United States Department of Agriculture

Scanned Film Products
INFORMATION SHEET
February 2015

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

  Yes, APFO will create image scans for customers from the photography in our historical film collection. 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 neither georeferenced nor ortho-rectified.

  APFO has initiated a program to scan our entire film collection. Check with the Customer Service Section (Sales) for the progress of this effort and availability.

- **What pixel resolutions are available?**

  All current scans of the APFO film vault are at 12.5 microns; this has been established as the standard. A 12.5 micron scanning resolution produces a 2,136 DPI image; this will be comparable to a 0.5 meter (1.6') pixel resolution.

  A matrix on the following page compares scanning resolutions with pixel resolutions 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, produces an image with more pixels per inch, and more dots per inch (DPI) than more coarse scanning resolutions. Pixel size and the number of DPI are inversely proportional.

  The formula to calculate DPI from microns is:
  a) Divide the number of microns by 1,000,000
  b) Multiply that amount by 39.37 (number of inches in a meter)
  c) Calculate 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 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 side, 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?**

  At present, all scans at APFO are at a 12.5 micron scanning resolution. 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.

- **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. Custom prints are also available.

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

  As of February 2015 the cost is $13.00 per scan. Quantity discounts are available.

Table 1: The scales for film are listed under **SCL**. 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 Louise Mathews, 801-844-2934 or, Joan Biediger, 801-844-2951.