Principles of Wetland Creation and Restoration: 40 Years and Lessons Learned

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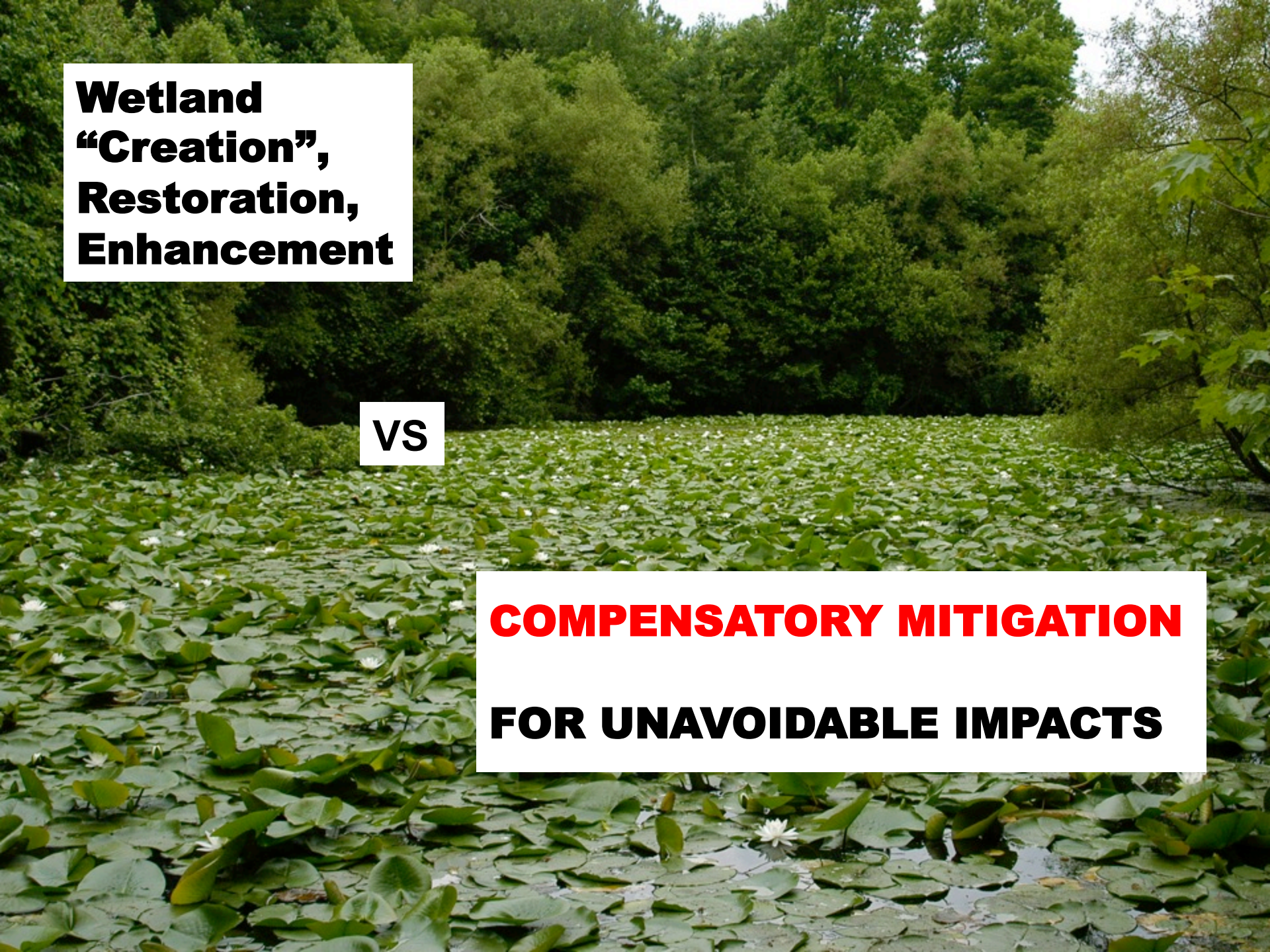
Unfortunately..... ***Impossible in time we have.***

