

#### 4. Image Interpretation

##### Non-photographic Imagery

Materials: pencil/pen, engineer's scale, calculator, stereoscope, frame camera imagery, Landsat imagery, SPOT imagery, AVHRR imagery, radar imagery, AL/MS Forest Habitats map, Bradley and Starkville quadrangles. Other small-scale maps.

In B&W imagery, remember that the shade is related to reflectance intensity (i.e. light tones represent greater reflectance than dark tones). In color imagery, displayed color is related to the combination of reflectance intensities of each band displayed in RGB combination. Keep in mind the color shift that occurs when generating color images from NIR, red and green (or other combinations) of image bands.

##### 1) Digital frame camera

A mission was flown on October 31, 1996 over the MSU Starr Forest to acquire digital frame camera imagery for forestry studies and to update the GIS of the forest. These data consist of three-channels (bands) of imagery with very narrow wavelengths designed for forest interpretation (ch 1 = 0.675, ch 2 = 0.695, ch 3 = 0.840 $\mu$ m). The mission was flown at an average altitude of 3,700' AGL with 12.5 mm lenses (three cameras) giving a resolution of 2.05' per pixel at nadir. The unrectified imagery is approximately 1278 x 1000 pixels per frame. Complete stereo overlap between frames was achieved for north/south oriented flight lines.

Assuming that one axis of the imagery is oriented N/S, mark an arrow indicating the north direction on your frame (hint: shadow direction). Orient a pair of these frames for stereo viewing (assume the corners of the frames are the fiducials for purposes of PP and CPP location).

In this false color composite (channel 1 = blue, channel 2 = green, channel 3 = red), the hickories have lost their leaves prior to this fall mission, what color are the crowns in this imagery?

The red oaks had not lost their leaves yet, what color are they in the images?

Sweetgums are usually intermediate in the time they lose their leaves. To your eyes, they would be reddish in color when this mission was flown. What color might they be in these images?

What color are the pines and why?

## 2) Satellite data (hardcopy) interpretation (Landsat MSS and SPOT)

This exercise is designed to provide some familiarity with the information content of various satellite data hardcopy products. The instructor will describe features in satellite imagery set up on a table in the lab. There are maps for reference that cover all or parts of the images. At your leisure, examine these images and see if you can identify features described in the sections below. There is also a map of Alabama and Mississippi as a hand out to give a larger regional perspective of some of the land forms and land-use patterns you will observe in the single frames of data.

Coastal islands, riverine systems, bays, flatwoods, developed areas. There are two Landsat MSS prints here. Each is of the same frame but one is MSS band 5 (visible red reflectance) the other is MSS band 7 (NIR). Notice the large amount of contrast between these two products. The date of this imagery is January 1973.

Describe the difference in water characteristics as observed offshore depicted in the two products. Why are they so different? Which band is better for distinguishing the beaches? Which band gives better contrast for distinguishing differences in agricultural vs. forest land use? Which one is better for wetland determinations? Why?

Take a few minutes to find some features on the maps and the images. Locate: (1) The Pascagoula River Basin, (2) the Pearl River Basin, (3) Cat Island, (4) Bogaloussa, LA, (5) The Gulfport Harbor, (6) U.S. Hwy. 49 North from Gulfport.

Mississippi Delta and Uplands. Here we have Landsat MSS bands 5 (red ) of the region north of Jackson, MS imaged in January 1976.

Find the Mississippi River and notice the differences between its gray tone and some of the oxbow lakes. Explain these differences. Notice and explain the differences in the pattern/texture between the bluff region in the center of the image and the riverine bottomlands to the west. What would cause these differences (hints: geographic, time of year, physiography, land use)? Can you see any cropland shape/patterns in the region west of the river? How do they differ in shape and pattern from forests or pastures?

Find the following features in the image: (1) Jackson, MS, (2) The Delta National Forest, (3) the Big Black River, (4) Lake Lee (an oxbow lake), and 5) Greenville, MS.

SPOT multispectral color composite. This SPOT data print has the green (Ch 1), red (Ch 2), and NIR (Ch 3) channels of SPOT data depicted as a simulated CIR composite.

Notice the resolution of these data (20m) almost gives a broad idea of forest vegetation density. Can you tell differences in ages of clearcuts (forest harvest areas)? Explain. What image characteristic gives a clue to terrain steepness in some of the parallel ridges?

