FSA
HANDBOOK

Common Land Unit

To access the transmittal page click on the short reference.

For State and County Offices

SHORT REFERENCE

8-CM
(Revision 1)

UNITED STATES DEPARTMENT OF AGRICULTURE
Farm Service Agency
Washington, DC 20250

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Common Land Unit 8-CM (Revision 1)	Amendment 4

Approved by: Deputy Administrator, Farm Programs

Amendment Transmittal

A Reasons for Amendment

Part 8 has been added to:

- provide instructions for GIS specialists/geospatial officers for emergency preparedness and response
- correspond with 1-SEM, paragraphs 126 through 132.

Page Control Chart		
TC	**Text**	**Exhibit**
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Exhibits

Part 1 Purpose and Responsibilities

1 General Information

A Handbook Purpose

This handbook provides:

- policy and standards for establishing and using CLU's
- specifications for developing a CLU geo-referenced data layer for use with GIS.

B CLU Initiative

The CCE initiative is providing FSA, NRCS, and RD with modern, windows-based computers that support the use of GIS, as well as local databases and other software tools.

The Agencies are taking advantage of this new environment through projects such as the spatial data initiatives and investing in a nationwide coverage of orthophotography. With the new CCE equipment, GIS software, and digital versions of the photographs, a new work environment is being created. The orthophotographs can be displayed on a computer screen, and additional layers of data can be displayed on top of the photograph to produce many new types of products for use in USDA offices and for USDA customers.

The CLU initiative described in this handbook is a major step in establishing an interagency standard for delineating the boundaries of a piece of land. A common definition established across agencies for the most basic divisions or segments of land will:

- improve data sharing
- make information provided to customers more complete and meaningful.

Transferring CLU polygons into GIS is called digitizing. Digitization is the creation of digital lines in GIS and is accomplished using heads-up digitizing methods. Heads-up digitizing is the process of tracing lines over an image displayed on the computer screen using a computer mouse. For Service Centers, these polygons will represent CLU boundary lines.

Note: See Exhibits 6 through 9 for examples of digital polygons.

Continued on the next page

1 General Information (Continued)

C
CLU Link to Existing Data

In addition to the orthophotograph data, CLU's are currently being digitized to produce a CLU data layer. Digitizing involves using GIS to draw a border around a unit of land found on a photograph. This border forms a polygon (a many-sided shape) that can be processed by GIS.

GIS can:

- make these lines a particular color
- overlay the border lines on top of the original orthophotograph
- calculate the area of the polygon
- attach elements of data, such as a label or a field number or a record identifier, to this polygon shape.

In this way, the Agencies will build a framework for linking the vast stores of data currently held in files and databases to new data in the spatial dimension. This ties an agency's existing data to a specific point or area on the ground.

D
Definition of CLU

CLU is the smallest unit of land that has a:

- permanent, contiguous boundary
- common land cover and land management
- common owner
- common producer association.

It is difficult to define terms and boundary delineations for CLU that covers all land uses and earth covers. To accommodate this diversity, the definition in this subparagraph has been adopted with the understanding that the rules for delineation will vary slightly across land categories. The differences are noted in this handbook as each basic category of land use is discussed.

Note: CLU's are closely related to:

- FSA's definition of "fields", according to 2-CP
- lands units such as parcels, farmsteads, and lots, that are used by NRCS, RMA, and RD program administration.

Continued on the next page

1 General Information (Continued)

E
Uses of CLU's

While the potential uses of CLU data are many, work is currently focused on:

- replacing current paper maps with digital images that can be updated and produce high-quality prints whenever needed
- using GIS to achieve greater accuracy in acreage calculations
- drawing the established boundaries of a field, and then using those boundaries as the basis for creating other data layers to show cropping patterns, subdivisions, and conservation plans
- establishing a central, national database of land unit boundaries, and linking these land units to customers
- building user-friendly tools to make the creation and maintenance of spatial data layers easier
- speeding the process for implementing disaster payment and other specialized systems.

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1 General Information (Continued)

F
Benefits

CLU's will:

- improve communication and data flow between Service Center Agencies, and with farmers and other customers
- improve communication between software applications by providing a common set of data elements to describe every CLU, establish common identifiers for units of land, and provide a common framework for spatially locating data in relation to the ground
- facilitate the creation of shared Service Center Agency data warehouses for land-related data
- provide for the incorporation of data from outside sources, including demographic data, satellite imagery, global position system data, and elevation data
- provide for consistent and more accurate land measurements, such as field acreage and riparian buffers and wetland areas
- provide for data summarizing to a county, watershed, regional, State, Congressional District, or national level.
- encourage the establishment of agreements with Federal, State, local, and private agencies, such as BLM, State GIS Policy Boards, property valuators, county appraisers, utility companies, etc., to facilitate the exchange of data and resource costs
- provide more efficient and timely program-specific data.

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1 General Information (Continued)

G
Replacing Paper Maps With GIS Technology

As GIS becomes established in the Service Centers, the current paper aerial photography used for planning program delivery, and for identifying land holdings, will be superseded by digital orthophotographs and digitized "layers" or "themes" of data. To give a digital equivalent of the current maps, the CLU layer will be viewed on top of an orthophotograph base. Attributes from CLU and other layers will be displayed in place of previously-handwritten notations.

H
Converting Data on Paper Maps

Before Service Centers can stop maintaining paper aerial photography, additional information, must be added to the descriptive information stored in the GIS system (wetland point data, easements, and HEL determinations). In addition, since subdivisions are not digitized in the initial transfer process, CLU's may need to be added for fields that were incorrectly numbered as subdivisions on the aerial photography. Other additional information may be added as sublayers at the option of the Service Center according to paragraph 92.

2 Authority and Related Handbooks

A
Source of Authority

Authority for the development of the CLU theme (data) was provided by the National Food and Agricultural Council. The USDA Service Center GIS Strategy, as approved by the National Food and Agricultural Council on August 18, 1998:

- designated FSA as the Data Steward for the CLU theme
- provided the initial funding and production schedule for CLU digitizing.

B
Related Handbooks

Service Center Agencies' handbooks related to CLU's are:

- 25-AS for recordkeeping requirements
- 1-CM for common management procedures
- 2-CM for reconstitutions procedures
- 3-CM for farm records
- 2-CP for compliance procedures and field definition
- 6-CP for HELC and WC procedures
- 2-CRP for Agricultural Resource Conservation Program procedures
- 2-INFO for information available to the public
- 3-INFO for Privacy Act operations
- NRCS's technical and policy manuals
- RMA's and RD's policy and procedure handbooks.

3-30 (Reserved)

Part 2 Managing CLU

Section 1 CLU Data Managers

31 Overview

A Agency Responsibilities

The CLU layer is a shared geospatial dataset used by all agencies in the Service Center. FSA assumes primary responsibility at the national, State, and local level for the maintenance of the layer, with partner agencies collaborating on the content and standards for the layer.

B CLU Data Managers

Data Managers, alternatively referred to as CLU Stewards for the CLU layer, will be appointed at national, State, and local levels, wherever CLU data is stored and maintained.

C Role of Digitizing Centers

Digitizing centers are responsible for initially delineating CLU and entering CLU attribute data.

32 CLU Data Responsibilities

A Executive Sponsor Responsibilities

The Executive Sponsor is a high-level, business-area manager who is accountable for the collection, management, and use of data assets. The person has overall responsibility for:

- determining the potential business value of data
- overseeing the creation of software systems to collect and process data
- providing ongoing executive leadership over data content, validity, and usage
- designating national Data Manager and other critical data management roles and responsibilities as appropriate.

Note: Diane Sharp is the Executive Sponsor for CLU.

Continued on the next page

32 CLU Data Responsibilities (Continued)

B
National Data Manager Responsibilities

The national CLU Data Manager, alternatively referred to as the national CLU Steward, is responsible for:

- acting as the designated authority and point of contact for all business-area decisions concerning the database
- establishing and maintaining business rules and consistent definitions for data elements
- establishing data quality and certification standards associated with the contents of the database
- ensuring that metabase is colleced, approved, and certified for release according to the adopted industry, Federal, and USDA metadata and data management standards
- establishing policy and procedures that ensure the validity, accuracy, and completeness of the physical data and supporting metadata
- establishing policy and procedures for certifying that data is ready for release for internal and/or public use
- establishing policy and procedures for ensuring that data meets quality standards
- ensuring that adequate stewardship of data occurs at each location where data is collected and stored
- delegating responsibilities as necessary to ensure the accuracy of new data and the ongoing protection of data assets
- providing training to the State Offices on CLU data stewarding roles and responsibilities.

Note: Sandy Bryant has been designated as the national Data Manager.

Continued on the next page

32 CLU Data Responsibilities (Continued)

C
State Data Manager Responsibilities

The State CLU Data Manager, alternatively referred to as the State CLU Steward, and backup will be identified in each FSA State Office. Both the manager and backup are responsible for:

- establishing adequate CLU training procedures for Service Centers
- developing and implementing a certification process for Service Center CLU stewards
- maintaining a list at the State Office of certified local CLU Data Stewards and their backups at the State Office
- certifying that Service Center CLU's meet quality control standards before Service Center converts to GIS
- conducting annual reviews of CLU datasets for the State to ensure continued quality control
- knowing the standards and criteria for maintaining the official CLU layer
- ensuring that Service Centers maintain the data and metadata to meet the needs of the partner agencies and protect data from loss
- collecting, validating, and linking geospatial State data to related tabular data; distributing geospatial State level data.

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32 CLU Data Responsibilities (Continued)

D Local Data Manager Responsibilities

The Service Center Data Manager, alternatively referred to as the local CLU Steward, is responsible for:

- knowing the standards and criteria for maintaining the official CLU layer
- ensuring that persons updating CLU have had adequate training
- clearing all changes to the official CLU layer
- performing periodic reviews of CLU to ensure continued quality control
- maintaining the data and metadata to meet the needs of the partner agencies
- collecting and validating new county level data
- linking county level geospatial data to related tabular data
- verifying that changes have been forwarded to the national database
- protecting the data from loss.

33 CLU Service Center Managers

A
Overview

The person assuming responsibility for the CLU delineations and data in each Service Center shall be designated the CLU Data Manager. One CLU Data Manager and at least one backup shall be identified in each Service Center. The manager and backup shall be responsible for knowing the standards and criteria for maintaining the official CLU layer and for making appropriate changes.

B
Certification of CLU Managers

The CLU Manager and backup at the Service Center must be certified by the State CLU Manager.

C
Delegation of Authority for Local CLU Manager

Personnel from other agencies may be assigned to manage the CLU data at the local level only when FSA, with mutual agreement of the partner agencies in the Service Center, designates another agency to handle the duties. The State CLU Manager must approve the delegation of authority.

A person from another agency may be assigned as the backup CLU manager, with the approval of the State CLU Manager.

D
Primary Responsibility

The manager's primary responsibility is maintaining the integrity and quality of the CLU boundaries and associated data for the partner agencies.

Continued on the next page

33 CLU Service Center Managers (Continued)

E
General CLU Maintenance

Maintaining CLU data in the Service Center includes:

- seeing that day-to-day updates are performed as necessary on CLU's
- adding CLU's for FSA or partner agency business needs
- correcting CLU boundaries
- updating CLU attributes
- performing regular backups of the data.

F
Service Center CLU Manager Training

State CLU Managers are responsible for establishment and training of CLU managers and certification of personnel.

34-60 (Reserved)

Section 2 CLU Data Quality Control

61 Ensuring Quality Control

A
Overview

Quality control is an essential part of managing the CLU data. Quality begins with the Service Center ensuring that the aerial photography used to prepare CLU are updated and correct. It continues with accuracy in digitizing and entry of CLU attributes. Once initial digitizing is completed, quality again depends on the Service Center reviewing, correcting, and maintaining CLU boundaries and attributes.

B
Preparing Base Maps

Service Centers shall follow 2-CP to ensure that all aerial photographs that will be used as base maps are correct before they are shipped for digitizing. This includes review and correction of areas that are not within the county boundaries, but cover farms administered by the Service Center. Sending base maps for all farms that a Service Center administers will reduce the amount of work that a Service Center has to do after CLU is digitized and returned.

C
Digitizing Centers

Digitizing centers are responsible for digitizing the CLU according to this handbook. They are also responsible for entry of the initial set of CLU attributes. See paragraph 62 for specific instructions on quality control in digitizing centers.

Continued on the next page

61 Ensuring Quality Control (Continued)

D Replacing Official USDA Photography

Once the initial digitizing of CLU and entry of attributes is completed, the mosaicked orthophotography and CLU file are sent to the Service Center for a quality control review. This review includes the checking of returned CLU data and entry of additional information, such as wetland point data, CRP data, farm numbers, easements, and HEL determinations.

The review and entry of the additional information is necessary to ensure that no data from the aerial photographs is lost in the conversion to CLU. Once the conversion is complete, the Service Center is responsible for maintaining CLU's and the underlying orthophotography layer will become the official USDA photography.

E Tools and Standards

Specialized tools and basic standards have been developed to assist digitizing centers and Service Centers in creating, maintaining, and using CLU. See Exhibit 13 for a list of the available tools and Exhibit 14 for a list of approved standards documents.

62 Quality Control in Digitizing Centers

A
Overview

Digitizing centers use FSA's aerial photography as the "source" document or "base map" for initial delineations of CLU boundaries. Only existing field and tract lines will be transferred as CLU boundaries. Line work and data added by counties that is not required or provided as an option, such as subdivisions, will not be transferred. Attribute information from the base map will also be part of the initial transfer.

B
Digitizing

Digitizing centers shall:

- follow this handbook for rules and procedures for digitizing
- use the Digitizing Tool to digitize CLU.

C
Attribute Data

Digitizing centers shall enter the following CLU attribute data from the base maps:

Tract number in TRACTNBR
CLU number in CLUNBR
Farm number in FARMNBR
Highly erodible land type code in HELTYPECD
Official acreage in FSA_ACRES.

Note: Items in this subparagraph shall be left blank when not present on the base map.

D
State and County Codes

Digitizing centers shall use the FIPS button in the Digitizing Tool to enter the following in the CLU attribute table:

- State code where land is physically located, in STATECD
- county code where land is physically located, in COUNTYCD.

Note: These are the FIPS codes, not the county code FSA uses to identify the Service Centers. In the future, the county code will be linked to the FIPS code to handle cases where the FIPS code does not match the county code.

Continued on the next page

62 Quality Control in Digitizing Centers (Continued)

E
Reasons for Entering Official Acreage

Digitizing centers shall enter the official field acreage from the aerial photographs in FSA_ACRES. This entry allows Service Centers to compare official acreage from the aerial photographs with the CLU calculated acreage. During the Service Center's initial quality review, at a minimum CLU's with differences that exceed the greater of 3 percent or 5 acres will be reviewed to determine whether the CLU boundaries were misinterpreted or whether the official acreage was incorrect.

The differences between official acreage and CLU calculated acreage will also be tracked to determine the general trend in acreage changes.

F
Running Quality Control Tools

Digitizing centers shall:

- run the set of quality control tools provided in the Digitizing Tool against the CLU file
- correct errors before file is sent to the Service Center.

63 Service Center Initial Quality Control Review

A
Overview

Quality control is an essential part of managing the CLU data. Before Service Centers can stop maintaining the aerial photographs, additional information required by various handbooks, such as wetland point data, CRP data, farm numbers, easements, and HEL determinations shall be added as needed. This is necessary to ensure that no data from the aerial photography is lost in the conversion to CLU.

Once the initial digitizing of CLU's and the conversion of labels and other data from paper maps conversion is complete, the Service Center will be responsible for reviewing, correcting, and maintaining the CLU boundaries and attributes. CLU's and the underlying orthophotography layer will become the official USDA photography.

B
Initial Certification of CLU's

A quality control review shall be performed on the CLU layer after digitizing is complete. This is necessary to ensure that no data from the paper maps is lost in the conversion process.

The Service Center CLU Data Manager is responsible for overseeing the initial quality control review. Once CLU's are considered complete, the State Office CLU Manager will perform a review and determine whether CLU's can be certified.

Note: See 2-CP, Part 5, Section 2 for how to get CLU and the underlying orthophotography layer initially certified as official USDA photography.

64 Maintaining CLU Quality

A
Overview

Quality is contingent on training and reviews of work completed. It also involves ensuring that a sufficient number of staff are trained and certified in each Service Center to manage the CLU layer.

Each employee allowed to modify CLU must demonstrate to the local CLU Data Steward that they have sufficient knowledge of the GIS software to conduct Agency business and maintain CLU as the official USDA photography for the partner agencies. Limiting the use of this software to only certified employees is intended to ensure that the quality of CLU is maintained to specifications.

B
Clearing Changes to CLU

All changes to the official CLU layer shall be cleared through the local CLU Data Manager or the backup.

C
Acreage Changes

GIS will automatically provide the calculated acreage of the digitized land unit polygon. This acreage may differ from the acreage calculated by other means and recorded as "official acreage" in historical records and program-delivery systems. Acreage changes in official acres or in tract acreage shall be handled according to 2-CP and 3-CM.

65-90 (Reserved)

Part 3 Delineating CLU's

Section 1 Rules for Delineation

91 Overview

A
Key Information

Transferring CLU polygons is called digitizing. Digitization is the creation of digital lines in GIS and is accomplished using heads-up digitizing methods. Heads-up digitizing is the process of tracing lines over an image displayed on the computer screen using a computer mouse. For Service Centers, these polygons represent CLU boundary lines.

Service Centers shall delineate CLU at a level of detail and accuracy that matches or exceeds that used on 24" x 24" aerial photography. This includes not only the tract and field boundaries, but key information such as CRP data; HEL determinations; farm, tract, and field numbers; and easement identification. The information associated with CLU is entered by attributing (attaching) these characteristics to CLU.

B
Land Classifications

The partner agencies have established 10 fundamental land classifications based on land cover and land use. These classifications are:

- Barren
- Cropland
- Forest
- Mined
- Other Agricultural
- Perennial Snow and Ice
- Rangeland
- Tundra
- Urban
- Water Body.

The specialized rules for delineating each of these land classifications are included in this section.

Continued on the next page

91 Overview (Continued)

C
Rules for Delineating CLU

Land categories represent various combinations of land cover and land use, and are the basis for determining CLU boundaries. CLU delineations may change based on changes in land cover or land use. Delineating CLU's involves 3 steps.

Type of Boundary	Rules for Delineating
Visible	Determine the initial boundary for CLU using land cover, such as timber, range, or cropped, and physical boundaries, such as fences, roads, and waterways visible on aerial photographs or annual 35mm slides.
Management	Define land use, according to the delineation rules for the land category, to further divide the area according to management differences, such as pine trees verses hardwood timber. Management boundaries not visible on the aerial photograph or annual 35mm slide may be delineated according to information provided by the customer or other sources.
Ownership	Divide the area into CLU's based on ownership lines delineated according to the rules for the land category that applies to the area.

D
Inclusions

In all efforts to segregate spatial data into discrete units, such as soil map units, CLU's, and forest type maps, virtually every CLU delineation on the map includes areas that are not identified in the name of the unit. For example, although CLU might be labeled as a field, the land unit may not contain 100 percent cropland. There may be some small percentage of noncropland, such as small stock ponds, turnrow deductions, etc., that are inclusions in the field. Many areas of these inclusions are too small to be delineated separately. If they were larger, such as a grassed waterway, they might be delineated as a separate CLU.

The size and type of inclusions to be delineated will be jointly agreed upon by the FSA SED, NRCS State Conservationist, and other USDA Service Center Agencies' State Managers. The determination on the size and type of inclusions will be submitted to the National Office for review and final approval.

The ability to delineate CLU's, with close to 0 percent inclusions, is largely dependent on the size of the terminal screen and the scale at which the orthophotograph is displayed.

When delineating CLU's, judgment must be exercised as to the effects of inclusions on program administration and Service Center workload. Inclusions that are large enough to effect Service Center programs shall be delineated.

92 Data Layers

A Subordinate Data Layers

By definition, CLU is delineated by permanent features such as fence lines, roads, waterways. This requirement minimizes the number of changes that will be required to CLU boundaries.