Try to focus on one or two critical components of the WETLAND DESIGN/CONSTUCTION


Wetland
"Creation",
Restoration,
Enhancement
VS
COMPENSATORY MITIGATION
FOR UNAVOIDABLE IMPACTS


ALTRUISTIC
i.e., Preserves, wildlife management areas, refuges, parks .....
VS
REGULATORY COMPLIANCE
FOR UNAVOID IMPACTS

ALTRUISTIC Wetland
"Creation", Restoration, Enhancement

- usually PUBLIC/PRIVATE Lands
- Goals can be limited (Spin-off Functions)
- Complex structures allowed (Dams, Dikes, Levees, water controls, amenities....)
- Long-term monitoring management/ maintenance is assumed...Also, corrections/improvements over time

ALTRUISTIC Wetland
"Creation", Restoration, Enhancement

Past.....

"FUN" PROJECTS

Wetland "Creation", Restoration, Enhancement – For Compensatory Mitigation

- Regulatory environment (as COMPENSATION)
- Functional Replacement (measurable suites)
  (acreage → functions)
- "Self-sustaining" .... following the mandatory monitoring period...
- By NECESSITY....our Goals/Objectives....and our calculations MUST BE much better defined and more precise

“FUN” or REGULATORY ---

Fundamental Principles apply to both situations…..

… PROTOCOLS & KNOW-HOW are already AVAILABLE …… *and being improved upon*
(in scientific literature, white papers, and various agency manuals…..AND, in courses/training taught by knowledgeable persons….)

- **PRACTIONERS….just need to know guidance is available, how it is accessed, and how it can be applied…..**

(AND….That there are nuances….)

At a minimum…… (Collect DATA)

- **Establish a "reference" wetland**
- **Assess Functions….. Identify critical**

ENVIRONMENTAL FILTERS

that support the functions…..

- **Soils, parent materials**
- **suites and distribution of vegetation,**
- **location in landscape…. topography**
- **Depth, duration, timing (of hydrology)**
  -how water is distributed across the site.

Because time is limited …..

Let's Focus on DDT……

Knowledge of DDT for reference wetland(s)….. Is extremely helpful in <u>PROJECT DESIGN</u> …..for the "new" site.

REFERENCE SITE DDT… (hydroperiod)

Can be projected with monitoring wells and staff gauges….. or

DDT……

Can be calculated ….

and THEN ….compared with data from monitoring wells and staff gauges….. Or not

IN ALL CASES .....

Advanced Knowledge of DDT.....

CRITICAL **for assessing the viability AND POTENTIAL SIZE LIMITATIONS of the "new" site.**

Should be MANDATORY for any *PERMITTED PROJECT SITE*

Doing a relatively simple hydrology calculation…..

And plotting an annual hydrograph for a typical (median) year of precipitation….

