

# Basic Waterfowl Ecology and BREEDING ENERGETICS

LEIGH FREDRICKSON  
+ ECOLOGICAL CONSIDERATIONS FOR  
WETLAND MANAGEMENT

IN NEBRASKA

Crane Trust

Wood River, Nebraska

9-11 September, 2026

# **CHARACTERISTICS OF WATERFOWL**

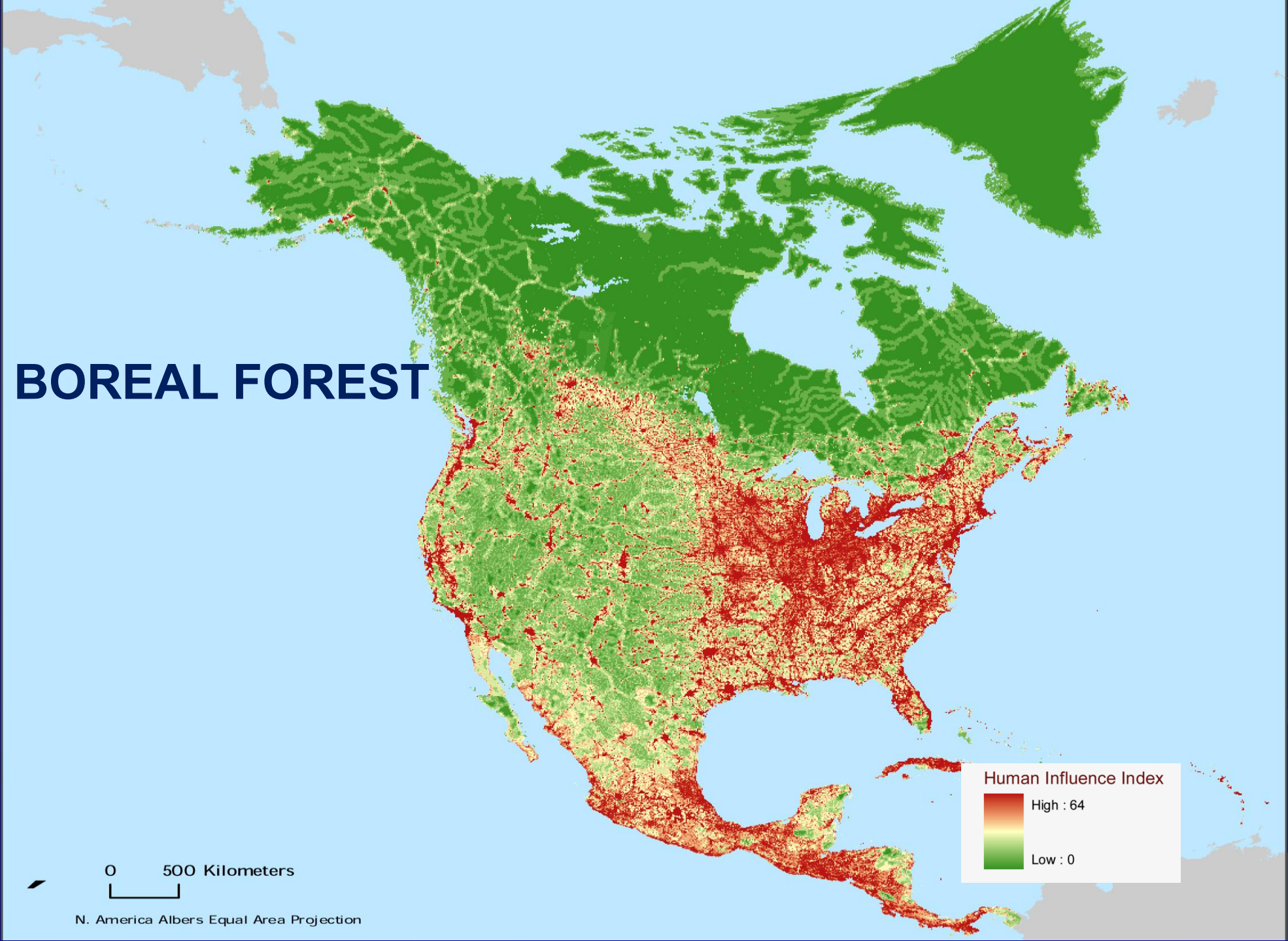
# WATERFOWL

- ADAPTED TO WETLAND ENVIRONMENTS  
WORLDWIDE
- LARGE BODY SIZE
- MIGRATORY
- HIGHLY MOBILE
- GREGARIOUS
- PRECOCIAL YOUNG

