross et al. 2008, Plattner et al. 2010

Sample Processing


- Thawed
- Stained (Rose bengal 1%)
- Washing: Sieves (x3)
- Macroinvertebrates/SAV:
 - ID
 - Oven dry
 - Weigh 0.1 mg



Murkin et al. 1994, Gray et al. 1999, Wirwa 2009

Sample Processing

- Air dry sieve contents (≥ 48 hrs)
- Seeds and tubers (duck foods)
- ID (Genus), oven dry
- Weigh 0.1 mg



Gray et al. 1999, Hagy and Kaminski 2012b

Duck Energy Days

kg/ha

kg/ha

Available Food x Available Energy
Reinecke and Uihlein 2006


FA x E

DER

Daily energetic requirement
Reinecke et al. 1989

= **DED**

DEDs/ha



Analyses

Hypothesis #2

Do waterfowl use available habitat during winter?

Analysis: Mixed repeated measures ANOVA (SAS Proc MIXED)

Response Variable: Wetland/forage use

Analysis: Multivariate Ordinations

Response Variable: Behavioral percentages within species flocks

Response Variable: Waterfowl density

Fixed = Habitat type

Random = Year

Repeat = Month

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