

RATIONALE FOR THIS WORKSHOP

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❑ **Our intent is to challenge you to think**

- Ecologically
- Beyond your property boundaries
- Long-term

❑ **Our philosophy**

- Abiotic factors define the range of management options available
- Maintaining/restoring processes are critical to success over the long-term

❑ **You are the expert on your site(s)**

- Be open to the thoughts of others
- Question the status quo
- Be capable of using sound information to communicate your intended actions

Definitions

❑ Wetland

- Transitional areas between terrestrial and aquatic lands

❑ Seasonal wetland (moist-soil)

- Surface water present for extended periods of the growing season but absent by the end of the season in most years

❑ System

- A set of things working together as parts of an interconnected network

❑ Ecosystem

- A biological community of interacting organisms and their physical environment

Changing Landscapes & Societal Conditions

❑ **Multiple factors, including**

- Habitat loss and modification
- Management practices
- Climate change
- Infrastructure

❑ **Operating at multiple spatial scales**

- Ecosystem, Watershed, Wetland

❑ **That contribute to**

- Altered physical properties
- Altered ecological processes

❑ **And ultimately influence our ability to**

- **Reliably** provide resources over the **long-term**
- Contribute to other ecosystem services (e.g., recreation, clean water, etc.)

Evidence of Changing Local Site Conditions

☐ Water quantity

- Augmentation & impairment
- Water Right jeopardy

☐ Water quality

- Contaminants (e.g., selenium, methyl-mercury)
- Nutrients (e.g., nitrogen, phosphorous)
- Pesticides

☐ Sediment/erosion (e.g., loads, distribution)

☐ Plants (e.g., non-native & invasive species)

☐ Animals (e.g., declining diversity/populations)

Goals and Objectives

- ▶ Often requires interpretation because agency mission/strategic plans have evolved to include broader concepts than original purpose

- ❑ Duck Creek CA

Purchased in 1950 to establish a waterfowl hunting area in conjunction with Mingo NWR

- ❑ MDC Design for the future (strategic plan)

Maintain & improve ecological functions of watersheds & wetland systems

Recover & maintain priority species of conservation concern to sustainable levels & conserve Missouri's full diversity of fish, wildlife & plants

Non-ecological Complications (missions and evolving policies)

❑Varies depending on agency

- Some disparity among programs within agencies
- Lack of coordinated response (is it really a unifying mission?)
- Requires increased communication

❑Application of knowledge in management complicated

- Interpretation in context of site required
- Requires good observational skills (monitoring)

❑Often involves actions that

- Require cooperation among agencies & private landowners
- Focus on resolving issues related to wetland processes

**“Conserve healthy fish & wildlife populations
while effectively engaging the public in the face
of rapidly changing landscapes and societal
conditions”**



**Manage for priority outcomes
within the context of long-term sustainability**

Evaluating the Need to Change

- It is the right thing to do
 - Helps ensure long-term ecological sustainability
 - Increases biological effectiveness
 - Contributes to lower operation costs
 - Addresses changing environmental conditions
 - Fits within context of larger landscapes

Therefore, the question is “how to accomplish” not “should we accomplish”.

- **Hydrology**

- Source
- Frequency
- Timing
- Magnitude
- Duration
- Quality

- **Soils**

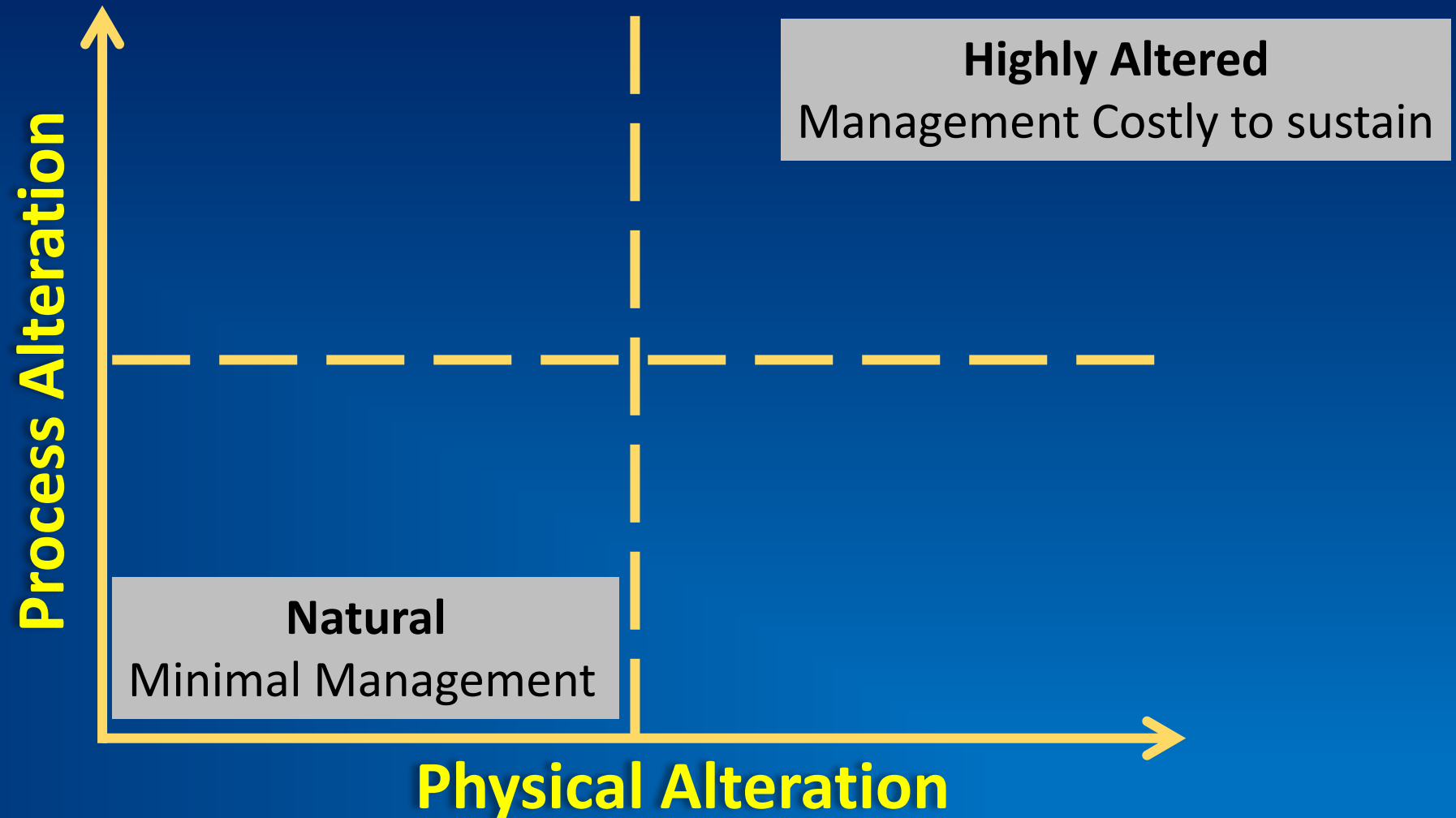
- Structure
- Infiltration
- Drainage
- Cation exchg