# **ADAPTED TO WETLANDS**

- USE MANY DIFFERENT WETLANDS TO MEET ANNUAL CYCLE REQUIREMENTS**
- USE WETLANDS ACROSS A LARGE SPATIAL SCALE**

# BOREAL FOREST



# BOREAL FOREST RIVER CHANNEL YUKON RIVER



## Wetlands of Yukon Flats

**BOREAL FOREST FLOODPLAIN  
YUKON RIVER**



# PRAIRIE POTHOLE

## Rivers-South Saskatchewan River



# PAIRIE POTHOLE Grasslands



# PRAIRIE POTHOLE TYPICAL AGRICULTURAL MODIFICATION

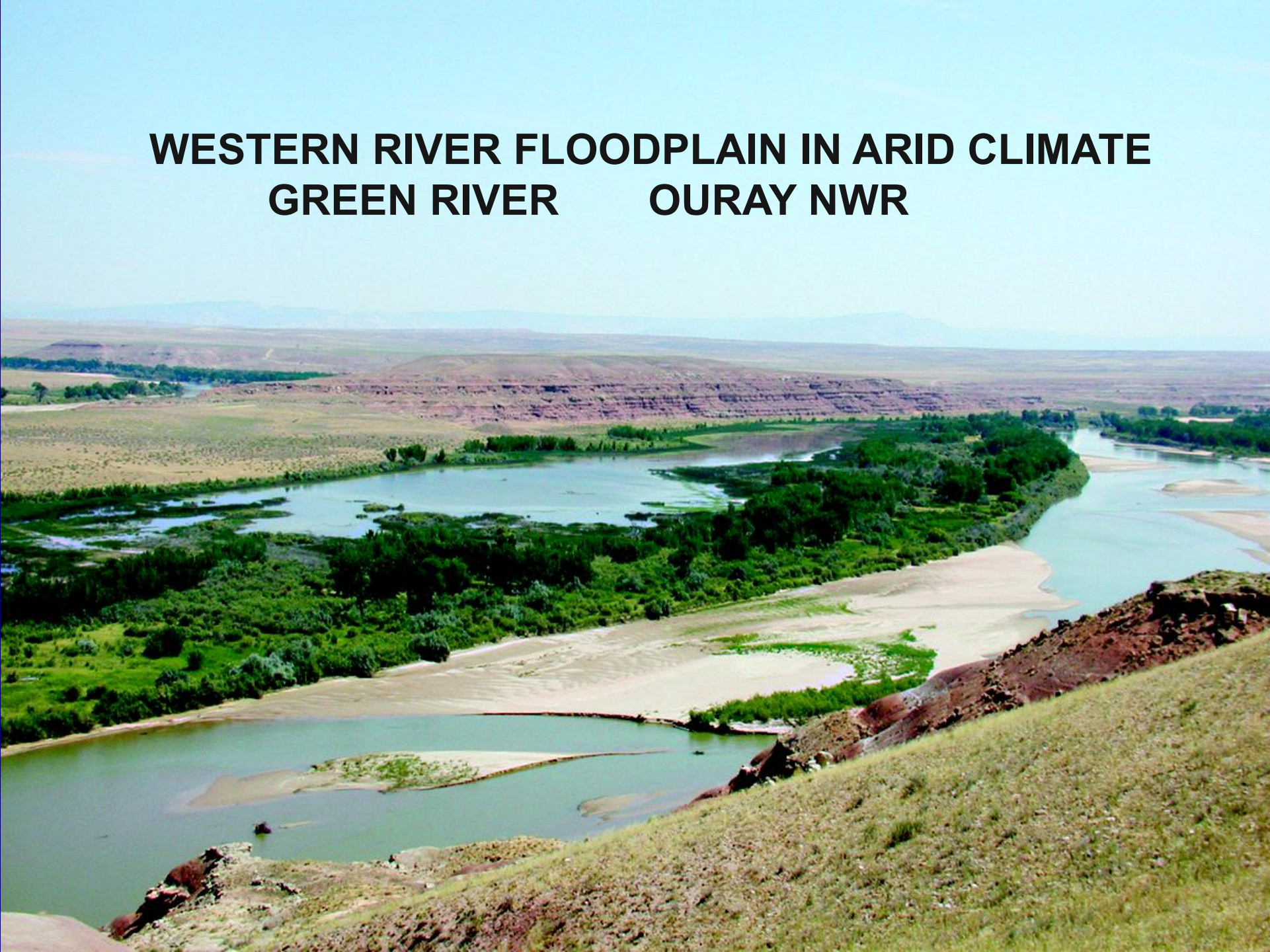


# LOWER MISSISSIPPI ALLUVIAL VALLEY

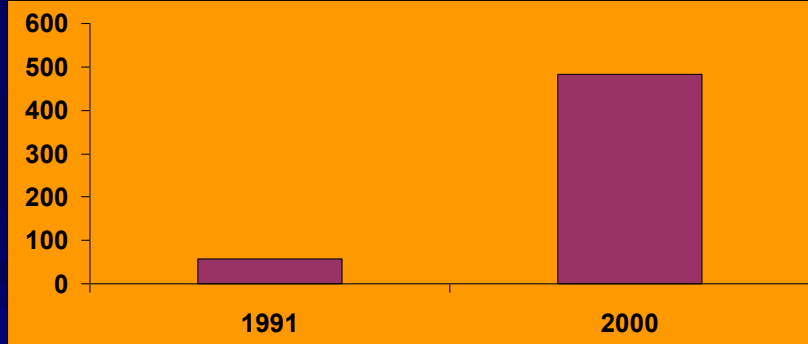


# **WESTERN RIVER FLOODPLAIN IN ARID CLIMATE**

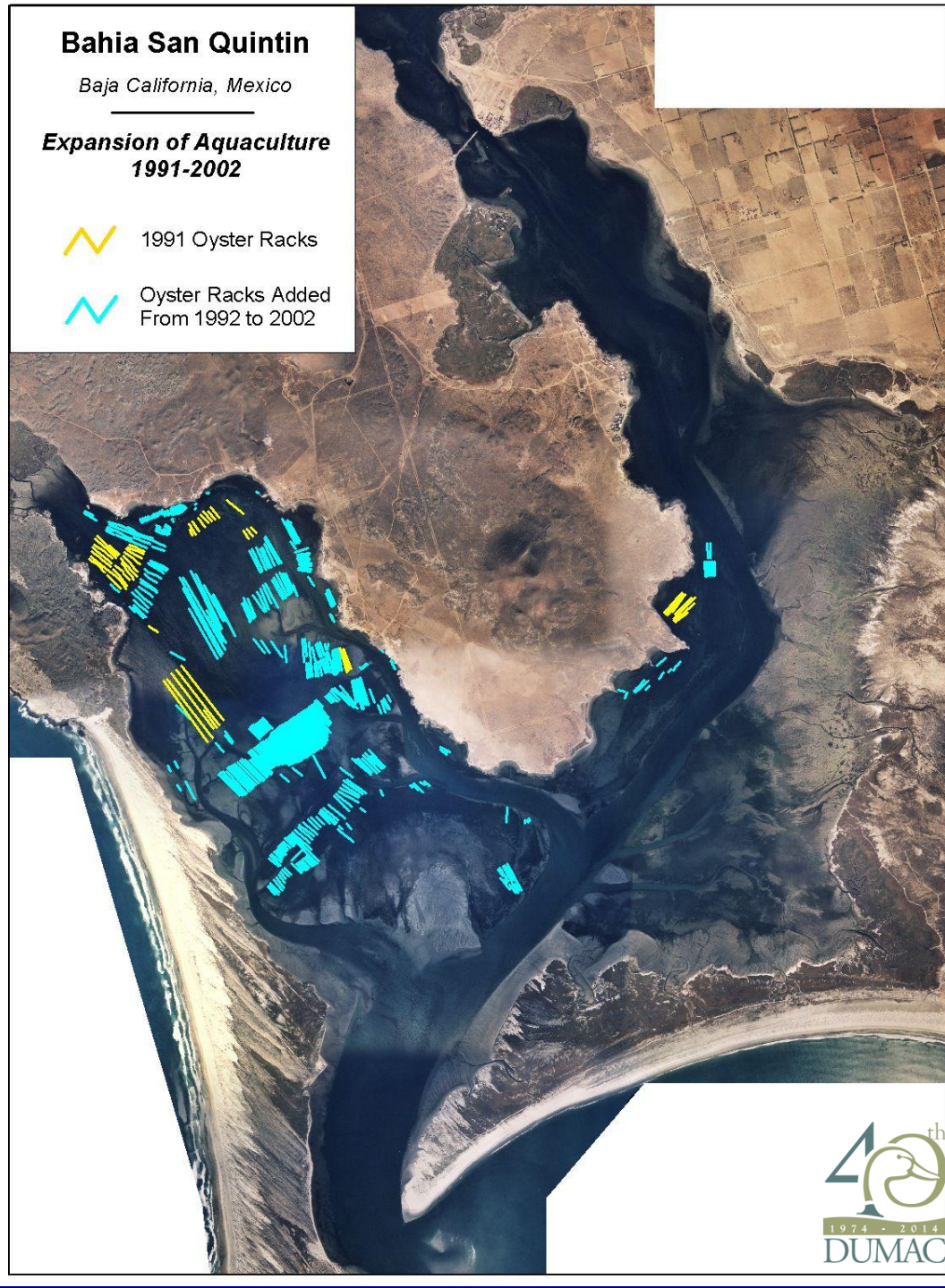
## **GREEN RIVER      OURAY NWR**



# Expansión de los cultivos de ostión en la Bahía de San Quintín



## COASTAL WETLANDS



# MIDWEST RIVER FLOODPLAIN GRAND PASS CONSERVATION AREA

MISSOURI RIVER



# **ALLUVIAL FAN SACRAMENTO NATIONAL WILDLIFE REFUGE**



# WATERFOWL DISTRIBUTION

TUNDRA 15 SPECIES BREED

BOREAL FOREST 25 SPECIES BREED

PRAIRIE POTHOLE 12 SPECIES BREED

HARDWOOD FORESTS  
4 SPECIES BREED

COASTAL MARSHES  
3 SPECIES BREED

15 SPECIES WINTER

# **GREGARIOUS**

- **FORM LARGE FLOCKS DURING THE NONBREEDING SEASON**
- **ENABLES USE OF SITES WITH CONCENTRATIONS OF FOOD OR OTHER CONDITIONS TO MEET LIFE HISTORY NEEDS**