However, an important function and advantage of GIS is the ability to build additional layers of data. For example, subdivisions of CLU to show cropping patterns or conservation practices can be created in a separate layer and superimposed over the established CLU boundaries. The CLU layer can thus become the base layer for many other program-specific information layers created by partner agencies.

B Examples of Subordinate Data Layers

Layers already identified to be built from and tied to the CLU layer are NRCS's CM Land Units layer, and FSA's Wetland Points data layer.

Other possible examples are:

- subdividing an existing CLU to indicate crop variations or terraces
- combining CLU's with other layers such as soils to create thematic maps that show the soils for specific fields
- partitioning wetland determinations
- grouping CLU's with common attributes into new data layers such as CRP fields or tracts.

These layers may have permanent or short-term use in a Service Center or at other levels of the Service Center Agencies.

Continued on the next page

92 Data Layers (Continued)

C
Subdivisions

Subdivisions may change regularly within CLU boundaries because of farm management factors. FSA currently delineates subdivisions on a photocopy of the aerial photograph enlargement. Subdivisions are delineated according to compliance reporting dates, if not sooner, and are based on a description by the farmer. The placement of the boundary line is often approximated since it is not likely that MDOQ or the base layer digital map matches current conditions.

Initial delineation of CLU's will not include data on any field subdivisions, such as CRP or terraces. The Service Center may transfer these subdivisions into the automated system as subordinate data layers after the initial delineations are completed.

93 Delineating Urban CLU

A
Defining Urban CLU

Urban CLU's include:

- land that includes cities, towns, villages, strip developments along highways, transportation, power, and communications facilities
- areas such as those occupied by mills, shopping centers, industrial and commercial complexes
- institutions that may, in some instances, be isolated from the urban areas.

B
Rules for Delineating

The following table describes the rules for delineating Urban CLU's.

Type of Boundary	Rules for Delineating
Visib1e	A permanent fence line is delineated as observed on aerial photograph or annual photography. Permanent waterways are delineated as the outside edge of established permanent waterways on aerial photograph or annual photography unless a property line divides the waterway. If the property line divides the waterway, delineate according to property boundary. Forest lines are considered the edge of the tree line, not the shadow line, as shown on aerial photography or annual photography. A sidewalk, street, or landscaping is delineated as a boundary when it falls at a property line.
Management	Change in zoning classification within a town or city, such as residential or commercial, is delineated as a boundary except in the case where a customer's property is split by zoning. If an urban area is surrounded by land that has not been previously delineated, the user will use the rules for delineation associated with the land categories adjacent to the urban area.
Ownership	Property boundaries that divide an otherwise contiguous CLU shall be drawn according to the actual property boundary line. County plat maps, if available, may provide a guide to assist delineation.

94 Delineating Cropland CLU

A
Defining Cropland CLU

Cropland CLU's include land:

- newly broken out, if both of the following apply:
  - land is planted to a crop intended for harvest
  - tillage and cultural practices in planting and harvesting the crop are consistent with normal practices in the area
- currently being tilled to produce a crop
- **not** currently tilled, but have been tilled in a prior year and are suitable to be tilled for crop production
- currently devoted to 1- or 2-row shelterbelt planting, orchard, vineyard, or other related crops
- in terraces that, according to FSA records, were cropped in the past even though they are no longer capable of being cropped
- in sod waterways or filter strips planted to perennial cover
- under CRP-1, including alternative perennials enrolled before June 3, 1999, until CRP-1 expires or is terminated.

Note: The definition of cropland in this subparagraph is consistent with the cropland definition in 2-CM and 3-CM.

Continued on the next page

94 Delineating Cropland CLU (Continued)

B
Rules for Delineating

The following table describes the rules for delineating Cropland CLU's.

Type of Boundary	Rules for Delineating
Visib1e	Lines defining a road boundary are delineated at the edge of the road, not the centerline of the road. A permanent fence line is delineated as observed on aerial photograph or annual photography. **Note:** Placement of newly installed permanent fence lines delineated according to producer measurements should be verified with annual photography (35mm slides) and GPS, if available. The outside edge of established permanent waterways that are not cropped according to the visible boundary on aerial photograph or annual photography. Established grass backed terraces may be delineated according to the terrace boundaries on aerial photograph or annual slides. Forest lines are considered the edge of the tree line, not the shadow line. Irrigation patterns, such as pivot systems and corners, will not be delineated during the development of base-line CLU's.
Management	Crop line is the planting line where the producer consistently stops planting and begins planting another. The crops planted do not have to remain the same, but the line between crops should remain in the same place for 1 or more years before being used as a delineation line. Changes in chemical application rates, fertilizer rates, or tillage practices are not delineated as a boundary on the CLU layer. Changes in irrigation pattern or practice are not delineated as a boundary on the CLU layer.
Ownership	Where property boundaries fall at the centerline of a road, the land unit boundary shall be drawn at the edge of the road, not the centerline of the road. Property boundaries that do not follow a visible physical boundary, but do divide an otherwise contiguous CLU, shall be drawn according to the actual property boundary line. Property boundaries that fall at the centerline of a stream, creek, or river shall be drawn at the outside edge of the waterway, not the centerline of the waterway.

95 Delineating Rangeland CLU

A
Defining Rangeland CLU

Rangeland CLU's:

- include herbaceous, shrub, brush, or mixed range that has native vegetation dominated by grasses, grasslike forbs, or shrubs
- include introduced forage species that are managed like rangelands
- do not need to be grazed
- are most commonly defined by physical boundary that is a permanent fence or other similar feature.

B
Rules for Delineating

The following table describes the rules for delineating Rangeland CLU's. This includes areas not originally digitized from the county photographs.

Type of Boundary	Rules for Delineating
Visible	A permanent fence line is delineated as observed on aerial photograph or annual photography. Placement of newly installed permanent fence lines delineated according to producer measurements should be verified with annual slides and GPS, if available. Temporary livestock fencing shall not be used as a boundary.
Management	None.
Ownership	Property boundaries that divide an otherwise contiguous CLU shall be drawn according the actual property boundary line. County plat maps can also be used as a guide.

96 Delineating Other Agricultural CLU

A
Defining Other Agricultural CLU

Other agricultural CLU's include farmsteads, holding areas for livestock such as corrals, breeding and training facilities on horse farms, farm lanes and roads, ditches and canals, small farm ponds, and similar uses.

Note: This corresponds to "other land on the farm" portion of Farmland as defined in 3-CM.

B
Rules for Delineating

The following table describes the rules for delineating other agricultural land CLU's.

Type of Boundary	Rules for Delineating
Visible	A permanent fence line is delineated as shown on aerial photography or annual photography. Placement of newly installed permanent fence lines delineated according to producer measurements should be verified with annual photography. Temporary livestock fencing will not be used as a boundary. The outside edge of established permanent waterways that are not cropped are delineated according to visible boundary on aerial photograph or annual photography. Newly created permanent waterways can be delineated according to measurements provided by NRCS. Forest lines are considered the edge of the tree line, not the shadow line, as shown on aerial photography. A sidewalk, street, or landscaping is delineated as a boundary when it falls at a property line.
Management	Changes in land cover, such as from cropped land to a holding area for livestock, could cause boundary delineation if required for a Service Center Agency's business needs.
Ownership	Property boundaries that divide an otherwise contiguous CLU shall be drawn according to the actual property line.

97 Delineating Forest CLU

A

Defining Forest CLU

Forest CLU's include land that includes deciduous, evergreen, grazed forest, or mixed forest land that:

- have tree-crown density (crown closure percentage) of 25 percent or more of the total acres of tree or vegetative cover
- had tree-crown density (crown closure percentage) of 25 percent or more removed by clear cutting or fire, but still are primarily used for forest uses
- is defined by physical boundaries that include forest, fences, or other similar features.

Continued on the next page

97 Delineating Forest CLU (Continued)

B
Rules for Delineating

The following table contains rules for delineating Forest CLU's.

Type of Boundary	Rules for Delineating
Visible	Access, fire control breaks, logging, or recreational roads are not considered a boundary. A maintained fire break is considered a boundary if it also marks a change in ownership, management type, or timber type; otherwise, it should not be delineated. A permanent fence line is delineated as shown on aerial photograph or annual photography. Placement of newly installed permanent fence lines delineated according to producer measurements should be verified with annual slide or GPS, if available. Temporary livestock fencing will not be used as a boundary. Forest lines are considered the edge of the tree line, not the shadow line. A stream or river contained in the forest is considered a boundary only if it also marks a change in ownership, management type, or timber type.
Management	A change in timber type could be delineated as a boundary if required by the Service Center Agency's business need. This includes changes from evergreen forest to deciduous or mixed types of forest. A change in tree species could also be used to delineate a boundary if it also meant that the management or treatment of species was different from the surrounding species. Changes in chemical application rates, fertilizer rates, or tillage practices are not delineated as a boundary on the CLU layer. These types of changes could be included on future Service Center Agency's specific layer as needed.
Ownership	Property boundaries that divide an otherwise contiguous CLU shall be drawn according to the actual property boundary line.

98 Delineating Water Body CLU

A
Defining Water Body CLU

Water Body CLU's:

- include areas such as streams, rivers, canals, lakes, reservoirs, ponds, bays, estuaries, or aquaculture units
- are defined by physical boundaries, such as edge of water, but may include permanent fences, roads, or other similar features.

B
Rules for Delineating

The following table describes rules for delineating Water Body CLU's.

Type of Boundary	Rules for Delineating
Visible	Lines defining water boundary are delineated at the normal water line, not the centerline of the stream, river, riverbed, etc. Ponds and lakes under 1 acre shall not be delineated, unless needed for Service Center program purposes.
Management	Areas that are used for irrigation will not be separately delineated from those that are used for livestock water or recreation.
Ownership	Property boundaries that divide an otherwise contiguous CLU shall be drawn according to the actual property boundary line.

99 Delineating Mined CLU

A
Defining Mined CLU

Mined CLU's include:

- extractive mining activities that have significant surface expression
- areas where vegetative cover and overburden are removed to expose such deposits as coal, iron ore, limestone, and copper
- areas where quarrying of building and decorative stone and recovery of sand and gravel deposits also result in large open surface pits
- inactive, unreclaimed, and active strip mines; quarries, borrow pits, and gravel pits even where current mining activity is not always distinguishable are included in this category until other cover or use has been established.

Note: Unused pits or quarries that have flooded, however, are placed in the Water category.

B
Rules for Delineating

The following table describes rules for delineating Mined CLU's.

Type of Boundary	Rules for Delineating
Visible	A permanent fence line is delineated as shown on aerial photography or annual photography. Placement of newly installed permanent fence lines delineated according to producer measurements should be verified with annual photography. Temporary livestock fencing will not be used as a boundary. The outside edge of established permanent waterways that are not cropped are delineated according to visible boundary on aerial photograph or annual photography. Newly created permanent waterways can be delineated according to measurements provided by NRCS. Forest lines are considered the edge of the tree line, not the shadow line, as shown on aerial photography.
Management	Changes in land cover, such as from a strip mine to a gravel pit, could cause boundary delineation if required for a Service Center Agency's business needs.
Ownership	Property boundaries that divide an otherwise contiguous CLU shall be drawn according to the actual property boundary line.

100 Delineating Barren CLU

A
Defining Barren CLU

Barren CLU's:

- include land that has minimal (generally < 5 percent) natural cover and limited capacity to support vegetative covers
- include land that includes contiguous dry salt flats, beaches, sandy areas other than beaches, bare exposed rock, transitional areas, or mixed barren land
- have no-vegetative natural cover, often having a limited capacity to support vegetation, with a surface of sand, rock, thin soil, or permanent ice or snow
- are defined by physical boundaries that may include fences, roads, sidewalks, streets, landscaping, permanent waterways, forests, or other similar features.

B
Rules for Delineating

The following table describes the rules for delineating Barren land CLU's.

Type of Boundary	Rules for Delineating
Visible	A permanent fence line is delineated as shown on aerial photography or annual photography. Placement of newly installed permanent fence lines delineated according to producer measurements should be verified with annual photography. Temporary livestock fencing will not be used as a boundary. The outside edge of established permanent waterways that are not cropped are delineated according to visible boundary on aerial photograph or annual photography. Newly created permanent waterways can be delineated according to measurements provided by NRCS.
Management	Changes in land cover could cause boundary delineation if required for Service Center Agency's business needs.
Ownership	Property boundaries that divide an otherwise contiguous CLU shall be drawn according to the actual property boundary line.

101 Delineating Tundra CLU

A
Defining Tundra CLU

Tundra CLU's:

- include treeless regions beyond the geographic limit of the boreal forest or above the altitudinal limit of trees in high mountain areas
- are defined by physical boundaries that include forests, permanent waterways, or other similar features.

B
Rules for Delineating

The following table describes the rules for delineating Tundra CLU's.

Type of Boundary	Rules for Delineating
Visible	The outside edge of established permanent waterways that are not cropped are delineated according to visible boundary on aerial photograph or annual photography. Forest lines are considered the edge of the tree line, not the shadow line, as shown on aerial photograph or annual photography.
Management	Changes in tundra types could cause boundary delineation if required for Service Center Agency's business needs.
Ownership	Property boundaries that divide an otherwise contiguous CLU shall be drawn according to the actual property boundary line.

102 Delineating Perennial Snow and Ice CLU

A
Defining Tundra CLU

Perennial Snow and Ice CLU's include:

- lands that have a cover of either snow or ice because of a combination of environmental factors which cause these features to survive the summer melting season

  Note: In doing so, they persist as relatively permanent features on the landscape and may be used as environmental surrogates.

- snow, firn (coarse, compacted granular snow) or ice accumulation in these areas exceeds ablation, which is the combined loss of snow or ice mass by evaporation and melt-water runoff.

  Note: Adjacent lands most commonly will be classed as Water, Wetland, Barren Land or Tundra, with their common boundaries being distinguished most readily on late summer imagery.

B
Rules for Delineating

The following table describes the rules for delineating Perennial Snow and Ice CLU's.

Type of Boundary	Rules for Delineating
Visible	The outside edge of established permanent waterways that are not cropped are delineated according to visible boundary on aerial photograph or annual photography.
Management	Changes in perennial snow and ice could cause boundary delineation if required for Service Center Agency's business needs.
Ownership	Property boundaries that divide an otherwise contiguous CLU shall be drawn according to the actual property boundary line.

103-130 Reserved)

Section 2 Digitizing Standards

131 Introduction

A Overview

Transferring CLU polygons into GIS is called digitizing. Digitization is the creation of digital lines in GIS and is accomplished using heads-up digitizing methods. Heads-up digitizing is the process of tracing lines over an image displayed on the computer screen using a computer mouse. For Service Centers, these polygons will represent CLU boundary lines.

Note: See Exhibits 6 through 9 for examples of digital polygons.

B Relationship of CLU to MDOQ

MDOQ map images are used for digitizing in Service Centers. When the user has completed tracing CLU's, the software will "close" the lines into a completed polygon and the software functionality will maintain the placement of the CLU boundary lines in reference to MDOQ.

Example: When the user prompts the computer to show CLU's for a particular tract, the software will automatically display the polygon with precise placement over MDOQ. Digitized polygons drawn on top of the digital orthophotographs will remain exactly as placed until the lines are manually changed.

132 Minimum Digitizing Scale

A
Overview

GIS software allows the user to select, enlarge, and minimize the map image in the window area of the computer screen. The window is the actual viewable area of map features on the computer screen. As a minimum, it is suggested that the Service Centers use a digitizing window of approximately 6" x 8" and start at a scale that yields approximately 40 acres, more or less, in the window.

B
Required Digitizing Scale

The minimum scale at which on-screen digitizing will be performed is 1:4800. Small CLU areas will have to be done at a larger scale.

133 Minimum Precision

A
Overview

Precision is the standard of accuracy for acreage measurements.

B
Required Precision

The standard precision for acres for the Service Center Agencies is .01 acres.

Note: In those areas that grow tobacco, MDOQ may not support digital acreage measurements to one one-hundredth of an acre. At present, these areas require field measurements.

134 Standard Digitizing Defaults

A
Overview

GIS functionality allows for numerous defaults and settings in the system when digitizing CLU's. To maintain consistency through all Service Centers, standard settings were developed for basic GIS operations.

B
CLU Digitizing Standard Defaults

The following table describes standards to use when digitizing CLU's and tracts into the Service Center's GIS.

Item	Standard
Digital Maps	DOQ dated after 1994 provided by the National Digital Orthophotography Program
Map Display	North American Datum for 1983
Map Projection (conversion from 3-dimensional to 2-dimensional)	Universal Transverse Mercator Grid System
All Other Standards	See forthcoming USDA FSA Map Symbology Guide.

135 Tract Digitizing Standards

A
Overview

FSA tract lines shall be digitized and maintained when the CLU boundaries do not equal the tract boundaries. Tract lines shall be entered after CLU boundaries are completed.

Note: Tract lines are digitized to the point where land management ends, not to the center of roads.

B
Tract Digitizing Standards

Service Centers shall follow the standards included in the following table when digitizing tract boundaries.

IF CLU boundaries...	THEN...
do not equal the tract boundaries	tract boundaries shall also be digitized.
equal only part of the total tract boundary	remaining tract boundary shall be digitized. The CLU boundary that is the same as the tract boundary shall be assigned multiple attributes for both CLU and tract identification.
form the entire tract boundary	tract boundary will not be digitized. The CLU boundary shall be assigned multiple attributes for both CLU and tract identification.

136 Handling Existing Multi-Tracts

A
Overview

FSA multi-tracts will not be maintained as part of the CLU layer. Tract lines for member tracts shall be entered after CLU boundaries are completed.

Note: Member tract lines are digitized to the point where land management ends, not to the center of roads.

B
Tract Digitizing Standards

Service Centers shall follow the standards included in the following table when digitizing member tract boundaries.

IF CLU boundaries...	THEN...
do not equal the member tract boundaries	member tract boundaries shall also be digitized.
equal only part of the total member tract boundary	remaining member tract boundary shall be digitized. The CLU boundary that is the same as the member tract boundary shall be assigned multiple attributes for both CLU and member tract identification.
form the entire member tract boundary	member tract boundary will not be digitized. The CLU boundary shall be assigned multiple attributes for both CLU and member tract identification.

C
Recording Multi-Tract Number

Digitizing centers shall enter the multi-tract number in the “Comments” field in the CLU attribute table for each member tract in a multi-tract.

Note: The Digitizing Tool used in the digitizing centers creates a “Comments” field for each CLU. The Maintenance Tool does not create a “Comments” field.

137 Land Physically Located Outside of County

A
Overview

FSA Service Centers sometimes administer land that is physically located outside of their county boundaries. This can occur as the result of a farm transfer or designation as an alternative servicing County Office under 3-CM.

This land usually will not be included in the initial CLU layer provided to the Service Center. When this is the case, the Service Center will be responsible for creating and maintaining this CLU data.

B
Obtaining Digital Photography

Service Centers shall request the necessary digital photography images according to the following table.

IF the area is in...	THEN request the images from...
your State and it has already been digitized	the county.
your State but has not been digitized	APFO.
another State.	

C
Adding CLU's

Digitize CLU's, enter attribute data, and add related data according to Parts 3 through 5.

Note: Make certain to enter in the CLU attribute table the State and county codes for where the land is physically located.

138-160 (Reserved)

Part 4 Identifying CLU

161 Numbering and Labeling CLU

A
Unique CLU ID

With the greater use of GIS software and the installation of the new CCE equipment, it is important to ensure that data can easily move among systems and databases without overwriting data that someone else previously created. It is essential that each CLU have a globally-unique identifier GUID.

For the most part, the generation of unique identifiers for CLU's will be:

- accomplished by the software
- largely transparent to the user.

To ensure uniqueness, GUID's are usually long jumbles of characters that have little recognition value except to the computer. The important thing for the user to remember is that you need one. CLU records usually contain other attributes, such as a field number and a CLU label, that provide a human-recognizable identification.

