

**GUIDE TO AERIAL
IMAGERY OF IOWA**

Prepared by the Remote Sensing Laboratory Staff

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Cover Photograph. The cover photograph is of Terrace Hill, the future residence of the Governor of Iowa, and was taken in April of 1973 from an altitude of 1,200' by Aerial Services, Incorporated, Cedar Falls, Iowa.

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FOREWORD

In 1971 the Iowa Map Advisory Council was formed to consider Iowa's needs for mapping. Aerial imagery acquisition was recognized as an important adjunct to mapping activity and the Air Photo Subcommittee was formed in 1972. Mr. Richard Riley, of Iowa Power and Light Company was appointed chairman of the subcommittee and he asked the Iowa Geological Survey Remote Sensing Laboratory to compile an index of existing imagery of the State of Iowa. This index was furnished to the Iowa Map Advisory Council in November, 1973. After examining the index the council recommended to Governor Robert D. Ray that the Iowa Geological Survey be designated the agency to maintain and distribute an index of aerial photography and imagery of Iowa. This "Guide to Aerial Imagery of Iowa" is respectfully submitted in fulfillment of the Map Advisory Council's recommendation.

Raymond R. Anderson
Bernard E. Hoyer
James V. Taranik
1974

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INTRODUCTION

Aerial photographs are produced by private as well as governmental agencies. Often, there is a lack of communication concerning the availability of this photography, and duplication of coverage can occur. The purpose of this index is to make available, in one document, a list of the aerial photographic coverage available for Iowa. Not only can a listing of available photographic coverage avoid duplication, but it may also increase public awareness of the use of photographic tools for natural resource management.

A brief description of the properties of light, as well as an explanation of the cameras, filters, and films used in aerial photography, is included with this index. Although an understanding of the systems used to produce the photographs is not crucial to an individual wishing to use them, it does aid in understanding some of the problems and limitations involved with different imagery types.

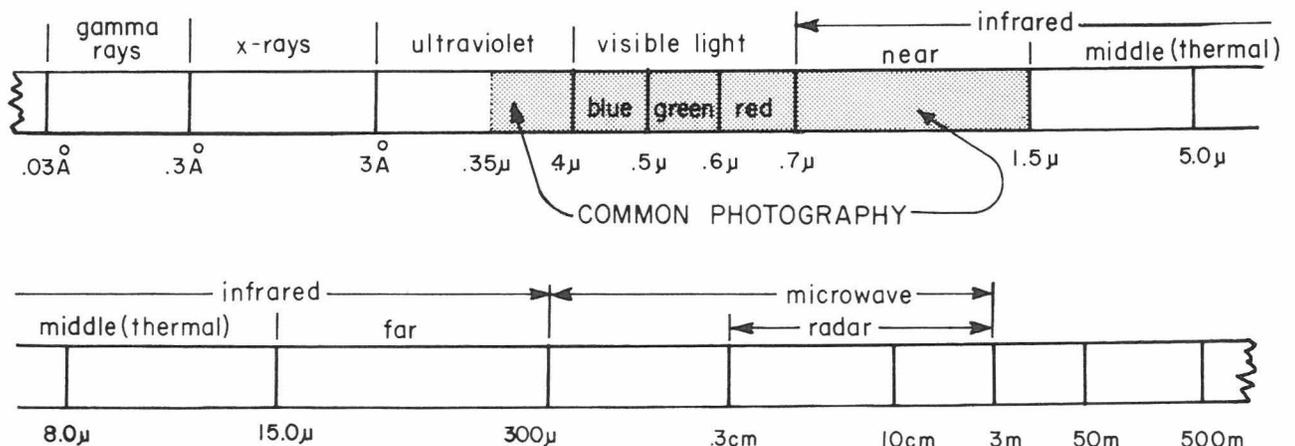
If problems or questions arise in the use of this index or if there is knowledge of additional sources of aerial photography not outlined in this index, please contact:

*Ray Anderson
Iowa Geological Survey
Remote Sensing Laboratory
16 West Jefferson Street
Iowa City, Iowa 52240
Phone - (319) 338-1173*

The Electromagnetic Spectrum

Aerial photography usually utilizes the sun as an energy source and records the resultant of the interaction of the sun's energy with earth materials (reflectance). Using photography, we are able to record a spectrum of wavelengths from ultraviolet, through visible, to the near infrared. The energy from the sun is called *electromagnetic energy* and it consists of particles (*photons*) that travel in waves of energy. *Electromagnetic energy* (x-rays, ultraviolet, heat, visible light, microwave, radar, or radio waves) is classified according to *wavelength* (the distance between wave crests) or *frequency* (the number of wave crests passing a point per unit time). A classification of *electromagnetic energy* is listed in figure 1. Note that different units are utilized. Physicists commonly like to work with *angstroms*, electronic engineers in *centimeters* and more commonly *cycles per second (hertz)*, and in photography (Kodak manuals, etc) *electromagnetic radiation (EMR)* is usually classified in *nanometers* which are one billionth of a meter ($1\text{nm} = 10^{-9}\text{m}$) long. Scientists that conduct investigations using the visible and infrared portions of the spectrum commonly classify *EMR* in *microns*, a micron is one millionth of a meter ($1\mu = 10^{-6}\text{m}$) long.

Electromagnetic energy travels at the speed of light (300,000,000 meters per second), and there is a simple relationship between *wavelength* and *frequency*: *Wavelength* times *frequency* must equal the speed of light. The number of wave crests passing per second (cycles per second) are classified in *hertz* (1 hertz = 1 cycle per second). Usually frequencies are expressed in *kilohertz*, *megahertz*, and *gigahertz* or 10^3 hertz, 10^6 hertz, and 10^9 hertz respectively.



\AA — angstrom = .000,000,001 meter
 μ — micron = .000,001 meter
 cm — centimeters = .01 meter
 m — meter

Figure 1. A portion of the
Electromagnetic Spectrum

Aerial Cameras

Aerial cameras used in obtaining low-altitude pictures of Iowa usually have a 9-inch by 9-inch square *format* and utilize rolls of 9.5-inch wide film -- hundreds of feet long. Most low-altitude aerial photography of Iowa is obtained utilizing a 6-inch *focal length* lens. The relationships between *focal length*, *format*, and flight height determine ground coverage and these relationships are proportional:

$$\frac{\text{Format}}{\text{Focal Length}} = \frac{\text{Ground Coverage}}{\text{Altitude Above Mean Terrain}}$$

The ratio of *format* (in inches) to ground coverage (in inches) is scale (a pure number):

$$\frac{\text{Format}}{\text{Ground Coverage}} = \text{Scale}$$

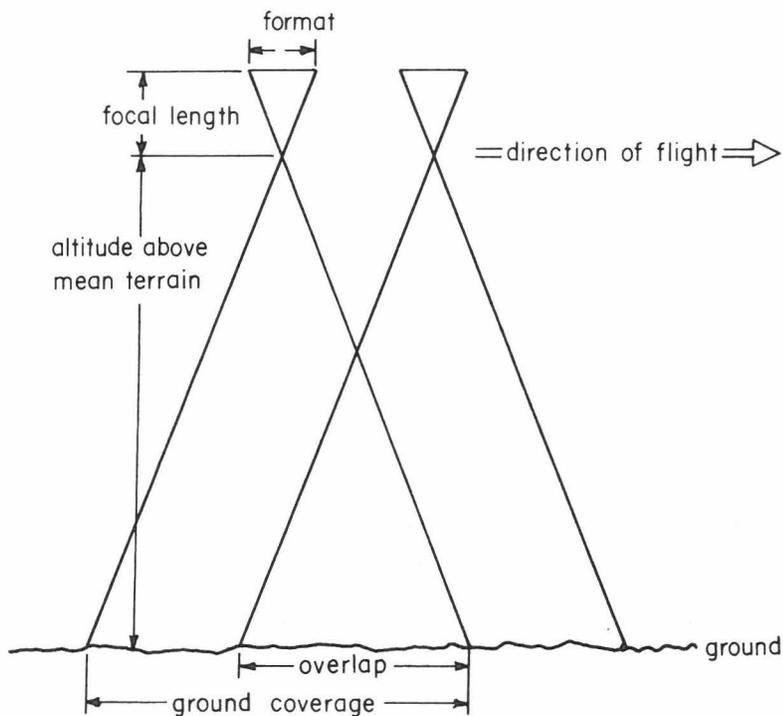


Figure 2. Relationship of Aerial Photographic Parameters

Generally most aerial photography is acquired with 60% ground coverage *overlap* to permit stereo viewing. Thus, in three consecutive exposures, usually only the first and third are required for coverage. Multiple flight lines are flown to cover large areas and usually ground coverage is *sidelapped* 30% to insure complete coverage.

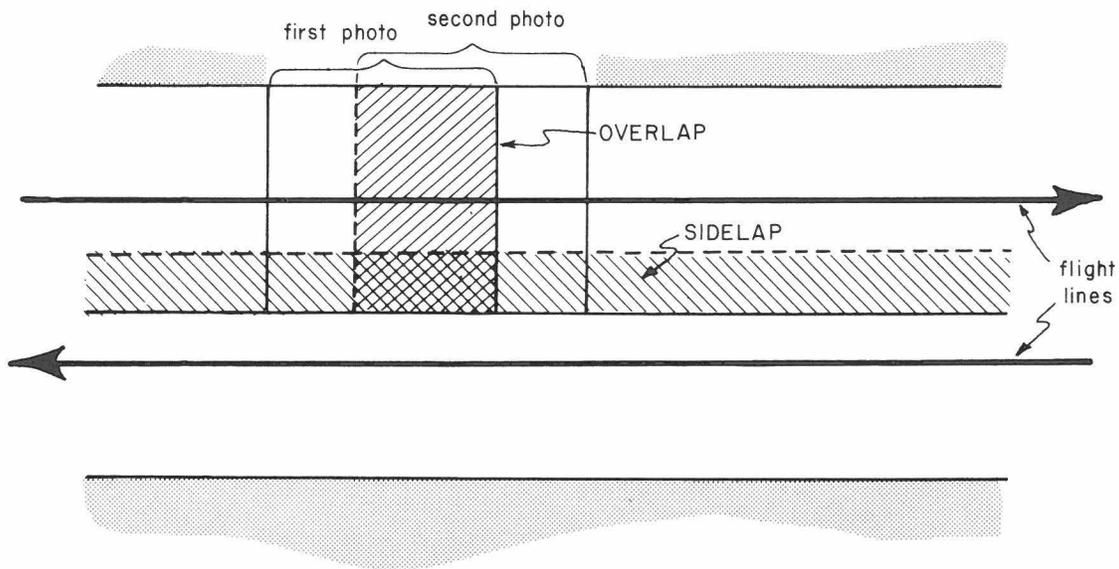


Figure 3. Overlap and Sidelap in Aerial Photography

Most aerial photography is acquired with a high-precision cartographic mapping camera, called a *metric camera*. The *metric camera* has a lens focal length calibrated in millimeters (152.63 mm, or 6 inches for example). Also, the distortion at the film plane radially out from the image center, is known so that stereoplotting can be accomplished. Secondly, most metric aerial cameras have color corrected lenses, so all wavelengths of light are focused at the film plane. Older military reconnaissance cameras often do not have these characteristics.

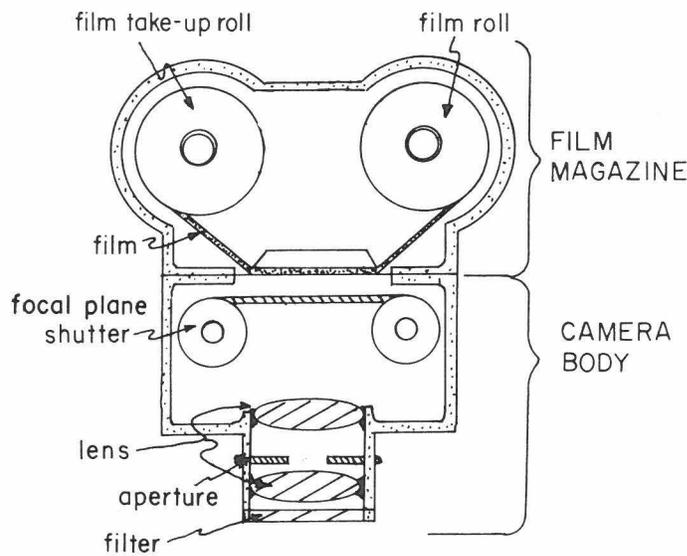


Figure 4. An Idealized Aerial Camera

Some photography of Iowa available from NASA and the U.S. Environmental Protection Agency is acquired with a high-resolution, 24-inch *optical bar system*. This is a panoramic camera system, built by ITEK Corporation, that was declassified for civilian agency use in 1972. This system utilized 5-inch wide film and scans a 5-foot long portion for each exposure. This system allows detection and identification of 1-foot by 1-foot objects having high contrast difference from over 70,000 feet. This imagery can be viewed stereoscopically because the camera scans fore and aft under the aircraft during each exposure.

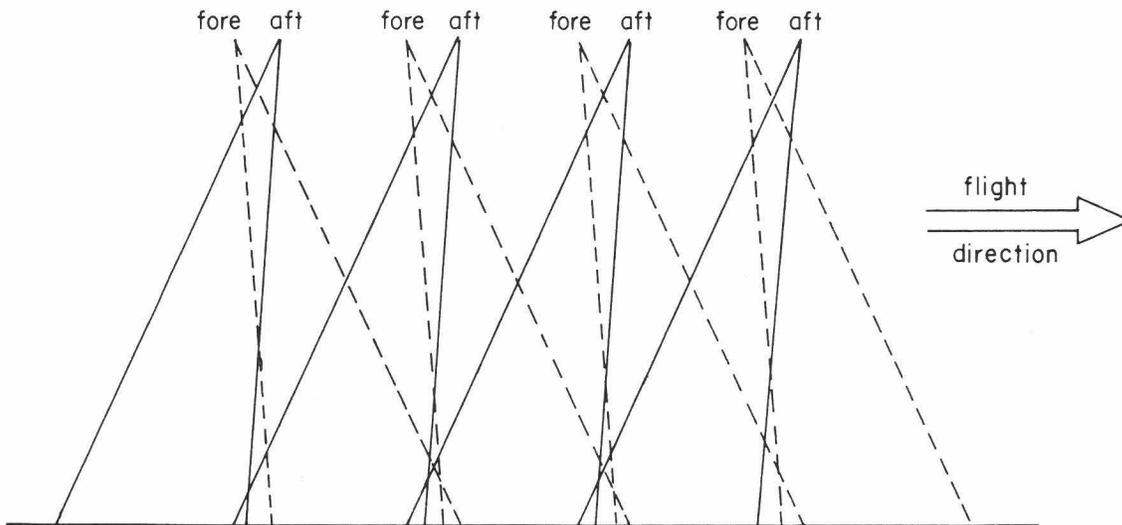


Figure 5. Fore and Aft Camera Coverage by the Optical Bar System

Panoramic imagery does have a convergent distortion, that makes the imagery progressively more difficult to analyze nearer the the edges.

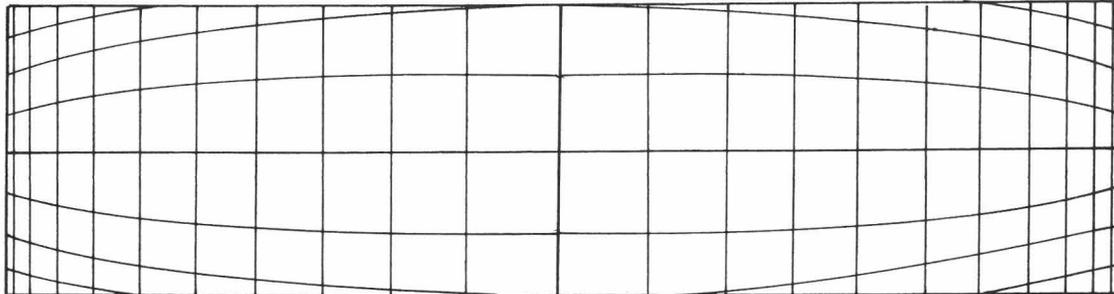


Figure 6. An Example of Panoramic Distortion.

Focal Length

Currently most photography is obtained with 6-or 8 $\frac{1}{4}$ -inch focal length lenses, although 3 $\frac{1}{2}$ -and 12-inch focal lenses are also available. Shorter focal length lenses produce wide area coverage and smaller scale imagery from the same flying height than a longer focal length lens. This fact, by itself, is not important to the imagery user since the aerial contractor must determine these parameters to meet the scale specified in contract. However, the shorter focal length lenses have more displacement of objects toward the edges of the photographs than the longer focal length lenses. This increases the effect of stereoscopic relief, which is good for interpretation or map production, but makes area measurements more difficult because imagery scale changes radially out from the center. Generally the U.S.G.S., S.C.S., Corps of Engineers, Iowa Highway Commission, and private corporations obtain imagery produced with a 6-inch lens, while the A.S.C.S. imagery is often produced with an 8 $\frac{1}{4}$ -inch lens.

Imagery Formats

Most aerial imagery that is available is produced on aerial cameras that produce 9 X 9 inch negatives. The negatives are contact printed

to produce 9 X 9 inch images. Assuming a scale of 1:20,000, the area covered by a 9 X 9 image would be about 8 sq. miles. An image at the scale of 1:6,000 covers about 3/4 sq. miles, whereas an image at the scale of 1:90,000 covers about 160 sq. miles. Imagery available from the A.S.C.S., S.C.S., U.S.G.S., and most NASA imagery, is all available in the 9 X 9 inch format. Unless otherwise noted the imagery in this index is available on 9 X 9 inch format.

Other imagery formats are available for other sources of imagery. Some imagery available from the Iowa Geological Survey is on a 3½ X 3½ inch format. However, this imagery is recorded as four 3½ X 3½ inch images on a 9 X 9 inch area. Each of the four images records different wavelengths of light reflected from the same area.

Satellite imagery is often in different formats. ERTS imagery is produced at 70 mm X 70 mm images. Skylab imagery is available both as 4½ X 4½ inch and 70 mm X 70 mm formats. Enlargements of both formats are available.

Film

Most of the imagery available is *black and white panchromatic* imagery. This means that the film records the visible portion of the spectrum as tones of grey. Generally the imagery is acquired with a filter to eliminate all or most of the blue wavelengths. This includes the imagery available by the A.S.C.S., S.C.S., U.S.G.S., and most other organizations, both public and private.

The Iowa Highway Commission, the U.S. Army Corps of Engineers, U.S. Soil Conservation Service and the Iowa Geological Survey have acquired very limited amounts of *color* photography. This imagery records the visible spectrum approximately as our eye would detect the color of the landscape. This imagery is usually obtained with a filter to alleviate the effect of haze.

Limited *black and white infrared* imagery has been obtained by the Corps of Engineers, Iowa Natural Resources Council, and the Iowa Geological Survey. This film may record some of the visible wavelengths, as well as infrared wavelengths that our eyes cannot see. It should be noted that photographic infrared wavelengths are not related to the phenomenon of heat. This is a very common misconception. Our eyes are sensitive to wavelengths of .4 to .7 microns. Infrared sensitive films record wavelengths from .4 to .9 microns. Heat is associated with wavelengths that are about 8.0 to 14.0 microns. This *black and white infrared* film is commonly filtered to eliminate blue wavelengths, blue and green wavelengths, or all visible wavelengths. The result is a black and white picture that records only near infrared wavelengths.

The Iowa Geological Survey Remote Sensing Laboratory commonly uses this *black and white infrared* film in conjunction with special filters to record the wavelengths associated with the "colors" blue, green, red, and infrared as separate images. This "multiband imagery" can be interpreted directly or the separate images may be combined with a special viewer to "false color" the images. Certain features may be enhanced by this technique.

Color infrared films are color films with sensitivity to visible wavelengths and near infrared wavelengths. Blue wavelengths are filtered out and thus not recorded. Wavelengths corresponding to green are recorded as blue, red wavelengths are recorded as green, and the infrared wavelengths are recorded on the film as the color red. The outstanding feature of the film is that green vegetation is recorded as red on this film because it has a high infrared reflectance. NASA, in conjunction with the Department of Agriculture, produced *color infrared* coverage of Iowa from 70,000 feet, using this film. This imagery is generally referred to as *Corn Blight* imagery because in 1971 it was used to study this disease in Iowa. The Corps of Engineers have also experimented with this film in very limited amounts. *Multiband* imagery can be made to simulate *color infrared* imagery.

The *multiband* imagery was utilized in both the ERTS and Skylab systems that imaged Iowa. This imagery records discrete portions of the spectrum. If desired, the images can be combined in color creating a "color composite." These color composites simulate color infrared photographs. Skylab produces pictures from actual *color* and *color infrared* films as well as *black and white* and *multiband* images. But ERTS only produces *black and white multiband* images.

Examples of the photography described can be located using the index of photography at the beginning of the index.

Platforms for Aerial Photography

Aircraft Platforms

A wide variety of *aircraft platforms* now exists for persons desiring aerial photography. Most local aerial contractors acquire aerial photography with *light aircraft* limited to altitudes of 15,000 feet. Some contractors fly *twin engined aircraft* capable of reaching altitudes of 25,000 feet. A few large contractors own *Jets*, capable of flying up to 45,000 feet. No commercial aerial contractors have the capability of flying over 45,000 feet.

The *National Aeronautics and Space Administration* (NASA) flies two aircraft, for research purposes, which can reach altitudes of 60,000 and 70,000 feet. These aircraft are the *RB-57F* and *U-2*, respectively. The U.S. Air Force flies a strategic reconnaissance aircraft, the *SR-71*, which has a maximum ceiling reported at 120,000 feet and a top speed of over 2,300 miles per hour. Data from this last platform are not available to the general public.

Spacecraft and Satellite Platforms

A series of manned spacecraft or unmanned satellite platforms are planned or in operation over the United States which provide or will provide photographic data of Iowa.

SATELLITES:

- (1) Film return, short-lived, 150-500 km altitude, sun-synchronous satellites mainly operated by the Department of Defense in cooperation with NASA. This data is highly classified and is not available to the general public, although several federal agencies with proper security facilities and properly cleared personnel are using this data for landuse planning.
- (2) Electronic data transmission, long-lived 300-1,500 km altitude, sun-synchronous satellites like the Earth Resources Technology Satellite (ERTS), and the weather satellites.
- (3) Electronic data transmission, long-lived 36,000 km altitude, geostationary (geosynchronous) weather satellites and planned Synchronous Earth Observation Satellites (SEOS).

SPACECRAFT:

- (1) Mercury, Gemini and Apollo: These missions took aloft hand held Hassleblad cameras to photograph the earth. Apollo 9 used a multispectral photographic array (the SO-65 experiment). No imagery of Iowa is available from these missions because of spacecraft orbit configuration.
- (2) Skylab-A, launched into a 435 km orbit in May of 1973, has provided excellent coverage of much of the Iowa landscape. Refer to page 120 for complete description of Skylab imagery.
- (3) Space shuttle is now clearly defined as an operational program of NASA. Shuttle is scheduled to be operational by 1980 and will have numerous experimental remote sensing instruments, including aerial cameras, aboard. Shuttle will fly most

missions at 200 km, although geosynchronous (36,000 km) orbits are possible. The shuttle could make low-orbit, high resolution photographic satellites cost-effective because of its service capability.

Table 1. Earth Resources Satellites

<u>Satellite</u>	<u>Agencies</u>	<u>Description</u>
*EOS - Earth Observatory Satellite	NASA	Sun synchronous orbit earth resources satellite adaptable to shuttle. Launch, 1979, 1981.
ERTS - Earth Resources Satellite	NASA-USDI	Sun synchronous orbit earth resources satellite currently operating. At least one additional satellite ERTS-B is planned.
*SEOS-Synchronous Earth Resources Satellite	NASA	Geosynchronous orbit. Planned launches in 1981, 1983.
*Heat Capacity Mapper Satellite (Thermal Inertia Satellite)	NASA	Sun synchronous with both day-time and nighttime imaging capability to map thermal properties of the earth, to be launched in 1976.

*Planned missions

Reference on Platforms:

Colvocoresses, A.P., 1974, Remote Sensing Platforms:
U.S. Geological Survey, Circular 693.

Scale and Coverage of Imagery

Most imagery in Iowa is acquired at scales between 1:16,000 to 1:24,000. However, imagery ranges from 1:3,000 to 1:3,500,000. What do these numbers mean? The numbers are a ratio indicating that one unit on the negative represents some number of units on the ground. Thus the scale 1:20,000 means that 1 inch on the film represents 20,000 inches on the ground. Table 2 indicates some representative scales and the agencies responsible for this type of photography.

TABLE 2. IMAGERY INFORMATION

Source of Imagery (on a 9 inch format unless other- wise noted)	Scale	1 inch on photo represents... (Engineering Scale)	Area Covered
Local, County, and State	1:3,000	250'	.18 square miles
Governmental Agencies and	1:5,000	416'	.50 " "
Private Photography	1:6,000	500'	.72 " "
	1:9,000	750'	1.60 " "
	1:12,000	1000'	2.90 " "
ASCS, SCS	1:15,840	1320'	5.10 " "
USGS, ASCS	1:18,000	1500'	6.50 " "
	1:20,000	1667'	8.10 " "
	1:24,000	2000'	11.60 " "
SCS	1:38,000	3167'	29.20 " "
	1:48,000	4000'	46.40 " "
	1:63,360	5280'	81.00 " "
Smallest Non-Military Scale	1:90,000	7500'	153.0 " "
NASA U-2 and RB-57 High Altitude Aircraft	1:120,000	10,000'	290.0 " "
Skylab (S190B)*	1:950,000	15 miles	4556 " "
(S190A)**	1:2,800,000	44 miles	9887 " "
ERTS**	1:3,370,000	53 miles	21,207 " "

*Images produced on 4½ inch format

** Images produced on 70 mm (2.75 inch) format

Time of Imagery Acquisition

Studies which are involved in mapping the ground surface or analyzing the earth materials need imagery acquired when vegetation and/or snow is not obscuring the soils. Generally, this means imagery acquired in the spring or late fall. Studies of vegetation generally need imagery produced in late spring, through the summer, and into the fall. As you may see in the section entitled "Description of Aerial Photography Available in Iowa," the Agricultural Stabilization and Conservation (ASCS) imagery is acquired in summer because they are interested in crops, whereas much of the other photography is obtained in early spring or late fall.

The year that imagery is acquired may also be important. The oldest, and most repetitive imagery is held by the ASCS. Studies involving land cover change through long periods of time may find this imagery most useful. However, for studies of recent change through short periods of time, combinations of imagery, especially the U.S.D.A. Corn Blight imagery or the NASA - ERTS and Skylab imagery may be most useful as they are repeatable, in some cases, over 2 week intervals.

HOW TO USE THIS INDEX

This index is based on regions. Figure 11 indicates the regions used. Identify the area for which you are interested and go to the page number indicated to see the area enlarged. This page maps governmental coverage, the following pages map private photographic coverage. The base of the regional maps corresponds to the maps published by the Iowa Highway Commission (IHC). This may aid identification of the locations of interest.

As some imagery covers complete county areas, they are not indicated on the map. Rather, the years that imagery was obtained are indicated on the page opposite the map. Thus, complete county coverage is not indicated on the maps.

Significant blocks of coverage are indicated by various patterns, superimposed on the county maps. These include imagery produced by the U.S.G.S., NASA Corn Blight and I.G.S. The U.S.G.S. imagery is listed with a capital letter, which is cross listed on the page facing the regional maps to indicate the scale and year of imagery. The areas are plotted as well as possible, but one should employ some caution for areas of interest close to the edges of the indicated coverage. Some fringe areas not indicated may be covered and, likewise, some fringe areas indicated may not actually be imaged.

Towns imaged by the IHC are named. Private companies that possess imagery of cities are listed with initials within parentheses behind the town's name. The years that the imagery was acquired is listed on the page facing the regional map.

A list of private aerial contractors can be found on page 137 of the appendix at the end of this report.

Smaller scale governmental and satellite imagery is found on a statewide map located behind the regional maps. The satellite data is going out of date very quickly because the imagery is being acquired so rapidly. Skylab imagery is plotted as strips across the state. ERTS images with less than 30% cloud cover are indicated. Only several images are shown for ERTS. These boundaries are indicated to be used as examples of the coverage for each frame of ERTS imagery. For all other images only the centers of images are plotted. The numbers indicated adjacent to the image center points indicate the data and the image ordering number.

HOW TO ORDER IMAGERY

For the most part, this index does not give sufficient information from which you could directly order the imagery. This index only indicates the coverage which is available and the agency responsible for the imagery. The exact frame numbers are not provided as this would be impossible without duplicating all the photo index sheets produced by the agencies which normally provide imagery to the public or producing these sheets for agencies which do not normally provide much photographic duplication for the public.

Two or three contacts will probably be necessary to obtain any imagery from the main agencies generally handling aerial photography for public purchase, i.e., A.S.C.S., S.C.S., U.S.G.S., and EROS. Initial contact may be necessary for identifying the photographic sheets necessary for one to select the exact image numbers desired. This would not be necessary if this information can be obtained previously. A.S.C.S. offices have these photo indexes for their area of service. U.S.G.S. images might be identified satisfactorily by naming the quadrangle map or maps which have been produced in the area of interest, and by explaining the precise location within them for which coverage is desired. ERTS imagery, obtained from the EROS Data Center, could be ordered directly since the ordering numbers are included in the index. Payment must be included with any order to a federal agency for photographic processing. This requirement makes some preliminary information contact important to enable an order to be placed, unless one has access to photo index sheets or one knows all the important information including the number of pages. Page 100 indicates the current prices of photographs purchased from the U.S.G.S. Other agencies' prices are comparable. The prices of products obtained from the EROS Data Center can be found on page 138. Questions concerning imagery should be directed either to the agency directly, or addressed to the *Iowa Geological Survey, Remote Sensing Laboratory*, which can answer any general question.

In general, provide as much information as possible to the agency you contact. This information should include:

1. Your name, address, and telephone number where you can be reached during normal working hours.
2. Location of the point of interest including as much of the following as appropriate or possible -- state, county, town, township, range, section, longitude, latitude, and a verbal description like "quarry seven miles southeast of Cedar

Rapids on south side of Cedar River." For areas of interest, one must explain the area. As examples, one might indicate an entire county or several counties; the northern half of a county; or the area extending about 15 miles around a certain town. If one has a photo index sheet available, the date of photography, roll number, print number, and project symbol should be included. These would be indicated in the index as indicated in figure 7.

3. The size of the print desired (9 X 9 contact print or some enlargement); the material on which image is to be printed (i.e., single or double weight paper or transparency).
4. Purpose for which the images are to be used. The agency might detect any obvious incongruities between the ordered product and the projected use. It should be noted that these images cannot generally be used to endorse any product. Stereo coverage or pictorial coverage should be indicated.

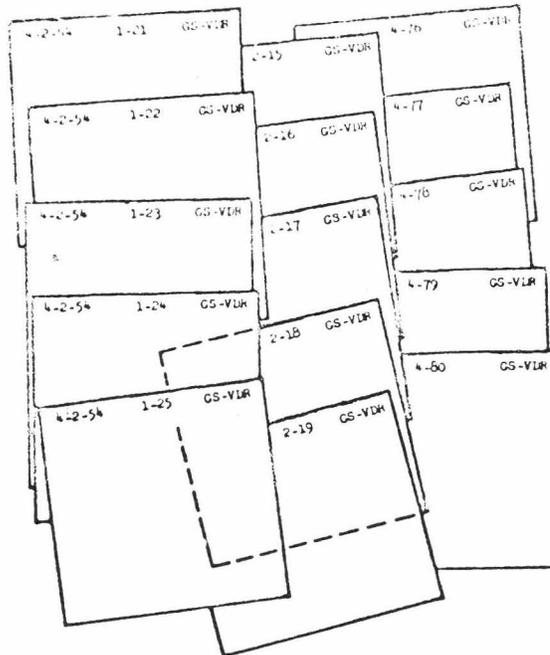


Figure 7. Diagram Showing the Overlapping Arrangement of 9- X 9-in Exposures on a Typical Photoindex

GOVERNMENTAL PRODUCERS OF AERIAL PHOTOGRAPHY
(a complete list of mailing addresses can be found on pages 25 and 26)

Agricultural Stabilization and Conservation Service

The most important source of aerial photography in Iowa is the imagery produced by the A.S.C.S. All imagery is obtained on black and white panchromatic film. The most common scale is 1:15,840, but it ranges between 1:15,840 and 1:20,000. Each county has been imaged repetitively once every 5 to 10 years since 1938. The imagery is obtained generally during the late spring and especially the summer months. Since this imagery is produced to measure areas, it is often flown with an 8½-inch focal length lens. The most recent set of photographs for each county, respectively, is available for inspection at the local A.S.C.S. county office. All the most recent imagery is available at the A.S.C.S. state office in Des Moines. Out-of-date imagery is archived at various college and university libraries, with most of them being located either at the University of Iowa, Iowa State University, or Drake University. Prints can be ordered for private ownership from Asheville, N.C. (see Mailing Addresses on page 25.

Soil Conservation Service

The photography produced by the S.C.S. is utilized for soils mapping. It has been acquired for entire county areas since 1969. A total of thirty counties have been photographed. Imagery is usually acquired in May or June, but some imagery has been acquired in July, September and October. The black and white imagery is commonly produced at scales of 1:38,000 or 1:48,000 with a 6-inch lens, but occasionally it is acquired with a 3½-inch lens. Imagery is held at S.C.S. offices where active soil surveys are in progress and at the S.C.S. offices in Des Moines. Photographs may be obtained from Hyattsville, Maryland.

U.S. Geological Survey

Low altitude photography for the U.S.G.S. is produced once prior to preparation of topographic maps. Thus, blocks of photography are scattered throughout the state without regard for county boundaries. About one-half of the state is covered with the photography going back to 1947, although most has been obtained since 1961. The black and white imagery is usually produced at a scale of about 1:20,000, using a 6-inch or shorter focal length lens. The range of scales varies between 1:18,000 and 1:34,000. Imagery is obtained in spring and fall.

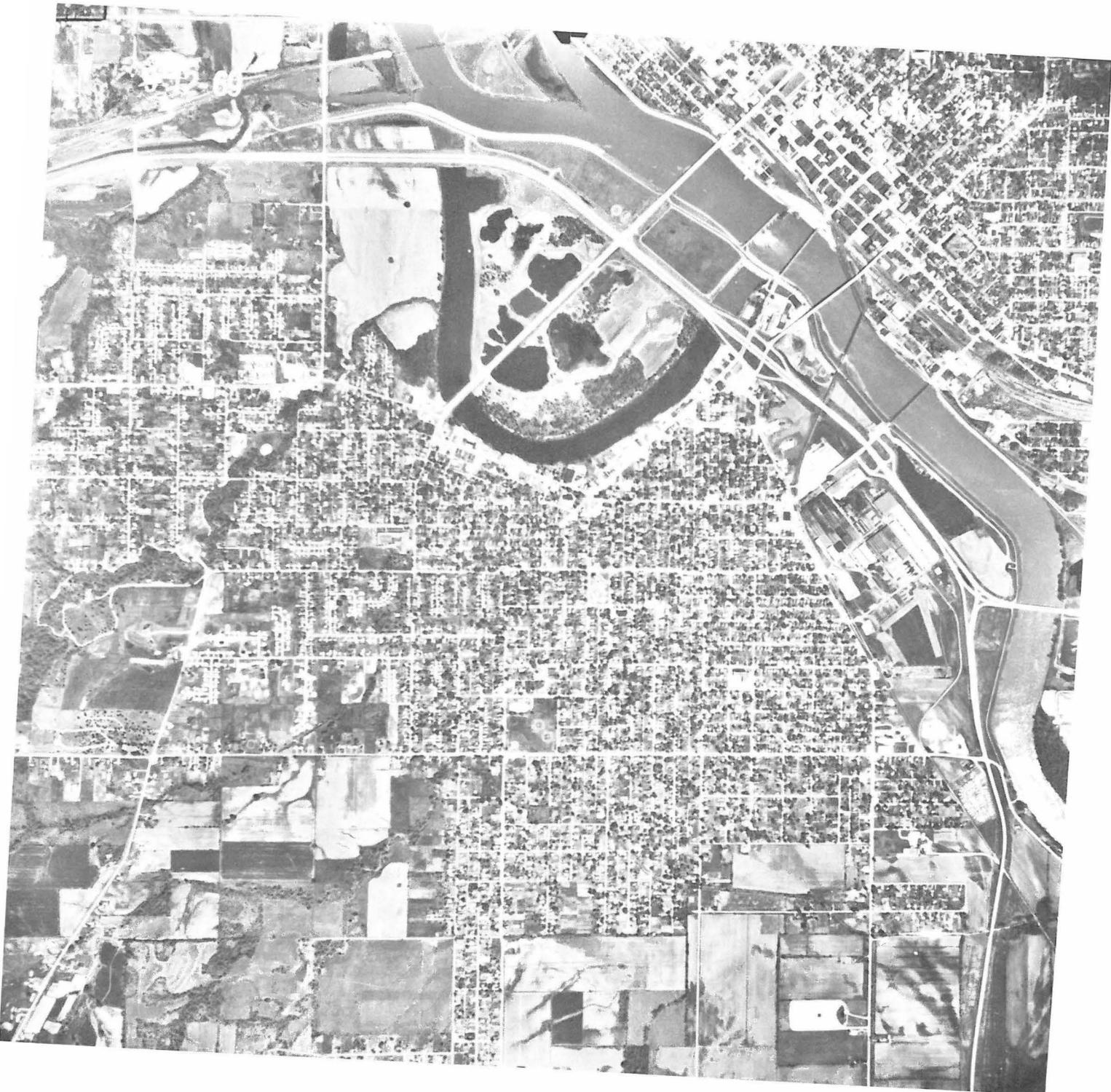


Figure 8. An ASCS Photograph of
Ottumwa (reduced from 9"x9").