# LARGE BODY SIZE

- THERMOREGULATE EFFECTIVELY UNDER HARSH CONDITIONS
- CARRY LARGE ENDOGENOUS RESERVES
- LAY LARGE EGGS

# IMPORTANCE OF A SINGLE WETLAND SITE FOR VERTEBRATES

Izembek NWR

- PACIFIC BLACK BRANT





## PACIFIC BLACK BRANT

| <u>LOCATION</u> | <u>STATUS</u>    | <u>DATE</u> | <u>WEIGHT (G)</u> |
|-----------------|------------------|-------------|-------------------|
| TESHEKPUK LAKE  | MOLT             | JUL-AUG     | 1200-1400         |
| ICY CAPE        | MIGRATION        | AUG-SEP     | 1200-1400         |
| IZEMBEK LAGOON  | ARRIVAL          | SEP         | 1200-1400         |
|                 | FALL STAGING     | NOV         | 2100-2200         |
| SAN QUINTIN     | ARRIVAL          | NOV         | 1200-1400         |
|                 | SPRING DEPARTURE | FEB         | 2100-2200         |

# MIGRATORY

- **EXPLOIT SEASONAL ENVIRONMENTS EFFECTIVELY**
- **DIFFERENT SPECIES ADAPTED TO AND MOVE TO DIFFERENT WETLAND HABITATS**

# HIGHLY MOBILE

- **MOVE LONG DISTANCES QUICKLY**
- **READILY MOVE TO FIND OR TO AVOID UNSATISFACTORY CONDITIONS**
- **SHIFT SITES OF USE DEPENDING UPON LIFE HISTORY NEEDS**

