

IMPORTANT POINTS IN UNDERSTANDING HOW WETLANDS WORK

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ECOLOGICAL CONSIDERATIONS FOR WETLAND MANAGEMENT
IN NEBRASKA

Crane Trust
Wood River, Nebraska
9-11 September, 2026

TRADITIONAL INCOME

- ONLY ACCOUNTS FOR 5-10% OF TOTAL VALUE
- FOREST PRODUCTS
- FOOD
- RECREATION
 - VIEWING
 - HUNTING

WETLAND VALUES TO SOCIETY

- ATMOSPHERIC STABILITY
- FLOOD CONTROL
- NUTRIENT CYCLING
- GROUND WATER RECHARGE
- WATER PURIFICATION
- TRADITIONAL INCOME

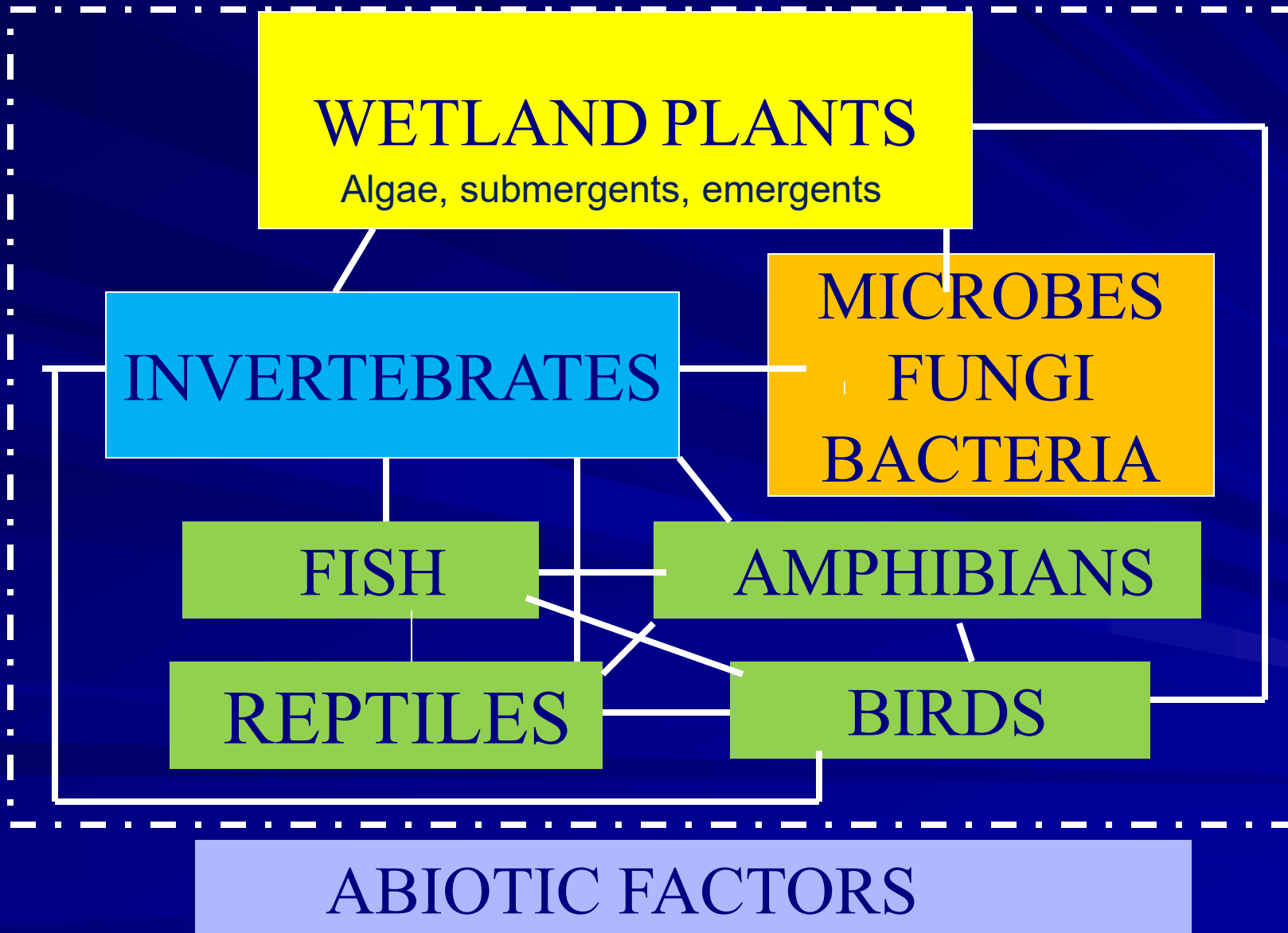
FLOOD CONTROL

- MISSISSIPPI ALLUVIAL VALLEY HOLDS ABOUT 60 DAYS WITH 25 MILLION ACRES OF BOTTOMLAND HARDWOODS
- IN FLOOD OF 1973 PREDICTION WAS THAT MAV STORED LESS THE 25% OF HISTORIC CAPACITY

