AVIAN WETLAND USE

ABIOTIC FACTORS

- **HYDROLOGIC**
  - **WATER PRESENCE/ABSENCE**
  - **WATER DEPTH**
- **CLIMATIC**
  - **TEMPERATURE**
    - **HABITATS AVAILABLE**
    - **THERMOREGULATION**
  - **PRECIPITATION**
  - **WIND**

BIOTIC FACTORS

- HABITAT
  - FOOD
    - QUALITY/TYPE
    - ABUNDANCE
    - AVAILABILITY
  - COVER

TIMING OF USE

- SUBARCTIC
  - SEASONAL – TEMPERTURE DRIVEN
- N TEMPERATE
  - SEASONAL – TEMPERATURE DRIVEN
- TEMPERATE
  - SEASONAL – TEMPERATURE AND PRECIPITATION
- SUBTROPICAL
  - CONTINUOUS – PRECIPITATION DRIVEN
- TROPICAL
  - CONTINUOUS – PRECIPITATION DRIVEN

PREFERRED WATER DEPTHS OF WATERBIRDS

- 81 SPECIES REQUIRING FLOOD WATER FOR USE OF HERBACEOUS WETLANDS

- >25 CM (10 IN) 19 SPECIES
  - 10 REGULARLY USE WATER < 10 IN
- 5-25 CM (2-10 IN) 24 SPECIES
- <10 CM (< 4 IN) 34 SPECIES

FORAGING DEPTHS

BIOTIC FACTORS

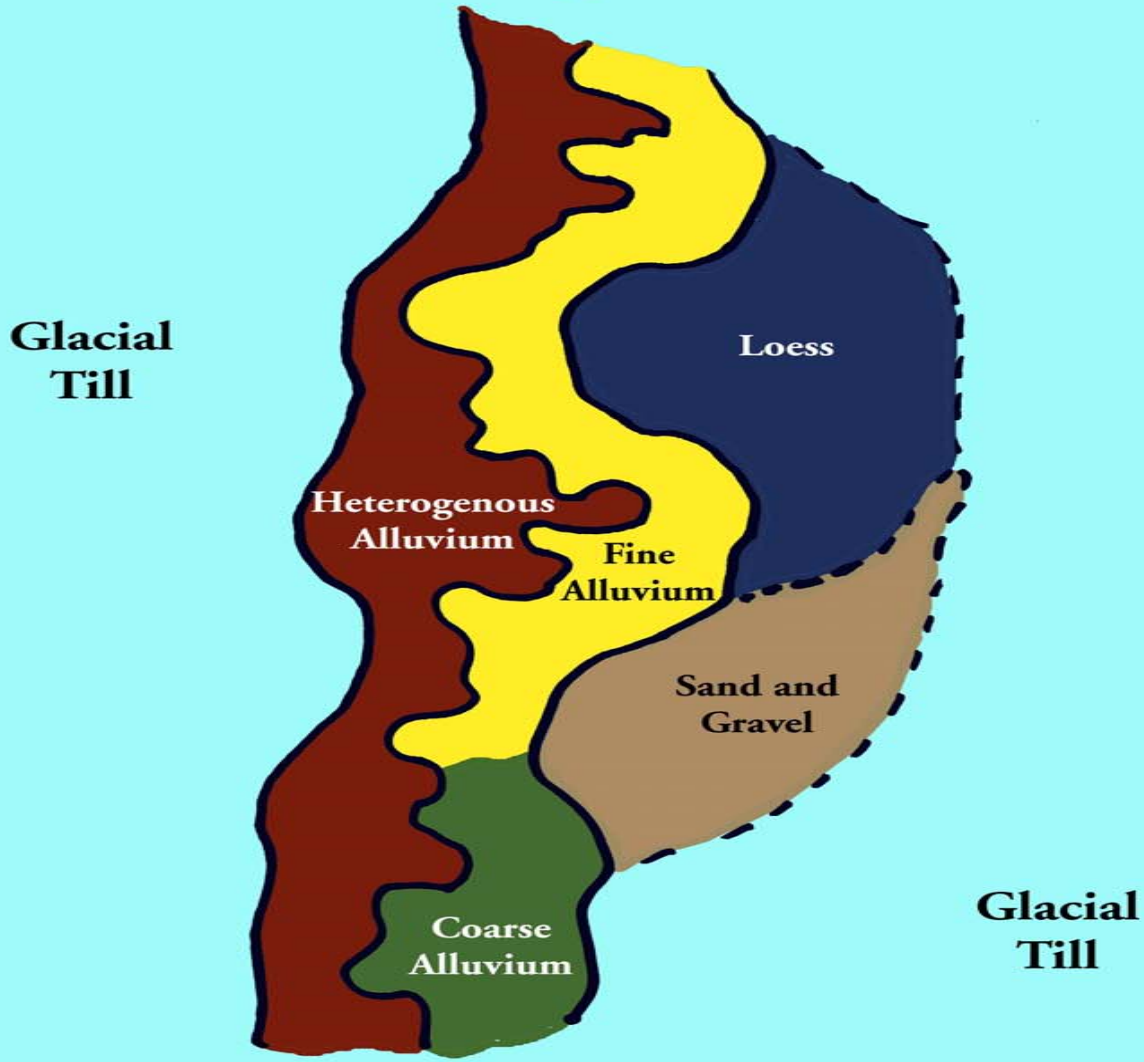
- HABITAT
  - FOOD
    - QUALITY/TYPE
    - ABUNDANCE
    - AVAILABILITY
  - COVER

