

LIFE HISTORY STRATEGIES

**WATERFOWL BREED
OVER A WIDE AREA**

**WATERFOWL WINTER ON A
RELATIVELY SMALL AREA**

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**

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

SPRING MIGRATION

BREEDING

MOLT

FALL MIGRATION

MOLT

FALL STAGING AND MOLT

FALL MIGRATION AND MOLT

FEMALE

PAIR FORMATION

AND

MOLT

OFFSPRING

SURVIVE

RESERVE DEPOSITION

FEMALE

SPRING MIGRATION

SURVIVES

EGG LAYING

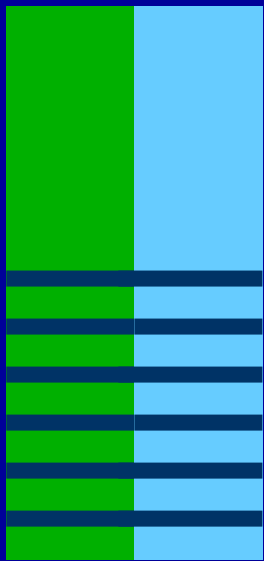
INCUBATION

SUCCESSFUL

UNSUCCESSFUL

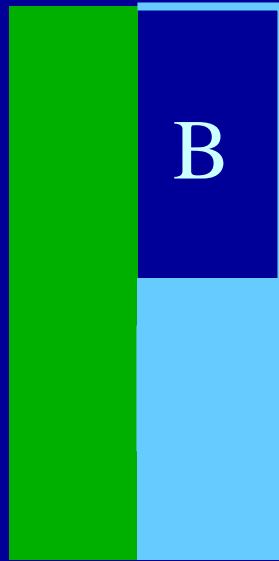
GENERAL BIOENERGETIC STRATEGIES

SNOW
GOOSE



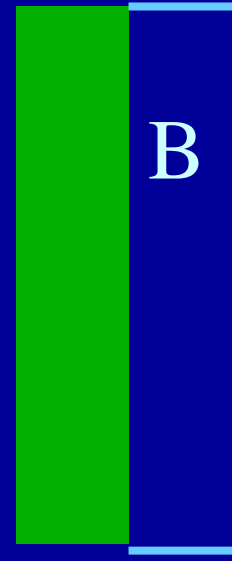
L P

MALLARD



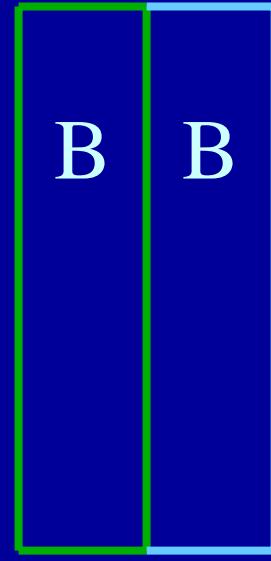
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WOOD
DUCK