NUTRIENT CYCLING

- AEROBIC TO ANAEROBIC
- OXIDATION VS REDUCTION
- BACK TO BASIC ELEMENTS RAPIDLY

WETLAND MODEL



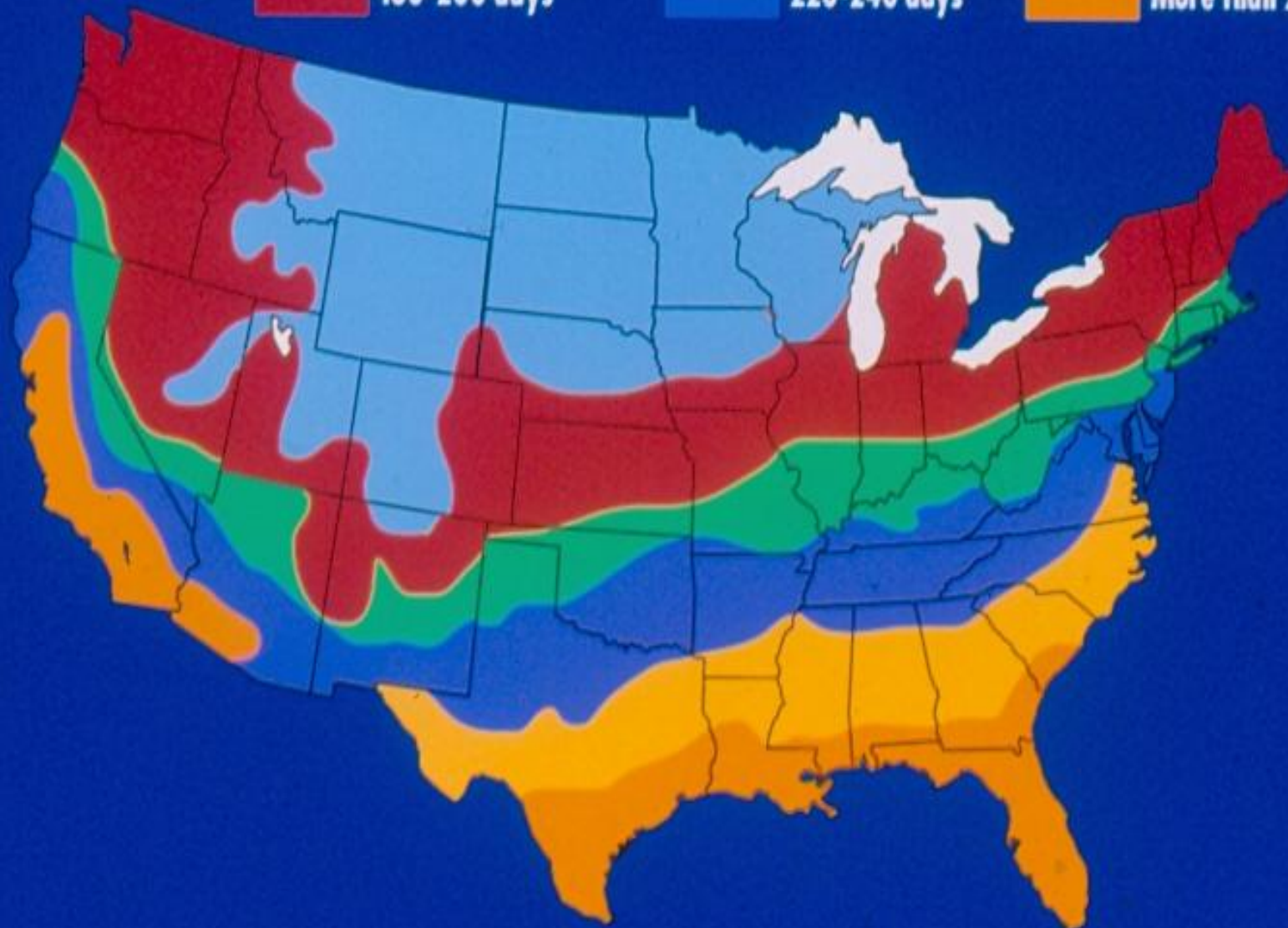
ABIOTIC FACTORS

HYDROLOGY

SOILS

CLIMATE

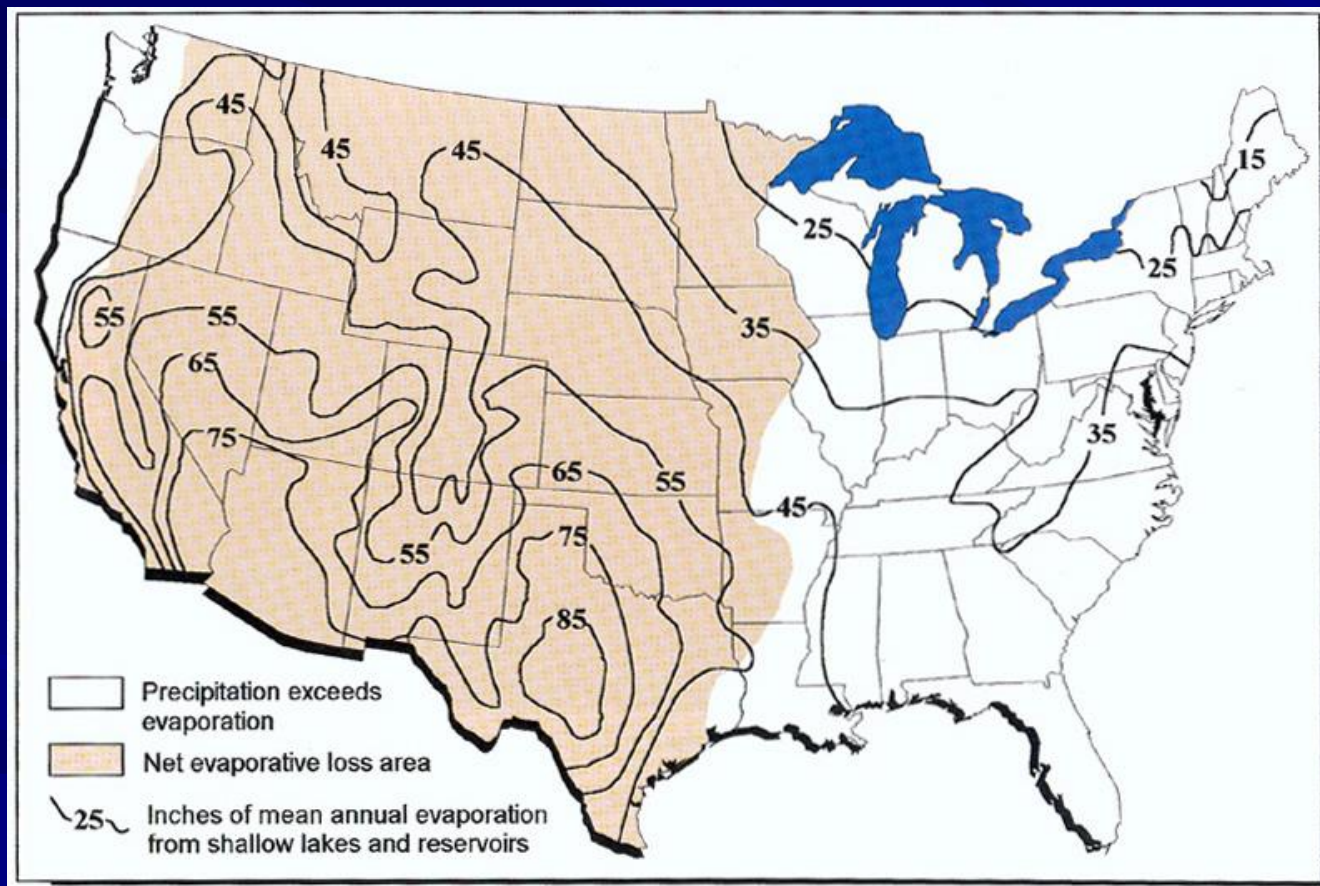
FIRE





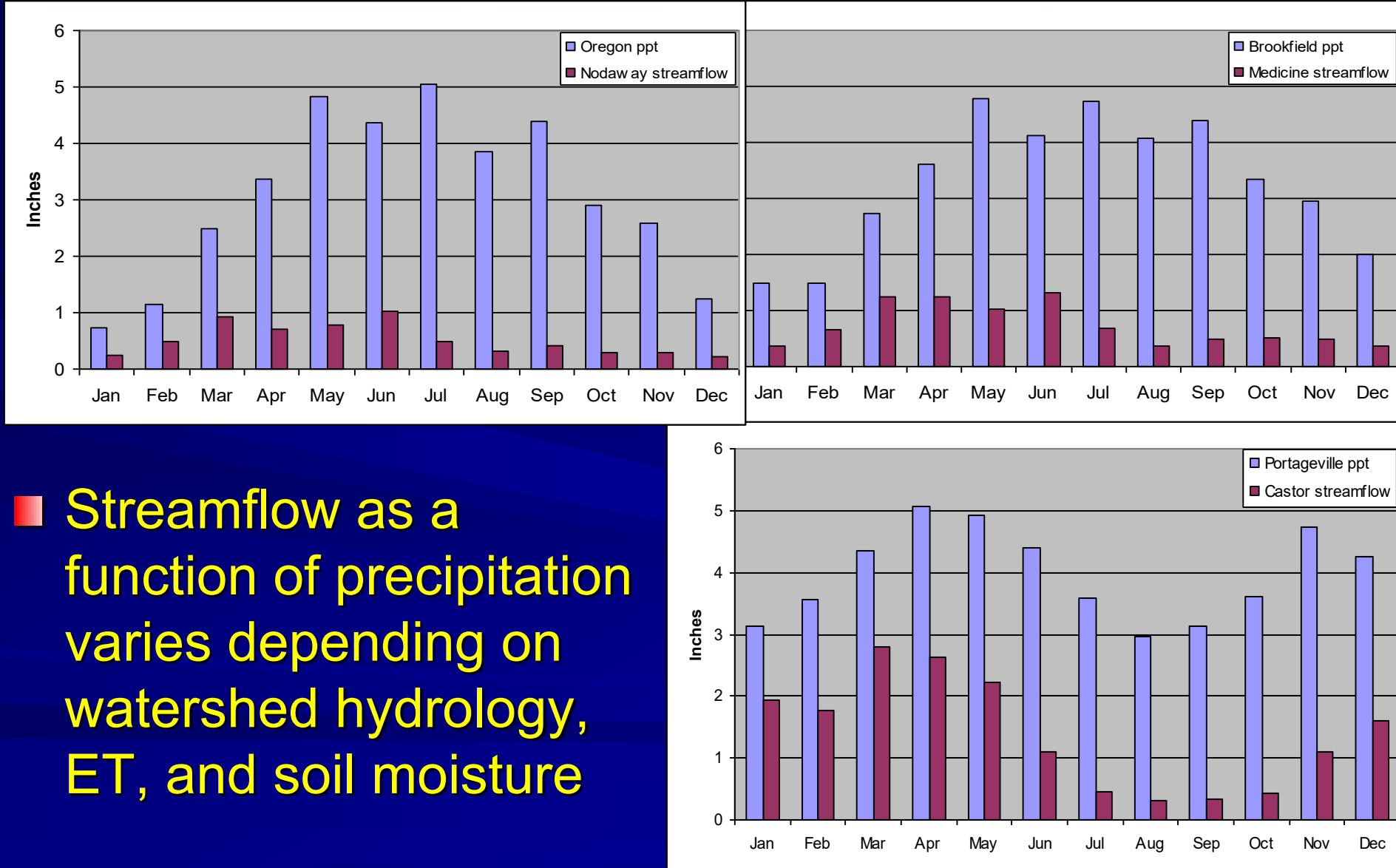
National Wetlands Inventory

National Applicability for Riparian System



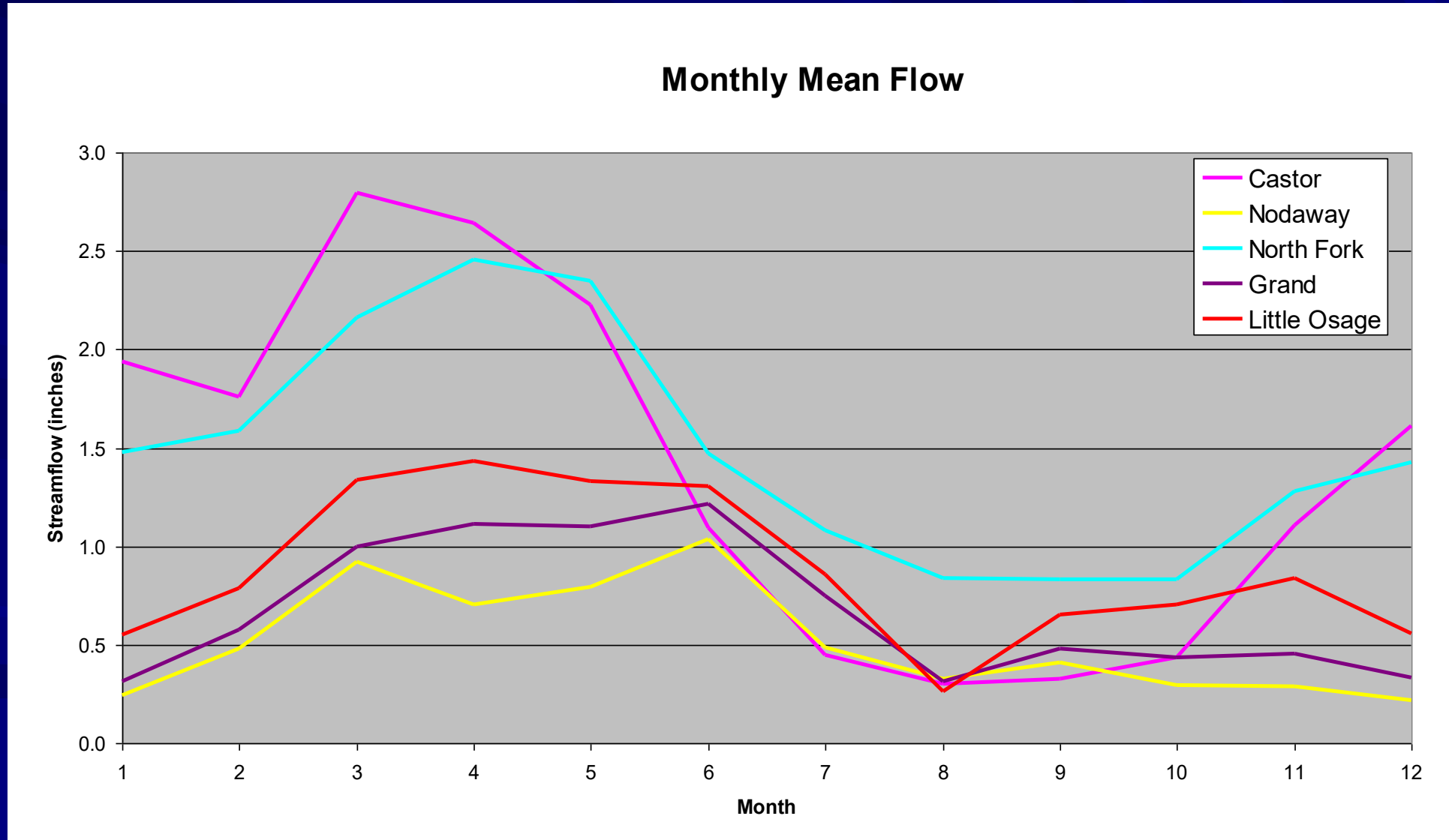
Mean annual evaporation exceeds mean annual precipitation.

Comparison of monthly mean precipitation and streamflow

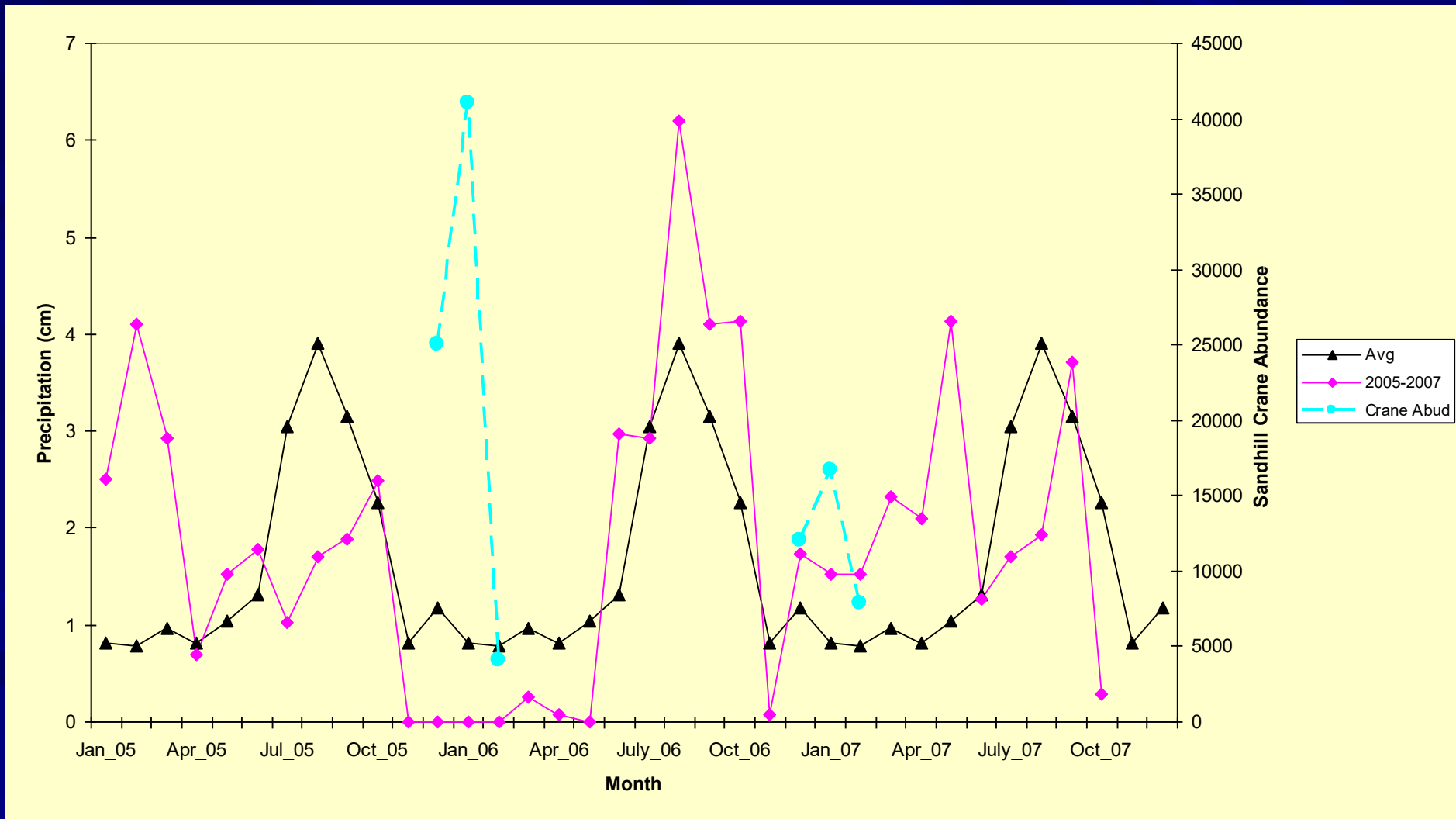


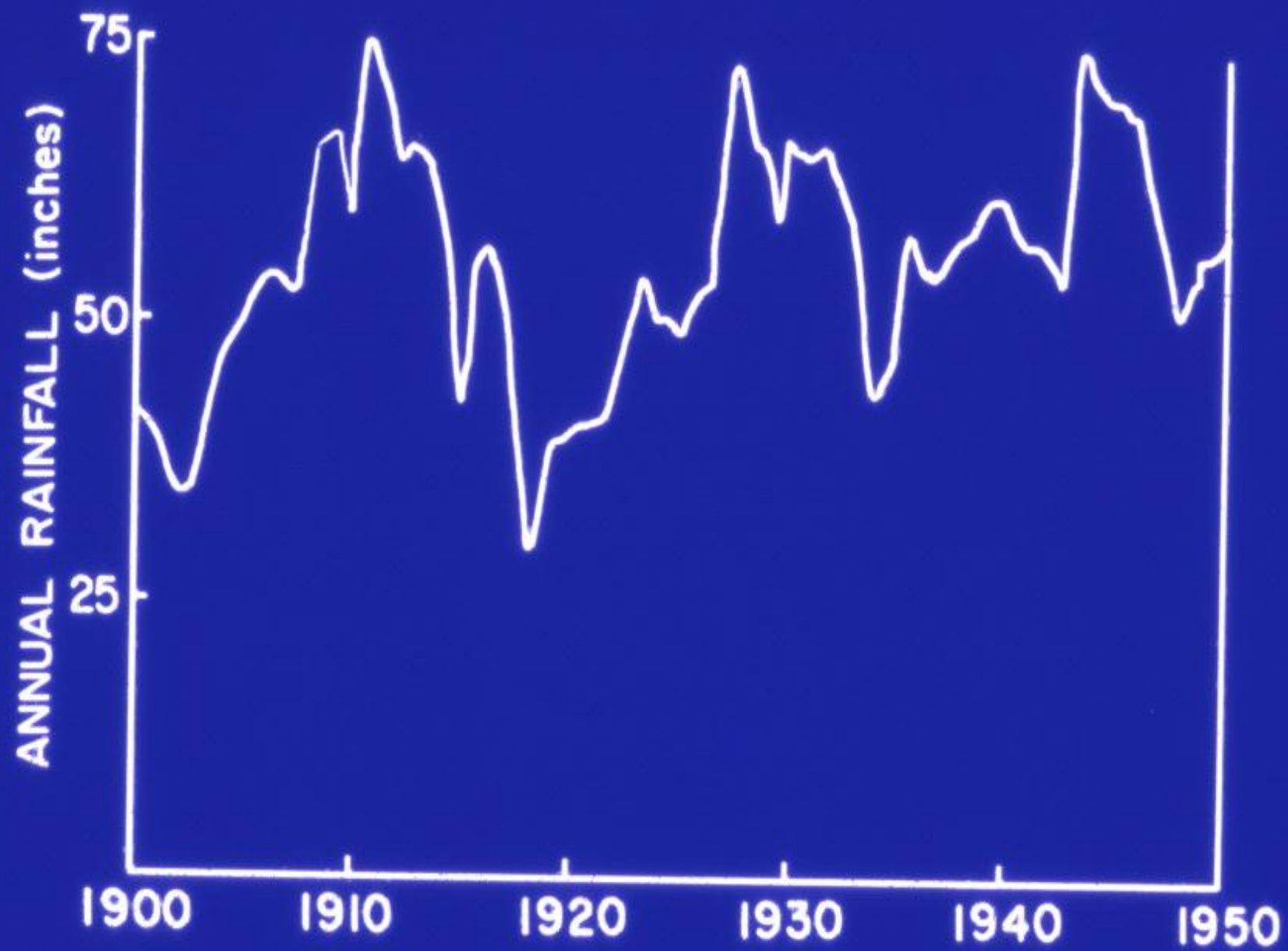
- Streamflow as a function of precipitation varies depending on watershed hydrology, ET, and soil moisture

Looking just at streamflow for a few rivers

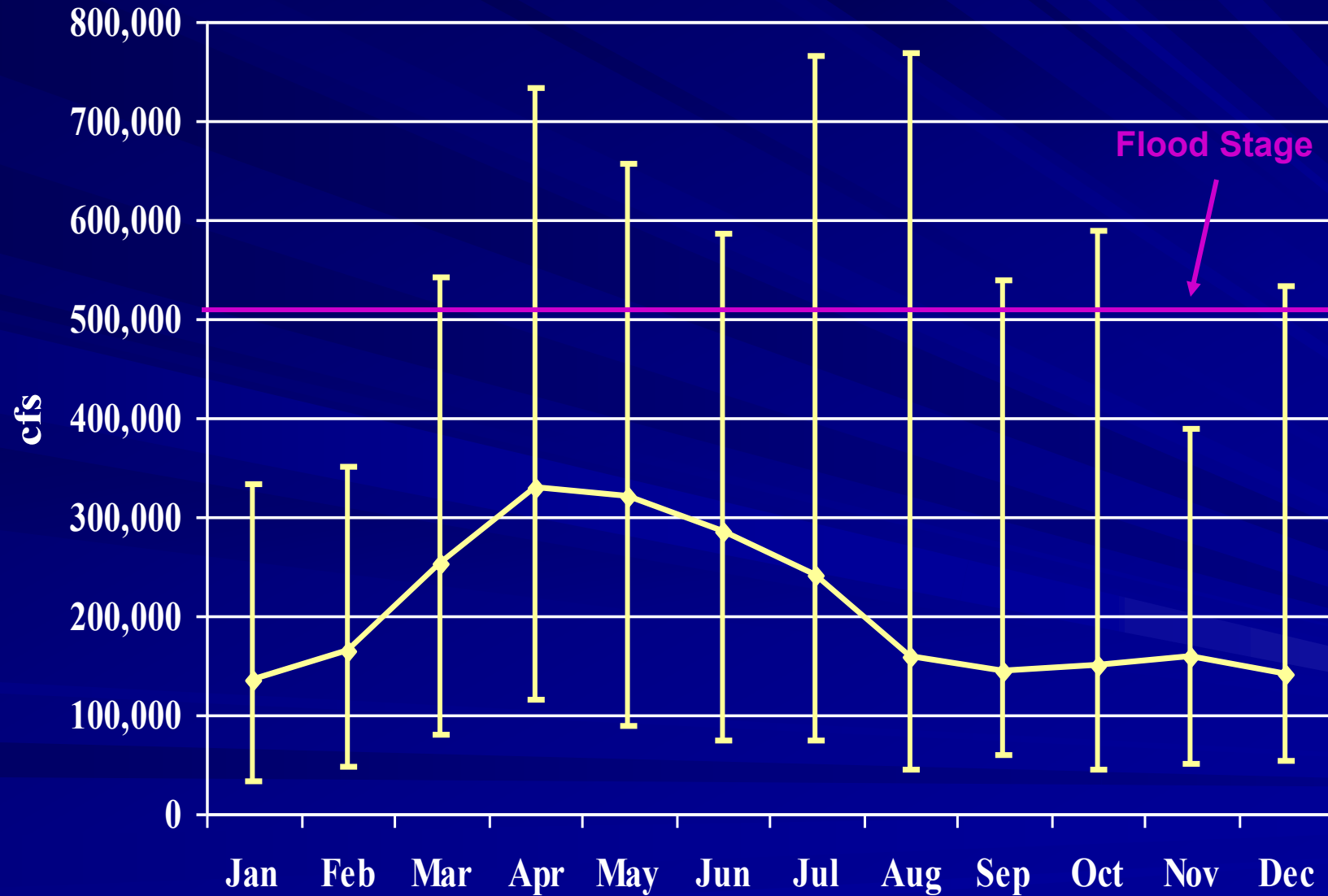


Precipitation Variation across Years Relative to Sandhill Crane Abundance for Bernardo, New Mexico