Note: Whenever CLU is created by the Maintenance Tool, it will be assigned a unique identifier. It is called CLUID.

B
CLU Label Overview

A label will also be assigned or attributed to each CLU to:

- identify CLU for Agencies in a specific Service Center
- assist in effective communication with the farmer and customers
- provide a link to previous historical tabular data.

This label is not related to the ID number. Each Agency in the Service Center will use the same label to identify CLU so that the farmer or other customer understands which CLU is being discussed no matter which Agency in the Service Center uses the number.

Example: Tract 2002, field 1 will be assigned to identify the same CLU by all Agencies in that Service Center.

Continued on the next page

161 Numbering and Labeling CLU (Continued)

C

CLU Labels for Existing Fields

CLU that was correctly identified on an aerial photograph as a tract and field will be assigned the same tract and field number as it had on the photograph when CLU data is entered into GIS. Using existing field number minimizes the changes required to historical data, such as NRCS conservation plans, that is tied to FSA field numbers. Any existing field number that does not meet 2-CP guidelines for numbering fields must be corrected on the 24" x 24" aerial photograph before it can be used to identify CLU.

D

CLU Labels for Other Areas

CLU's or land enclosed in tract boundaries that did not have an FSA field number will not be assigned a label that is unique to the tract; instead, these areas will be assigned a field number of "0". This number is used as a generic flag denoting undefined CLU's prompting the Service Center to review and assign CLU a new number. Undefined tracts will be assigned the number "0". When a CLU boundary is the same as a tract boundary, a field number of "1" shall be assigned to CLU.

Note: Follow 2-CP, paragraph 494 to determine new CLU numbers.

162 Attributing CLU's

A
What Is Attributing

GIS systems allow data elements (called attributes) to be attached to geospatial points, lines, and polygons. These attributes can contain human-recognizable identifiers and labels, or they may contain identifiers that point to data stored in other files and databases. Identifiers can provide a path to a potential bounty of information about a place on the ground.

B
CLU Attribute Table

A standard set of data attributes, such as data elements, shall be attached to each CLU polygon. See Exhibit 17 for a table listing the standard set of attributes and the method of entry. Additional attributes may be added to this standard set to meet unique agency business requirements.

163-190 (Reserved)

Part 5 Relationship With Other Data

191 Overview

A Background

Decades of records exist in files and databases describing USDA programs applied to abstract locations such as a tracts, management units, development sites, etc. GIS systems can now be used to relate this information concerning program delivery to specific points on the earth. This new capability envisions the user clicking the mouse on a place on a map or photograph and having the computer respond with data about the land.

B Examples of Linking Tabular and Spatial Data

This capability can be a major productivity enhancer. If you know a specific point on the earth, you can find all of the instances of program delivery that relate to that point on the earth. Any data that can be tied to a point on the ground can be related to any other data tied to that same geographic point. The following are a few examples of the type of data that could be displayed:

- who owns the land
- who is the current operator
- CRP contract data
- wetlands identified on the property
- the distance from the nearest road or river
- the conservation plan
- outstanding financial obligations tied to the land.

C Future Plans for Links

It will take time to establish all of the data linkages needed to implement this capability. Existing and new tabular data (data contained in database tables or traditional computer files) must be linked to geospatial locations. Acquiring additional layers of spatial data will produce other links. Through reengineering, program delivery systems will be adapted to store links to digitized land units, or to store spatial coordinates for the area where an activity takes place.

Additional information on linking CLU's to tabular data will be forthcoming in documentation for new and reengineered systems.

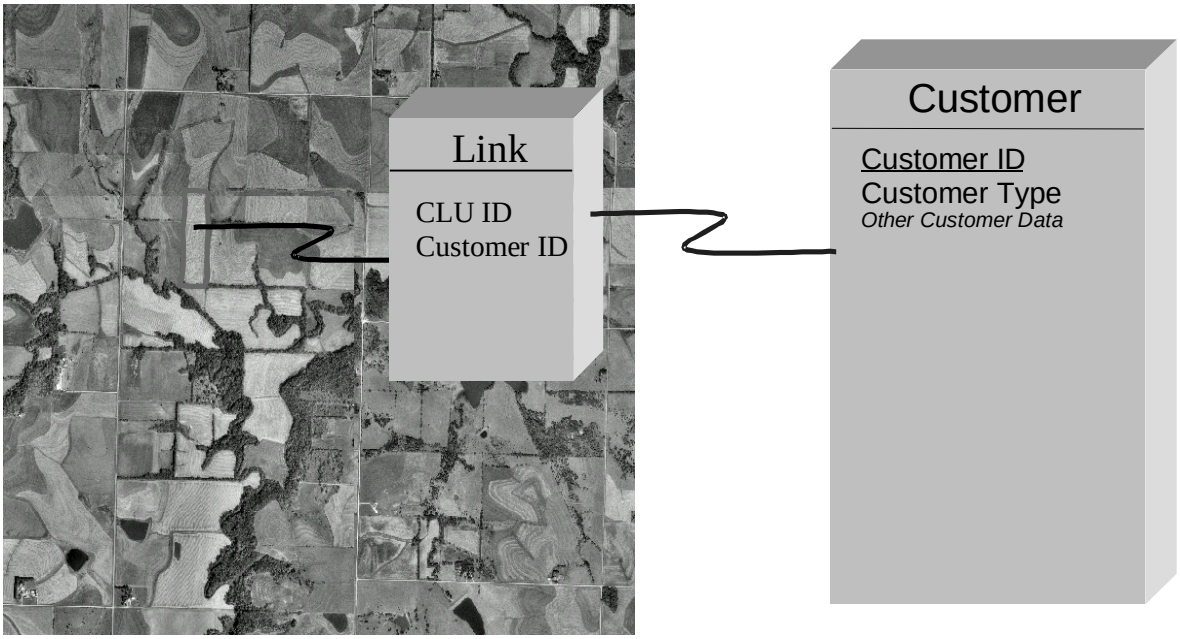
192 Linking CLU to Customer

A
Overview

Future software will provide some of the initial linkages, in particular the linking of 1 or more customers to each CLU.

B
Customer Link

The following is a graphic representation of 1 way to link between CLU and the customer.



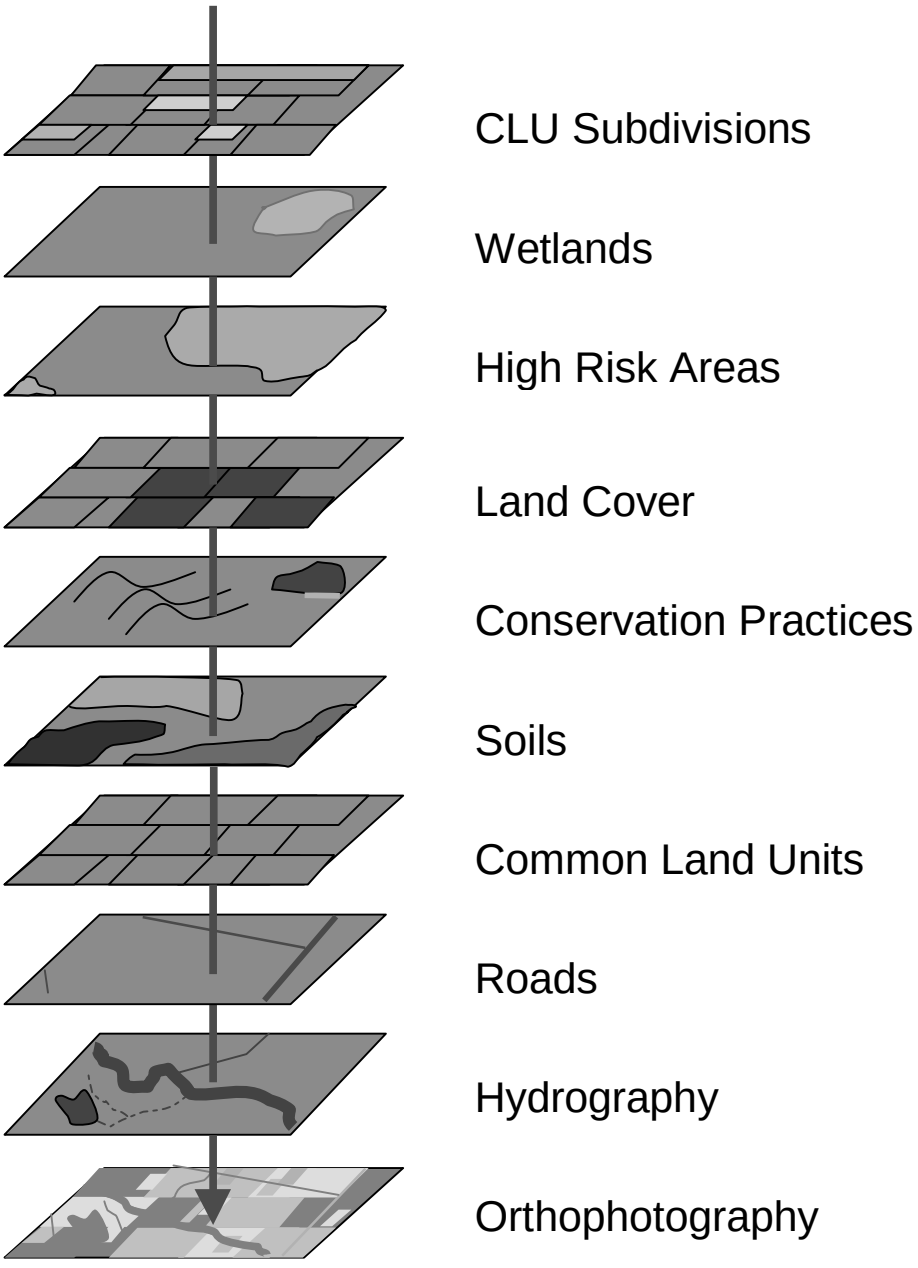
Linking CLU polygons to tabular data stored in files and databases.

193 CLU and Other Data Layers

A
Additional Data Layers

Additional data layers are needed to properly maintain farm and producer records. While the Service Center Agencies have agreed on the basic area designation for CLU, each will want to create additional data layers to meet Agency specific needs. See Exhibits 6 through 9 for examples.

The following graphic represents some of the data layers which may be used by Service Centers to conduct their business.



194 Wetland Point Layer

A Background

NRCS is responsible for delineating official certified wetlands, but the certified wetland layer may not be complete by the time the initial CLU layer arrives in the Service Center. To assist producers before wetlands are completely certified, FSA will associate both basic certified and inventoried wetland information from the existing aerial maps to points on a layer separate from CLU.

When this point data is displayed in conjunction with the CLU layer, producers can be directed to NRCS for appropriate wetland certifications on specific CLU's. Once the certified wetland layer is completed, the FSA wetland point data for corresponding wetlands will no longer be used. Point data associated with existing inventoried wetland determinations that are not officially certified will continue to be used until NRCS makes an official certification at the producer's request.

B Establishing Points

Information for both certified official wetlands and noncertified wetlands on existing aerial maps shall be transferred to the wetland point layer. Place the wetland points and enter the appropriate attribute data according to the FSA manual provided with the Wetland Point Data Tool. The manual can also be found by selecting download at the following website: http://dc.ffasintranet.usda.gov/fsagis.

C Wetland Attribute Data

The following attribute data shall be recorded for FSA wetland points:

- approved wetland label from 2-CP, subparagraph 495 D
- acreage of wetland if shown on aerial map
- whether wetland is certified or inventoried
- date certified.

195 Conservation Management Units Layer

A
CM Unit Layer

The NRCS Customer Service Toolkit software produces a GIS data layer called "Conservation Management Land Units". These CM Land Units:

- delineate and describe land where conservation activities are being planned or have been applied
- are derived from the CLU layer but form a separate spatial layer.

The CM Land Units layer retains all the attributes of the CLU layer, plus it has additional attributes related to conservation planning.

A District Conservationist may create several of these conservation management layers, each one representing a planning alternative. One or more of these layers/themes may represent a customer's conservation plan or contract.

When a land owner finally implements a conservation plan, it may trigger changes to the CLU layer. However, it will be up to the CLU data steward in each Service Center to actually change the boundaries in the CLU layer. The CLU boundary changes will usually occur after the conservation practice is constructed, and is based on the new physical CLU boundaries found on the ground.

The NRCS Conservation Planning Handbook refers to these types of land units as "Conservation Management Units". In previous versions of the handbook, these were referred to as "Conservation Treatment Units".

195 Conservation Management Units Layer (Continued)

B
Subdivisions

Frequently, a District Conservationist will subdivide a CM Land Unit into multiple land units for conservation treatment purposes. This is especially common for pasture or grazing land. These subdivisions are:

- delineated on the CM Land Units layer
- are usually referred to as management units.

For example, a field conservationist may divide pastures or grazing land into several management units to develop grazing plans for customers. In this case, Fields 1 and 2, CLU's that are pastureland, can be divided into CM Land Units 1a, 1b, 2a, and 2b respectively.

C
Merging CLU's into Larger Units

As conservationists develop land unit themes for individual customers, they will probably want to merge them to cover larger geographic areas. This provides the ability to query on current and planned land use, and on conservation practices for scheduling or reporting purposes.

D
Tabular Attributes for CM Land Units

See Exhibit 18 for the data elements for the CM Land Units. The first 8 attributes come directly from the CLU data layer.

196-220 (Reserved)

Part 6 Releasing Data

Section 1 Rules for Release of Data

221 General Information

A Overview

It is FSA policy to safeguard individual privacy from the misuse of Federal records while granting individuals access to records concerning themselves. FSA information that is now available in digital form has no new release procedure than when it was retained in paper format.

As before, the information that is released to agencies of USDA should only be provided when they have an official use for the information. Release of this information to other Government agencies or a third party is allowable only if there has been a routine use established in the FSA Privacy Act system of records granting use of the information.

2-INFO provides procedures for all FSA offices to follow when making records available to the public, other Federal agencies, and Congress. 3-INFO provides procedures to be followed by all offices when collecting, maintaining, or disclosing data or information concerning an individual.

B Releasing CLU Data

In general, CLU boundaries may be released as long as no identifying information links CLU to a particular producer. Appropriate metadata must accompany the data according to Part 7.

222 Releasing CLU Data

A Releasing CLU Boundaries

CLU boundaries may be released as long as **no** identifying information links CLU to a *****--particular producer. All attribute information, except calculated acreage figures, must be stripped from CLU before distribution. Appropriate metadata must accompany the data according to Part 7.

B Not Releasing Farm, Tract, and CLU Numbers

Farm, tract, and CLU numbers appearing in the CLU attribute shall not be released, except to a producer on a farm in which that producer has an interest.

C Releasing CLU Acreage

Calculated acreage appearing in the CLU attribute table may be released.

D Releasing CLU Unique ID

The CLU unique numbers appearing in the CLU attribute table shall not be released, except to a producer on a farm in which that producer has an interest. A producer is considered to have an interest in CLU if the producer is an operator, owner, or other producer on CLU.--*****

E HEL or Non-HEL Attributes

HEL/non-HEL status appearing in the CLU attribute table shall not be released, except to a producer on a farm in which they have an interest.

223-250 (Reserved)

Section 2 Servicing Requests

251 Basic Policy

A Overview

2-INFO provides procedures for all FSA offices to follow when determining the cost of making records available to the public, other Federal agencies, and Congress. 2-INFO, Part 4 provides procedures for determining the cost of search services, review services, computer services, and related services.

B Metadata Requirements

For CLU and related data, it will be necessary to provide metadata that accurately describes the data whenever data is released. See Part 7 for information on metadata.

*--C Official Distribution Point for CLU

APFO is the official collection and distribution point for FSA CLU data. County Offices shall provide copies of their CLU to APFO, through the APFO FTP site, immediately following certification and post an updated copy every 30 days. APFO will process CLU for archival and distribution.

Note: See 2-CP, Exhibit 37 for FTP instructions.--*

*--252 Requests for Ortho-Imagery

A Basic Policy

APFO is the USDA data steward for ortho-imagery. There are no privacy issues concerning this data.

B Requests for Large Areas

Requests for ortho-imagery for the entire county or large areas shall be directed to APFO. This is similar to the existing policy concerning photographs.

C Requests for Small Areas

Requests from an individual producer for ortho-imagery covering their land can be filled--* at the Service Center.

D Charges

Producers shall not be charged for digital or paper copies of farms in which they have an interest. Charge other requestors only for the cost of reproduction. See Exhibit 19 for additional information on calculating costs for digital data and printed maps.

*--E More Information on Ortho-Imagery

For more information on ortho-imagery, see APFO's web site at **http://www.apfo.usda.gov**.--*

253 Requests for CLU

A Basic Policy

The release of CLU information has many privacy issues and Service Centers must ensure that privacy requirements are not violated according to paragraph 222, 2-INFO, and 3-INFO.

*--B Requests for Entire CLU

County Offices shall direct producers and the public to contact APFO by phone, e-mail, or mail for copies of entire CLU. See Exhibit 19 for the cost of data to be reproduced on CD. County Offices will soon be able to direct all geospatial data orders, CLU included, through the USDA Geospatial Data Gateway at **http://datagateway.nrcs.usda.gov/**. There is no charge when CLU is downloaded using FTP from this web site.**--***

***--253 Requests for CLU (Continued)**

C Servicing Producer Requests for CLU In Which the Producer Has an Interest

Requests from an individual producer for CLU's covering their land may be filled at the Service Center. In this case, privacy issues do not apply to the data associated with that producer and the data is provided at no charge. Only the CLU associated with that producer may be provided with full attribute data. A producer is considered to have an interest in CLU if the producer is an operator, owner, or other producer on CLU. Appropriate metadata must accompany that data according to Part 7.

Select the producer's CLU, click "Theme" and then click "Convert to Shapefile" to create a file containing only the producer's CLU. See the Maintenance Tool User Guide, "Search CLU and PLSS" for specific instructions on how to select CLU by farm, tract, or CLU number.

Note: File is **not** saved on hard drive or server.

D Charges

Producers shall **not** be charged for digital paper copies of farms in which they have an interest. A producer is considered to have an interest in CLU if the producer is an operator, owner, or other producer on CLU. See Exhibit 19 for additional information on how**--*** to calculate costs for digital data and printed maps.

254 Requests for Wetland Point Data

A Basic Policy

Requests for official wetland information should be directed to NRCS as they are the responsible agency.

B Requests for Large Areas

The Wetland Point Layer data shall not be released except to a producer for a farm in which they have an interest. NRCS will have access to the data through CCE so it will not be necessary to provide them with a copy of the data.

C Requests From Producers

The Wetland Point Layer data shall be provided to a producer for farms in which they have an interest. The data is provided as a tool for producers to use when communicating with NRCS. It is very important that producers understand the proper use of the data and request a final determination as soon as possible for all noncertified wetlands.

D Charges

Producers shall **not** be charged for digital or paper copies of farms in which they have an interest.

--

255 Requests for CRP Data

A Basic Policy

CRP data recorded for CLU cannot be released except to a producer on a farm in which they have an interest.

B Requests for Large Areas

CRP data cannot be released on a county wide, or large scale basis. Partner agencies will have access to the data through CCE so it will not be necessary to provide them with a copy of the data.

C Requests From Producers

The CRP data shall be provided to a producer for farms in which they have an interest.

D Requests for Small Areas

CRP data cannot be released except to a producer on a farm in which they have an interest.

E Requests for CRP Data

Producers shall **not** be charged for digital or paper copies of farms in which they have an interest.

256-280 Reserved

Part 7 Metadata

281 General Information

A Background

Metadata essentially describes the information in a dataset. For GIS data, it answers questions such as:

- what does the dataset describe
- who produced the dataset
- why was the dataset created
- how was the dataset created
- and how reliable are the data.
- who wrote the metadata
- how can someone get a copy of the dataset.

See **http://geology.usgs.gov/tools/metadata/tools/doc/ctc** to see a more detailed explanation of metadata.

Metadata is included when you provide a copy of digital data to someone who requests it. It is also used to describe the datasets that are searchable by using the web. For maps of CLU and related data, it will be necessary to provide metadata that accurately describes the data whenever data is released.

