

A Successional Model for Restoration and Management of Natural South Florida Plant Communities

Michael Duever and Richard Roberts

Overall Project Goal

- Mechanism for Capturing Knowledge of Land Managers and Other Experts
- Can Be Passed on to New Land Managers
- Can Be Used to Explain a Land Management Program to Others

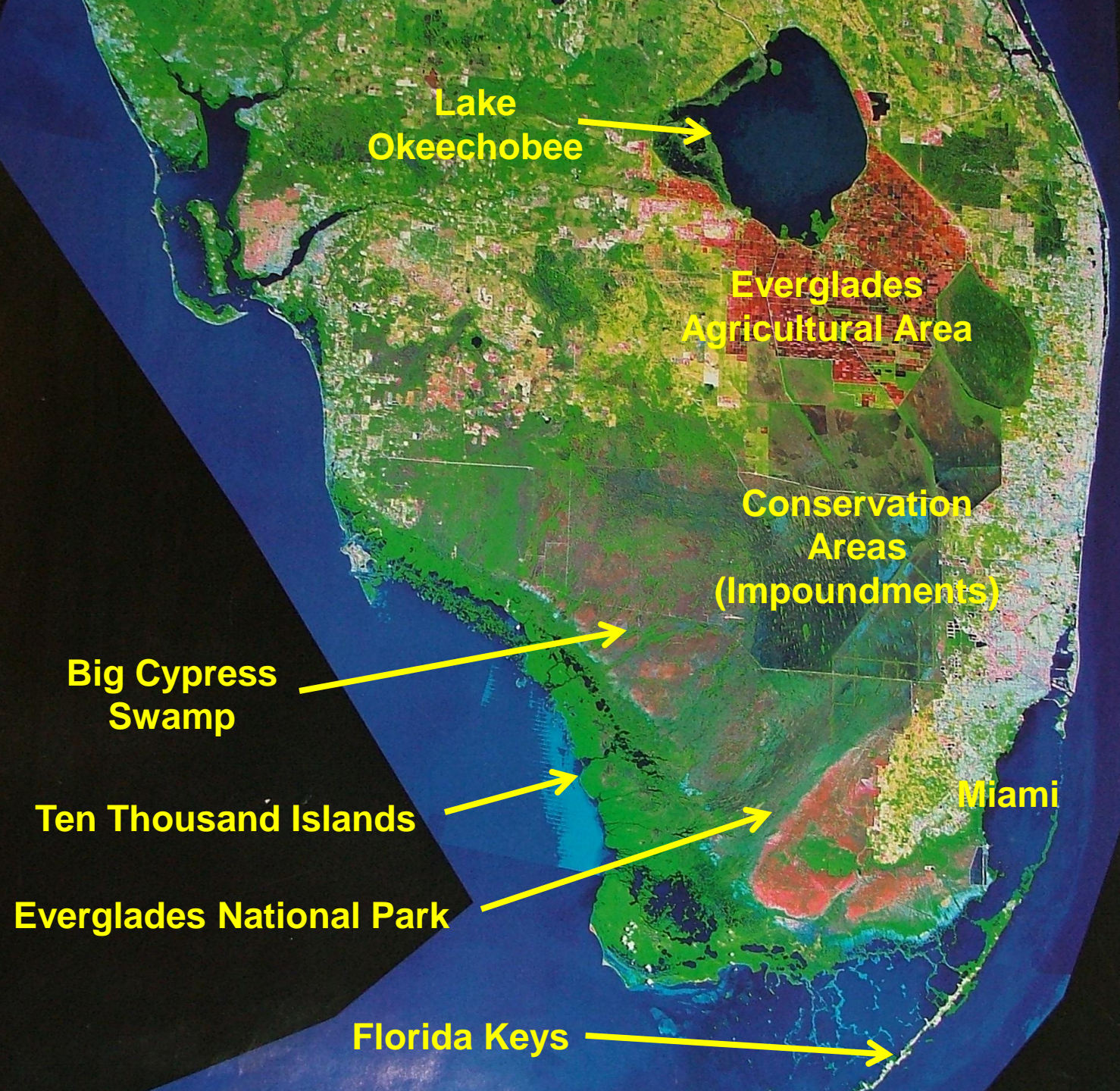
Model of Natural Succession

- **Models Help Us Organize Available Information to Understand How Plant Communities are Influenced by Major Natural Processes**
 - **Hydrologic Regimes**
 - **Fire Regimes**
 - **Substrate Characteristics**
 - **Site History**

Objectives

- **Plant Community Successional Model for South Florida**
 - **Information Sources**
 - **Model Assumptions**
 - **Model Design**
 - **Model Application**

South Florida



Plant Community Classification

- **Need for Classification**
 - Agreement on Communities to be Modeled
- **Criteria**
 - Communities Must be Naturally Occurring
 - Most Are Detectable on Aerial Photography
 - Boundaries Verifiable on the Ground
 - Explicitly Related to Natural Processes
 - Hydrologic Regimes
 - Fire Regimes
 - Types of Substrates

Model Development

- Sources of Information
 - Old and Current Photography
 - Tree Ages
 - Substrate C-14 Dates
 - Pine Stump Holes
 - Field Experience of Authors and Others
 - Best Professional Judgment

