Evaluation of Ecosystem Restoration Projects in the Cache River Basin with Special Reference to the Grubbs Channel Blockage and Sedimentation from the Big Creek Subbasin

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Study Components

1. Evaluation of Ecosystem Restoration Options for the entire Cache River Basin
2. Evaluation of Ecosystem Effects of the Channel Blockage near Grubbs
3. Evaluation of Sediment Originating in the Big Creek Subbasin

General Objective for All 3 Tasks

- Identify opportunities for ecosystem restoration and remediation of problems in the Cache Basin that have led to :
  - Channel obstructions
  - High Sediment runoff
  - Altered hydrology and flows
  - Degraded Community Structure and Function

Task 1: Ecosystem Restoration Options for the Cache Basin

- Methods – Hydrogeomorphic (HGM) Evaluation

The "HGM" Approach

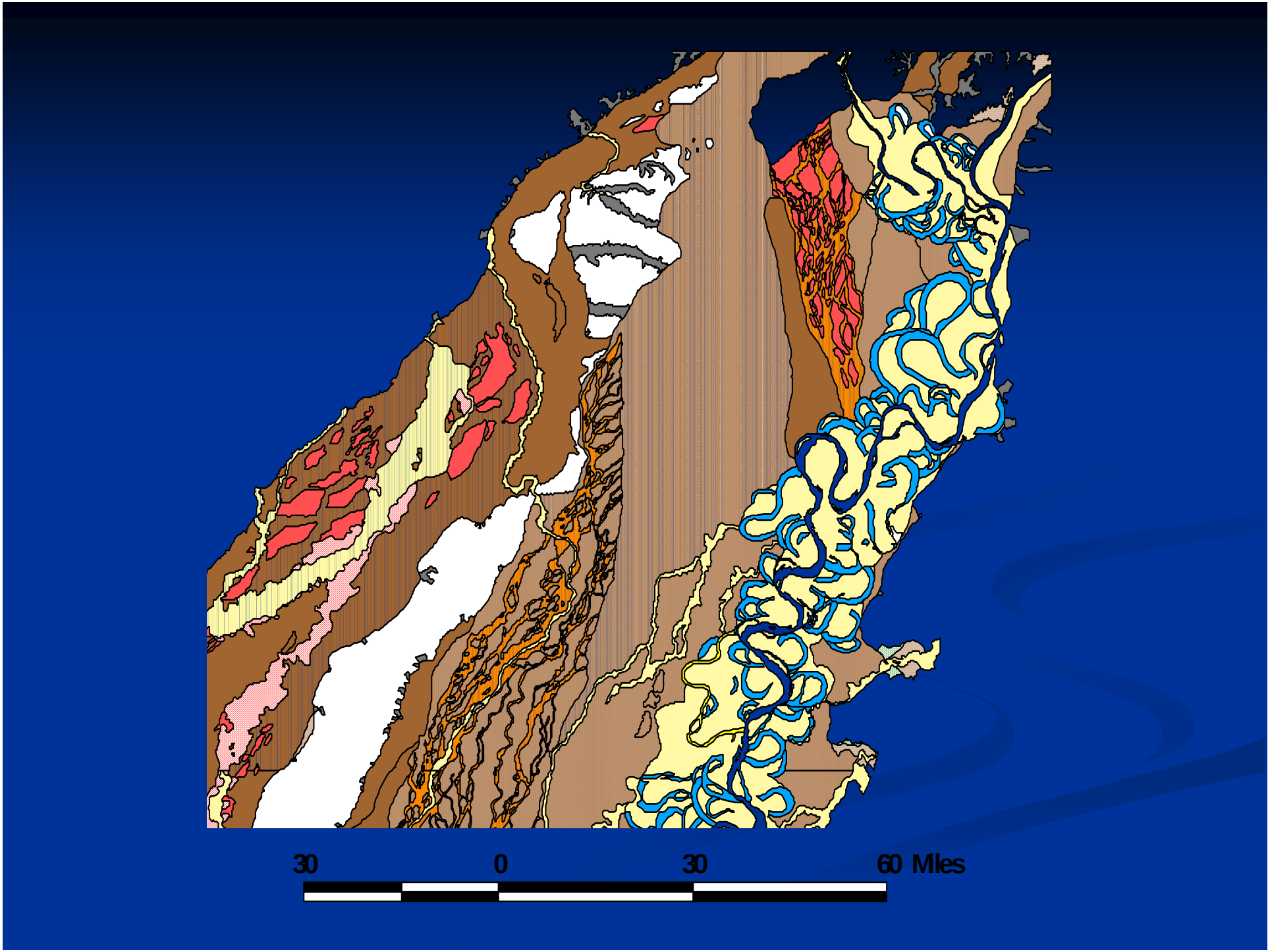
1. Identify the historic ecosystem condition and ecological processes