B Metadata Standards

Metadata for Service Center Agency datasets is to conform to FGDC Metadata Content Standards. See **http://www.fgdc.gov/metadata/meta_stand.html** to download the standards.

C Creating Compliant Metadata

FGDC compliant metadata will be available to Service Centers after certified CLU files are sent to APFO at **http://www.apfo.usda.gov/**. Metadata files for certified CLU's already sent to APFO will also be posted to the same web site for Service Centers to download their metadata using FTP.

D Example of CLU Metadata

See Exhibit 22 for an example of FGDC compliant metadata for a CLU file.

282-290 (Reserved)

*--Part 8 GIS in Emergency Preparedness and Response

Section 1 Roles and Responsibilities

291 GIS Specialist Duties for Emergency Management

A Overview

The State Office GIS specialist has critical job functions relevant to both general program administration and emergency events. 1-SEM has established National and State Emergency Response Teams. Unless otherwise designated by SED, GIS specialist shall serve as the geospatial officer as part of the State Emergency Response Team. The geospatial officer provides geospatial support to the State Office, Service Centers, and emergency response teams at the National, State, and local levels for emergency planning, response, and recovery. For the purpose of this Part, the State Office **GIS specialist** and State Office **geospatial officer** are considered the **same resource** and used interchangeably.

The geospatial officer shall work and coordinate efforts with the:

- CEB, as needed
- national geospatial officer
- SEB
- SED
- State Emergency and Homeland Security Offices
- other FSA GIS specialists, as appropriate
- other Federal Agencies supporting a large scale event in the respective State.

The State Office geospatial officer shall use geospatial information and GIS software to support emergency management activities. Responsibilities for emergency management include, but are **not** limited to:

- assessing possible structural impacts or damage for agriculture
- assisting in activities for preparedness, response, recovery, and mitigation efforts
- assisting in coordinating efforts with Field Offices, SEB's, and CEB's in assessing and completing LAR's using GIS
- evaluating the location and spatial extent of damage
- identifying affected areas of damage of CLU.**--***

***--291 GIS Specialist Duties for Emergency Management (Continued)**

B Preparedness

The geospatial officer's responsibilities to emergency management directly concerns GIS operations and should be employed in each State. These operations support day-to-day program activity and are also paramount for data preparation and overall readiness for response and recovery efforts during an emergency. The geospatial officer shall ensure that the data requirements in the following table are met.

Note: Geodata files should be stored in both Statewide and county format. Geospatial officers **must** have access to files if network access is unavailable. A designated laptop and/or external drive are necessary for GIS specialist/geospatial officer job functions.

Activity	Program Area	Timeframe to Complete	Notes
Bookmark Geodata and Disaster Resources	Security and Emergency Management	Update as needed.	Takes time to enter sites and bookmark references.
C:\geodata replicated to local drive and external drive	Geodata Management	Update monthly.	Redundant backups are critical for FSA readiness.
Create County Emergency Management Map Template	Security and Emergency Management	Update yearly.	Prepare a county template with basic legend, disclaimers, title, and logos that is ready to use.
Create State CLU	Common Programs	Create monthly.	Create and archive State CLU by month.
Create State CRP Layer	Conservation	Create monthly.	
Create State Emergency Management Map Template [Cannot use EM because already in 1-CM.]	Security and Emergency Management	Update yearly.	Prepare a State template with basic legend, disclaimers, title, and logos that is ready to use.
Create State FFSF Point Layer	Security and Emergency Management	Create and update yearly.	DR 1800 requirement.
Create State Service Center Point Layer	Geodata Management	Update as needed.	Maintain locations of all Service Centers.
Create Statewide Grain Storage Bin Point Layer	Facility Loans	Create monthly.	Updated as sites are added using the ArcGIS Grain Storage Bin Tool.

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***--291 GIS Specialist Duties for Emergency Management (Continued)**

B Preparedness (Continued)

Activity	Program Area	Timeframe to Complete	Notes
Create Tract Emergency Management Map Template	Security and Emergency Management	Update yearly.	1-SEM, paragraph 127 provides map standards. Prepare a tract template with basic legend, disclaimers, title, and logos that is ready to use.
F:\geodata\Cadastral Folder Maintenance	Geodata Management	Check yearly.	Ensure that PLSS and national grid are available on F drives and on an external hard drive in the State Office.
F:\geodata\Disaster_events\Storm_summaries Folder Maintenance	Geodata Management	Check yearly.	Ensure that year folders are created and subfolders are added for each date_event.
F:\geodata\Disaster_events\USDM Folder Maintenance	Common Programs, Security and Emergency Management, and Disaster Programs	Update weekly during drought events.	Ensure that year folders are created.
F:\geodata\geology Folder Maintenance	Geodata Management	Check yearly.	Ensure that seismic zones are ready to use.
F:\geodata\government_units Folder Maintenance	Geodata Management	Check yearly.	Ensure that county boundaries, city boundaries, and townships are ready to use.
F:\geodata\Hazard_site Folder Maintenance	Geodata Management	Check yearly.	Ensure that FEMA floodplains, sink holes, and other hazard sites are ready to use.
F:\geodata\Hydrography Folder Maintenance	Geodata Management	Check yearly.	Ensure that streams and lakes are ready to use.
F:\geodata\hydrologic_units Folder Maintenance	Geodata Management	Check yearly.	Ensure that hydrologic unit codes are ready to use.

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***--291 GIS Specialist Duties for Emergency Management (Continued)**

B Preparedness (Continued)

Activity	Program Area	Timeframe to Complete	Notes
F:\geodata\ortho_imagery Folder Maintenance	Geodata Management	Check yearly.	Ensure that current NAIP is available and ready to use.
F:\geodata\soils Folder Maintenance	Geodata Management	Check yearly.	Ensure that Soil Survey Geographic Soils are ready use.
F:\geodata\topographic_images Folder Maintenance	Geodata Management	Check yearly.	Ensure that 1:24000 topographic images are ready to use by county.
F:\geodata\transportation Folder Maintenance	Geodata Management	Check yearly.	Ensure that roads, rail, and airports files are ready to use.
Geocode FSA Employee Home Locations	Security and Emergency Management	Update quarterly.	Used for identification of impacted employees.
Install and Prepare HAZUS-MH Software	Security and Emergency Management	Update as needed.	OCIO, TSD distributes. Also load State-level data.
Install FSA Map Series	Security and Emergency Management	Update as needed.	OCIO, TSD distributes.
Install HURREVAC Software	Security and Emergency Management	Update yearly before hurricane season.	OCIO, TSD distributes. Not required in all States.
Maintain External Geodata Access Login Accounts	Security and Emergency Management	Update as needed.	Ensure that data access accounts and passwords are current for external emergency data sites.
Setup and Bookmark NCDC Weather and Climate Toolkit	Security and Emergency Management	Update as needed.	No OCIO, Technical Support Division permissions required. Ensure that bookmark is available.

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***--291 GIS Specialist Duties for Emergency Management (Continued)**

C Response

The geospatial officer must be able to quickly respond to an event, using data and resources either already staged or available through outside sources at the time of the event. Successful response during disaster events is directly linked to effective preparation. The following table identifies general tasks the geospatial officer is responsible for during an emergency event.

Activity	Knowledge Areas	Timetable	Notes
Create Maps and Reports	Apply MXT files, spatial statistics, and tabular reports.	Updated throughout the event.	Numerous map types may be required for each event that include State, county, and tract level maps.
Identify Area of Impact (Scope)	Digitize, create shape file, and theme selections.	Create Immediately.	Create a shapefile and begin taking notes of event for metadata.
Imagery Prioritization	Data transfers from external web sites.	**High Priority** - Satellite sources vary in timing, availability, and usability.	Provides a picture to identify the impact and severity of event.
Incorporate External Geodata (Magnitude)	GPS data, NEXRAD, HURRIVAC, HAZUS-MH, SPC, plot locations, and hot linking.	**High Priority** - Make requests for external data after location and data is established.	Begin augmenting disaster response with data from external sources showing magnitude of the event.
Locate Service Center Locations	Geocode, spatial selection, and intersect.	As needed for SEB and National Office.	**Required** for major event situations.
Metadata Maintenance	ArcCatalog, XML, projections, and attributes.	Create for each event and shapefile.	Needed to archive files.
Spatial Analysis	Intersect, spatial selections, predictive models, image comparisons, image interpretation, overlay operations, buffer, and query.	As needed.	This will vary by event type.

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***--291 GIS Specialist Duties for Emergency Management (Continued)**

D Recovery

Recovery activities provide an opportunity for the geospatial officers to summarize the overall event and create maps that display/designate damaged areas, county eligibility for a Secretarial disaster designation, Administrator physical loss notification, and Presidential disaster declarations. Tasks in the following table shall be considered for each event and completed as appropriate.

Activity	Timeframe	Audience	Notes
Archive Event Geospatial Data	1 week after event completion.	GIS specialists and National Office.	Archives and finalizes data developed for event response/recovery.
Complete Process and Event Notes	1 week after event completion.	GIS specialists and National Office.	Identifies what worked, what did not work, and details steps used for the event.
Finalize Metadata	1 calendar day after completion of event.	GIS specialists and National Office.	Helps in updating the geospatial data and developing geospatial data in the future.
Identify Needs And Key Recovery Areas Through Shapefile	Throughout recovery phase.	SEB, National Office, and CEB.	Maps created with this information are primarily used after major damage events, such as floods, hurricanes, tornadoes, and wildfires.
Map Creation (Includes maps showing Presidential, Secretarial, and Administrative physical loss notifications.)	Throughout event.	SEB, SED, State Office, National Office, and CEB.	Provide overview maps (such as State, county, and area maps) that define the scope, extent, and magnitude of the event.
Obtain Post-Event Satellite Imagery	Approximately 1 month after event, as needed.	GIS specialists and SEB.	Image comparisons of the event before, during, and after, as needed.
Geospatial Data Coordination During /After Events	Throughout event.	Government Agencies addressing Emergency Management	FSA may only share aggregate data (totals, generalized statistics, State- or county-level reference maps), and shall not share actual FSA geospatial data, such as CLU, CRP, wetlands, or bin information with non-USDA Federal, State, or local agencies during an event. All maps for public release must be cleared by SED. If additional guidance is needed, contact EPD for emergency management issues or the FSA FOIA officer for privacy concerns.

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***--291 GIS Specialist Duties for Emergency Management (Continued)**

E Mitigation

Mitigation efforts are a core component of geospatial officer responsibilities. Effective mitigation improves FSA's ability to respond to and recover from disaster events. Mitigation tasks should be considered ongoing and are summarized in the following table.

Activity	Timeframe	Notes/Examples
County Agricultural Assets and Mapping	Review for each SEB meeting.	Identify FFSF facility locations and Service Center points locations with elevation, bin locations, prime farmland, soils susceptible to flooding, CLU cropland, CRP, FLP easements, employee locations, etc.
Develop County Risk Maps	Develop and maintain.	Create a set of State maps that show counties thematically for overall risk, flood risk, prevent plant claims, tornado touchdowns, drought, etc.
Develop Service Center Risk Maps	Develop and maintain.	Use NAIP and Service Center location overlay risks, such as flood zones, seismic zones, sink hole locations, etc.
GIS Drill Exercises	After every 3 years.	Participate in State and FSA emergency drills run by FEMA, State, or local emergency groups. **Note:** FSA may only share aggregate data (totals, generalized statistics, State- or county-level reference maps), and shall not share actual FSA geospatial data, such as CLU, CRP, wetlands, or bin information with non-USDA Federal, State, or local agencies during an event. All maps for public release must be cleared by SED. If additional guidance is needed, contact EPD for emergency management issues or the FSA FOIA officer for privacy concerns.
Identify Risk Areas/Hazard Identification for the State	Ongoing updates.	Flood risks, earthquake zones, inundation zones, high risk areas, and prevent plant areas.

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***--291 GIS Specialist Duties for Emergency Management (Continued)**

F Emergency Training Requirements

To successfully prepare for and respond to an emergency or disaster events, some specialized training is necessary. Free, online and self-paced emergency preparedness and response training resources are available to FSA employees and shall be added to the GIS specialist/geospatial officer IDP in consultation with their supervisor. The courses in the following table are part of a curriculum that will build overall skill sets in emergency management. Optional courses discussed later further strengthen skills in emergency management and geospatial concentration. Skills acquired, particularly in the geospatial arena, translate into GIS support for other FSA program areas. Listed classes are free resources provided by USDA (AgLearn or USDA ESRI Enterprise Contract) or FEMA at **http://training.fema.gov/is/crslist.asp**. The classes last an average 1 hour and the curriculum can be spread out over 2 calendar years for the core emergency management classes identified.

Year 1			
Course Number	**Course Title**	**Training Location**	**Contact Hours**
	Emergency and Disaster Preparedness	AgLearn	0.5
	Reading and applying the national grid	**http://publicintelligence.net/us-national-grid-training-information-and-maps/**	1.0
	SEB and CEB Training	AgLearn	0.5
ICS-100	Introduction to the Incident Command System	AgLearn	3.0
ICS-200	Incident Command System	AgLearn	1.5
ICS-288	The Role of Voluntary Agencies in Emergency Management	AgLearn	0.5
IS-271	Anticipating Hazardous Weather & Community Risk	FEMA EMI at **http://training.fema.gov/IS/crslist.asp**	1.0
SEC-NIMS-001	Introduction to National Incident Management System	AgLearn	1.0

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***--291 GIS Specialist Duties for Emergency Management (Continued)**

F Emergency Training Requirements (Continued)

Year 2			
Course Number	**Course Title**	**Training Location**	**Contact Hours**
IS-1	Emergency Manager: An Orientation to the Position	AgLearn	10.0
IS-111.a	Livestock in Disasters	FEMA EMI at **http://training.fema.gov/IS/crslist.asp**	3.5
IS-120.a	An Introduction to an Exercise		1.0
IS-230.b	Fundamentals of Emergency Management		1.0
IS-241	Decision Making and Problem Solving		0.5
IS-331	Introduction to Radiological Emergency Preparedness		1.0
IS-800.b	National Response Framework		0.3
IS-811	Emergency Support Functions #11 Agriculture and Natural Resource Annex		.25

The following table provides additional courses beyond the 2-year curriculum for consideration when developing IDP's.

Course Number	Course Title	Training location	Contact Hours
IS-10a	Animals in Disasters: Awareness and Preparedness	FEMA EMI	0.4
IS-11a	Animals in Disasters: Community Planning		0.6
IS-102a	Deployment Basics for FEMA Response Partners	**http://training.fema.gov/IS/docs/IS%20Brochure.pdf**	1.0
IS-241.a	Decision Making and Problem Solving	FEMA EMI	0.8
IS-393.a	An Introduction to Hazard Mitigation	AgLearn	1.0
IS-546.a	Continuity of Operations Awareness Course	FEMA EMI	1.0
IS-547.a	Introduction to Continuity of Operations		2.0
IS-814	Emergency Support Function #14 – Long Term Community Recovery		1.0

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***--291 GIS Specialist Duties for Emergency Management (Continued)**

F Emergency Training Requirements (Continued)

The USDA ESRI Enterprise Contract offers free online GIS courses through the ESRI Virtual Campus and should be considered a resource when IDP's are developed. ESRI courses provide the geospatial officer an opportunity to refine existing GIS skill sets and develop new GIS skill sets as they relate both to emergency management and daily activities for GIS responsibilities within FSA. State Office GIS specialists can contact Amy Penechar by e-mail to **amy.penechar@slc.usda.gov** to register for Virtual Campus courses. Some course examples are as follows:

- Basics of the Geodatabase Data Model
- Geocoding with ArcGIS Desktop
- Geoprocessing with ArcGIS Desktop
- HAZUS-MH Flood Model Output and Applications
- Introduction to the HAZUS-MH Comprehensive Data Management System
- Introduction to Using HAZUS-MH for Earthquake Loss Estimation
- Introduction to Using HAZUS-MH for Hurricane Loss Estimation
- Introduction to Using HAZUS-MH to Assess Losses from a Riverine Flood Hazard
- Learning ArcGIS Spatial Analyst
- The 15-Minute Map: Creating a Basic Map in ArcMap
- Understanding GIS Queries
- Using LiDAR Data in ArcGIS.

G Software

The following software that is available from OCIO, TSD, directly supports emergency management and shall be installed on all GIS specialist/geospatial officer workstations/laptops:

- ArcGIS Geostatistical Analyst
- ArcGIS Spatial Analyst
- Desktop ArcGIS Arc/Info
- FEMA HAZUS-MH
- FSA Map Series
- HURREVAC (all States with hurricane risk, or as needed, if providing support/assistance).**--***

***--291 GIS Specialist Duties for Emergency Management (Continued)**

H Outreach for Emergency Management

State and local groups in both emergency management and geospatial fields have resources, training, and information that are beneficial for FSA. Opportunities to partner with and develop an awareness of State-based activities occur at both State and regional meetings and conferences throughout the year. The geospatial officer shall engage in outreach efforts to build partnerships with outside groups and agencies as they relate to emergency management and GIS. Examples of these activities include the following.

Activity	Frequency	Benefit/Considerations	Notes
Emergency Brochures	Develop and maintain, as needed. Consider only major events impacting the State.	Educational resource for producers and other emergency management groups to define FSA involvement and resources.	The geospatial officer shall work with the State communication coordinator to obtain existing brochures or develop local materials that meet visual standards. Powerful and easy to maintain outreach tool for State and local governments and producers.
GIS Consortium Conference	Once per year.	Valuable partnership opportunities, resource awareness, and ongoing education.	Opportunities for FSA presentations about how GIS is used in the State for FSA.
Newsletter or Professional Articles	Periodic, as needed.	Outreach opportunity for FSA to further define what FSA is doing in each State as it relates to emergency management and GIS.	Quantifiable outreach component that serves as an FSA resource for producers, stakeholders, and partners.
State Emergency Management Associations	Once or twice per year.	Allows for FSA to develop and maintain contacts in the emergency management area Statewide.	Outreach opportunity to educate emergency management groups of USDA, FSA role in disaster recovery and available resources.
State GIS Committees and Regional GIS Groups	Periodic throughout the year.	Allows FSA to have a visible role in GIS nationwide.	Powerful partnership opportunities for NAIP and other FSA- and GIS-based programs.
Table Top Exercises	Once per year with Executive Board and once every 3 years for FSA.	Develop and practice response and recovery plans for FSA to protect and serve producers. Ensure readiness for FSA, when needed.	Required in 1-SEM.

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292-300 (Reserved)

*--Section 2 Supporting Geospatial Hazards

301 Hail

A Overview

Hail may cause damage to crops, livestock, buildings, and equipment, including:

- complete destruction of crops from large amounts of hail
- damage to USDA buildings
- damage to USDA employee homes
- damage to farm buildings, such as roof damage, broken windows, or damaged siding
- severe injuries or death of livestock because of very large hail
- yield losses to crops that are damaged, but not destroyed, by hail.

B Recommended Data Sources

Hail events can be mapped based on reports from the public, observations by FSA personnel, analysis of radar data, or analysis of post-event satellite imagery.

Potential data sources for hail location and estimated size include the following:

- NOAA NCDC at **http://www.ncdc.noaa.gov/nexradinv**
- NOAA NWS at **http://www.nws.noaa.gov**
- NOAA SPC at **http://www.spc.noaa.gov**.

C Best Practices for Analysis

GIS analysis can be effective in determining the location and estimated size of hail damage, but **cannot** be used in place of a field visit to determine actual damage. Typical analysis of hail data may require the GIS specialist to complete the following processes and tasks:

- provide preliminary location data to CED based on storm reports catalogued on the SPC web site

- extract hail index data from NCDC archives to identify more refined point locations of potential hail storms

- extract storm total precipitation data from NCDC archives to identify areal extents of potential hail storms--*

***--301 Hail (Continued)**

C Best Practices for Analysis (Continued)

- heads-up digitizing of aerial extents of hail storms
- create attribute and spatial queries
- union and intersect overlay operations
- data manipulation
- process GPS data.