# PRECOCIAL

- **MOBILE AT HATCH**
- **FEATHERED AND CAN THERMOREGULATE AT HATCH**
- **CAN FORAGE AT HATCH**
- **LARGE YOLK SAC**

# **PRECOCIAL YOUNG**

**CAN MOVE LONG DISTANCES AT  
HATCH**

**CAN DIVE FOR FOOD OR ESCAPE  
PREDATORS AT HATCH**

**LARGE YOLK SAC PROVIDES THE  
ENERGY**

# **MAJOR ENERGETIC EVENTS    DUCKS**

**SPRING MIGRATION**

**BREEDING**

**MOLT**

**FALL MIGRATION**

**MOLT**

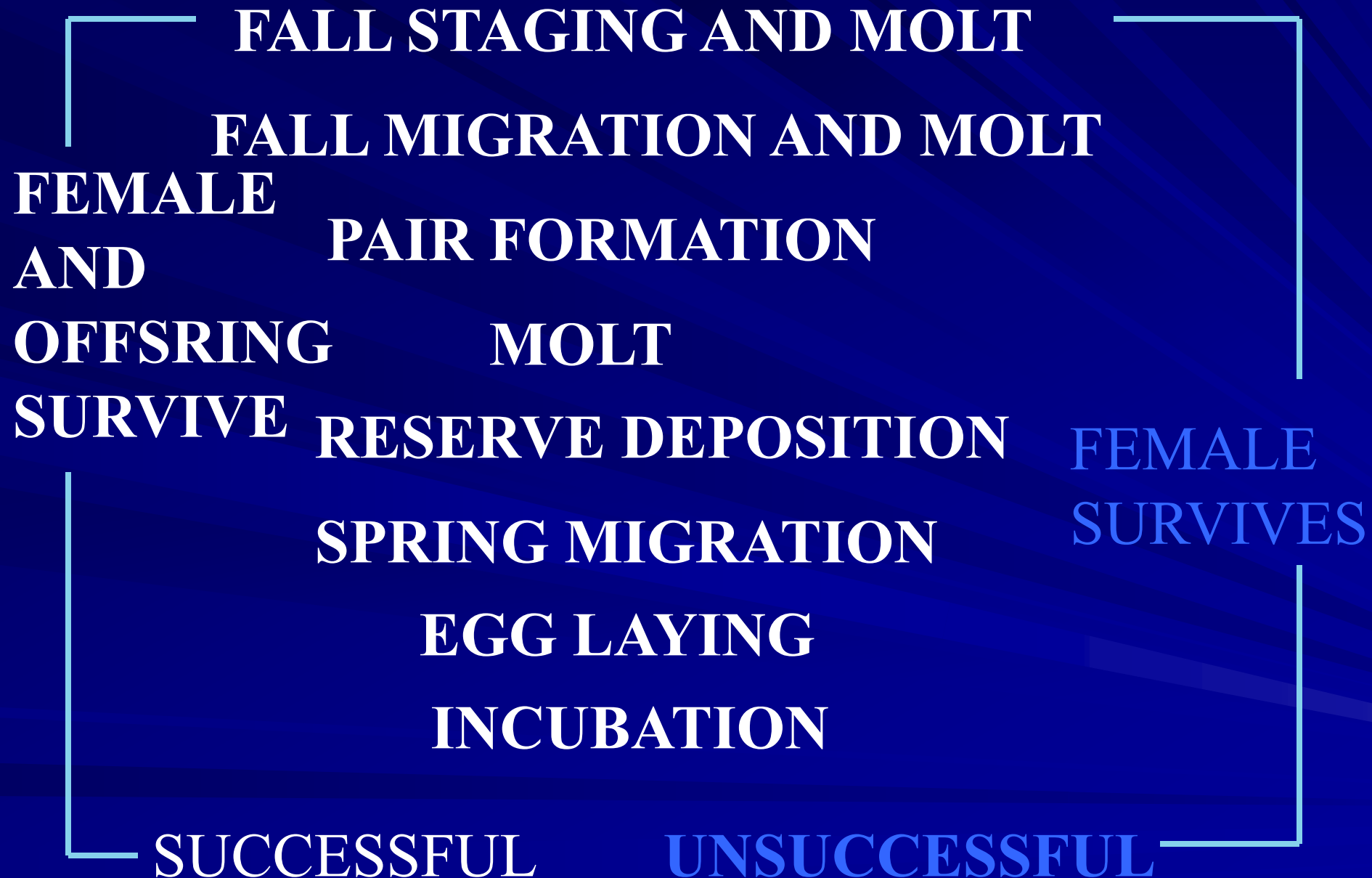
# **MAJOR ENERGETIC EVENTS    GEESE**

**SPRING MIGRATION**

**BREEDING**

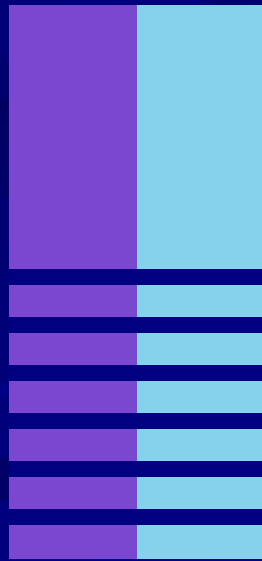
**MOLT**

**FALL MIGRATION**



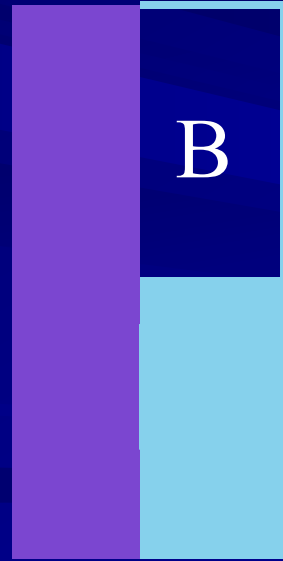
# GENERAL BIOENERGETIC STRATEGIES

SNOW  
GOOSE



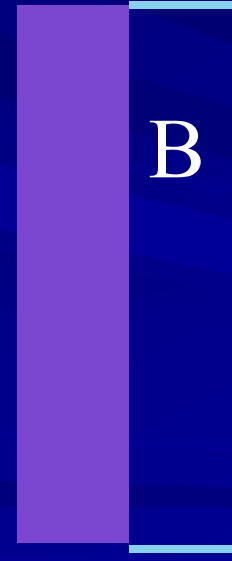
L P

MALLARD



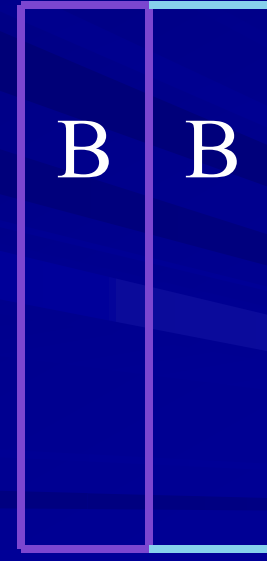
L P

WOOD  
DUCK



L P

COMMON  
EIDER



L P

# WATERFOWL HABITAT STRATEGIES

BREEDING

FRESH

MORE CARNIVORIOUS

LAYING FEMALES AND YOUNG

MORE OMNIVORIOUS

SUBADULTS AND ADULTS

SALINE

WINTER



TERRESTRIAL



AQUATIC  
AND  
MARINE

# **WATERFOWL BIOENERGETICS**

- **SPRING MIGRATION - ENERGY**
- **BREEDING – PROTEIN AND  
ENERGY**
- **PREALTERNATE MOLT – PROTEIN**
- **FALL MIGRATION – ENERGY**
- **PREBASIC MIGRATION - PROTEIN**