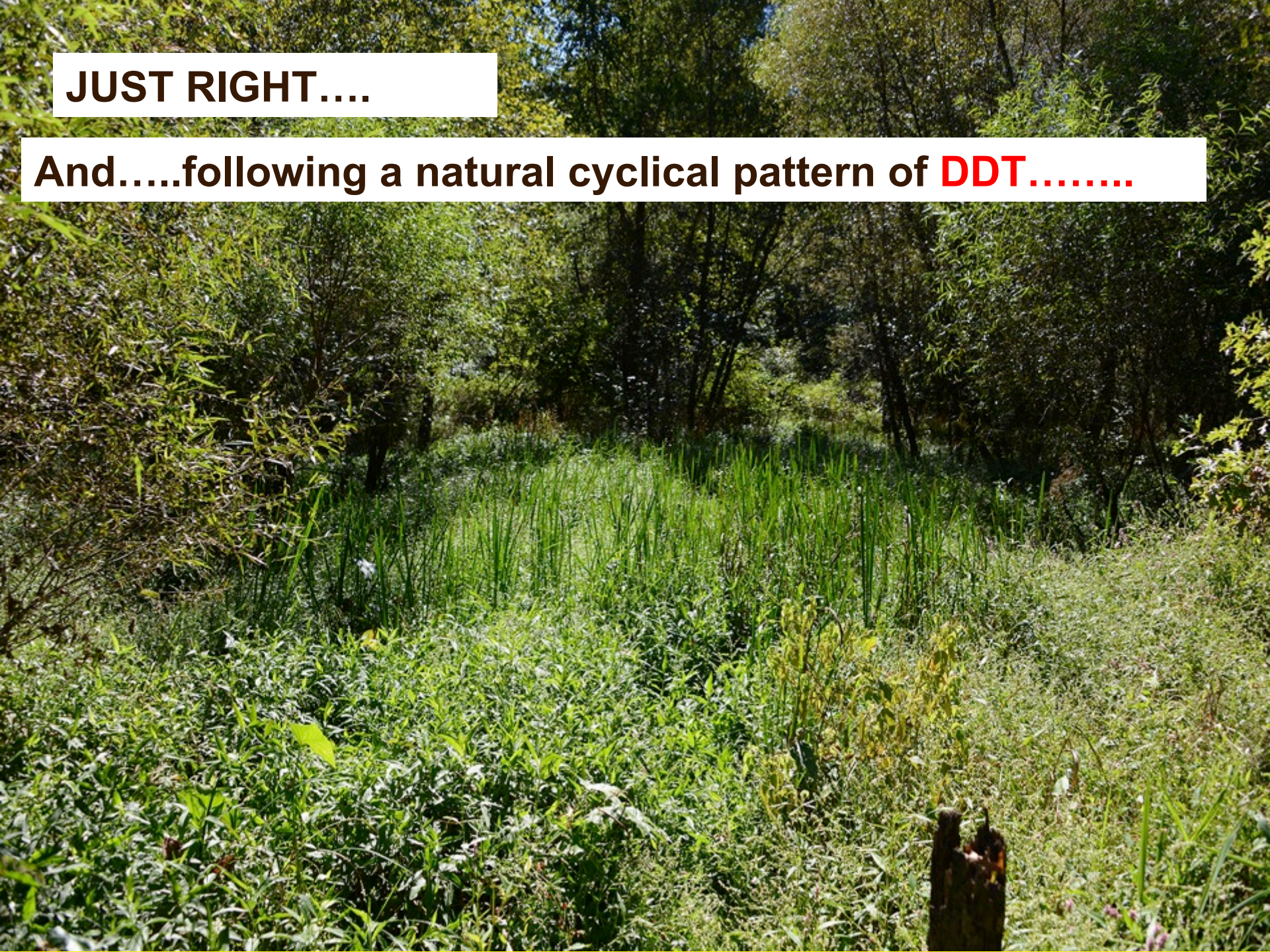
- **Allows an assessment of the potential size of the replacement wetland….. (HOW BIG?)**