When a hail storm has occurred in an area, the GIS specialist shall determine the best available data to use in analysis. Preliminary data within 24 hours of a storm tends to be less refined and may be limited to SPC reports, but as data becomes available through NCDC, location data may become more usable. Extreme hailstorms that cause large amounts of defoliation may be visible on satellite images acquired after the storm event.

D Presentation of Analysis Results

Maps generated in response to a hail event are generally designed to provide CEB with spatial information to assist in locating damage and completing LAR. Hail maps should be designed to:

- depict the general location and extent of a hail storm in relation to known landmarks like roads or cities
- differentiate between radar-estimated hail size and location and observer reports
- support local and national reporting requirements.**--***

***--301 Hail (Continued)**

D Presentation of Analysis Results (Continued)

Datasets that should be included on hail analysis maps include:

- city locations
- CLU's
- county boundaries
- FFSF facilities
- hail report locations (points)
- highway or other road data
- other farm data as available
- section and/or township boundaries
- storm total precipitation
- USDA Office locations.

Note: Maps containing CLU and FFSF data are for internal distribution **only**. Cropland and other land use data may be included on maps for use outside of Service Center Agencies **only** if data has been sufficiently aggregated to protect sensitive data covered under 2008 Farm Bill, Section 1619. Guidance about protected data can be found in 2-INFO.**--***

*--302 Heavy Precipitation

A Overview

Heavy precipitation events can cause significant property, soil, and crop damage or loss. This type of event can occur in very short bursts or over a more prolonged period of time. The damage from these events can be modeled over a couple hours, a 24-hour period, a 48-hour period, a week, or longer accumulations. Crops, feed, and hay supplies are the most susceptible to heavy precipitation events. Doppler weather radar can be used for the detection of heavy precipitation within a storm system.

Common agricultural losses for heavy precipitation include:

- crops
- feed and hay supplies
- fence damage
- transportation infrastructure damage or loss.

GIS analysis can be very effective in assessing damage and losses caused by heavy precipitation events. State Office GIS specialists shall use GIS analysis to assist with program administration for heavy precipitation in disaster, conservation, and prevented plant program requirements. This includes tracking and compiling weather events, imagery analysis, and map development.

B Recommended Data Sources

The following are heavy precipitation data sources/resources for GIS specialists.

Note: In addition to the following resources, local data is often available from many State agencies and may provide more detailed information.

Data Source/Resource	Purpose	Resource Location	Notes
AHPS	Single-day shapefile archive for precipitation data that are quality-controlled, multi-sensor (radar and rain gauge) precipitation estimates obtained from NWS River Forecast Centers.	**http://water.weather.gov/precip/download_nonjs.php**	The original data are in XMRG format and projected Hydrologic Rainfall Analysis Project grid coordinate system.
GLOVIS	Access to several types of imagery, including Landsat and MODIS.	**http://glovis.usgs.gov/**	

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***--302 Heavy Precipitation (Continued)**

B Recommended Data Sources (Continued)

Data Source/Resource	Purpose	Resource Location	Notes
HDDS	Access to pre-and post-event imagery for selected disaster events.	**http://hdds.usgs.gov/hdds2/**	A log-in account **must** be established to access restricted data and can be requested on the web site.
NCDC Data Inventory Search	Access and download NEXRAD data files in shapefile format by national Doppler Radar sites.	**http://www.ncdc.noaa.gov/nexradinv/**	1-hour precipitation (N1P/78), 3-hour precipitation (N3P/79), and Digital Precipitation Array (DPA/81).
NCDC NEXRAD Data Inventory Search	Documentation and summary reports for all weather-related events for the entire U.S.	**http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms**	Users can query State, county, date, and type of weather event.
NCDC Weather Station Results	Summary reports for the weather stations throughout the U.S.	**http://www.ncdc.noaa.gov/oa/climate/stationlocator.html**	Users can select, State, county, city, or latitude and longitude, if known.
NEXRAD National Mosaic Reflectivity Images	Archival mosaiced reflective images from NEXRAD that can be searched by day, month, and year.	**http://www.ncdc.noaa.gov/extremes/scec/searchrecs.php**	
NOAA Heavy Precipitation	U.S. climate monitoring weekly products that summarize NCDC for weekly temperatures map, weekly precipitation maps, and the Palmer Crop Moisture Index Map.	**http://www.ncdc.noaa.gov/oa/climate/severeweather/rainfall.html**	
NOAA Heavy Rainfall Frequencies	Archival information for summaries of major precipitation events in the U.S.	**http://www.ncdc.noaa.gov/oa/documentlibrary/rainfall.html**	Summaries occur for the entire country and can be isolated by State.

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***--302 Heavy Precipitation (Continued)**

B Recommended Data Sources (Continued)

Data Source/Resource	Purpose	Resource Location	Notes
NOAA Satellite and Information Services for Temperature and Precipitation Maps	Information and summary maps for both temperature and precipitation based by 1-month to 1-year increments.	**http://www.ncdc.noaa.gov/temp-and-precip/maps.php**	
NOAA U.S. State Climate Extremes Committee	Summarizes major weather events for all-time extremes for temperature, precipitation, and snow depth.	**http://www.ncdc.noaa.gov/extremes/scec/searchrecs.php**	
NWS CPS	Various outlook forecasts for temperature and precipitation.	**http://www.cpc.ncep.noaa.gov/**	
USDA FAS Crop Explorer	Access to daily MODIS imagery.	**http://www.pecad.fas.usda.gov/cropexplorer/modis_summary/index.cfm**	
USGS Earth Explorer	Access to several types of imagery including Landsat and SPOT.	**http://earthexplorer.usgs.gov/**	A log-in account **must** be established to access restricted data and can be requested on the web site.
USGS Landsat Acquisition Schedule	Landsat 5 and Landsat 7 acquisition schedule.	**http://landsat.usgs.gov/tools_acq.php**	

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***--302 Heavy Precipitation (Continued)**

C Best Practices for Analysis

Heavy precipitation events are characterized by point data that can be interpolated to define the severity and extent using spatial analysis techniques in GIS. The damage for heavy precipitation events is often characterized by saturated soils, washouts, and standing water that can often be further identified using satellite imagery, and ground truthing using GPS and digital cameras. Typical analysis requires the State Office GIS specialist to complete the following geospatial techniques:

- create thematic maps to summarize various aspects of the data by State, county, and tract
- IDW, Trend, and Kriging interpolations
- perform attribute and spatial queries
- perform table manipulations
- perform union and intersect overlay operations
- plot and project precipitation point data
- rasterize data
- use cartographic displays to depict precipitation intensity
- use spatial selections to identify impacted CLU's.

The State Office GIS specialist shall use the following table to better understand and depict damage for heavy precipitation.

Note: The period of time that is covered and spatial analysis techniques that need to be used are often determined by the severity of the event and the amount of damage that has occurred. A combination of multiple days of worth of data to possibly weeks or months of data may be needed depending on the situation. The following table is a guide.

IF...	**THEN...**			
heavy precipitation events occurs	follow steps 1 through 5.			
	Step	**Action**	**Purpose**	**Notes**
	1	Obtain the precipitation shapefile for the past days event.	Needed to create rainfall interpolation map.	Data source is AHPS at **http://water.weather.gov/precip/download_nonjs.php**.
	2	Interpolate rainfall data.	Creates a gridded shapefile to display rainfall.	ArcToolbox - Interpolation - IDW.

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***--302 Heavy Precipitation (Continued)**

C Best Practices for Analysis(Continued)

IF...	THEN...			
heavy precipitation events occurs (Continued)	**Step**	**Action**	**Purpose**	**Notes**
	3	Request Field Offices to obtain GPS points and digital photos.	Support information for disaster requests.	Used in APLN requests and Secretarial disasters.
	4	Plot field GPS points and add to Map Document (Hot Links).	Assists in developing damage reports.	
	5	Determine if Imagery is available and needed	Assists in identifying areas of standing water or flooding.	Improves data accuracy and assists the field in addressing standing water issues in fields. Possible data sources are SPOT, LandSat TM (30-Meter), AWiFS (56-Meter), or MODIS (250-Meter).
exceptional precipitation is sustained over time	complete steps 1 through 5 and continue with the following steps.			
	6	Obtain imagery to show standing water over time.	Valuable support information for heavy precipitation events.	Requires a number of satellite images to show length of time water inundated fields or impacted land. Possible Data Sources are SPOT, LandSat TM (30-Meter), AWiFS (56-Meter), or MODIS (250-Meter).
	7	Use AHPS.	Obtain the gridded rainfall data for length of time precipitation has occurred.	Data source is AHPS at **http://water.weather.gov/precip/download.php**.
	8	Use imagery analysis to show standing water.	Show concentrations of water standing on the ground or flooded areas.	Used in APLN requests and Secretarial disasters. Look for Bands 5 and 3 combine to a numeric grid. High values will reflect water reflectivity.

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***--302 Heavy Precipitation (Continued)**

C Best Practices for Analysis(Continued)

IF...	THEN...			
exceptional precipitation is sustained over time (Continued)	**Step**	**Action**	**Purpose**	**Notes**
	9	Request additional GPS and digital images of impacted areas.	Streamline field data collection and document event.	Used in APLN requests and Secretarial disasters.
	10	Check NCDC NEXRAD inventory.	Create additional documentation of rainfall event, if needed.	Can create a base weather image of event path using Level II data. Useful for SEB and CEB discussions of rain events to make factual decisions on storm paths.
	11	CLU intersect or overlay.	Identify areas impacted by a heavy precipitation event.	Allows for identification and statistical summary of total farmland impacted.

D Reports and Maps

At the conclusion of heavy precipitation events, the State Office GIS specialist shall create a series of reports and maps that assist in the local Field Offices, SEB's, CEB's, and the National and State Offices in assessing the scope, magnitude, and extent of the event. Reports and maps can be created to determine the scale of damages and the impact to agriculture. To evaluate the location and spatial extent of damage:

- assess possible structural impacts or damage concerning agriculture
- assist in coordinating efforts with Field Offices, SEB's, and CEB's in completing LAR's
- identify areas in the State or county that are highly susceptible to crop damage because of standing water, hydric soils, and/or flooding conditions
- pinpoint areas of damage that include CLU.**--***

***--302 Heavy Precipitation (Continued)**

D Reports and Maps (Continued)

The following table provides examples of reports and maps that will be prepared for heavy precipitation depending on the damage impact and situation.

Note: Maps containing CLU and FFSF data are for internal distribution **only**. Cropland and other land use data may be included on maps for use outside of Service Center Agencies **only** if data has been sufficiently aggregated to protect sensitive data covered under 2008 Farm Bill, Section 1619. Guidance about protected data can be found in 2-INFO.

Heavy Precipitation Event	Base Tasks to Accomplish	Timeframe to Complete	Primary Product Recipients	Primary Data Sources/Resources
Multi-Day Events	FSA Map Series Emergency Management	Defines farms impacted by standing or flood water.	CED and producers impacted.	Current NAIP, CLU, national grid, and bin locations.
Multi-Day Events	Landsat Map Comparisons	Approximately 16 calendar days after event. Requires before and after satellite images.	GIS specialist/ geospatial officer.	Satellite imagery, county boundary, and digitized path location.
Single-Day Events	County Precipitation Extent Maps (Use FSA map series to create individual county maps based on the Precipitation Extent State Map.)	Next workday after event.	CED and CEB.	AHPS, county boundary, national grid, major roads, Service Center locations, and major geographical features.
Single-Day Events	Damage Point Map (If needed, based on the situation.)	Completed and updated as field data is provided.	CEB and SEB.	County boundary, major roads, Service Center locations, national grid, and major geographical features.

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***--302 Heavy Precipitation (Continued)**

D Reports and Maps (Continued)

Heavy Precipitation Event	Base Tasks to Accomplish	Timeframe to Complete	Primary Product Recipients	Primary Data Sources/Resources
Single-Day Events	Precipitation Extent State Map	Next workday after event.	SED and CED.	AHPS and county boundary.
Single-Day or Multi-Day Events	PowerPoint Overview of Storm Damage Report	Compiled before SEB Meeting.	SEB.	Maps in this table, statistics from analysis, digital photos, news articles, and other related information.

303 Floods

A Overview

Flooding is the most common natural disaster in the U.S. and can negatively impact both agriculture and USDA business functions. Potential negative impacts from flooding include:

- damage or destruction of homes of FSA employees
- damage or destruction of USDA buildings
- inability of FSA employees to report to work because of inundated roads
- losses to crops because of prolonged inundation, inability to plant, or inability to access fields
- losses to dairy production because of the inability to deliver product because of inundated roads
- losses to farms, including damaged or destroyed buildings, fences or livestock feed supplies
- losses to livestock either because of inundation or inability to graze.**--***

***--303 Floods (Continued)**

B Recommended Data Sources

Floods are classified according to whether they are slow- or fast-rising. The type of flood may dictate the data used to perform flood impact analysis. For preliminary situation reports, modeled flood extents may be the most accurate data available. For slow-rising flood events, remotely sensed data (satellite imagery, radar data, or aerial photography) may be available to determine actual flood extents after the event has occurred.

Potential data sources for modeled flood extents include:

- FEMA floodplain maps at **http://www.fema.gov/hazard/map/flood.shtm**
- flood extents developed by local emergency management groups or engineering firms
- HAZUS-MH-generated flood extents
- U.S. Bureau of Reclamation at **http://www.usbr.gov/pmts/flood/index.html**
- USACE modeled discharges (for rivers managed by USACE).

Analysis of flood extents should be performed using the best available data.

The geospatial officer should communicate with local emergency managers to identify availability of modeled data.

Data sources for remotely sensed data include:

- GLOVIS at **http://glovis.usgs.gov** for access to several types of imagery, including Landsat and MODIS

- HDDS at **http://hdds.usgs.gov/hdds2** for access to pre- and post-event imagery for selected disaster events

  Note: A log-in account **must** be established to access restricted data and can be requested on the web site.

- USDA FAS Crop Explorer - MODIS Rapid Response at **http://www.pecad.fas.usda.gov/cropexplorer/modis_summary/index.cfm** for access to daily MODIS imagery

- USGS Landsat Acquisition Schedule at **http://landsat.usgs.gov/tools_acq.php** that provides the Landsat 5 and Landsat 7 acquisition schedule.**--***

***--303 Floods (Continued)**

C Best Practices for Analysis

GIS analysis can be effective in assessing impacts of flooding to agriculture. Typical analysis may require the GIS specialist to complete the following processes and tasks:

- attribute and spatial queries
- data manipulation
- heads-up digitizing
- processing GPS data
- processing satellite imagery
- union and intersect overlay operations.

When flooding is predicted for an area, preliminary analysis shall be done to determine potential flood impacts, as follows:

- if modeled flood extent data is available for the area that may be affected, use the modeled flood extent data that corresponds with the forecast flood magnitude (for example 100-year flood, 500-year flood)

- if no modeled flood extent data is available, but historical imagery from a flood event of similar magnitude is available, use the historical imagery for analysis

- use the Intersect Tool in ArcToolbox to “cut” CLU polygons based on the flood extent

- update the “Calculated Acres” column of the resulting CLU data to reflect the updated geometry

- summarize the attribute table of the resulting data by land classification code, including the sum of the calculated acres as a summary statistic

- use a spatial query to identify all Service Centers, FFSF points, and grain storage bins within the affected area.**--***

***--303 Floods (Continued)**

C Best Practices for Analysis (Continued)

When flooding has occurred in an area, the GIS specialist shall determine the best available data for use in analysis. Data sources, in preferred order, may include:

- high resolution imagery (for example SPOT satellite imagery, FEMA aerial photography, etc.)
- medium resolution imagery (LandSat TM 30-Meter satellite imagery and AWiFS 56-Meter satellite imagery)
- low resolution imagery (MODIS 250-Meter satellite imagery)
- modeled flood-extent data from USACE or other authoritative source
- modeled flood-extent data from HAZUS-MH
- observations from field personnel.

Note: Observations from field personnel may be impossible to obtain for a large flood area and do not necessarily lend themselves to large-scale analysis.

After a flood extent has been obtained for the flood event:

- use the Intersect Tool in ArcToolbox to “cut” CLU polygons based on the flood extent
- update the “Calculated Acres” column of the resulting CLU data to reflect the updated geometry
- summarize the attribute table of the resulting data by land classification code, including the sum of the calculated acres as a summary statistic
- use a spatial query to identify all Service Centers, FFSF points, and grain storage bins within the affected area.**--***

***--303 Floods (Continued)**

D Presentation of Analysis Results

Maps and reports generated in response to a flood event should be designed to:

- depict the general location and extent of flooding
- distinguish flooded cropland from other agricultural land
- identify other impacts to agriculture, including farm buildings, USDA offices, and FFSF facilities
- support local and national reporting requirements.

Datasets that should be included on flood analysis maps include:

- CLU
- FFSF facilities
- flood extent
- satellite imagery
- USDA office locations
- other farm data as available.

Note: Maps containing CLU and FFSF data are for internal distribution **only**. Cropland and other land use data may be included on maps for use outside of Service Center Agencies **only** if data has been sufficiently aggregated to secure data according to 2008 Farm Bill, Section 1619. Guidance about protected data can be found in 2-INFO.

Because flood-extent data of riverine floods may not be suited for detailed presentation (for example, the flood extent is extremely narrow in relation to the length of the river), textual summaries and charts are useful for identifying flooded cropland totals.**--***

*--304 Tornadoes

A Overview

Tornadoes are violent storms that arrive with little or no notice. The damage inflicted by tornadoes can be devastating in the areas that are directly impacted by the event. Crops, farm buildings, equipment, infrastructure, and lives can be wiped out in an instant. Doppler weather radar can detect rotational algorithms that indicate the likely presence of a strong mesocyclone that is in some stage of tornadic development. This data can be used to further address tornado impacts when combined with satellite imagery.

Common agricultural losses for tornadoes include:

- barns and other structures
- crops
- equipment and machinery
- feed and hay supplies
- fences
- forests
- grazing/pasture losses
- homes
- livestock
- transportation infrastructure
- utilities.

GIS analysis is very effective in assessing damage and losses caused by tornadoes. GIS specialists shall assist in tornado-related program administration by tracking tornado events, compiling imagery, and develop maps in support of emergency management efforts for tornado events impacting agriculture.--*

***--304 Tornadoes (Continued)**

B Recommended Data Sources

Potential data sources for tornado analysis are provided in the following table.

Note: In addition to the following resources, local data is often available from many State agencies and may provide more detailed information.

Data Source	Purpose	Resource Location	Notes
GLOVIS	Access to several types of imagery including Landsat and MODIS.	**http://glovis.usgs.gov/**	
HDDS	Access to pre- and post-event imagery for selected disaster events.	**http://hdds.usgs.gov/hdds2/**	A log-in account **must** be established to access restricted data and can be requested on the web site.
NCDC Data Inventory Search	Access and download NEXRAD data files in shapefile format by National Doppler Radar Sites.	**http://www.ncdc.noaa.gov/nexradinv/**	Mesocyclone (NME/60) and Tornadic Vortex Signature (NTV/61).
NCDC NEXRAD Data Inventory Search	Documentation and summary reports for all weather-related events for the entire U.S.	**http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms**	Users can query by State, county, date and type of weather event.
NCDC Weather Station Results	Summary reports from weather stations throughout the U.S.	**http://www.ncdc.noaa.gov/oa/climate/stationlocator.html**	Users can select by State, county, and city, or latitude and longitude, if known.
NOAA Severe Weather for Tornadoes	Information for tornado activity in the U.S. Includes recent tornadic activity and historical information.	**http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html**	
NOAA State of the Climate Tornadoes	Access monthly tornado reports by month and year.	**http://www.ncdc.noaa.gov/sotc/tornadoes/**	

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***--304 Tornadoes (Continued)**

B Recommended Data Sources (Continued)

Data Source	Purpose	Resource Location	Notes
SPC	Access to preliminary storm reports for hail, tornadoes, and high winds for the past 24 hours.	**http://www.spc.noaa.gov/climo/reports/yesterday.html**	CSV files can be downloaded and plotted using latitude and longitude.
USDA FAS Crop Explorer	Access to daily MODIS imagery.	**http://www.pecad.fas.usda.gov/cropexplorer/modis_summary/index.cfm**	
USGS Earth Explorer	Access to several types of imagery, including Landsat and SPOT.	**http://earthexplorer.usgs.gov/**	A log-in account **must** be established to access restricted data and can be requested on the web site.
USGS Landsat Acquisition Schedule	Landsat 5 and Landsat 7 acquisition schedule.	**http://landsat.usgs.gov/tools_acq.php**	

C Best Practices for Analysis

GIS analysis can be effective in assessing the damage inflicted by a tornado for agriculture. Analysis may require the following tasks be completed:

- create thematic maps to summarize various aspects of the data
- heads-up digitizing
- hot link digital photos of the area
- imagery comparisons
- insert buffer zones around line and area layers
- perform attribute and spatial queries
- perform table manipulations
- perform union and intersect overlay operations
- process GPS data
- process satellite imagery
- process XY event theme data from NWS.**--***

***--304 Tornadoes (Continued)**

C Best Practices for Analysis (Continued)

The following table of spatial analysis options can be used to understand and depict damage from tornadoes.