Logged Pine Flatwoods - 1976



Pine Flatwoods - 2009



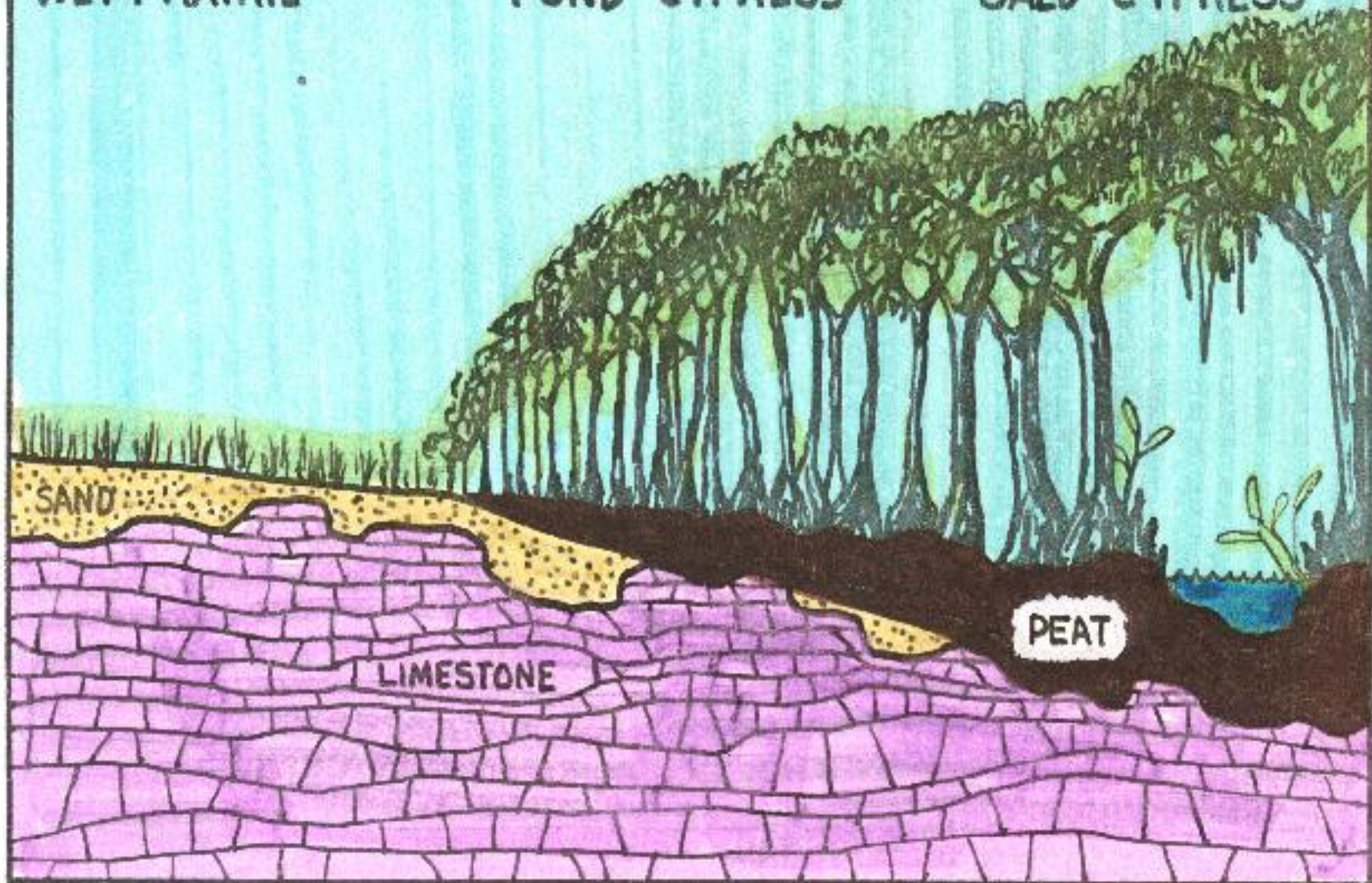
Model Development

- Sources of Information
 - Current and Old Aerial Photography
 - **Tree Ages**
 - Substrate C-14 Dates
 - Pine Stump Holes
 - Field Experience of Authors and Others
 - Best Professional Judgment

WET PRAIRIE

"POND" CYPRESS

"BALD" CYPRESS



Cypress DBH and Peat Depth Central Marsh Transect

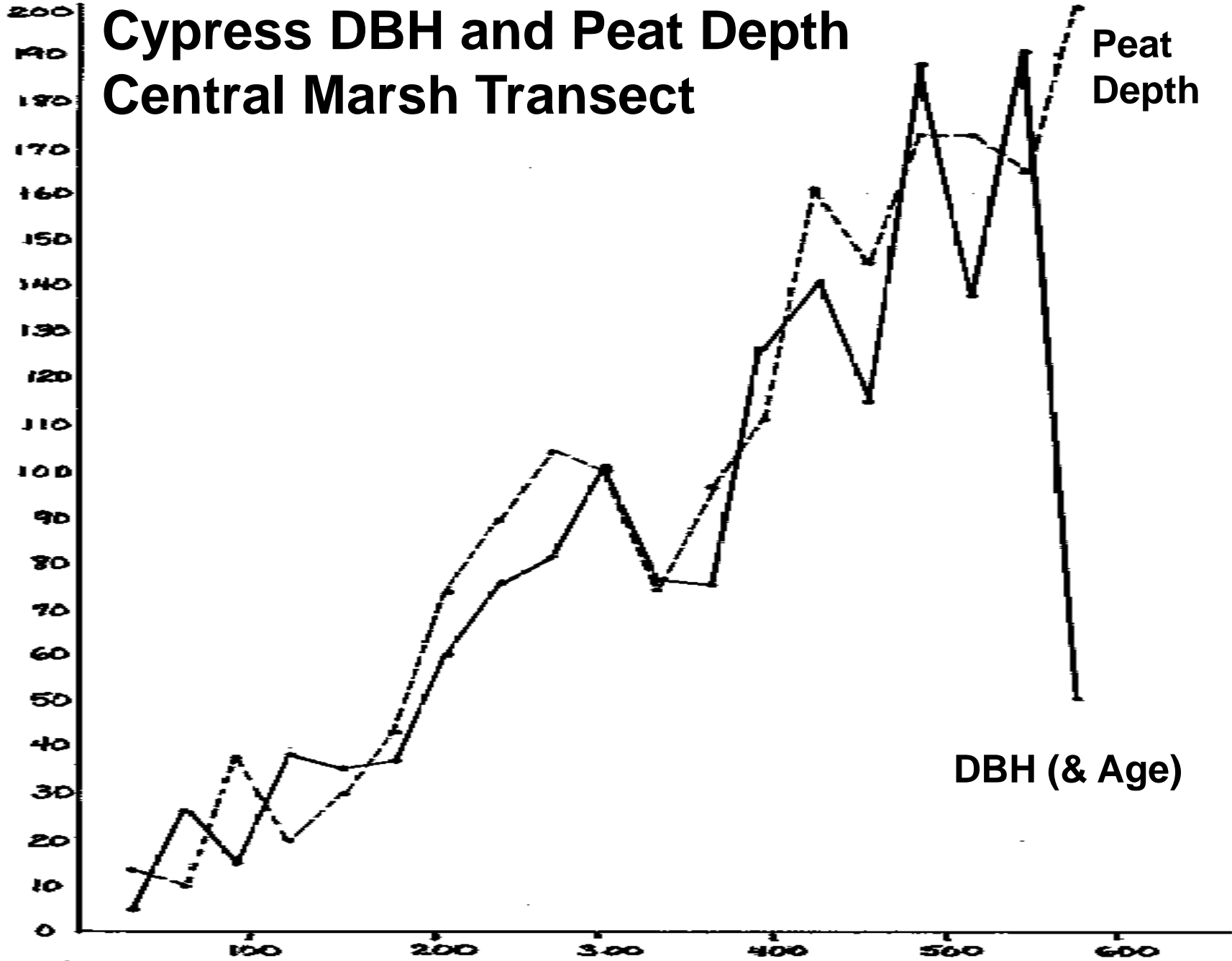
Diameter Breast Height (cm)
Peat Depth (cm)