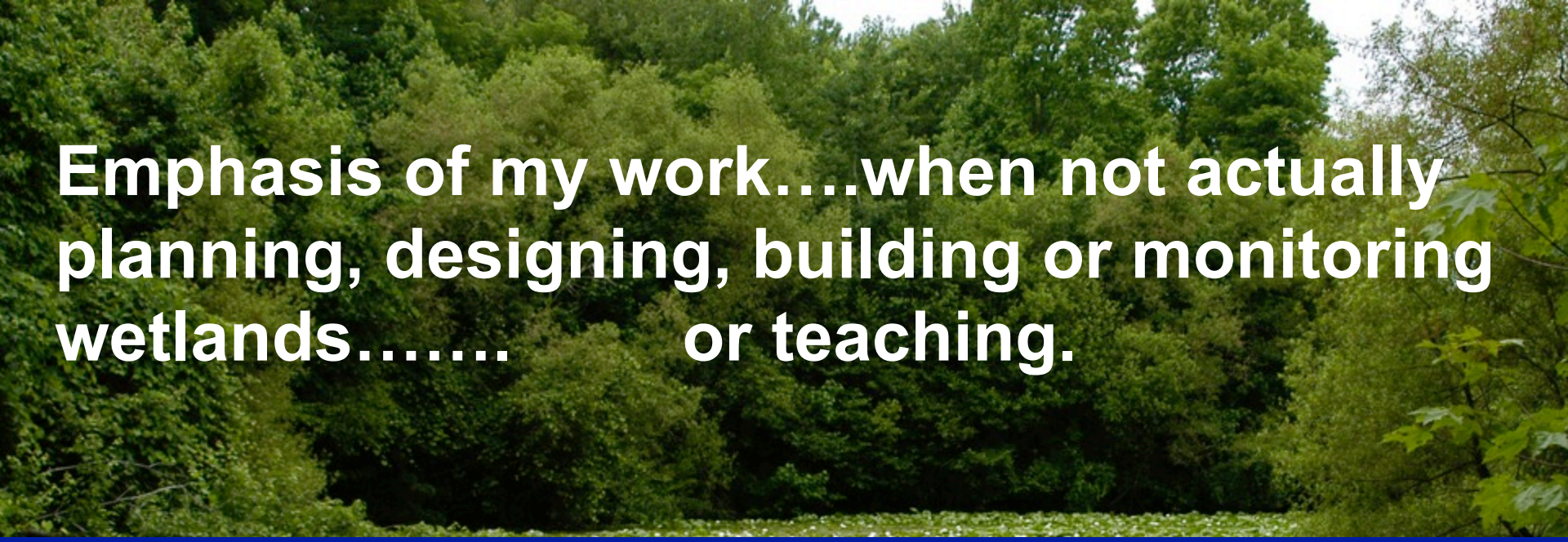
- **Allows us to look at the seasonal distribution of water across BOTH the REFERENCE site and the CANDIDATE site…**

(Will the DDT of the proposed site mirror the cyclical pattern in the reference?)


“Goldie Locks”
Too Much??.... Too long??


Too Dry….or not wet enough …
long enough???