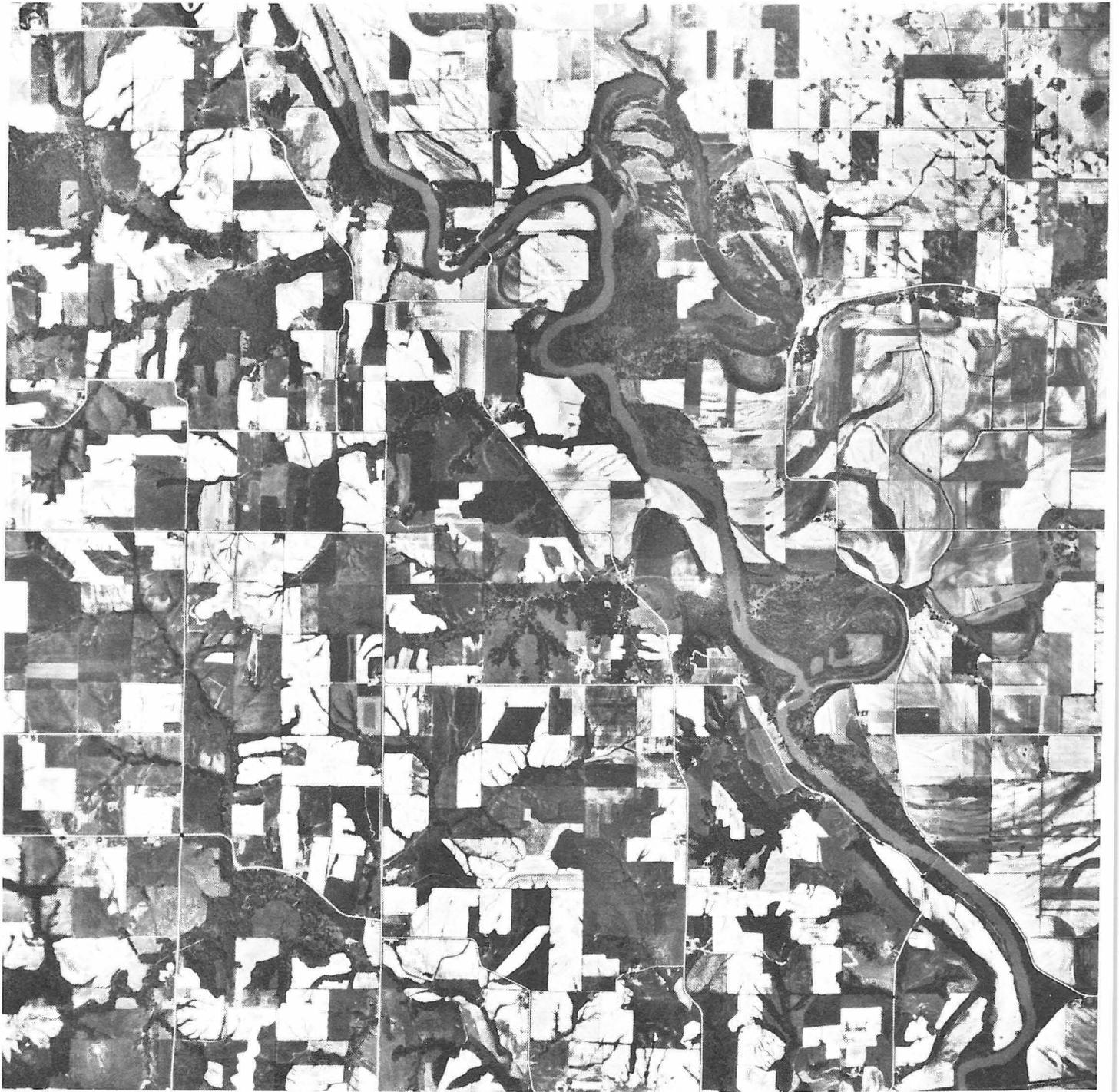


Figure 9. Soil Conservation Service Photograph of a Portion of the Iowa River in Johnson County (reduced from 9"x9").

High altitude U.S.G.S. photography was obtained between 1948 and 1958 at scales of 1:66,000 to 1:70,000 using cameras with 6-inch focal length lenses. Virtually the entire state is covered by this photography.

Maps showing statewide coverages of the low and high altitude U.S.G.S. imagery are reproduced on pages 97 and 99 respectively. Also, low altitude coverage is outlined on the larger scale maps of governmental photographic coverage found on pages 28 thru 91. For further information or to order contact the United States Geological Survey, Map Information Office, Washington, D.C. 20244 or the EROS Data Center, Sioux Falls, South Dakota 57198.

U.S. Army Corps of Engineers

The U. S. Army Corps of Engineers has photography for both reconnaissance and engineering purposes along the Mississippi and Missouri Rivers, as well as at reservoirs throughout the state. The photos may be at scales from 1:3,000 to 1:120,000. Most would be black and white imagery, but some may be color or color infrared images. The photography would be available at the Rock Island District Office or the Omaha District Office. The Kansas City District Office may also have some imagery.

Of equal importance is the black and white panchromatic photography obtained of the entire state in the fall, 1949, and the spring, 1950. This imagery, produced at a scale of 1:70,000 was produced to make the 1:250,000 scale maps distributed now by the U.S.G.S. This imagery is available from the EROS Data Center in Sioux Falls, South Dakota. The photo index sheets are available at the Iowa Geological Survey, Remote Sensing Laboratory (IGSRSL) in Iowa City.

NASA: Corn Blight Watch Experiment

NASA, in cooperation with the U.S.D.A. obtained color infrared photography of four north-south strips in Iowa during the summer of 1971. The photos, offering repeated (8 times) coverage, are at a scale of 1:130,000 and are available in Sioux Falls, South Dakota, at the EROS Data Center. Some of this imagery is available at IGSRSL in Iowa City.

Iowa Geological Survey, Remote Sensing Laboratory

IGSRSL has acquired specialized imagery in cooperation with many other agencies over selected areas throughout the state. Imagery has been acquired since 1971 at scales of 1:8,000 to 1:24,000. Three film types are generally used by the lab; color, color infrared, and multispectral. Explanations of these types of photography can be found on pages 7 and 8 of this index. For further information on this photography contact the Iowa Geological Survey Remote Sensing Laboratory in Iowa City, Iowa.

Iowa Highway Commission

The Iowa Highway Commission acquires imagery along the right-of-ways of state and federal highways. The imagery is used for road location planning and for road designing. The black and white panchromatic imagery is at scales ranging from 1:3,000 to 1:18,000, however, most is acquired at the larger scale to facilitate 1-foot contour mapping. Imagery is acquired when vegetation is at a minimum.

Small scale imagery (1:80,000) has been obtained for many urban areas. Sixteen urban areas with populations greater than 25,000 persons were imaged in the summers of 1969 and 1973. Cities with population between 5,000 and 25,000 persons were imaged at that same scale in 1971.

The Highway Commission photography located on the maps on pages 28 thru 93 is identified as special photography. It was obtained for right-of-way and corridor studies at a scale of 1:18,000. Contact the Iowa Highway Commission, Ames, Iowa, for further information.

Iowa Natural Resources Council

The I.N.R.C. has acquired a very limited amount of aerial imagery along Iowa Rivers. Most of it is associated with record floods along several major rivers in Iowa. It has been acquired up to scales of 1:24,000. Inquiries should be addressed to the Iowa Natural Resources Council, Des Moines, Iowa.

Environmental Protection Agency

The EPA has obtained color imagery of Hardin County in 1972. The imagery is at a scale of 1:16,000. It would be available from the



Blue Band

Infrared Band

Green Band

Red Band

Figure 10. An Iowa Geological Survey Multispectral Photograph of the Nishnabotna River in Western Iowa.

EPA office in Kansas City, Missouri. Other imagery, especially of some lakes, may have been obtained by the EPA, but record of this imagery is not presently available.

Iowa Conservation Commission

The Iowa Conservation Commission has acquired a small amount of aerial photography over park areas in Iowa.

Omaha-Council Bluffs Metropolitan Area Planning Agency

This agency has aerial photography of the Omaha-Council Bluffs area as well as the surrounding towns in Pottawattamie County and the town of Missouri Valley in Harrison County, Iowa. The photographs are produced at a scale of 1:24,000 on black and white film with a 35% stereo overlap. To order send a request for an index to the Omaha-Council Bluffs Metropolitan Area Planning Agency in Omaha, Nebraska.

Linn County Regional Planning Commission

The Linn County Regional Planning Commission has 1967 Cedar Rapids Metropolitan Area photographs as well as flood photographs of the Cedar Rapids area from 1963 and 1968. Also available are 35 millimeter oblique aerial slides of the same area. For information regarding using or ordering of these photographs contact the Linn County Regional Planning Commission, Cedar Rapids, Iowa.

PRIVATE PRODUCERS OF AERIAL PHOTOGRAPHY

(a complete list of mailing addresses can be found on page 27)

Gulf Central Pipeline Company

The Gulf Central Pipeline Company, a subsidiary of Santa Fe Pipeline System, has produced aerial photographs of its entire pipeline route thru Iowa. These photos were taken in 1968 on black and white film at a scale of 1:12,000. Requests should be sent to their Tulsa, Oklahoma office.

Iowa-Illinois Gas & Electric

Iowa-Illinois Gas and Electric has available black and white photographs of the Davenport area. Produced at a 1:12,000 scale the photographs were taken in 1970. For more information contact the Electric Engineering Department in Davenport, Iowa.

Northern Natural Gas Company

Photography along the route of Northern Natural Gas Company's pipelines in Iowa has been produced since 1969 and is updated on a continuing basis. These are black and white photographs at a scale of 1:12,000. Requests for further information should be directed to their Omaha, Nebraska, office.

Northwestern Bell Telephone Company

The Northwestern Bell Telephone Company has a large amount of black and white aerial photography in Iowa. This has been obtained since 1969 and most has been obtained during the winter or spring. Generally the imagery is at scales ranging from 1:12,000 to 1:32,000 but the imagery has been obtained at large scales of 1:3,000 to 1:6,000 around some major urban areas and for some regions it has been obtained at scales as small as 1:48,000. The imagery centers around most of the larger urban areas and other areas serviced by Northwestern Bell. For more information contact the Northwestern Bell office nearest the area of interest.

Union Electric Company

Black and white aerial photography has been produced by Union Electric Company along the route of its 345 KV transmission line. Flown in March of 1964 at a scale of 1:10,020, copies of these photographs are available from the aerial contractor SURDEX Corporation of Chesterfield, Missouri.

MAILING ADDRESSES - GOVERNMENTAL AGENCIES

Agricultural Stabilization and Conservation Service

A.S.C.S., Eastern Aerial Photography Laboratory
Program Performance Division
ASCS-USDA
45 South French Broad Avenue
Asheville, North Carolina 28801

EROS Data Center

EROS Data Center
10th and Dakota Avenue
Sioux Falls, South Dakota 57198
Phone - (605) 594-6511

Iowa Conservation Commission

Iowa Conservation Commission
Valley Bank Building
4th and Walnut
Des Moines, Iowa 50309

Iowa Geological Survey

Iowa Geological Survey
Remote Sensing Laboratory
16 West Jefferson Street
Iowa City, Iowa 52240
Phone - (319) 338-1173

Iowa Highway Commission

Cartographic Department
Iowa Highway Commission
Ames, Iowa 50010
Phone - (515) 296-1101

Linn County Regional Planning Commission

Linn County Regional Planning Commission
Sixth Floor - City Hall
Cedar Rapids, Iowa 52404

Omaha-Council Bluffs Metropolitan Area Planning Agency

Omaha-Council Bluffs Metro. Area Planning Agency
Suite 200
7000 West Center Road
Omaha, Nebraska 68106
Phone - (402) 397-0330

Soil Conservation Service

Cartographic Division
Soil Conservation Service
Department of Agriculture
Federal Center Building No. 1
East-West Highway & Belcrest Road
Hyattsville, Maryland 20781

U.S. Army Corps of Engineers

Kansas City, Missouri

Kansas City District Corps of Engineers
700 Federal Building
Kansas City, Missouri 64106

Omaha, Nebraska

Remote Sensing Coordinator
Department of the Army
Missouri River Division Corps of Engineers
P. O. Box 103, Downtown Station
Omaha, Nebraska 68101
Phone - (402) 221-1221

Rock Island, Illinois

U.S. Army Corps of Engineers
Rock Island District Office
Clock Tower Building
Rock Island, Illinois 61201

U.S. Geological Survey

Rolla, Missouri

U.S.G.S. Central Region Engineer
U.S. Geological Survey
Box 133
Rolla, Missouri 65401

MAILING ADDRESSES - PRIVATE

Gulf Central Pipeline Company

V. J. Ryba, Manager of Engineering
Gulf Central Pipeline Co.
1200 Thompson Building
Tulsa, Oklahoma 74103

Iowa Illinois Gas and Electric Company

Electric Engineering Department
Iowa Illinois Gas and Electric Co.
206 East Second Street
Davenport, Iowa 52801

Northern Natural Gas Company

L. L. Briggs
Northern Natural Gas Company
2223 Dodge St.
Omaha, Nebraska 68102

Union Electric

Surdex Corporation
Chesterfield, Missouri 63017
Phone - (314) 532-3427

INDEX TO LOCAL AERIAL
PHOTOGRAPHY IN IOWA

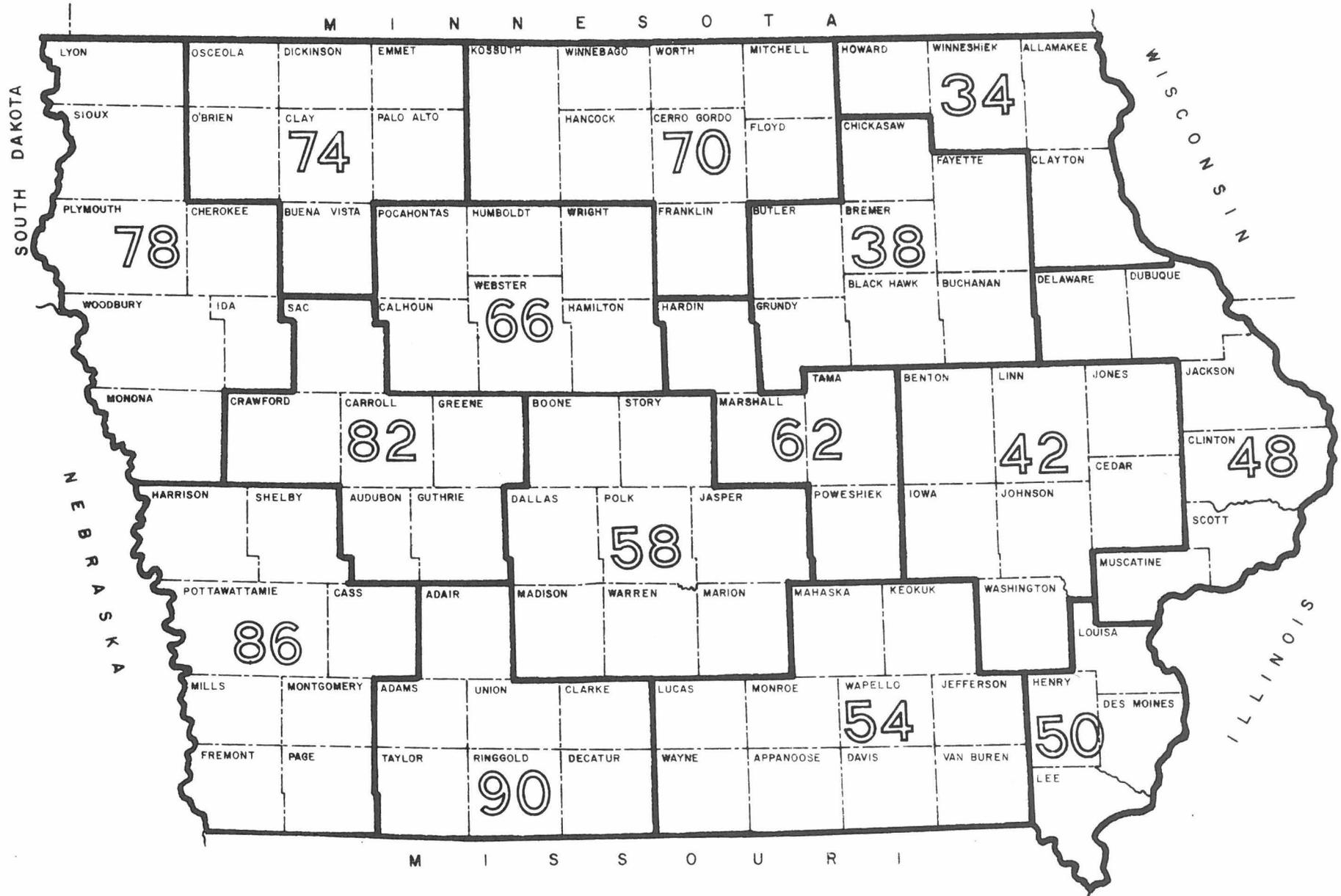


Figure 11. Page Numbers for Regions Used in This Index.

Key to Governmental Aerial Photography in Iowa

Entire County area has been imaged. See "Complete County Coverage."

Area not covered by local photography.

Iowa Geological Survey imagery. Multispectral, color or color infrared at various scales.

Iowa Highway Commission
- Special photography produced since 1961 1:18,000.

NASA Corn Blight Watch imagery of this area, 1:120,000.

- Cities photographed in 1969 & 1973 - 1:80,000.

U.S. Army Corps of Engineers based at Kansas City scales of 1:12,000 or 1:48,000.

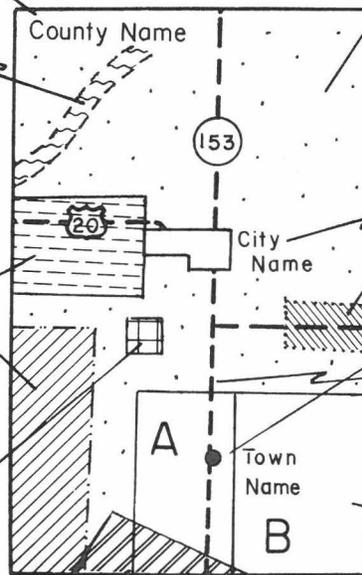
- Towns photographed in 1971 - 1:80,000

- Various scales of photography was produced along these highways.

Linn County Regional Planning Commission photography.

U.S.G.S. has imagery: A. obtained in 1967 at a scale of 1:20,000; B. obtained in 1970 at a scale of 1:24,000

Omaha-Council Bluffs Metropolitan Area Planning Commission photography produced in 1973 at a scale of 1:24,000.



EXAMPLE OF INFORMATION CONTAINED IN LISTING FOR REGION ON OPPOSITE PAGE:

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)

ERTS

*Complete County Coverage

County Name County: ASCS - 1938, 1942, 1953, 1959, 1965, 1972
SCS - 1970 (1:38,000)

Other Coverage

U.S.G.S. Low Altitude Photography
A. 1967 (1:20,000) VBPV (Project Symbol)
B. 1970 (1:24,000) VCMG

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - 1971 (1:18,000)

*Cities - 1969 & 1973

*Towns - 1971

*Highways

Iowa Geological Survey Imagery
a. Multispectral Imagery - 1:24,000)

Iowa Natural Resource Commission

U.S. Army Corps of Engineers
Kansas City Office - 1973 (1:12,000)

Omaha-Council Bluffs Metropolitan Area Planning Agency
1973 (1:24,000)

Linn County Regional Planning Commission - 1963

No Local Coverage

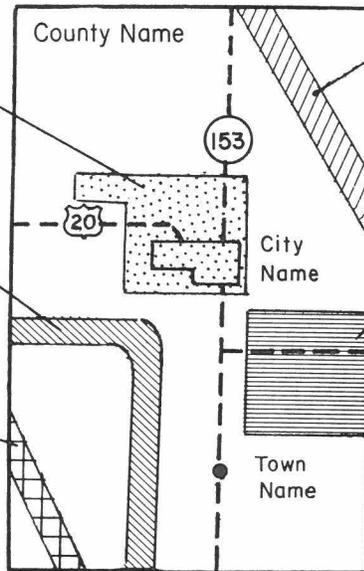
*Denotes coverage not shown on facing map

Key to Private Aerial Photography in Iowa

Northwestern Bell Telephone Company Imagery produced at various dates and scales

Gulf Central Pipeline Company Imagery produced in 1968 at a scale of 1:12,000

Union Electric Company imagery produced in 1964 at a scale of 1:10,000.



Northern Natural Gas Company imagery produced since 1969 at a scale of 1:10,000.

Iowa Illinois Gas and Electric Company imagery produced in 1970 at a scale of 1:12,000.

EXAMPLE OF INFORMATION CONTAINED IN LISTING FOR REGION ON OPPOSITE PAGE:

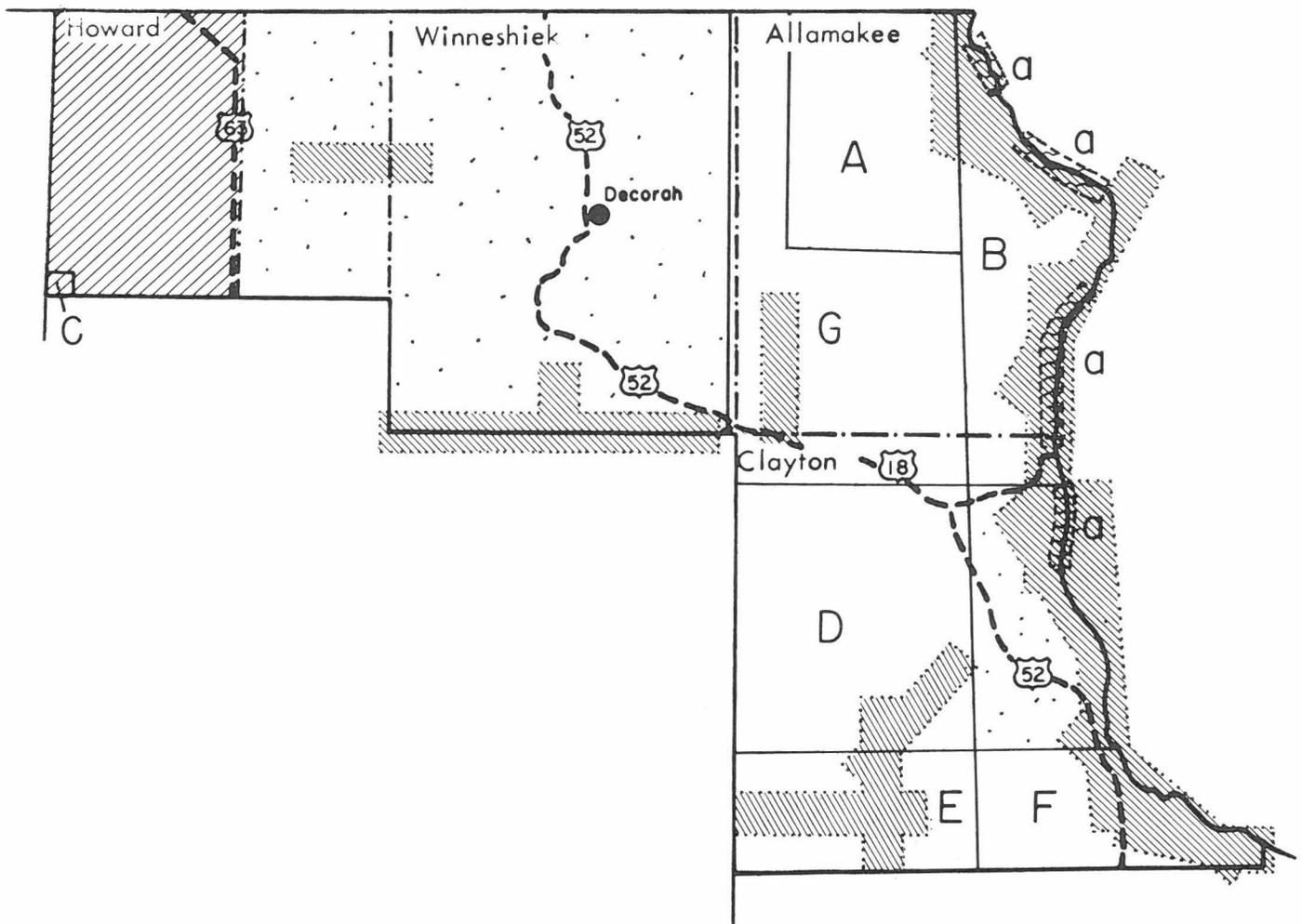
Northwestern Bell Telephone Company 

Gulf Central Pipeline Company 
1968 (1:12,000)

Northern Natural Gas Company 
(1:12,000)

Iowa Illinois Gas and Electric Company 
1970 (1:12,000)

Union Electric Company 
1964 (1:10,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)
or: 1957-1958 (1:66,000)
ERTS

*Complete County Coverage

Allamakee Co.: ASCS - 1940, 1952, 1957, 1964, 1971
Clayton Co.: ASCS - 1940, 1952, 1957, 1964, 1970
SCS - 1972 (1:38,000)
Howard Co.: ASCS - 1941, 1952, 1957, 1964, 1970
SCS - 1970 (1:38,000)
Winneshiek Co.: ASCS - 1940, 1952, 1957, 1964, 1971

Other Coverage

U.S.G.S. Low Altitude Photography
A. 1965 (1:26,000) VBCA
B. 1965 (1:26,000) VBEJ
C. 1967 (1:20,000) VBPV
D. 1963 (1:29,000) VATT
E. 1963 (1:20,000) VATT
F. 1954 (1:17,000) VBI
G. 1971 (1:24,000) VCRZ

NASA Corn Blight Photography - 1971 (1:20,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

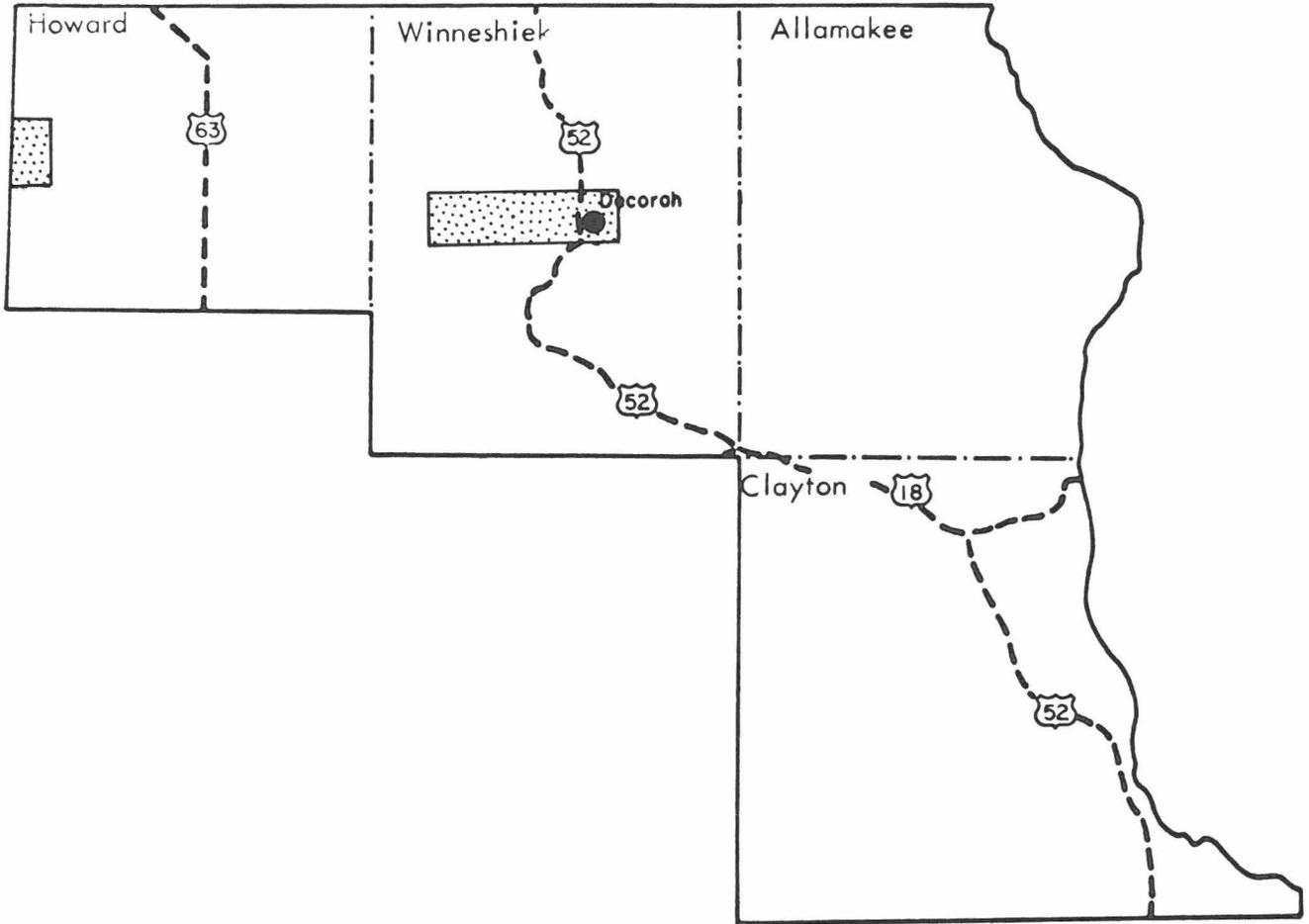
*Towns - 1971 (1:80,000)

*Highways

Iowa Geological Survey Imagery
a. Color Infrared - (1:8,000)

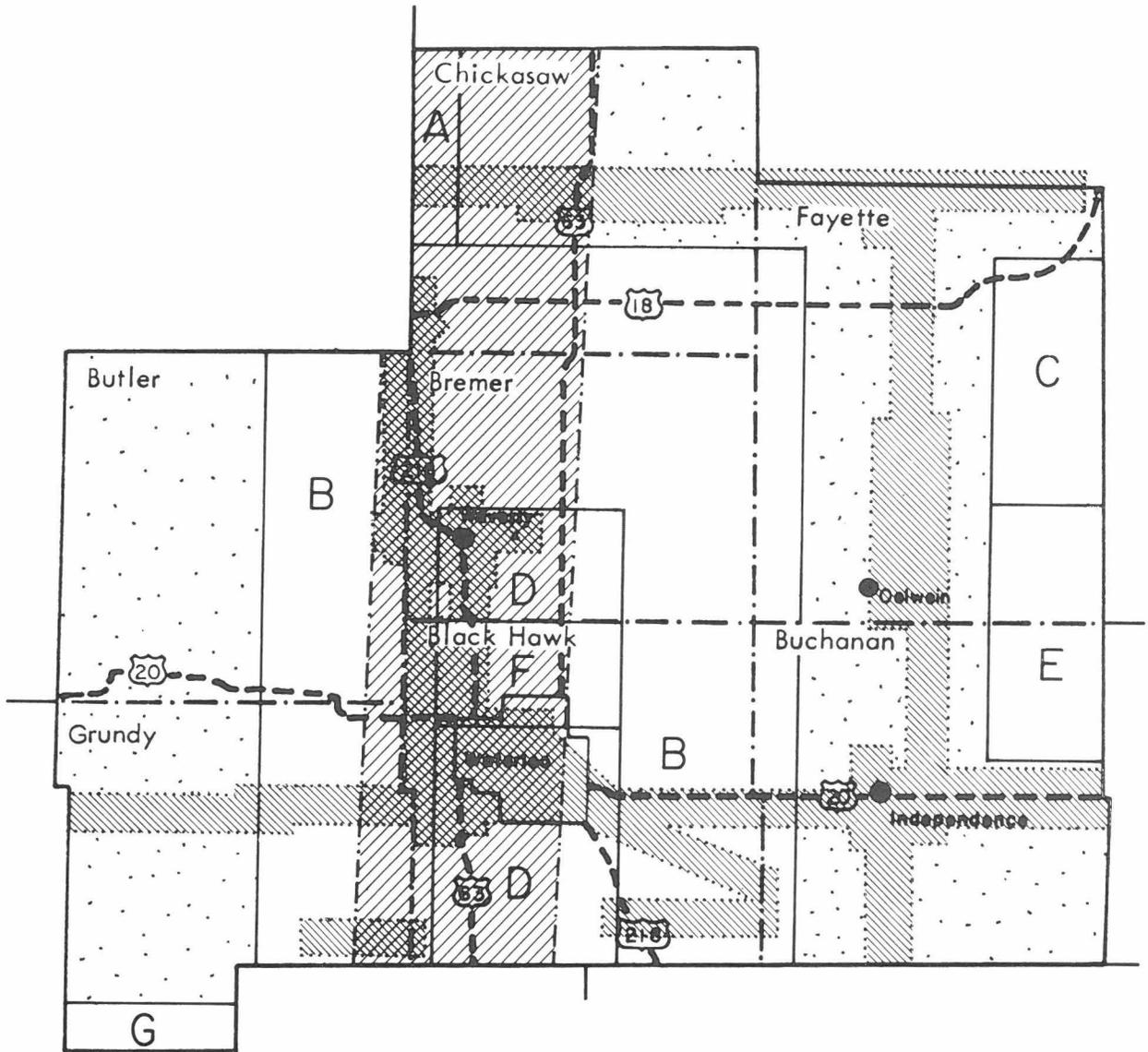
No Local Coverage

*Denotes coverage not shown on facing map



PRIVATE

Northwestern Bell Telephone Company 



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)

or: 1957-1958 (1:66,000)

ERTS

*Complete County Coverage

Black Hawk Co.: ASCS - 1941, 1952, 1957, 1964, 1970

Bremer Co.: ASCS - 1941, 1952, 1957, 1964, 1971

Buchanan Co.: ASCS - 1940, 1952, 1957, 1964, 1970

SCS - 1972 (1:38,000)

Butler Co.: ASCS - 1939, 1952, 1957, 1964, 1971

SCS - 1972 (1:38,000)

Chickasaw Co.: ASCS - 1941, 1952, 1957, 1964, 1971

Fayette Co.: ASCS - 1938, 1957, 1964, 1971

Grundy Co.: ASCS - 1939, 1952, 1958, 1965, 1971

Other Coverage

U.S.G.S. Low Altitude Photography

A. 1967 (1:20,000) VBPV

B. 1967 (1:18,000) VBPW

C. 1963 (1:29,000) VATT

D. 1958 (1:17,000) VSR

E. 1963 (1:20,000) VATT

F. 1963 (1:24,000) VAPT

G. 1958 (1:17,000) VMS

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

*Cities - 1969, 1973 (1:80,000)

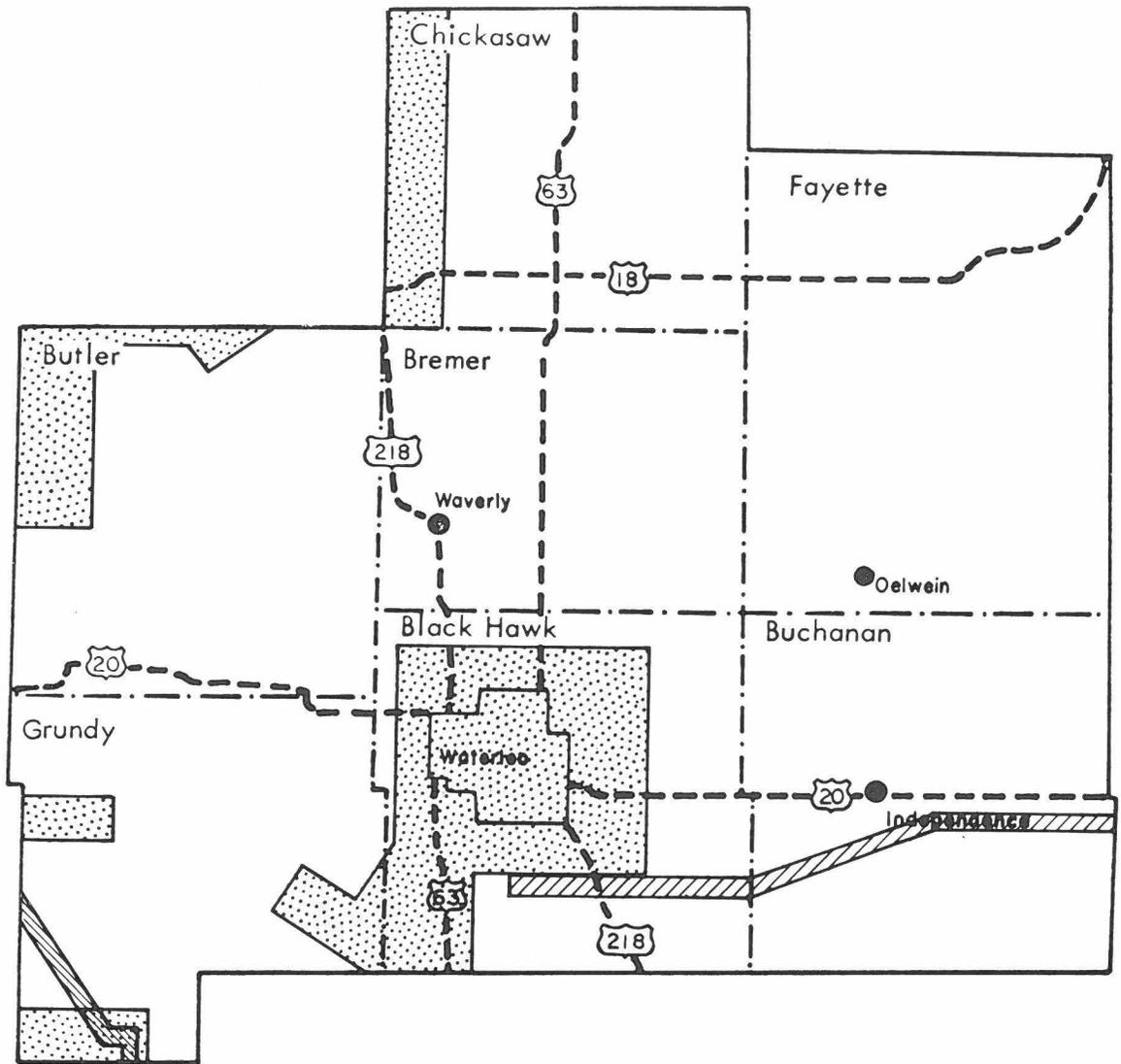
*Towns - 1971 (1:80,000)