- **Nutrient cycling**

- Frequency
- Magnitude

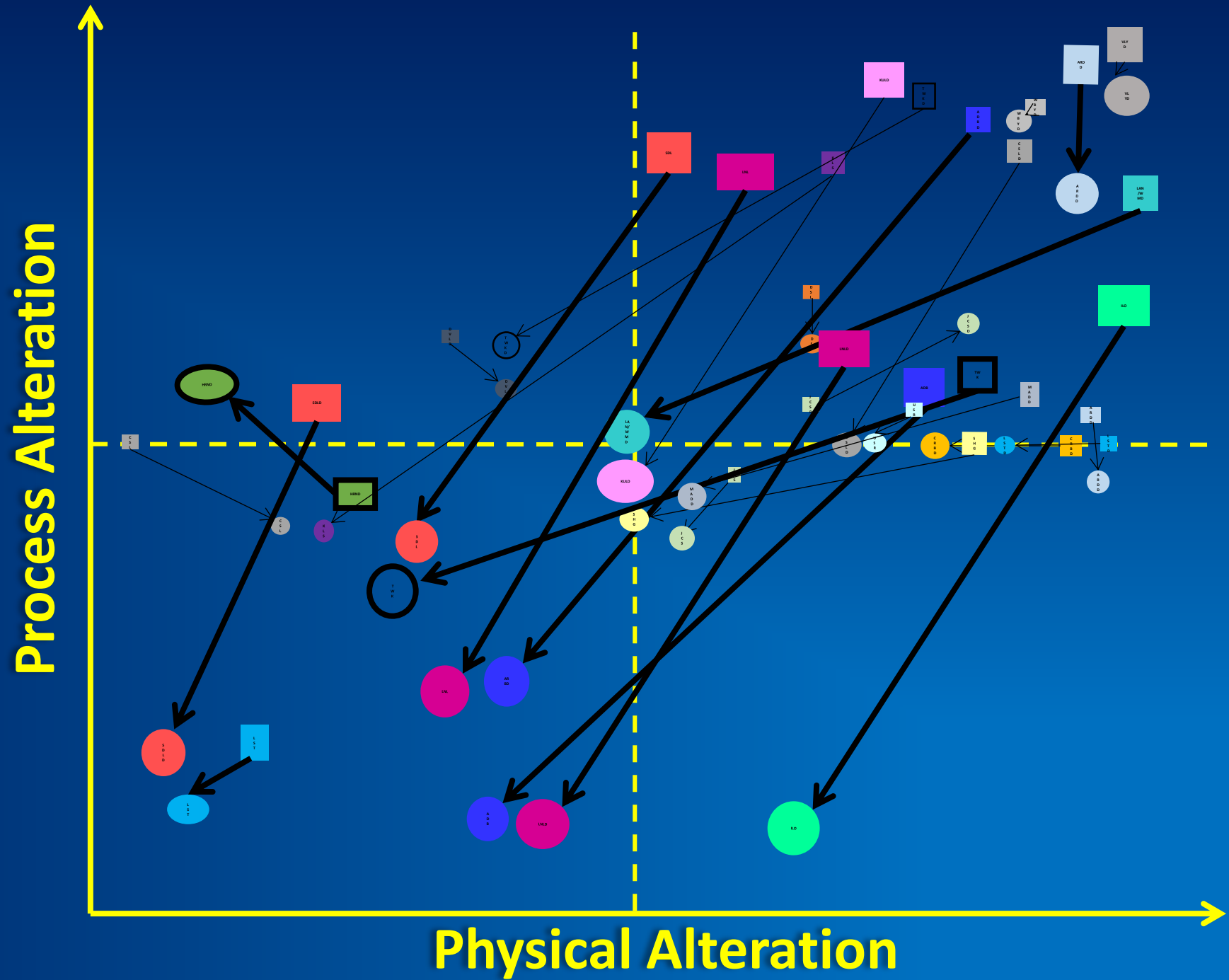
- **Sediment**

- Extent
- Load
- Pattern

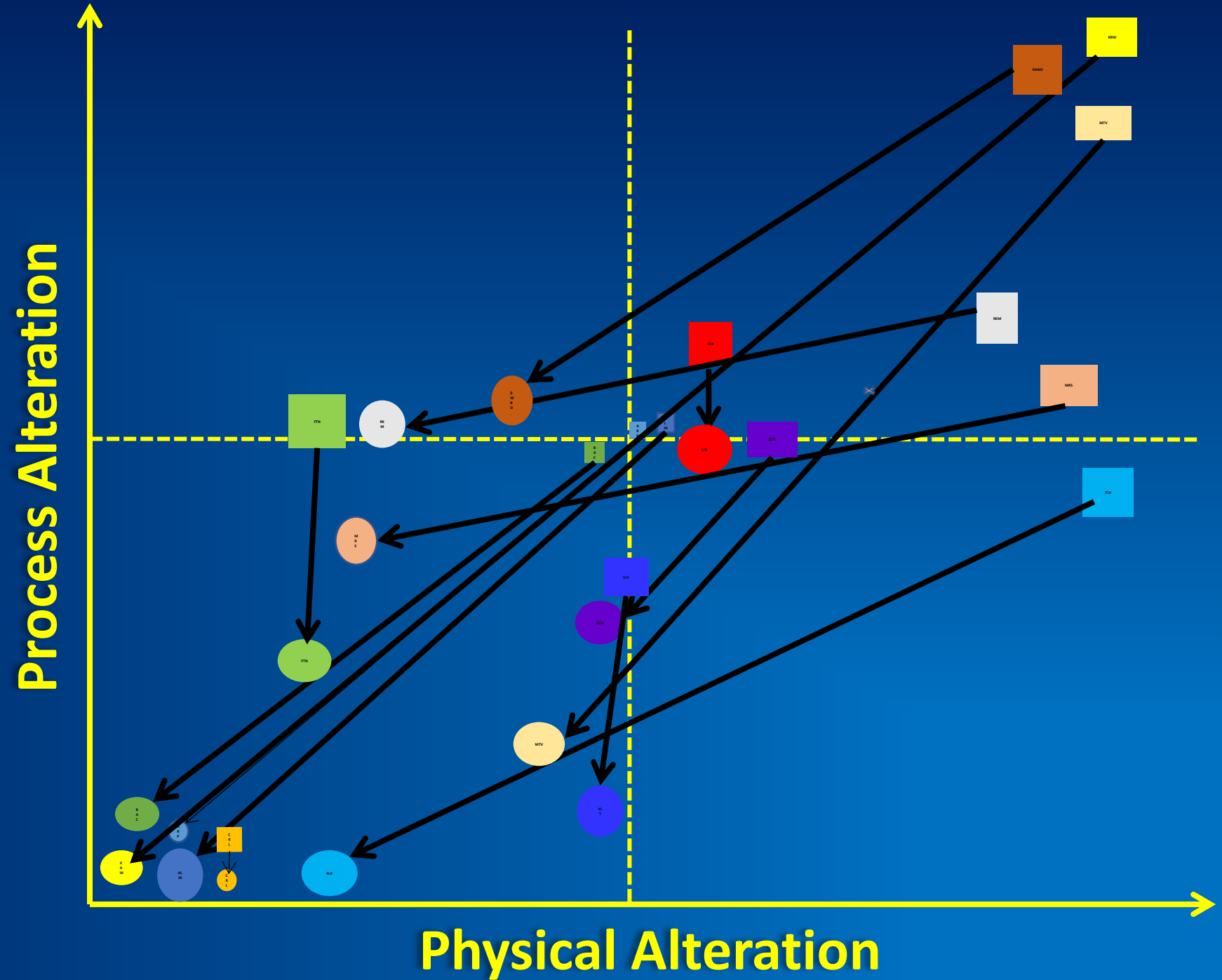


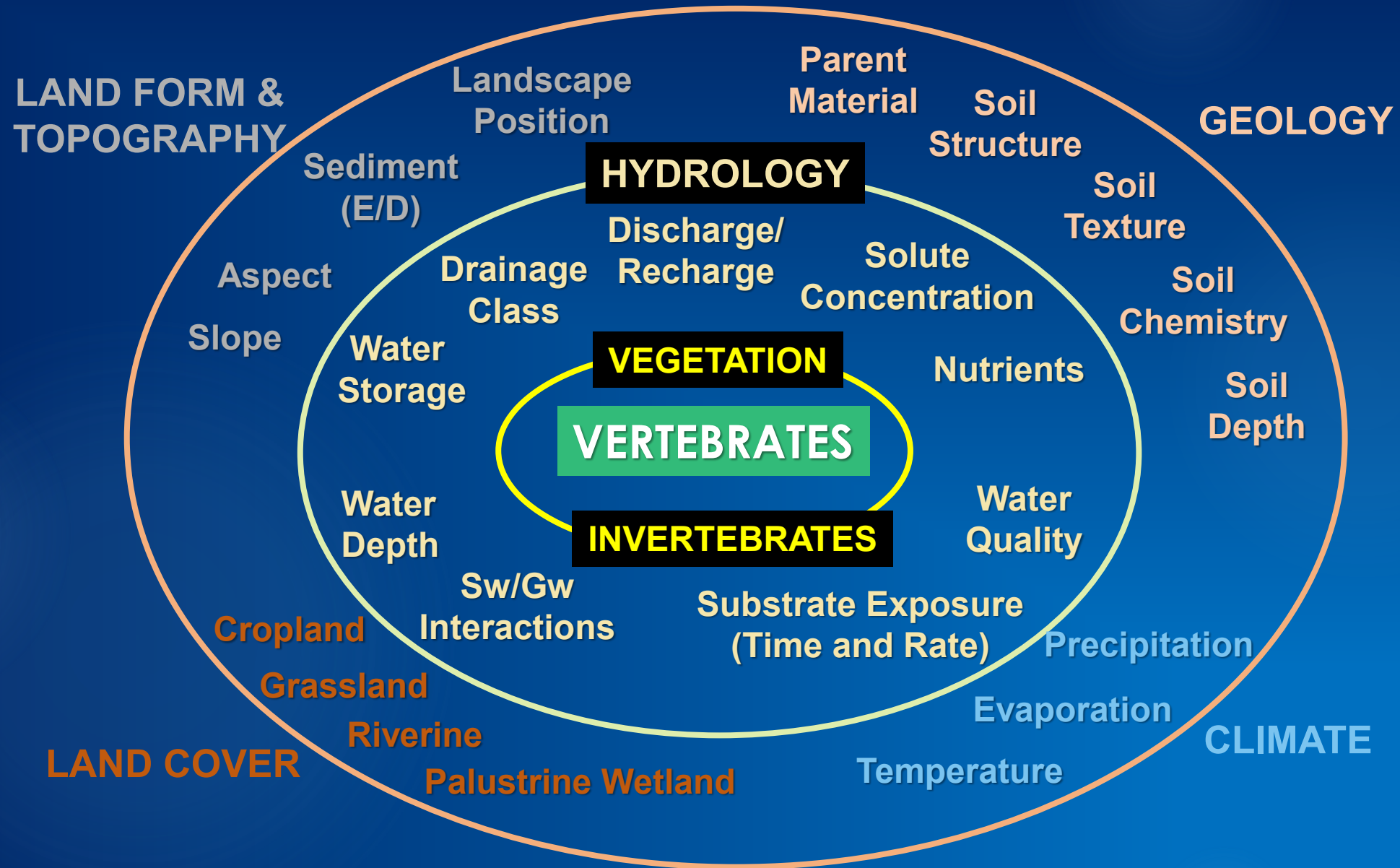
- Levees, ditches & roads (location, size, extent)