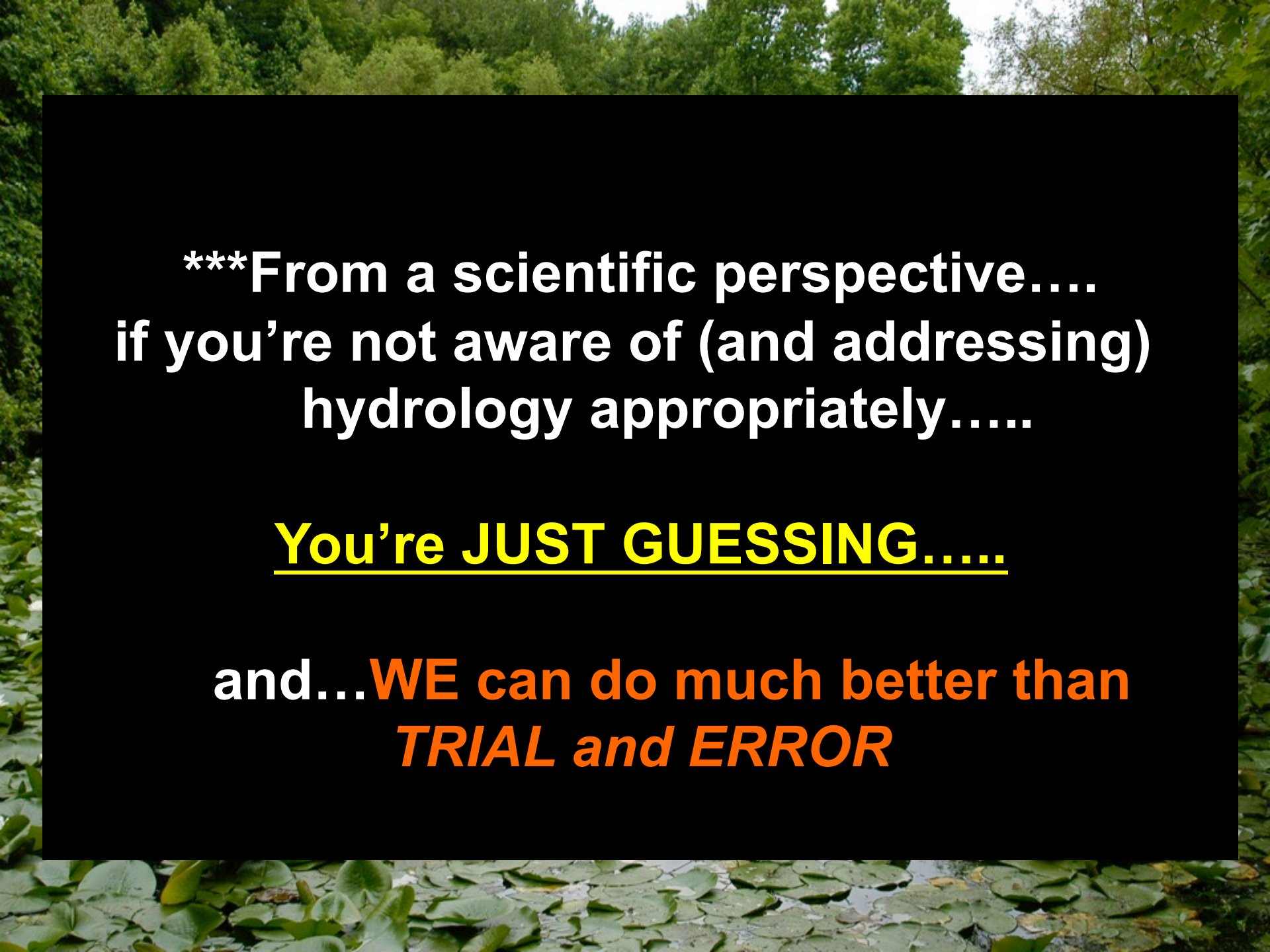

JUST RIGHT….
And…..following a natural cyclical pattern of DDT……..



Assessment of HYDROLOGY to enhance

PREDICTABLE OUTCOMES

in wetland construction and restoration projects….



***From a scientific perspective….
if you're not aware of (and addressing) hydrology appropriately…..

You're JUST GUESSING…..

and…WE can do much better than
TRIAL and ERROR


Dr. Gary Pierce

PLANNING HYDROLOGY FOR CONSTRUCTED WETLANDS

By
GARY J. PIERCE

Prepared By
Wetland Training Institute

1993…..

49 pages

Wetland Mitigation

Planning Hydrology, Vegetation, and Soils for Constructed Wetlands

Gary J. Pierce
with
Mallory N. Gilbert

DRAFT
Manuscript

July 15, 2011

Froghome Environmental, llc
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Dowling, Michigan 49050
froghome@voyager.net

2013…..

240+ pages

Va Tech, Old Dominion University

New methods for wetland water budgeting: WetBud

Tess Wy[illegible] Thompson and W. Lee [illegible]niels, Virginia Tech
Rich Whittecar, Old Dominion University
Zach Agioutantis, Technical University of Crete

Students: Kerby Dobbs, Matt Gloe, John McLeod,
Eric Neuhaus, O. Waverly Parks,
Candice Piercy, Tracy Thornton, Cal Smith

At a minimum……

- Observe reference site(s)….note filters…
  record functions
- In PARTICULAR….DDT
  prepare hydrographs
- Note distribution/zonation of vegetation….
  ELEVATIONS where growing
- SELECT SITE USING HGM ….note soils
  ….prepare hydrographs….no HGM hybrids

- **Integrate FUNCTIONS into the design process by respecting the water you have to work with…..and**
- **Prepare GRADING PLANS based on DDT & your projected vegetation zonation (plant accordingly-with natives)**

TO "PREDICT"

THE DEPTH, DURATION, TIMING OF WATER IN A WETLAND....

