Appendix 2.2 Potential Habitat GIS Methodology

Approach: Use GAP Vegetation Map in combination with ancillary layers (polygons from Level III Omernik Ecoregions, STATSGO soils, 1:500,000 Arkansas Geology, Saucier Geomorphology. These were used to clip the GAP Vegetation Raster map to define areas of existing vegetation associated with particular ecological systems). Future phases will add to and improve this map. In the Ozark-Ouachita (Interior Highlands) region, systems are not generally defined in such a way that the data layers available for Phase 1 added any ability to map ecological systems. Therefore in these areas GAP vegetation units were selected without using any other layers.

The 2ha aggregate GAP Vegetation Map was the base vegetation layer – Initial efforts used the finer 30-m pixel size that was the base GAP map resulting from image classification. After doing some clipping of this map it was apparent that the selected areas of vegetation included many single-pixel or few-pixel "speckles" that would have to be aggregated with larger areas before a useful polygon map could be created. The GAP project had already produced aggregated raster maps of 2ha, 10ha and 100ha. It would simplify the current project to use one of these. After inspecting the alternatives the 2ha was chosen as the base vegetation map since it would be easy to "polygonize" but would retain considerable detail. This was a smaller area than would be tracked by the CWCS planning effort for large patch or matrix communities but might be useful for some small patch communities.

Factors involved in selecting clipping layer – GAP used STATSGO map to constrain spectral classification, that is, spectral classification was often done within certain STATSGO polygons within a certain satellite scene. Therefore the vegetation map overlays better on the STATSGO map than on the other maps and is the preferred clipping file unless another is preferred for a specific reason. The STATSGO map was most useful in the Coastal Plain because systems there are closely associated with soils. The Saucier map was preferred in the Mississippi Alluvial Plain because it better represents the definitions of those alluvial systems. The Ecoregion map did not exactly overlay the other maps but CWCS has already made the decision to use that map to define ecoregions so it was used for that purpose. The Geology map was used as a backup to these.

Map Accuracy: The ecological systems map can be no more accurate than the maps used in creating it. The GAP project did an accuracy assessment and found wide variations in accuracy depending on the vegetation type. The highest accuracy was forest vs. non-forest at 75%. In creating the ecological systems map, unless it was essential to do otherwise, all natural vegetation types within a clipping polygon were selected as representing the system, even if, for example, wetland types along streams were known to be a different system from the dominant upland system. The wetland pixels were usually scattered and occurred both along defined stream courses and in inappropriate sites as well, indicating that there would have been as much error in placing them into a different system as including them in the prevalent system. Thus overall accuracy was improved by selecting all forested types as belonging to the system. Although this resulted in a decrease in detail within any given system polygon, the number of systems so defined, at about 20, is not greatly different from the total number of vegetation types defined in the original GAP map, 31.

Map Units Organized by Ecoregion

OZARK-OUACHITA (INTERIOR HIGHLANDS) REGION (comprised of Omernik Level 3 ecoregions Ozark Highlands, Boston Mountains, Arkansas Valley, Ouachita Mountains)

Method: Select vegetation types from the 2 ha. Gap vegetation map (no clip polygons are used).

Ozark-Ouachita Dry-mesic Oak Forest habitat (and same ecological system)

GAP types:

8 T.1.B.3.a.II, *Quercus alba*, white oak - mixed hardwoods

9 T.1.B.3.a.III, *Quercus rubra* - Quercus spp., northern red oak - oak

10 T.1.B.3.a.IV, *Quercus falcata* - Quercus spp., south-

ern red oak - oak 15 T.2.B.4.a.I, *Quercus* spp. - *Carya texana*, oak - black hickory

"**Interior Highlands Glade-Barrens**" type includes three habitats: Central Interior Highlands Dry Acidic Glade and Barrens (and same ecological system)

Central Interior Highlands Calcareous Glade and Barrens (and same ecological system)

Ozark-Ouachita Dry Oak Woodland (and same ecological system)