*Highways

*Skylab

No Local Coverage

*Denotes coverage not shown on facing page

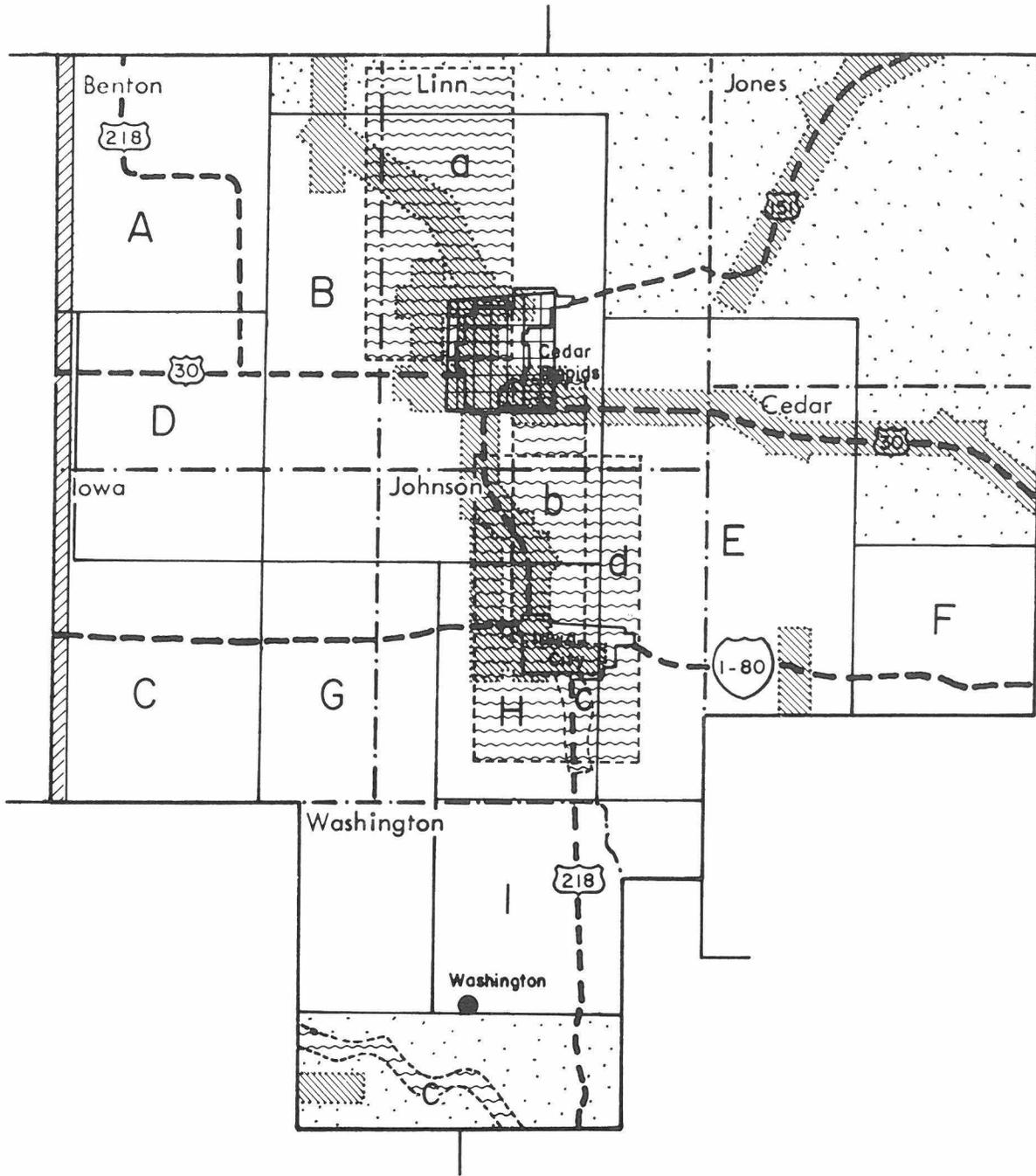


PRIVATE

Northwestern Bell Telephone Company 

Gulf Central Pipeline Company 
1968 (1:12,000)

Northern Natural Gas Company 
(1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1949-1950 (1:70,000)
or: 1956 (1:60,000)
or: 1957-1958 (1:66,000)

ERTS

*Complete County Coverage

Benton Co.: ASCS - 1937, 1950, 1956, 1963, 1969
SCS - 1969 (1:48,000)
Cedar Co.: ASCS - 1940, 1951, 1956, 1963, 1969
SCS - 1969 (1:48,000)
Iowa Co.: ASCS - 1940, 1951, 1956, 1963, 1970
Johnson Co.: ASCS - 1937, 1956, 1963, 1970
SCS - 1972 (1:38,000)
Jones Co.: ASCS - 1940, 1952, 1957, 1964, 1970
Linn Co.: ASCS - 1940, 1952, 1957, 1964, 1970
SCS - 1970 (1:38,000)
Washington Co.: ASCS - 1937, 1951, 1957, 1963, 1969

Other Coverage

U.S.G.S. Low Altitude Photography

- A. 1967 (1:18,000) VBPW
- B. 1965 (1:21,000) VBK
- C. 1965 (1:20,000) VBCK
- D. 1963 (1:18,000) VARH
- E. 1963 (1:18,000) VARI
- F. 1970 (1:24,000) VCMH
- G. 1969 (1:20,000) VCEU
- H. 1964 (1:20,000) VAZZ
- I. 1967 (1:18,000) VBVI

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

*Cities - 1969, 1973 (1:80,000)

*Towns - 1971 (1:80,000)

*Highways

Iowa Geological Survey Imagery

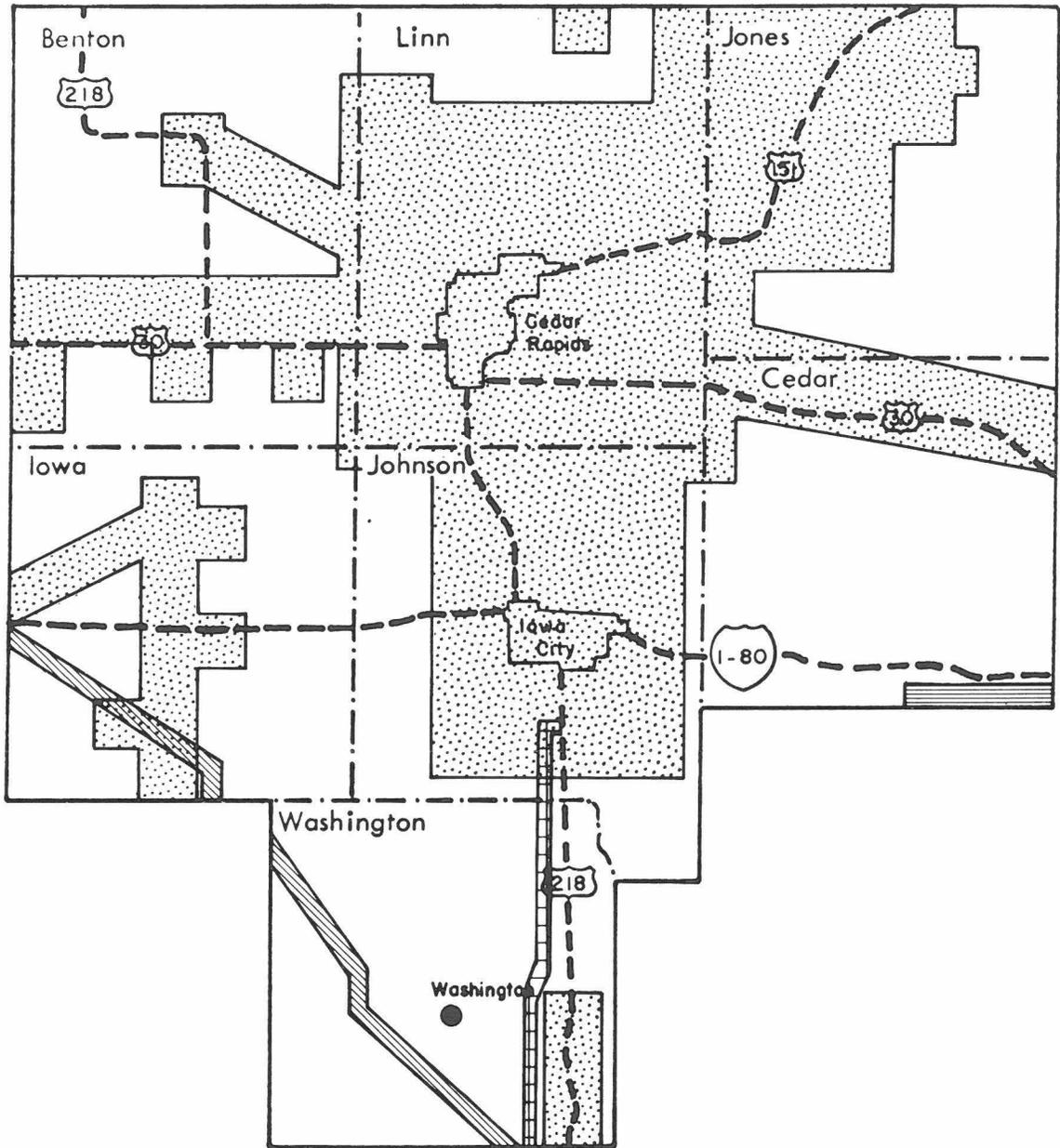
- a. Multispectral - 1972 (1:8,000 and 1:16,000)
- b. Multispectral - 1972 (1:16,000)
- c. Multispectral - 1973 (1:24,000)
- d. Color and Color Infrared - 1974 (1:15,840)

Linn County Regional Planning Commission

*Skylab (Partial Coverage)

No Local Coverage

*Denotes coverage not shown on facing map



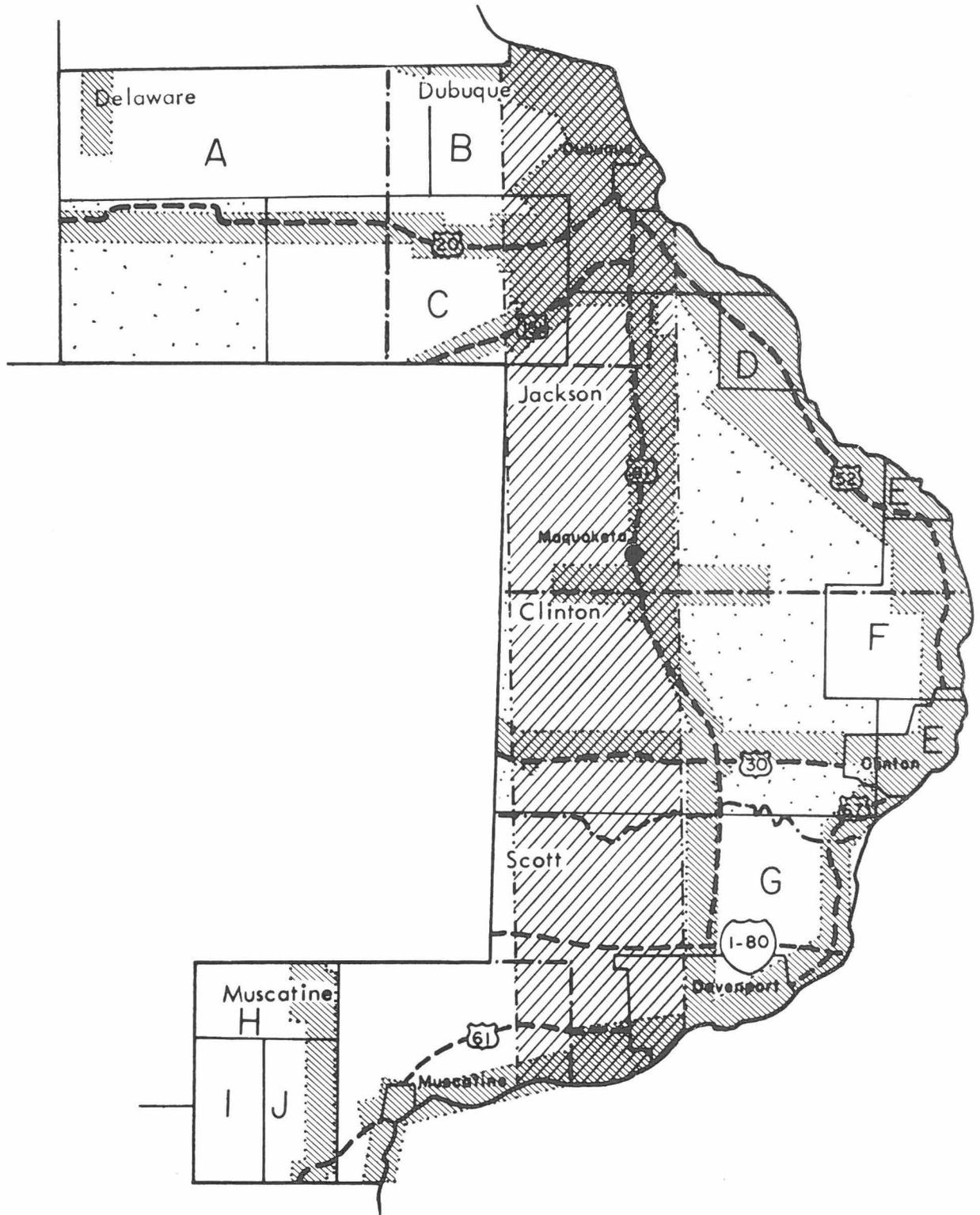
PRIVATE

Northwestern Bell Telephone Company 

Gulf Central Pipeline Company 
1968 (1:12,000)

Iowa Illinois Gas and Electric 
1970 (1:12,000)

Union Electric Company 
1964 (1:10,000)



GOVERNMENTAL

*Most of Region:

U.S.G.S. High Altitude: 1948-1950 (1:70,000)
or: 1956 (1:60,000)
or: 1957-1958 (1:66,000)

ERTS

*Complete County Coverage

Clinton Co.: ASCS - 1937, 1951, 1956, 1957, 1963, 1969
SCS - 1970, 1973 (1:38,000)
Delaware Co.: ASCS - 1940, 1950, 1952, 1957, 1964, 1970
Dubuque Co.: ASCS - 1940, 1957, 1964, 1970
Jackson Co.: ASCS - 1940, 1952, 1957, 1964, 1970
Muscatine Co.: ASCS - 1937, 1951, 1956, 1963, 1969
Scott Co.: ASCS - 1937, 1951, 1956, 1963, 1969

Other Coverage

U.S.G.S. Low Altitude Photography

- A. 1963 (1:20,000) VATT
- B. 1954 (1:17,000) VBI
- C. 1964 (1:20,000) VAZW
- D. 1966 (1:22,000) VBOK
- E. 1951 (1:24,000) PU
- F. 1966 (1:20,000) VBLO
- G. 1970 (1:24,000) VCMH
- H. 1963 (1:18,000) VARI
- I. 1967 (1:18,000) VBVI
- J. 1964 (1:18,000) VBAD

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

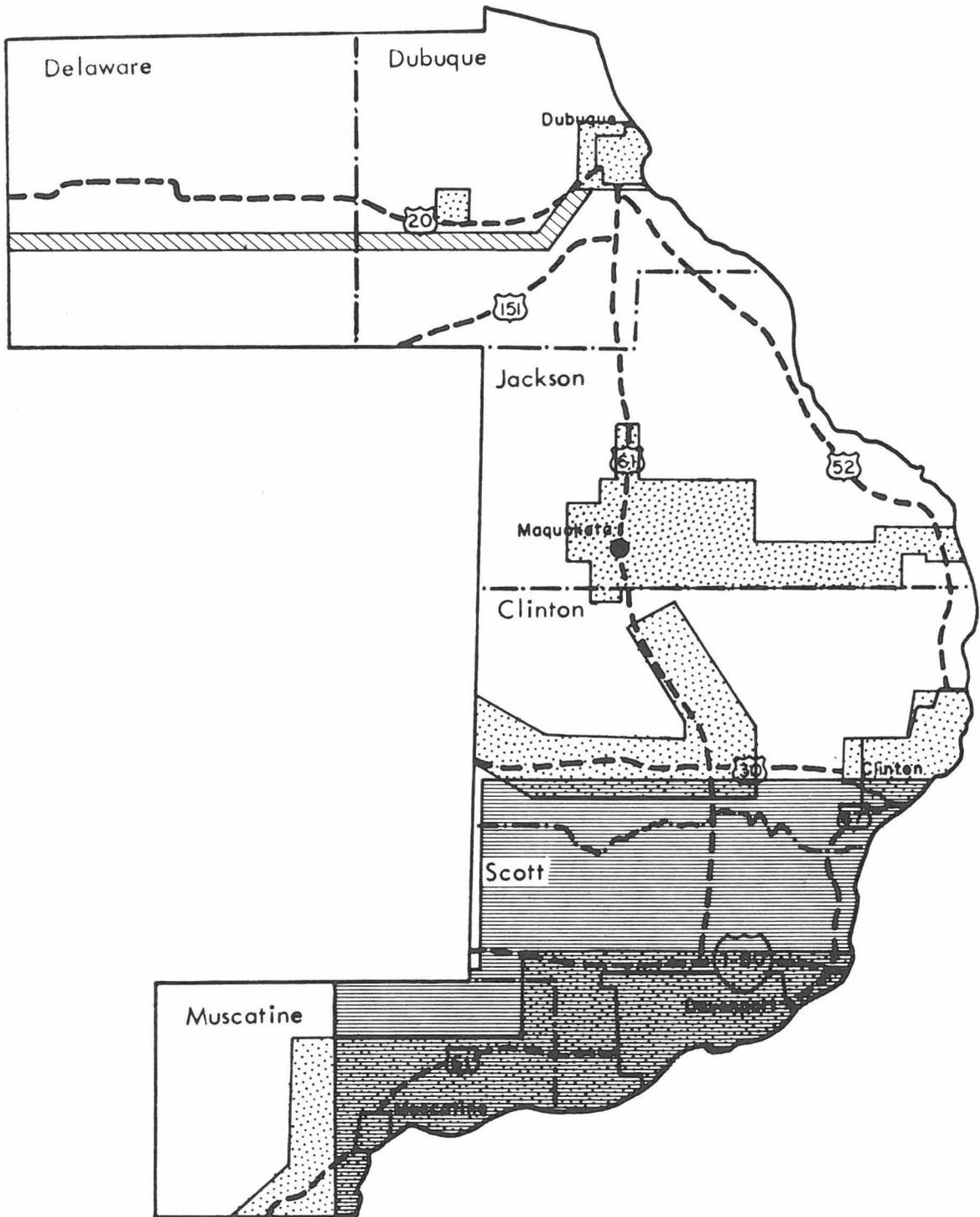
* Cities - 1969, 1973 (1:80,000)

* Towns - 1971 (1:80,000)

* Highways

*Skylab (Partial Coverage)

No Local Coverage

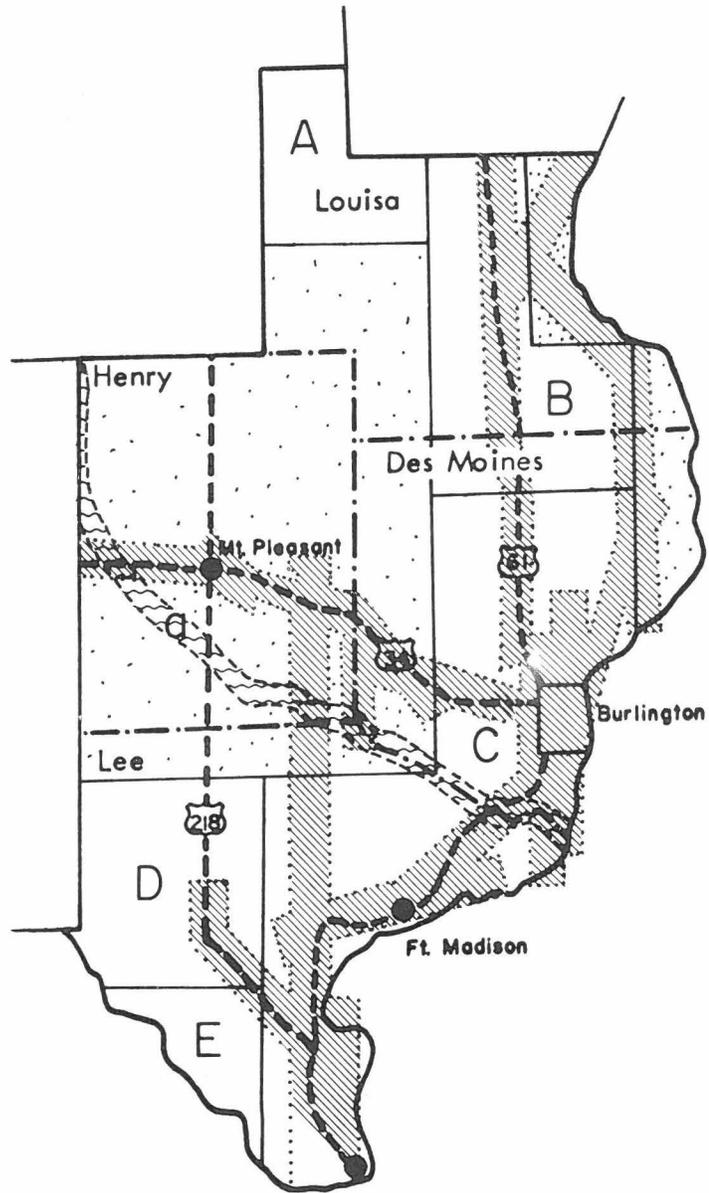


PRIVATE

Northwestern Bell Telephone Company 

Iowa Illinois Gas and Electric Company 
1970 (1:12,000)

Northern Natural Gas Company 
(1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)
or: 1956 (1:60,000)

ERTS

*Complete County Coverage

Des Moines Co.: ASCS - 1941, 1951, 1956, 1963, 1969
Henry Co.: ASCS - 1941, 1951, 1957, 1963, 1971
Lee Co.: ASCS - 1940, 1951, 1956, 1963, 1969
Louisa Co.: ASCS - 1941, 1951, 1957, 1963, 1969

Other Coverage

U.S.G.S. Low Altitude Photography

- A. 1967 (1:18,000) VBVI
- B. 1964 (1:18,000) VBAD
- C. 1962 (1:18,000) VAOA
- D. 1965 (1:20,000) VBBZ
- E. 1947 (1:27,000) DZ

Iowa Highway Commission Photography

Special Photography - (1:18,000) 

*Cities - 1969, 1973 (1:80,000)

*Towns - 1971 (1:80,000)

*Highways

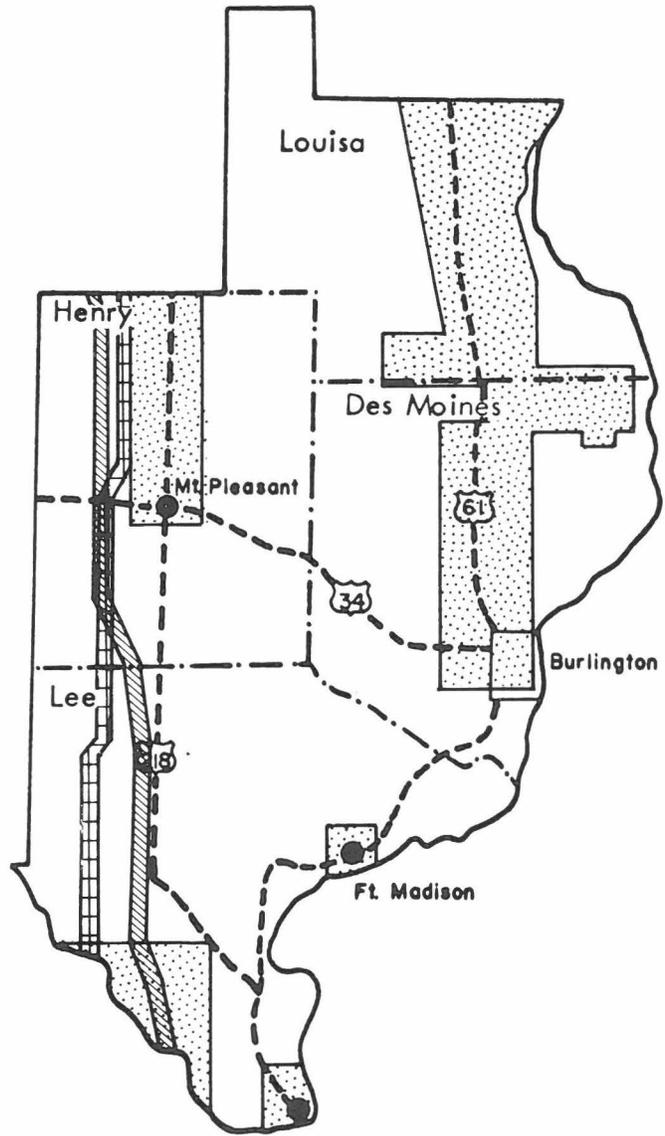
Iowa Geological Survey Imagery 

a. Multispectral - 1973 (1:24,000)

*Skylab (partial coverage)

No Local Coverage

*Denotes coverage not shown on facing map

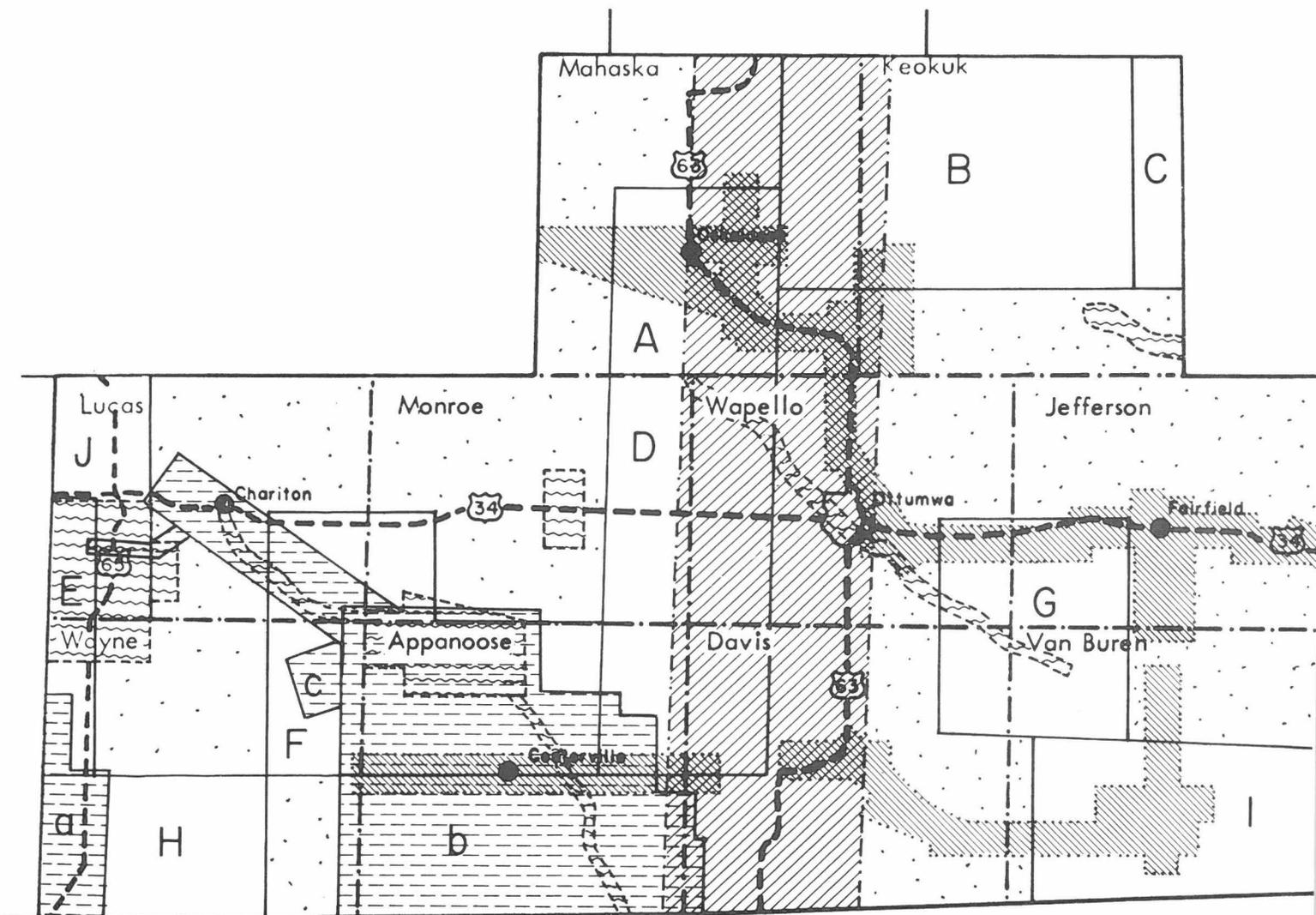


PRIVATE

Northwestern Bell Telephone Company 

Gulf Central Pipeline Company 
1968 (1:12,000)

Union Electric Company 
1964 (1:10,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)
ERTS

*Complete County Coverage

Appanoose Co.: ASCS - 1941, 1950, 1955, 1961, 1967
SCS - (Incomplete)
Davis Co.: ASCS - 1941, 1951, 1957, 1963, 1969
Jefferson Co.: ASCS - 1941, 1951, 1957, 1963, 1969
Keokuk Co.: ASCS - 1940, 1951, 1957, 1963, 1969
Lucas Co.: ASCS - 1941, 1950, 1955, 1961, 1967
Mahaska Co.: ASCS - 1938, 1951, 1956, 1963, 1969
SCS - (Incomplete)
Monroe Co.: ASCS - 1941, 1950, 1955, 1961, 1967
Wapello Co.: ASCS - 1941, 1951, 1956, 1961, 1967
SCS - 1972 (1:38,000)
Wayne Co.: ASCS - 1941, 1950, 1955, 1961, 1967
Van Buren Co.: ASCS - 1941, 1951, 1957, 1963, 1969

Other Coverage

U.S.G.S. Low Altitude Photography

- A. 1966 (1:20,000) VBLN
- B. 1964 (1:20,000) VAZZ
- C. 1969 (1:20,000) VCEM
- D. 1964 (1:20,000) VBAK
- E. 1963 (1:18,000) VATR
- F. 1964 (1:18,000) VBAL
- G. 1963 (1:18,000) VARG
- H. 1962 (1:18,000) VANE
- I. 1965 (1:20,000) VBBZ
- J. 1947 (1:27,000) DY

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

*Cities - 1969, 1973 (1:80,000)

*Towns - 1971 (1:80,000)

*Highways

Iowa Geological Survey Imagery

a. Multispectral - 1973 (1:24,000)

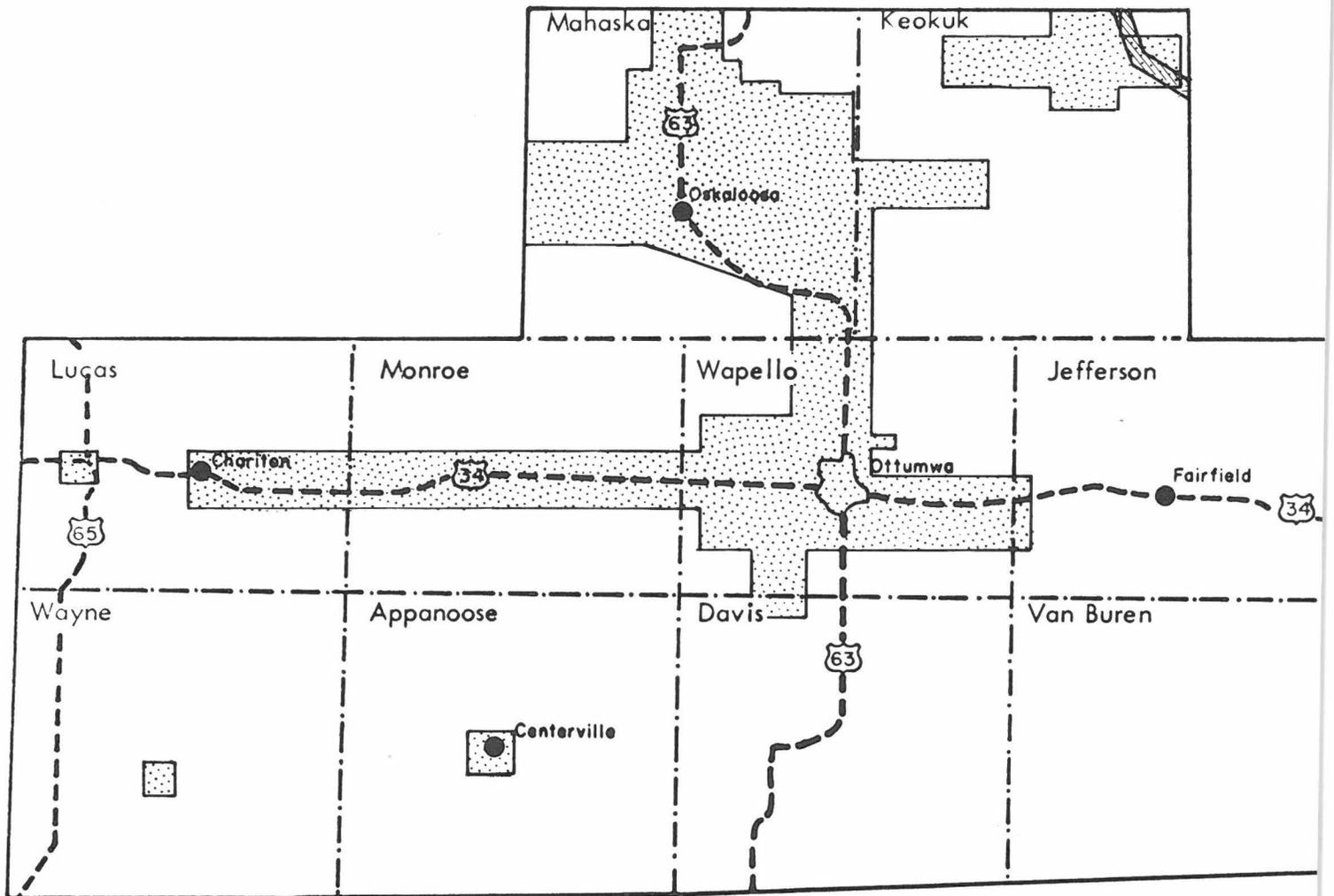
U.S. Army Corps of Engineers

1971 (1:12,000)
1974 (1:12,000)
1974 (1:48,000)

*Skylab (Partial Coverage)