# ANIMAL PROTEIN SOURCES

## ■ SMALL COLD BLOODED VERTEBRATES

- FISH

- SALAMANDERS

## ■ INVERTEBRATES

# PLANT PROTEIN SOURCES

## ■ NATIVE PLANTS

- LEAVES/STEMS OF ANNUALS OR PERENNIALS
- ROOTS/TUBERS OF PERENNIALS

## ■ FORAGE CROPS

- EARLY GROWTH SEASONALLY
- NEWLY PLANTED

# PLANT ENERGY SOURCES

## ■ SEEDS

- NATIVE WOODY PLANTS
  - SOFT MAST
  - HARD MAST
- NATIVE ANNUAL PLANTS
- ROWCROPS

## ■ TUBERS

- NATIVE PERENNIAL PLANTS
- SOME COMMERCIAL CROPS

# ANIMAL ENERGY SOURCES

## ■ INVERTEBRATE

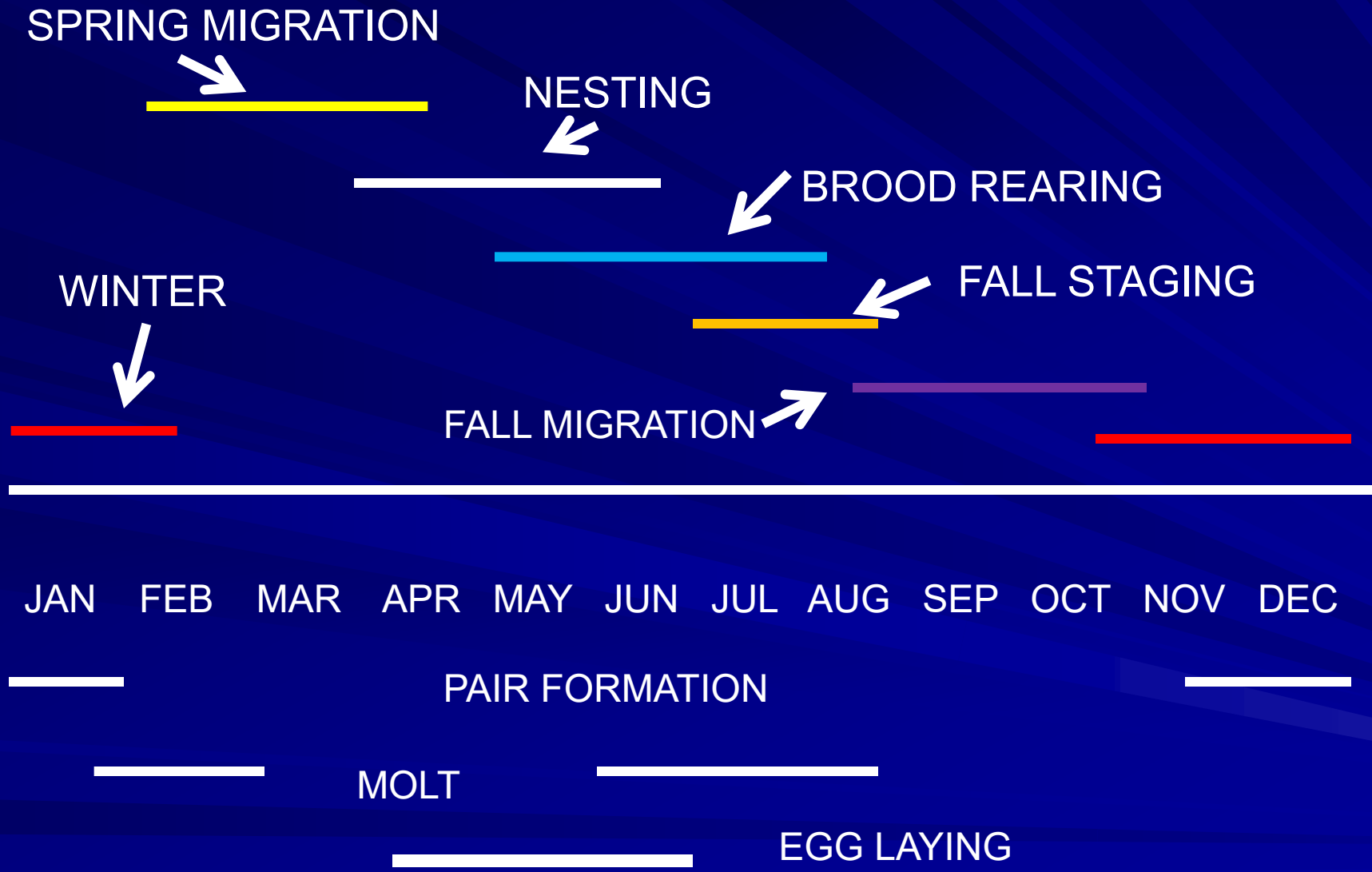
- FORMS WITH HIGH LIPID CONTENT
- LARGE GRAVID FEMALES











# BREEDING DUCK STRATEGIES: CAVITY AND PRAIRIE NESTING WATERFOWL

# FACTORS INFLUENCING RECRUITMENT

- AGE AT FIRST BREEDING
- LONGEVITY
- OCCURRENCE OF BREEDING  
(NUMBER OF NESTS ANNUALLY)
- NEST SUCCESS
- HATCHING SUCCESS
- BROOD SURVIVAL

# PRAIRIE NESTING DABBING DUCKS

- IN GRASSLANDS SURROUNDING WETLANDS  
(MALLARDS MORE FLEXIBLE)
- ADAPTED TO VARIOUS DEGREES OF COVER
- FEW EXTENSIVE AREAS OF HABITAT REMAINING
- PREDATORS HAVE AN ADVANTAGE

# COVER

- DENSE/TALL - MALLARD, GADWALL
- SPARSE/LOW – PINTAIL, BLUE-WINGED TEAL, CINNAMON TEAL
- BRUSHY – GREEN-WINGED TEAL

# DISTANCE TO WETLAND

- NEAR – BLUE-WING, SHOVELER, CINNAMON TEAL
- DISTANT – PINTAIL
- VARIABLE – MALLARD, GADWALL

# TYPE OF WETLAND

- TEMPORARY/SEASONAL – PINTAIL, BLUE-WINGED TEAL, CINNAMON TEAL
- SEMIPERMANENT – BLUE-WING, SHOVELER, GADWALL
- MORE VARIABLE - MALLARD