Peat
Depth

DBH (& Age)

Edge of Strand

Distance into Strand (m)



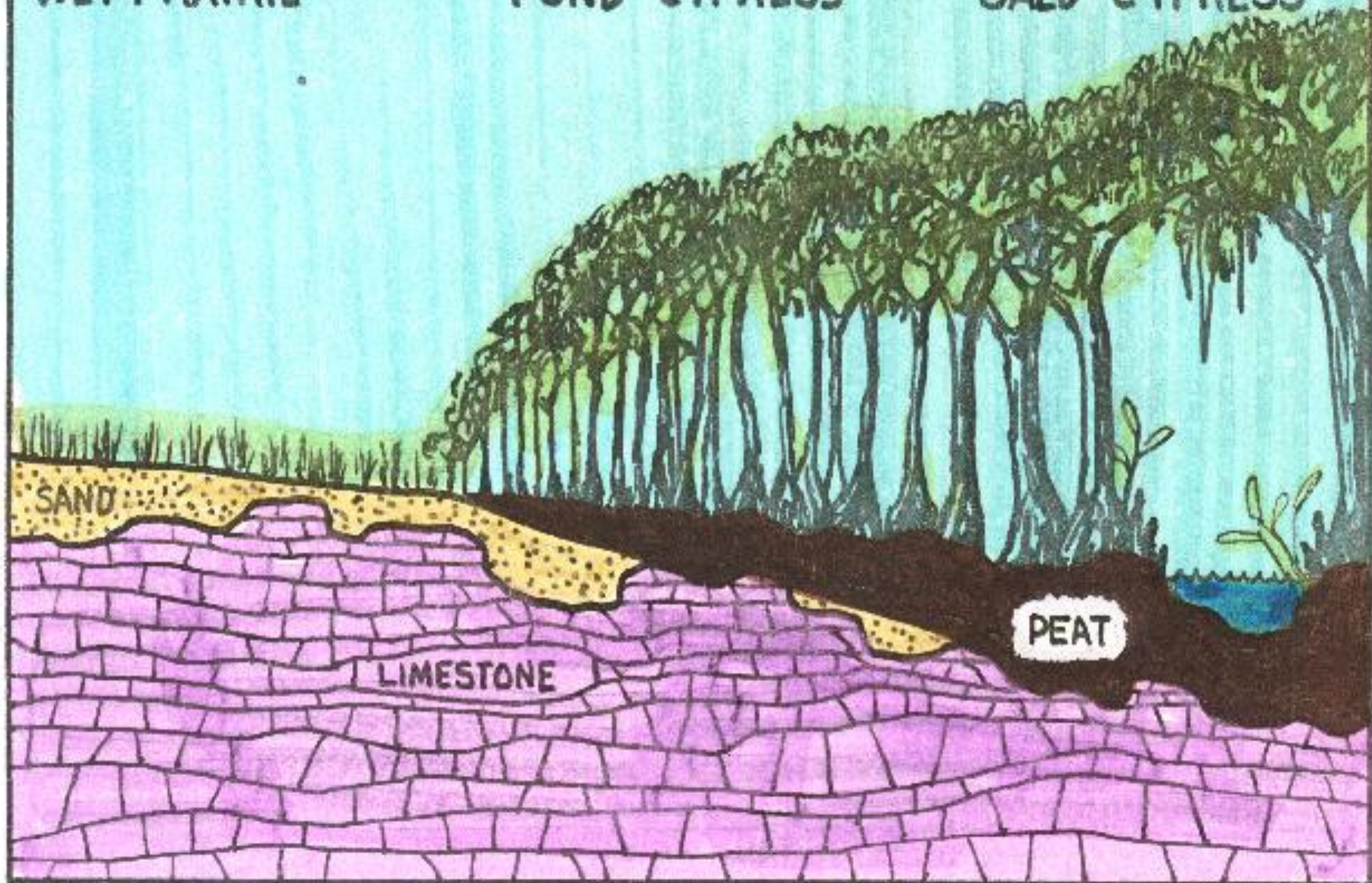
Model Development

- Sources of Information
 - Current and Old Aerial Photography
 - Tree Ages
 - **Substrate C-14 Dates**
 - Pine Stump Holes
 - Field Experience of Authors and Others
 - Best Professional Judgment

WET PRAIRIE

"POND" CYPRESS

"BALD" CYPRESS



Model Development

- Sources of Information
 - Current and Old Aerial Photography
 - Tree Ages
 - Substrate C-14 Dates
 - Pine Stump Holes
 - Field Experience of Authors and Others
 - Best Professional Judgment

Logged Pine Flatwoods - 1976



Model Development II

- Sources of Information
 - Current and Old Aerial Photography
 - Tree Ages
 - Substrate C-14 Dates
 - Pine Stump Holes
 - Field Experience of Authors and Others
 - Best Professional Judgment