No Local Coverage

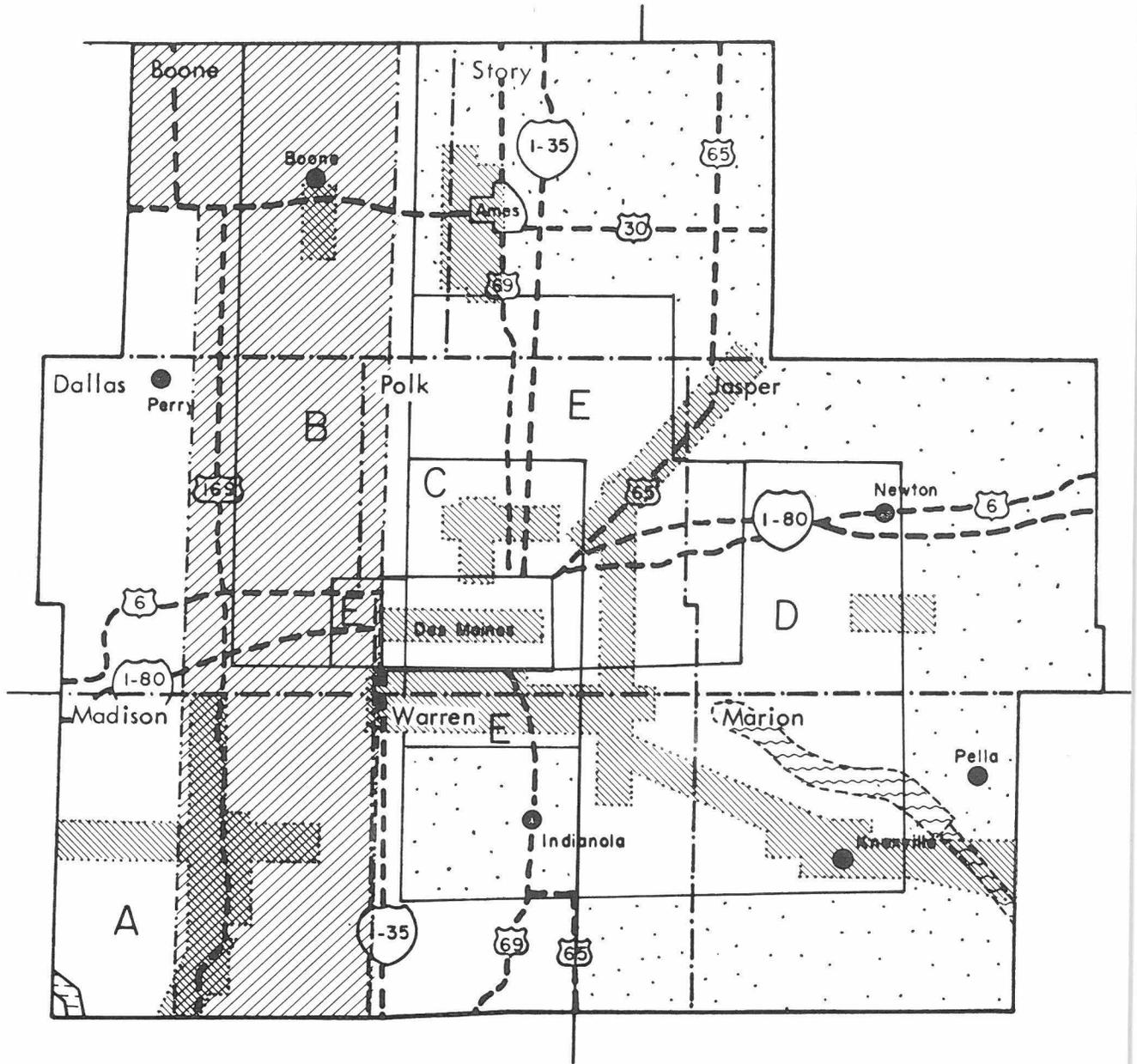
*Denotes coverage not shown on facing map



PRIVATE

Northwestern Bell Telephone Company 

Gulf Central Pipeline Company 
1968 (1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude 1948-1950 (1:70,000)

ERTS

*Complete County Coverage

Boone Co.: ASCS - 1939, 1958, 1965, 1972
SCS - 1972 (1:38,000)
Dallas Co.: ASCS - 1938, 1950, 1955, 1961, 1967
Jasper Co.: ASCS - 1940, 1946, 1950, 1955, 1961, 1967
Madison Co.: ASCS - 1938, 1948, 1954, 1961, 1967
Marion Co.: ASCS - 1938, 1950, 1955, 1961, 1967
SCS - 1970 (1:38,000)
Polk Co.: ASCS - 1955, 1961, 1967
Story Co.: ASCS - 1938, 1953, 1958, 1965, 1972
Warren Co.: ASCS - 1938, 1950, 1955, 1961, 1967

Other Coverage

U.S.G.S. Low Altitude Photography

- A. 1947 (1:27,000) DY
- B. 1963 (1:17,000) VAUD
- C. 1967 (1:24,000) VCTL
- D. 1964 (1:34,000) SWAG
- E. 1971 (1:20,000) VCSA

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

* Cities - 1969, 1973 (1:80,000)

* Towns - 1971 (1:80,000)

* Highways

Iowa Geological Survey Imagery

a. Multispectral - 1973 (1:24,000)

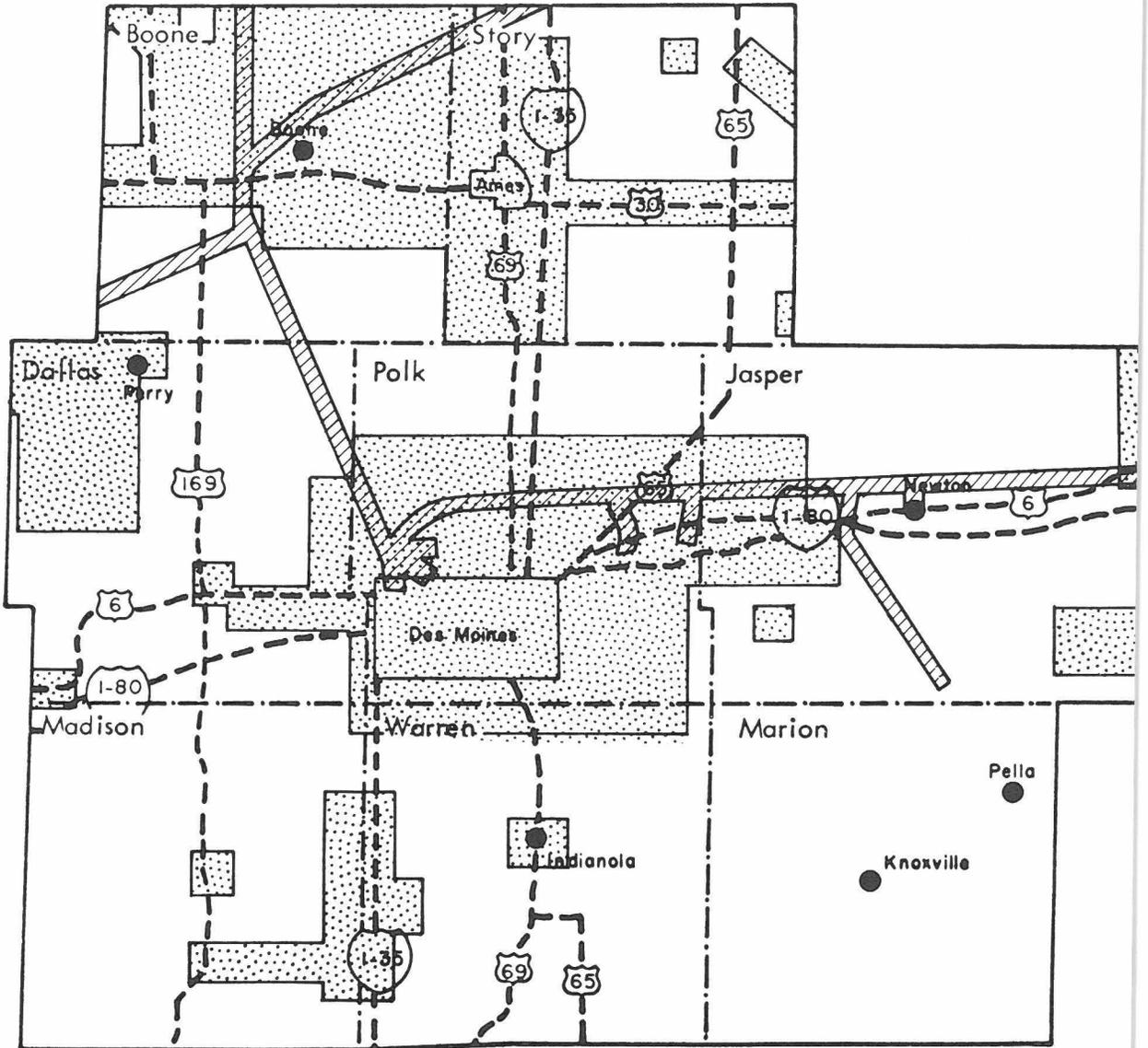
U.S. Army Corps of Engineers

Kansas City Office - 1974 (1:12,000)

*Skylab (partial coverage)

No Local Coverage

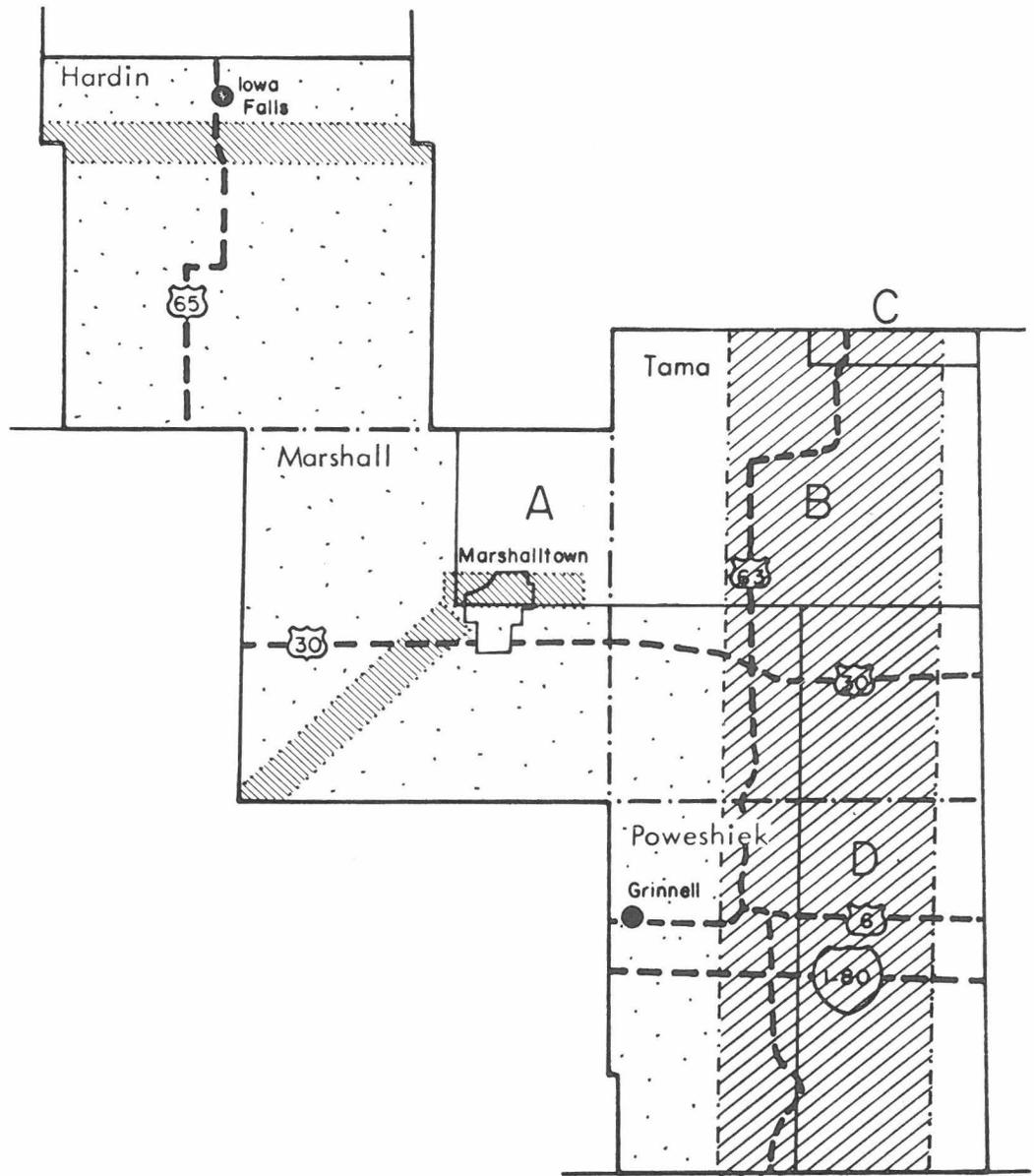
*Denotes coverage not shown on facing map



PRIVATE

Northwestern Bell Telephone Company 

Northern Natural Gas Company - 
(1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)

ERTS

*Complete County Coverage

Hardin Co.: ASCS - 1939, 1953, 1958, 1965, 1971

EPA - Color, 1972 (1:16,000)

Marshall Co.: ASCS - 1939, 1952, 1958, 1965, 1971

Poweshiek Co.: ASCS - 1941, 1951, 1956, 1963, 1970

SCS - 1972 (1:38,000)

Tama Co.: ASCS - 1940, 1951, 1956, 1963, 1970

Other Coverage

U.S.G.S. Low Altitude Photography

A. 1958 (1:17,000) VMS

B. 1967 (1:18,000) VBPW

C. 1958 (1:17,000) VSR

D. 1965 (1:20,000) VBCK

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

*Cities - 1969, 1973 (1:80,000)

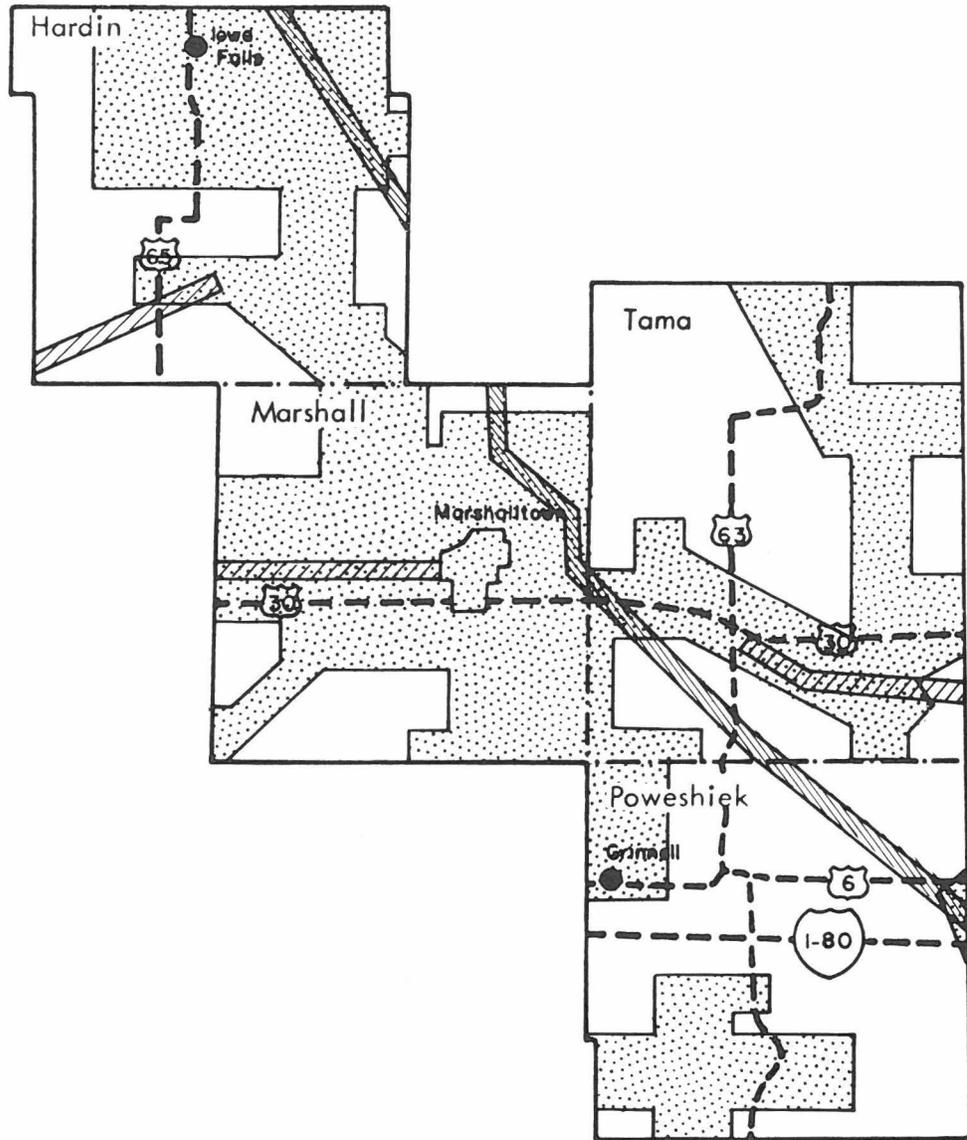
*Towns - 1971 (1:80,000)

*Highways

*Skylab

No Local Coverage

*Denotes coverage not shown on facing map

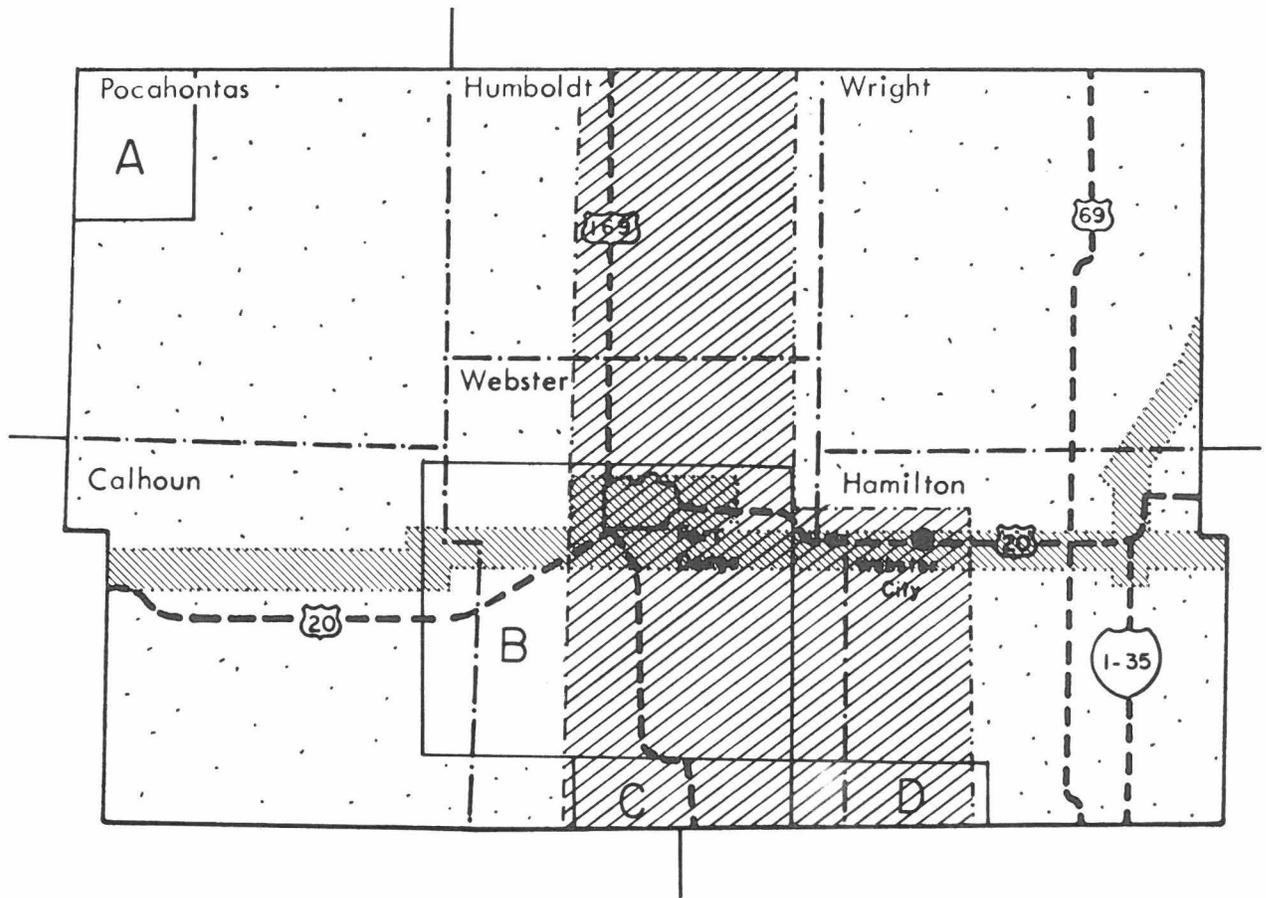


PRIVATE

Northwestern Bell Telephone Company 

Gulf Central Pipeline Company 
1968 (1:12,000)

Northern Natural Gas Company 
(1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)
ERTS

*Complete County Coverage

Calhoun Co.: ASCS - 1939, 1958, 1965, 1972
SCS - 1972 (1:20,000)
Hamilton Co.: ASCS - 1939, 1953, 1958, 1965, 1972
Humboldt Co.: ASCS - 1939, 1953, 1958, 1965, 1972
Pocahontas Co.: ASCS - 1939, 1940, 1953, 1958, 1965, 1972
Webster Co.: ASCS - 1939, 1950, 1953, 1958, 1965, 1972
SCS - 1970 (1:38,000)
Wright Co.: ASCS - 1939, 1953, 1958, 1965, 1972

Other Coverage

U.S.G.S. Low Altitude Photography
A. 1968 (1:24,000) VBZT
B. 1964 (1:20,000) VBAC
C. 1947 (1:27,000) DY
D. 1963 (1:17,000) VAUD

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

* Cities - 1969, 1973 (1:80,000)

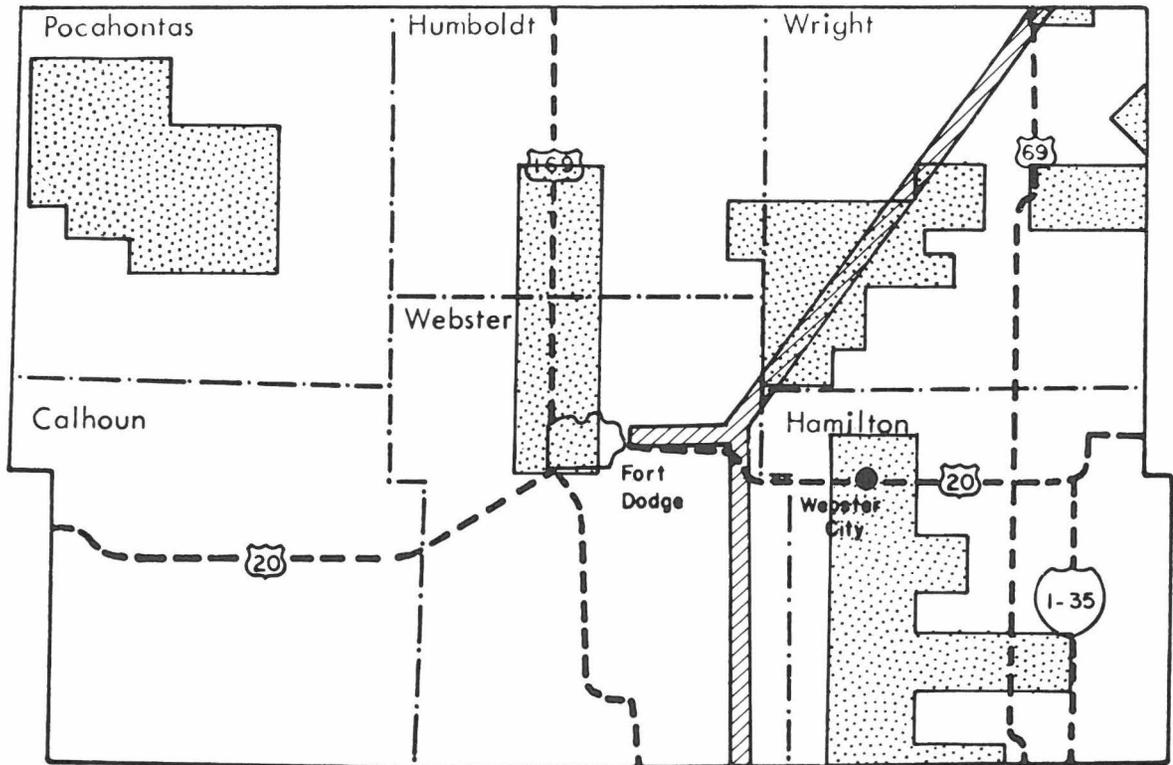
* Towns - 1971 (1:80,000)

* Highways

*Skylab

No Local Coverage

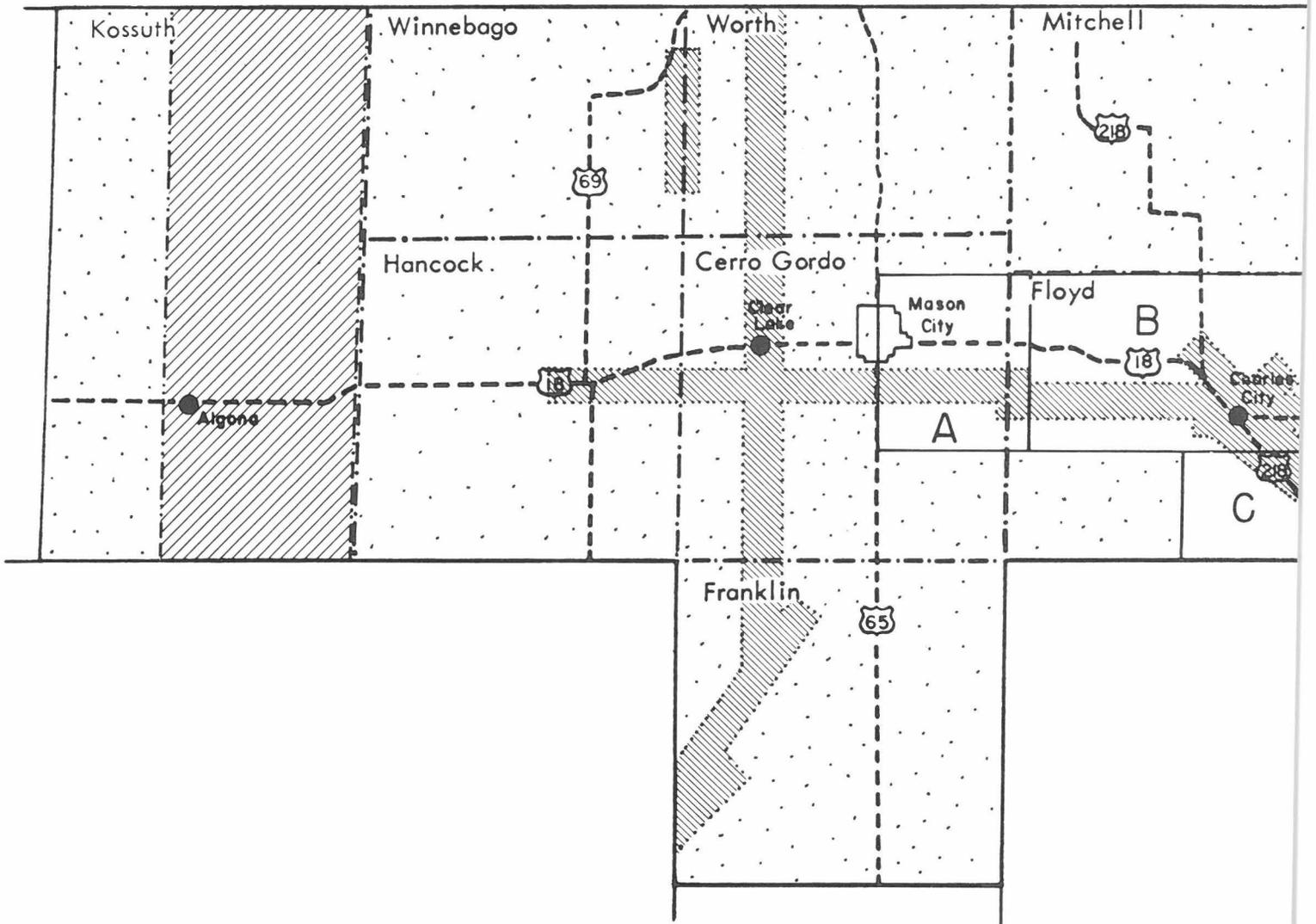
* Denote coverage not shown on facing map



PRIVATE

Northwestern Bell Telephone Company 

Northern Natural Gas Company 
(1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)
ERTS

*Complete County Coverage

Cerro Gordo Co.: ASCS - 1938, 1950, 1953, 1958, 1965, 1970
SCS - 1970, 1973 (1:38,000)
Floyd Co.: ASCS - 1952, 1957, 1964, 1971
Franklin Co.: ASCS - 1939, 1958, 1965, 1971
SCS - 1970, 1973 (1:38,000)
Hancock Co.: ASCS - 1939, 1953, 1958, 1965, 1972
Kossuth Co.: ASCS - 1939, 1953, 1958, 1965, 1972
SCS - 1972 (1:20,000)
Mitchell Co.: ASCS - 1939, 1952, 1957, 1964
SCS - 1971 (1:38,000)
Winnebago Co.: ASCS - 1939, 1953, 1958, 1965, 1972
Worth Co.: ASCS - 1939, 1953, 1958, 1965, 1971
SCS - 1971 (1:38,000)

Other Coverage

U.S.G.S. Low Altitude Photography
A. 1957 (1:17,000) VPE
B. 1967 (1:20,000) VBPV
C. 1967 (1:18,000) VBPW

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

*Cities - 1969, 1973 (1:80,000)

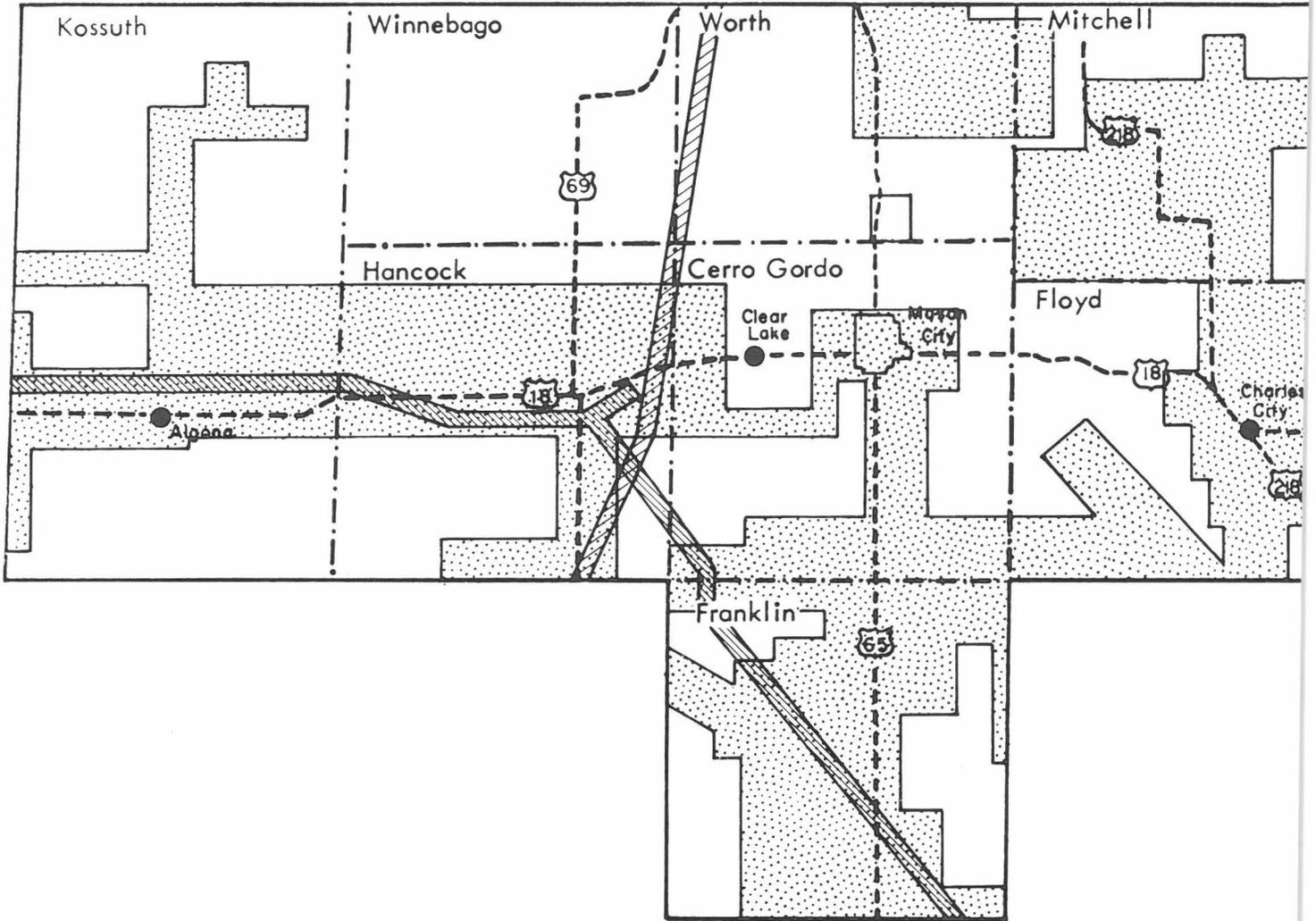
*Towns - 1971 (1:80,000)

*Highways -

Iowa Geological Survey Imagery
a. Multispectral, 1972 (1:8,000)

*Skylab (Partial Coverage)

No Local Coverage

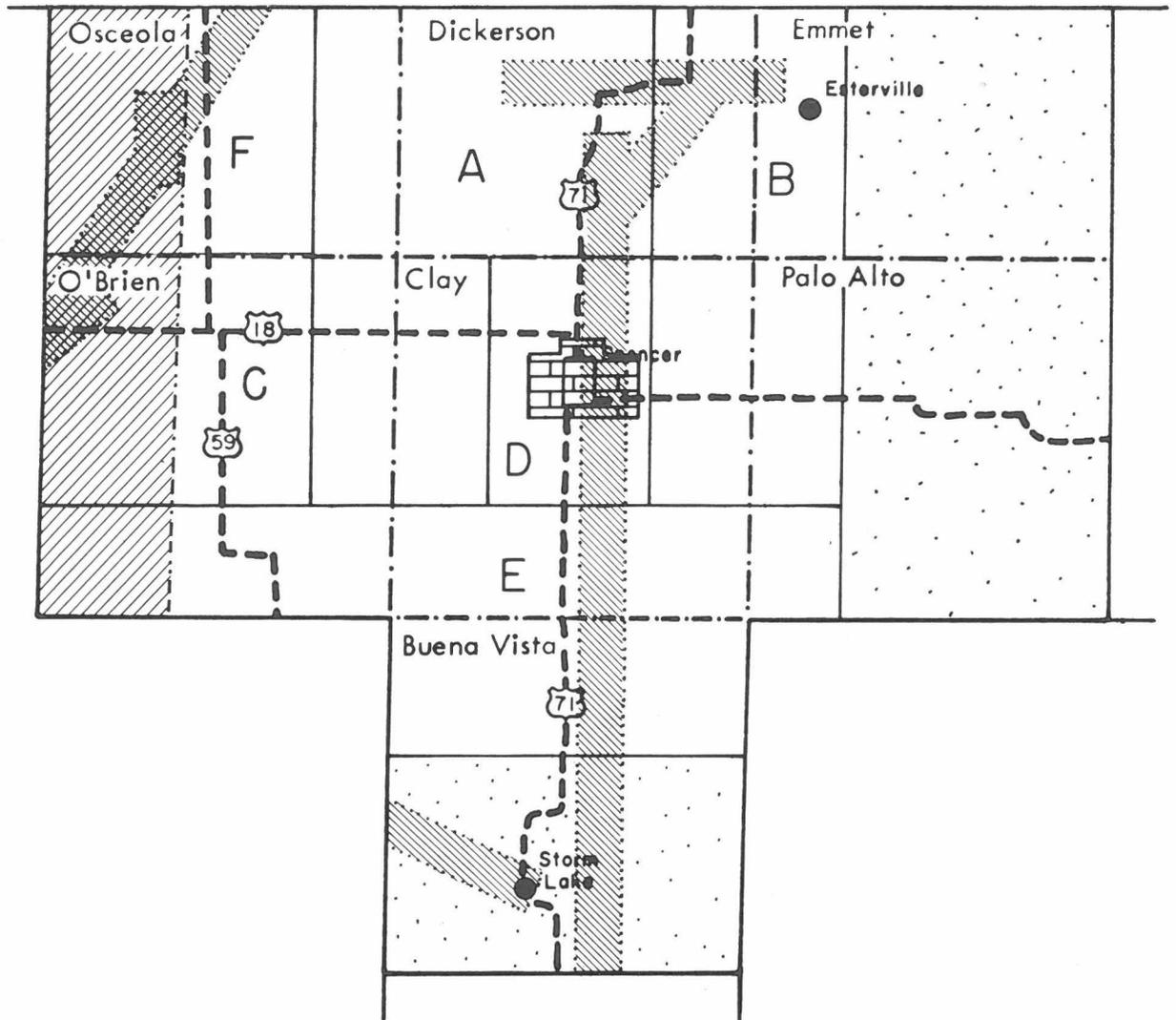


PRIVATE

Northwestern Bell Telephone Company 

Gulf Central Pipeline Company 
1968 (1:12,000)

Northern Natural Pipeline Co. 
(1:12,000)



GOVERNMENTAL

*Entire Area

U.S.G.S. High Altitude 1948-1950 (1:70,000)
ERTS

*Complete County Coverage

Buena Vista Co.: ASCS - 1939, 1949, 1954, 1961, 1968
Clay Co.: ASCS - 1939, 1949, 1955, 1962, 1968
Dickenson Co.: ASCS - 1939, 1949, 1954, 1962, 1968
SCS - 1972 (1:38,000)
Emmet Co.: ASCS - 1939, 1953, 1958, 1965, 1972
O'Brien Co.: ASCS - 1938, 1948, 1954, 1962, 1968
Osceola Co.: ASCS - 1938, 1949, 1954, 1962, 1968
SCS - Incomplete
Palo Alto Co.: ASCS - 1938, 1950, 1955, 1958, 1960, 1965, 1972