INVERTEBRATE CONSUMPTION

	# SPECIES	AQUATIC	TERRESTRIAL
GREBES	1	1	0
BITTERNS	2	2	1
HERONS	5	5	0
EGRETS	3	3	1
IBIS	2	2	0
SWANS	2	1	0
DUCKS	23	23	3
SHOREBIRDS	24	24	6
RAILS	7	7	6
CRANES	1	1	1

BOMBAY HOOK NATIONAL WILDLIFE REFUGE

HETEROGENOUS SUBSTRATES
Large Scale



Annual Cycle Events

- Migration
- Reproduction (Pre-Laying, Egg Laying, Incubation, Brood Rearing)
- Molt
- Postbreeding Dispersal
- Staging
- Migration
- Pairing
- Molt
- Reserve Deposition

Nutritional Requirements of Female Mallards (Heitmeyer and Fredrickson 1989)

	PreA Molt	Fall Alt	Winter Paired	PreBas Molt	Pre - Depart
Protein	+ + +		+ +	+ + +	+ +
Lipid	+	+ + +	+ +	+	+ + +
Mineral	+ +			+ +	+ + +
Vitamin	+ +			+ +	+ + +

Nutritional Contributions of Foods (Heitmeyer 1985)

	Moist Soil Seeds	Inverts	Acorns	Row Crops
Protein	+	+ + +		
Lipid	+ +		+ + +	+ + +
Minerals	+ +	+ +		
Vitamin	+ +	+ +		

Nutritional Requirements of Female Mallards (Heitmeyer and Fredrickson 1989)

	PreAlt Molt	Fall Alt	Winter Paired	PreBas Molt	Pre-Depart
Protein	+ + +		+ +	+ + +	+ +
Lipid	+	+ + +	+ +	+	+ + +
Mineral	+ +			+ +	+ + +
Vitamin	+ +			+ +	+ + +

Nutritional Contributions of Foods (Heitmeyer 1985)

	Moist Soil Seeds	Inverts	Acorns	Row Crops
Protein	+	+ + +		
Lipid	+ +		+ + +	+ + +
Minerals	+ +	+ +		
Vitamin	+ +	+ +		

Relative Abundance of Key Waterfowl Foods to Demonstrate "Crunch" Periods

	Inverts	Seeds/ Mast	Tubers	SAV
Spring	+ +	+	+	
Summer	+ + +		+	+ + +
Fall	+ +	+ + +	+ + +	+ +
Winter	+	+ +	+ +	