2. Evaluate changes from the historic condition

3. Identify restoration and management options and ecological attributes needed to restore and manage specific habitats

Modeling the Habitat Community

- A "GIS" Approach that includes reference areas for the combination of:
  - Geomorphologic surface
  - Topography and slope
  - Soils
  - Flood frequency zone


30
0
30
60 Miles

Geomorphology +
Soils +
Elevation +
Flood Frequency +

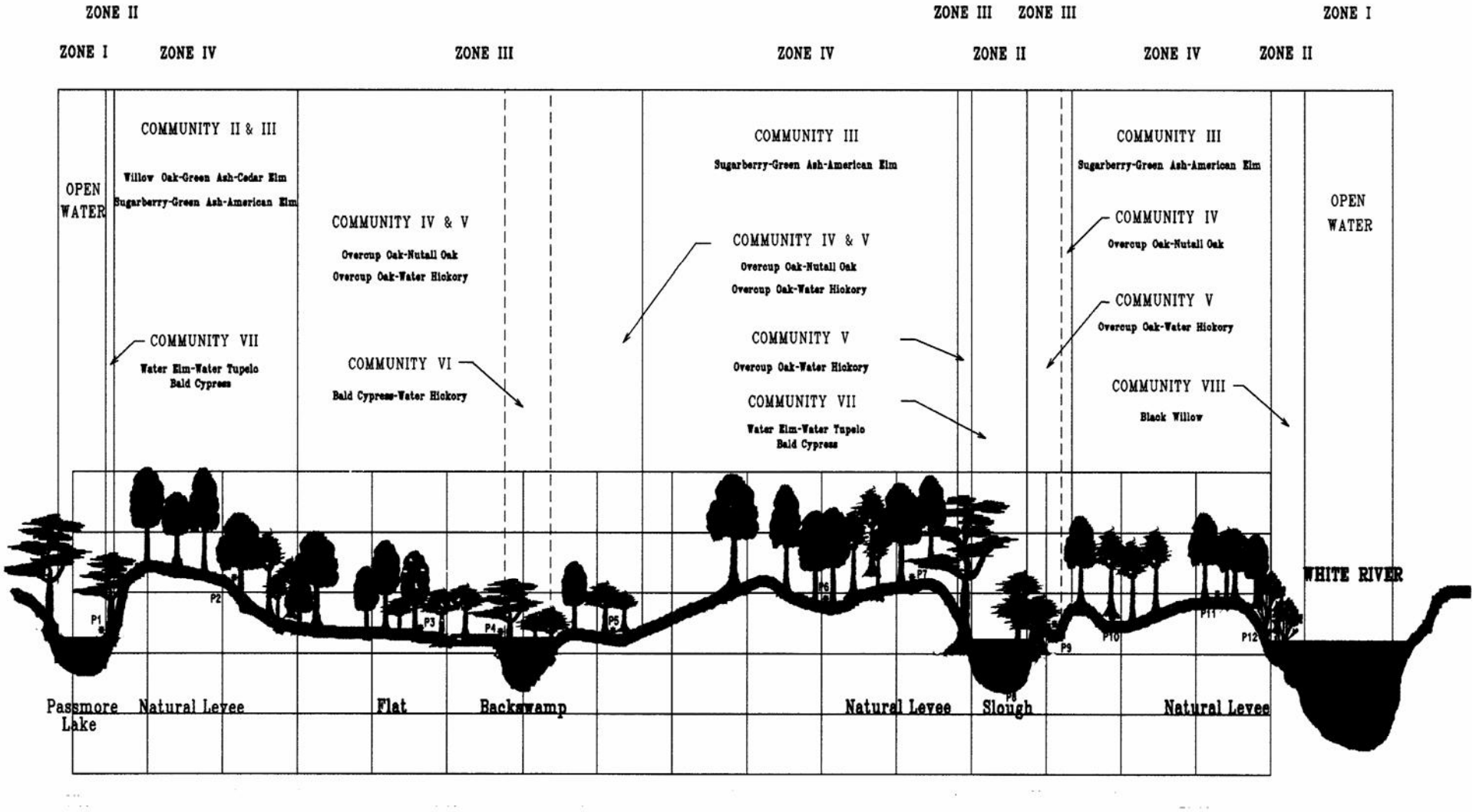
=

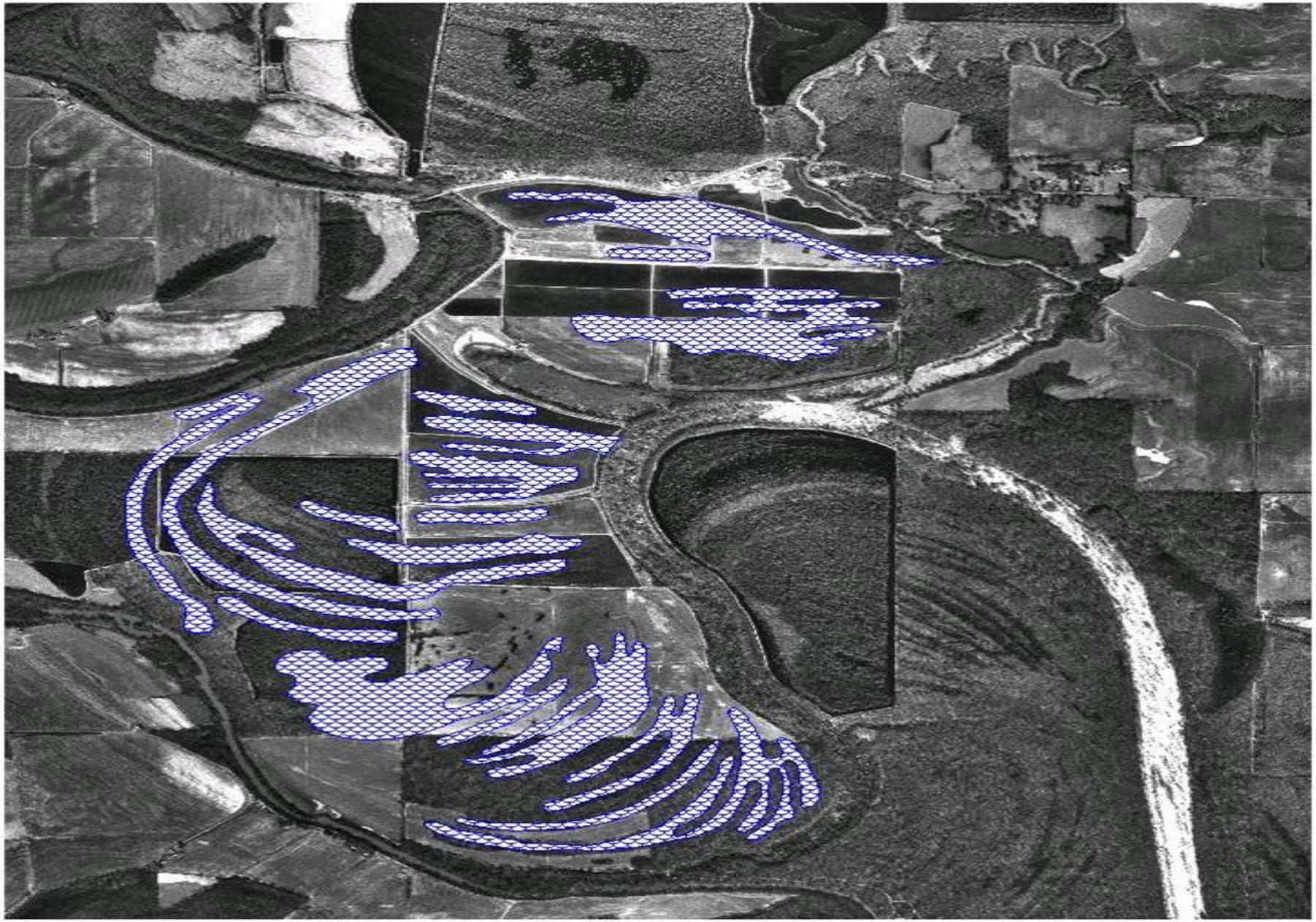
Vegetation/Habitat Community

WETLAND ZONES AT CLARENDON

TRANSECT 1

Fall 1996

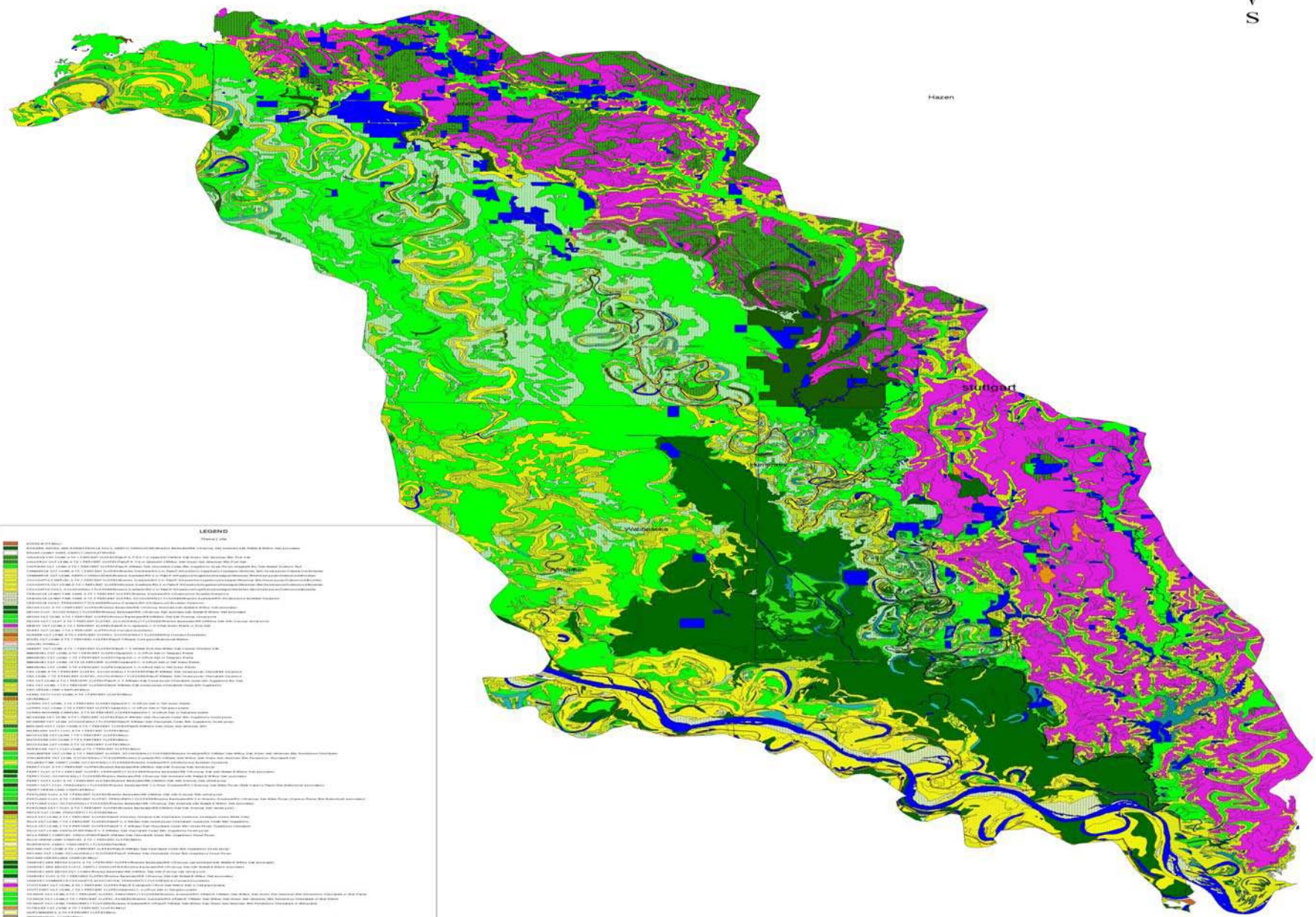




LEGEND

Dunklin_lows.shp

Potential plant community distribution map for the Bayou Meto Basin, Arkansas



Map created 8/28/01 Jody Pagan-NRCS

The Beauty of the HGM Matrix

- History and Science determines what belongs where – no subjectivity!
- Landscape based – places the refuge into proper context of it position and habitats
- Identifies the ecological processes and "drivers" needed to restore communities

What is the current condition?

- Structure: What changes in habitats, land forms, hydrological system, etc.
- Functions: What changes in resources/functions?
- Ecological Processes: What changes in hydrology, disturbance, regenerating mechanisms, nutrients, etc.