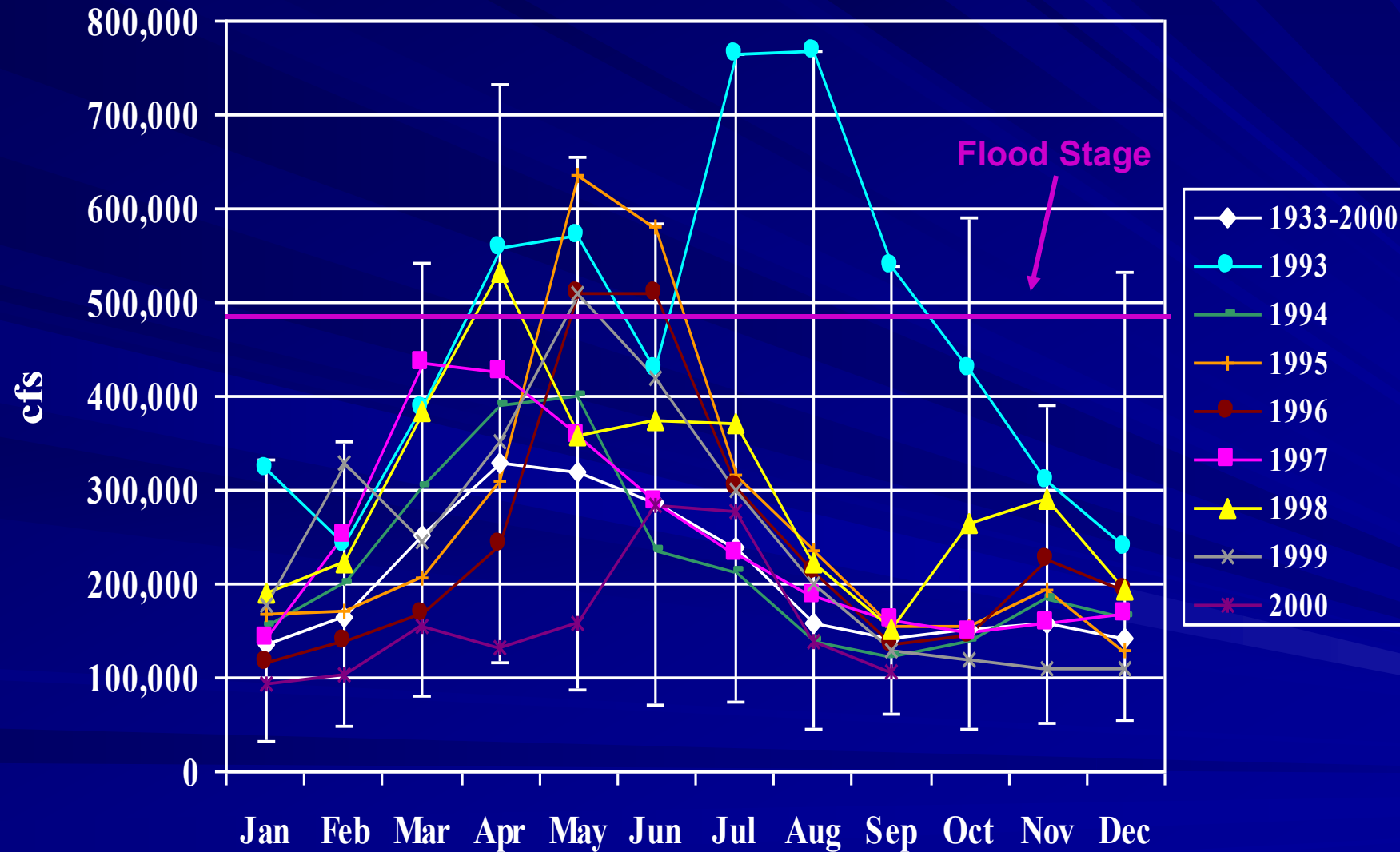




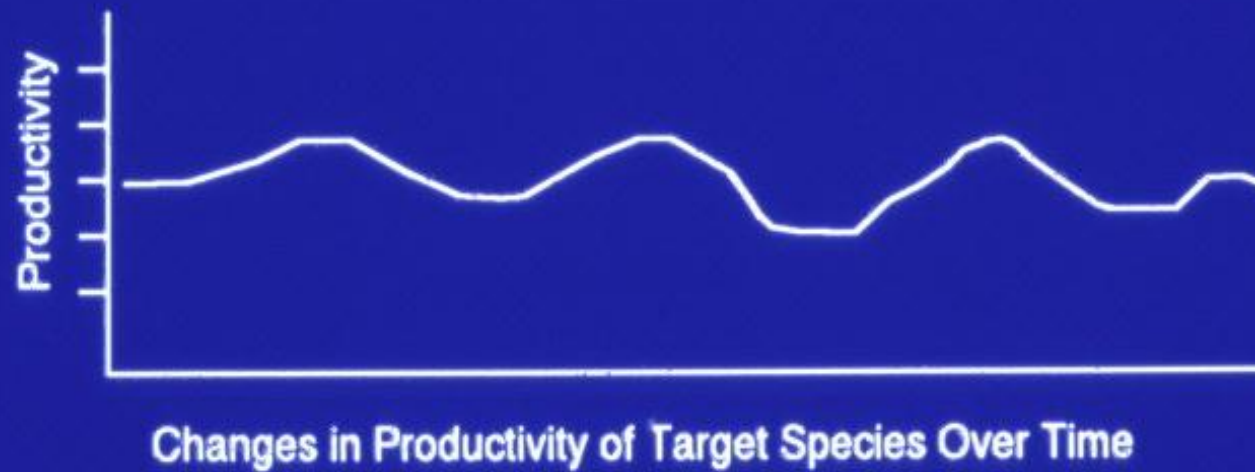
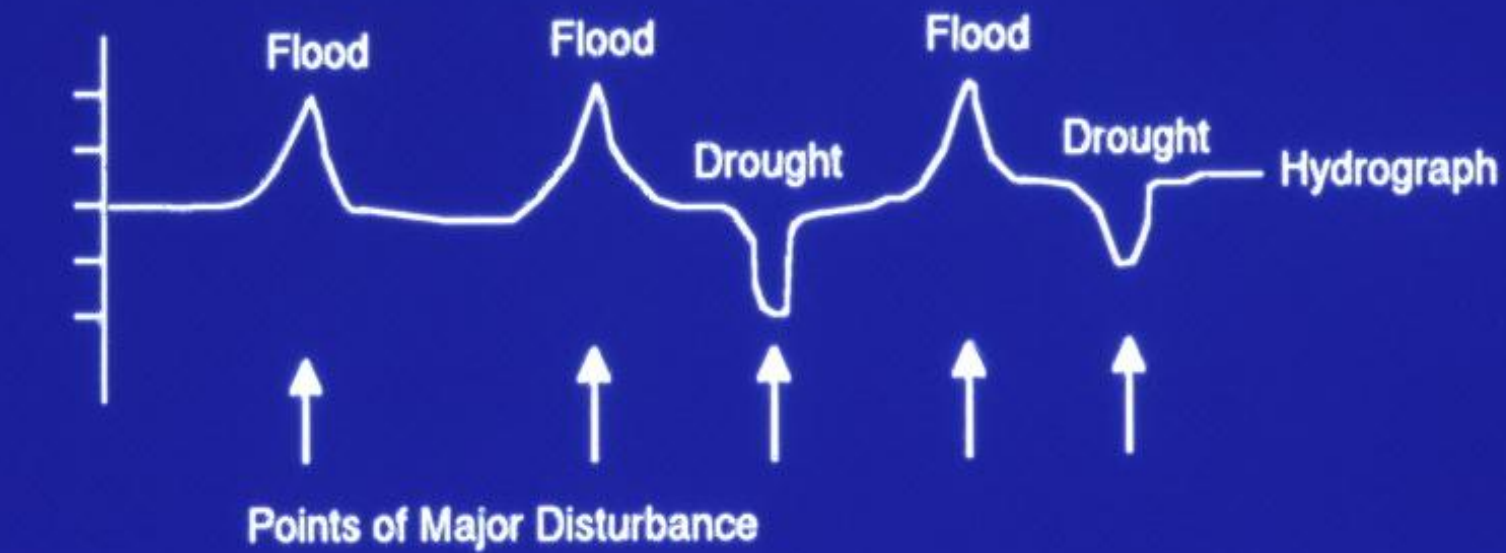
Mean monthly discharge of the Mississippi River from 1933-2000



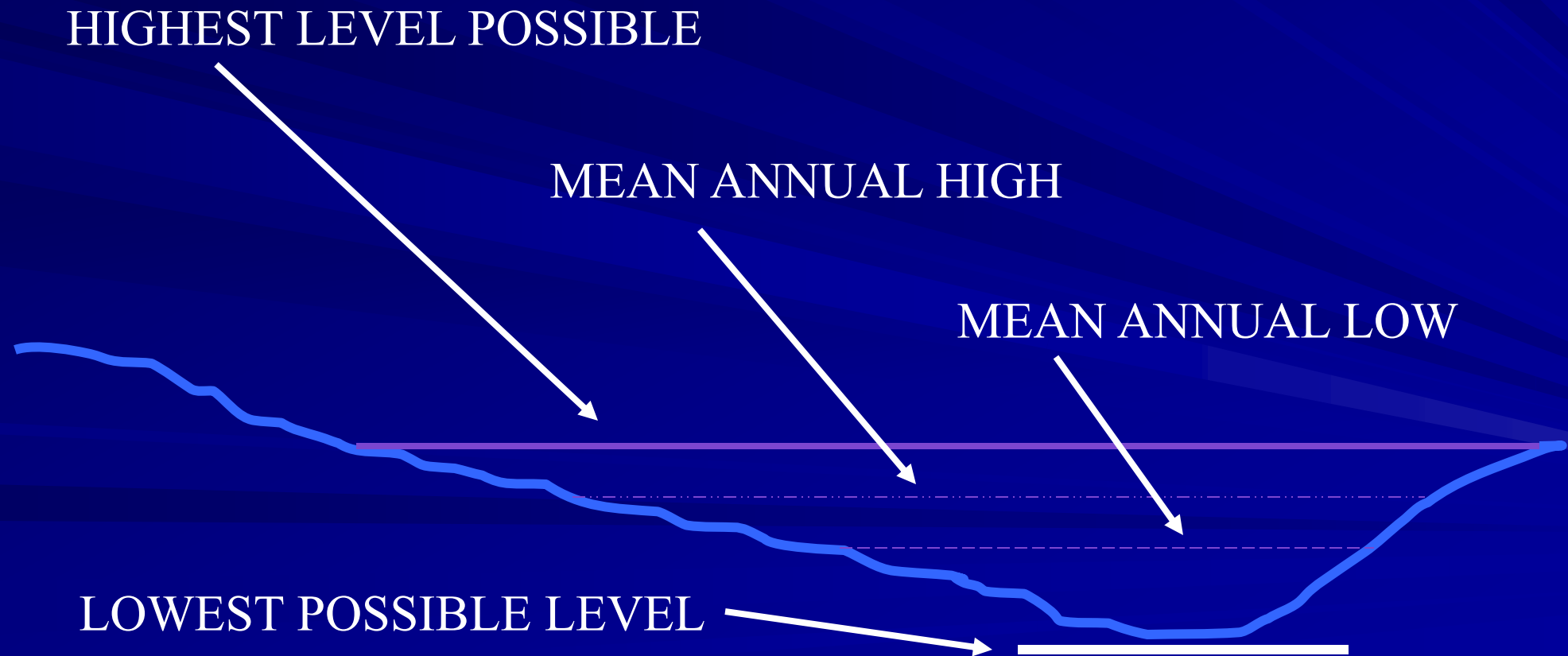
Mean monthly discharge of the Mississippi River from 1993-2000