### 3) Recent Satellite Imagery (NOAA AVHRR, and Landsat TM)

NOAA AVHRR handout. These data were collected in the time period from April 16 - 29, 1993. Multiple dates were used to produce this near-cloud-free product of AVHRR channel 1 (visible). What features can you still detect (Coast line, Mobile Bay, Miss. River Floodplain, The Blackbelt? Can you see any other general vegetative patterns? Compare these features with their appearance on the MS/AL Landsat MSS mosaic handout. The Landsat mosaic was produced from NIR MSS imagery.

Eastern MS Landsat TM color composites. These October 1992 and January 1999 color composites were produced from small subsets of TM data by using the green (Ch 2), red (Ch 3) and NIR (Ch 4) channels of TM data. Healthy vegetation is different tones of red. Central (commercial) regions of cities generally show up as blue-gray with small regular geometric patterns. Residential areas show up as vegetated with some blue-gray and also have a somewhat regular grid pattern (streets)

Find Starkville, Columbus and the MSU Campus. Can you see Columbus Lake Lock and Dam? Locate the intersection of Highways US 45 Alternate and US 82. Can you also find the GTR Airport? What is the general color of the MSU South Farm.

In the SW region of the images, locate Bluff Lake on the Noxubee National Wildlife Refuge. What is the general color difference between pine and hardwood timber in this region as seen in the growing and dormant seasons? Can you see shadows from trees? Explain. Why are the fields in the Blackbelt (the agriculture region through the center of the image different shades of blue, gray and red? What do you think is the general color of pasture land? What are the darker blue regular polygons in the SE portion of the image?

Use the Bradley and Starkville Quadrangles to see how many features you can spot such as different areas around Starkville, the MSU Campus, Craig Springs Road, The Noxubee River Basin, Hwy. 25, etc. While examining these images, compare and contrast changes that have occurred. Can you see the new Hwy 82 and 25 bypasses? There is a large new lake SE of Starville that did not exist in 1992. Any other changes?

We will be looking at a lot more imagery similar to this on the computers so stay tuned.

### 4) Radar

Obtain a copy of the radar image of Starkville, MS. This image was acquired in April 1992. The instructor will describe general characteristics of this type of imagery. Refer to the Starkville Quadrangle for orientation of the image. Describe differences you see in the Central Business District and older residential areas. Why are they like this? What do the apartments at Lynn Lane look like? Why? Can you find the airport? What accounts for its tone? What types of rural features are accentuated by radar? Can you see the MSU Campus.

## **Photo-Interpretation of Aerial Images**

### Vegetation and Forest Species/Stand Analysis

The objectives of these exercises are (1) to become familiar with aerial image characteristics of vegetative cover, (2) to learn to use visual elements and patterns/tones/textures for the identification and interpretation of forest/stand condition classes, and (3) to identify individual tree species of importance to forest resource management.

#### Study Materials:

1. Forester's Guide to Aerial Photo Interpretation. U.S.D.A. Agriculture Handbook No. 308
2. Identifying Southern Forest Types on Aerial Photographs. by T. Eugene Avery. U.S.D.A. Forest Service, Southeastern Forest Experiment Station Paper No. 112
3. Original aerial photographs used for Paper No. 112
4. Identification of Tree Species on Large-Scale Panchromatic and Color Aerial Photographs. U.S.D.A. Agriculture Handbook No. 261
5. Forest Cover Photo-Interpretation Key for the Mountain Forest Habitat Region of Alabama. Auburn University, Forestry Department Series No. 7
6. Stereograms 1-14 of forest species/condition classes.
7. Other aerial photographs and exhibits

#### Equipment: Pocket stereoscope

1. Study each of the items listed above.
2. Study the exhibited aerial photographs and other materials.
3. Be prepared to take subsequent photo-interpretation test(s).

## **Photo-Interpretation Tests 1 and 2**

The objectives of these exercises are to test the students ability to identify and interpret the significance of aerial images relating to (1) structures and man-made objects, (2) landforms and drainage patterns, (3) land-use, (4) forest/stand condition classes, and (5) individual tree species of importance to forest resource management.

### Photo-Interpretation Test 1.

Using the attached answer sheet, visit the station for each stereopair and identify, as specifically, as possible, the circled or arrowed objects or features. Leave photos face down when you leave a station. Take your stereoscope with you. Do not mark or bend the photos.

Note the number of items for each stereopair vary from A to D; i.e. 4 or less items per station. The stations are numbered 1-4, 6-11, and 15-18.