- Water-control structures (location, type, number)
- “Created habitats” (location, type, extent)

Production Areas



Migration Areas





Non-ecological Complications

► Budgets and funding sources for wetland process and function

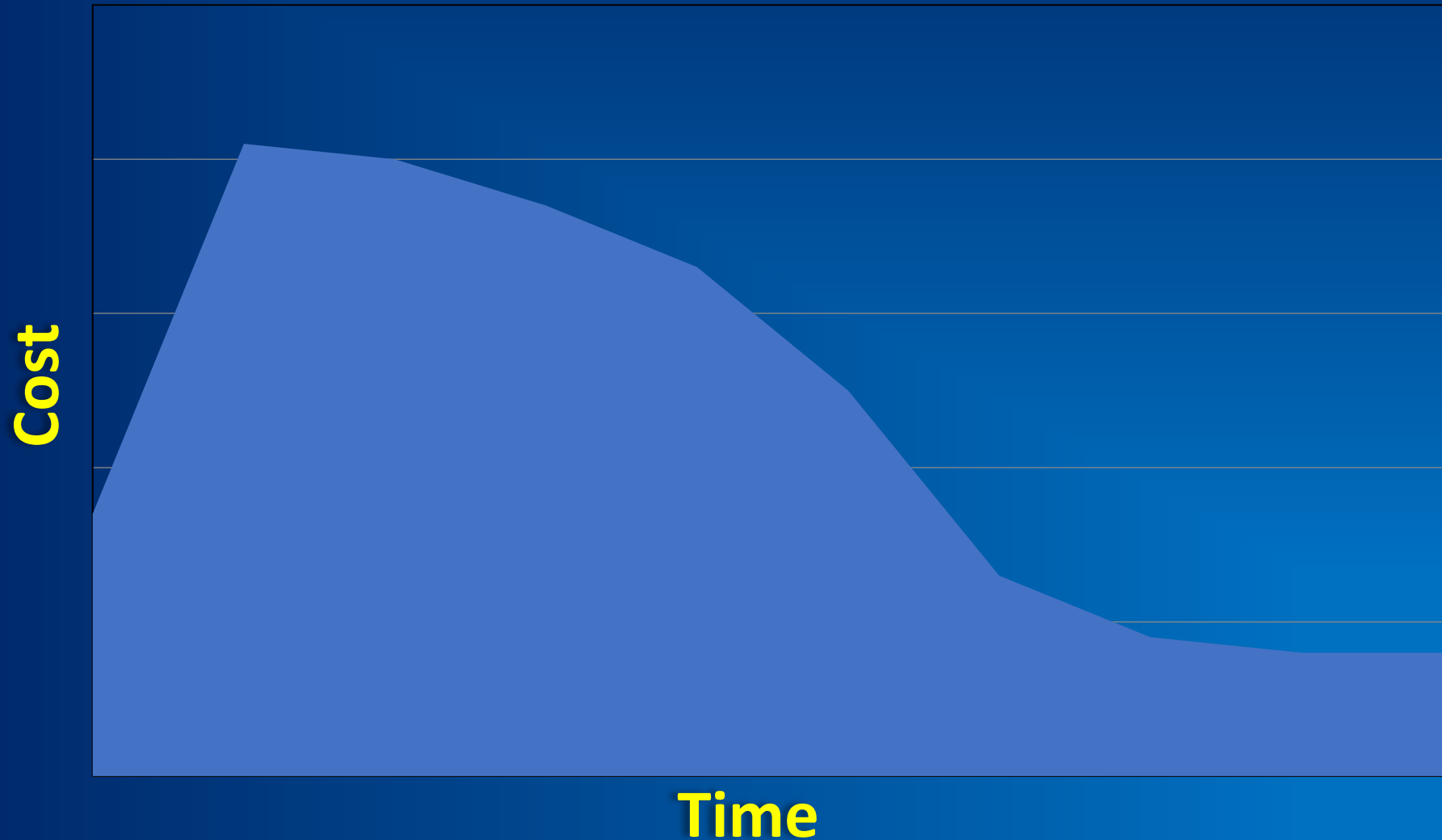
- Addressing challenges can be costly & exceed annual budget
- “Special” funding often tied to other initiatives
 - Human use (e.g. hunting, nature observation)
 - Capital improvements (e.g., buildings, equipment)
 - Target species (e.g., pollinators, endangered species)