Plant Communities and Their Characteristics in South Florida

Plant Community	Dominant Vegetation	Hydrology	Fire	Topographic Setting and Soils
Mesic Pine Flatwoods	<p>Canopy trees primarily slash pine.</p> <p>Understory dominated by dense saw palmetto.</p>	<p>Inundated 0 - 1 months per year.</p> <p>Normal wet season water depths from 0-100 cm below ground.</p> <p>Annual water table fluctuation of 120 - 150 cm.</p>	<p>Maintained by moderately intense fires about every 1 - 6 years.</p>	<p>Light-to-dark brown, sandy soils or limerock on sites with little topographic relief.</p>
Hydric Pine Flatwoods	<p>Canopy trees primarily slash pine.</p> <p>Diverse, primarily herbaceous groundcover with about 500 species, e.g. wiregrass, bluestems, saw palmetto.</p>	<p>Inundated 1 - 2 months per year.</p> <p>Normal wet season water depths from 0 – 15 cm above ground.</p> <p>Annual water table fluctuation of 90 - 120 cm.</p>	<p>Maintained by moderately intense fires about every 1 - 6 years.</p>	<p>Light-to-dark brown, sandy soils or limerock on sites with little topographic relief.</p>

Mesic Flatwoods



Hydric Flatwoods



Plant Communities and Their Characteristics in South Florida

Plant Community	Dominant Vegetation	Hydrology	Fire	Topographic Setting and Soils
<p>Freshwater Marsh</p>	<p>Tall (1.5 – 3 m) dense herbaceous community with only a few species, e.g. pickerelweed, arrowhead, tall sawgrass, fire flag, maidencane.</p>	<p>Inundated 6 - 10 months per year.</p> <p>Normal wet season water depths of 30 - 60 cm.</p> <p>Annual water table fluctuation of 60 - 120 cm.</p>	<p>Maintained by moderately intense fires about every 1 - 10 years</p>	<p>Depression and flowway wetlands on organic soils.</p>
<p>Mixed Cypress - Hardwood Swamp</p>	<p>Closed canopy of large cypress and mixed hardwoods, e.g. dominated by red maple, sweetbay, Carolina ash, Carolina willow, pond apple, dahoon holly, and occasional sabal palms.</p>	<p>Inundated 6 - 10 months per year.</p> <p>Normal wet season water depths of 30 - 60 cm.</p> <p>Annual water table fluctuation of 60 - 120 cm.</p>	<p>Found on sites infrequently (± 100 years) reached by fire due to extended inundation and high soil moisture in organic soils.</p>	<p>Depression and flowway wetlands on deep (>30 cm) organic soils.</p>