### Photo-Interpretation Test 2.

Using the attached answer sheet, visit each of the 15 stations and answer the questions regarding the identified objects and/or locations on the photographs. Leave the photos face down when you leave a station. Take your stereoscope with you. Do not mark or bend the photos.

Note the number of questions under each item; answer each part or subpart of the question. For example, question 6 asks for a species/type, size, and density of Stand A and Stand B. Question 7 asks for type, size, and density of Stands 1-3.

## Photo Interpretation Test 1

**Instructions:** Make certain you use the correct answer spaces for the stereopair. You may visit the pairs in any sequence. Identify as specifically as possible the circled or arrowed objects or features. An elongated oval indicates a linear feature. **LEAVE PHOTOS FACE DOWN WHEN YOU LEAVE A STATION. TAKE YOUR STEREOSCOPE WITH YOU !!! DO NOT MARK OR BEND PHOTOS!!**

PAIR #	ITEM	NAME OR DESCRIPTION
1	A	_____
	B	_____
	C	_____
	D	_____
2	A	_____
	B	_____
	C	_____
	D	_____
3	A	_____
	B	_____
	C	_____
4	A	_____
	B	_____
	C	_____
6	A	_____
	B	_____
	C	_____

P.I. Test 1

NAME \_\_\_\_\_

**PAIR #**      **ITEM**

**NAME OR DESCRIPTION**

7

A

\_\_\_\_\_

B

\_\_\_\_\_

C

\_\_\_\_\_

8

A

\_\_\_\_\_

B

\_\_\_\_\_

C

\_\_\_\_\_

9

A

\_\_\_\_\_

B

\_\_\_\_\_

C

\_\_\_\_\_

10

A

\_\_\_\_\_

B

\_\_\_\_\_

C

\_\_\_\_\_

11

A

\_\_\_\_\_

B

\_\_\_\_\_

15

A

\_\_\_\_\_

B

\_\_\_\_\_

16

A

\_\_\_\_\_

B

\_\_\_\_\_

C

\_\_\_\_\_

D

\_\_\_\_\_

E

\_\_\_\_\_

P.I. Test 1

NAME \_\_\_\_\_

**PAIR #**      **ITEM**

**NAME OR DESCRIPTION**

17

A

\_\_\_\_\_

B

\_\_\_\_\_

C

\_\_\_\_\_

D

\_\_\_\_\_

18

A

\_\_\_\_\_

B

\_\_\_\_\_

C

\_\_\_\_\_

## Photo-Interpretation Test 2

NAME \_\_\_\_\_

**Underline or Circle correct answer (100 pts)**

**1. East Central Miss., Panchromatic, ± 11:00 a.m.**

- A. The most probable species at A. is:  
(a) tung (b) pecan (c) fruit trees (d) non mentioned
- B. The terrain on the east side of the oxbow lake at B. is:  
(a) higher (b) lower than the west side
- C. The stand composition at C. is predominantly:  
(a) sweetgum (b) cypress-tupelo (c) mixed bottomland oaks  
(d) willow
- D. The general trend of movement of the river channel is:  
(a) NE (b) E (c) S (d) W

**2. N.E. U.S. B&W IR**

- A. 1. Within A there are 2 major species groups:  
(a) spruce-fir and oak (b) spruce-pine and oak
2. The central portion of the area is:  
(a) an abandoned field (b) a pasture
- B. The percentage of coniferous species in Stand B is:  
(a) 25% (b) 50% (c) 75% (d) 100%
- C. If the height of the larger residual hardwood in Stand C is 85 ft., the average height of the remainder of the stand is:  
(a) 35' (b) 45' (c) 55' (d) 65'
- D. The average height of Stand D is:  
(a) 35' (b) 45' (c) 55' (d) 65'
- E. The average height of Stand E is:  
(a) 35' (b) 45' (c) 55' (d) 65'

**3. Pan. Interior Flatwoods of Mississippi**

A & B. A comparison of stand A and B indicates that:

- A. Stand A is predominantly \_\_\_\_\_ (species) while B is predominantly \_\_\_\_\_ and \_\_\_\_\_ (species).
- B. The difference in the two stands was caused by \_\_\_\_\_.
- C. The terrain illustrated in the stereo triplet is:  
(a) Karst (b) strongly dissected and rough (c) flat  
(d) gently rolling, slightly dissected

**4. B&W Infrared, NE U.S.**

- A. Assuming that stand A is 35 ft. tall with essentially 100% survival, then Stand B height is:  
(a) 35' (b) 45' (c) 55' (d) 65'
- with a survival of:  
(a) 85% (b) 90% (c) 70% (d) 100%
- Stand C  
(a) 25' (b) 35' (c) 45' (d) 15'
- (a) 65% (b) 75% (c) 85% (d) 95%
- Stand D  
(a) 15' (b) 20' (c) 25' (d) 30'
- (a) 65% (b) 75% (c) 85% (d) 95%
- B. What are the similarities and differences between the two hardwood stands East of Area E?