Note: The amount of damage inflicted by a tornado will dictate the spatial analysis techniques that will need to be applied.

<table>
<tr><th>IF…</th><th colspan="4">THEN…</th></tr>
<tr><td rowspan="6">a tornado with EF0 to EF2 winds occurs</td><td colspan="4">follow steps 1 through 4.</td></tr>
<tr><td>Step</td><td>Action</td><td>Purpose</td><td>Notes</td></tr>
<tr><td>1</td><td>Plot the latitude and longitude of the tornado in a shapefile/ geodatabase.</td><td>Identifies touchdown locations.</td><td>Data source is SPC.</td></tr>
<tr><td>2</td><td>Request Field Offices collect GPS points and digital photos.</td><td>Supporting information for disaster requests.</td><td rowspan="3">Supports APLN requests and Secretarial disaster designations.</td></tr>
<tr><td>3</td><td>Plot GPS points and add to map document.</td><td>Assists in developing damage reports.</td></tr>
<tr><td>4</td><td>Use hot links to include GPS point data linked with digital photos.</td><td>Overview information for overall damage.</td></tr>
<tr><td rowspan="3">a tornado with winds exceeding EF3 or greater occurs</td><td colspan="4">complete steps 1 through 4 and continue with the following steps.</td></tr>
<tr><td>Step</td><td>Action</td><td>Purpose</td><td>Notes</td></tr>
<tr><td>5</td><td>Determine best imagery available before and after tornado.</td><td>Imagery analysis.</td><td>Possible data sources are SPOT, LandSat TM (30-Meter), AWiFS (56-Meter) or MODIS (250-Meter).</td></tr>
</table>

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***--304 Tornadoes (Continued)**

C Best Practices for Analysis (Continued)

IF…	THEN…			
a tornado with winds exceeding EF3 or greater occurs (Continued)	**Step**	**Action**	**Purpose**	**Notes**
	6	Create tornado path (shapefile) based on imagery comparison.	Identify tornado damaged areas.	See tornado methodology using imagery. Use pan sharpening or principle component analysis.
	7	Obtain weather warning polygons.	Narrow down and verify tornado location.	Data source at **http://www.nws.noaa.gov/regsci/gis/shapefiles/**.
	8	Intersect CLU with tornado path.	Quantify damage to cropland.	See tornado methodology. Intersect in ArcToolbox.
	9	Summarize CLU to define damage based on land class codes and total farms/tract impacted.	Provide CED and CEB statistical support for LAR.	Used as supporting documentation for STORM Reports.
	10	Use spatial query to identify all Service Centers, FFSF points, and grain storage bins in tornado path.	Identify agricultural resources impacted by tornado.	Used as supporting documentation for STORM Reports.

D Presentation of Analysis Results

In the aftermath of a tornado, the geospatial officer shall create a series of reports and maps that assist local Field Offices, SEB's, CEB's, and the National Office in assessing the scope, magnitude and extent of the tornado. This information can be used to:

- assess possible structural damage concerning agriculture
- assist in coordination efforts of Field Offices, SEB's, and CEB's in assessing and completing LAR's
- evaluate the location and spatial extent of damage
- pinpoint CLU in damage areas.**--***

***--304 Tornadoes (Continued)**

D Presentation of Analysis Results (Continued)

Use following table as a guide for reports and maps for tornadoes:

Note: Maps containing CLU and FFSF data are for internal distribution **only**. Cropland and other land use data may be included on maps for use outside of Service Center Agencies **only** if data has been sufficiently aggregated to secure data according to 2008 Farm Bill, Section 1619. Guidance about protected data can be found in 2-INFO.

Tornado Scale	Tasks to Accomplish	Timeframe to Complete	Primary Product Recipients	Primary Data Sources and Resource Sites
EF0 - EF5	Tornado Touchdown Map	Day of or next workday after event.	SED and CED.	SPC and national grid.
EF1 - EF5	Damage Point Map	Completed and updated as local offices provide field data.	CEB and SEB.	County boundary, major roads, Service Center locations, national grid, and major geographical features.
EF1 - EF5	Initial Tornado Path Overview Map	Day of or next workday after event.	SED, CED, and CEB.	SPC, county boundary, national grid, major roads, Service Center locations, major geographical features, and bin locations.
EF2 - EF5	PowerPoint Overview of Storm Damage Report	Compiled before SEB meeting.	SEB.	Maps listed in this table, statistics from analysis, digital photos, news articles, and other related information.
EF3 - EF5	FSA Map Series Emergency Management	After the path has been delineated.	CED and producers impacted.	Current NAIP, CLU, tornado path, national grid, and bin locations.
EF3 - EF5	Landsat Map Comparisons	Approximately 16 calendar days after event. Requires before and after satellite images.	GIS specialist.	Satellite imagery, county boundary, and digitized path location.
EF3 - EF5	Updated Tornado Path Overview Map	After the path has been delineated.	CEB and SEB.	County boundary, national grid, tornado path, major geographical features, and CLU.

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*--305 Hurricanes

A Overview

Hurricanes are predictable, seasonal, maritime storms that arrive with significant advance warning. Hurricanes largely affect the Gulf of Mexico and southern Atlantic Coast regions. They occur less frequently in the northeast Atlantic coastal region and rarely in the Hawaiian Islands. Although a hurricane is primarily a coastal event, the powerful storms can travel deep inland causing far reaching negative impact. The widespread damage caused by hurricanes can affect crops, livestock, structures, and equipment. Damage can be because of high winds, tornadoes, excessive precipitation, storm surge, and flooding.

Hurricane can cause damage or destruction to:

- barns and other structures
- crops
- equipment and machinery
- feed and hay supplies
- fences
- forests
- grazing lands/pasture
- homes
- levees and dams
- livestock
- soils
- transportation infrastructure
- utilities.

GIS analysis can be effective in assessing hurricane damage. It can assist in storm-tracking, disaster-related program administration, disaster recovery, and provide analysis and supporting documentation for Secretarial disaster declaration or Administrator's loss notification.--*

***--305 Hurricanes (Continued)**

B Data Sources

In addition to the following resources, local data is often available and may provide more detailed information.

Data Source/Resource	Purpose	Resource Location
GLOVIS		**http://glovis.usgs.gov/**
HAZUS-MH	Nationally applicable standardized methodology that contains models for estimating potential losses from hurricanes and floods.	**http://www.fema.gov/plan/prevent/hazus/** **http://hazus.org/**
HDDS		**http://hdds.usgs.gov/hdds2/**
HSIP Gold		**http://www.hifldwg.org**
HURREVAC	Software used by emergency managers to track hurricanes and assist in decisionmaking.	**http://www.hurrevac.com/**
NOAA Historical Hurricane Tracks	Comprehensive historical hurricane and typhoon track data worldwide.	**http://csc-s-maps-q.csc.noaa.gov/hurricanes/**
NOAA, NWS, AHPS	Archived precipitation data.	**http://water.weather.gov/precip/**
NWS, NHC	Continually updated alerts, warnings, and status of tropical storm activity.	**http://www.nhc.noaa.gov/**
The National Association of Radio Distress		**http://hisz.rsoe.hu/alertmap/index2.php**
USDA FAS Crop Explorer		**http://www.pecad.fas.usda.gov/cropexplorer/modis_summary/index.cfm**
USGS Earth Explorer		**http://earthexplorer.usgs.gov/**
USGS Landsat Acquisition Schedule		**http://landsat.usgs.gov/tools_acq.php**

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***--305 Hurricanes (Continued)**

C Best Practices for Analysis

Hurricane data can be used effectively before and after the storm occurs. It can assist in making agriculture-related damage assessments within a hurricane affected area. Typical analysis may require the geospatial officer to complete the following tasks:

- classify soil types
- create thematic maps to summarize various aspects of the data
- insert buffer zones around line and area layers
- perform attribute and spatial queries
- perform table manipulations
- perform union and intersect overlay operations
- use HAZUS-MH to model hurricane scenarios
- use NWS AHPS to provide precipitation data
- use NWS NHC and HURREVAC to provide geospatial data (tracks, wind).

Note: The damage inflicted by a hurricane will often dictate the spatial analysis techniques that need to be used and the time needed to complete them. Prestaged data (paragraph 291) is particularly important in hurricane prone areas.

The following spatial analysis steps can be used to better understand and depict damage from hurricanes.

Follow these steps **before** a significant hurricane is expected.

Step	Action	Purpose	Notes
1	Plot hurricane track using latitude and longitude.	Needed to track hurricane path and predict landfall sceneries.	
2	Complete HAZUS-MH scenarios for review.	Scenarios should have already been run as part of a exercise and testing process for FSA according to 1-SEM.	HAZUS–MH hurricane module.
3	Use HURREVAC to track predicted path.	Support information for disaster requests.	

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***--305 Hurricanes (Continued)**

C Best Practices for Analysis (Continued)

Follow these steps **after** landfall of a hurricane.

Step	Action	Purpose	Notes
1	Obtain imagery to show standing water over time.	Valuable support information for heavy precipitation events.	Requires a number of satellite images to show length of time water inundated fields or impacted land. Possible data sources are SPOT, LandSat TM (30-Meter), AWiFS (56-Meter), or MODIS (250-Meter).
2	Use AHPS.	Obtain the gridded rainfall data for length of time precipitation has occurred.	Data source at **http://water.weather.gov/precip/download.php**.
3	Use imagery analysis to show standing water.	To show concentrations of water standing on the ground or flooded areas.	Used in APLN requests and Secretarial disasters. Look for Bands 5 and 3 combine to a numeric grid. High values will reflect water reflectivity.
4	Use imagery comparison from previous month for damage assessments.	Assists in addressing high damage areas and crop losses.	Used in APLN requests and Secretarial disasters.
5	Request additional GPS and digital images of impacted areas, as appropriate, from County Offices.	To streamline field data collection and document event.	
6	Check NCDC NEXRAD inventory.	To create additional documentation of rainfall event, if needed.	Can create a base weather image of event path using Level II data. Useful for SEB and CEB discussions of rain events to make factual decisions on storm paths.
7	CLU intersect or overlay.	To identify areas impacted by heavy precipitation from hurricane.	Allows for identification and statistical summary of total farmland impacted.
8	Identify proximity risk to Service Centers.	For status reports.	

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***--305 Hurricanes (Continued)**

D Presentation of Analysis Results

The geospatial officer shall create maps and reports to assist local Field Offices, SEB's, CEB's, and the National Office in assessing the scope, magnitude, and extent of the event. Maps and reports should be designed to:

- assess possible structural impacts or damaged concerning agriculture
- assist in coordinating efforts with Field Offices, SEB's, and CEB's in assessing and completing LAR's
- evaluate the location and spatial extent of damage
- identify areas of risk for Service Center employees
- identify areas of risk for Service Centers
- implement and support State and County Emergency Operations Plans and cooperative activities
- pinpoint affected areas of damage for CLU.

GIS can also be used to create maps and reports to assist SEB's and CEB's in damage assessments and National and State Offices with information dissemination.

Note: The types and number of maps and reports needed, and the updates required to properly assess the situation, will be based on the severity of the hurricane.**--***

***--305 Hurricanes (Continued)**

D Presentation of Analysis Results (Continued)

Hurricane Maps	Purpose	Completion Timeframe	Primary Recipients	Primary Data Sources
Before Landfall				
Track Maps	Depicts potential hurricane path.	Days to hours before landfall.	National Office, SED, and CED.	County boundary and wind speeds.
HAZUS-MH Scenario Maps	Defines possible damage expected from a landfall event.	Months to days before event.	SED, CED, and CEB.	HAZUS-MH scenario, county boundary, national grid, major roads, Service Center locations, and major geographical features.
Destruction Point Map	Compiles field information from GPS and digital photos defining the hurricane impact.	Completed and updated as Field Offices provide data.	CEB and SEB.	County boundary, major roads, Service Center locations, national grid, and major geographical features.
After Landfall				
Landsat Comparisons	Compares previous month imagery by county or localized areas of concern.	Approximately 16 calendar days after event. Requires before and after satellite images.	GIS specialist.	Satellite imagery, county boundary, and digitized path location.
FSA Map Series	Identifies farms impacted by standing or flood water.	If needed based on the situation.	CED and producers impacted.	Current NAIP, CLU, national grid, and bin locations.
Report	PowerPoint overview of Hurricane Damage Report.	Compiled before SEB Meeting.	SEB.	Maps in this table, statistics from analysis, digital photos, news articles, and other related information. Includes images submitted by local offices to document extent, scope, and magnitude of the event.

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*--306 Droughts

A Overview

Although defining a drought event can be difficult, the basic premise is the deficiency of precipitation over a period of time compared to normal conditions. Drought conditions take time to develop and can last for long periods. In addition, drought conditions may be localized in a small area or persist across many States.

Determining impact to agriculture can be complicated. Many factors must be considered, such as timing of precipitation in relation to the growing season, wind, and temperature. Common agricultural losses for drought include:

- crops
- grazing/pasture losses
- water resources.

GIS analysis is effective in assessing impacts of a drought event. GIS specialists shall assist by monitoring drought events and developing maps and reports in support of emergency management efforts and program administration.

B Data Sources

The following are core data sources for drought.

Note: In addition to the following resources, local data is often available and may provide more detailed information.

Data Source/Resource	Purpose	Resource Location	Notes
CPC	Various precipitation and drought outlook maps.	**http://www.cpc.ncep.noaa.gov**	
Crop Moisture Index	Weekly crop moisture index.	**http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/cmi.gif**	
NASS Vegetation Condition	Vegetation condition images derived from AVHRR NDVI data.	**http://www.nass.usda.gov/research/avhrr/avhrrmnu.htm**	Includes comparison map from previous year.

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***--306 Droughts (Continued)**

B Data Sources (Continued)

Data Source/Resource	Purpose	Resource Location	Notes
National Integrated Drought Information System, U.S. Drought Portal	Comprehensive source of drought information and data.	**http://www.drought.gov/portal/server.pt/community/drought_gov/202**	
NWS AHPS	Multiple gridded precipitation products. Cumulative data is based on various timeframes.	**http://water.weather.gov/precip/download.php**	Use "Normal", "Departure", and "Percent" datasets.
NWS Drought Information Statements	Access to regional NWS drought statements that include summaries and impacts.	**http://www.drought.gov/portal/server.pt/community/drought.gov/drought_information_Statements**	
Palmer Drought Severity Index	Access to weekly Palmer Drought Severity Index.	**http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif**	
U.S. Drought Monitor	Access to weekly drought level shapefiles and tabular data.	**http://www.drought.unl.edu/dm/dmshps_archive.htm**	
U.S. Drought Monitor Graphics	Customized drought monitor statistics in a time-series chart format.	**http://www.drought.gov/portal/server.pt/community/drought.gov/drought_monitor_graphics**	
USDA FAS Crop Explorer, MODIS NDVI Image Gallery	Download access to regional NDVI composites and NDVI departure from 5-year average.	**http://www.pecad.fas.usda.gov/cropexplorer/modis_imageview2.cfm?regionid=us&product=modis_ndvi**	

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***--306 Droughts (Continued)**

C Best Practices for Analysis

Typical analysis requires the GIS specialist to complete the following processes and tasks:

- attribute and spatial queries
- data manipulation
- spatial interpolation
- union and intersect overlay operations.

The following table provides specific analysis steps associated with disaster response and reporting during a drought event.

Note: The extent and duration of a drought event will often dictate the time period and spatial analysis techniques to be applied.

Step	Action	Purpose	Notes
1	Download USDM weekly shapefile.	• To evaluate the extent and intensity of the drought event. • For requests for managed haying and grazing on CRP and prevented planting purposes.	Archive in F:\geodata\disaster_events\ USDM folder.
2	Clip CLU based on the weekly USDM shapefile.	Overview of the types of acreage affected.	Display CLU's by land class code.
3	Join acreage report data to CLU.	Allows for displaying specific crops and acreage reported as failed.	For large events, summarize failed acreage at the county level.
4	Interpolate AHPS precipitation data.	Displays percent of normal and departure from normal precipitation estimates.	Use "Departure" and "Percent" datasets. Timeframes available are previous 7, 14, 30, 60, 90, and 180 calendar days. Month, year, and water year to date is also available. Determine appropriate timeframe based on time of year, length of drought, and local conditions.

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***--306 Droughts (Continued)**

D Maps and Reports

Maps and reports are needed to assess impacts to agriculture and support various reporting requirements at the local, State, and national level. See 1-SEM for guidance when including maps with disaster situation reports.

Note: Maps containing CLU, CRP, or acreage report data are for internal FSA distribution **only**. Cropland and other land use data may be included on maps for use outside of Service Center Agencies only if data has been sufficiently aggregated to secure data according to the 2008 Farm Bill, Section 1619. Guidance about protected data can be found in 2-INFO.

See this table for maps and reports as they relates to drought events.

Map/Report Description	Timeframe	Primary Recipient	Notes
General overview of areas impacted by drought.	Update weekly.	SED and CED.	
Assemble supplemental maps and graphics from other sources.	Bi-weekly.	SED and CED.	CPC drought outlook, NASS vegetation condition, CPC precipitation outlook, Crop Moisture Index, etc.
Precipitation (percent of normal and departure from normal).	Monthly.	SED and CED.	More frequent updates may be needed depending on normal precipitation amounts.
NDVI and NDVI departure from average.	Monthly.	SED.	
Land use map based on CLU, identifying failed acreage.	Update throughout growing season.	SEB and CEB.	For large events, summarize failed acreage at the county level.
Map of approved haying and grazing on CRP.	Update as needed.	SEB.	Include effective dates.
Tabular report of failed acreage by crop type and intended use.	Update throughout growing season.	SEB and CEB.	

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*--307 Wildfires

A Overview

Wildfires are a major threat to agriculture and generally occur with little or no notice. Wildfires vary in size, are unpredictable, and have the potential to spread quickly. While row crops are usually not affected, grass, rangeland, and timber losses can be significant.

Common agricultural losses for wildfires include:

- barns and other structures
- equipment and machinery
- feed and hay supplies
- fences
- grazing/pasture losses
- livestock
- timber
- watering systems.

GIS analysis is effective in assessing damage and losses caused by wildfires. GIS specialists shall assist in wildfire-related activities by tracking wildfire events, compiling imagery, and developing maps and reports in support of emergency management efforts and program administration.

B Data Sources

The following are wildfire data resources for GIS specialists.

Note: In addition to the following resources, local data is often available and may provide more detailed information.