GAP types:

3 T.1.A.9.c.I, *Juniperus virginiana*, eastern red cedar

6 T.1.B.2.b.IV, *Juniperus virginiana*, eastern red cedar

11 T.1.B.3.a.V, *Quercus stellata*, post oak

12 T.2.A.2.b.I, *Juniperus virginiana* - Quercus spp., eastern red cedar - oak

14 T.2.B.3.a.II, *Juniperus ashei* - *Quercus* spp., white cedar - oak

"**Ozark-Ouachita Pine-Oak Forest and Woodland**" type includes pine-hardwood co-dominated sites in three habitats:

Ozark-Ouachita Pine-Oak Forest habitat

Ozark-Ouachita Pine-Oak Woodland habitat

Ozark-Ouachita Pine/Bluestem Woodland habitat

All of which make up Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland ecological system. (This map unit is probably more comparable to the first two habitats, depending on structure, either forest or woodland, not distinguished by GAP).

GAP types:

4 T.1.B.2.b.II, *Quercus* spp. - *Pinus echinata* - *Carya* spp., oak - shortleaf pine - hickory 13 T.2.B.3.a.I, *Pinus echinata* - *Quercus* spp., shortleaf pine - oak

"**Ozark-Ouachita Pine**" type includes pine-dominated sites in three habitats:

Ozark-Ouachita Pine-Oak Forest habitat

Ozark-Ouachita Pine-Oak Woodland habitat

Ozark-Ouachita Pine/Bluestem Woodland habitat

All of which make up Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland ecological system. (This may be comparable to the third habitat if structure is very open, and may also be a distinct habitat from the first two, even if fairly dense.)

GAP types:

1 T.1.A.9.b.I, *Pinus echinata*, shortleaf pine

Ozark-Ouachita Mesic Hardwood Forest habitat (and same ecological system)

GAP types:

7 T.1.B.3.a.I, *Fagus grandifolia*, american beech (The GAP map shows very few areas of this type in only part of the highlands – the type is under-represented in that map.)

"**Ozark-Ouachita Riparian**" type includes two habitats:

Ozark-Ouachita Riparian habitat (and same ecological system)

South-Central Interior Large Floodplain habitat (and same ecological system)

GAP types:

23 P.1.B.3.c.VII, *Quercus phellos*, willow oak

24 P.1.B.3.c.VIII, *Liquidambar styraciflua*, sweetgum

30 R.1.B.3.c.I, *Salix* - *Populus*, willow - cottonwood

31 R.1.B.3.c.II, *Betula* - *Platanus* - Acer, birch - sycamore - maple

CROWLEY'S RIDGE ECOREGION (defined by Omernik Level 3 map)

"**Crowley's Ridge Dry-Mesic Forest**" type is a part of Mississippi River Alluvial Plain Loess Slope Forest habitat (and same ecological system)

GAP types:

8 T.1.B.3.a.II, *Quercus alba*, white oak - mixed hardwoods

9 T.1.B.3.a.III, *Quercus rubra* - Quercus spp., northern red oak - oak

10 T.1.B.3.a.IV, *Quercus falcata* - Quercus spp., southern red oak - oak

15 T.2.B.4.a.I, *Quercus* spp. - *Carya texana*, oak - black hickory

"**Crowley's Ridge Pine**" type is a part of Mississippi River Alluvial Plain Loess Slope Forest habitat (and same ecological system)

GAP types:

1 T.1.A.9.b.I, *Pinus echinata*, shortleaf pine

MISSISSIPPI ALLUVIAL PLAIN ECOREGION defined by Omernik Level 3 map.

Method: Clip 2 ha. GAP vegetation map with appropriate geomorphology polygons defined by Saucier's map.

Lower Mississippi River Dune Woodland and Forest habitat (equivalent to Lower Mississippi River Dune Woodland and Forest and Lower Mississippi River Dune Pond ecological systems).