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**5. Pan. Interior flatwoods, Mississippi**

- A. Describe Stand A with respect to species composition and size.

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- B. The texture of stand B is:

(a) smooth, regular (b) coarse, regular (c) coarse, irregular (d) smooth, irregular

- C. The drainage divide between the creek at the N end of 5A and the river at the S end of 5C is located:

(a) center of 5B (b) N end 5B (c) S end 5B (d) S end 5A

**6. Single photo. Pan. Mississippi**

- A. Stand A is:

Type: (a) upland hardwood-pine (b) bottomland hardwood-pine (c) bottomland hardwood or (d) loblolly-shortleaf

Size-Class: (a) poles (b) small saw (c) large saw (d) sapling

Stocking: (a) understocked (b) overstocked (c) normal

- B. Stand B is:

Type: (a) upland hardwood-pine (b) bottomland hardwood-pine (c) bottomland hardwood or (d) loblolly-shortleaf

Size-Class: (a) poles (b) small saw (c) large saw (d) sapling

Stocking: (a) understocked (b) overstocked (c) normal

- C. Area C is:

(a) plantation (b) field (c) pasture

**7. Black and White IR. North Carolina**

Stand 1 is:

(a) loblolly (b) shortleaf (c) longleaf

(a) pole (b) sapling (c) small saw (d) large saw

(a) understocked (b) overstocked (c) normal

Stand 2 is:

(a) mixed oaks (b) sweetgum-sycamore-cypress (c) willow  
(d) pine-mixed oaks, gum

(a) pole (b) sapling (c) small saw (d) large saw

(a) understocked (b) overstocked (c) normal

**8. Pan. New England**

Stand A is:

(a) pine (b) spruce (c) mixed hardwoods

Stand B is:

(a) white pine (b) spruce-fir (c) hardwoods

Stand C the mature trees are:

(a) white pine (b) spruce (c) fir (d) hardwoods

**9. Pan. East Central Mississippi.**

The drainage pattern is \_\_\_\_\_.

The topography is:

- (a) gently rolling, lightly dissected
- (b) gently rolling, moderately dissected
- (c) strongly rolling, lightly dissected
- (d) strongly rolling, moderately dissected

The species on the ridges is predominantly \_\_\_\_\_.

**10. New England. IR. Use mirror stereoscope. Photos from E-W. Sun in South**

1. What are the two major differences between the S slope and the N. face of the ridge?

2. Describe Stand A:

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3. Stand C is:

(a) hardwood (b) pine

(a) evenaged (b) unevenaged

Stereo-pairs 11 - 15 require descriptive answers. When stand description is required, the description should include: species composition, stand size (regeneration, pole, or sawtimber), and relative density (sparse, normal, or dense). Information concerning the imagery is as follows:

Color infrared, Wratten 12 filter, scale 1:12,000

Flight date 30 Sept. and 1 Oct., 1972

Location in northern Mississippi

**11. Stereo-pair 27 - 11 & 12**

1. Describe the situation at 9) and determine the significance.

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2. What is causing the yellow coloration at (2)?

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3. What is the difference between areas "a" and "b"?

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**12. Stereo-pair 27 - 25 & 26**

1. Identify and distinguish between "a" and "b".

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2. Describe the situation within (2).

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**13. Stereo-pairs 25 - 154 & 155**

1. What is the pink material? \_\_\_\_\_

2. What is the name of the yellow-crowned tree? \_\_\_\_\_

3. What is the semi-circular feature? \_\_\_\_\_

4. Describe the stand. \_\_\_\_\_

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**14. Stereo-pair 25 - 115 & 116 (OR 33 - 167 & 168)**

1. Describe the stand. \_\_\_\_\_

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2. What is the name of the light-colored tree? \_\_\_\_\_

3. Describe the stand. \_\_\_\_\_

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**15. Stereo-pair 33 - 168 & 169 (OR 25 - 115 & 116)**

1. Describe the stand. \_\_\_\_\_

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2. What is the name of the large, light-colored species within Stand 1? \_\_\_\_\_.

3. Describe the stand. \_\_\_\_\_

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