We need to understand:

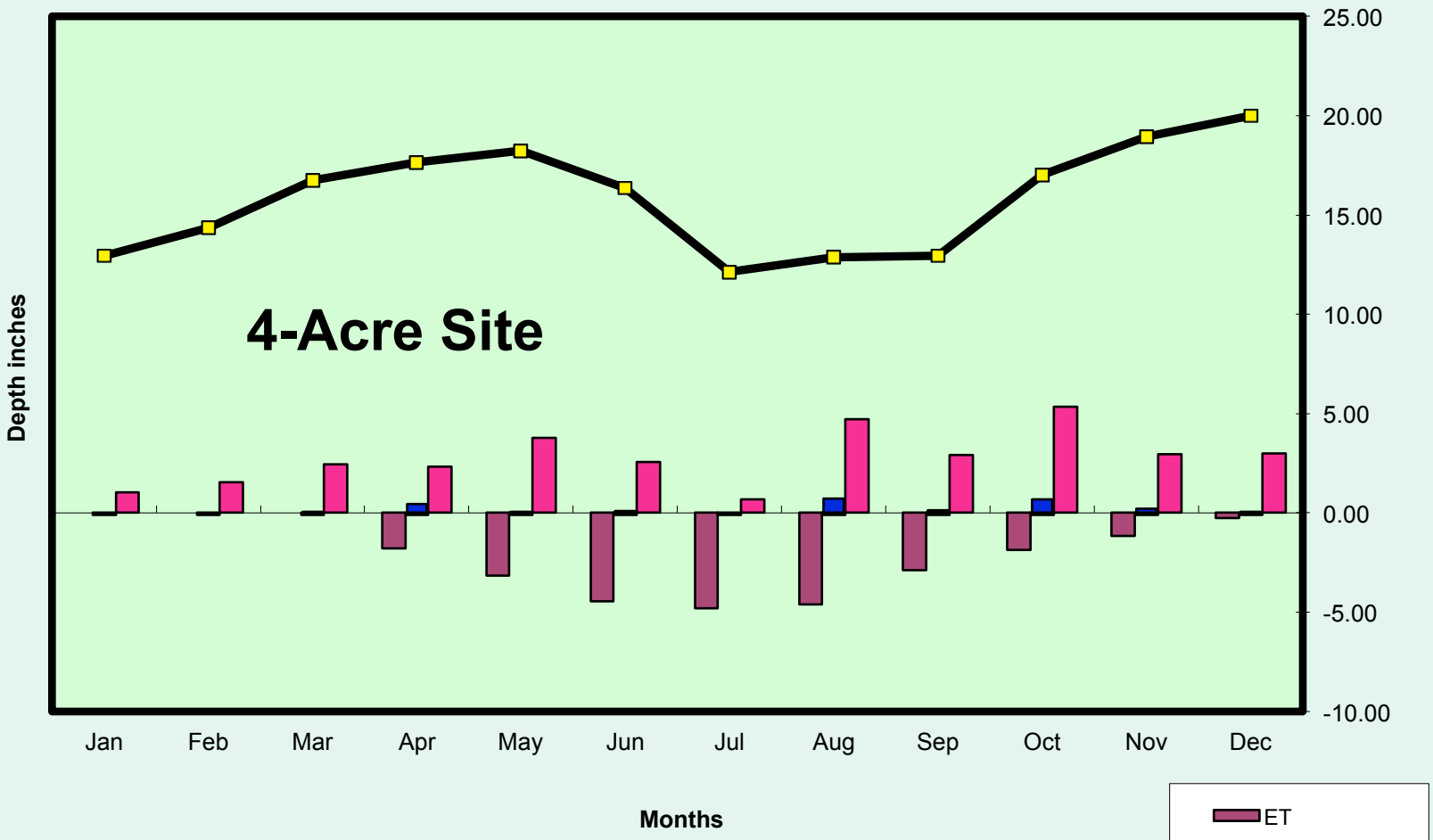
- How much water the wetland is capable of holding at full inundation....(STORAGE POTENTIAL - VOLUME) (average depth X area) ....and

- How much total water is actually available for the wetland (CUMULATIVE AVAILABLE WATER)

HOW THIS ANALYSIS WORKS…….