Data Source	Purpose	Resource Location	Notes
FS Active Fire Mapping	Access to daily MODIS imagery and fire detection shapefiles. Available shapefiles include MODIS fire detections for the previous 7 days, and cumulative fire detections for the year, are updated hourly.	**http://activefiremaps.fs.fed.us**	

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***--307 Wildfires (Continued)**

B Data Sources (Continued)

Data Source	Purpose	Resource Location	Notes
FS Active Fire Mapping ArcIMS Service	Access to several datasets through ArcMap including active watches/warnings and current MODIS, AVHRR, and Geostationary Operational Environmental Satellite fire detections.	**http://activefiremaps.fs.fed.us**	Create an ArcIMS server connection in ArcMap.
FS Burned Area Reflectance Classifications	Access to burn severity data for selected fires. Burned area reflectance classifications data has 4 classes; high, moderate, low, and unburned.	**http://activefiremaps.fs.fed.us/baer/download.php**	
GeoMAC	Access to fire perimeter shapefiles.	**http://rmgsc.cr.usgs.gov/outgoing/GeoMAC**	
GeoMAC ArcIMS Service	Access to several wildfire related datasets through ArcMap including satellite detected fires and fire perimeters.	**http://www.geomac.gov**	Create an ArcIMS server connection in ArcMap using **http://activefiremaps.fs.fed.us**.
GLOVIS	Access to several types of imagery including Landsat.	**http://glovis.usgs.gov**	
HDDS	Access to pre- and post-event imagery for selected disaster events.	**http://www.firedetect.noaa.gov**	A log-in account **must** be established to access restricted data and can be requested on the web site.

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***--307 Wildfires (Continued)**

B Data Sources (Continued)

Data Source	Purpose	Resource Location	Notes
NOAA National Environmental Satellite, Data, and Information Service Hazard Mapping System ArcIMS Service	Access to several fire-related datasets through ArcMap, including satellite analyzed fires.	**http://www.firedetect.noaa.gov**	Create an ArcIMS server connection in ArcMap.
USDA FAS Crop Explorer, MODIS Rapid Response	Access to daily MODIS imagery.	**http://www.pecad.fas.usda.gov/cropexplorer/modis_summary/index.cfm**	
USGS Earth Explorer	Access to several types of imagery including Landsat and SPOT.	**http://earthexplorer.usgs.gov**	A log-in account **must** be established to access restricted data and can be requested on the web site.
USGS Landsat Acquisition Schedule	Landsat 5 and Landsat 7 acquisition schedule.	**http://landsat.usgs.gov/tools_acq.php**	

C Best Practices for Analysis

Typical wildfire analysis requires the GIS specialist to complete the following tasks:

- attribute and spatial queries
- data manipulation
- heads-up digitizing
- process GPS data
- process satellite imagery
- union and intersect overlay operations.**--***

***--307 Wildfires (Continued)**

C Best Practices for Analysis (Continued)

The following table provides specific analysis steps associated with disaster response and reporting during and after a wildfire event.

Note: The location and size of a wildfire will often dictate the time period involved and spatial analysis techniques to be applied.

Step	Action	Purpose	Notes
1	Acquire and process satellite imagery.	To evaluate the location and spatial extent of the wildfire. Higher resolution imagery can also be used in program implementation, such as ECP.	MODIS should only be used when preparing initial estimates and maps when other imagery is not available. Do not use in detailed analysis or program administration. When using MODIS, the 7, 2, 1 False Color product is recommended. When using Landsat imagery, the 7, 4, 2 band combination is recommended.
2	Determine the fire perimeter.	Essential for detailed analysis.	This task is typically accomplished by heads-up digitizing from satellite imagery. Accuracy may be supplemented or validated with GPS data collected by field personnel. Perimeters for larger fires are often available from GeoMAC.
3	Clip CLU based on the fire perimeter layer.	Necessary to determine affected acreage.	When possible, join acreage report data to the CLU layer before intersecting with the fire perimeter layer. Depending on the location and scale of the event, join acreage report data at either the tract or field level.
4	Calculate affected acreage and summarize by land class code.	Data and statistics to support various reporting requirements.	If using acreage report data, also summarize by crop and intended use.
5	Intersect other layers such as grazing allotments or CRP with the fire perimeter, as needed.	Data and statistics to support various reporting requirements.	

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***--307 Wildfires (Continued)**

D Maps and Reports

Maps and reports are needed to assess impacts to agriculture and support various reporting requirements at the local, State, and National level. Since wildfires have the potential to last several weeks, maps and reports should be updated as needed. See 1-SEM for additional requirements when including maps with disaster situation reports.

Note: Maps containing CLU, CRP, or acreage report data are for internal FSA distribution **only**. Cropland and other land use data may be included on maps for use outside of Service Center Agencies only if data has been sufficiently aggregated to secure data according to the 2008 Farm Bill, Section 1619. Guidance about protected data can be found in 2-INFO.

See this table for maps and reports for wildfire events:

Map/Report Description	Timeframe	Primary Recipient	Notes
General overview of wildfire activity (State or county level, as appropriate).	Day of or next workday after event.	SED and CED.	Display initial wildfire activity as point data until fire perimeter is available.
Initial fire perimeter.	One or 2 calendar days after event.	SED, CED, and CEB.	Can be estimated using MODIS imagery.
Land use map based on CLU.	When wildfire perimeter is determined.	SEB and CEB.	When possible, include acreage report data.
Maps showing other acreage affected, such as CRP and grazing allotments.	When wildfire perimeter is determined.	SEB and CEB.	
Tabular report of affected acreage by land class code.	When wildfire perimeter is determined.	SEB and CEB.	When possible, acreage should also be summarized by crop type and intended use.
Updated fire perimeter.	After imagery is available or perimeter data is provided from other sources.	SEB and CEB.	Use Landsat, SPOT, or AWiFS 56-Meter imagery.

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*--308 Earthquakes

A Overview

Earthquakes are destructive events that arrive with little or no notice. The damage inflicted by an earthquake can be devastating in areas that are directly impacted by the event in terms of infrastructure damage. Crop damage for most types of earthquakes is a secondary concern because only those directly adjacent to the epicenter are typically destroyed. Damage moving out from the epicenter is moderated by distance and terrain type. Crops, farms, equipment, infrastructure, and lives can be wiped out in an instant during an earthquake, but the major damage is also associated with secondary events such as levee breaks, flooding, fires, and loss of infrastructure connections.

Common agricultural losses for earthquakes include:

- barns and other structures
- crops
- ditches
- equipment and machinery
- feed and hay supplies
- fences
- fish hatcheries
- forests
- grazing/pasture losses
- homes
- infrastructure damage or destruction
- irrigation infrastructure.
- levees and dams
- livestock
- nurseries
- pipelines
- ranches
- transportation infrastructure
- utilities.

GIS analysis is very effective in assessing damage and losses caused by earthquakes. GIS specialists shall assist in earthquake-related program administration, disaster recovery, and tracking. The assistance shall include tracking and compiling earthquake data, imagery analysis, HAZUS-MH support, and map development in support of emergency management efforts for FSA support and recovery of events impacting agriculture.**--***

***--308 Earthquakes (Continued)**

B Data Sources

The following are earthquake data resources for GIS specialists:

Note: In addition to the following resources, local data is often available from many State agencies and may provide more detailed information.

Data Source	Purpose	Resource Location	Notes
Advanced National Seismic System	Access to accurate and timely information products for seismic events, including their effects on buildings and structures, and employing modern monitoring methods and technologies.	**http://earthquake.usgs.gov/monitoring/anss**	
Earthquake Animations	Shows maps for the past 7 calendar days for the U.S., world, California/Nevada, and the Intermountain West (Utah and Yellowstone).	**http://earthquake.usgs.gov/earthquakes/recenteqsanim**	
Earthquake Lists and Maps	USGS historic inventory of earthquakes, including maps, statistics, and history of earthquakes in the U.S.	**http://earthquake.usgs.gov/earthquakes/eqarchives**	
GLOVIS	Access to several types of imagery, including Landsat and MODIS.	**http://glovis.usgs.gov**	
HAZUS-MH Seismic Data	HAZUS-MH data disks have seismic zones and software models for assessing earthquake damage.	**http://www.fema.gov/plan/prevent/hazus**	HAZUS-MH information at **http://hazus.org**.
HDDS	Access to pre- and post-event imagery for selected disaster events.	**http://hdds.usgs.gov/hdds2**	A log-in account **must** be established to access restricted data and can be requested on the web site.

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***--308 Earthquakes (Continued)**

B Data Sources (Continued)

Data Source	Purpose	Resource Location	Notes
HSIP Gold	A unified homeland infrastructure geospatial data inventory assembled by National Geospatial-Intelligence Agency in partnership with the Homeland Infrastructure Foundation-Level Data community for common use by the Homeland Security, Homeland Defense and Emergency Preparedness, and response and recovery communities.	**http://www.hifldwg.org**	Data is provided by a national level agreement through Citrix Systems, Inc.
The National Association of Radio Distress	Map and tabular placement of major events occurring and ongoing around the world.	**http://hisz.rsoe.hu/alertmap/index2.php**	
U.S. Earthquake Information by State	State-level summaries of earthquake information, maps, and other earthquake-related data or links.	**http://earthquake.usgs.gov/earthquakes/States**	
USDA FAS Crop Explorer	Access to daily MODIS imagery.	**http://www.pecad.fas.usda.gov/cropexplorer/modis_summary/index.cfm**	
USGS Earth Explorer	Access to several types of imagery, including Landsat and SPOT.	**http://earthexplorer.usgs.gov**	A log-in account **must** be established to access restricted data and can be requested on the web site.
USGS Earthquakes	USGS general information following current earthquake events.	**http://earthquake.usgs.gov/earthquakes**	Provides links to really simple syndication feeds, maps, earthquake reporting, notifications signups, and seismogram displays.

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***--308 Earthquakes (Continued)**

B Data Sources (Continued)

Data Source	Purpose	Resource Location	Notes
USGS Earthquakes Regional	USGS general information following current earthquake events displayed regionally.	**http://earthquake.usgs.gov/regional/neic**	
USGS Hazard Mapping	Data for past events that document historical earthquakes.	**http://earthquake.usgs.gov/hazards/products**	
USGS Landsat Acquisition Schedule	Landsat 5 and Landsat 7 acquisition schedule.	**http://landsat.usgs.gov/tools_acq.php**	
USGS Shakemap Products	USGS information and summary data for earthquake information collected by year and event.	**http://earthquake.usgs.gov/earthquakes/shakemap/list.php?y=2011**	
USGS Shakemaps	Maps that depict shaking intensity.	**http://earthquake.usgs.gov/earthquakes/shakemap/formats.php**	

C Best Practices for Analysis

Earthquakes typically exhibit damage along a slipped fault that radiates damage from the epicenter. Damage and strength of the earthquake are correlated with the earthquake's measured Richter Magnitude Scale. Events with magnitudes of over 4.5 are measured worldwide and typically result in damage that can be quantified. The damage inflicted by an earthquake can be analyzed and correlated using geospatial techniques that assist FSA in addressing damage assessments for the agricultural community within a given area impacted by an earthquake. Typical earthquake analysis may require that the GIS specialist complete the following tasks:

- classify soil types
- create epicenter analysis based on earthquake locations
- create thematic maps to summarize various aspects of the data.
- identify seismic zones and fault lines
- identify slope risks using triangulated irregular network, digital elevation model, or LiDAR data [Can't use "TIN", in 1-CM and DEM only used once so spell out.]
- insert buffer zones around line and area layers
- perform attribute and spatial queries**--***

***--308 Earthquakes (Continued)**

C Best Practices for Analysis (Continued)

- perform table manipulations
- perform union and intersect overlay operations
- use HAZUS-MH to model earthquake scenarios.

The geospatial officer shall use spatial analysis to better understand and depict damage for earthquakes by completing the following steps.

Note: The damage inflicted by an earthquake will often dictate the period of time and spatial analysis techniques that will need to be applied. GIS specialists should have staged data and scenarios based on real-time exercises completed in preparation for the eventual need to respond to an earthquake event.

Complete the following steps to **prepare** for an event.

Step	Action	Purpose	Notes
1	Identify Seismic zones and known fault lines Statewide.	Identifies what areas to focus HAZUS-MH earthquake scenarios.	
2	Run HAZUS-MH scenarios for earthquake in high risk areas.	Prepare State and County Offices with scenarios.	GIS specialists **must** practice using the HAZUS-MH software to become proficient.
3	Identify areas of high risk from previous earthquakes.	Identifies areas of high risk in a county.	Targets focus areas for planning purposes.
4	Assemble earthquake monitoring web sites.	Preload the web sites so they can be used.	

Complete the following steps **after** an event.

Step	Action	Purpose	Notes
1	Identify area impacted by earthquake and intensity.		
2	Plot earthquake epicenter.		
3	Identify earthquake damage areas.		
4	Complete HAZUS-MH scenario real-time using actual data.		
5	Request Field Offices to collect GPS points and digital photos.	Support information for disaster requests.	Used in APLN requests and Secretarial disasters.
6	Plot field GPS points and add to map document.	Assists in developing damage reports.	

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***--308 Earthquakes (Continued)**

C Best Practices for Analysis (Continued)

Step	Action	Purpose	Notes
7	Use hot links to include GPS point data linked with digital photos.	Overview information for overall damage.	Used in APLN requests and Secretarial disasters.
8	Determine best imagery available before and after.	Imagery analysis.	Possible data sources are SPOT, LandSat TM (30-Meter), AWiFS (56-Meter), or MODIS (250-Meter).
9	Intersect CLU with earth quake area.	Quantify damage to cropland and agricultural structures.	Intersect in ArcToolbox.
10	Identify proximity risk to Service Centers.	Status reports.	
11	Identify proximity risk to FSA staff home locations.	Status reports.	

D Presentation of Analysis Results

In the aftermath of an earthquake, maps and reports can be used to help assess impacts to agriculture and support various reporting requirements at the local, State, and National level. The purposes of the maps and report analysis are to:

- assess possible structural impacts or damaged concerning agriculture
- assist in coordinating efforts with Field Offices, SEB's, and CEB's in assessing and completing LAR's.
- evaluate the location and spatial extent of damage
- identify areas of risk for Service Center employees
- identify Service Center areas of risk
- implement and support State and County Emergency Operations Plans and cooperative activities
- pinpoint affected areas of damage as they relates to CLU.

Note: Maps containing CLU, FFSF, and CRP are for internal FSA distribution **only**. If data is sufficiently aggregated, cropland and other land use data may be included on maps for use outside of Service Center Agencies. Guidance about protected data can be found in 2-INFO.**--***

***--308 Earthquakes (Continued)**

D Presentation of Analysis Results (Continued)

This table provides maps and reports for earthquakes.

Earthquake Severity	Task	Completion Timeframe	Primary Product Recipients	Primary Data Sources and Resource sites
3.0 magnitude and greater	Complete Earthquake Epicenter Map.	Next workday after event.	SED and CED.	County boundaries.
5.0 magnitude and greater with impacts to agriculture	Complete Earthquake Event Overview Map, if needed based on the situation.	Next workday after event.	CED and CEB.	HAZUS-MH scenario, county boundary, national grid, major roads, Service Center locations, and major geographical features
	Complete Damage and Destruction Point Map, if needed based on the situation.	Completed and updated as local offices provide field data.	CEB and SEB.	County boundary, major roads, Service Center locations, national grid, and major geographical features
	Complete Landsat Map, if needed based on the situation.	Approximately 16 calendar days after event. Requires before and after satellite images.	GIS specialist.	Satellite imagery, county boundary, and digitized path location.
	Complete FSA Map Series, if needed based on the situation.	Defines farms impacted by standing or flood water.	CED and producers impacted.	Current NAIP, CLU, tornado path, national grid, and bin locations.
	PowerPoint overview of Earthquake Damage Report.	Compiled before SEB Meeting.	SEB.	Maps in this table, statistics from analysis, digital photos, news articles, and other related information.

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Reports, Forms, Abbreviations, and Redelegations of Authority

Reports

None

Forms

This table lists all forms referenced in this handbook.

Number	Title	Display Reference	Reference
AD-1026	Highly Erodible Land Conservation (HELC) and Wetland Conservation (WC) Certification		Ex. 10

Abbreviations

The following abbreviations are not listed in 1-CM.

Approved Abbreviation	Term	Reference
AHPS	Advanced Hydrologic Prediction Service	302, 305, 306
APLN	Administers Physical Loss Notification	302, 304, 305, 308
AVHRR	advanced very high resolution radiometer	306, 307
AWiFS	Advanced Wide-Field Sensor	302-305, 307, 308
CD	compact disc	253, Ex. 13, 19
CEB	County Executive Board	291, 301, 302, 304-308
CM	Conservation Management	92, 195
CPC	Climate Prediction Center	302, 306
DOQ	digital orthophotography quadrangle	134, Ex. 6-9
EF	Enhanced Fujita	304
EMI	Emergency Management Institute	295, 301, 306
ESRI	Environmental Systems Research Institute	291
FFSF	food, feed, seed, and fertilizer	291, 301-304, 308
FGDC	Federal Geographic Data Committee	281, Ex. 22
FTS	file transfer protocol	251, 253, 281
GeoMAC	Geospatial Multi-Agency Coordination Group	307
GLOVIS	USGS Global Visualization Viewer	302-305, 307, 308
GPS	global positioning system	94, 95, 97, 291, 301-305, 307, 308
GUID	globally-unique identifier	161

Reports, Forms, Abbreviations, and Redelegations of Authority (Continued)

Abbreviations (Continued)

Approved Abbreviation	Term	Reference
HAZUS-MH	Hazards U.S. Multi-Hazard	291, 303, 305, 308
HDDS	USGS Hazards Data Distribution System	302-305, 307, 308
IDW	inverse distance weighting	302
Landsat/ LandSat TM	land satellite thematic mapper	302-306, 307, 308
LAR	Loss Adjustment Report	291, 301, 302, 304, 305, 308
LiDAR	light detection and ranging	291, 308
MDOQ	mosaicked digital orthophotography	92, 31-133
MODIS	Moderate Resolution Imaging Spectroradiometer	302-308
NAIP	National Agriculture Imagery Program	291, 302, 304, 305, 308
NCDC	National Climatic Data Center	291, 301, 302, 304, 305
NDVI	Normalized Difference Vegetation Index	306
NEXRAD	Next-Generation Radar	291, 301, 302, 304, 305
NHC	National Hurricane Center	305
NOAA	National Oceanic and Atmospheric Administration	301, 302, 304, 305, 307
NWS	National Weather Service	301, 302, 304-306
PLSS	Public Land Survey System	291, Ex. 13
QC	Quality Control	Ex. 13
SCI	Service Center Initiative	281
SEB	State Executive Board	291, 302, 304-308
SPC	Storm Prediction Center	291, 301, 304
SPOT	Spot Image, a public limited company.	302-305, 307, 308
STORM	Systematic Tracking for Optimal Risk Management	304
TSD	Technical Service Division	291
USACE	U.S. Army Corps of Engineers	303
USDM	U.S. Drought Monitor	291, 306

Redelegations of Authority

None

Definitions of Terms Used in This Handbook

Attribute Table	An attribute table is a database, or other tabular file, containing rows and columns. It is used to store nongeospatial data, such as cropping history and system calculated acres, in precise fields which allow the system to quickly find, retrieve, and query the data when prompted by the user.
Attribute Field	An attribute field is a single column of information contained in an attribute table.
Common Data	Common data: • is common to more than 1 of the Service Center Agencies • originates outside the Service Centers and is maintained for all Agencies by the Service Center data steward or system administrator.
Common Land Unit (CLU)	CLU is the smallest unit that has: • a permanent, contiguous boundary • common land cover management • a common owner • a common producer association.