Other Coverage

U.S.G.S. Low Altitude Photography
A. 1966 (1:19,000) VBIT
B. 1970 (1:20,000) VCMG
C. 1962 (1:18,000) VANG
D. 1964 (1:18,000) VAZO
E. 1968 (1:24,000) VBZT
F. 1972 (1:21,000) VCVL

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:1,800)

* Cities - 1969, 1973 (1:80,000)

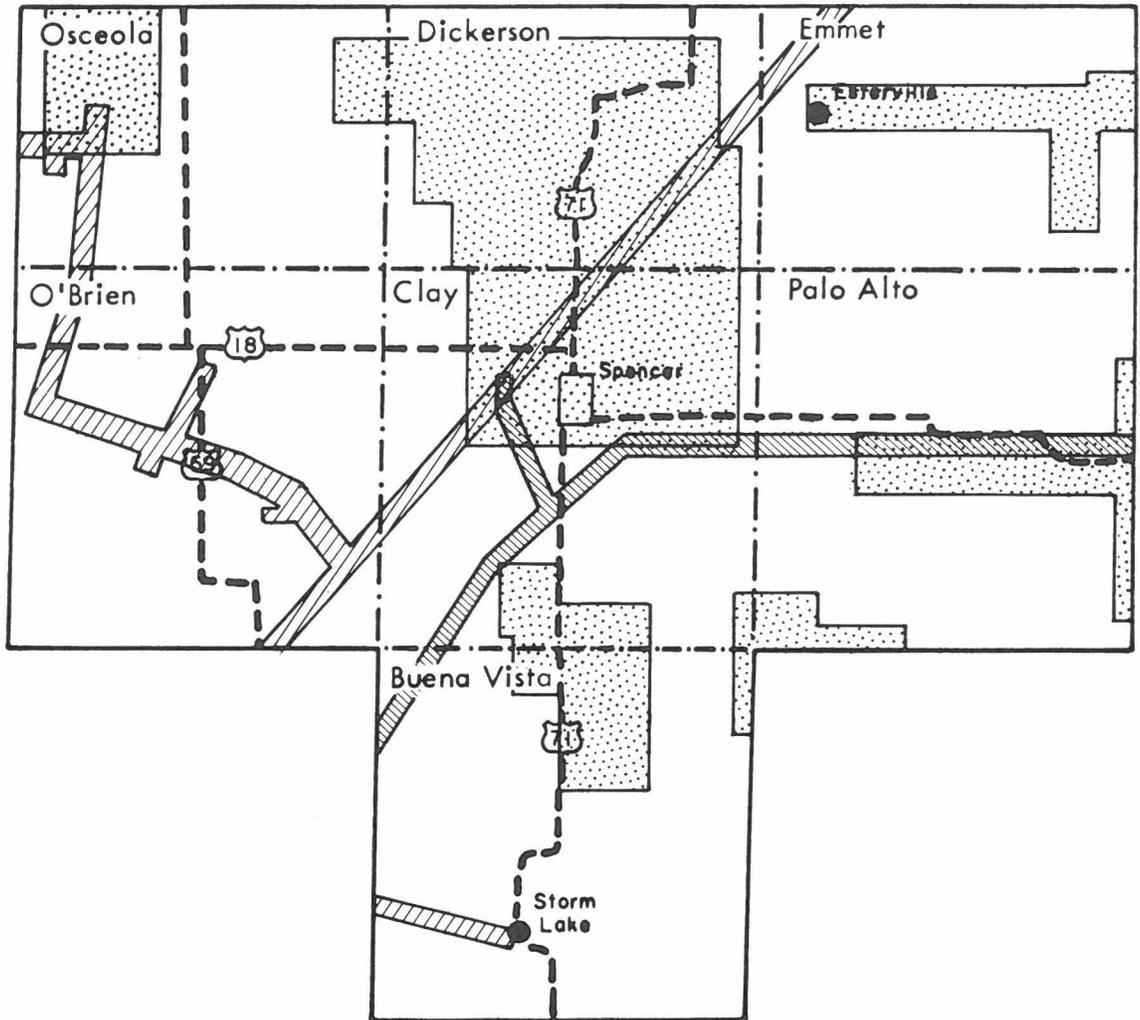
* Towns - 1971 (1:80,000)

* Highway

Iowa Natural Resources Commission

*Skylab

No Local Coverage

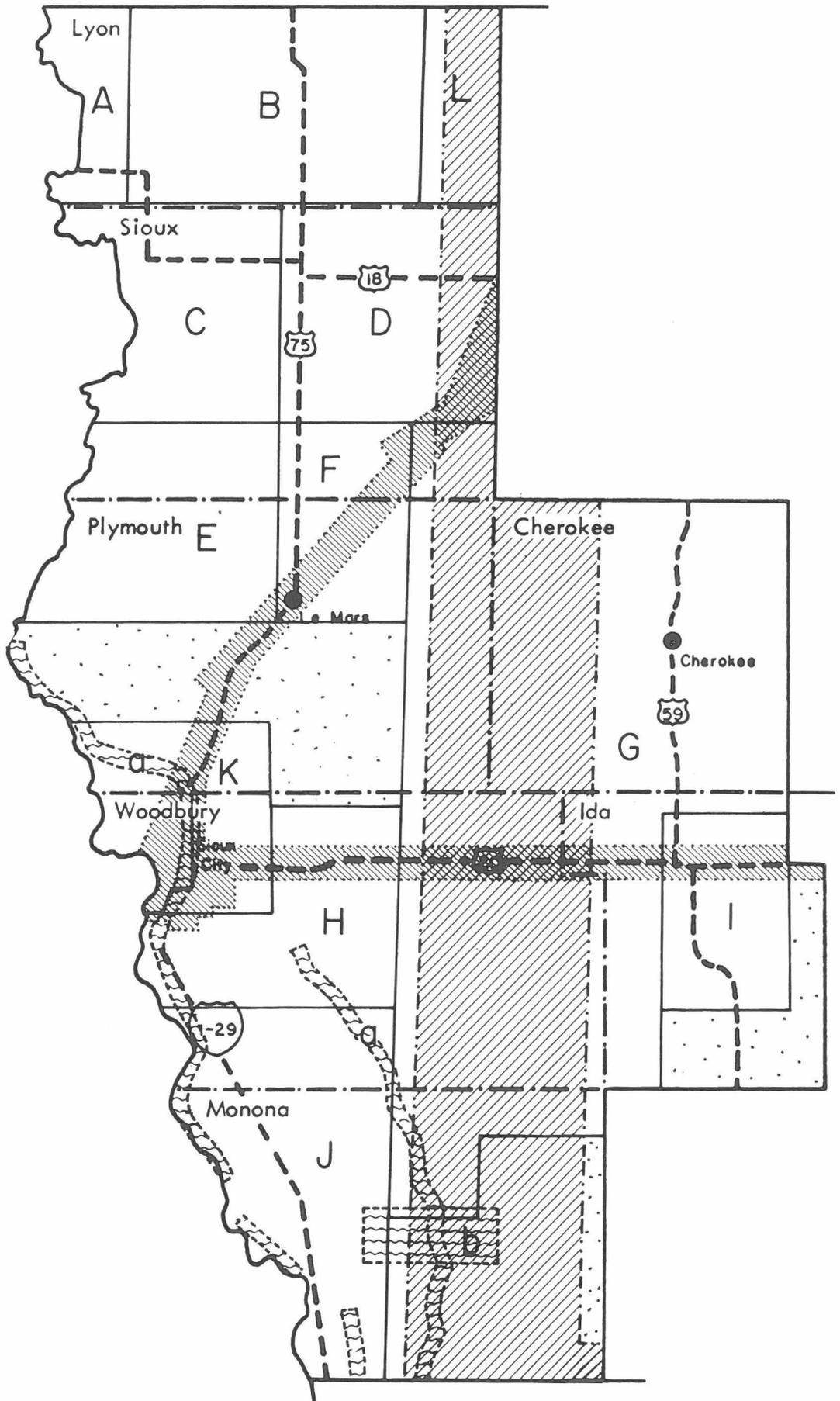


PRIVATE

Northwestern Bell Telephone Company 

Gulf Central Pipeline Company 
1968 (1:12,000)

Northern Natural Gas Company 
(1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)
or 1953 (1:69,000)
ERTS

*Complete County Coverage

Cherokee Co.: ASCS - 1938, 1949, 1956, 1961, 1968
Ida Co.: ASCS - 1938, 1949, 1958, 1961, 1968
Lyon Co.: ASCS - 1938, 1951, 1956, 1962, 1968
Monona Co.: ASCS - 1940, 1949, 1954, 1960, 1966, 1973
Plymouth Co.: ASCS - 1938, 1949, 1955, 1962, 1968
SCS - 1972 (1:48,000)
Sioux Co.: ASCS - 1938, 1949, 1955, 1962, 1968
Woodbury Co.: ASCS - 1938, 1949, 1955, 1960, 1966, 1973

Other Coverage

U.S.G.S. Low Altitude Photography

- A. 1958 (1:17,000) VSS
- B. 1969 (1:20,000) VCET
- C. 1966 (1:19,000) VBNO
- D. 1962 (1:18,000) VANG
- E. 1967 (1:13,000) VBRG
- F. 1967 (1:25,000) VBRG
- G. 1968 (1:24,000) VBZT
- H. 1962 (1:18,000) VAJB
- I. 1966 (1:21,000) VAFD
- J. 1965 (1:21,000) VBDM
- K. 1971 (1:30,000) VCQZ
- L. 1972 (1:21,000) VCVL

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

*Cities - 1969, 1973 (1:80,000)

*Towns - 1971 (1:80,000)

*Highways

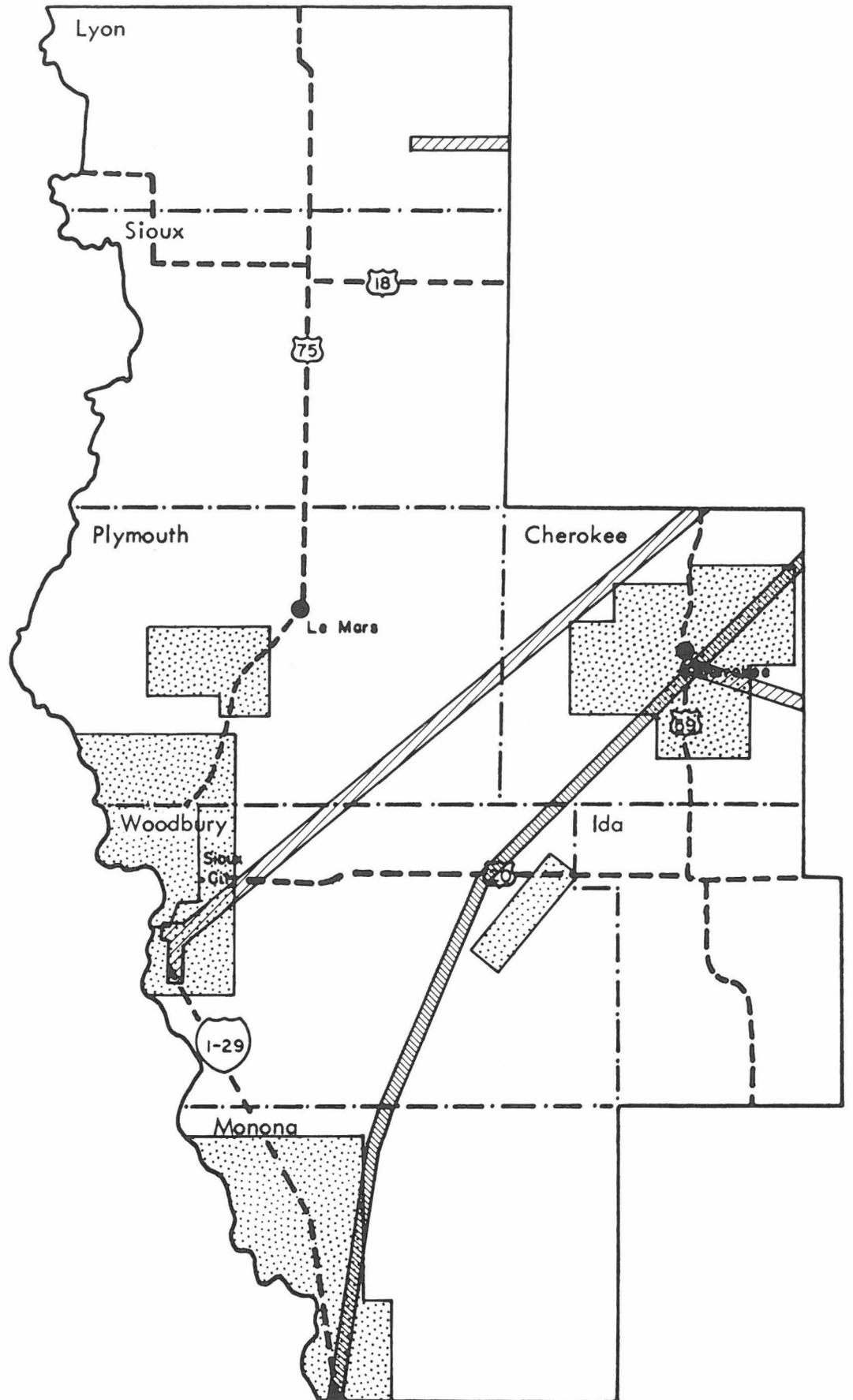
Iowa Geological Survey Imagery

- a. Multispectral - 1972 (1:12,000) or (1:6,000)
- b. Multispectral - 1973 (1:6,000 and 1:24,000)

*Skylab (Partial Coverage)

No Local Coverage

*Denotes coverage not shown on facing map

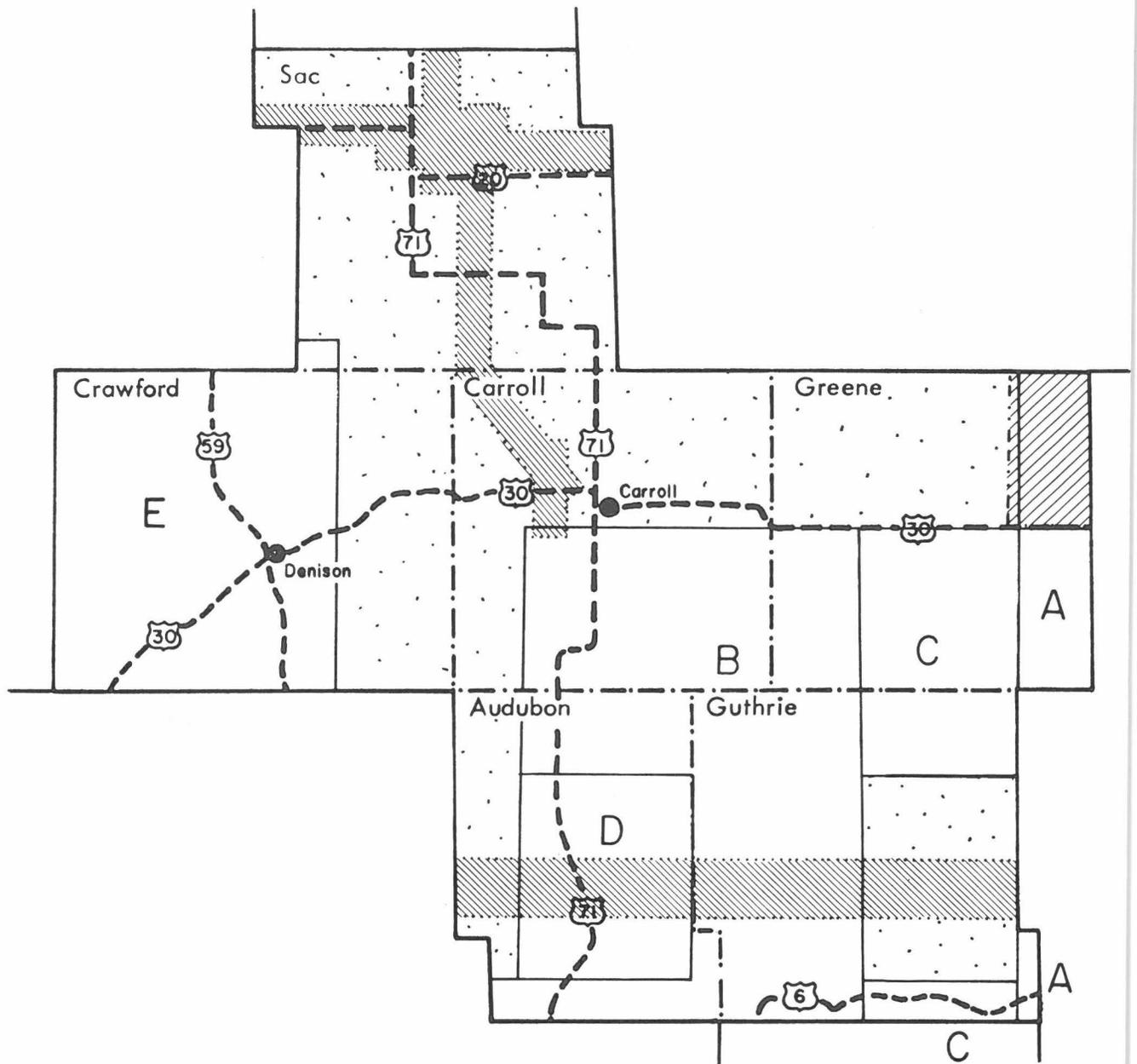


PRIVATE

Northwestern Bell Telephone Company 

Gulf Central Pipeline Company 
1968 (1:12,000)

Northern Natural Gas Company 
(1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude 1948-1950 (1:70,000)

ERTS

*Complete County Coverage

Audubon Co.: ASCS - 1938, 1950, 1955, 1961, 1962, 1968

Carroll Co.: ASCS - 1938, 1950, 1955, 1961, 1968

Crawford Co.: ASCS - 1938, 1950, 1955, 1961, 1968

Greene Co.: ASCS - 1939, 1958, 1966, 1972

Guthrie Co.: ASCS - 1938, 1950, 1955, 1961, 1967

SCS - 1970 (1:38,000)

Sac Co.: ASCS - 1939, 1949, 1950, 1954, 1961, 1962, 1968

Other Coverage

U.S. G.S. Low Altitude Photography

A. 1947 (1:27,000) DY

B. 1966 (1:23,000) VBOJ

C. 1953 (1:24,000) WY

D. 1956 (1:24,000) VMV

E. 1971 (1:24,000) VCRY

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

*Cities - 1969, 1973 (1:80,000)

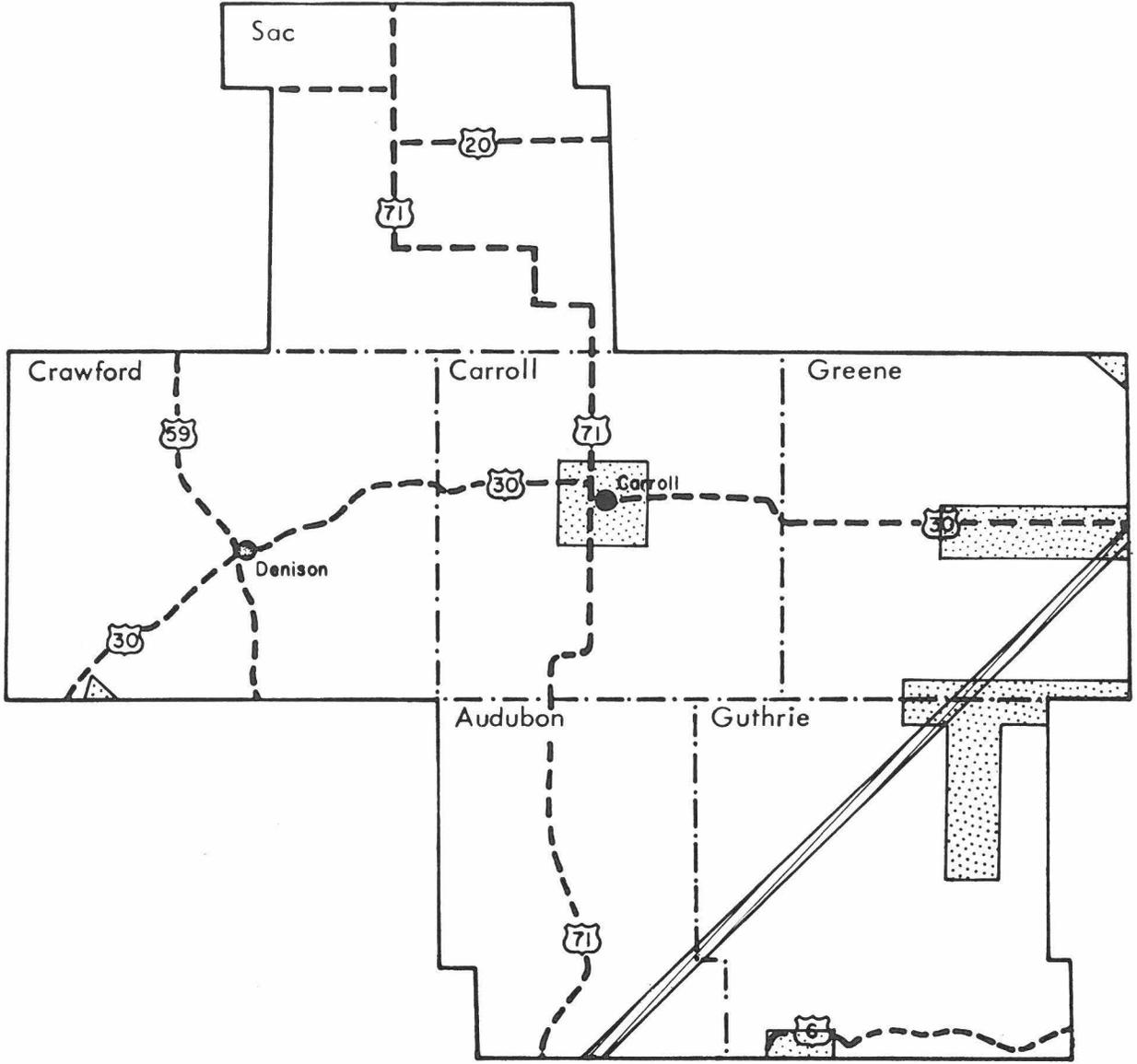
*Towns - 1971 (1:80,000)

*Highways

*Skylab

No Local Coverage

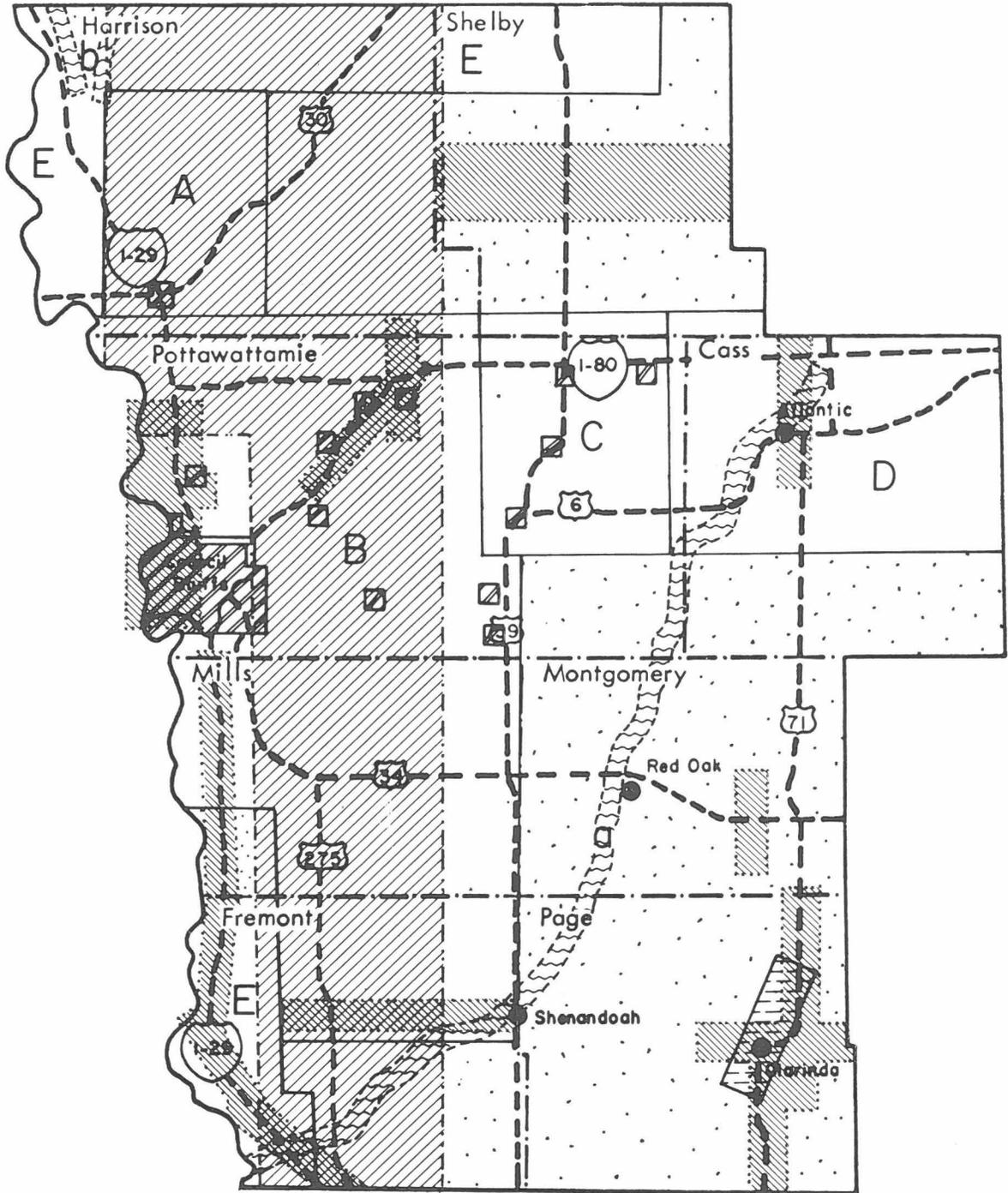
*Denotes coverage not shown on facing map



PRIVATE

Northwestern Bell Telephone Company 

Northern Natural Gas Company 
(1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude:1948-1950 (1:70,000)
or:1953 (1:67,000)

ERTS

*Complete County Coverage

Cass Co.: ASCS - 1940, 1950, 1955, 1960, 1966
Fremont Co.: ASCS - 1938, 1950, 1955, 1957, 1958, 1960, 1966, 1973
SCS - 1971 (1:48,000)
Harrison Co.: ASCS - 1938, 1949, 1954, 1960, 1966
SCS - 1972 (1:38,000)
Mills Co.: ASCS - 1935, 1938, 1950, 1955, 1960
SCS - 1972 (1:38,000)
Montgomery Co.: ASCS - 1938, 1950, 1955, 1960, 1966, 1973
Page Co.: ASCS - 1938, 1950, 1955, 1960, 1966, 1973
Pottawattamie Co.: ASCS - 1938, 1950, 1955, 1960, 1966, 1973
Shelby Co.: ASCS - 1935, 1938, 1950, 1955, 1961, 1962, 1968

Other Coverage

U.S.G.S. Low Altitude Photography
A. 1965 (1:22,000) VBDM
B. 1952 (1:17,000) TL
C. 1961 (1:18,000) VAFD
D. 1966 (1:23,000) VBOJ
E. 1965 (1:18,000) VAZB
F. 1971 (1:24,000) VCRY

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

*Cities - 1969, 1973 (1:80,000)

*Towns - 1971 (1:80,000)

*Highways

Iowa Geological Survey Imagery

- a. Multispectral - 1972 (1:16,000)
- b. Multispectral - 1972 (1:12,000 to 1:16,000)

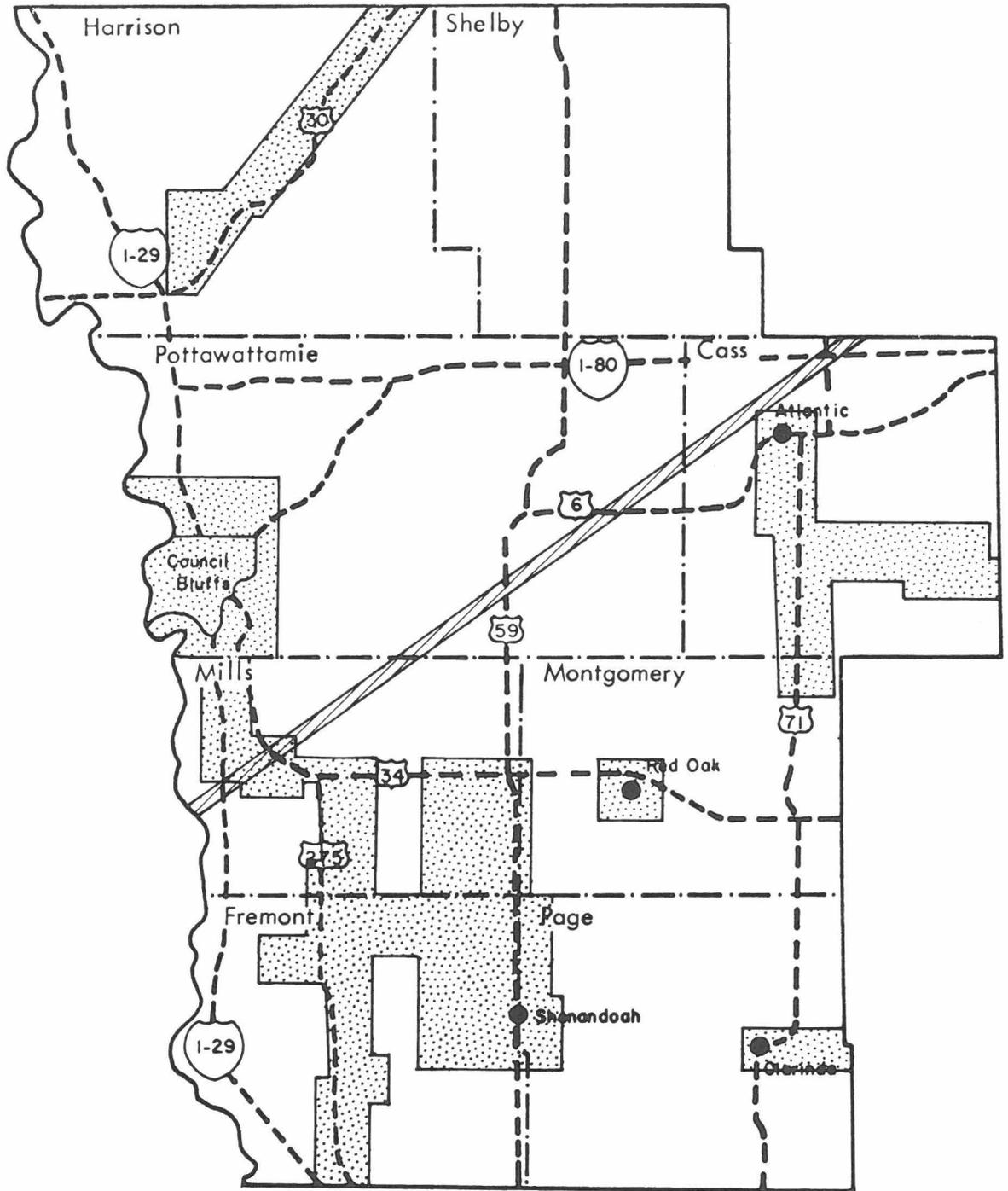
Omaha-Council Bluffs Metropolitan Area Planning Agency-1973 (1:24,000)

U.S. Army Corps of Engineers - Kansas City Office - 1974 (1:12,000)

*Skylab (partial coverage)

No Local Coverage

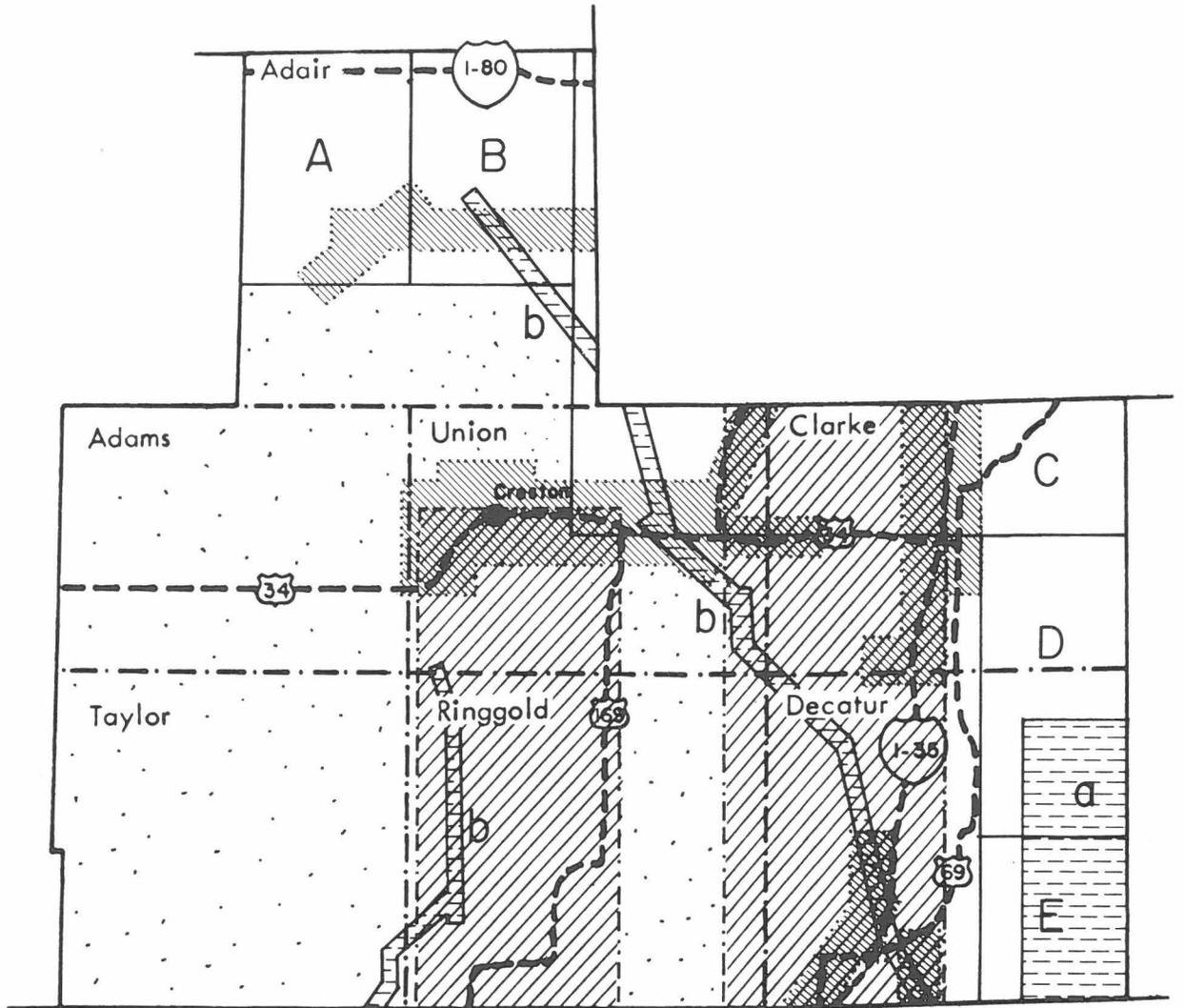
*Denotes coverage not shown on facing map



PRIVATE

Northwestern Bell Telephone Company 

Northern Natural Gas Company 
(1:12,000)



GOVERNMENTAL

*Entire Region

U.S.G.S. High Altitude: 1948-1950 (1:70,000)

ERTS

*Complete County Coverage

Adair Co.: ASCS - 1938, 1948, 1954, 1961, 1967
SCS - 1970 (1:38,000)

Adams Co.: ASCS - 1938, 1950, 1955, 1960, 1966

Clarke Co.: ASCS - 1938, 1948, 1954, 1961, 1967

Decatur Co.: ASCS - 1941, 1950, 1955, 1962, 1967

Ringgold Co.: ASCS - 1938, 1947, 1950, 1954, 1960, 1965, 1973

Taylor Co.: ASCS - 1940, 1947, 1951, 1955, 1960, 1966, 1973

Union Co.: ASCS - 1938, 1947, 1954, 1961, 1967

Other Coverage

U.S.G.S. Low Altitude Photography

A. 1966 (1:23,000) VBOJ

B. 1953 (1:23,000) WY

C. 1947 (1:27,000) DY

D. 1963 (1:18,000) VATR

E. 1962 (1:18,000) VANE

NASA Corn Blight Photography - 1971 (1:120,000)

Iowa Highway Commission Photography

Special Photography - (1:18,000)

*Cities - 1969, 1973 (1:80,000)

*Towns - 1971 (1:80,000)

*Highways

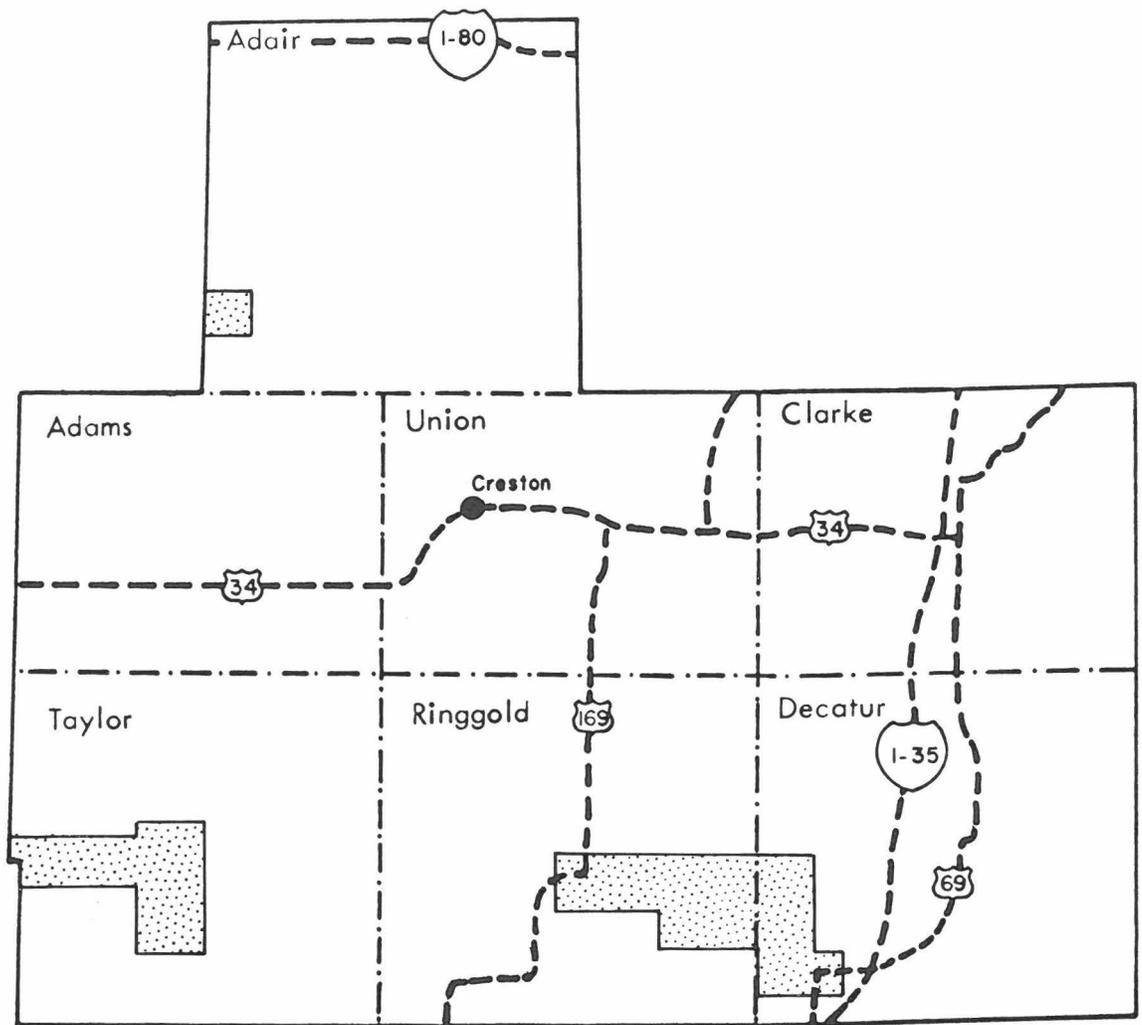
U.S. Army Corps of Engineers

Kansas City Office - 1974 (1:12,000)

*Skylab (partial coverage)

No Local Coverage

*Denotes coverage not shown on facing map



PRIVATE

Northwestern Bell Telephone Company 

INDEX TO REGIONAL AERIAL
PHOTOGRAPHY OF IOWA

United States Geological Survey

Low Altitude

The *U.S. Geological Survey*, in conjunction with its 7½ minute topographic mapping program, has produced black and white aerial photographs since 1947 at scales from 1:17,000 to 1:34,000 of select areas of the state. Most of these photographs are no older than 1963. The cameras used in almost all cases utilized 6-inch focal length lenses. The only exceptions were the 1947 imagery in which a 5.2-inch focal length lens was used and the 1964, 1:34,000 scale imagery which used a 3.5 inch lens.