Saucier types:

Ps sand dune fields and eolian deposits on valley trains

GAP types - All except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

"**Mississippi River Low Bottomland and Depression**" map unit includes Lower Mississippi River Low Bottomland Forest and Lower Mississippi River Bottomland Depression habitats (equivalent to Mississippi River Low Floodplain (Bottomland) Forest and Lower Mississippi River Bottomland Depression ecological systems).

Saucier types:

Hb Backswamp (floodbasin) deposits

Hal Alluvial fans and aprons along valley margins

Hchm Abandoned channels (neck and chute cutoffs) of the Mississippi River

Hcom Abandoned courses of the Mississippi River

Pdch Abandoned channels (cutoffs) of the Deweyville Complex

Pdp Point bar (meander scroll) deposits of the Deweyville Complex

Pdu Undifferentiated fluvial deposits of the Deweyville Complex

Ptc Undifferentiated fluvial deposits of the Cache River Terrace

Pvcl Relict channels of late Wisconsin Stage Valley Train

GAP types – All except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

"**Mississippi River Riparian and High Bottomland**" map unit includes Lower Mississippi River Riparian Forest and Lower Mississippi River High Bottomland Forest habitats (equivalent to Lower Mississippi River Riparian Forest and Lower Mississippi River High Floodplain (Bottomland) Forest.

Saucier types:

Hpa 1-7 Point bar (meander scroll) deposits of Arkansas meander belts

Hps Point bar (meander scroll) deposits of small streams

GAP types – All except:

32 R.6.A.1.a.I, Bare, bare

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

Lower Mississippi Alluvial Plain Grand Prairie habitat (equivalent to Lower Mississippi Alluvial Plain Grand Prairie ecological system).

Saucier types:

Ppu Undifferentiated fluvial deposits of the Prairie Complex. Mostly natural levee and backswamp deposits of the Mississippi, Arkansas and Red rivers.

Pdp Point bar (meander scroll) deposits of the Deweyville Complex. Note-some prairie occurred on Pdp but it is primarily in flatwoods, below.

Pi The part adjacent to Ppu

GAP types – all except:

25 Baldcypress – mixed hardwoods (moved to Mississippi River Low Bottomland and Depression.

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

Lower Mississippi River Flatwoods Woodland and Forest habitat (equivalent to Lower Mississippi River Flatwoods ecological system).

Saucier types:

Had Principal abandoned deltaic distributaries.

Pdp Point bar (meander scrolls) of the Deweyville Complex.

Pve 1-4 Early Wisconsin Stage valley trains.

Pvl Late Wisconsin Stage valley trains where levels are not separately delineated.

Pvl 1-2 Late Wisconsin Stage valley trains Levels 1 and 2.

GAP types – all except:

25 Baldcypress – mixed hardwoods (moved to Mississippi River Low Bottomland and Depression.

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water 34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

WEST GULF COASTAL PLAIN ECOREGION defined by Omernik Level 3 map.

Method: Clip 2 ha. GAP vegetation map with appropriate polygons defined by NRCS STATSGO soil map.

"**West Gulf Coastal Plain Flatwoods**" includes two habitats:

West Gulf Coastal Plain Dry Pine-Hardwood Flatwoods (and same ecological system)

West Gulf Coastal Plain Wet Hardwood Flatwoods (and same ecological system)

STATSGO types:

Adaton-Felker-Gore AR035

Amy-Pheba-Guyton AR040

Calloway-Henry-Grenada AR038

Bussy-Tullou-Guyton

Sacul-Savannah-Sawyer

Smithdale-Savannah-Sacul (only that area of Sacul lying within the 1:500,000 geology Qt-Quaternary Terrace)

Wrightsville-Acadia-Louin

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial 3

8 URR, Urban, Urban Residential

"**West Gulf Coastal Plain Sandhill**" equivalent to West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland habitat (and same ecological system)

STATSGO types:

Briley-Alaga

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

"**Red River**" equivalent to West Gulf Coastal Plain Red River Floodplain Forest habitat and Red River Large Floodplain Forest ecological system.