NATURAL PROCESSES/FUNCTIONS - UNMANAGED

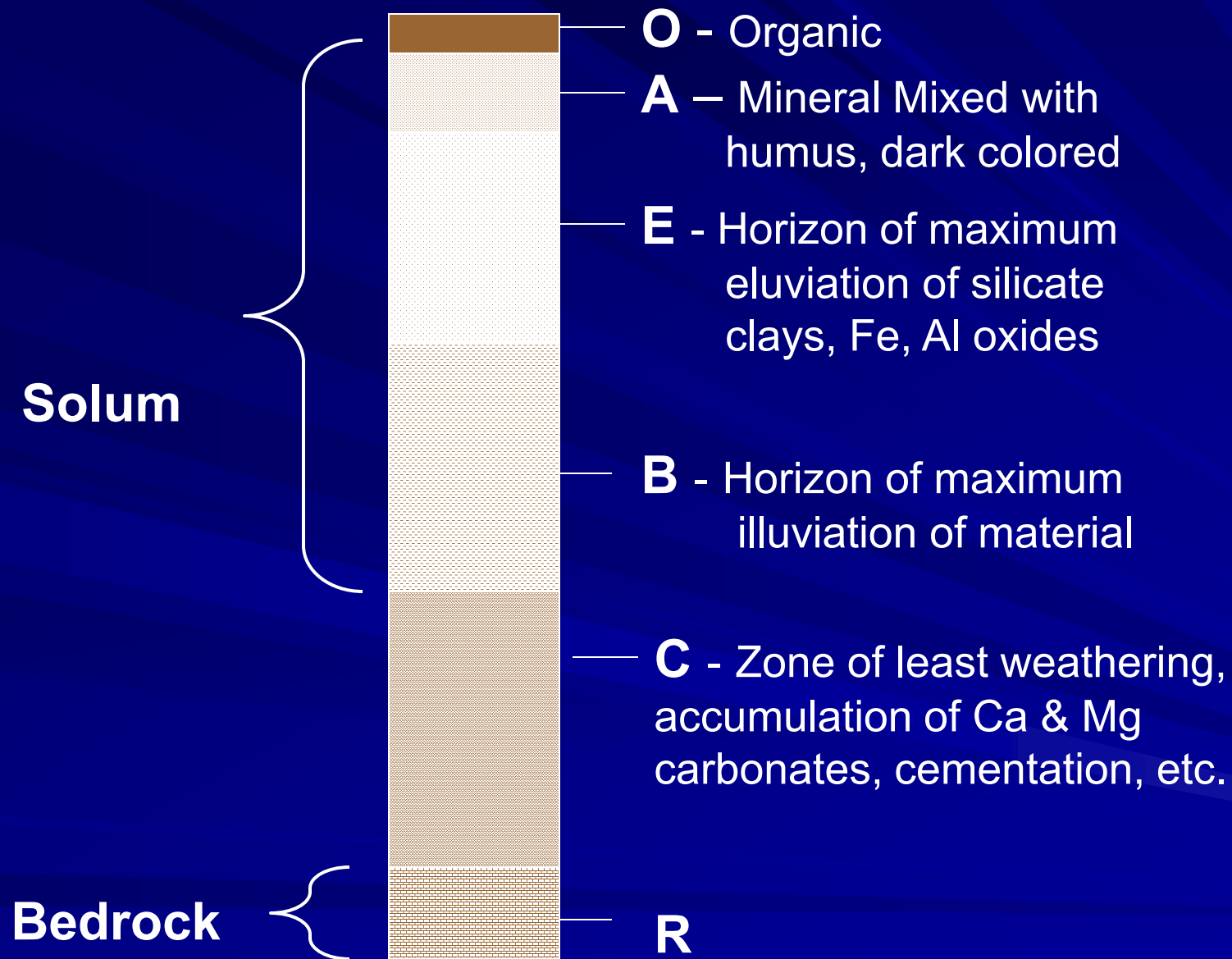


VARIATION IN ANNUAL WATER LEVEL



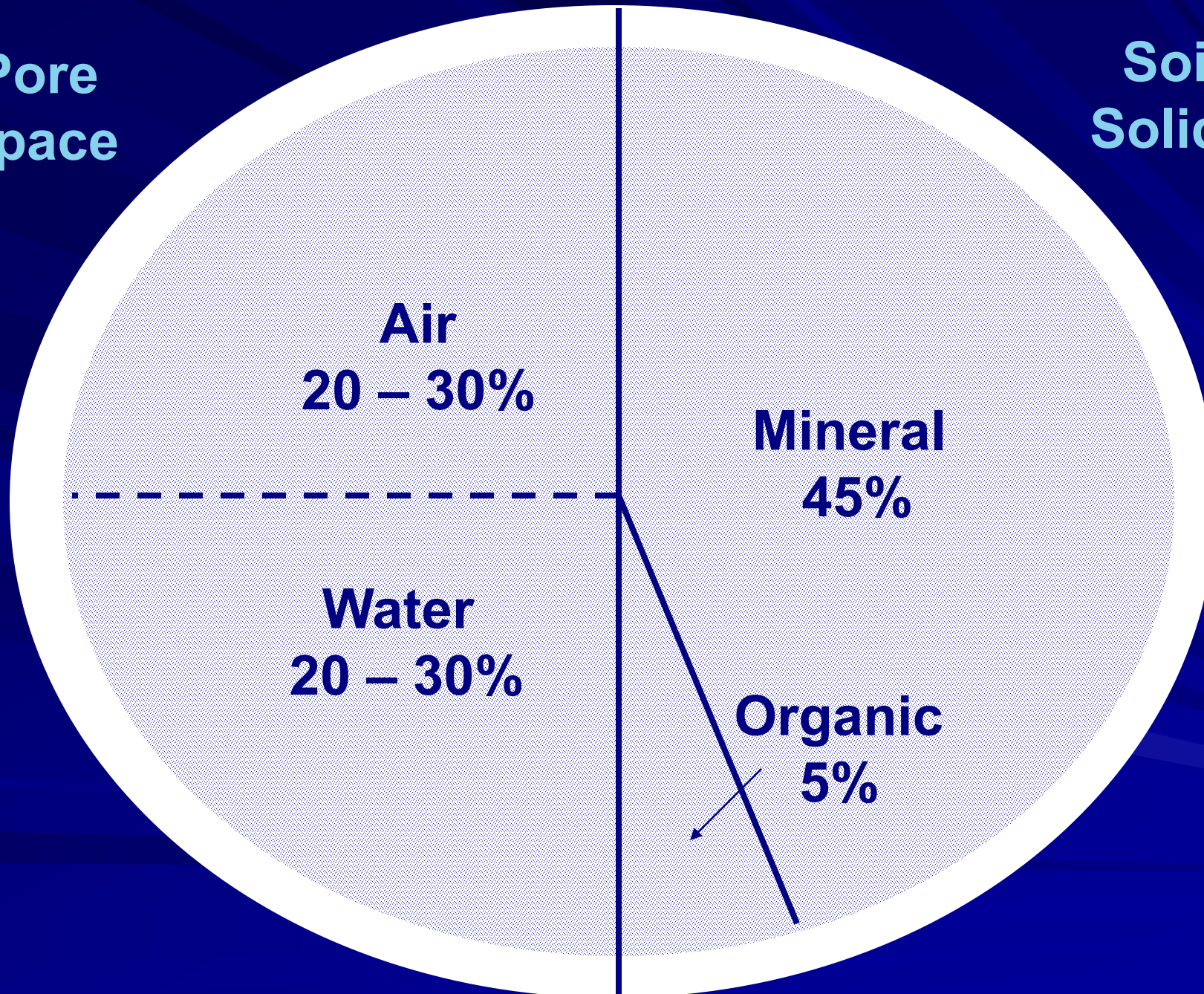
SOIL PROFILE





**Pore
Space**

**Soil
Solids**



Particle Fractions

■ Type

– Sand

– Silt

– Clay

■ Size

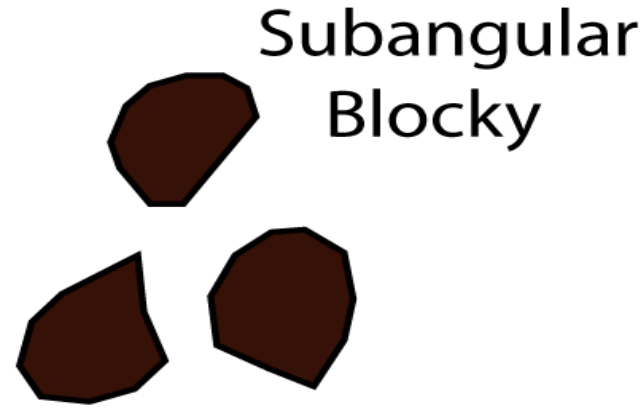
.05 – 2 mm

.002 - .05 mm

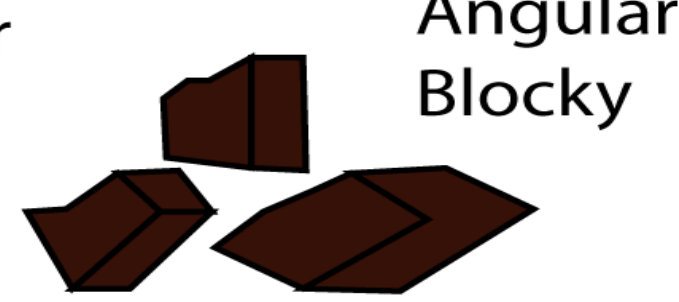
<.002 mm



10 mm

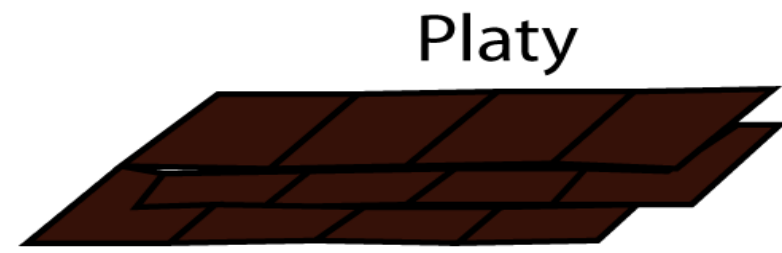


10 mm

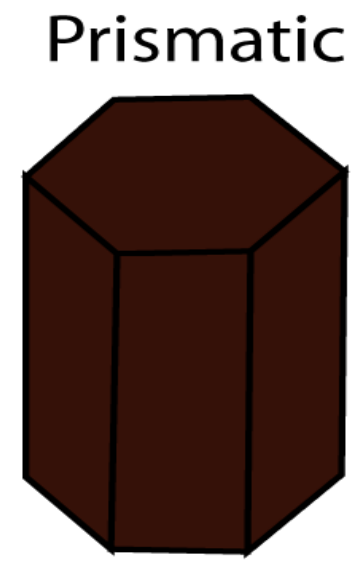


10 mm

Examples of Different
Soil Structure Classes

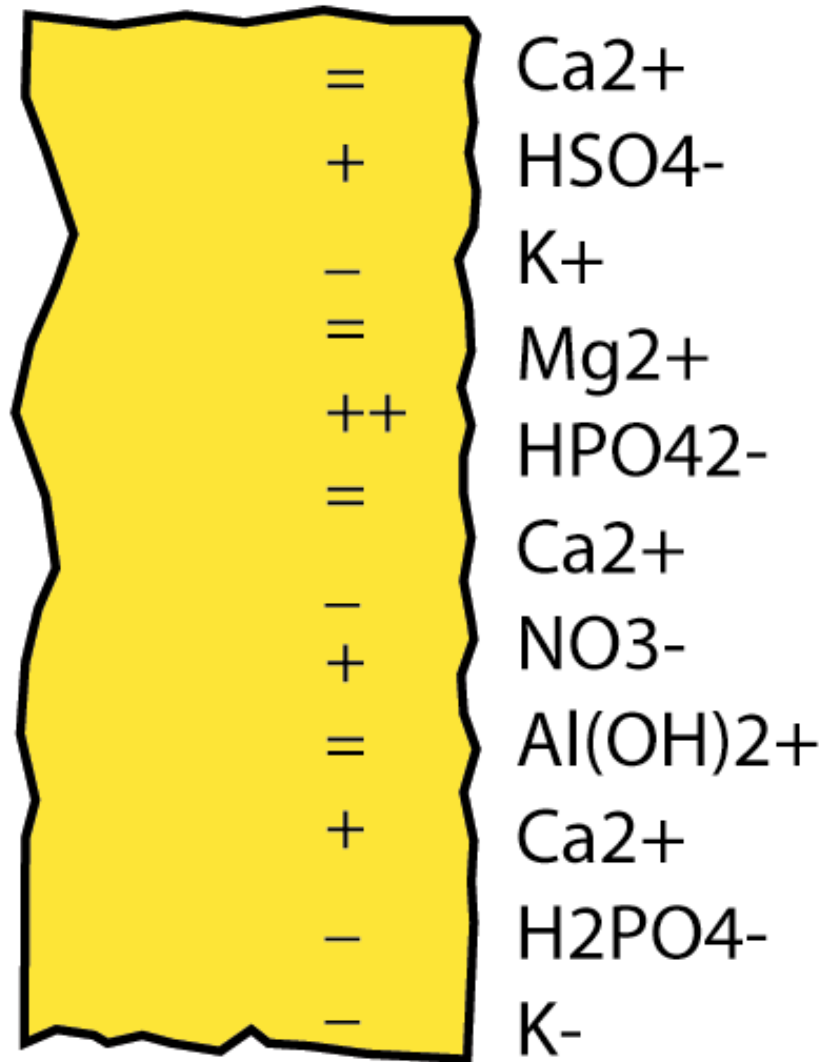


10 mm

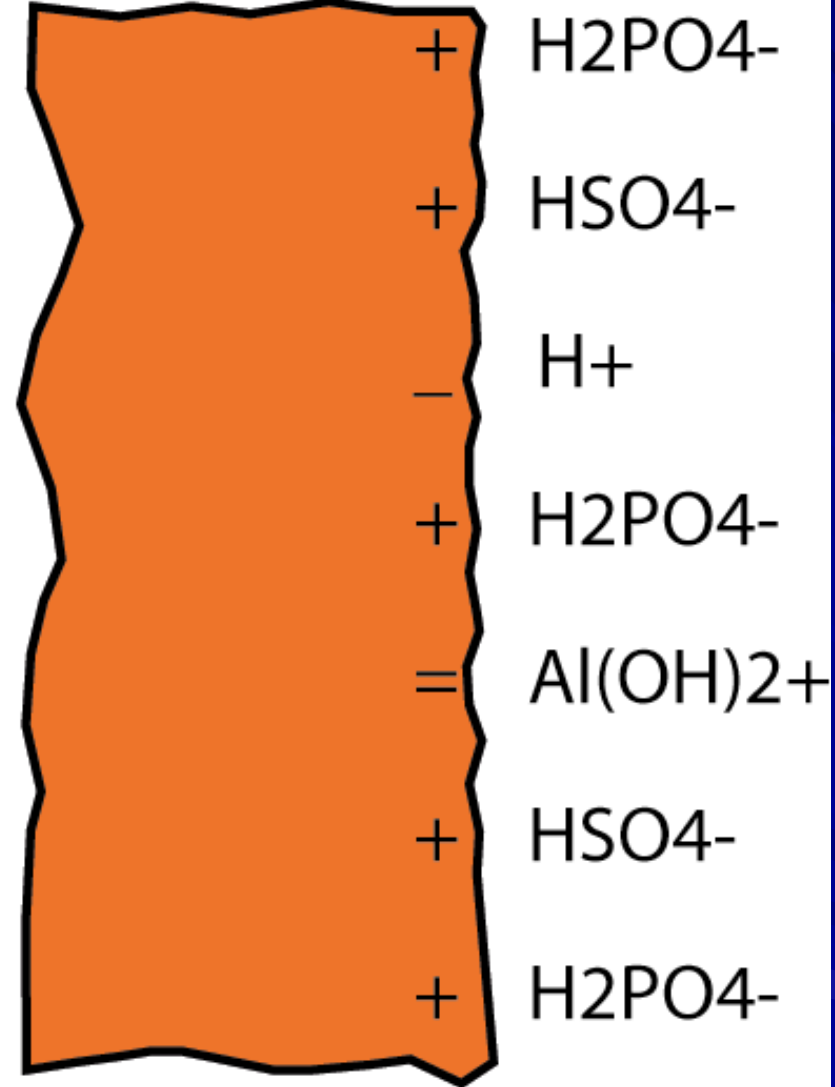


10 mm





(a) 1:1 - type silicate clay particle