What is current condition? – the process

- Contemporary information on:
  - Land forms, topography, developments
  - Hydrology – timing, depth, duration, source
  - Vegetation communities – type, distribution, health
  - Social/management issues

Percentage Loss of Habitats in the Cache Basin, Arkansas: 1850-2008

Habitat Type	% Loss
Seasonal Herbaceous	87.5
Savanna/Prairie	98.5
Cypress/Tupelo	28.6
Low Bottomland Hardwood (BLH)	64.0
Intermediate BLH	86.1
High BLH	95.0
Riverfront Forest	50.0

Task 2: Channel Blockage Study

- Highway 145 on south to river mile 135 on north

1. Development of Landscape Habitat Models
2. Determine "Condition" of BLH (pre-blockage and current)
3. Evaluate "effects" of sediments and water stress
4. Projection of Benefits/Impacts

Summary of Cache Basin Degradations

- Channelization north of RM 128.5 (Cache) and north of RM 43.5 (Bayou DeView)
- Conversion of > 90% BLH in north and ca. 50% in south
- Loss of most Savanna, Prairie, High BLH
- Extensive Land-leveling
- Levees and Reservoirs on Black, St. Francis, White
- 2,200 miles of drainage ditches

Degradations - continues

- Lower flow and reduced flooding north of Grubbs and opposite in the south, espcially at the confluence with the White River
- Increased withdrawal of surface and ground water for irrigation
- Degraded goundwater quality
- Low base flows and frequent dry channels in most summers
- Altered plant and animal communities

Ecosystem Restoration Recommendations

- 1. Restore key ecological processes and communities dominated by BLH and braided stream channels
- 2. Restore altered geo-physical features of the basin

Restoration of Processes - Hydrology

- Restore connectivity of Cache and Bayou DeView with their floodplains – north areas
- Restore BLH in the 100-year floodplain and connect corridors
- Restore braided-type channel configuration and water flow pathways
- Inter-basin floodwater connectivity?
- ASWCC base flow recommendations

Restoration of Processes – Nutrient and Sediment Dynamics

- Reforest areas along all major drainages
- Restore braided stream-type drainage corridors in north and mid regions
- Support soil conservation programs, especially HEL sites that are still farmed

Restoration of Processes- Energy Flow

- Reconnect and enlarge BLH patches
- Restore community distribution and composition – HGM predicted types
- Emulate natural water regimes in managed sites
- Provide spatial and temporal refugia for key animal groups
- Evaluate predator-prey relationships

Task 2: Grubbs Channel Blockage Condition

- Methods – Extensive sampling of remnant BLH above and below the blockage
- Methods – Sediment and debris origin via basin-wide HGM evaluation

Major Blockage Issues

- Accelerated flow via channel and land changes north of the blockage
- Increased sediment and debris deposition, at least pre-1980
- Changed BLH species composition, distribution and health with shift to "wetter-type" species
- Increased mortality of red oaks and high water-stress indicators
- Excessive changes north and at blockage – reduced further south

Blockage Remediation Options – Basin-wide Sediment Control

- Reforestation of BLH throughout Basin, especially in the north
- Expanded floodway corridors and braided channel configurations
- Promotion of conservation tillage
- Carefully designed silt basins
- Curtail enlargement and realignment of ditches
- Channel grade-control structures
- Reduce small farm ditches in HEL lands

Blockage Remediation Options – Blockage Area

- Expand floodway connectivity and widen leveed areas
- Restore flow in former Cache River channels
- Construct new, ecologically engineered, channels around the blockage area
- Construct silt basins along new channels

Task 3: Sediment Reduction in Big Creek Watershed

- Evaluation of impacts on local on-site communities
- Application of sediment reduction and changed hydrology models to calculate downstream impacts
- After the Channel Blockage study is completed, can assess relative contribution of Big Creek projects to the channel blockage area

Big Creek Subbasin Conclusions

- Past high erosion from sheet-and-rill erosion of conventionally tilled croplands, especially soybeans
- Now more sediment from gully and ditch bank erosion
- Positive effects of CRP, EQUIP, ponds and reservoirs
- Positive effects of conservation tillage
- Negative effects of regular ditch cleaning – head cutting, bank erosion

Big Creek Recommendations

- Conversion of soybean production to less intensive land use – pasture, hay, forest
- Intensify conservation treatments with minimum tillage, buffers, drop pipes, and w/c structures
- Treatments on pasture/hay lands with warm season mixes, fencing, silt basins
- Improved forest management
- Grade-stabilization structures

Final Thoughts – Challenges Daunting, but …

- All studies suggest a "landscape approach"
- Degradations and solutions are obviously inter-related
- Best strategy is to work from the largest scale (Basin) to the smallest (Big Creek)
- Hydrological "fixes" must involve landscape efforts to reduce sediment/head cutting, ag runoff, and riparian/forest buffering
- Many excellent opportunities for BLH community restoration