Scanned Film Products
INFORMATION SHEET
May 2008

- **Is it possible to purchase scanned photography from APFO?**

Yes, APFO will create image scans for customers from the photography in our historical film library. APFO will also scan film flown for the NDOP or NAIP programs at a ground sample distance (GSD) smaller than 1 meter. Scanned images are made from original film whenever possible and are provided in a standard tiff format. This imagery is not georeferenced, or ortho-rectified.

- **What pixel resolutions are available?**

The standard scan is at 25 microns, which will produce a 1016 Dots Per Inch (DPI; sometimes referred to as PPI - Points Per Inch) image. This is comparable to a 1 meter (3.2') pixel resolution for film flown at a 1:40,000 scale. The highest scanning resolution available, at 12.5 microns, produces a 2136 DPI image; this will be comparable to a 0.5 meter (1.6') pixel resolution image. A matrix on the following page provides an idea of what scanning resolution will produce the desired pixel resolution for differing scales of photography.

- **What is a micron, and how does it relate to the pixel resolution?**

A micron is a unit of measurement equal to one millionth of a meter. One micron equals 0.00003937 inches. It is the unit used in scanning to determine pixel sizes. The highest resolution available at APFO, 12.5 microns, will contain more pixels per inch, and more dots per inch (DPI). Pixel size and the number of DPI are inversely proportional.

The formula to calculate DPI from microns is:
a) number of microns/1,000,000
b) that amount * 39.37 (number of inches in a meter)
c) the inverse of that number

Example: 20 microns/1,000,000 = 0.00002;
0.00002 * 39.37 = 0.00078; 1/0.00078 = 1282 DPI.

The Ground Sample Distance for the scan will depend upon the scanning resolution and the scale of the original photography. The matrix on the second page will find the correct scanning resolution for a desired GSD.

The formula for finding Ground Sample Distance is:
Scale of Photography/ DPI/inches in a foot
Example: 40,000/1700 = 23.529/12 = 1.96'

- **What about scale on the digital photography?**

Scale is irrelevant with digital imagery because the user can zoom to different scales in the screen display. Ground sample distance, (also known as pixel resolution) is the critical element with digital photography, because it defines how much area on the ground is represented by one pixel. A 1 meter pixel resolution would be 1 meter on all four sides, with a total area of 1 square meter. A two meter pixel resolution would have a pixel that is 2 meters on each size, and would cover an area of 4 square meters.

When working with the digital scans, the user can see more detail in a scanned image than in an enlarged photograph.

- **Do I need to know what scanning resolution I want before ordering?**

The Customer Service Section at APFO will assist in deciding the best options for your order. However, it is a good idea to become familiar with the information in the matrices on the next page, and to see how the scanning resolution, original photographic scale, and scanned file size relate to each other.

For some high altitude photography, a higher resolution scan may not be able to capture any more detail than a somewhat lower resolution scan. The APFO staff will be able to assist with making that decision.

- **How can I find the original photo scale**

The scale is given in the Imagery Catalogs available on the APFO website. An example is given on the next page.

- **Will the scanned negative film be negative?**

All scans will be positives.

- **What are the delivery options for scanned photography?**

Delivery options will vary depending on the file size. They could be sent on CD, DVD, or portable hard drive. See the table on the next page for more details

- **What is the cost for scanned imagery?**

$13.00 per scan, as of May 2008.

Table 1: In the imagery catalog, the **scales** for film are listed under the abbreviation **SCL**. RES indicates resolution in digital projects. In this case the FSA film is 1:40,000 and the "other" is 1:60,000.

PROG	%COV	YEAR	RES SCL	BND FILM	FMT	QTY	RA	REMARKS
FSA	100	1990	40	BW	LI	3	N	
OTHER	(P)	1984	60	BW	LI	1	N	

Table 2: A higher resolution micron scan (lower number) will contain more Dots Per Inch (DPI) and will cover a smaller Ground Sample Distance (GSD). The area covered will depend upon the scale of the original photography.

MICRONS	**12.5**	**15**	**17.5**	**20**	**25**	**30**	**40**	**50**	**60**	**70**
DPI	2136	1700	1515	1282	1016	850	636	508	425	363
	Ground Sample Distances in Feet									
1:80,000	3.1'	3.9'	4.4'	5.2'	6.5'	7.8'	10.5'	13.1'	15.7'	18.4'
1:60,000	2.3'	2.9'	3.3'	4.0'	6.0'	6.9'	7.8'	9.8'	12.0'	14.0'
1:40,000	1.6'	1.9'	2.2'	2.6'	3.2'	3.9'	5.2'	6.5'	7.8'	9.2'
1:38,000	1.5'	1.8'	2.0'	2.5'	3.1'	3.7'	4.9'	6.2'	7.5'	8.7'
1:24,000	0.9'	1.2'	1.3'	1.6'	1.9'	2.4'	3.1'	3.9'	4.7'	5.5'
1:20,000	0.8'	1.0'	1.1'	1.3'	1.6'	1.9'	2.6'	3.2'	3.9'	4.6'
1:15,840	0.6'	0.8'	0.9'	1.0'	1.3'	1.6'	1.9'	2.6'	3.1'	3.6'
1:12,000	0.5'	0.6'	0.7'	0.8'	1.0'	1.3'	1.6'	2.0'	2.4'	2.8'
1:7,920	0.3'	0.4'	0.44'	0.5'	0.6'	0.8'	1.0'	1.3'	1.5'	1.8'
1:6,000	0.2'	0.3'	0.33'	0.4'	0.5'	0.6'	0.8'	1.0'	1.2'	1.4'
	Ground Distance Formula: Scale of Photography/DPI/Feet									
	Example: 60,000/2136 = 28.08/12 = 2.3'									

Table 3: The file sizes will vary with the scanning resolution. Larger files will require more CDs or DVDs for delivery.

MICRONS	12.5	15	17.5	20	25	30	40	50	60	70
DPI*	2136	1700	1515	1282	1016	850	636	508	425	363
** DPI formula is: 20 microns/1,000,000 = .00002 * 39,37 = .00078; 1/.00078 =1282 DPI*										
B & W SCAN (file size in MB)	337	234	172	132	84	58.5	32.9	21	14.6	10.8
	Number of B & W Images per Media Type									
CD (media capacity = 700 MB)	2	2	3	5	8	11	21	33	47	64
DVD (media capacity = 4.7 GB)	13	19	27	35	55	80	142	223	321	434
COLOR SCAN (file size in MB) **	984	684	501	382	246	171	96	62	43	32
	Number of Color Images per Media Type									
CD (media capacity = 700 MB)	0	1	1	1	2	3	7	11	16	21
DVD (media capacity = 4.7 GB)	4	6	9	12	18	27	48	75	109	146
**** The file size (in megabytes) required for each 9.5' x 9.5" scanned image.**										

Who do I contact for more information?

1) For sales information, contact the Customer Service Section, APFO-USDA-FSA at 2222 W 2300 S, Salt Lake City UT, 84119-2020; call 801-844-2922; email apfo.sales@slc.usda.gov or visit http://www.apfo.usda.gov.
2) For more information, contact GIS Specialists Brian Vanderbilt, 801-844-2930, or Louise Mathews, 801-844-2934.