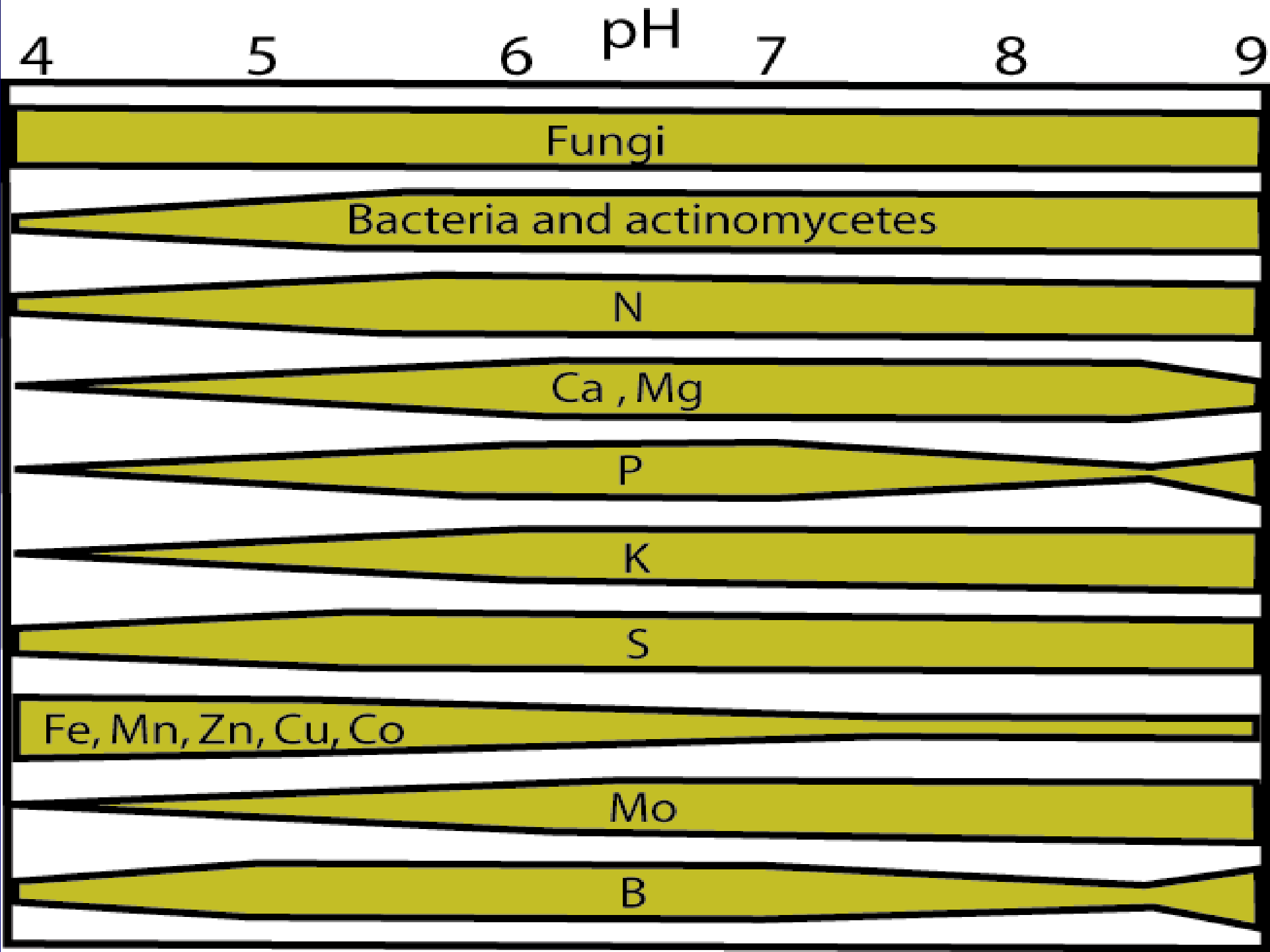


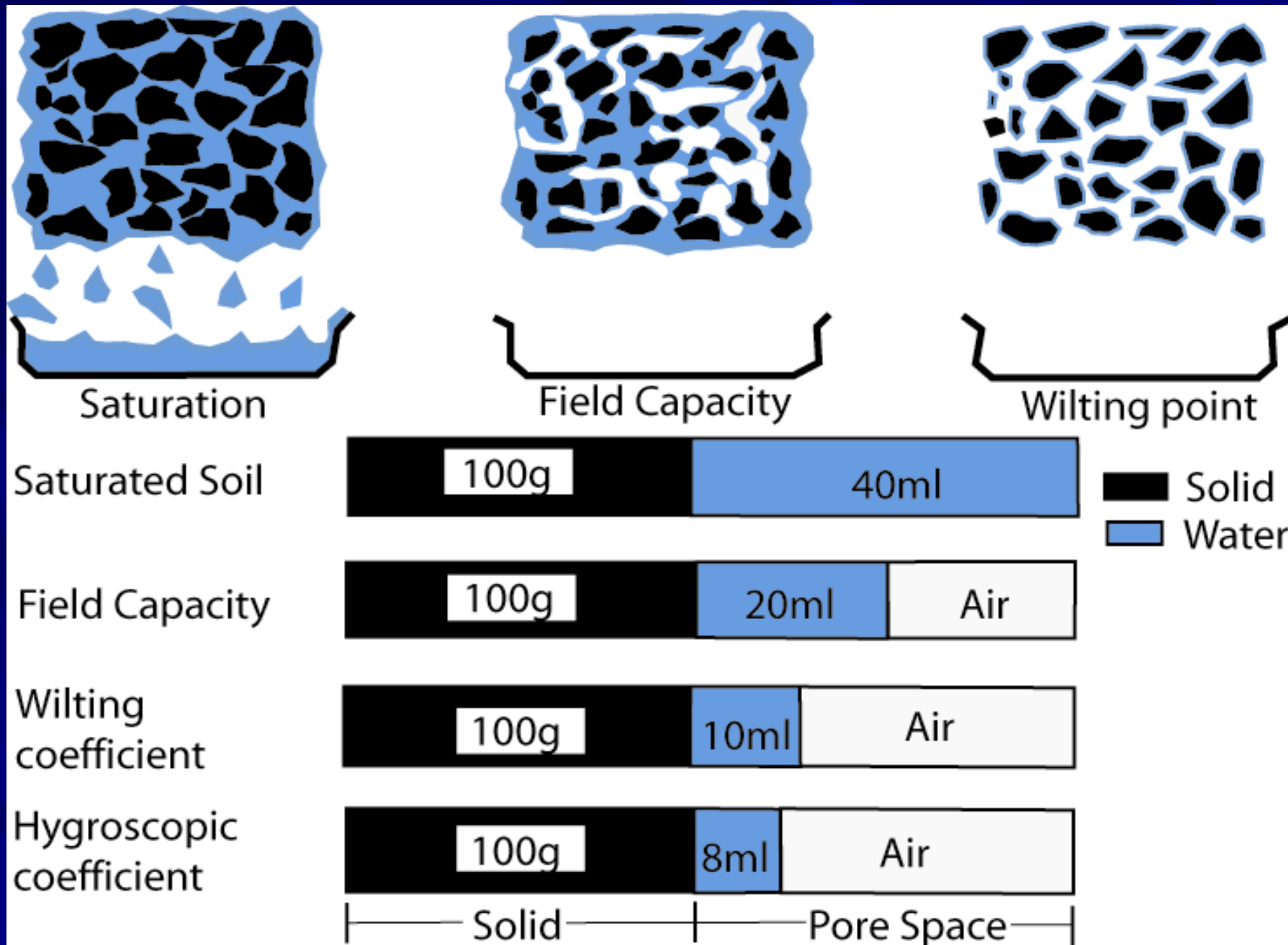
(b) Iron/aluminum oxide particle

Factors Affecting SOM

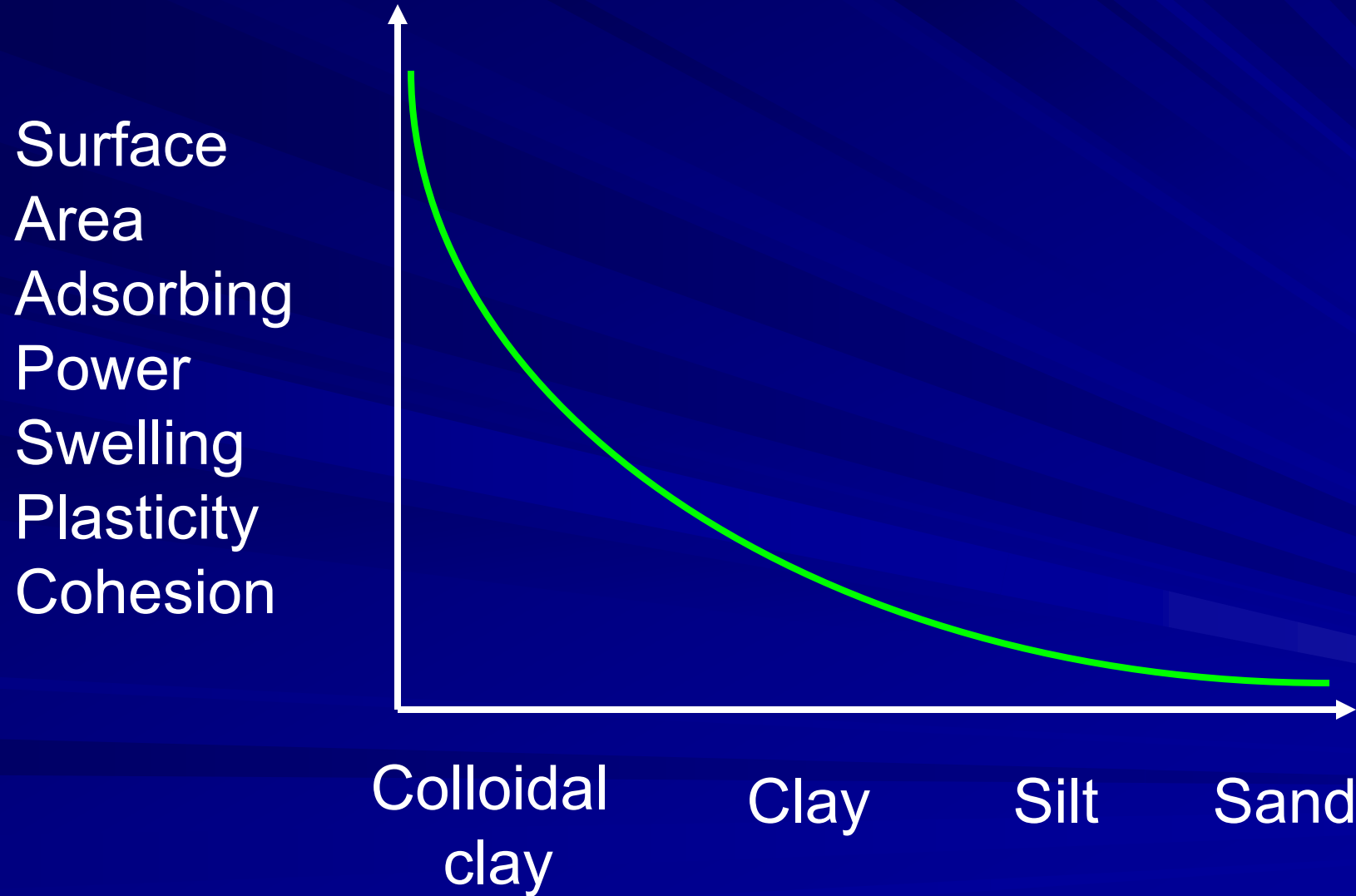
(Jenny 1930)

- Climate (temp & precipitation)
- Vegetation
- Topography
- Parent Material
- Age



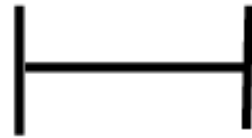


Characteristic of Soil Separates



Clay Shrink/Swell Capacity

dry



**0.001
mm**

wet



**0.02
mm**

**0 to 20 times
Dry Size
(Bentonite)**



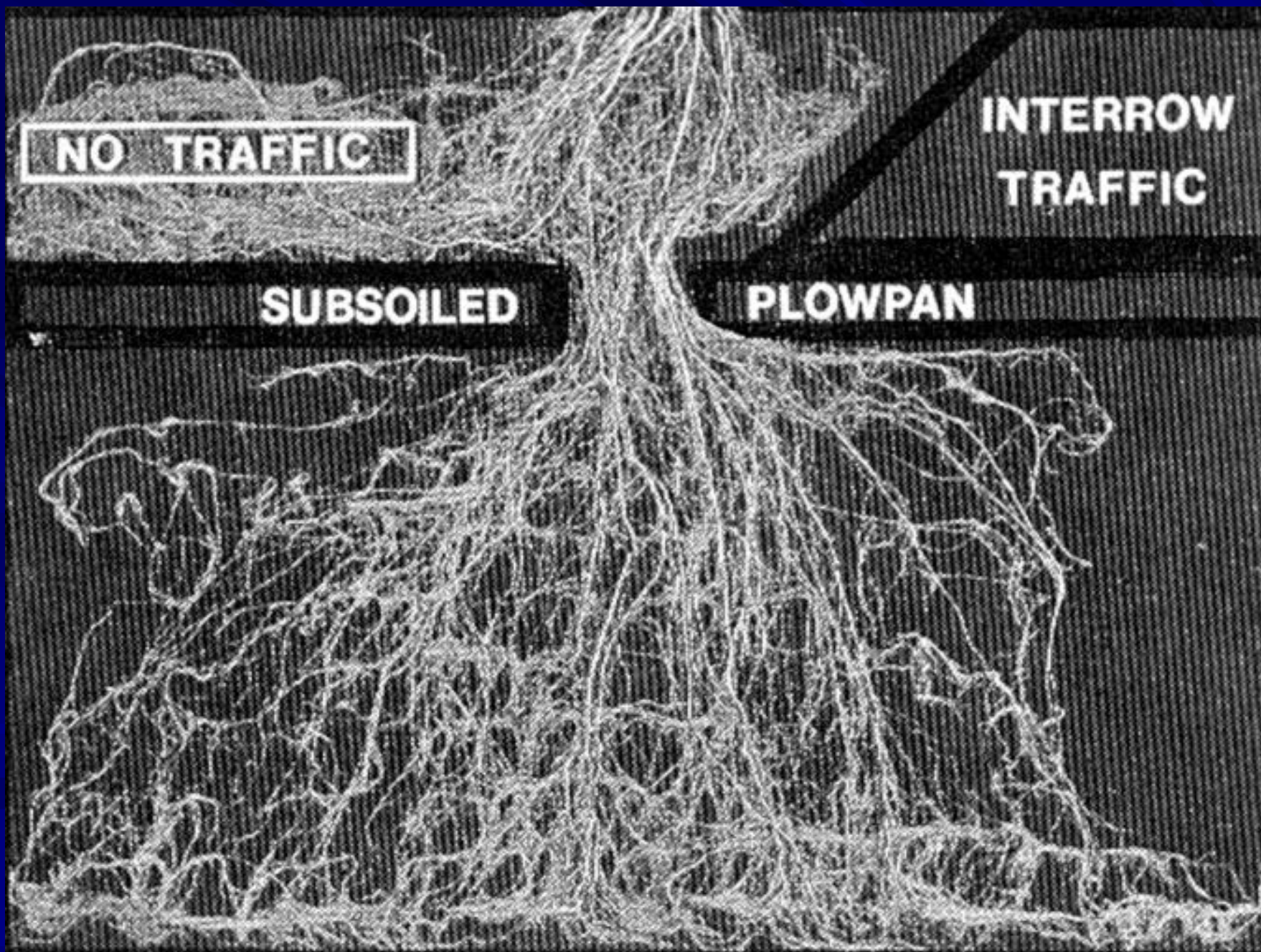


Capillary Fringe (est. thickness)

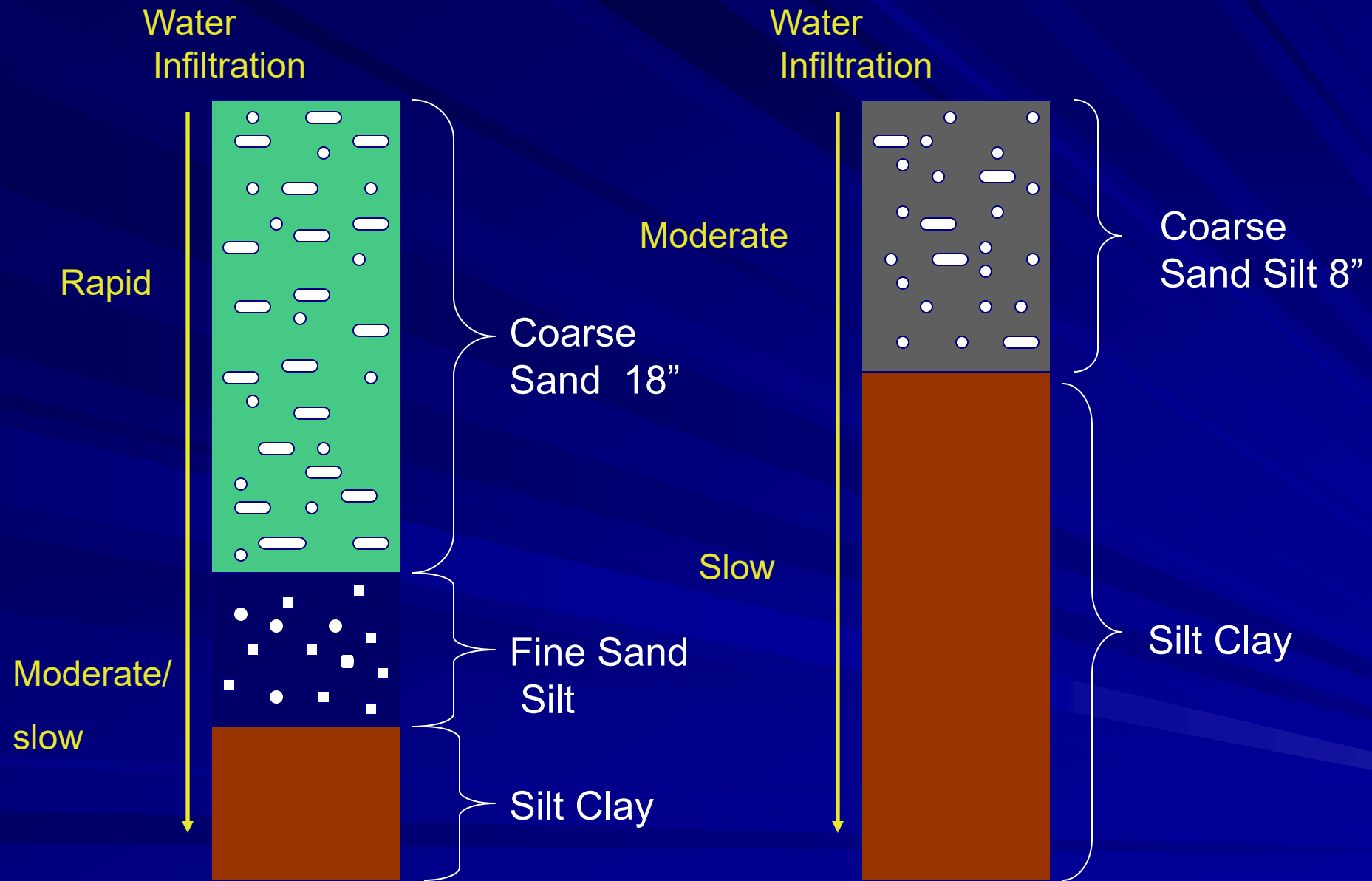
Soil	Range in Depth	Avg.
Sands	0-3 in.	2 in.
Silts	0.5 – 5 ft.	<12 in.
Clays	5-10 ft.	<60 in.