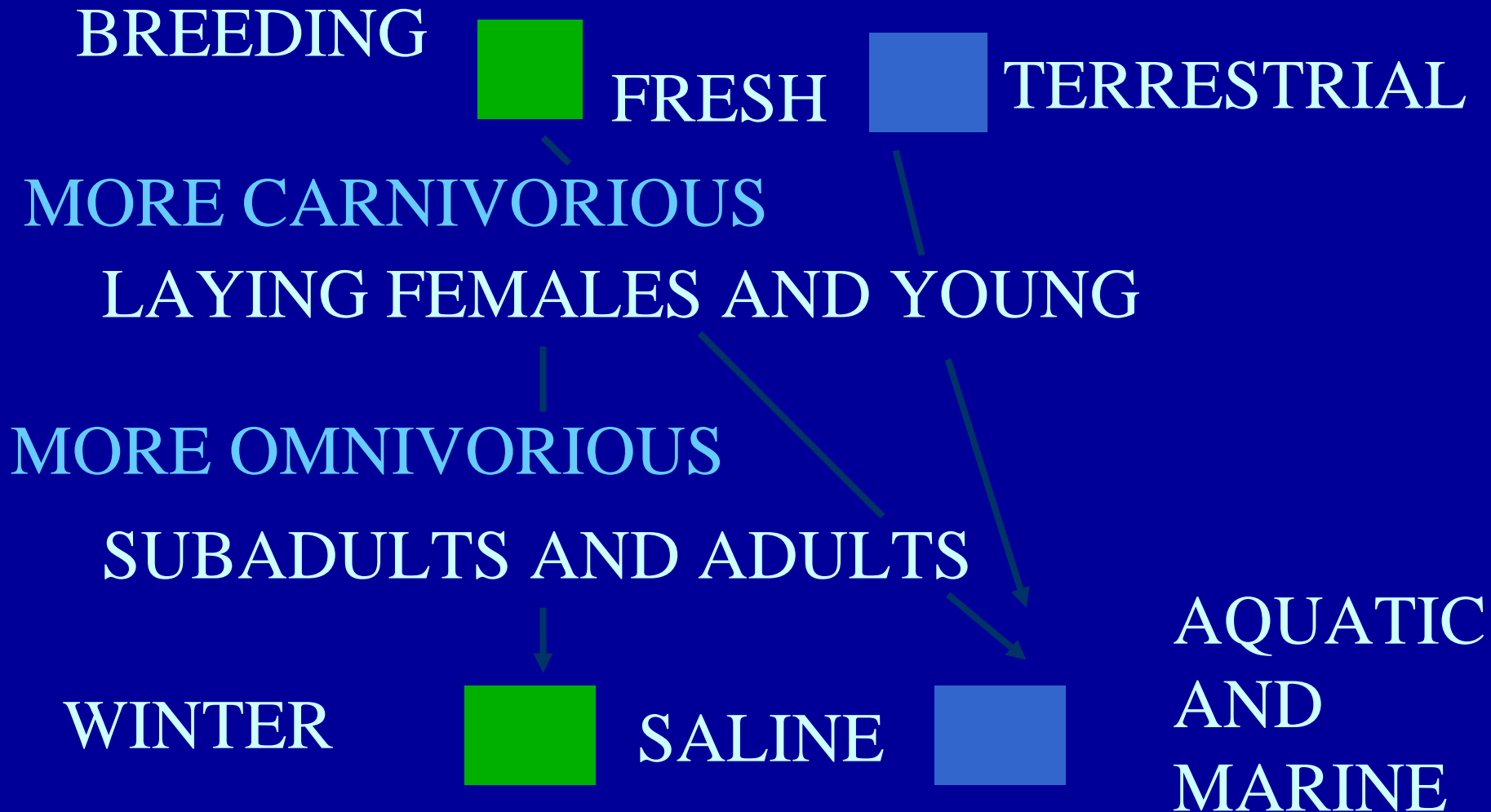
L P

COMMON
EIDER



L P

HABITAT STRATEGIES



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

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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**

HAWAIIAN WATERBIRDS VEGETATION DENSITY/WATER DEPTH

← DECREASING VEGETATION

INCREASING VEGETATION →

OPEN MUDFLAT

DEEP WATER OPEN

STILT

COOT

MOORHEN

KOLOA

NENE

HAWAIIAN WATERBIRDS

SALINITY

← INCREASING SALINITY

DECREASING SALINITY →

STILT

COOT

MOORHEN

KOLOA

NENE

HAWAIIAN WATERBIRDS NESTING

← DECREASING VEGETATION

INCREASING VEGETATION →

OPEN DRY/MOIST

DENSE TERRESTRIAL

DENSE VEG OVER WATER

— STILT —

COOT —

MOORHEN —

— KOLOA

— NENE

HAWAIIAN WATERBIRDS FOODS

← INCREASING ANIMAL

INCREASING VEGETATION →

PREDOMINANTLY INVERTEBRATES

PREDOMINANTLY PLANTS

STILT

COOT

MOORHEN

KOLOA

NENE