STATSGO types:

Severn-Billyhaw

Billyhaw-Perry

Rilla-Hebert

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

"**Blackland**" equivalent to West Gulf Coastal Plain Calcareous Prairie habitat (and same ecological system)

STATSGO types:

Oktibbeha-Sumter (But eliminated areas south of I-40 and north of the main belt of these soils.

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

ALSO within a TNC conservation site boundary, included

36 AGP, Agriculture, Agriculture (pasture): This was done because there is a substantial amount of native prairie pasture within this area. However, it is properly beyond Phase 1.

West Gulf Coastal Plain Large River Floodplain Forest habitat (and same ecological system)

STATSGO Types:

Guyton-Amy-Ouachita (but only those areas along the Ouachita, Saline, Little Missouri, Little and Cossatot Rivers.)

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

West Gulf Coastal Plain Small Stream/River Forest habitat (and same ecological system)

STATSGO Types:

Guyton-Amy-Ouachita (but only those areas other than the Ouachita, Saline, Little Missouri, Little and Cossatot Rivers.)

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

West Gulf Coastal Plain Pine-Hardwood Forest habitat (and same ecological system)

STATSGO types:

All, except those listed above

GAP types – all except:

32 R.6.A.1.a.I, Bare, bare33 W, Water, water

34 AGW, Agriculture, Agriculture (wet crops)

35 AGD, Agriculture, Agriculture (dry crops)

36 AGP, Agriculture, Agriculture (pasture)

37 URC, Urban, Urban Commercial-Industrial

38 URR, Urban, Urban Residential

MOSAICKING IMAGES

The purpose of mosaicking was to stitch all the different images that were produced during different spatial operations into one continuous reclassified image.

Each one of those map units discussed earlier in the draft were output as a raster image and each raster image ended up with pixels representing two classes. One class would be the appropriate gap type or types aggregated into one and other class would the classes that weren't taken into consideration from the original GAP 2Ha data due to their inappropriacy; hence were classified under single class as unclassified. The unclassified classes from all the images were given a consistent number "0" and each class was given a unique number depending on its order in the mosaic operation. At end there were 21 images (21 classes) to be mosaicked.

Mosaic rule: Since there was lot of clipping operations done on the STASGO soil layer there were likely overlaps amongst the raster layers (most expectedly at the borders) while mosaicking all of them together. As a general rule, the classes having smaller spatial extents were given higher priority in the overlap areas over the classes having bigger spatial extents. For instance, if there is a classification conflict due to pixel overlap between the red river and the uplands image then the overlapping pixels will be classified as red river and not the uplands since the red river has much smaller geographical extent than the uplands which are widespread in the UWGCP. To implement this general rule, the "Maximum" overlap function was set while mosaicking all these images together into one contiguous raster. What the maximum overlap function does is in any instance of overlapping pixels for the classification purpose the priority will be given to the pixel or class having higher order. Again as an example; in an overlap between Sandhills- class 3 and Blackland-class 4; according to our rule the overlapping pixel will classified as blacklands since it has higher order than Sandhills and hence will get the preference. Setting the same rule, all the images were mosaicked together and were output as a single image representing all the classes including unclassified pixels.

ERDAS Imagine 8.7 remote sensing software was used to do all the raster operations including mosaicking and the other spatial data were produced, edited and displayed in ESRI software suite.

MOSAICKING ORDER

Upper West Gulf Coastal Plain

0- Unclassified
1- Uplands
2- Flatwoods
3- Sandhills
4- Blacklands
5- Red River
6- Large River
7- Small River

Interior Highlands

8- Dry Mesic Uplands Oak
9- Pine
10- Pine Hardwoods
11- Glade Barrens
12- Riparian
13- Mesic Forest

Crowley's Ridge

14- Mesic Uplands Oak
15- Pine Hardwoods

Mississippi River Alluvial Plain

16- Riparian
17- Grand Prairie
18- Low bottomland
19- Flatwoods
20- Sand Dunes