► Lack of knowledge/skills

- Communication (internal and external)
- Access to information (spatial imagery, literature)
- Access to individuals with relevant skills and experience

Cost to Achieve Ecological Sustainability

(monetary, policy, personnel, partners, ...)



A COMPARISON OF THINKING

ECOLOGICAL

- Recognize natural variability required to maintain productivity and sustainability
- Changing life history needs are linked to the seasonal availability of resources
- Actions often taken to achieve benefits in future growing seasons
- Enhance or work with natural processes
- Limited energy inputs

AGRICULTURAL

- Control variability, focus on single impediments without consideration for sustainability
- Actions primarily taken in the current growing season for a selected outcome
- Attempt control of natural processes
- Massive energy inputs

EVOLUTION OF WETLAND ECOLOGY AND MANAGEMENT (100 YEARS OF CHANGE)

- **1930s** Species focused
- **1945 – 1960** Species focused with more basic ecology
First nationwide surveys with shifts toward populations
- **1960 – 1990** Rapid demise of wetlands nationally
Development of wetland science
Energetic studies
Importance of environmental legislation
- **1990 – 2010** Use of PCs and internet
Recognition of geomorphic, hydrologic, and climate factors
- **2010 – 2025** Recognition of global conditions
Importance of understanding global processes

Thus, a new way of addressing variability successfully

STABLE DOGMA

- **Promotes Monotypic Vegetation**
- **Compromises Wetland Processes**
- **Compromises Wetland Food Production**
- **Creates Conditions for Invasive Species**
- **Increases Management Costs and Challenges**

WETLANDS and VARIABILITY

➤ NATURAL VARIABILITY DETERMINED BY YOUR LOCATION

- GEOMORPHIC SURFACES
- HYDROLOGIC CONDITIONS
- CLIMATIC CONDITIONS

➤ MAN INDUCED VARIABILITY

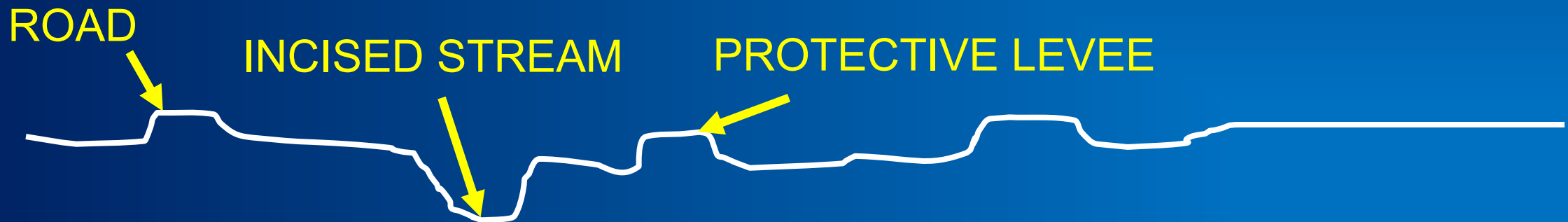
- RELEASING STORED CARBON
- CHANGING NATURAL TOPOGRAPHY
- MODIFIED HYDROLOGY
- DEGRADED BIODIVERSITY