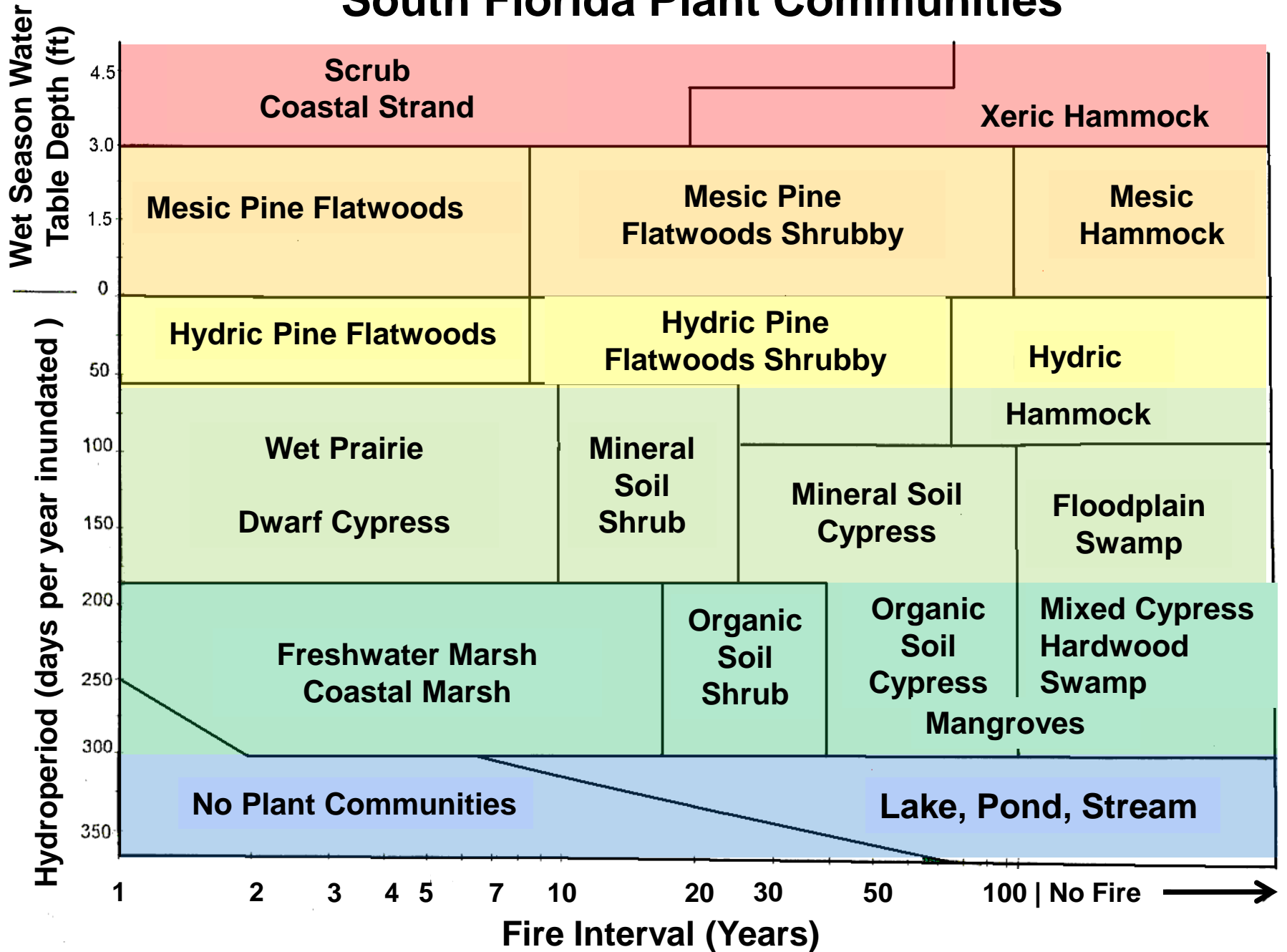
Freshwater Marsh



Mixed Cypress – Hardwood Swamp



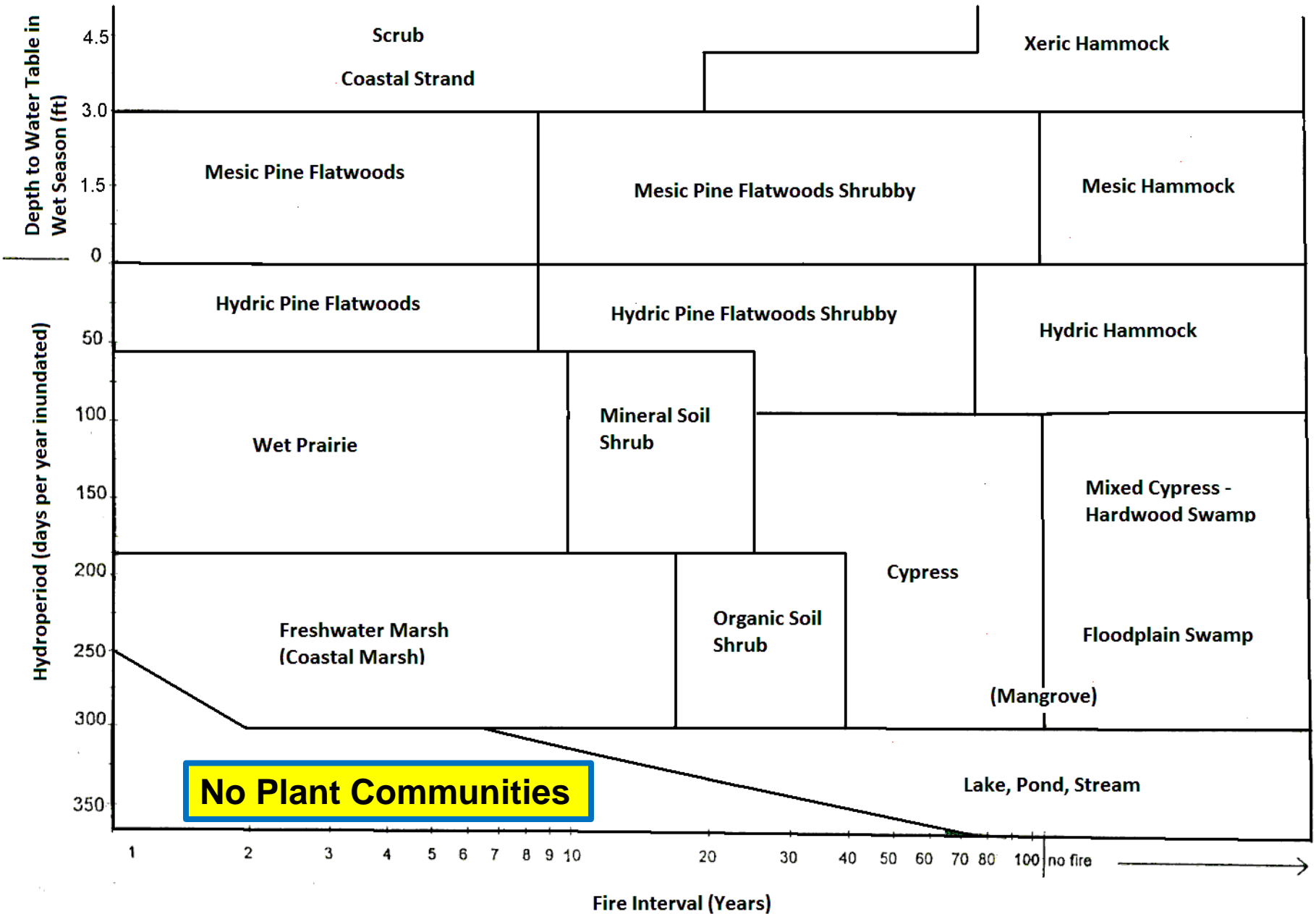
South Florida Plant Communities



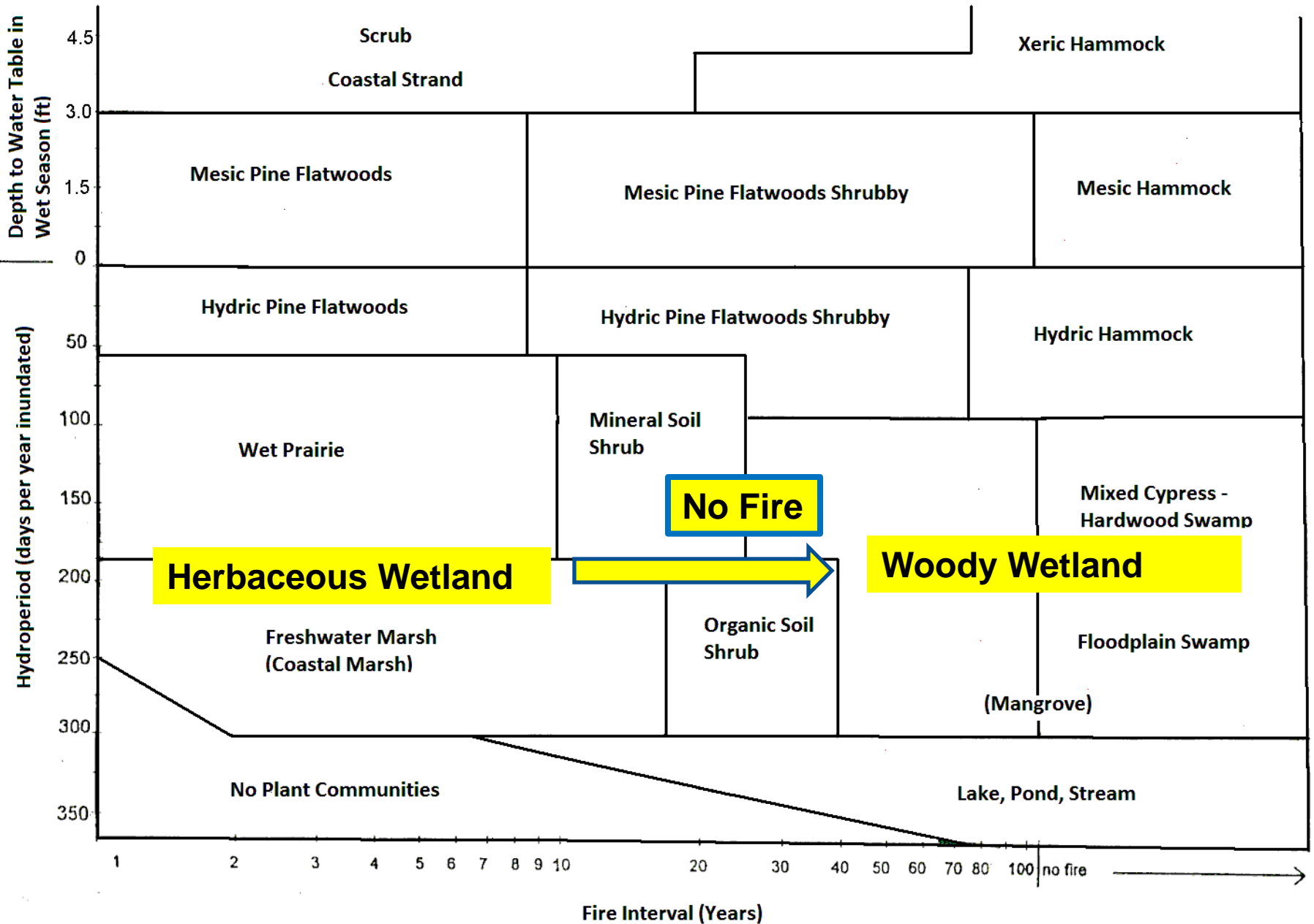
Model Assumptions

- **Maximum Rate of Succession**
 - **Seed Sources Were Always Available**
 - **Conditions Were Always Suitable for**
 - **Germination**
 - **Seedling Survival**
- **Long-Term Perspective**