# TIMING OF NESTING WITH FOOD

## ■ EARLY NESTING

### – MALLARD/PINTAIL

- ADULTS - FAIRY SHRIMP AND EARTHWORMS

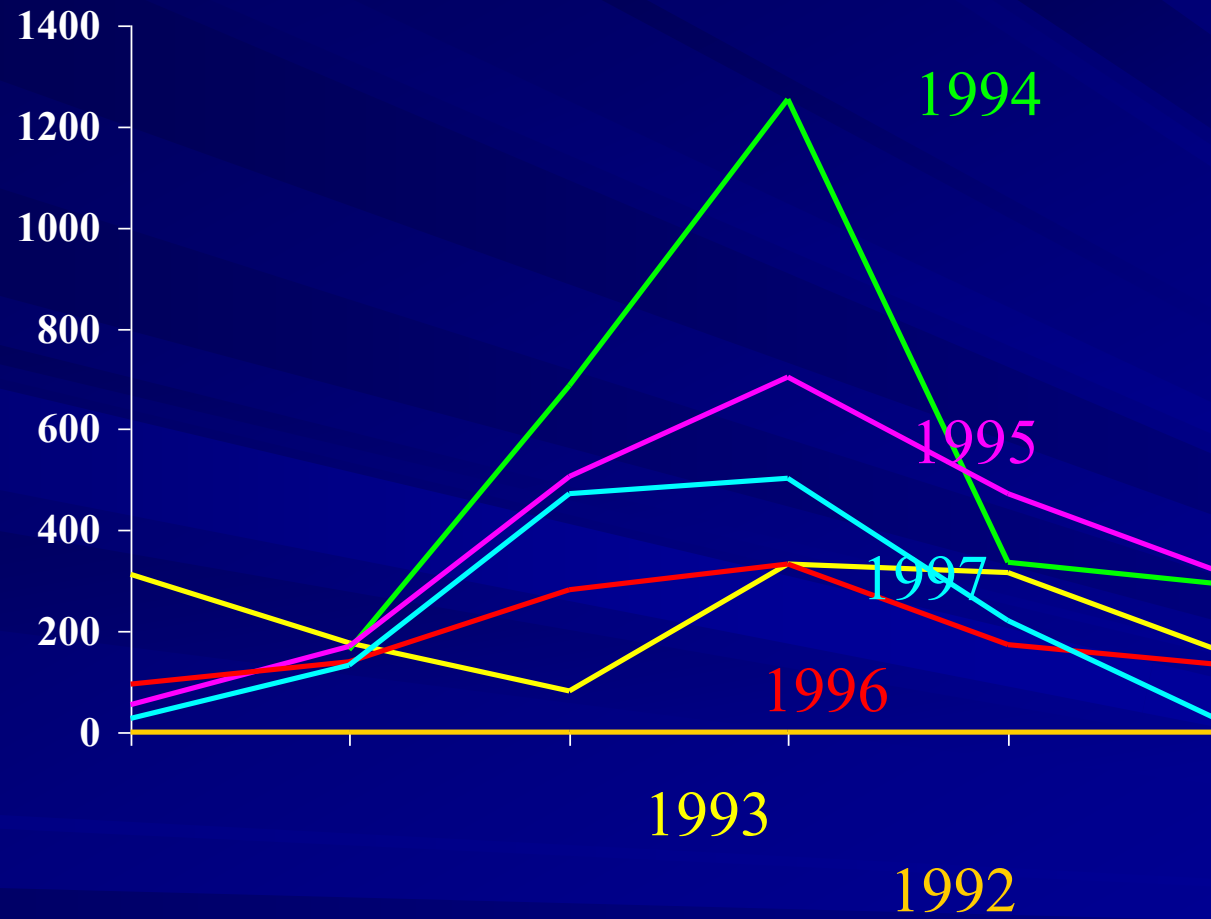
- YOUNG - TAKE ADVANTAGE OF AQUATIC INSECTS

## ■ LATE NESTING

### – RUDDY DUCK

- ADULTS – ABUNDANCE OF BLOODWORMS

# Invertebrate Biomass (grams x 100)



# CAVITY NESTING WATERFOWL

- WHY?? SPRING FLOODING INUNDATES GOOD GROUND NESTING SITES AND/OR THESE SITES SUBJECT TO HEAVY PREDATION

# CAVITY NESTING WATERFOWL

- WHY?? SPRING FLOODING INUNDATES GOOD GROUND NESTING SITES AND/OR THESE SITES SUBJECT TO HEAVY PREDATION
- Different strategies by tribes with first breeding at 1 or 2 years of Age (Cairinini vs Mergini)