NATURAL LANDSCAPE CONTOURS

GRADUAL SLOPES WITH DIVERSE MICROTOPOGRAPHY



MAN INDUCED CONTOURS



**NOTE ABUNDANCE OF STEEP SLOPES IN MAN MADE ENVIRONMENTS
MOST OBVIOUS WAY TO SAVE CONSTRUCTION COSTS**

TYPICAL NATURAL WETLAND TOPOGRAPHY

TERRESTRIAL PLANT ZONE

FACULTATIVE PLANT ZONE

OBLIGATE WETLAND PLANT ZONE

TOPOGRAPHY DRIVING MAN'S WETLAND MANAGEMENT EFFORTS

ZONE FOR OBLIGATE PLANTS DOMINATES

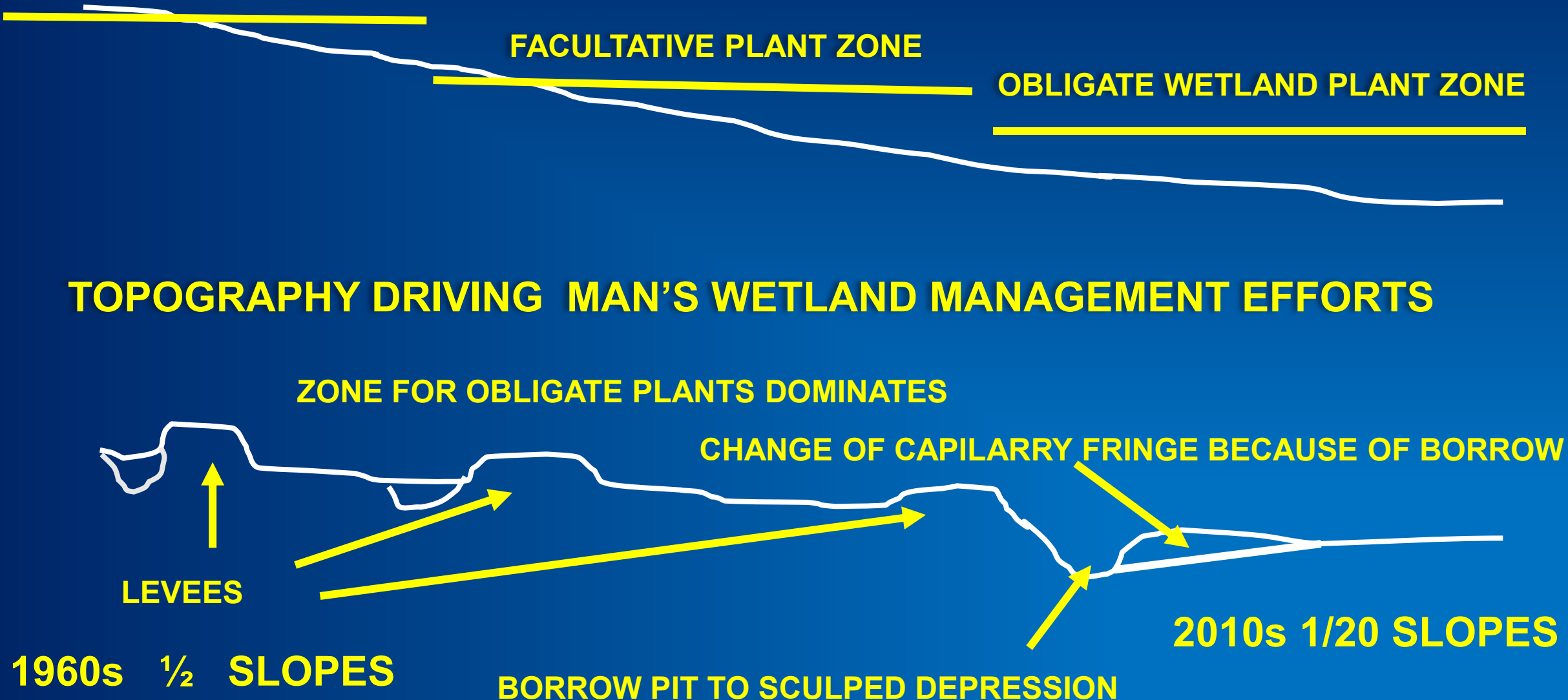
CHANGE OF CAPILARRY FRINGE BECAUSE OF BORROW

LEVEES

1960s 1/2 SLOPES

BORROW PIT TO SCULPED DEPRESSION

2010s 1/20 SLOPES



IT IS IMPORTANT FOR YOU TO UNDERSTAND THE BASIS OF WHAT WE HAVE TO SAY ABOUT VARIABILITY

➤ MY COMMENTS ARE BASED ON MY UNIQUE EXPERIENCES FOR THE PAST 8 DECADES

- Across the continent that represent varied geomorphic and hydrologic settings
- From observing many wet/dry cycles at different temporal and spatial scales
- From working with the best and worst in the wetland management arena from the administrative to maintenance level
- From a broad suite of organizational perspectives ranging the Washington Office, Flyway Councils, Regional Offices, State Offices, the Refuge or Management Area, and the Unit level
- From a vast exposure at the academic, agency, nonprofit/private, professional society, and individual levels

MY CHALLENGE IN DEALING WITH LIMITED INFORMATION

These small areas represent my limited knowledge of birds, bugs, plants, soils, biogeochemistry and hydrology in a sea of unknowns after over 80 years or curiosity

- I actually know little about the inherent complexity of natural systems
- Science aids in verifying conditions that determine outcomes
- The challenge is to understand that outcomes are only applicable to the site of study, under the conditions at the time of study
- Efforts to understand unexpected outcomes lead to analyses that promote wisdom of system processes that are in constant change
- It took me over 50 years to have key factors appear in publications and to have a broad range of experiences across time and space.