Soil Compaction

- Deeper effects in wet soil
- Impedes surface water infiltration/flow
- Restrict root development







SOIL DETERMINES

- PLANT COMMUNITY COMPOSITION
- PLANT STRUCTURE
 - LITTER FOR INVERTEBRATES
 - STRUCTURE FOR INVERTEBRATES
- FOOD PRODUCTION

WETLAND PLANT ENERGETICS

- How do they acquire oxygen?
- Where do they store energy?
- How do they store energy?
- What nutrients control their productivity?
- Are they inhibited by any natural occurring chemical conditions?

ALLEOPATHY



RAINWATER BASIN NEBRASKA



LATVIA



CATTAIL CHARACTERISTICS

- PERENNIAL MONOCOT
- LARGE BELOW GROUND BIOMASS
- 3 COMMONLY RECOGNIZED SPECIES AND HYBRIDS
- EACH SPECIES HAS DIFFERENT CHARACTERISTICS
- CREATE OWN HABITAT
- IN SATURATED OR FLOODED SOILS
- AEROBIC AND ANAEROBIC RESPIRATION
- ALLEOPATHIC
- DO WELL WITH HIGH NUTRIENTS

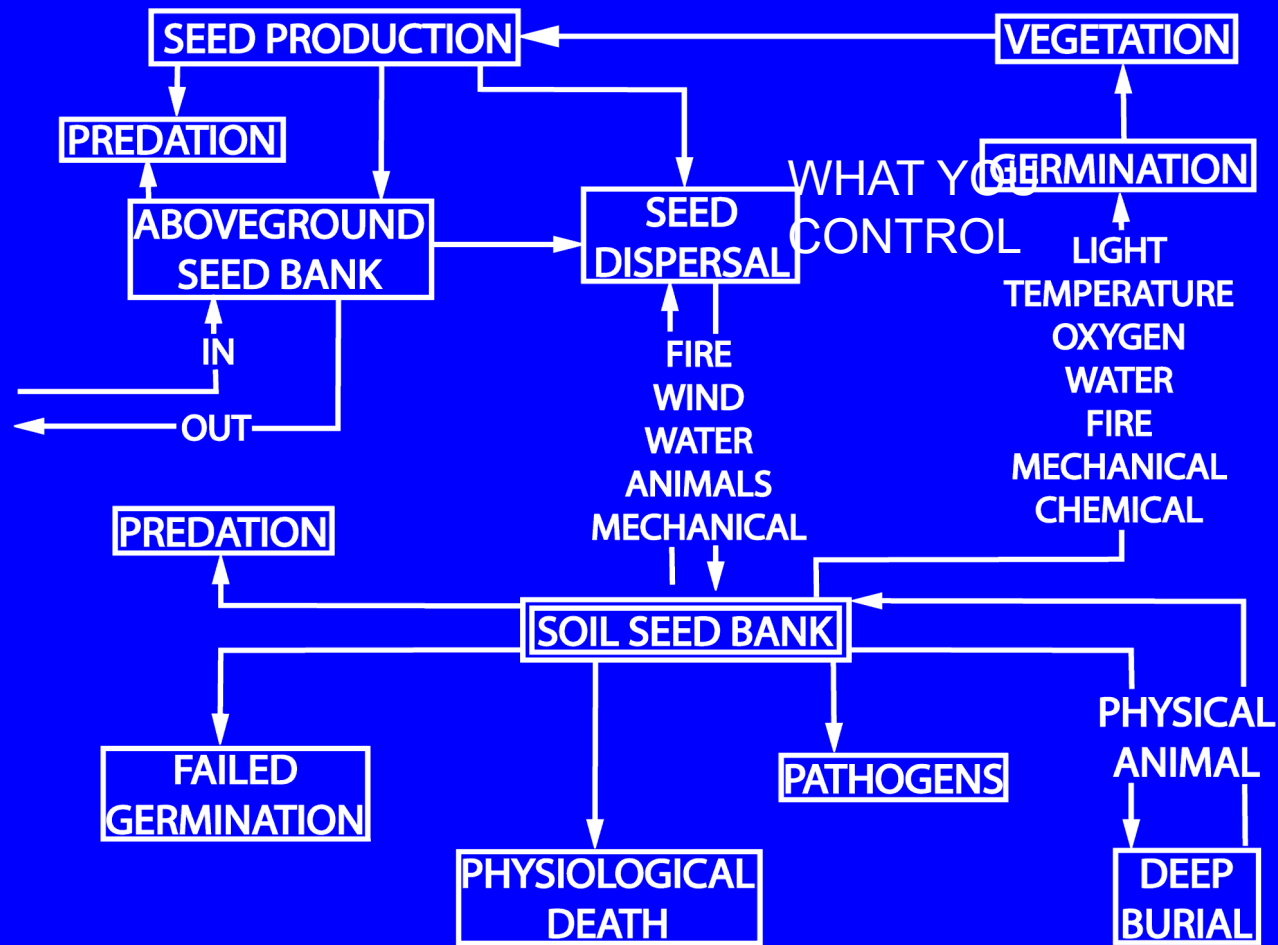








SEED BANK



All wetlands have horizontal zonation

ANNUALS

PERENNIALS



TERRESTRIAL VEGETATION

Your text here

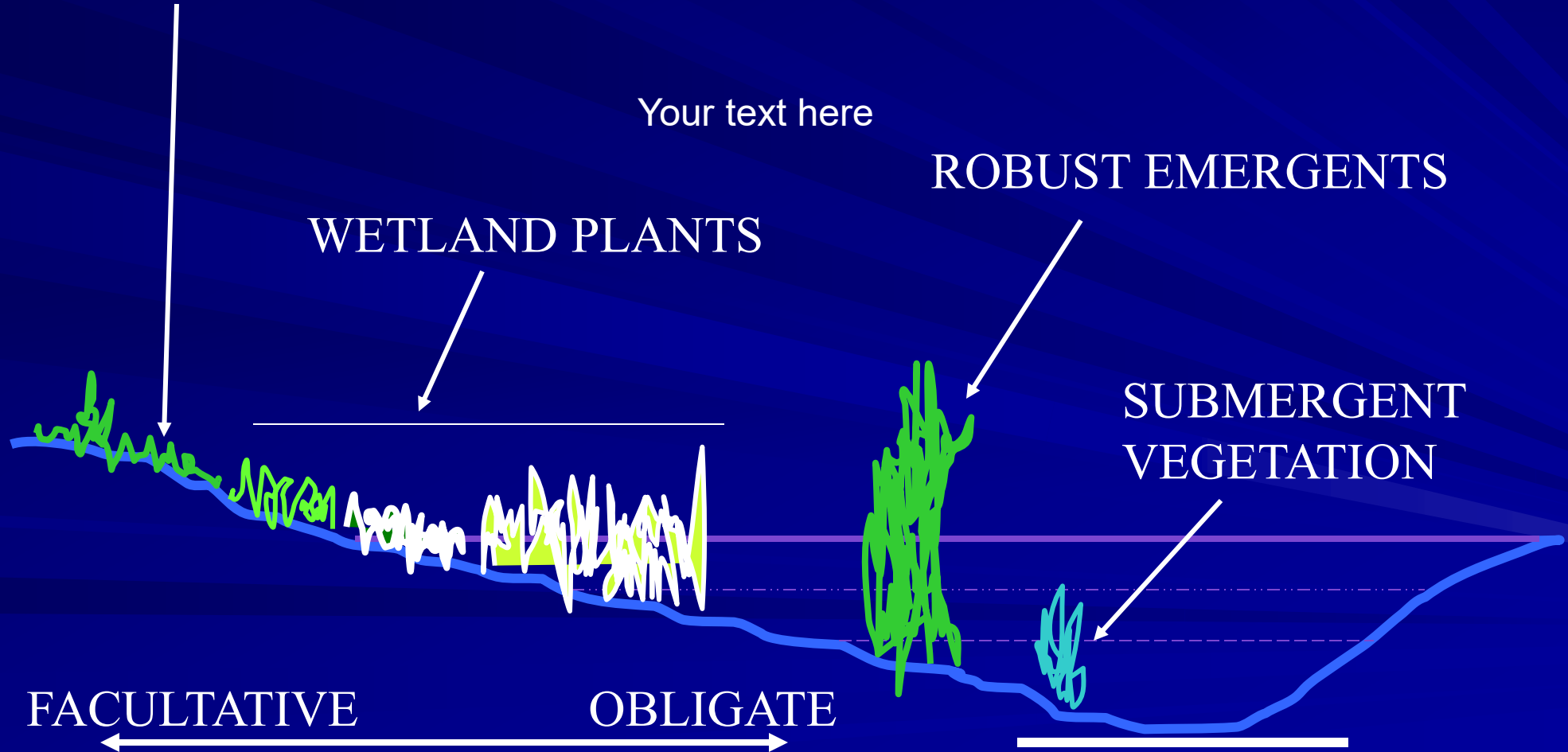
ROBUST EMERGENTS

WETLAND PLANTS

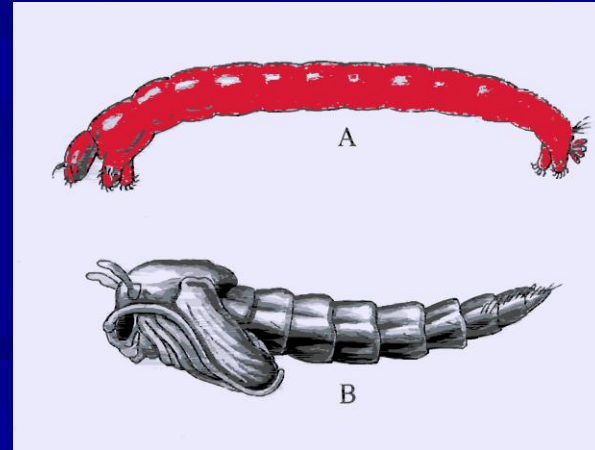
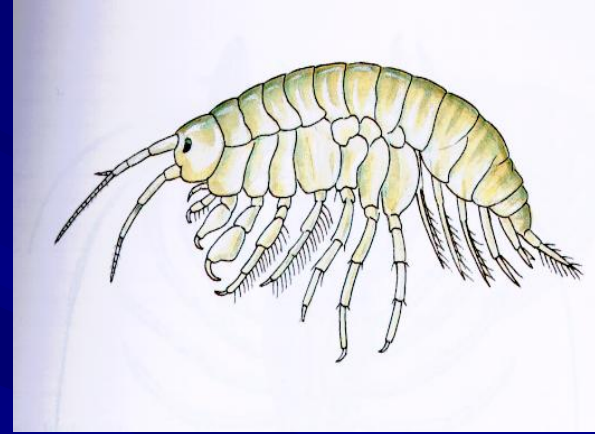
SUBMERGENT
VEGETATION