- **A very simple EXAMPLE….**
- **From an actual Mitigation Design…..**
- **Using a suite of National Weather Service Climatological Data…..**

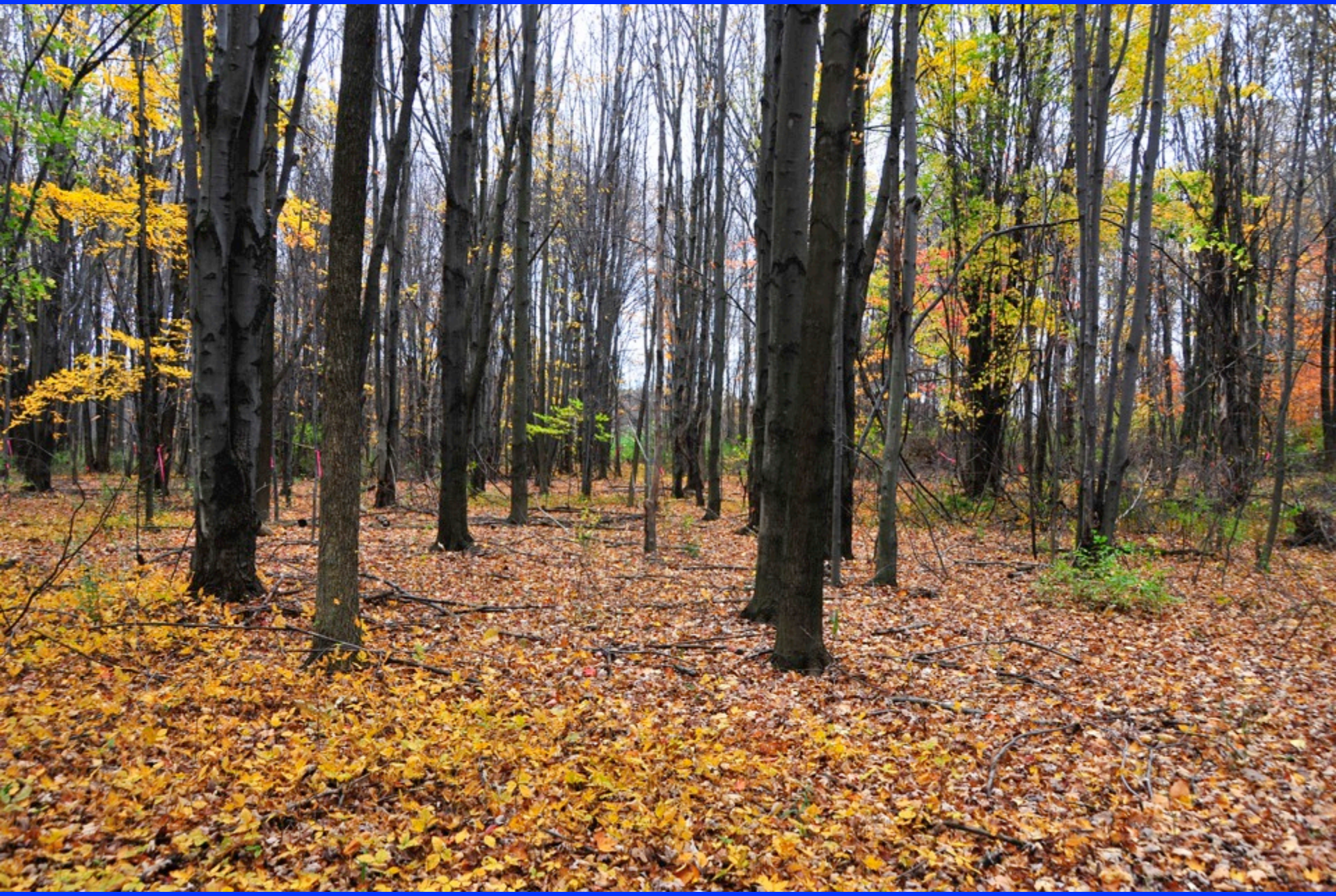
REFERENCE WETLAND HYDROGRAPH - CUMULATIVE STORAGE AVAILABLE

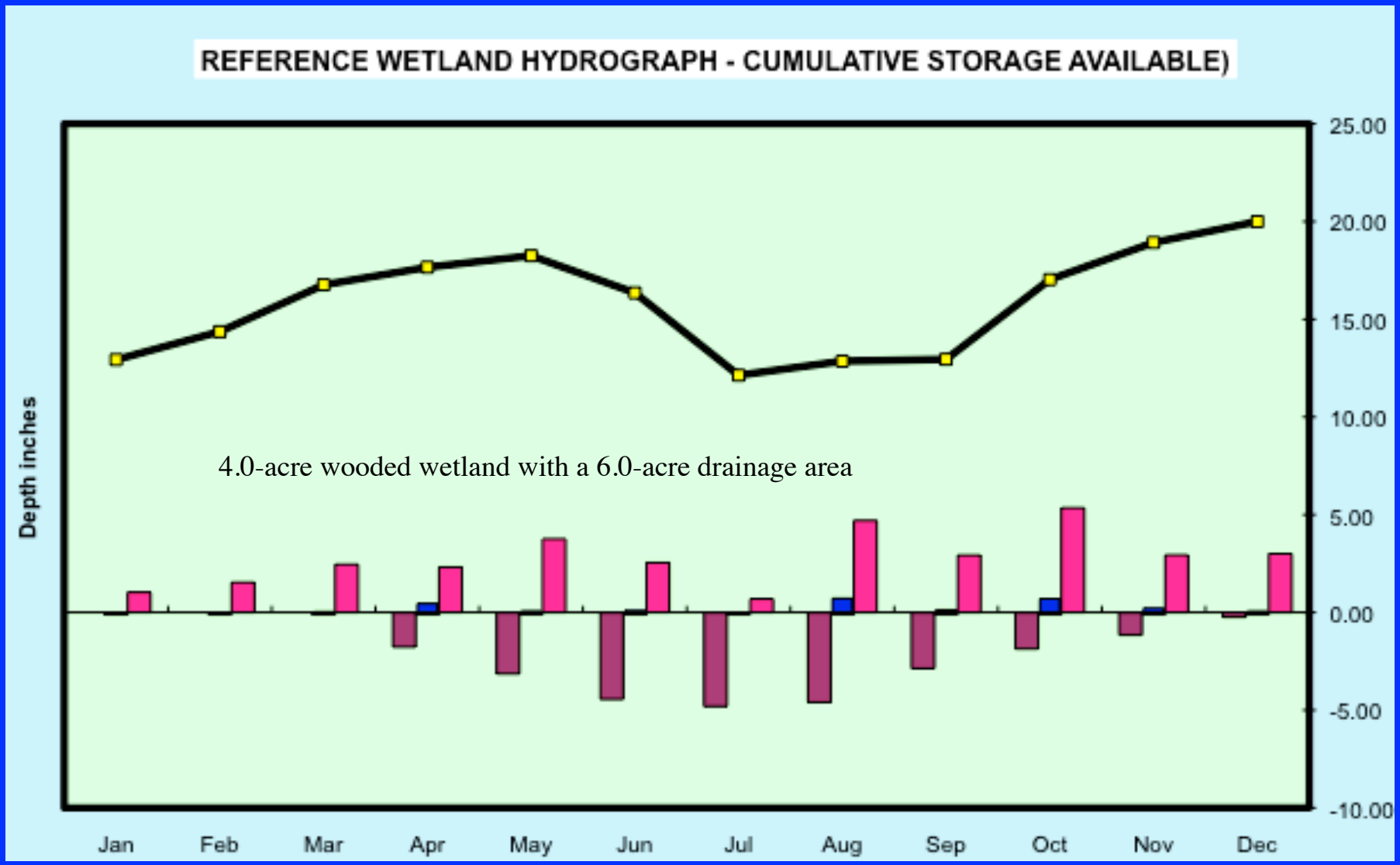


Flatwoods… Lacustrine sediments/tills glacial lake plains….

2001 Median Year
Geneva,Ohio Site
impact Wetland

Onset of ET




REFERENCE WETLAND HYDROGRAPH - CUMULATIVE STORAGE AVAILABLE)
Depth inches
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
4.0-acre wooded wetland with a 6.0-acre drainage area