WE ARE IN THE ANTHROPOCENE

➤ This requires wetland professionals to recognize and understand the importance of

- Global environmental drivers
- Formative processes
- Natural processes
- Topography and soil textures
- Variation in solar radiation that influences the surface soil environment (temperature, moisture, and aerobic/anaerobic conditions)

WHAT YOU MUST RECOGNIZE

- I have made plenty of mistakes
- I have failed to consistently articulate information in a management context
- Many will likely disagree with some or maybe a lot of what I have to say
- I, nor anyone else, has all the right answers
- I challenge you to think within a different context that may differ from your agency, supervisor, some academics/researchers, and the public; which may make your life hell
- My challenge is to provide to you something other than a bolus of information by attempting to organize this information based on a systems approach

THIS WORKSHOP FOCUSES ON THE COMPLEXITY OF THINKING REQUIRED TO MAKE BETTER DECISIONS IN HIGHLY MODIFIED ENVIRONMENTS

- **THERE WILL BE NO COOKBOOK**
- **THERE IS NO EASY WAY**
- **WE WANT YOU TO SUFFER THROUGH TESTING YOUR SKILLS!**
- **YOU MUST SPEND TIME ON THE LAND TO LEARN**

WE HOPE TO INSTILL A NEW OUTLOOK

- **FOCUS ON PROCESSES**
- **IDENTIFY IMPORTANT ABIOTIC CONDITIONS**
- **RECOGNIZE THAT FUNCTIONAL WETLANDS PROVIDE A WIDE SUITE OF BENEFITS TO MANY SPECIES BUT NOT NECESSARILY ANNUALLY**
- **EACH SITE AND EACH INDIVIDUAL PROFESSIONAL IS IMPORTANT**

We Hope to Convince You

- Your **BRAIN** is your most important tool and asset
- Wetlands are dynamic and **MUST DRY**
- **ECOLOGICAL THINKING** is far superior to **AGRICULTURAL THINKING** in land management
- **MOST MANAGED WETLANDS** are in floodplains
- **DECISIONS** must often be made with limited knowledge
- **ENUMERATING** is not **MANAGEMENT**
- **PATIENCE** is required

OUR DESIRE IS TO CHANGE YOUR THINKING ABOUT WETLAND ECOLOGY AND MANAGEMENT

- **Whether your focus is on ducks, shorebirds, rails, fish, or plants**
- **To switch your focus from SPECIES TO NATURAL PROCESSES that**
 - Drive system functions
 - Shape the adaptations of species
- **To recognize the importance of time and space at various scales**
- **To empower you to**
 - Embrace variability
 - Gain self confidence
 - Be a sceptic
 - Develop the patience and perseverance to be successful

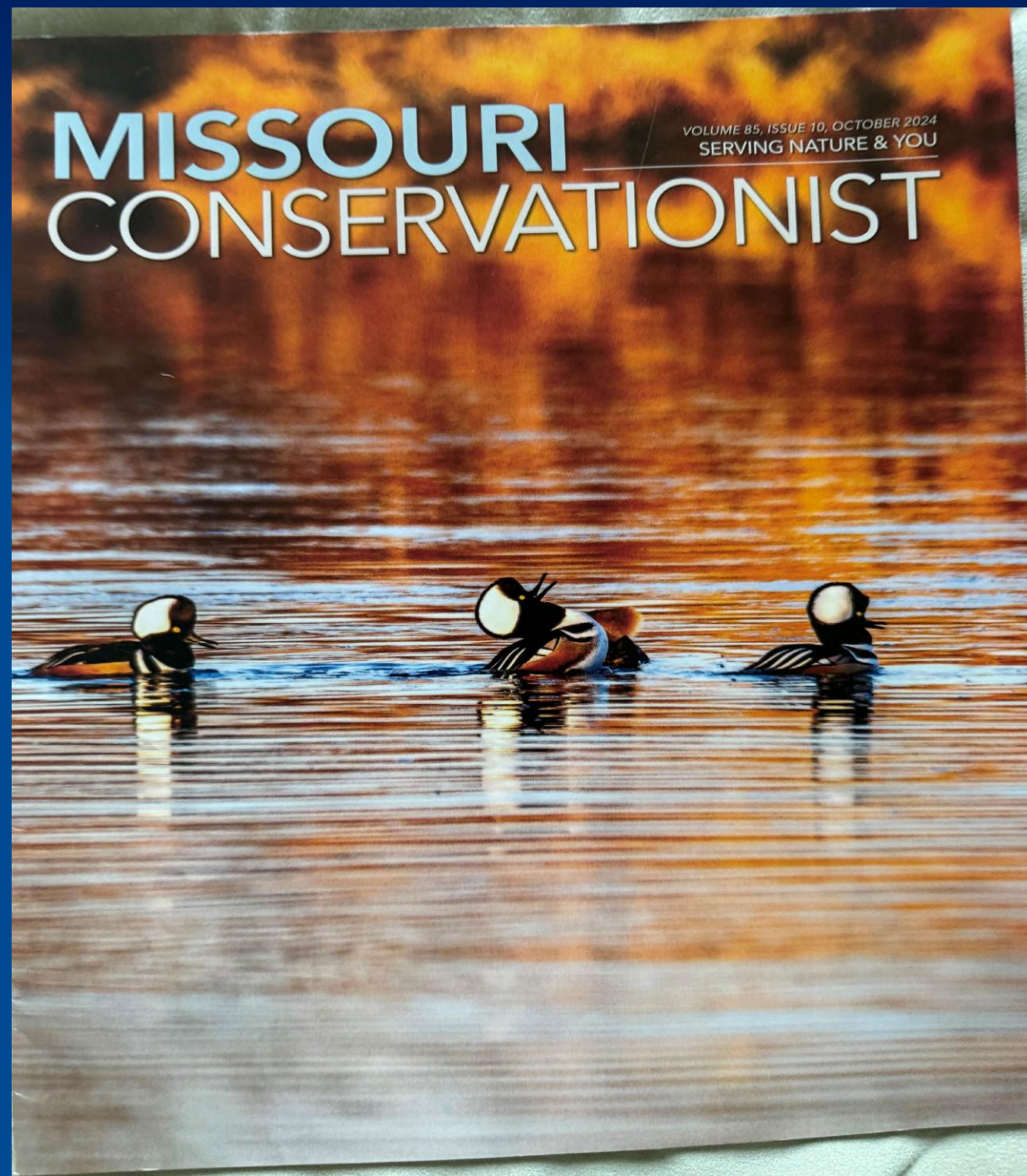
ART VS SCIENCE

➤ **Good management is based on evidence from the Scientific Method**

- Formal studies that have been peer reviewed
- Consistent on-site observations based on staged and unstaged experiments across site variability