FACULTATIVE

OBLIGATE



WETLAND INVERTEBRATES



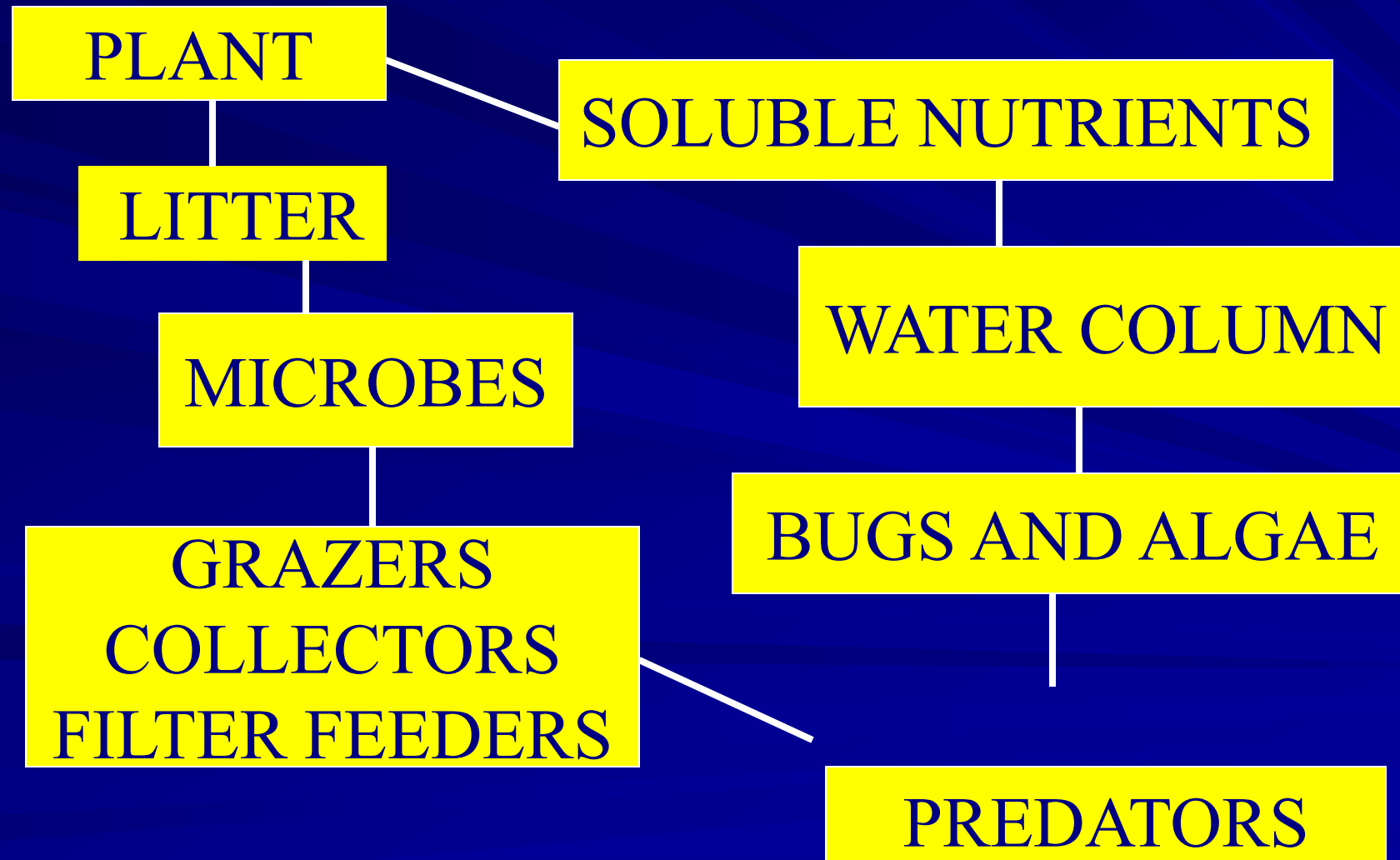
Crayfish Borrows



Typical snail densities in Seasonal Wetlands



DECOMPOSITION AND BUGS



DECOMPOSING LITTER

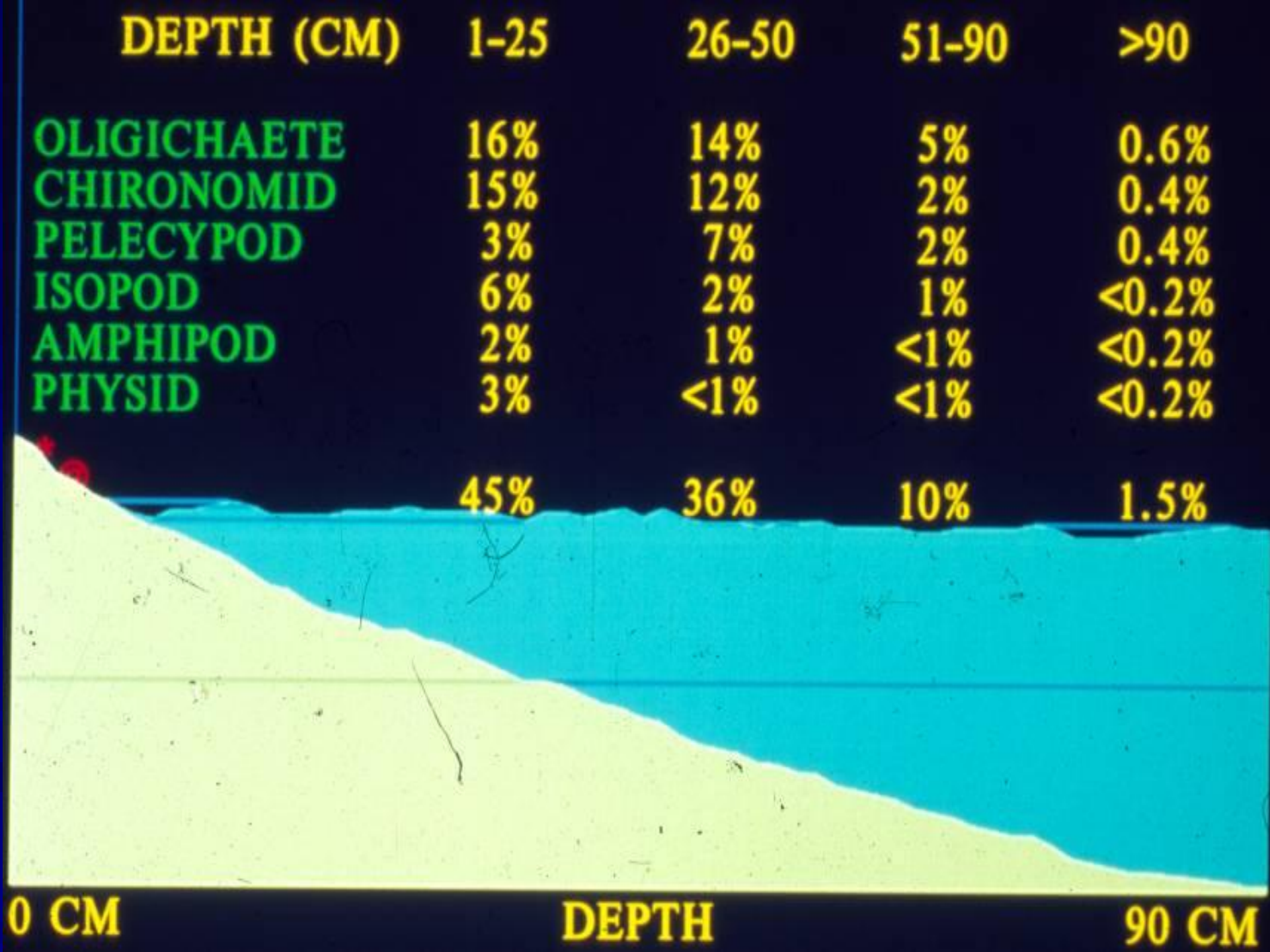


CHEYENNE BOTTOMS

- 15,000 ACRE MARSH
- CATTAIL DOMINATED MARSH
- 92 TONS DRY WEIGHT CATTAIL
- CHRONIMIDS DOMINATE IN OPEN MUD
- CHRONIMIDS DEVELOP OVER WINTER
- MANY OTHER SPECIES OF INVERTEBRATES

CHRONIMIDS ON CHEYENNE BOTTOMS TONS DRY WEIGHT

NOV	MAR	APR	MAY	JUN
81	68	45	19	107

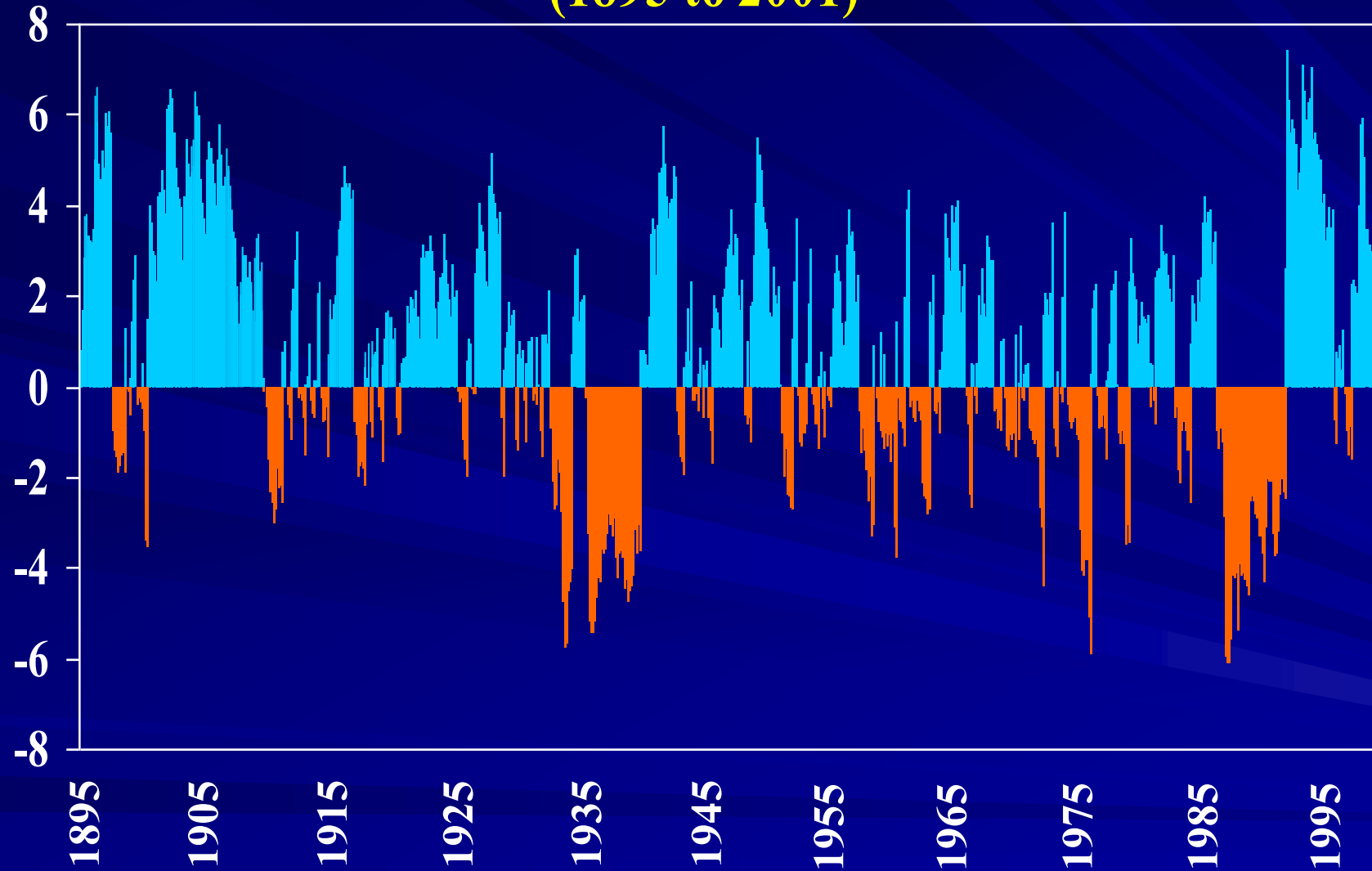


ABIOTIC CONDITIONS IN COMBINATION WITH STRUCTURE AND FOOD DETERMINES

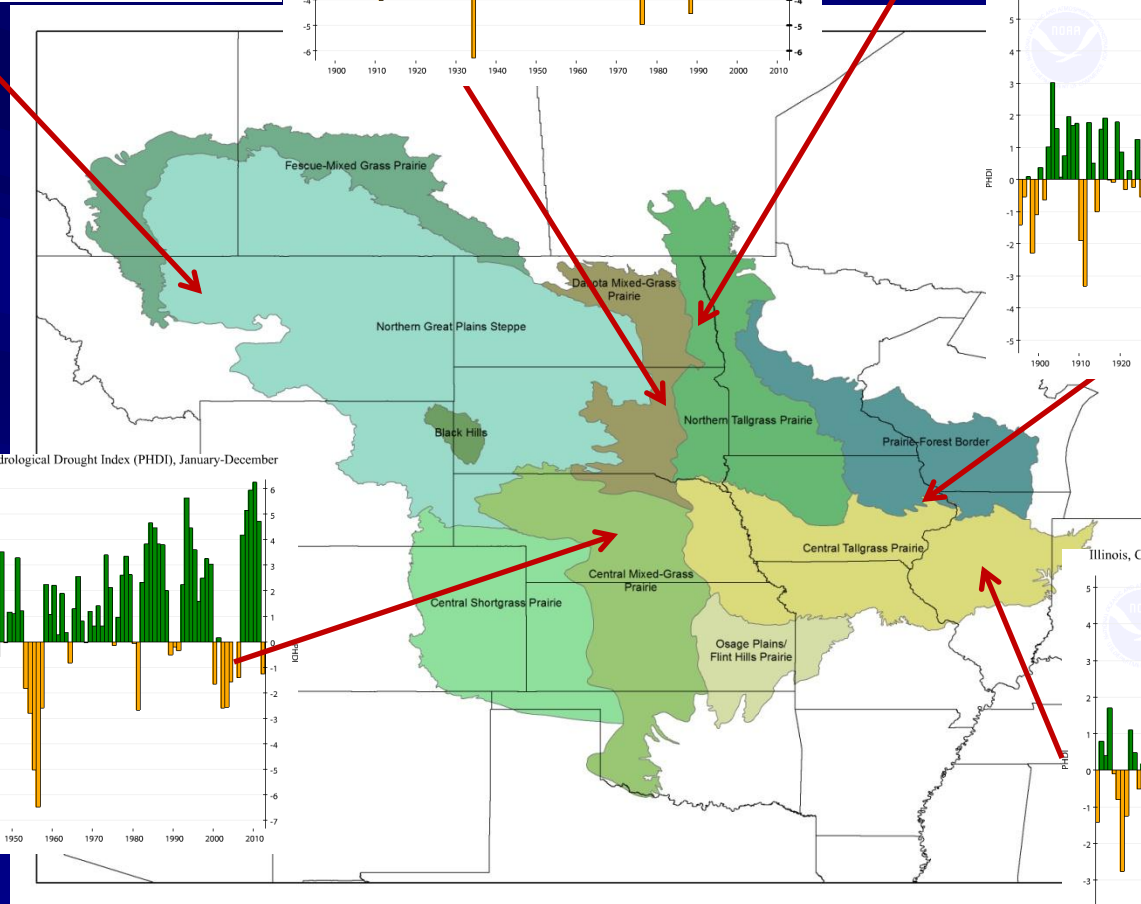
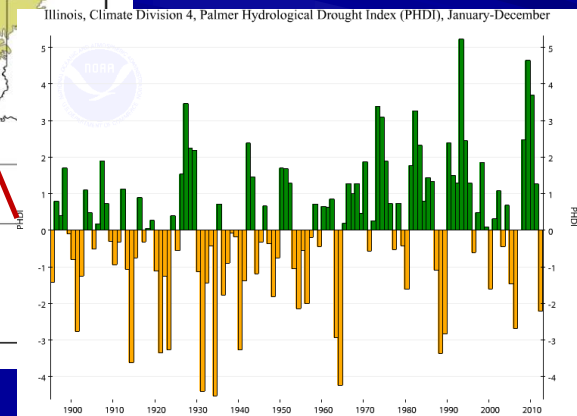
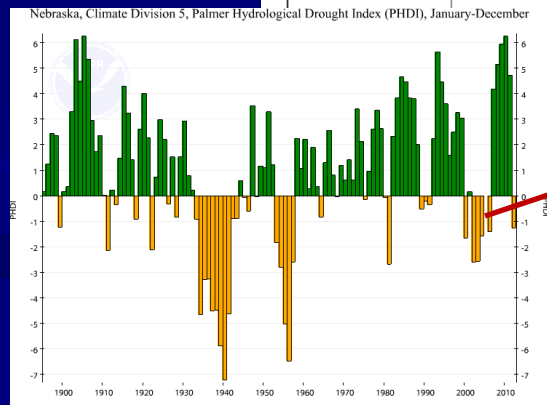
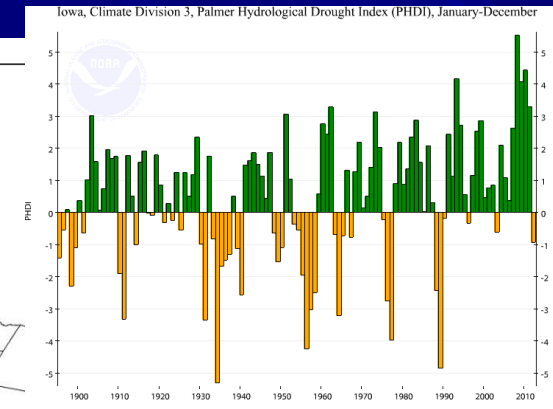
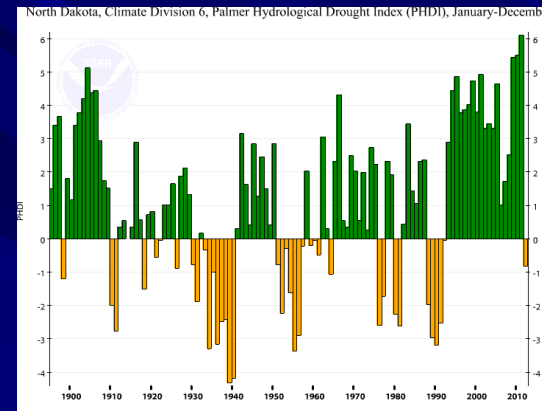
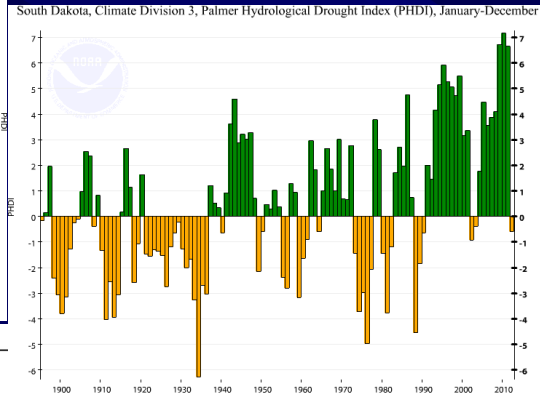
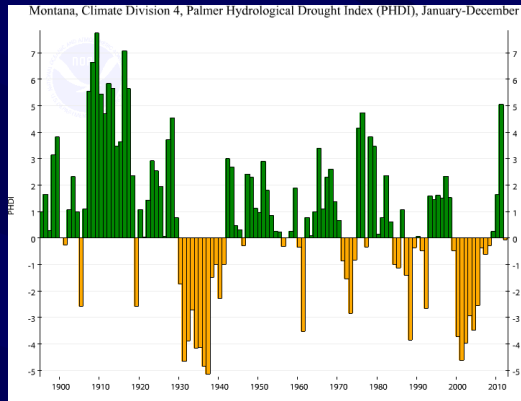
- COMPOSITION OF VERTEBRATE
COMMUNITIES
- ABUNDANCE OF VERTEBRATE
COMMUNITIES
- DISTRIBUTION OF VERTEBRATE
COMMUNITIES

WETLAND CYCLES

Palmer Drought Severity Index, Division 5, ND (1895 to 2001)