The areas covered by this photography are shown as the unshaded portions of the map on page 97. The areas are shown in greater detail on the maps of governmental imagery found on pages 28 thru 93 of this report. The project symbol of each area can be found after the scale representation on the page facing these multicounty maps. This symbol should be included when ordering this imagery. An order form can be found on page 100. This form should be mailed to:

*EROS Data Center
Sioux Falls
South Dakota 57198*

High Altitude

The *U.S.G.S.* has also generated higher altitude black and white photography, in association with the *Army Map Service*, for use in producing the 1:250,000 scale NK series topographic maps. A 6-inch focal length lens was used. The map on page 99 shows the area of coverage, and the following chart relates date, scale, and project symbol to the map area number.

<u>Area Number</u>	<u>Date</u>	<u>Scale</u>	<u>Project Symbol</u>
1	1957-58	1:66,000	161-BJ
2	1948-49-50	1:70,000	70A
3	1956	1:60,000	55-AM-32
4	1956	1:60,000	55-AM-33
5	1953	1:69,000	132-AX
6	1953	1:67,000	128-AR

The same order form for the low altitude U.S.G.S. imagery can be used for the high altitude. This form is on page 100 and should be mailed to:

*EROS Data Center
Sioux Falls, South Dakota 57198*

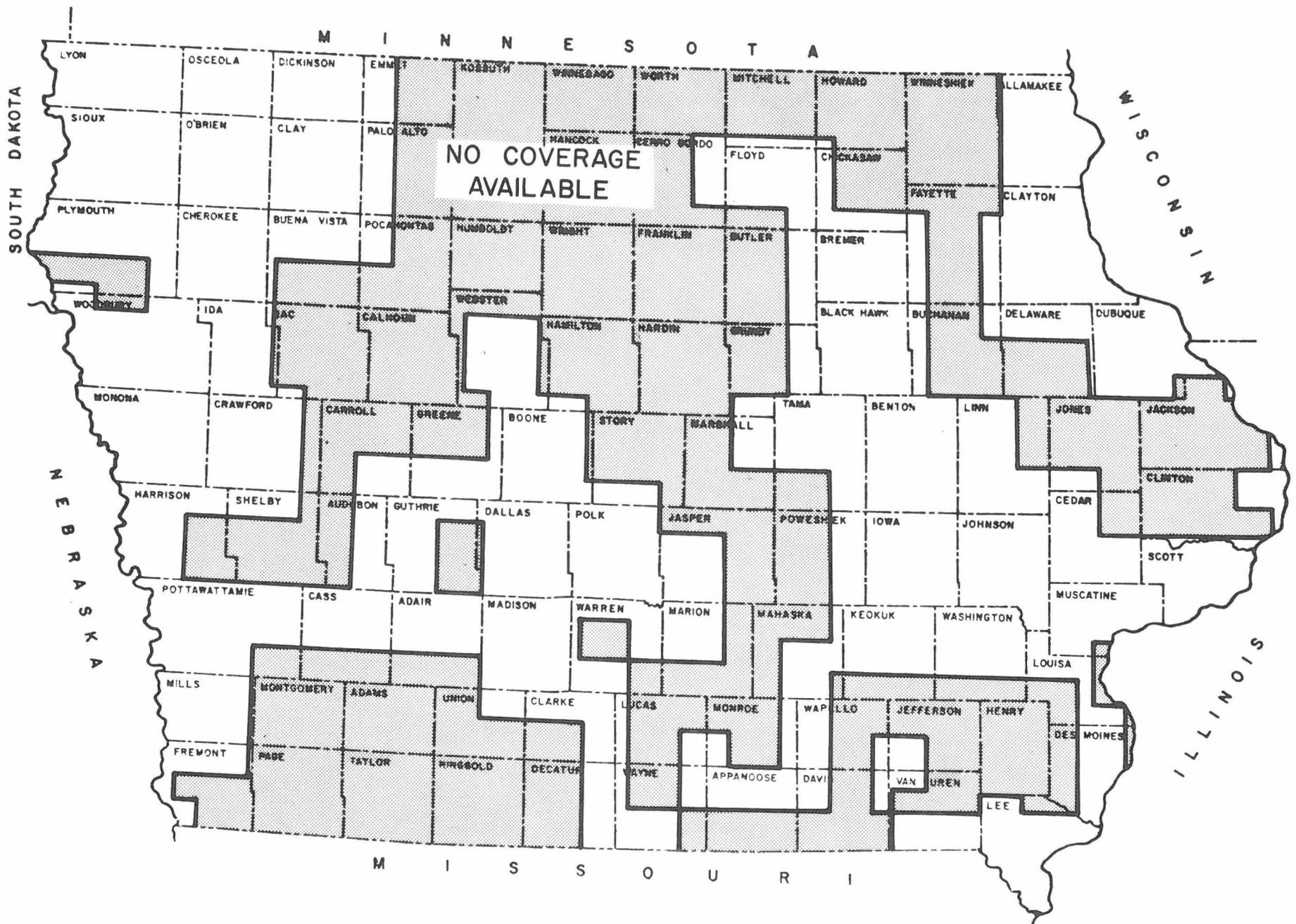


Figure 12. Low Altitude U.S.G.S. Photographic Coverage

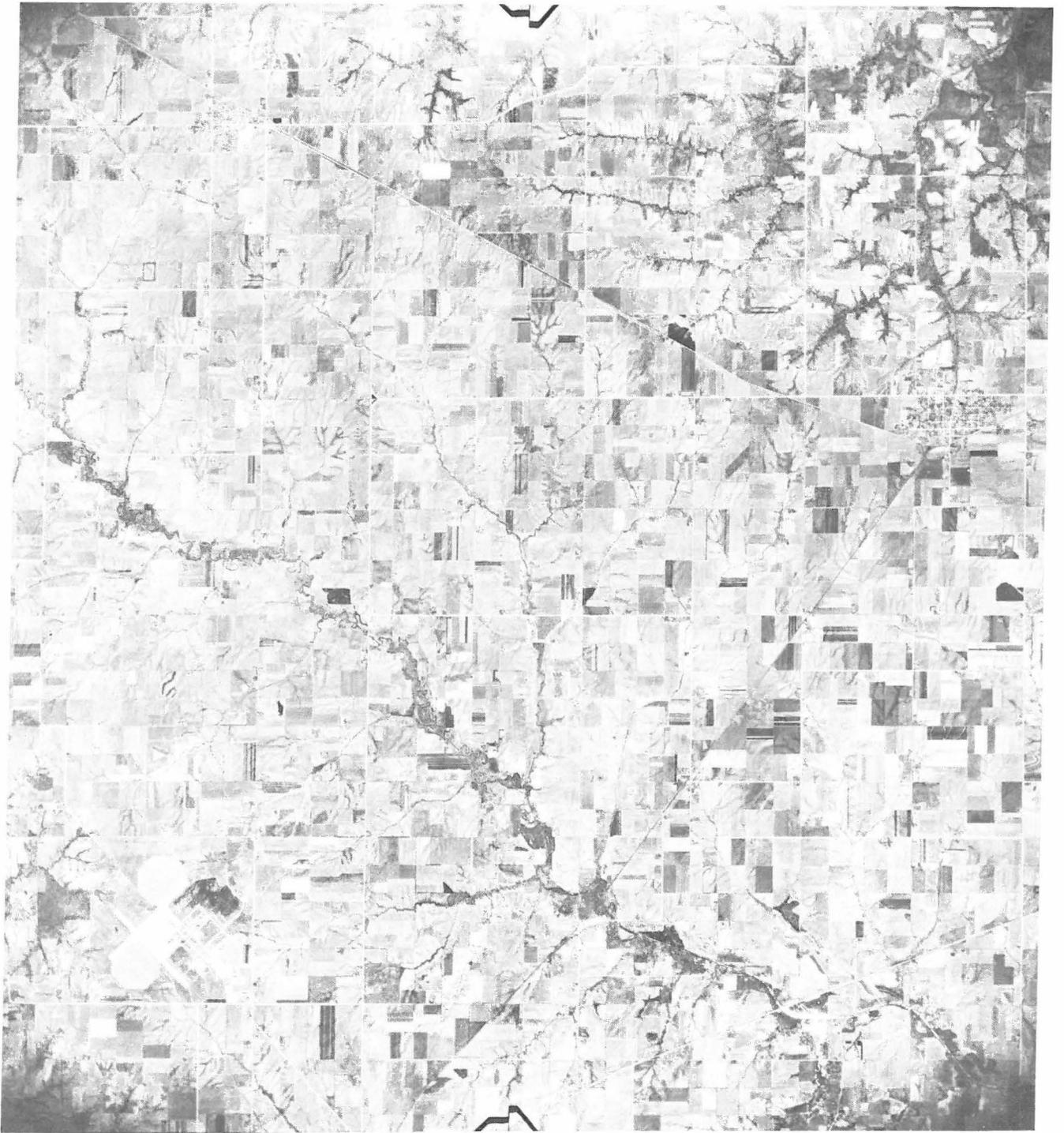


Figure 13. U. S. Geological Survey High Altitude Photograph
of the Ottumwa Airport and Parts of Wapello, Mahaska, and Keokuk Counties.
(Reduced from 9"x9".)

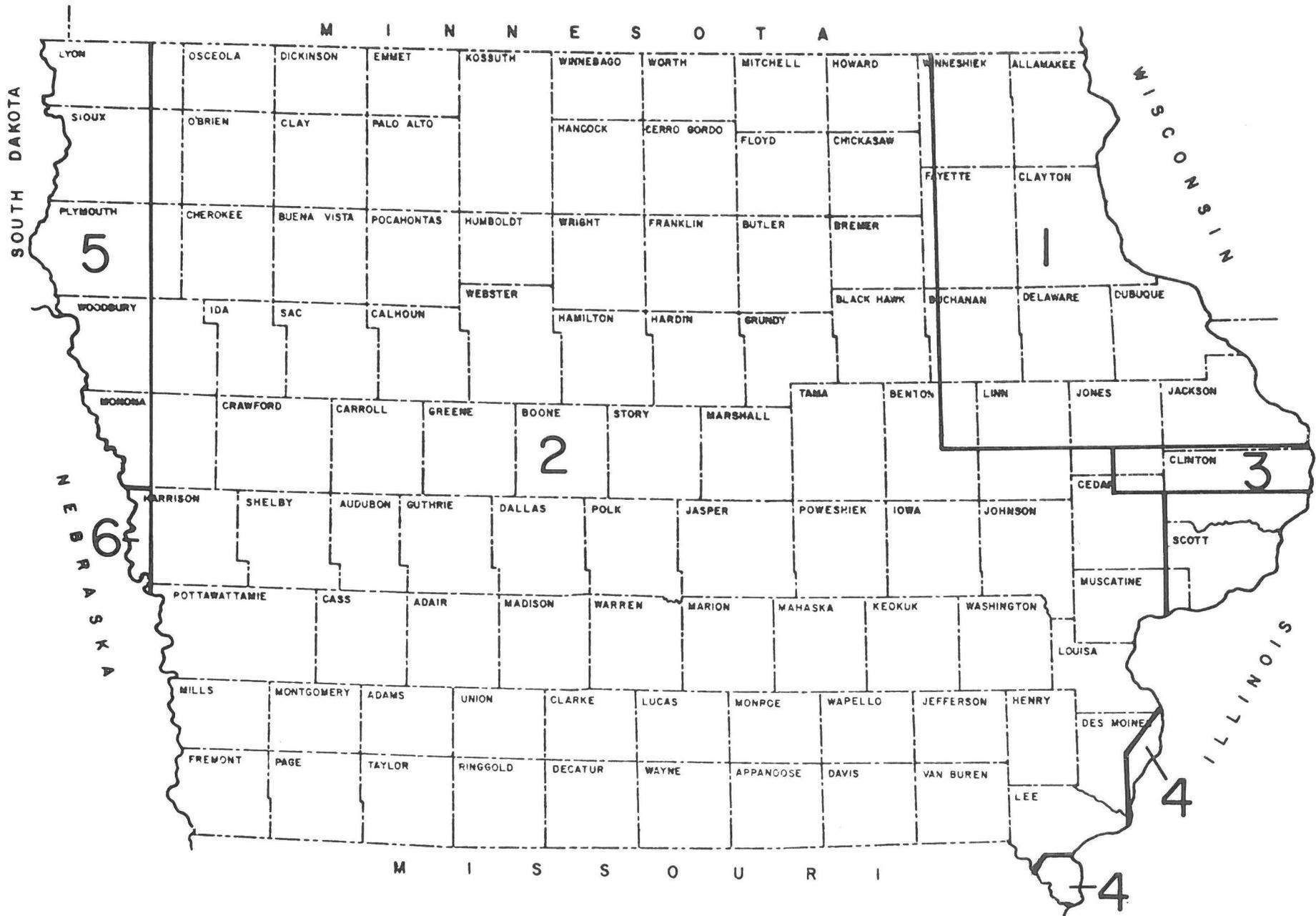


Figure 14. High Altitude U.S.G.S. Photographic Coverage Areas.

ORDER FORM
(please print or type)

For reproductions to be provided by:
EROS DATA CENTER
 Sioux Falls, SD 57198
 Commercial: 605-594-6511
 FTS : 605-594-6151

From imagery flown by:
U.S. GEOLOGICAL SURVEY
 Date _____
 Total \$ _____

NAME _____	PHONE _____
ADDRESS _____	Commercial _____
_____	Federal Telecommunications System
_____	(FTS) _____

DATA IDENTIFICATION		ROLL	STRIP	FRAMES
PROJECT SYMBOL	TO	FROM	TO	TO

IMAGERY DESIRED	UNIT PRICE		QUANTITY	TOTAL PRICE	ENLARGEMENT FACTOR	IMAGERY DESIRED	UNIT PRICE		QUANTITY	TOTAL PRICE	ENLARGEMENT FACTOR
	1-25	25**					1	2 OR MORE			
Black & White						Color					
Prints						Prints					
Contact Size						Contact Size					
9" x 9"	\$1.75	\$1.25			//////////	9" x 9"	\$7.00	\$5.00			//////////
10" x 12"***	2.50	2.50			//////////	Enlargements*					
20" x 24"	3.00	3.00			//////////	20" x 20"	15.00	9.00			
Enlargements*						30" x 30"	20.00	14.00			
20" x 20"	3.50	3.00				40" x 40"	25.00	20.00			
30" x 30"	4.50	3.50				Transparencies					
40" x 40"	9.00	8.00				Contact Size					
Transparencies						10" x 10"	10.00	8.00			//////////
(Specify Pos. or Neg.)						Enlargements*					
Contact Size						20" x 20"	20.00	15.00			
10" x 10"	3.00	3.00			//////////	30" x 30"	30.00	25.00			
Microfilm						40" x 40"	40.00	35.00			
16mm (100 ft. Roll)	10.00	10.00			//////////	Microfilm					
35mm (100 ft. Roll)	11.50	11.50			//////////	16mm (100 ft. Roll)	20.00	20.00			//////////
Transformed prints from either convergent or transverse low-oblique photographs	3.50	3.00			//////////	35mm (100 ft. Roll)	25.00	25.00			//////////
Total of A (enter in line A below)	//////////	//////////	//////////		//////////	Total of B (enter in line B below)	//////////	//////////	//////////		//////////

*Indicate enlargement factor in four(4) digits with an appropriately placed decimal point; such as: 5.00, 10.25, or 0.50.
 **Quantity prices apply only to those prints ordered in excess of 25 of the same size, i.e., 25 contact prints cost: 25 at \$1.75 each = \$43.75 plus 1 at \$1.25 = \$45.00.
 ***Available enlargers can accommodate only 9 x 9 format, therefore enlargements from 9" x 9" negatives can only be printed in two segments. For an intermediate-size enlargement, use price listed for the next larger size.

PRINTING INSTRUCTIONS

Check whether product should be:

1. **Undodged** (Reproductions will normally be dodged electronically or manually to achieve a uniform density over the image area. Check this item if you plan to use the image for radiometric analysis, in which case the density distribution in the original material will be preserved.)

2. **Print to:**
 Accentuate highlighted areas
 Normal
 Accentuate shadowed areas

3. **Special requirements:**

PRICE CALCULATION

A. Total from A (above) \$ _____

B. Total from B (above) + \$ _____

C. Total cost of reproductions (A + B) \$ _____

Plus Cost of Shipping

D. Regular Mail \$ 0.00

E. Air Mail (\$2 + 1% of line C) \$ _____

F. Total price of order (C + D + E) \$ _____

Payment Made By:

Purchase Order No. _____

Check No. _____

Government Account No. _____

EDCOM FORM 4
(REV. 11/8/73)

NASA

The *National Aeronautics and Space Administration* has a high altitude, 60,000 feet and above, imagery over much of Iowa. Most of this information, however, is not available.

Some *NASA* flights are public information. In 1971 they cooperated with the *U.S. Department of Agriculture* to obtain color infrared photography for use in corn blight studies. Flown at 60,000-65,000 feet with a 6-inch focal length lens, four strips of coverage include areas of Iowa (see the map on page 193, the unshaded areas indicate coverage). Each covered area was photographed on eight separate occasions from June through September. Details of the areas covered by *NASA Cornblight* imagery can be found on the governmental imagery maps on pages 29 thru 93 of this report. The *Iowa Geological Survey* has a copy of some of this photography available for examination. Copies can be obtained from the *EROS Data Center* in Sioux Falls, South Dakota.

One other *NASA* aerial photographic mission over Iowa is available to the public. This mission flown on November 28, 1973, covered an area 50 miles wide running from Tama and Poweshiek Counties over Des Moines and out of the state over Council Bluffs (see the map on page 105). Both color and color infrared films were produced with a 6-inch focal length camera and at a scale of 1:180,000. The *Iowa Geological Survey* has a copy of this imagery, and copies can be obtained from the *EROS Data Center* in Sioux Falls.

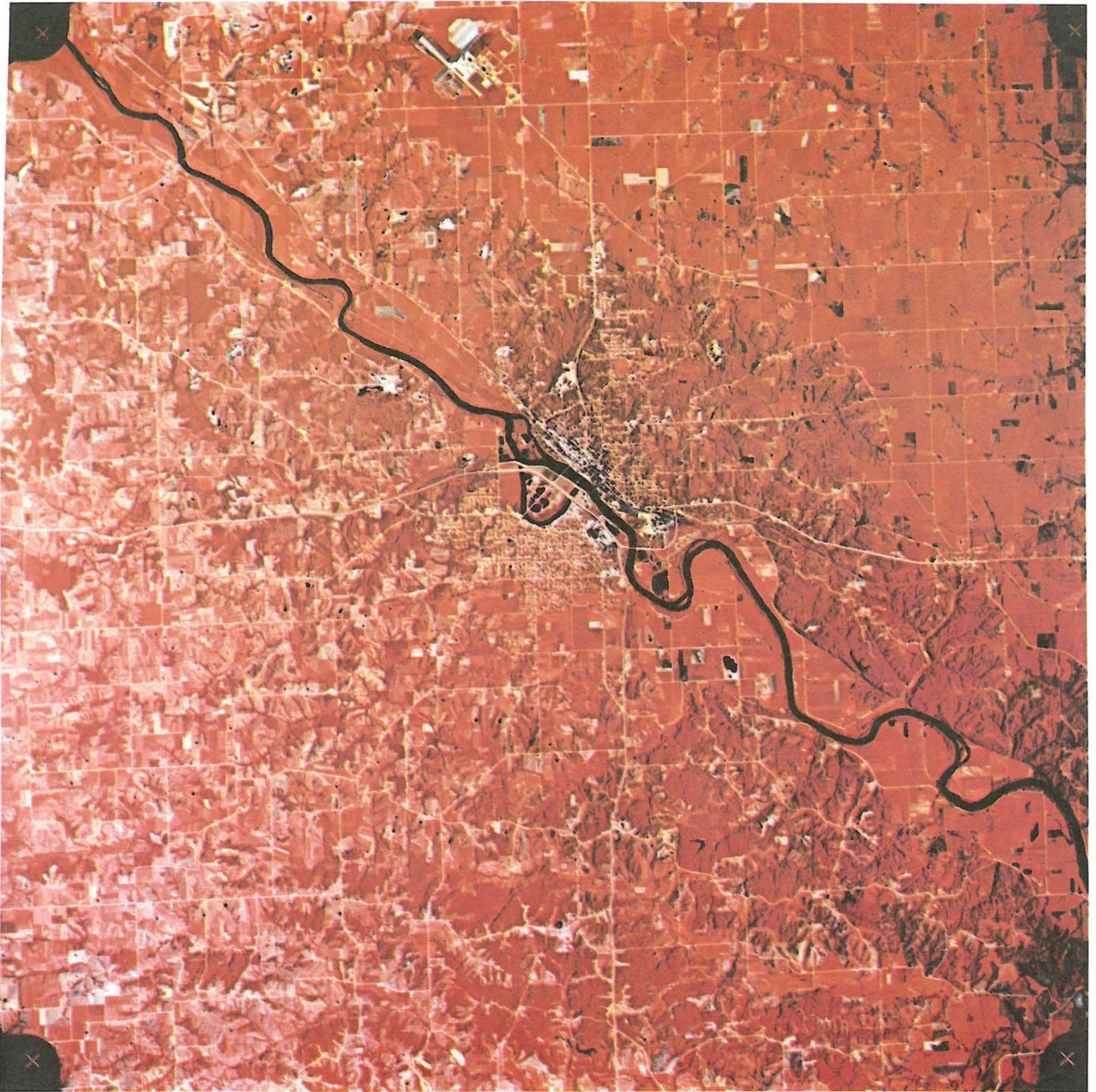


Figure 15. NASA Color Infrared Cornblight Photograph of the Ottumwa Area (reduced from 9"x9").

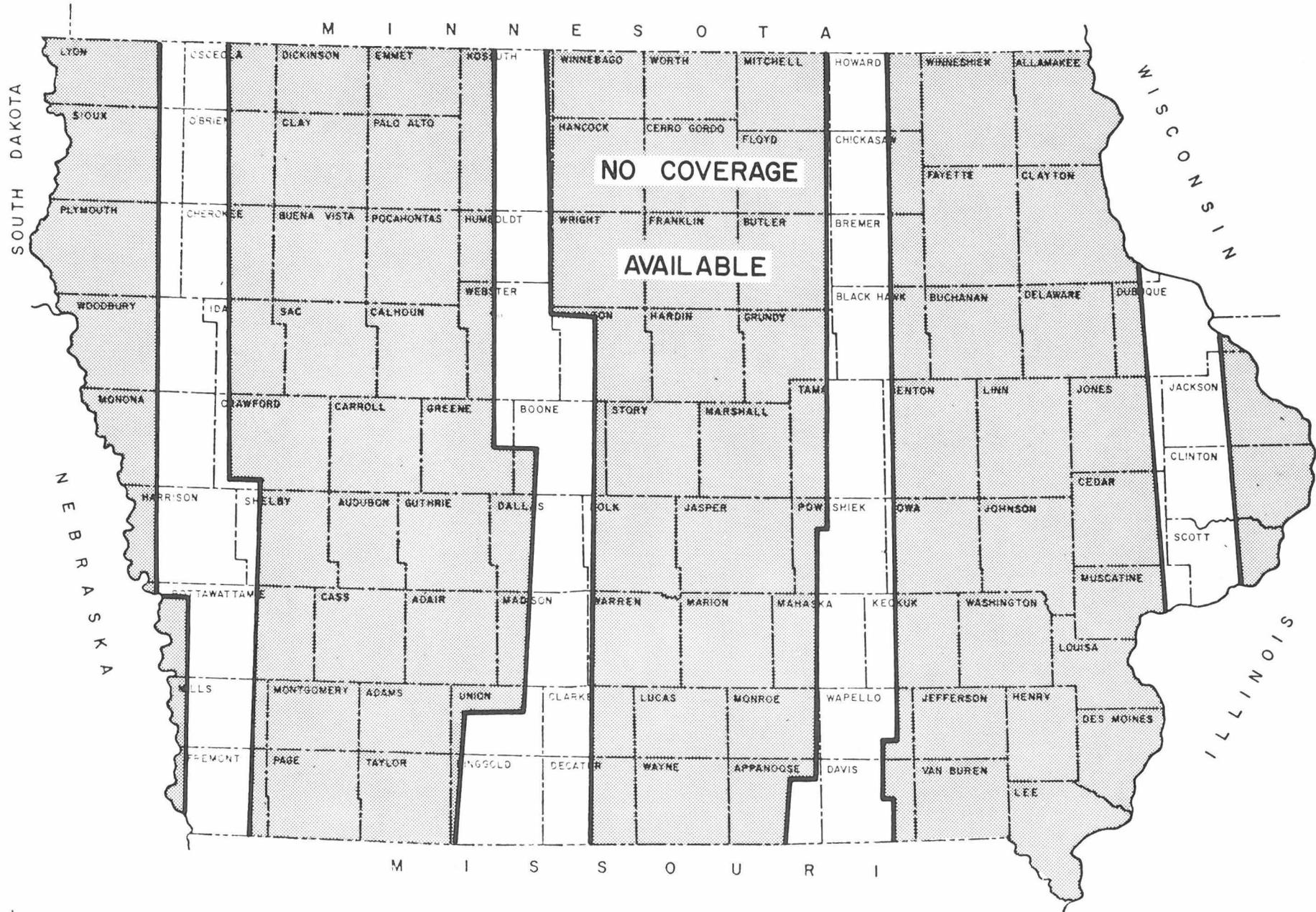
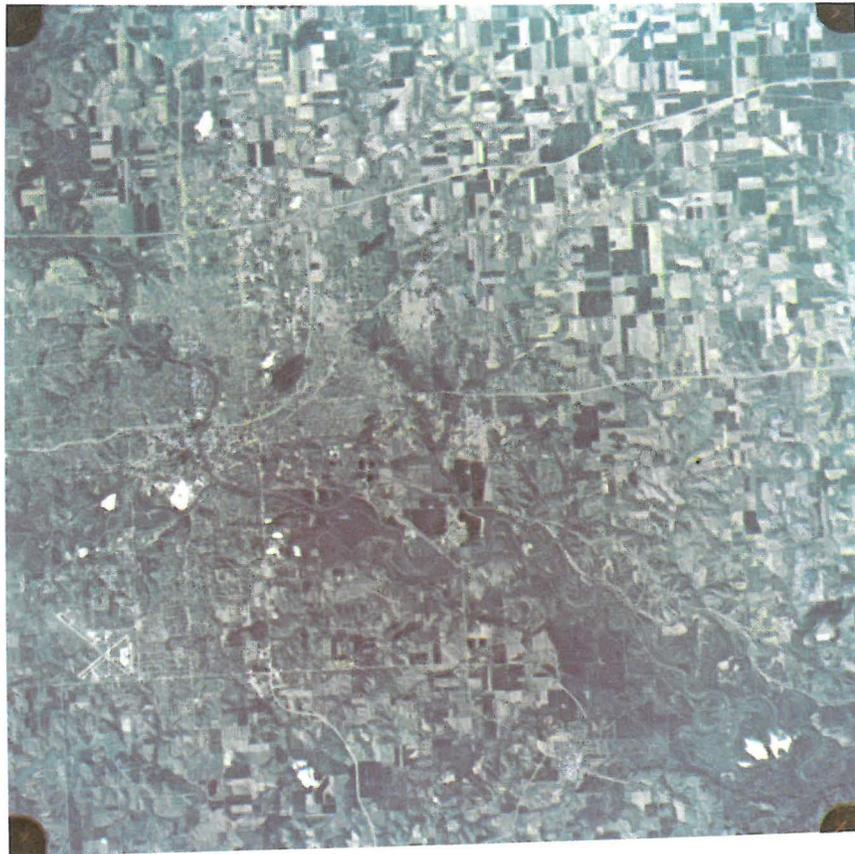


Figure 16. NASA Corn Blight Photography Coverage.

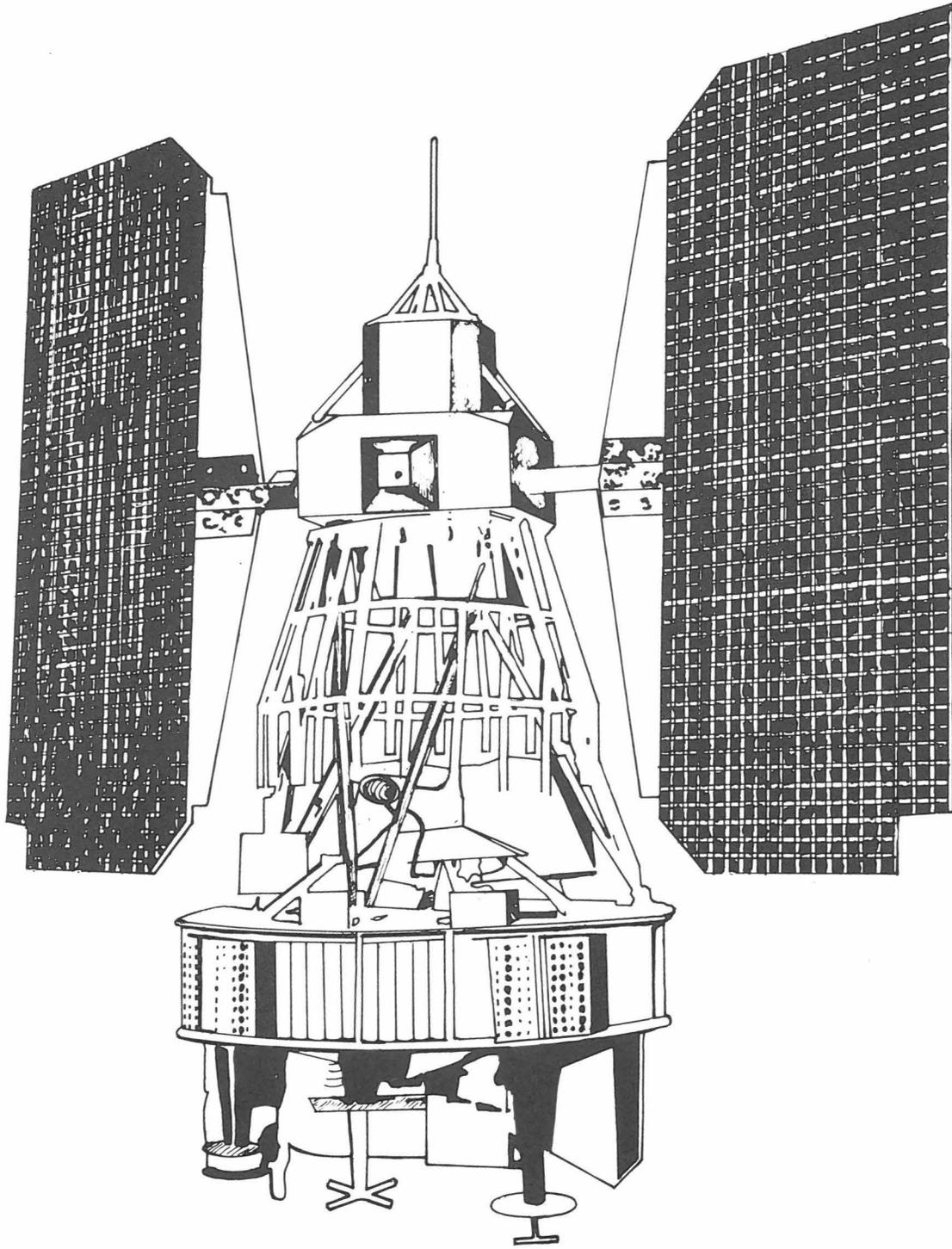
Figure 17. NASA High Altitude Photography of Des Moines (reduced from 9"x9").

Color



Color Infrared





ERTS
EARTH RESOURCES TECHNOLOGY
SATELLITE

ERTS-1

ERTS-1, the *Earth Resources Technology Satellite*, was launched in July, 1972. It was the first satellite to be launched with the express purpose of examining the earth for its resources, pollution detection, and other non-military functions. ERTS-1 orbits the earth every 18 days, at an altitude of 560 miles taking a total of five to six days to complete its imaging of Iowa. This means that every 18 days a new image of the state is available, cloud cover permitting.

The imaging system aboard the ERTS-1 is a *Multispectral Scanner System (MSS)* which looks at points on the earth's surface, measures the intensity of the light reflected from each point and transmits the information back to earth. Ground stations receive the telemetered data and construct pictures in a manner not unlike a television receiver. The images constructed at the ground receiving stations are preserved on 70 mm film at a scale of 1:3,700,000 (115 miles on a side). The *MSS* examines four unique wavelength ranges or *bands*. They are *Band 4* (.5 to .6 or green light), *Band 5* (.6 to .7 or red light), *Band 6* (.7 to .8 or red-to-infrared light) and *Band 7* (.8 to 1.1 or infrared light). This means that for each 115 mile square area, the *MSS* generates four images, that are transmitted to earth. These individual black and white images can be assigned different colors, and then combined to produce a color image of the area. Other color combinations can be used to accentuate desired features.

To obtain copies of ERTS imagery, the map on page 114 should be examined and the *image center* nearest the area of interest identified. From the list beginning on page 115 the *image date* desired should be matched to the *image center* and the order number obtained. The proper band or bands should next be determined. *Band 7* is best for land-water discrimination. *Band 5* is best for showing topographic and cultural features, such as drainage patterns, roads and towns. *Band 4* sometimes discriminates the depth and/or turbidity of standing bodies of water. *Band 6* shows the best land use information and maximum land-water contrast. For general display purposes *Band 5* will usually be the best selection. With this information the order form on page 122 should be filled out as completely as possible and mailed to EROS Data Center, Sioux Falls, South Dakota 57198.