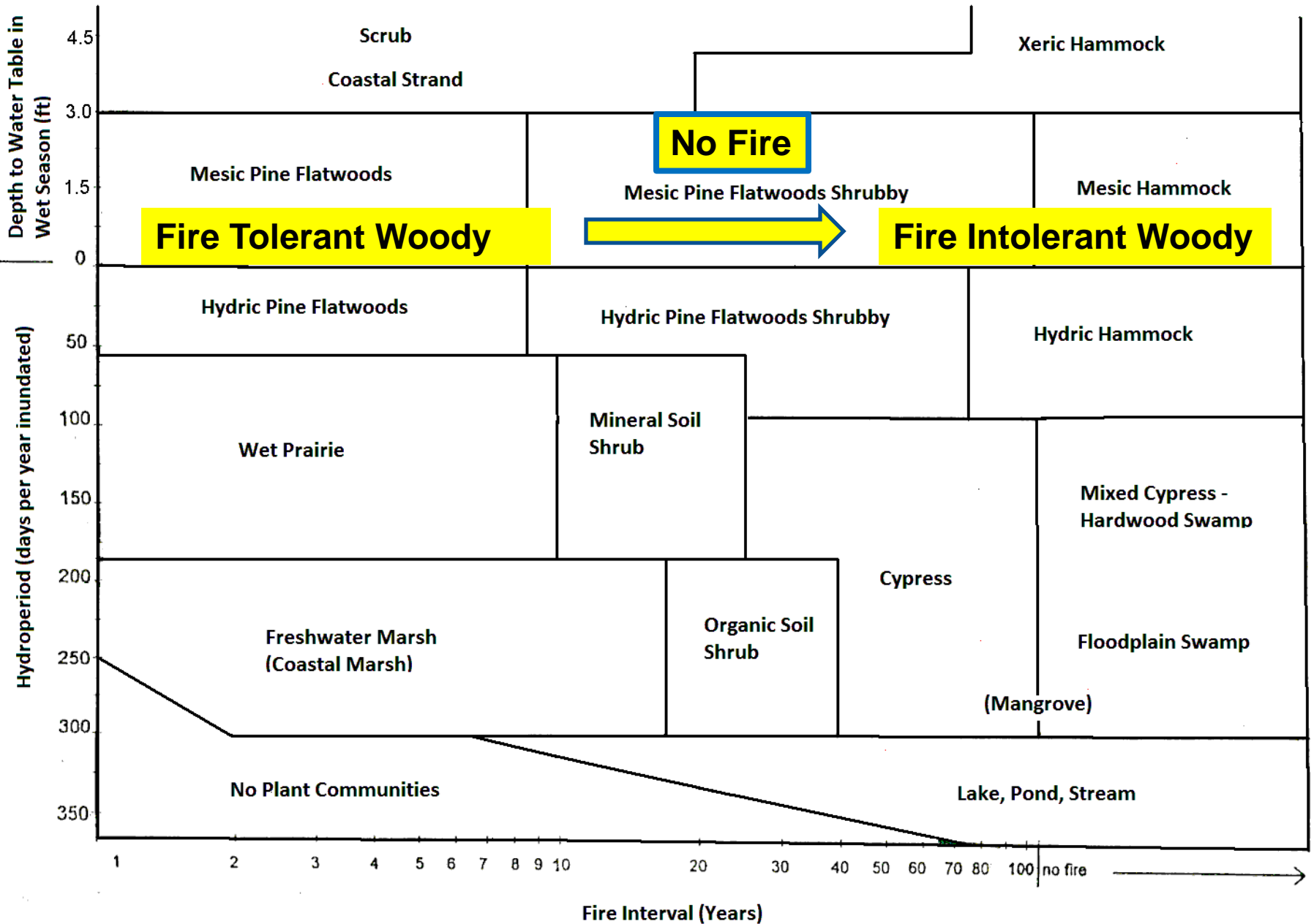
SOUTH FLORIDA PLANT COMMUNITIES



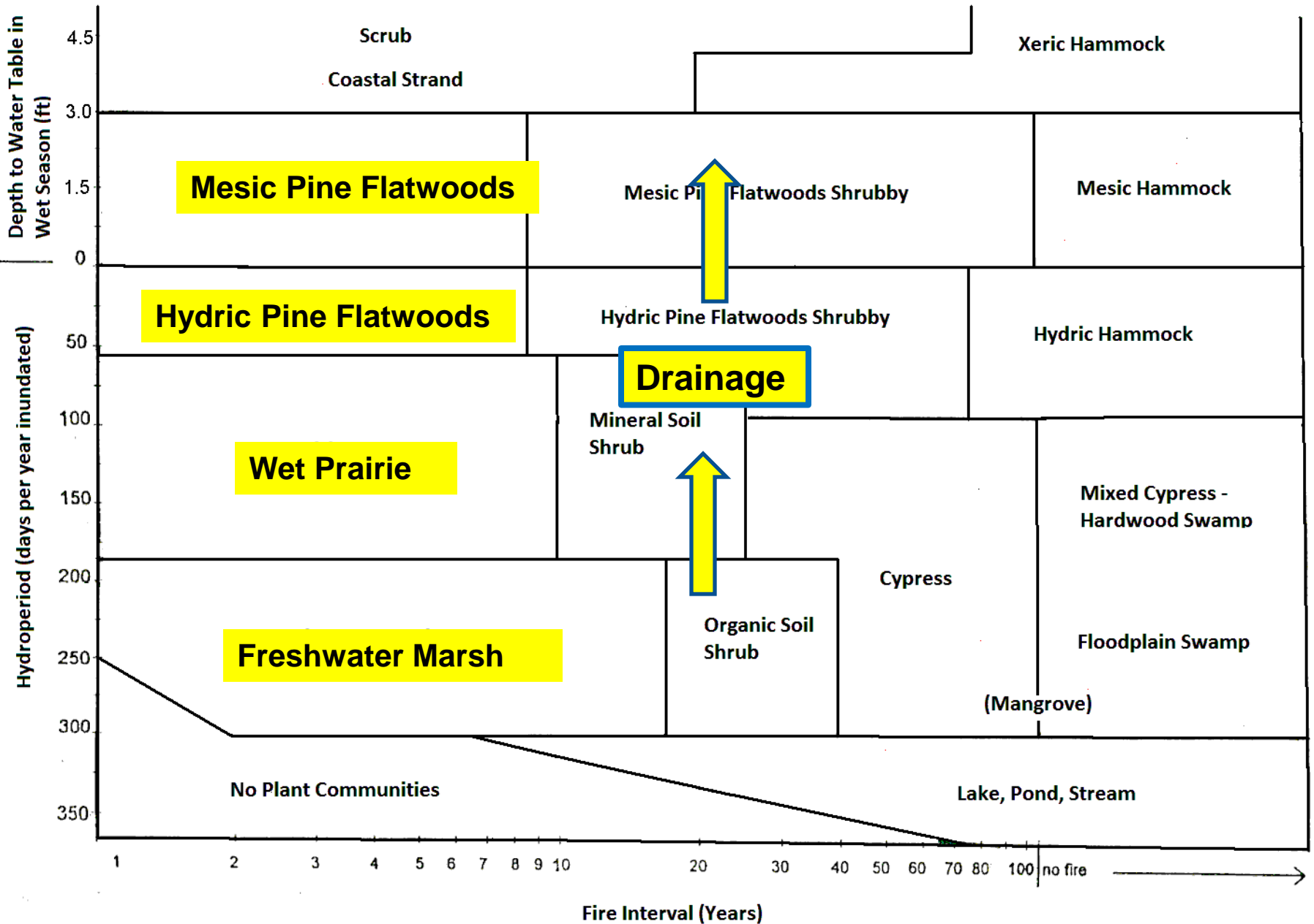
SOUTH FLORIDA PLANT COMMUNITIES



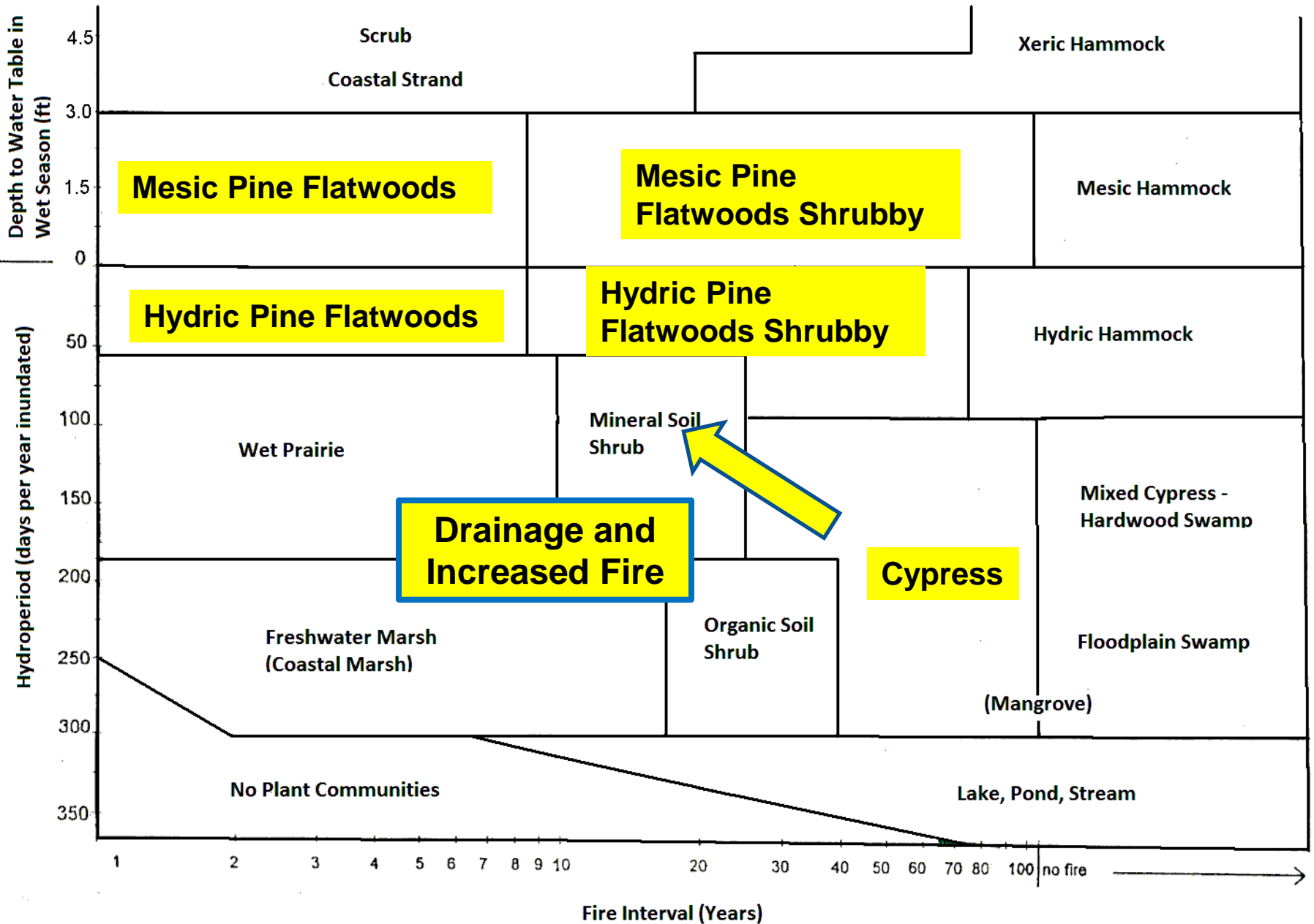
SOUTH FLORIDA PLANT COMMUNITIES



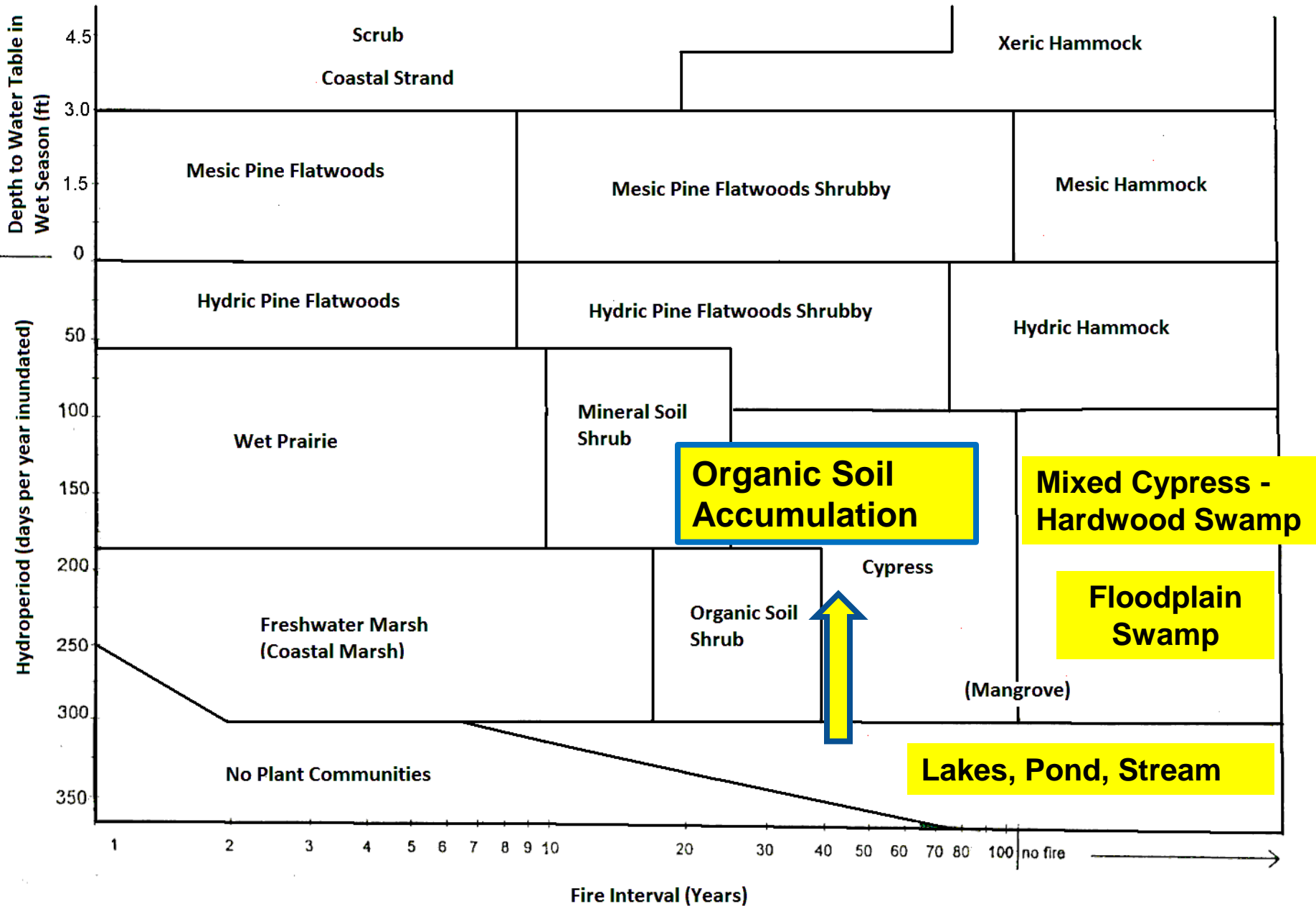
SOUTH FLORIDA PLANT COMMUNITIES



SOUTH FLORIDA PLANT COMMUNITIES (SALINE)



SOUTH FLORIDA PLANT COMMUNITIES



Model Application I

- **Generalization of Our Understanding of How Major Environmental Factors Determine the Characteristics and Distributions of Major Plant Communities**
- **Model Can Be Used to Identify Where Exotic Plant Species Could A Serious Problem**
- **Model is Specific to South Florida**
- **But It Can Be Readily Adapted to Other Areas**

History of Model Development

- **Adapted Earlier South and Central Florida Models**
 - **South Florida (Taylor Alexander 1971)**
 - **Corkscrew Swamp (1976)**
 - **Big Cypress Swamp (1984)**
 - **Kissimmee River Floodplain (1993)**
 - **Disney Wilderness Preserve (1999)**
 - **South Florida (2006)**

Model Application II

- **Is a Hypothesis About How an Area Will or Will Not Change as a Result of Management Actions or Inaction**
- **Is a Prediction as to the Likely Response of a Site to Off-Site Activities**

Model Application III

- While There are Other Factors Influencing Plant Communities in South Florida, **Hydrology and Fire are the Two by Which Humans Can Most Significantly Affect These Communities**, Either by Onsite Management or Offsite Activities
- Mechanism for Capturing Knowledge of Land Managers and Other Experts, so That It Can Be Passed on to New Land Managers or Be Used to Explain a Land Management Program to Others



Questions?