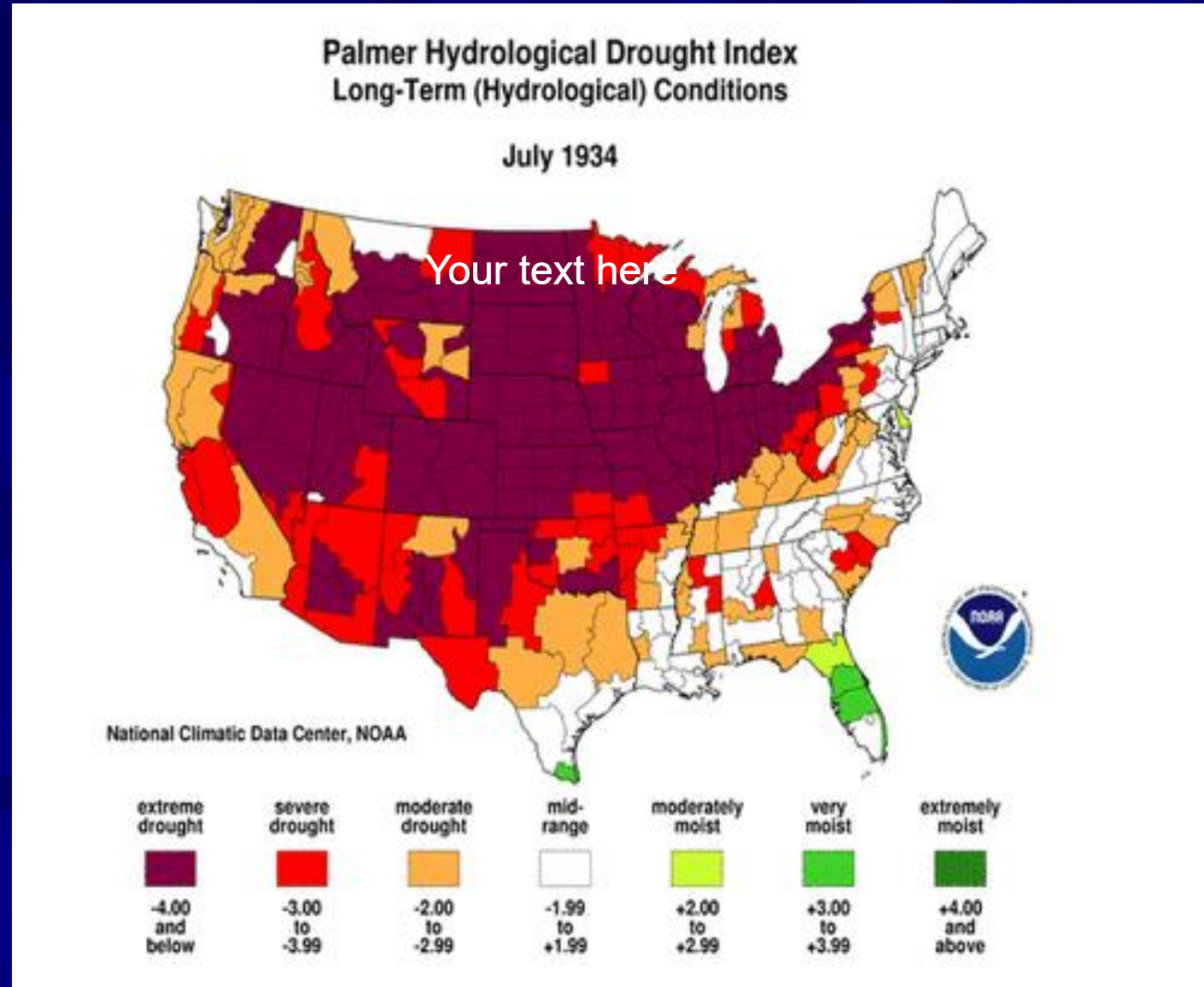


PDHI 1895-2012

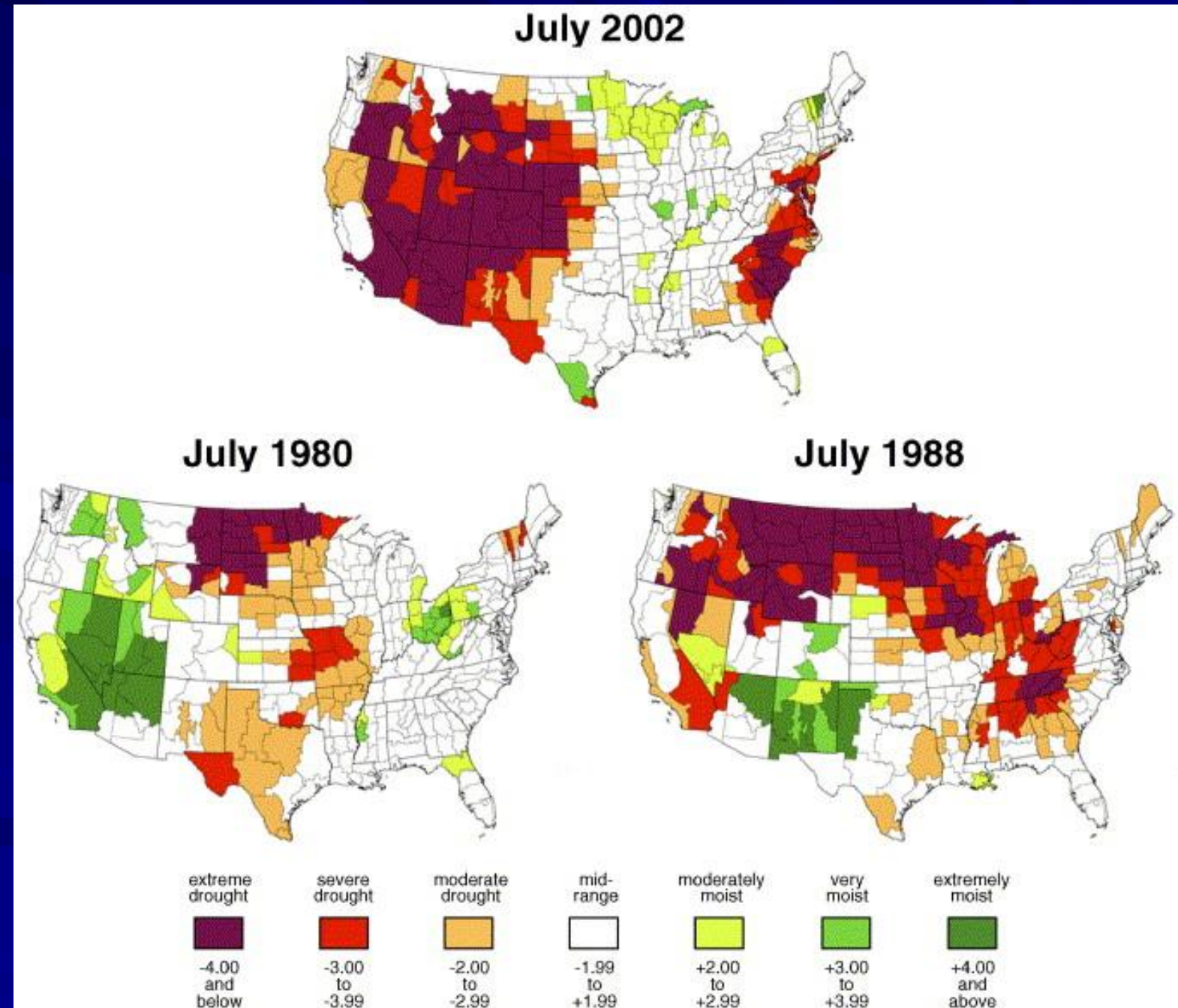


Mutiple Locations

Worst Drought on Record



Typical among
year variaation



CLIMATE DRIVEN MARSH CHANGES

MARSH STAGES

LAKE MARSH

NARROW BAND
OF EMERGENT
VEG
LOW RICHNESS
AND
ABUNDANCE

OPEN MARSH

MORE OPENINGS
AND LARGER
LOWER RICHNESS
AND NUMBERS

DRY MARSH

BARE MINERAL SOIL
DEEP CRACKS
MANY ANNUALS
TEMPERATURE AND MOISTURE
DETERMINE SPECIES
COMPOSITION
LOWER STEM DENSITY OF
PERENNIALS

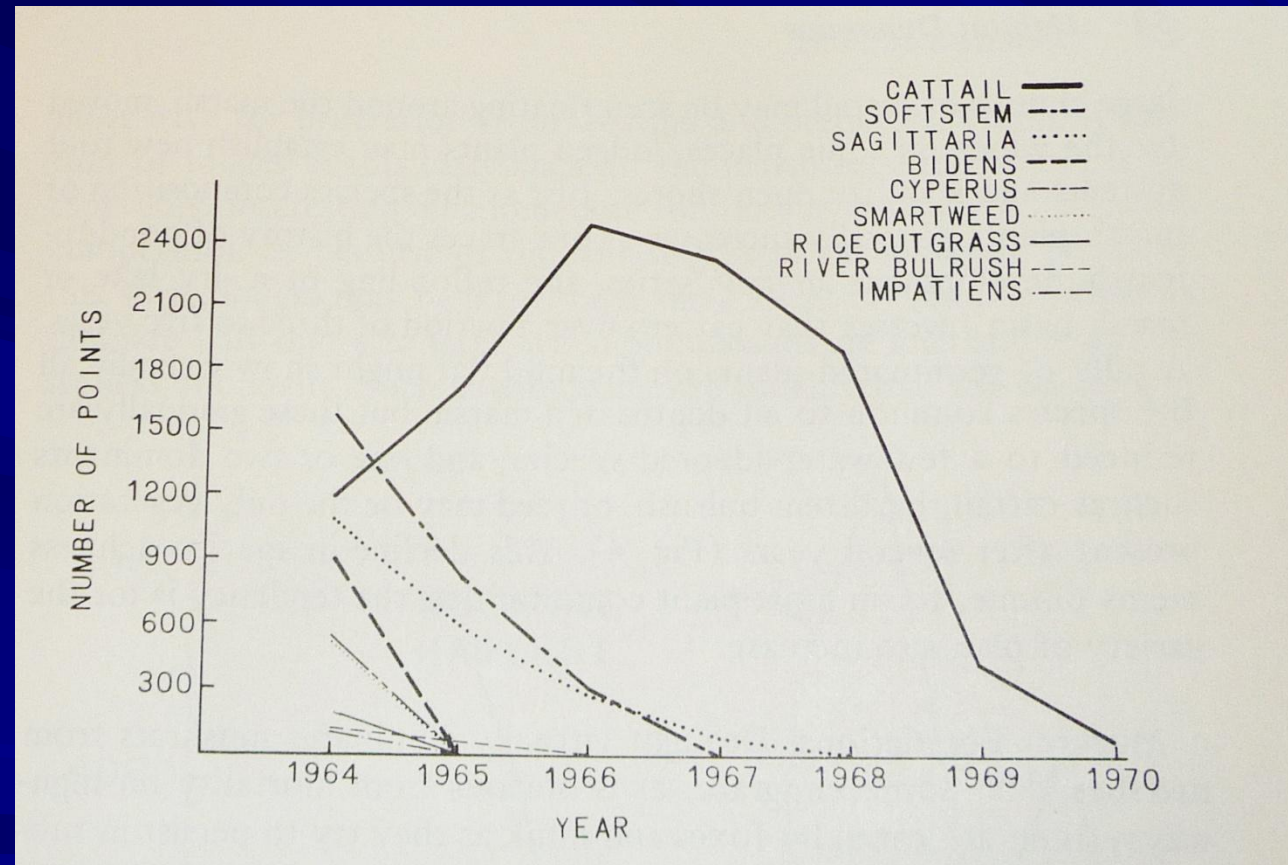
DENSE MARSH

SOME DEGREE OF FLOODING
HIGHER STEM DENSITY OF
PERENNIALS
MARSH SPECIES RETURNING
MUSKRATS RETURN

HEMI-MARSH

HIGHEST RICHNESS AND ABUNDANCE
IDEAL COVER/WATER INTERSPERSION
MUSKRATS PEAKING

VEGETATION TOLERANCE TO FLOODING



Weller 1987

ANNUALS DROP OUT WITH INCREASING HYDROPERIODS

A CHANGING LANDSCAPE

WHAT DOES IT MEAN FOR WETLAND
DEPENDENT SPECIES?

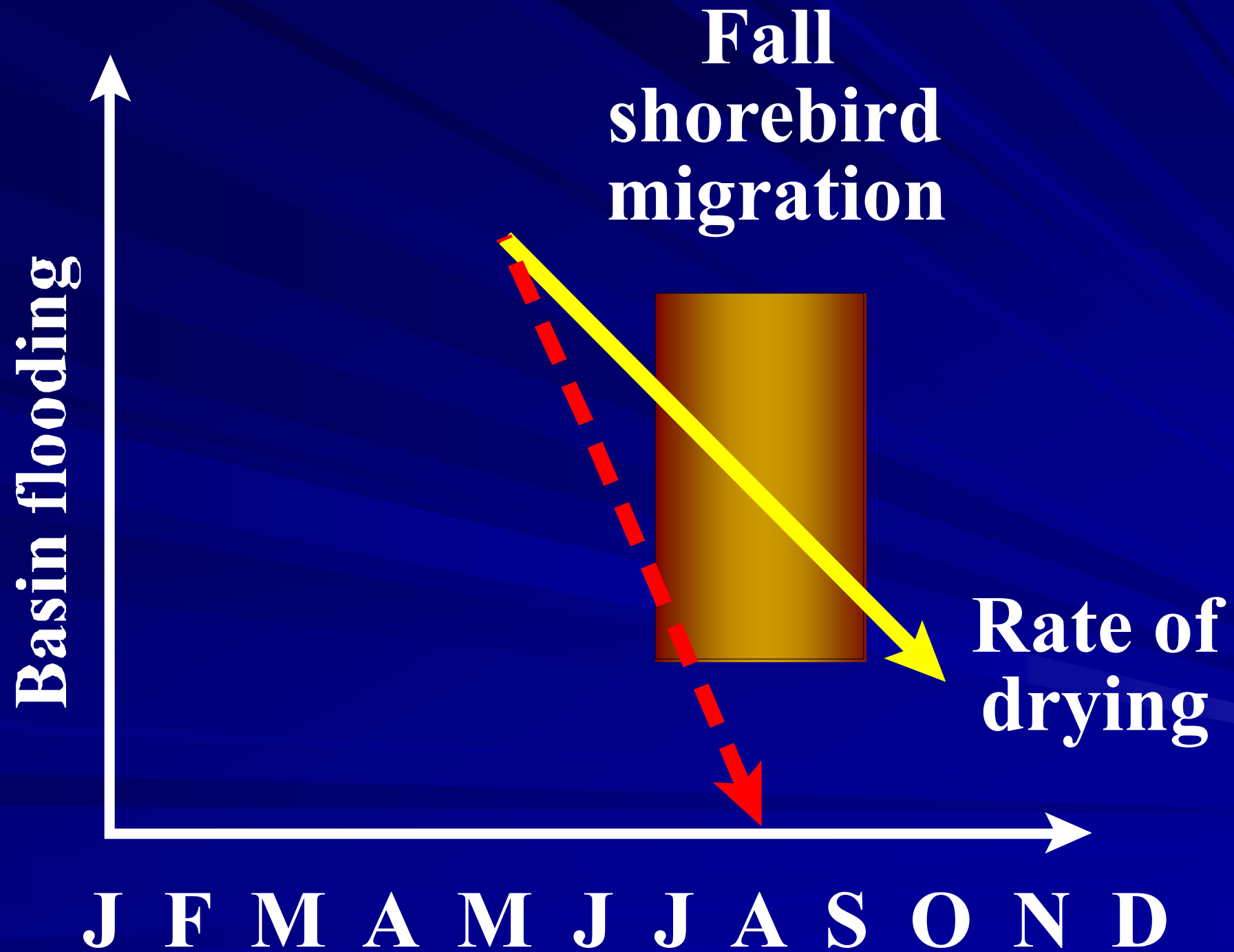






Matching biological events with processes





OTHER FACTORS INFLUENCING MANAGEMENT SUCCESS

- EXOTICS
- INVASIVE SPECIES
- DISEASES
- DISTURBANCE
- GLOBAL WARMING





TAKE HOME LESSONS

KNOW YOUR SITE

**ESTABLISH GOOD HABITAT
OBJECTIVES**

**MONITOR YOUR RESULTS TO TEST
YOUR OBJECTIVES**

**REMEMBER THAT WETLANDS ARE
DYNAMIC**

**SHALLOW WATER IS BEST
THINK BEYOND ONE SEASON**