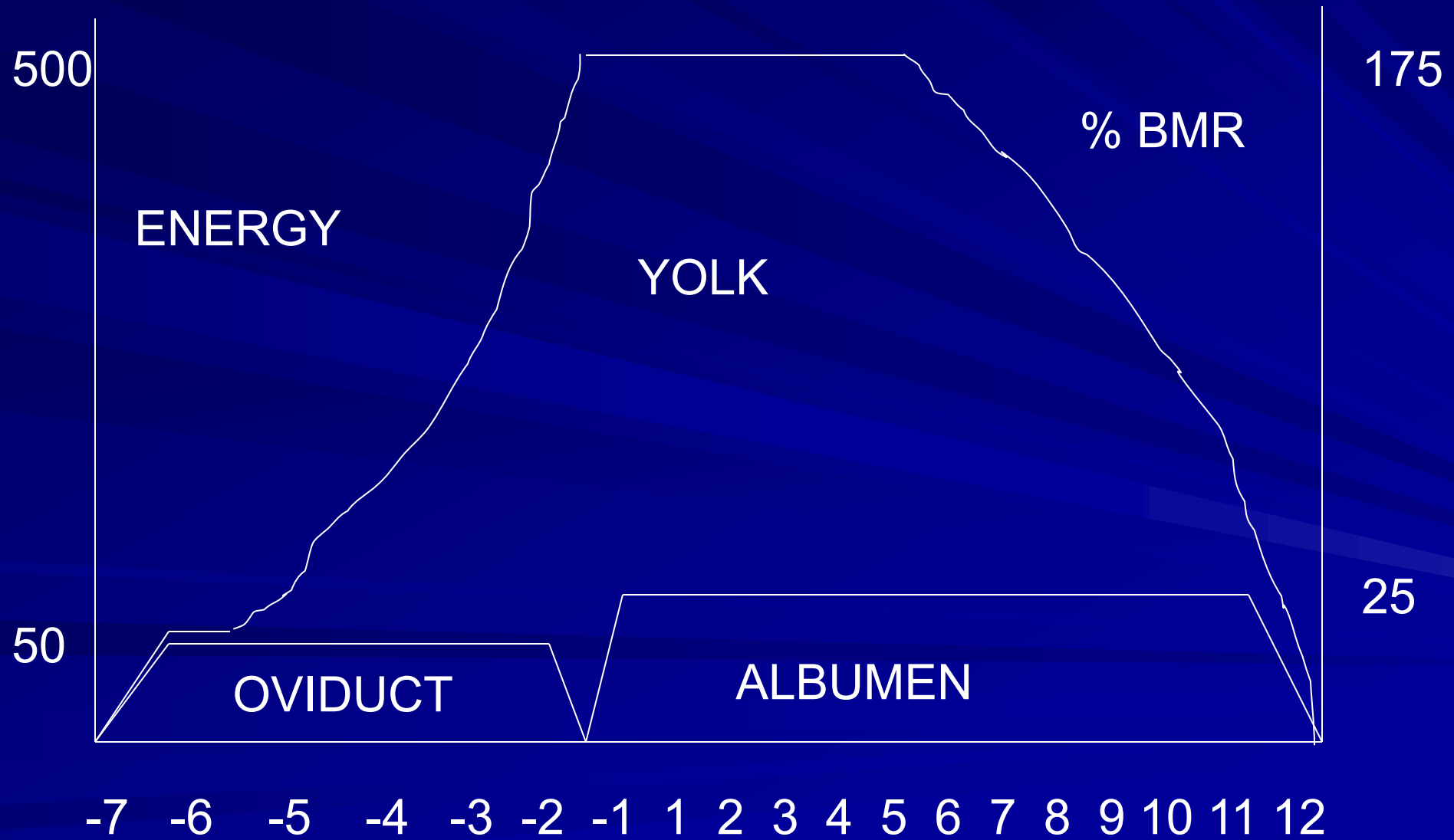
# SPRING WOOD DUCK FORAGING (PERCENT)

| FEEDING<br>MODE       | MALES | FEMALES |
|-----------------------|-------|---------|
| PECKING ON<br>SURFACE | 75    | 58      |
| SURFACE<br>DABBING    | 18    | 23      |
| SUBSURFACE<br>DABBING | 6     | 15      |
| BOTTOM<br>FEEDING     | 4     | 3       |

# FOODS CONSUMED BY WOOD DUCKS

| STATUS AND GENDER | PERCENT ANIMAL |
|-------------------|----------------|
| PRELAYING FEMALE  | 54             |
| LAYING FEMALE     | 79             |
| POSTLAYING FEMALE | 43             |
| BREEDING MALE     | 34             |
| FALL FEMALE       | 33             |
| FALL MALE         | 36             |

# DAILY ENERGY REQUIREMENTS



# HOW DO THESE FEMALES DO THIS

- INTENSIVE FORAGING
- 8 HOURS/DAILY
- NEED ABOUT 4.5 GRAMS PROTEIN
- NEED ABOUT 500 BUGS/HOUR TO BE SUCCESSFUL  
OR OVER 4000 BUGS/DAY

# INTERESTING FACTS FROM MINGO SWAMP STUDY

- A SMALL NUMBER OF WOOD DUCK HENS PRODUCE MOST OF THE RETURNING OFFSPRING
  - I CALL THEM SUPER FEMALES
  - THEIR DUCKLINGS HAVE HIGHER SURVIVAL RATES
  - IN A CLUTCH OF 12 THEY MAY HAVE 2 OR MORE RETURNING FEMALE OFFSPRING

# THESE SUPER FEMALES

- TEND TO NEST ABOUT THE SAME TIME ANNUALLY
- HAVE VERY PRECISE HOMING TO THE SAME BOX
- HAVE UNIFORM CLUTCH SIZES AMONG YEARS
- ALWAYS HAVE A SERIES OF INDICATORS THAT THEY HAVE GOOD NESTING CHARACTERISTICS