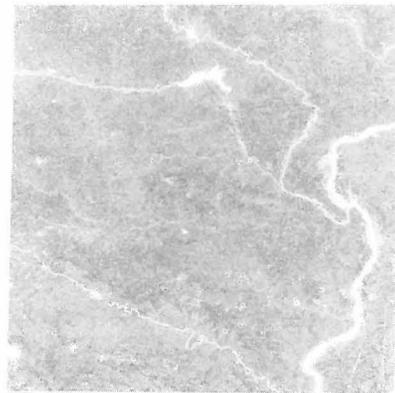
Band 4, green band



Band 6, red-infrared band



Band 5, red band



Band 7, infrared band

Figure 19. Photographs of Eastern Iowa
Produced from data transmitted from the ERTS.

BEST ERTS IMAGES

NASA has recently completed construction of a photomosaic map of the United States from ERTS imagery. The best available ERTS image of each area was used for the mosaic. The map on page 113 shows the image numbers used for construction of the Iowa portion. The boxed in areas show the area covered by a representative frame and its overlapping relationship with surrounding frames. For those who are interested in an ERTS image of their area, and the time of year that the area was imaged is not important, these images are probably the best to order. To order find the image center closest to the area of interest and draw a box around it, similar in shape and orientation to the example around the center. If the area you wish covered falls within the box then that is the frame to order. Two order forms can be found on page 111. Fill one out and mail it to the EROS Data Center, Sioux Falls, South Dakota 57198.

Special order forms to be used to order the special ERTS images used by NASA to make a photomosaic map of the United States.



1 ENTER MAP REFERENCE NUMBER

PLEASE PRINT:

4 NAME: _____
 ADDRESS: _____

5 MAIL WITH CHECK OR MONEY ORDER TO:
 U.S. GEOLOGICAL SURVEY
 EROS DATA CENTER / SIOUX FALLS, S.D. 57198

Q 00030697

2 CHECK PRODUCT DESIRED (one product per order card)

BLACK & WHITE PHOTOS		CHECK ONE
SINGLE PHOTO	9" X 9" (1:1,000,000)	<input type="checkbox"/> \$2.00
	20" X 20" (1:500,000)	<input type="checkbox"/> \$5.00
COMPLETE SET	9" X 9" (1:1,000,000)	<input type="checkbox"/>
COLOR PHOTOS		
SINGLE PHOTO	9" X 9" (1:1,000,000)	<input type="checkbox"/> \$7.00
	20" X 20" (1:500,000)	<input type="checkbox"/> \$15.00

3 ENTER PAYMENT AMOUNT



1 ENTER MAP REFERENCE NUMBER

PLEASE PRINT:

4 NAME: _____
 ADDRESS: _____

5 MAIL WITH CHECK OR MONEY ORDER TO:
 U.S. GEOLOGICAL SURVEY
 EROS DATA CENTER / SIOUX FALLS, S.D. 57198

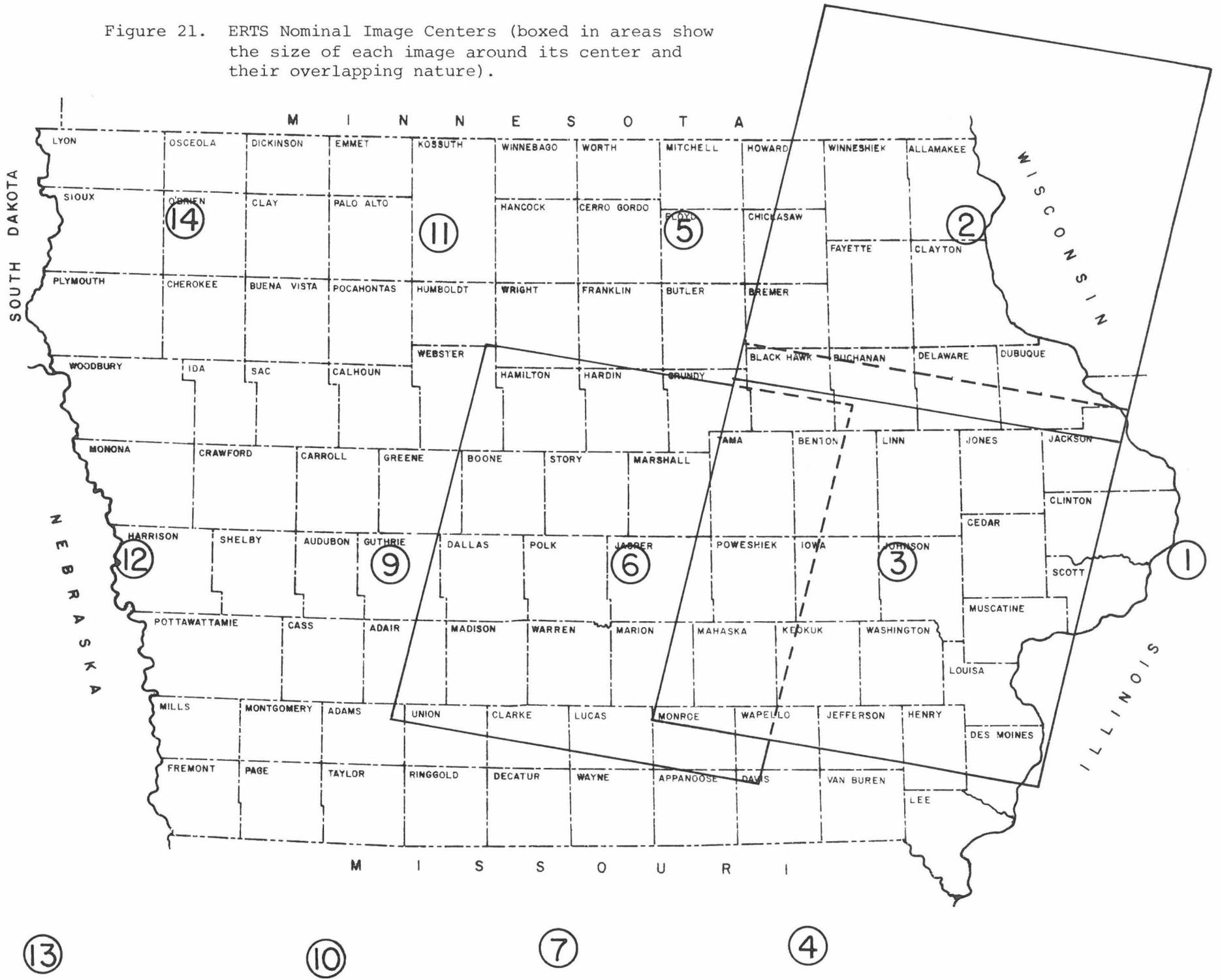
Q 00030697

2 CHECK PRODUCT DESIRED (one product per order card)

BLACK & WHITE PHOTOS		CHECK ONE
SINGLE PHOTO	9" X 9" (1:1,000,000)	<input type="checkbox"/> \$2.00
	20" X 20" (1:500,000)	<input type="checkbox"/> \$5.00
COMPLETE SET	9" X 9" (1:1,000,000)	<input type="checkbox"/>
COLOR PHOTOS		
SINGLE PHOTO	9" X 9" (1:1,000,000)	<input type="checkbox"/> \$7.00
	20" X 20" (1:500,000)	<input type="checkbox"/> \$15.00

3 ENTER PAYMENT AMOUNT

Figure 21. ERTS Nominal Image Centers (boxed in areas show the size of each image around its center and their overlapping nature).



13

10

7

4

<u>Nominal Centers</u>	<u>Date</u>	<u>Order Number</u>	<u>Color</u>
1	10 Aug. 1972	1018-16153	
	10 Aug. "	1018-16160	
	28 Aug. "	1036-16154	X
	28 Aug. "	1036-16161	
	29 Aug. "	1037-16204	
	9 Sept. "	1054-16154	
	26 Nov. "	1126-16163	
	14 Dec. "	1144-16163	
	14 Dec. "	1144-16165	
	1 Jan. 1973	1162-16161	
	24 Feb. "	1216-16164	
	24 Feb. "	1216-16178	
	14 Mar. "	1234-16165	
	14 Mar. "	1234-16171	
	24 May "	1305-16111	
	25 May "	1306-16165	
	11 June "	1323-16105	X
	29 June "	1341-16104	
	30 June "	1342-16163	
	17 July "	1359-16103	
	3 Aug. "	1378-16153	X
	3 Aug. "	1378-16160	
	22 Aug. "	1395-16160	
	16 Oct. "	1450-16142	
	3 Nov. "	1468-16134	
	3 Nov. "	1468-16141	
	9 Dec. "	1504-16133	
	9 Dec. "	1504-16135	
	14 Jan. 1974	1540-16130	
	22 Mar. "	1612-16112	
	20 May "	1666-16100	
	2	10 Aug. 1972	1018-16151
28 Aug. "		1036-16152	
29 Aug. "		1037-16210	
15 Sept. "		1054-16151	
16 Sept. "		1055-16210	
14 Dec. "		1144-16160	
15 Dec. "		1145-16214	
17 Dec. "		1147-16325	
1 Jan. 1973		1162-16155	
2 Jan. "		1163-16213	
14 Mar. "		1234-16162	
13 June "		1325-16213	X
30 June "		1342-16154	
5 Aug. "		1378-16151	X
11 Sept. "	1415-16202		
16 Oct. "	1450-16133		

<u>Nominal Centers</u>	<u>Date</u>	<u>Order Number</u>	<u>Color</u>
2	3 Nov. 1973	1468-16132	
	10 Dec. "	1505-16185	
	19 Feb. 1974	1576-16111	
	10 Mar. "	1595-16163	
	15 Apr. "	1631-16155	
3	29 Aug. 1972	1037-16213	
	16 Sept. "	1055-16212	
	2 Jan. 1973	1163-16220	
	13 June "	1325-16220	X
	6 Aug. "	1379-16212	
	11 Sept. "	1415-16204	
	10 Dec. "	1505-16191	
	15 Apr. 1974	1631-16161	
4	16 Sept. 1972	1055-16215	
	4 Oct. "	1073-16215	
	15 Dec. "	1145-16223	
	2 Jan. 1973	1163-16222	
	13 June "	1325-16222	
	6 Aug. "	1379-16214	
	29 Sept. "	1433-16204	X
	22 Nov. "	1487-16195	
	10 Dec. "	1505-16194	
	15 Jan. 1974	1541-16184	
	15 Apr. "	1631-16164	
5	12 Aug. 1972	1020-16264	
	17 Sept. "	1056-16264	X
	16 Dec. "	1146-16273	X
	8 Feb. 1973	1200-16273	X
	26 Feb. "	1218-16274	
	3 Apr. "	1254-16275	
	21 Apr. "	1272-16275	
	14 June "	1326-16272	X
	2 July "	1344-16270	
	12 Sept. "	1416-16260	
	5 Nov. "	1470-16245	
	11 Dec. "	1506-16243	
	3 Feb. 1974	1560-16225	
	22 May "	1668-16203	
6	17 Sept. 1972	1056-16271	
	16 Dec. "	1146-16275	
	8 Feb. 1973	1200-16280	
	3 Apr. "	1254-16282	
	9 May "	1290-16280	X
	14 June "	1326-16274	
	2 July "	1344-16273	
	7 Aug. "	1380-16270	

<u>Nominal Centers</u>	<u>Date</u>	<u>Order Number</u>	<u>Color</u>
6	5 Nov. 1973	1470-16251	
	11 Dec. "	1506-16245	
	22 May 1974	1668-16210	
7	12 Aug. 1972	1020-16273	
	17 Sept. "	1056-16273	
	28 Nov. "	1128-16282	
	16 Dec. "	1146-16282	
	23 Feb. 1973	1200-16282	
	9 May "	1290-16283	
	2 July "	1344-16275	
	7 Aug. "	1380-16273	
	25 Aug. "	1398-16271	X
	5 Nov. "	1470-16254	
	11 Dec. "	1506-16255	
	22 May 1974	1668-16125	X
8	13 Aug. 1972	1021-16321	
	18 Sept. "	1057-16323	
	29 Nov. "	1129-16331	
	17 Dec. "	1147-16331	
	4 Jan. 1973	1165-16330	
	9 Feb. "	1201-16332	
	17 Mar. "	1237-16333	
	22 Apr. "	1273-16333	
	10 May "	1291-16332	X
	3 July "	1345-16325	X
	26 Aug. "	1399-16320	
	22 Feb. 1974	1579-16282	
	12 Mar. "	1597-16280	
	17 Apr. "	1633-16271	
	5 May "	1651-16265	
	23 May "	1669-16262	
9	26 July 1972	1003-16334	X
	13 Aug. "	1021-16324	
	18 Sept. "	1057-16325	
	17 Dec. "	1147-16334	
	4 Jan. 1973	1165-16332	
	9 Feb. "	1201-16334	
	17 Mar. "	1237-16340	
	22 Apr. "	1273-16340	
	10 May "	1291-16335	
	3 July "	1345-16331	X
	26 Aug. "	1399-16323	
	19 Oct. "	1453-16311	
	22 Feb. 1974	1579-16284	
	12 Mar. "	1597-16282	

<u>Nominal Centers</u>	<u>Date</u>	<u>Order Number</u>	<u>Color</u>
9	30 Mar. 1974	1615-16280	
	17 Apr. "	1633-16274	
	5 May "	1651-16271	
10	31 Aug. 1972	1039-16332	
	18 Sept. "	1057-16332	
	17 Dec. "	1147-16340	
	4 Jan. 1973	1165-16335	
	9 Feb. "	1201-16341	
	12 Mar. "	1237-16342	
	22 Apr. "	1273-16342	
	10 May "	1291-16341	
	3 July "	1345-16334	
	26 Aug. "	1399-16325	X
	19 Oct. "	1453-16313	
	22 Feb. 1974	1579-16291	
	30 Mar. "	1615-16283	
	17 Apr. "	16331-16280	
5 May "	1651-16274		
11	14 Aug. 1972	1022-16375	X
	19 Sept. "	1058-16381	
	7 Oct. "	1076-16382	
	30 Nov. "	1130-16390	
	5 Jan. 1973	1166-16384	
	10 Feb. "	1202-16390	
	5 Apr. "	1256-16392	
	11 May "	1292-16391	
	29 May "	1310-16390	X
	16 June "	1328-16384	
	4 July "	1346-16383	
	27 Aug. "	1400-16375	X
	13 Mar. 1974	1598-16334	
	6 May "	1652-16323	
24 May "	1670-16320		
12	14 Aug. 1972	1022-16382	X
	15 Aug. "	1023-16442	
	19 Sept. "	1058-16383	X
	10 Oct. "	1076-16384	
	26 Oct. "	1095-16445	X
	19 Dec. "	1149-16450	
	5 Jan. 1973	1166-16391	
	6 Jan. "	1167-16445	
	24 Jan. "	1185-16445	
	10 Feb. "	1202-16394	
5 Apr. "	1256-16394		

<u>Nominal Centers</u>	<u>Date</u>	<u>Order Number</u>	<u>Color</u>
12	6 Apr. 1973	1257-16453	
	23 Apr. "	1274-16394	
	11 May "	1292-16393	
	12 May "	1293-16452	
	29 May "	1310-16392	
	30 May "	1311-16450	
	16 June "	1328-16390	
	17 June "	1329-16445	
	4 July "	1346-16390	
	5 July "	1347-16444	
	9 Aug. "	1382-16383	
	10 Aug. "	1383-16441	
	27 Aug. "	1400-16383	X
	28 Aug. "	1401-11643	
	14 Sep. "	1418-16375	
	2 Oct. "	1436-16372	
	21 Oct. "	1455-16423	
	1 Jan. 1974	1527-16414	
	13 Mar. "	1598-16341	
	19 Apr. "	1635-16390	
6 May "	1652-16325		
24 May "	1670-16322		
12 June "	1689-16373		
13	14 Aug. 1972	1022-16384	
	14 Aug. "	1022-16385	
	15 Aug. "	1023-16443	
	19 Sept. "	1058-16390	
	7 Oct. "	1076-16391	
	18 Dec. "	1148-16395	
	5 Jan. 1973	1166-16393	
	23 Jan. "	1184-16393	
	10 Feb. "	1202-16395	
	28 Feb. "	1220-16400	
	18 Mar. "	1238-16401	
	5 Apr. "	1256-16401	
	23 Apr. "	1274-16400	
	11 May "	1292-16400	
	29 May "	1310-16395	
	16 June "	1328-16393	
	4 July "	1346-16392	X
	9 Aug. "	1382-16385	
	27 Aug. "	1400-16384	
	20 Oct. "	1454-16371	
31 Mar. 1974	1616-16341		
6 May "	1652-16332		
24 May "	1670-16325		
14	15 Aug. 1972	1023-16433	
	15 Aug. "	1023-16434	

<u>Nominal Centers</u>	<u>Date</u>	<u>Order Number</u>	<u>Color</u>
14	8 Oct. 1972	1077-16440	
	26 Oct. "	1095-16442	
	24 Jan. 1973	1185-16443	
	6 Apr. "	1257-16450	
	12 May "	1293-16445	
	30 May "	1311-16444	
	17 June "	1329-16443	
	5 July "	1347-16441	
	10 Aug. "	1383-16435	
	28 Sept. "	1401-16433	X
	1 Jan. 1974	1527-16411	
	24 Feb. "	1581-16399	
	14 Mar. "	1599-16393	
	19 Apr. "	1635-16384	
	12 June "	1689-16371	

ORDERING ERTS IMAGES FROM THE EROS DATA CENTER

Placing an Order

You may place an order with the Data Center for reproductions of the System Corrected Images (bulk) by completing this form. Your cooperation in following these steps will be appreciated:

1. Please print or type all of the information on the form.
2. Give your complete address, including ZIP Code.
3. Give a telephone number where you can be reached during normal business hours. Enter the number in the blank marked "commercial" if the telephone given is not a Federal Telecommunications System number.
4. Indicate the photo identification code for the frame(s) you desire.
5. Select and check the RBV or MSS spectral bands desired. Each band checked is, of course, a separate photograph; therefore, if you check four different bands, you will receive four separate frames of photography.
6. Determine the size of the reproductions desired and enter in the Product Type Desired column. Note that there are separate entries for paper prints and transparencies. Be sure to enter the information from the appropriate column.
7. Complete any special printing instructions you may wish to give in the square at the lower left of the form. If you do not have any special printing instructions, our laboratory personnel will use their own judgment in attempting to make the best print possible. Film transparencies are reproduced to match the gray scale of the master film.
8. Multiply the number of units by the unit price and enter in the total price column. If you desire reproductions at several different sizes, indicate accordingly, using a new line for each product type.
9. Add the total price columns and carry the grand totals to the price computation area at the lower right of the form. Submit payment by check, money order, or purchase order payable to the U.S. Geological Survey in the CORRECT amount.
10. The mail charges are as follows:

<u>Surface</u>	<u>Charges</u>
U.S., Canada, and Mexico	None
Other Areas	\$1 + 1% of Line D
 <u>Air Mail</u>	
U.S., Canada, and Mexico	\$1 + 1% of Line D
Other Areas	\$2 + 2% of Line D

11. If you wish to order Scene Corrected Images (precision), indicate in space provided. You will be notified whether precision data are available over your area of interest, if requested.

If you have any questions regarding the above information or about the EROS Data Center in general, we invite your telephone call to:

605-594-6511 from private or commercial telephones
605-594-6151 from Federal Telecommunications System telephones

ERTS ORDER FORM

(please print or type, see reverse for instructions)

THIS ORDER FORM IS INTENDED FOR USE WHEN THE USER KNOWS THE PHOTO IDENTIFICATION NUMBERS, HAVING ACCESS TO CATALOGS OR BROWSE FILMS.

DATA TO BE FURNISHED BY: EROS Data Center Sioux Falls, SD 57198 Commercial: 605-594-6511 FTS : 605-594-6151	DATE: _____ TOTAL: _____
NAME : _____ ADDRESS: _____ _____ _____	PHONE: Commercial: _____ FTS : _____

DATA REQUESTED:

Photo Identification (black & white only)	Spectral Bands							No. of Bands Requested	Product Type Desired	Unit Price	Total Price	Remarks
	1	2	3	4	5	6	7					
TOTAL											Enter in line A below	////////

Photo Identification (color composites only)	No. of Copies Requested	Product Type Desired	Unit Price	Total Price	Remarks	
TOTAL					Enter in line B below	////////

Photo Identification Microfilm (b & w only)	No. of Copies Requested	Unit Price	Total Price	Remarks	
TOTAL				Enter in line C below	////////

Product	Scale	Black and White (price per frame)			Color (prices per frame)		
		1-25	over 25	Full Rolls	1	Over 1	Full Rolls
Paper Prints							
70 mm	1:3,369,000	\$1.25	\$1.00	\$0.65	N.A.	N.A.	N.A.
9" x 9"	1:1,000,000	1.75	1.25	1.00	\$ 7.00	\$ 5.00	N.A.
18" x 18"	1:500,000	3.50	3.00	N.A.	15.00	9.00	N.A.
36" x 36"	1:250,000	9.00	8.00	N.A.	25.00	20.00	N.A.
Film Transparencies							
16 mm (microfilm, 100' rolls)		N.A.	N.A.	\$10.00 per 100' roll	N.A.	N.A.	N.A.
70 mm	1:3,369,000	\$2.50	2.50	1.25	N.A.	N.A.	N.A.
9" x 9"	1:1,000,000	3.00	3.00	2.25	\$10.00	\$ 8.00	N.A.
18" x 18"	1:500,000	N.A.	N.A.	N.A.	20.00	15.00	N.A.
36" x 36"	1:250,000	N.A.	N.A.	N.A.	60.00	55.00	N.A.

NOTES:

-- On black and white orders for over 25 photographs of the same size, there is a reduction in unit price for only those photos in excess of 25.
 i.e., 26 9" x 9" prints cost: 25 @ \$1.75 = \$43.75
 1 @ \$1.25 = 1.25
 TOTAL = \$45.00

-- On color orders for over one photograph of the same size, there is a reduction in unit price for all photos in excess of one.
 i.e., 12 9" x 9" prints cost: 1 @ \$7.00 = \$ 7.00
 11 @ \$5.00 = 55.00
 TOTAL = \$62.00

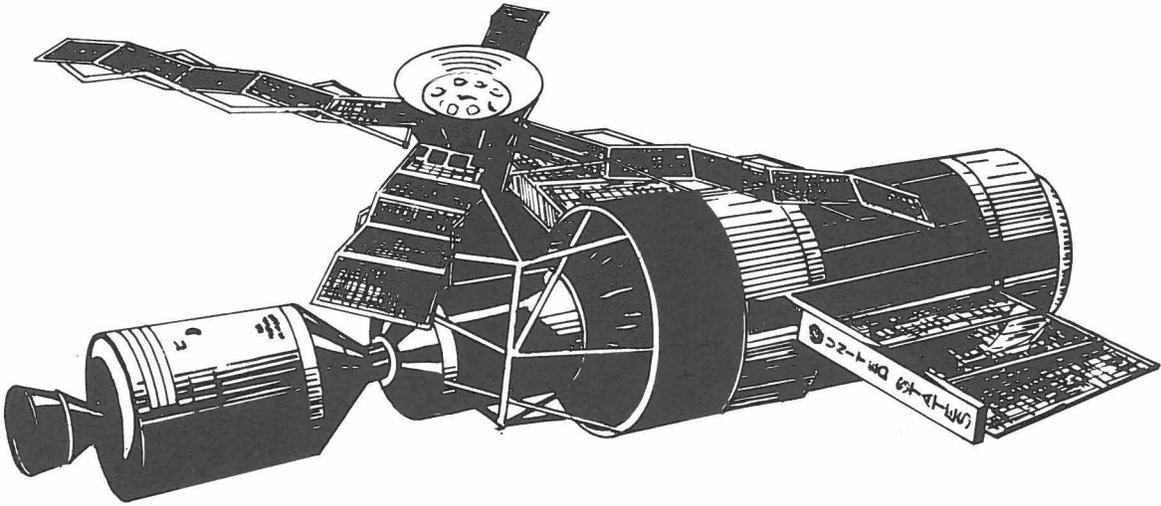
-- Full roll price applies to orders for all frames on a roll. Will be delivered in roll form.

-- N.A. = not available.

_____ I wish to receive information on the availability of scene corrected images of the following area. Please give latitude and longitude, if known.

<p>PRINTING INSTRUCTIONS:</p> <p>1. Print to: (check one)</p> <p>_____ Accentuate highlighted areas _____ Normal _____ Accentuate shadowed areas</p> <p>2. Special requirements:</p> <p>_____</p>	<p align="center">PRICE CALCULATIONS</p> <p>A. Total from A (above) \$ _____</p> <p>B. Total from B (above) \$ _____</p> <p>C. Total from C (above) \$ _____</p> <p>D. Total cost of reproductions (A + B + C) \$ _____ plus cost of shipping</p> <p>E. Regular or surface (see reverse) \$ _____</p> <p>F. Air mail (see reverse) \$ _____</p> <p>TOTAL PRICE OF ORDER (D + E + F) \$ _____</p> <p>payment made by:</p> <p>_____ Purchase order No. _____</p> <p>_____ Check or money order No. _____</p> <p>_____ U.S.G.S. account No. _____</p>
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EDCDM FORM 8 11-8-73
GMF 2M



SKYLAB

SKYLAB

The world's first orbital workshop, *Skylab*, was launched on May 14, 1973 and manned by its first crew eleven days later, May 25. After correcting problems of a faulty heat shield and solar cell arrays the crew began its series of experiments which included collection of earth resource data. Two of the systems used to collect this data, the *S190A Multispectral Photographic Facility* and the *S190B Earth Terrain Resources Camera*, provided a great deal of valuable information.

The *S190A Multispectral Photographic Facility* is, in effect, a bank of six cameras all of which are fired simultaneously. Each camera captures a unique portion of the electromagnetic spectrum on 70 millimeter film thru a 6-inch focal length lens. Table 3 below lists the camera, the portion of spectral images, and the types of film used by each.

<u>Camera</u>	<u>Spectrum Captured (wavelength)</u>	<u>Film Type</u>
1	.5-.6 microns (green band)	Pan X (EK2424)
2	.6-.7 " (red band)	Pan X (EK2424)
3	.7-.8 " (infrared band)	Black & White Infrared (EK3443)
4	.8-.9 " (infrared band)	Black & White Infrared (EK3400)
5	.5-.88 " (color infrared)	Color Infrared (EK3400)
6	.4-.7 " (color)	Aerial Color (SO242)

Table 3. S190A Multispectral Photographic Facility Data

The infrared bands photographed by cameras three and four are *not* thermal or heat bands.

The exposed film from the *S190A* system was returned to Earth with the astronauts. When processed each frame provides an image at a scale of 1:2,800,000 covering an area of 9,887 square miles. At this scale generally no object smaller than 300 feet can be detected on the image.

The *S190B Earth Terrain Resources Camera* is a single camera equipped with an 18 inch focal length lens. It produces color images on a 4½ inch format at a scale of 1:950,000 thus covering an area of 4,556 square miles. Generally only objects larger than 50 feet on the ground can be resolved on this imagery. These images were also returned to earth by the astronauts for processing.

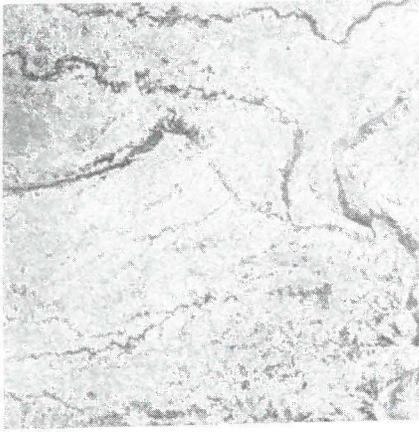
The *Skylab* program has been divided into four missions. *Skylab 1 (SL-1)*, the first mission included the launch of the unmanned

spacecraft. *Skylabs 2 thru 4 (SL-2, SL-3, and SL-4)* were manned missions during which the photography was produced. *SL-2*, lasted 28 days from May 25 thru June 7, 1973, and was manned by Pete Conrad, Joe Kerwin, and Paul Weitz. Due to the fact that this crew had to repair the damage sustained by the *Skylab* during its launching they were able to accomplish only 11 of the 14 planned earth resources runs.

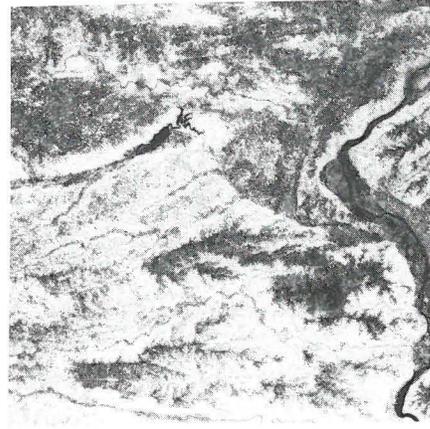
The second manned mission, *SL-3*, was flown by Al Bean, Owen Garriot, and Jack Lousma. This mission was launched on July 28 and returned to earth on September 25, 1973, 59 days later. This crew was only able to complete 26 of the 39 planned earth resources runs due to problems encountered.

The final manned mission was *SL-4*. The crewmen were Gerald Carr, Ed Gibson and Bill Pogue. Their 84-day mission began on November 16, 1973 and ended February 8, 1974. Their return marked the end of the *Skylab* program.

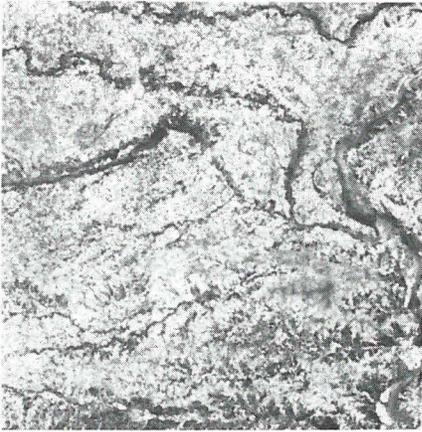
The four *Skylab* flight paths or *tracks* which include areas of Iowa are mapped on page 126. Because of cloud cover, not all *Skylab* missions obtained data from each *track*. Four other tracks running from the southwest to the northeast were planned, but no data was obtained. To date the Iowa Geological Survey has received all photographs from *SL-2* and part of the information from *SL-3*. The area covered by these photographs and the images centers are mapped on pages 127 thru 133. No information from *SL-4* has been received. To order *Skylab* imagery follow the instructions on page 128 and the order form on page 137.



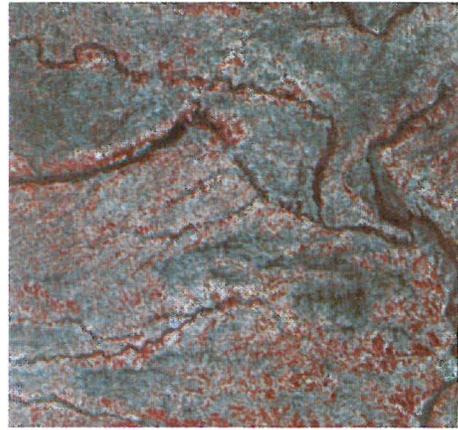
Camera 1, Green Band



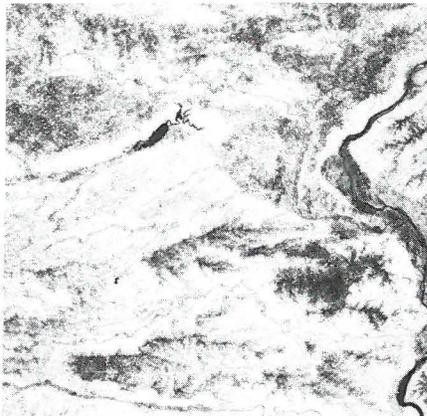
Camera 4, Infrared Band



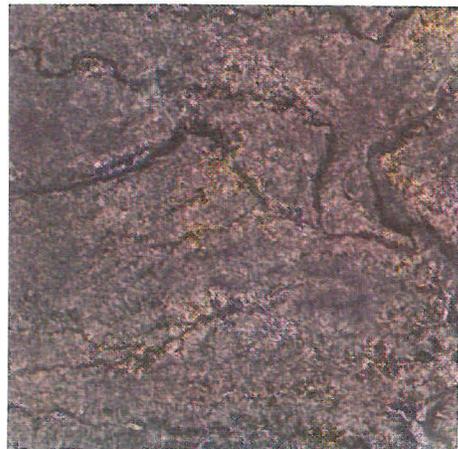
Camera 2, Red Band



Camera 5, Color Infrared Band



Camera 3, Nearest Infrared Band



Camera 6, Color Band

Figure 22. Photographs of Eastern Iowa
Taken by the Skylab S190A Multispectral System.

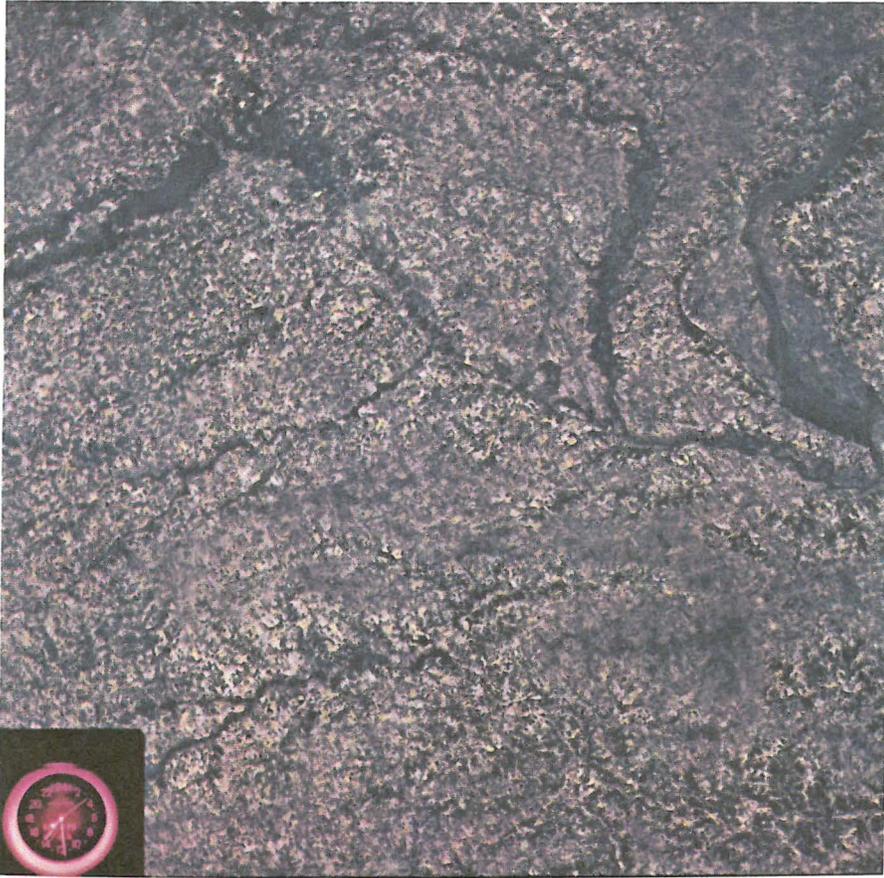
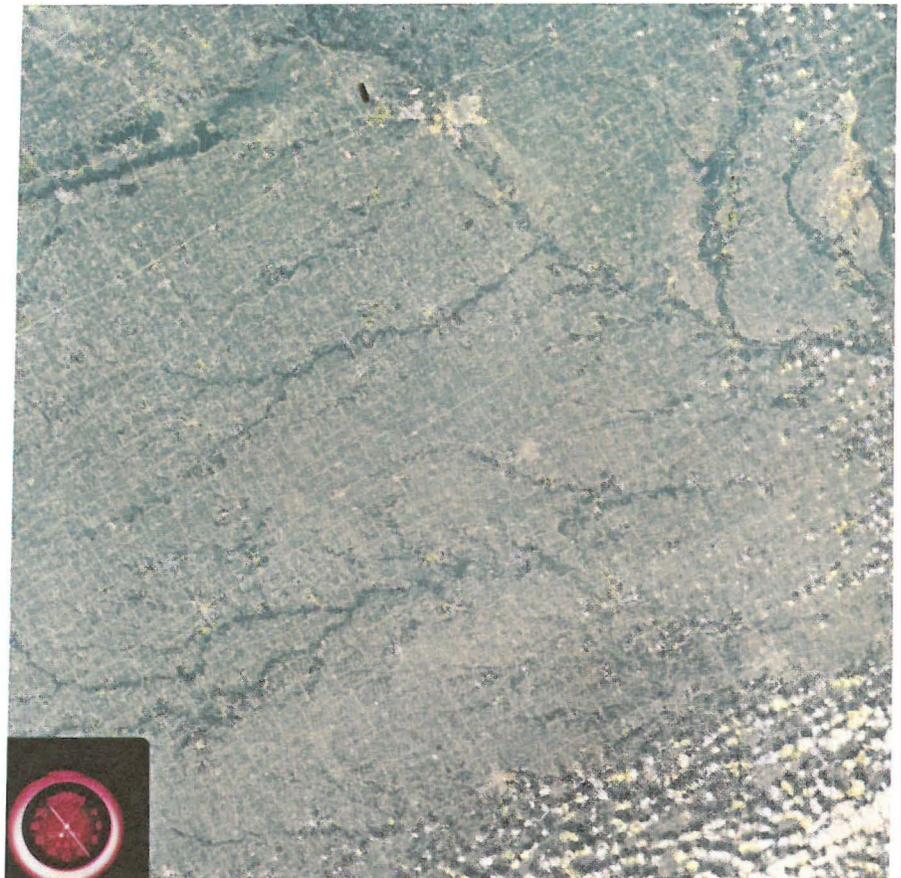


Figure 23. Photographs from the Skylab S190B Earth Terrain Resources Camera.