➤ **The high variability across large and small scales compromises published evidence that represents the unique evidence, at unique locations, at unique times. for selected variables which often results from inexperienced graduate student studies**

Decline of science





**GREATER
SCAUP**



**LESSER
SCAUP**



REDHEAD



CANVASBACK



RING NECK



COMMON GOLDENEYE



BUFFLEHEAD



**HOODED
MERGANSER**



AMERICAN MERGANSER



RUDDY

Decline of Science

DIVING DUCKS?

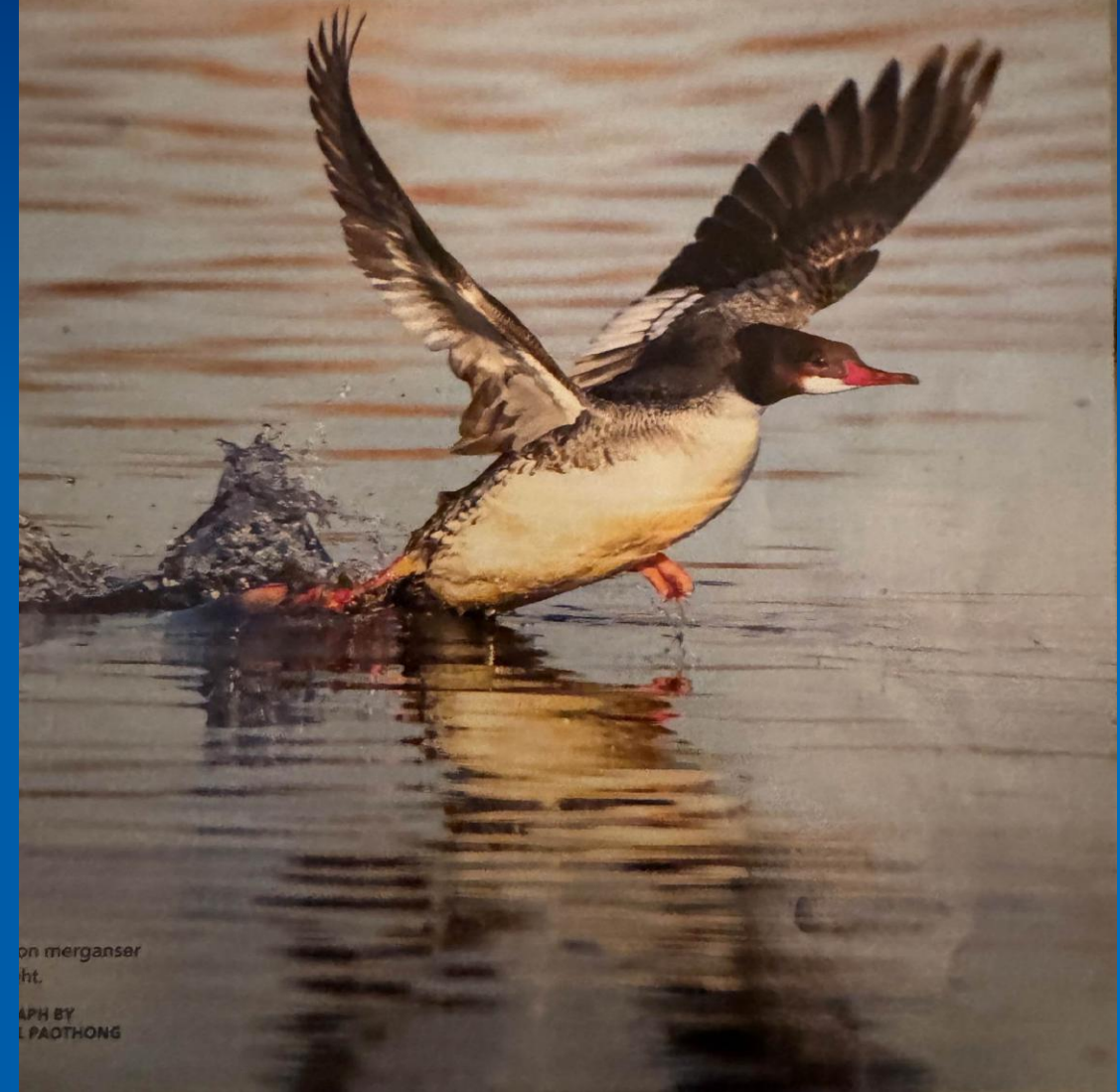
OR

DUCKS THAT DIVE
FOR FOOD?

DEEP DIVES AND LONG TAKE-OFFS

Regular visitors to Missouri, diving ducks add to wetland waterfowl diversity

by Angie Daly Morfeld



on merganser
ft.

APH BY
L PADTHONG

MOST OF ALL

➤ WE WANT YOU TO BE SUCCESSFUL

- For the many taxons of plants and animals
- For the habitat
- For the globe
- For a rich personal life