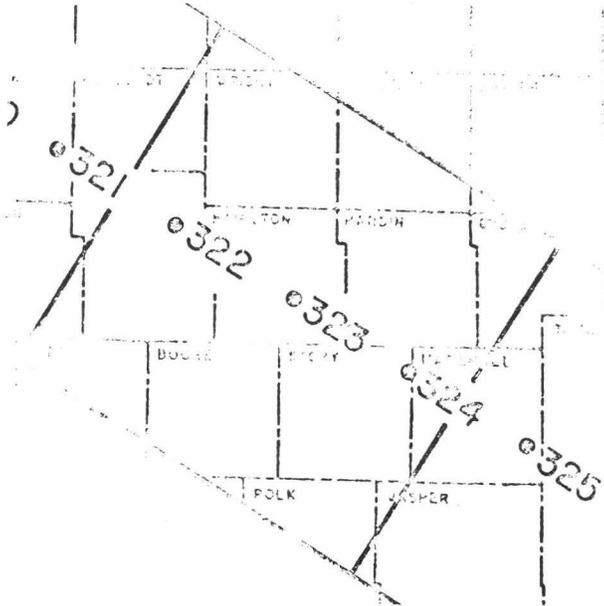
Skylab 2
June, 1973

Skylab 3
August, 1973



OBTAINING SKYLAB IMAGERY

Copies of Skylab imagery are not available from the Iowa Geological Survey. The best way to obtain the desired print or transparency is to identify the actual image desired. This is somewhat confusing because of the overlap of adjacent frames, but can be done using the maps on pages 129 thru 136 and follow 4 steps.



1. Locate which track is nearest the area of interest and choose a Skylab map of that track providing the desired camera and mission number.
2. Find the image center (a black dot with a number next to it) closest to the area that you are interested in.
3. Construct a square around the image center by adding two lines as shown by the example on each map.
4. Note the number next to the image center and the run number in the upper right hand corner of each map.

Example: If the area of interest was in northeastern Boone County (marked A on the map above) then the best Frame would be 323.

With this information fill out as much of the form on page 134 as possible and mail it to:

*EROS Data Center
Sioux Falls,
South Dakota 57198*

For answers to any questions regarding this form call:

*Ray Anderson
Iowa Geological Survey
(319) 338-1173*

For answers to any questions regarding the Skylab imagery call
EROS Data Center:

(605) 594-6511

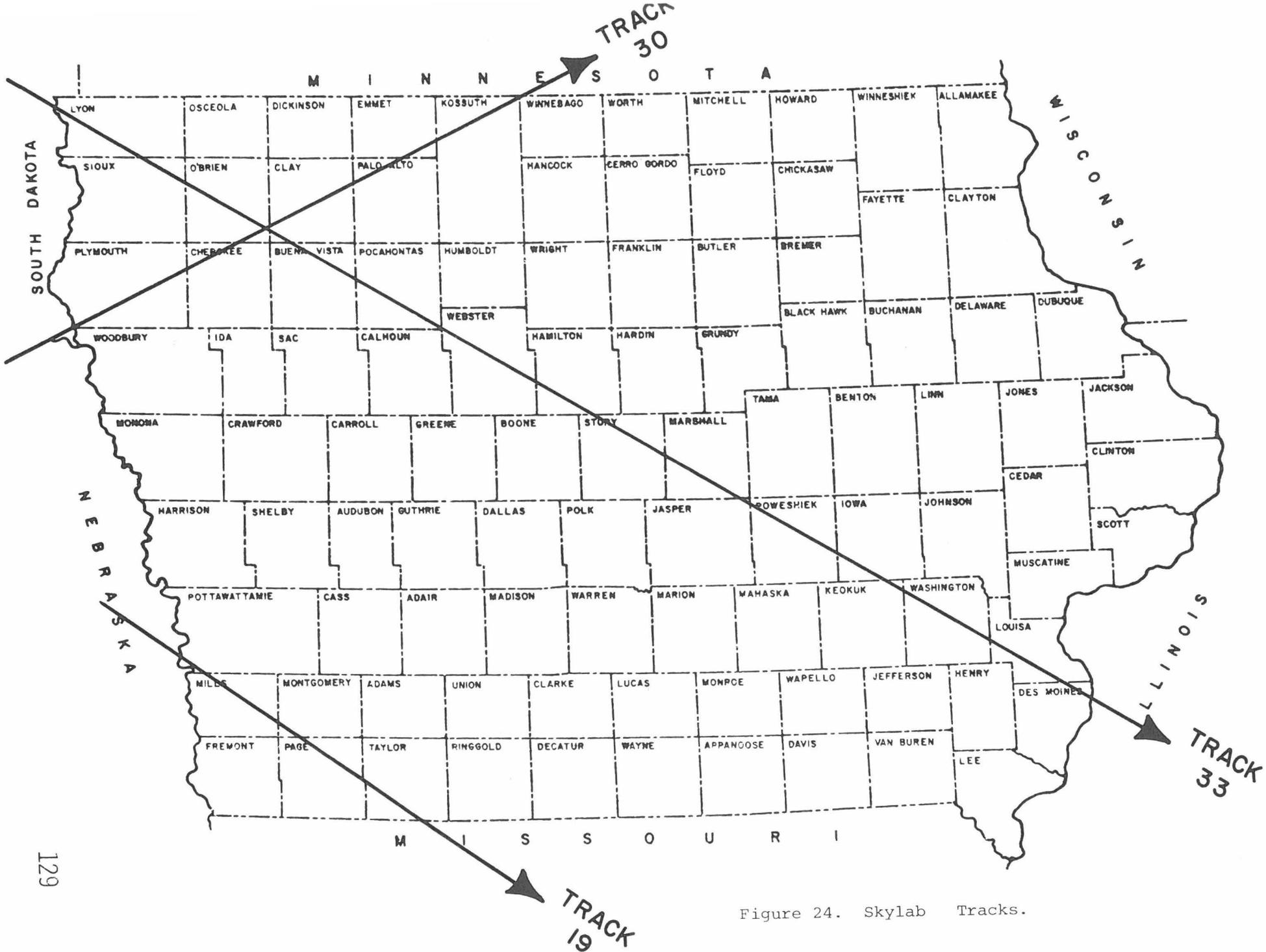


Figure 24. Skylab Tracks.

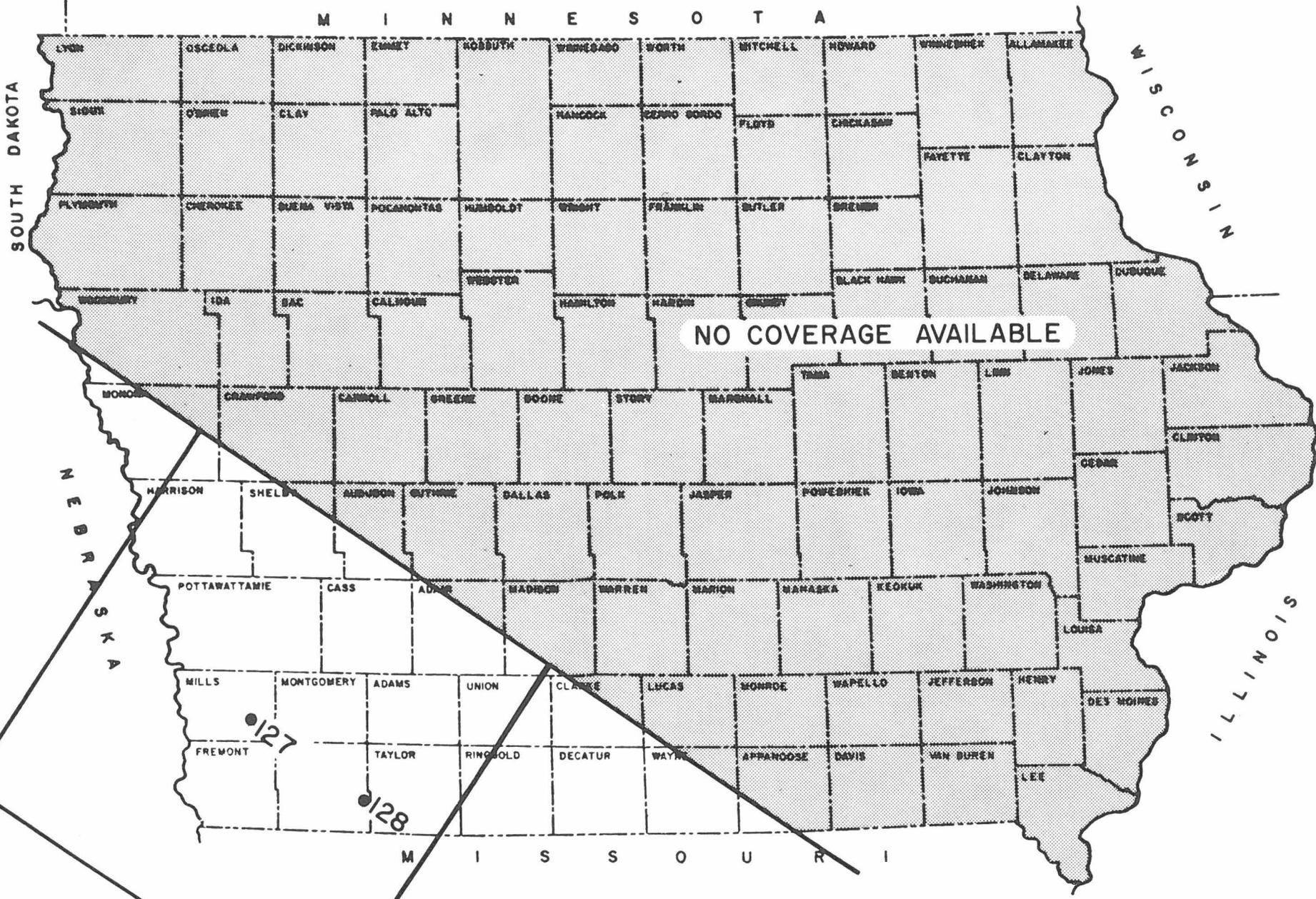


Figure 25. Skylab 2 Track 19 - S190A Coverage.

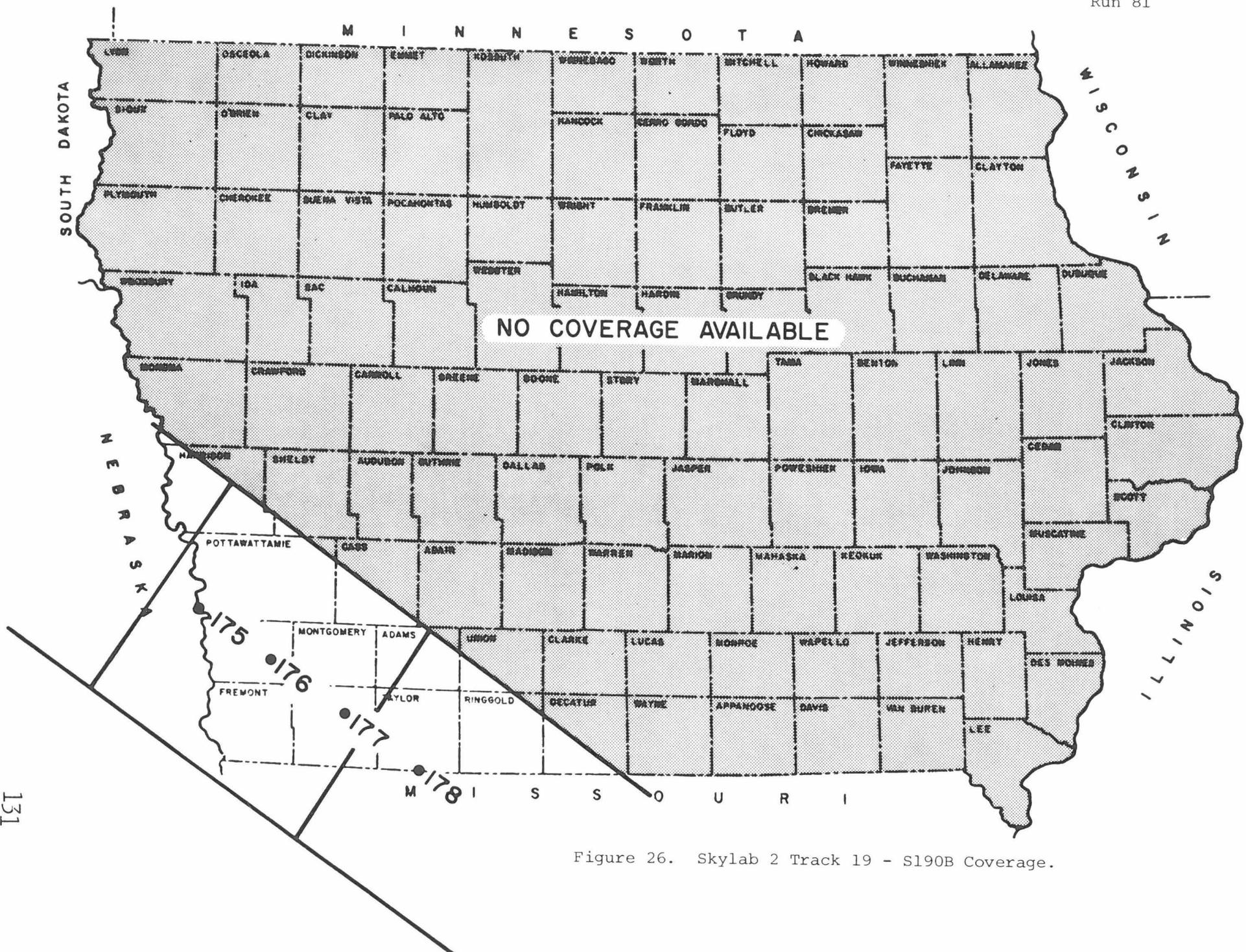


Figure 26. Skylab 2 Track 19 - S190B Coverage.

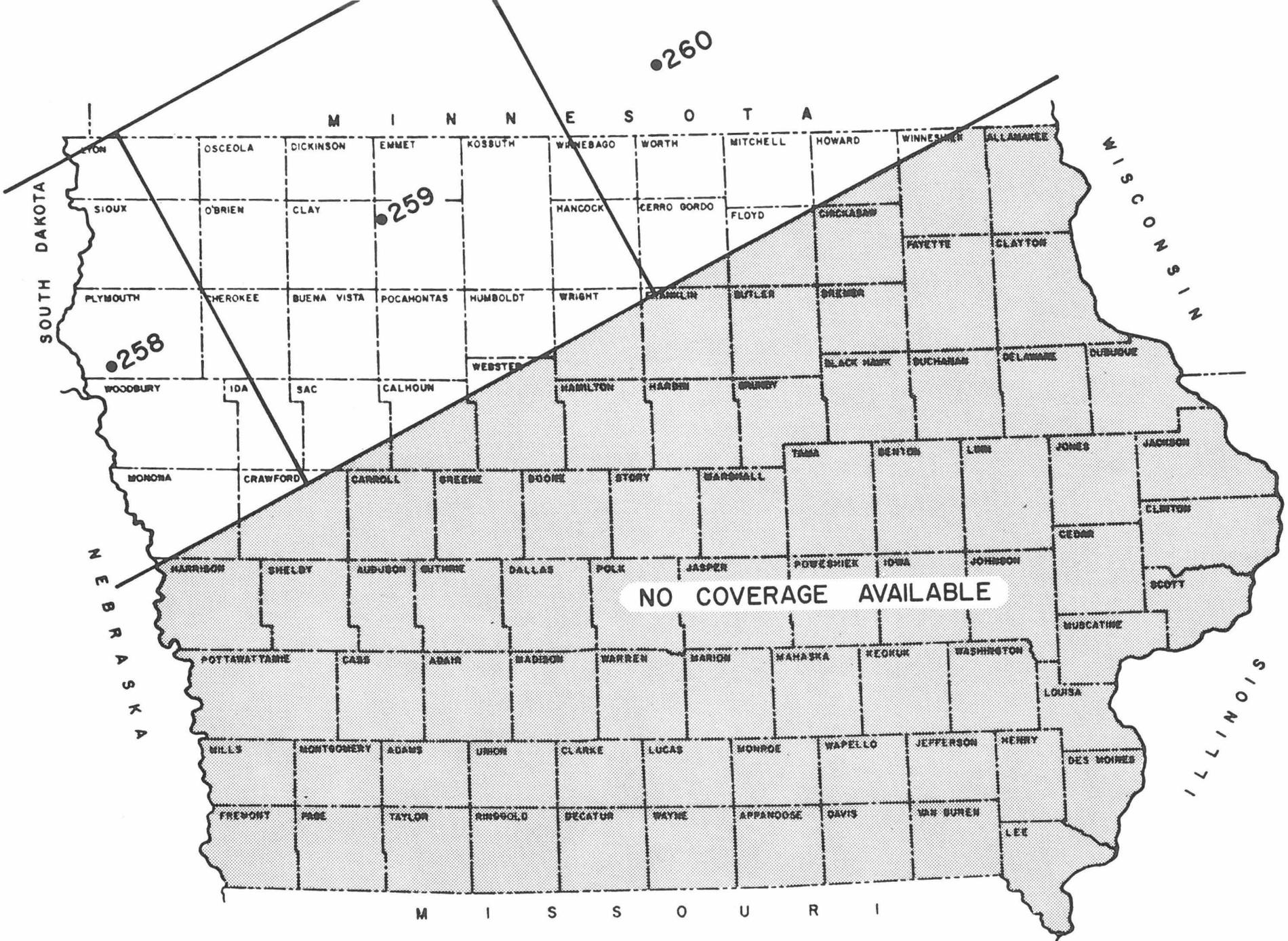


Figure 27. Skylab 2 Track 30 - S190A Coverage

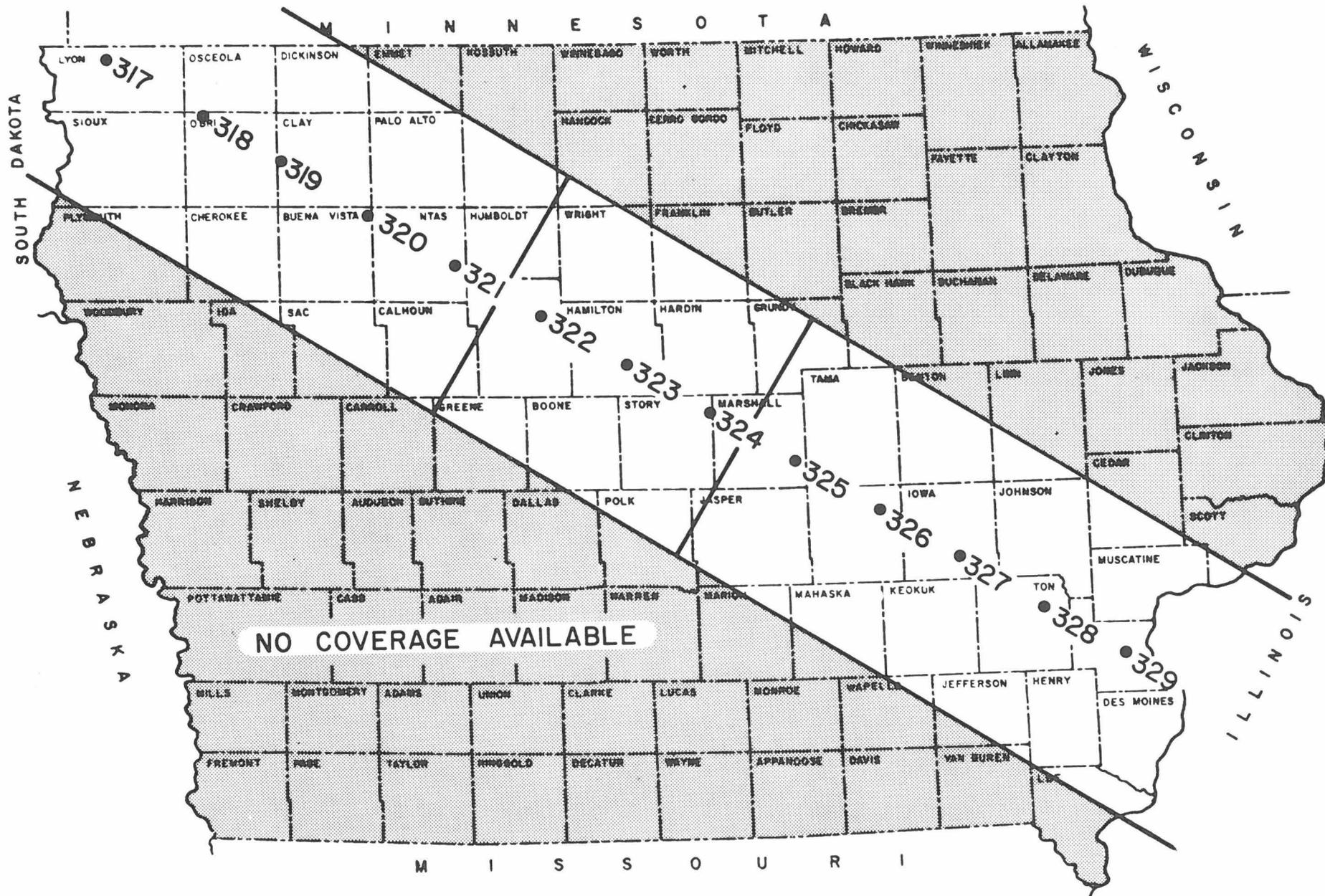


Figure 29. Skylab 2 Track 33 - S190B Coverage.

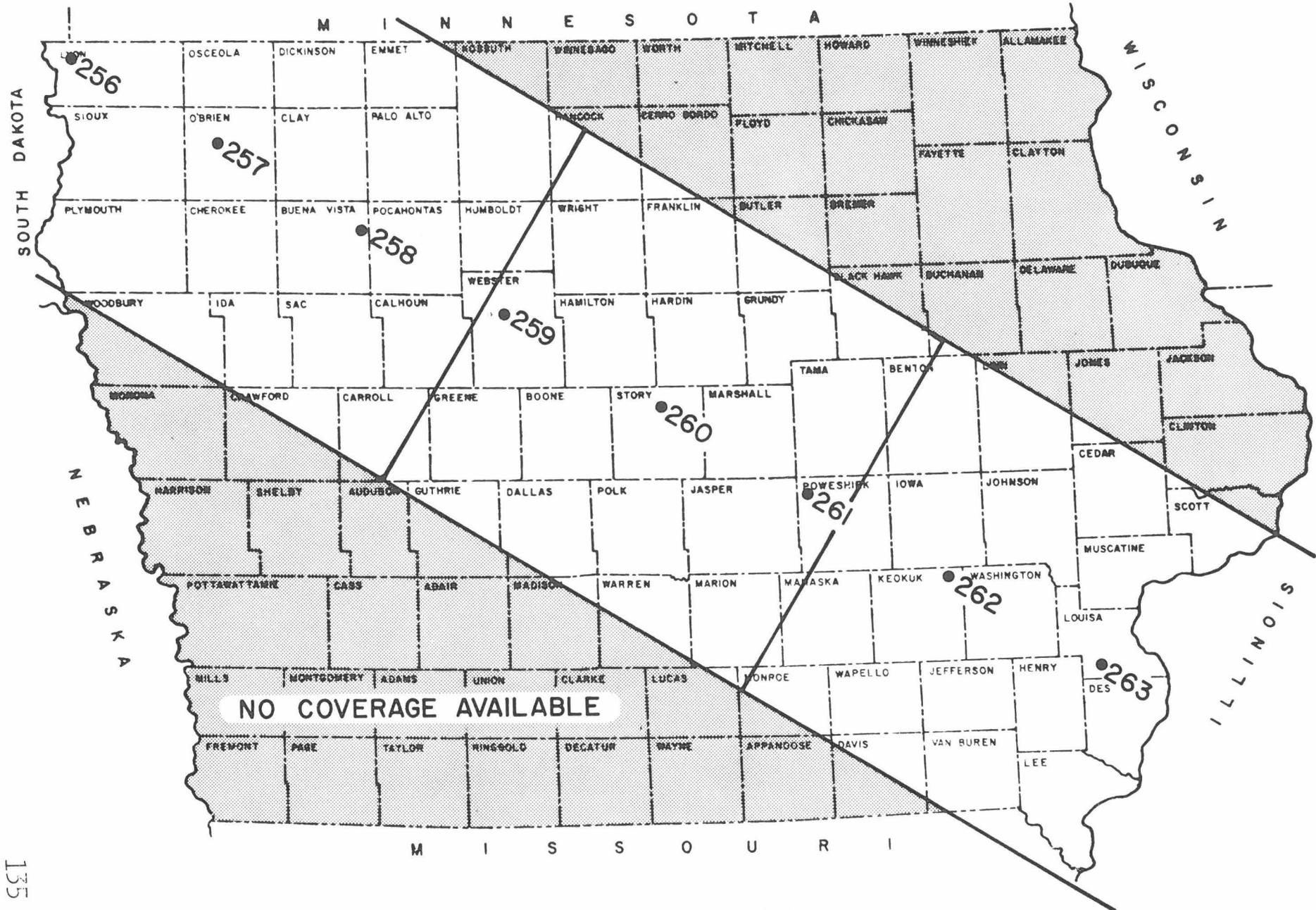


Figure 30. Skylab 3 Track 33 - S190A Coverage

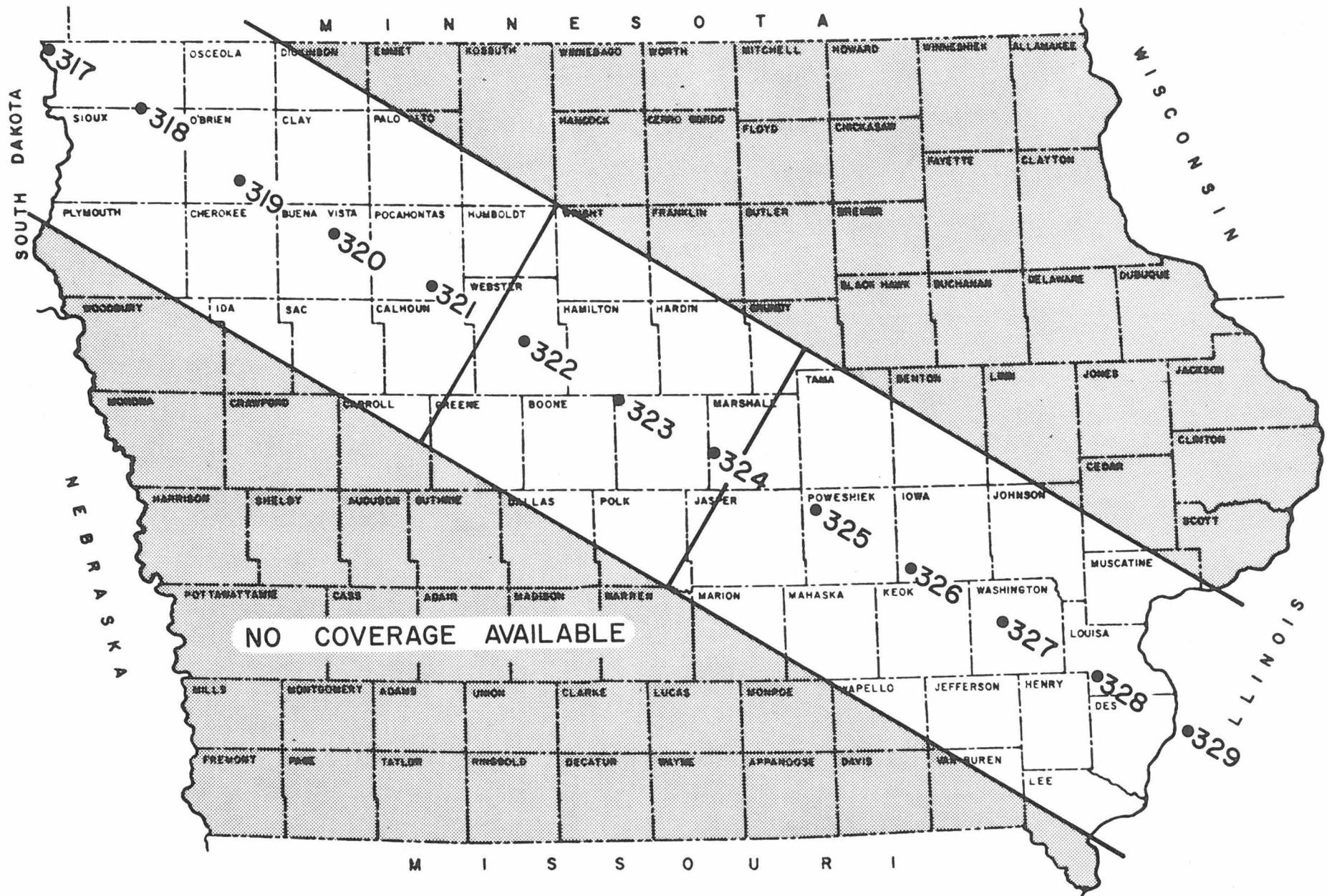


Figure 31. Skylab 3 Track 33 - S190B Coverage.

SKYLAB INQUIRY/ORDER FORM
(please print or type)

Mail to:
EROS Data Center
Sioux Falls, South Dakota 57198
phone: (605) 594-6511

Date _____
Total Enclosed _____

Your Name: _____

Your Phone No.: _____

Address: _____

Area of Interest (fill out as much as possible)

NASA: Skylab 2 (SL-2)
Skylab 3 (SL-3)
Skylab 4 (SL-4)

(check one)

SYSTEM: S190A Multispectral Photographic Facility

Camera 1 (Green Band)
2 (Red Band)
3 (Infrared Band)
4 (Infrared Band)
5 (Color)
6 (Color infrared)

(check desired images)

S190B Earth Terrain Resources Camera

FRAME Identification: Run Number _____ Frame Number _____

Latitude and Longitude of Area _____
(of center if area is large)

State _____ Distance and Direction from Nearest Town _____
County _____ Any Geographic or Specific Name of Area _____

Date Desired (check proper box):

Black & White Transparency
(S190A Cameras 1,2,3 and 4)
70mm, \$1.25 each
9" x 9", \$3.00 each

Color Transparency
70mm, \$7.00 each (S190A only)
5" x 5", \$10.00 each (S190B only)
9" x 9", \$10.00 each

Black & White Enlargements
(S190A Cameras 1,2,3 and 4)
9" x 9", \$1.75 each
20" x 20", \$3.50 each
40" x 40", \$9.00 each

Color Enlargements
20" x 20" \$15.00 each
40" x 40" \$25.00 each
(some discounts are allowed for more than one
enlargement of each frame)

Total Cost

Number of Copies _____ Type _____
Cost per each _____
Total Cost _____

All orders are shipped postage paid in the U.S. For Airmail add 10% of the total cost of the order plus \$1.00.

Payment Enclosed: Cash _____
Check _____
Money Order _____

Iowa Geological Survey
Remote Sensing Laboratory

APPENDIX

Table 4. Aerial Contractors Doing Work in Iowa

<p>Abrams Aerial Survey Corp. P. O. Box 508 Lansing, Michigan (517) 372-8100</p>	<p>Park Aerial Surveys, Inc. P. O. Box 21379 Louisville, Kentucky 40221 (502) 366-4571</p>
<p>Aerial Services, Inc. 4302 University Avenue Cedar Falls, Iowa 50613 (319) 266-6181</p>	<p>Remote Sensing Institute South Dakota State University Brookings, South Dakota 57006 (605) 688-4184</p>
<p>Aero-Metric Engineering 4708 N. 40th Street Sheboygan, Wisconsin 53081 (414) 457-3631</p>	<p>The Sidwell Co. 28 W. 240 North Avenue W. Chicago, Illinois 60185 (312) 231-0206</p>
<p>Cartwright Aerial Surveys, Inc. 6151 Freeport Blvd. Sacramento, California 95822 (916) 421-3465</p>	<p>Surdex Corporation 25 Mercury Blvd. Chesterfield, Missouri 63107 (314) 532-3427</p>
<p>Chicago Aerial Survey 2150 S. Wolf Road Des Plaines, Illinois 60018 (312) 298-1480</p>	<p>Tri-State Aero Engineering Co. P. O. Box 755 Bettendorf, Iowa (319) 355-3753</p>
<p>Chicago Aerial Survey 936 Wescott Square St. Paul, Minnesota (612) 454-7125</p>	
<p>Great Plains Aerial Survey 4935 S 136 Omaha, Nebraska (402) 333-7125</p>	
<p>Horizons, Inc. Box 1072 Deadwood Avenue Rapid City, South Dakota (605) 343-0280</p>	
<p>Mark Hurd Aerial Surveys, Inc. 345 Pennsylvania Avenue S. Minneapolis, Minnesota 55426 (612) 545-2483</p>	

Table 5.

AERIAL PHOTOGRAPHIC REPRODUCTIONS

May 1, 1973

PRODUCT	BLACK and WHITE PRINTS			COLOR PRINTS		
	1-25	Over 25	FULL ROLLS	1	2 or OVER	FULL ROLLS
CONTACT PRINTS (PAPER ONLY)						
70MM	1.25	1.00	0.65	4.00	2.50	1.25
5"x5"	1.50	1.00	0.75	NA	NA	NA
9"x9" or 10"x10" Neg. to Pos. Pos. to Pos.	1.75	1.25	0.85	7.00	3.00	2.00
10"x12" (PHOTOINDEX)	2.50	2.50	NA	7.00	5.00	2.50
20"x24" (PHOTOINDEX)	3.00	3.00	NA	NA	NA	NA
ENLARGEMENTS (PAPER ONLY)						
9"x9" (from 70mm only)	1.75	1.25	1.00	7.00	5.00	3.75
18"x18" THRU 20"x20"	3.50	3.00	NA	15.00	9.00	NA
24"x24" THRU 30"x30"	4.50	3.50	NA	20.00	14.00	NA
36"x36" THRU 40"x40"	9.00	8.00	NA	25.00	20.00	NA
FILM TRANSPARENCIES-INTER-NEGS						
16MM (100FT. ROLLS)	NA	NA	10.00	NA	NA	20.00
35MM (100FT. ROLLS)	NA	NA	11.50	NA	NA	25.00
70MM	2.50	2.50	1.25	4.00	2.50	1.25
5"x5"	2.75	2.75	1.35	NA	NA	NA
9"x9" or 10"x10"	3.00	3.00	1.50	10.00	8.00	4.00
FILM TRANSPARENCIES-ENLARGEMENTS						
9"x9" (from 70MM only)	3.00	3.00	2.25	10.00	8.00	4.00
20"x20"	NA	NA	NA	20.00	15.00	NA
30"x30"	NA	NA	NA	30.00	25.00	NA
40"x40"	NA	NA	NA	60.00	55.00	NA
KELSH PLATES						
Contact Prints on Glass. Specify thickness (0.25 or 0.06 inch) and method of printing (emulsion to emulsion or through film base)	6.50	6.00	NA	NA	NA	NA
ER-55 PLATES						
Reductions on Glass (11x11cm)	5.00	4.50	NA	NA	NA	NA
TRANSFORMED PRINTS						
From CONVERGENT or TRANSVERSE Low Oblique photographs	3.50	3.00	NA	NA	NA	NA

NOTES:

Prices listed are per frame except for 16mm and 35mm transparencies which are 100ft rolls. The "over 25" price applies only to those prints in excess of 25 of the same size. The full roll price applies to orders for all frames on the roll and for the product to be delivered in roll form.

For an intermediate-size enlargement, use the price listed for the next larger size.

GPO 850-870

9 inch format - 6 inch focal length

Altitude AGL (feet)	Scale	Coverage		60% Overlap			30% Overlap			Area Gained with 60 % Overlap and 30 % Sidelap (sq. mi)
		(feet)	(miles)	Ground Gained (feet)	(miles)	Frames per 100 Flight Miles	Ground Gained (feet)	(miles)	Frames per 100 Flight Miles	
2,000	1:4,000	3,000	.57	1,200	.23	435	2,100	.40	250	.092
3,000	1:6,000	4,500	.85	1,800	.34	294	3,150	.60	167	.204
4,000	1:8,000	6,000	1.14	2,400	.45	222	4,200	.80	125	.360
5,000	1:10,000	7,500	1.42	3,000	.57	175	5,250	.99	101	.564
6,000	1:12,000	9,000	1.70	3,600	.67	147	6,300	1.19	84	.797
7,000	1:14,000	10,500	1.99	4,200	.80	125	7,350	1.39	72	1.112
8,000	1:16,000	12,000	2.27	4,800	.91	110	8,400	1.59	63	1.447
9,000	1:18,000	13,500	2.56	5,400	1.02	98	9,450	1.80	56	1.836
10,000	1:20,000	15,000	2.84	6,000	1.13	88	10,500	1.99	50	2.249
12,000	1:24,000	18,000	3.40	7,200	1.36	74	12,600	2.39	42	3.250
24,000	1:48,000	36,000	6.82	14,500	2.75	36	25,200	4.77	21	13.118
45,000	1:90,000	65,000	12.88	27,000	5.11	20	47,600	9.02	11	46.092

Table 6. Metric Imagery Calculations