Continued on the next page

Definitions of Terms Used in This Handbook (Continued)

Database	A database is a logical collection of interrelated information, managed and stored as a unit, usually on some form of mass-storage system such as a magnetic tape or disk. A GIS database includes data about the spatial location and shape of geographic features recorded as points, lines, areas, pixels, grid cells, or tins as well as their attributes.
Digital Ortho-photography (DOQ)	Digital orthophotography is a digital representation (map) of an aerial photograph. Ground and land features are accurately located in their true map positions on DOQ. Distortions caused by differences in terrain relief and aerial camera tilt have been removed. Service Centers will use DOQ's as the base map in their GIS.
Digitizing	Digitizing is encoding map features, such as points, lines and polygons, as coordinates in a digital form, that is, using the computer to draw lines and points on an digital map. Field Service Agencies will be digitizing tract/CLU boundaries on top of the digital aerial photography.
Geographic Information System (GIS)	GIS is an application software capable of manipulating, analyzing, and storing spatial or geographic referenced data. GIS will automatically compute distances and acres using imbedded calculation models.
Geo-reference	Geo-reference is to establish the relationship between coordinates on a paper map (2-dimensional) and known real-world coordinates using longitude and latitude.
Map Projection	Map projection is the conversion of the Earth's 3-dimensional coordinates into a 2-dimensional plane. Since the Earth is round, when it is displayed as a flat map, map projections maintain the integrity of data by shifting the 2-dimensional map to correlate with 3-dimensional longitude and latitude locations.

Continued on the next page

Definitions of Terms Used in This Handbook (Continued)

Mosaicked Digital Ortho-Photography (MDOQ)	Mosaicked Digital Ortho Photography is a seamless mosaic of all the DOQ's in a single county that has been reformatted to remove visible seam lines, misalignment, and color variations between DOQ's.
Polygon	A polygon is a figure having multiple line segments connected to form a plane. Polygons are the GIS term for a CLU's boundary.
Program Specific Data	Program specific data is used and maintained by 1 Field Service Center Agency.
Record	A record is a single row of data in an attribute table. Users can define the exact record (row) and field (column) to locate exact program information in the automated system.
Relational Database Management System	A relational database management system has the ability to access data organized in tabular files that may be related together by a common field (item). It has the capability to recombine the data items from different files, thus providing a powerful tool for locating, updating, and querying information stored in the computer.
Shared Data	Shared data is shared by 2 or more Field Service Center Agencies, but is maintained by 1 Agency or an external organization. **Example:** Land ownership maintained by the county government.
Spatial Data	Spatial data is information about the location, shape, and relationships of map features, such as roads, fences, barns, feed lots, and other details contained on maps. Spatial data stores the geographic location of features, usually in a longitude and latitude numbering system, with attribute information describing what these features represent.
Views	Views are projected maps that allow the user to display, explore, query, and analyze geographic data in GIS.

Example of DOQ

Note: The quality has been reduced because of photocopying.

Example of Digitized CLU's on Top of DOQ

Note: The quality has been reduced because of photocopying.

Example of Digitized CLU's on Top of DOQ

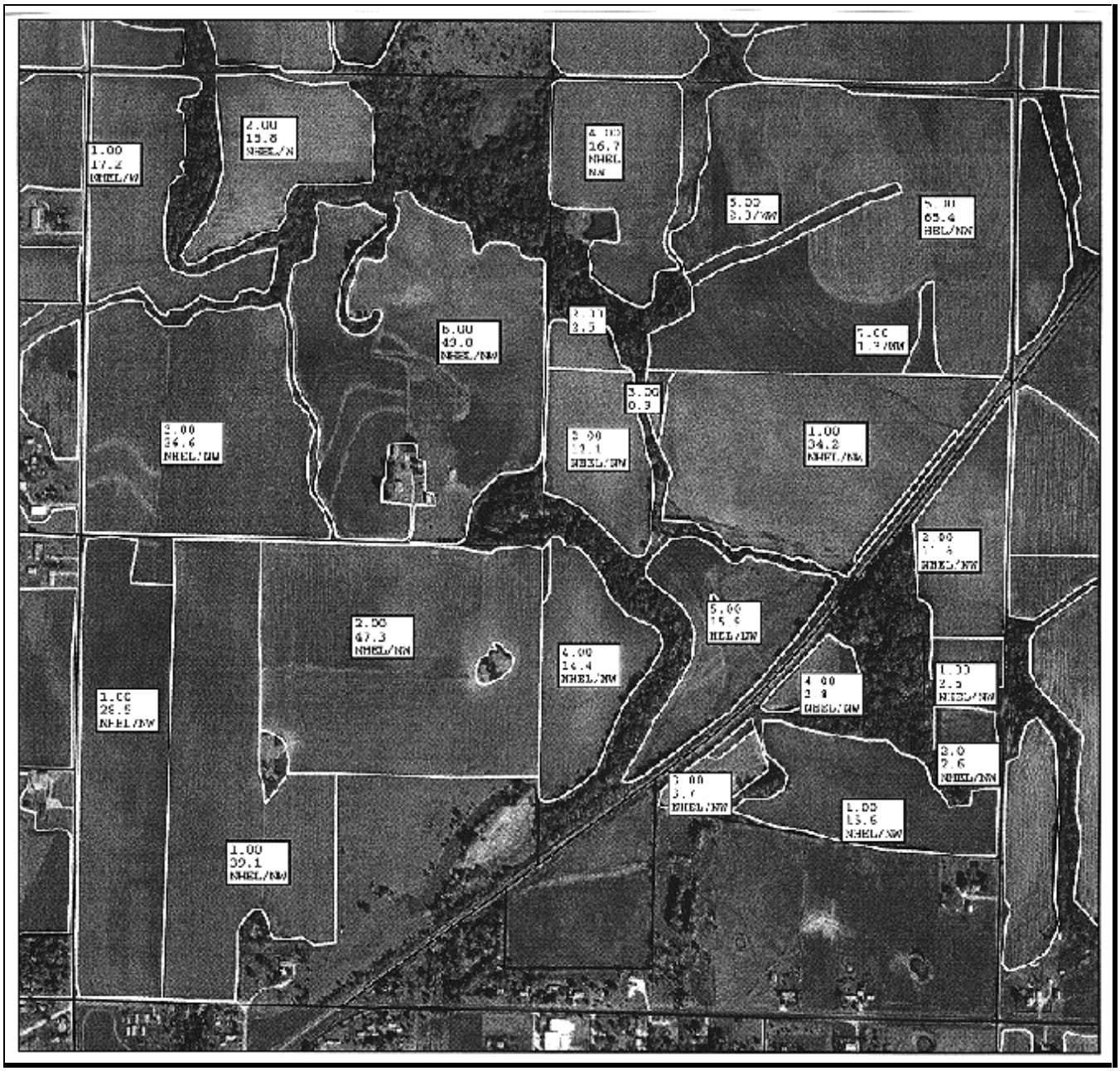
Note: The quality has been reduced because of photocopying.

Example of Digitized CLU's With Soils Layer on Top of DOQ

Note: The quality has been reduced because of photocopying.

Example of Digitized CLU's With Labels on Top of DOQ

Note: All CLU's have been labeled in the graphic. The quality has been reduced because of photocopying.



CLU Tools

A
FSA Tools

The following are tools used by FSA to create and maintain CLU.

FSA Tools	Description
CLU Digitizing Tool	Tool set for CLU data creation.
CLU Maintenance Tool	Tool set for Service Center CLU maintenance.
CLU Crop Reporting Tool	Prototype tool for collecting Crop Report data using CLU and GIS.
CLU HEL Tool	Automates the calculation of HEL acreage and map unit soil type of 1 or more CLU's within a tract.
CLU Utilities	Additional tools for labeling, searching CLU, generating PLSS section maps and other tools.
CLU QC Tools	Quality control tools for checking edit work on CLU or other data created at a Service Center.
FSA Mapmaker	Facilitates the creation of State/county thematic maps for project management, tracking, or decision support purposes.

Continued on the next page

B
NRCS Tools

The following are tools used by NRCS to create and maintain the CLU and data layers.

NRCS Tools	Description
Customer Service Toolkit	Customer Service Toolkit is a collection of software tools for USDA field employees who work with the public, primarily farmers and ranchers. The purpose of the tools is to help natural resource planners provide information to farmers and ranchers that result in conservation on the land. The tools incorporate commercial software products such as Microsoft Outlook, Excel, and Access. This enables conservationists to provide natural resource information in professional looking documents. Toolkit also provides tools for mapping and analyzing natural resource information. Maps are a traditional method of communicating with customers, and the Toolkit makes it easy to develop these maps for customers. Within the Toolkit environment are tools for managing wetland determinations and conservation easements.
Soil Data Viewer	The NRCS is the Federal agency responsible for mapping soils and developing databases of information about soils. Many groups including farmers and ranchers, State and local governments, universities, developers, and realtors come to NRCS for soils data. Traditionally, soils information has been provided on paper, but most of the soils data across the country has been converted into electronic databases. Many soil surveys are being digitized/mapped for use with geographic information systems. The Soil Data Viewer takes advantage of soil surveys that have been digitized. The tool makes it easy for NRCS resource conservationists to produce maps that show locations of soil types and provide information on how the soils located in a specific site should be used to conserve the resource and prevent pollution. A desktop and a web version of the Soil Data Viewer are available.
Resource Data Gateway	Web-based suite of tools for locating and delivering natural resource data including soils, orthoimagery, climate, plants, and CLU. The Gateway strives to provide easy “one stop shopping” for delivery to anyone, anywhere, at any time, supports geospatial data needs for Service Center applications like the Customer Service Toolkit and Soils Data viewer. The Gateway encourages better use, easier access, efficient delivery, and improved management of NRCS data. Gateway allows electronic download or CD delivery of data to internal and external customers. External customers include farmers, agribusiness consultants, Federal, State, and local conservation agencies, and the general public. The Gateway supports “locating” (by State, county, or user-specified area), “selecting” (by data theme such as soil, plant, climate, “formatting” (re-projection), and selecting “delivery preference” (download, FTP, or mail CD).

Available Standards

A
Current Geospatial Standards

The following titles describe current geospatial standards and are located on the following website: http://www.fsa.usda.gov/scdm.

Title	Description
Standard for Geospatial Data	This standard provides the USDA Service Center Modernization initiative with a geospatial data model and data standards. It describes a basic, nationally consistent set of core geospatial data that will provide a foundation on which to base business applications.
Standard for Geospatial Dataset File Naming	This document provides the USDA Service Center Modernization initiative standard for geospatial directory and file naming conventions. It describes the conventions used for the basic nationally consistent set of core geospatial data, locally acquired geospatial data, and derived geospatial data.

CLU Attributes

In the following table, the "Attribute Name" is the full system name for the attribute. The "Field Name" is a shortened, alternative name for use where GIS systems have a constraint on the maximum length of an attribute name.

SCIMS Physical Attribute Name	GIS Data Physical Name (ArcView .dbf data element)	Method of Entry	Attribute Length
***--Shape	SHAPE	System-generated	8 character--*
State_Code	STATECD	User entry[1/]	2 character
County_Code	COUNTYCD	User entry[1/]	3 character
Farm_Number	FARMNBR	User entry	7, numeric
Tract_Number	TRACTNBR	User entry	7, numeric
Common_Land_Unit_ Number	CLUNBR	User entry	7, numeric
CLU_Calculated_ Acreage	CALCACRES	System-generated	8, numeric, 2 decimals
Highly_Erodible_Land _ Type_Code	HELTYPECD	User entry	1, character
Common_Land_Unit_ Classification_Code	CLUCLSCD	User entry	2, numeric
FSA Official Acres	FSA_ACRES	User entry	8, numeric, 2 decimals
Common_Land_Unit_ Identifier	CLUID	System-generated	36 character
***--Comments	COMMENT	User entry	80 character

[1/] State and county codes are identical for all CLU's in a county dataset except for CLU's which fall outside the county boundary. See paragraph 137.

Notes: Using the FIPS tool in the merit tool will change all CLU's to what is entered in the pop up window.**--***

Comment field is created when using Digitizing Tool. The Maintenance Tool does not create a Comment Field.

CLU Attributes (Continued)

Definitions of CLU Attributes	
Attribute	**Definition**
***--Shape	Vector data storage format storing the location, shape, and attributes of the geographic feature. Format is listed as polygon.--*
State Code	The numeric Federal Information Processing Standards (FIPS Pub 5-2) code for a State within the United States, or a U.S. Territory. These codes can also be found in the GSA Locator Codes system. **Examples:** 01 = Alabama, 02 = Alaska, 20 = Kansas, 29 = Missouri, 51 = Virginia. **Note:** FIPS codes are character fields to preserve the leading zeroes.
County Code	The standard code used to identify physical counties and equivalent entities of the United States, its possessions, and associated areas as specified in FIPS PUB 6-4. A county code is only unique if it is combined with a State code. **Example:** 01 003 = Baldwin County in Alabama. **Note:** These codes are stored as character fields to preserve the leading zeroes.
Farm Number	An identifier attached to all land units under control of a particular "operator". The land units may have different owners. Land units may come and go from the farm as interest (lease, ownership) in the land units changes. An "operator" is the person or business that actually controls day-to-day operation of the farm. The Farm Number requires a State code and county code for uniqueness. **Domain:** Values of 0 to 9,999,999; with 0 indicating the lack of a specific farm number.
Tract Number	An identifier given to a collection of land units under the same ownership. An "owner" is a person or business having deed to the land. Tract Numbers are usually assigned by FSA; however, other agencies might create tract numbers for CLU's containing range land, wetlands, housing developments, and other types of noncropped land. This Tract Number requires a State code and county code for uniqueness. **Domain:** Values of 0 to 9,999,999; with 0 indicating the lack of a specific tract number.
CLU Number	Usually contains the FSA-assigned field number for CLU. In instances where FSA has not assigned a formal tract/field designation (for range land or housing developments), NRCS or RD may assign a CLU number meaningful to the user, and without an accompanying tract number. **Domain:** Values of 0 to 9,999,999; with 0 indicating the lack of a specific CLU number.

CLU Attributes (Continued)

Definitions of CLU Attributes	
Attribute	**Definition**
CLU Calculated Acres	The polygon acreage based on calculation by the GIS tool.
Highly Erodible Land Type Code	Indicates the determination of CLU to contain highly erodible land. **Domain:** H - Highly Erodible Land (HEL) N - Non Highly Erodible Land (NHEL) E - Exempted Highly Erodible Land (EHEL) (only in CA, AZ, NV, UT) U - Undetermined, that is, a determination has not yet been made. (Default) **Note:** Versions of this code have contained a 1-character "Y", "N"or Blank to indicate that the land unit is determined to be highly erodible. The Y/N/Blank value can be found on AD-1026. Both FSA and NRCS use AD-1026. This designation is not sufficient for future uses; and, when available, the actual determination will be recorded. If necessary, the codes listed above can be correlated back to the Y/N/Blank codes as follows: H (HEL) = "Y" N (NHEL) = "N" E (EHEL) = "N" U (Undetermined) = Blank
Common Land Unit Classification Code	A 2-character code to denote the current primary classification of land unit type as defined in this handbook. See Exhibit 18 for listing and explanation of land unit types. **Domain:** 01 Urban 02 Cropland 03 Rangeland 04 Forest 05 Water Body 06 Mined Land 07 Barren 08 Tundra 09 Perennial Snow and Ice 10 Other Agriculture
FSA Official Acres	An 8-character number to record the acreage from official fields.
Common Land Unit Identifier	A globally-unique identifier assigned to a spatial feature, such as CLU. This identifier will generally not be visible to the user but will provide the internal uniqueness needed to maintain electronic records as they are moved and merged among computers and offices.
***--**Comments	An 80 character free-form field.**--***

A

CLU Land Classification Codes

Following are CLU land classification codes relationship to Level II USGS categories.

CLU Class	CLU Code	Standard Color	Relationship to Level II USGS Categories	
			Code	Name
Urban	01	Red	11	Residential
			12	Commercial and Services
			13	Industrial
			14	Transportation, Communications, and Utilities
			15	Industrial and Commercial Complexes
			16	Mixed Urban or Built-up Land
			17	Other Urban or Built-up Land
Cropland	02	Light Brown	21	Cropland and Pasture
			22	Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas
Rangeland	03	Tan	31	Herbaceous Rangeland
			32	Shrub and Brush Rangeland
			33	Mixed Rangeland
			62	Nonforested Wetland
Forest	04	Dark Green	41	Deciduous Forest Land
			42	Evergreen Forest Land
			43	Mixed Forest Land
			61	Forested Wetland
Water Body	05	Blue	51	Streams and Canals
			52	Lakes
			53	Reservoirs
			54	Bays and Estuaries
Mined Land	06	Rose	75	Strip Mines, Quarries, and Gravel Pits
Barren	07	Grey	71	Dry Salt Flats
			72	Beaches
			73	Sandy Areas Other Than Beaches
			74	Bare Exposed Rock
			76	Transitional Areas
			77	Mixed Barren Land
Tundra	08	Light Green	81	Shrub and Brush Tundra
			82	Herbaceous Tundra
			83	Bare Ground Tundra
			84	Wet Tundra
			85	Mixed Tundra
Perennial Snow and Ice	09	Light Blue (Ice)	91	Perennial Snowfields
			92	Glaciers
Other Agriculture	10	Light Yellow	21	Confined Feeding Operations
			22	Other Agricultural Land

Continued on the next page

Land Classification Codes (Continued)

B
USGS Land Classification Definition and Codes

Following are the definitions and codes used to populate the CLU Land Classification data.

Land Use and Land Cover Classification System for Use With Remote Sensor Data	
Level I	**Level II**
1 Urban or Built-up Land	11 Residential 12 Commercial and Services 13 Industrial 14 Transportation, Communications, and Utilities 15 Industrial and Commercial Complexes 16 Mixed Urban or Built-up Land 17 Other Urban or Built-up Land
2 Agricultural Land	21 Cropland and Pasture 22 Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas 23 Confined Feeding Operations 24 Other Agricultural Land
3 Rangeland	31 Herbaceous Rangeland 32 Shrub and Brush Rangeland 33 Mixed Rangeland
4 Forest Land	41 Deciduous Forest Land 42 Evergreen Forest Land 43 Mixed Forest Land
5 Water	51 Streams and Canals 52 Lakes 53 Reservoirs 54 Bays and Estuaries
6 Wetland	61 Forested Wetland 62 Nonforested Wetland
7 Barren Land	71 Dry Salt Flats 72 Beaches 73 Sandy Areas Other Than Beaches 74 Bare Exposed Rock 75 Strip Mines, Quarries, and Grave Pits 76 Transitional Areas 77 Mixed Barren Land
8 Tundra	81 Shrub and Brush Tundra 82 Herbaceous Tundra 83 Bare Ground Tundra 84 Wet Tundra 85 Mixed Tundra
9 Perennial Snow or Ice	91 Perennial Snowfields 92 Glaciers

Charging for Data

A Calculating the Cost of Providing Digital Data

The following are items to consider when calculating the cost of providing digital data.

Item	Charge
CD, diskette, or other media.	Actual cost rounded to nearest dollar.
• Staff time spent on taking request. • Staff time for modifications to data, including changes for Privacy Act purposes. • Staff time for or modifying metadata, if needed. • Staff time preparing for mailing, etc.	Time rounded up to nearest ¼ hour times staff cost of either of the following: • when feasible, at the salary rate of the employee conducting the search, plus 16 percent of the employee's basic pay • where a homogeneous class of personnel is used exclusively, at the rate of $2.50 per quarter hour for clerical time and $5.00 per quarter hour for supervisory or professional time.
Computer time for transferring data.	Estimated time X average staff cost of either of the following: • when feasible, at the salary rate of the employee conducting the search, plus 16 percent of the employee's basic pay • where a homogeneous class of personnel is used exclusively, at the rate of $2.50 per quarter hour for clerical time and $5.00 per quarter hour for supervisory or professional time. **Note:** Service Center computer time is calculated as staff cost according to **7 CFR Subtitle A.**
Cost of packaging, if applicable.	Actual cost rounded up to nearest $.50.
Mailing cost, if applicable	Actual cost.

Charging for Data (Continued)

B Calculating Costs for Providing Maps

The following are items to consider when calculating costs for providing maps.

Item	Charge
Cost of paper and ink for printer.	Estimated cost rounded up to nearest dollar.
• Staff time spent on taking request. • Staff time for modifications to data, including changes for Privacy Act purposes. • Staff time for or modifying metadata, if needed. • Staff time for preparing map. • Staff time preparing for mailing, etc.	Time rounded up to nearest ¼ hour times staff cost of either of the following: • when feasible, at the salary rate of the employee conducting the search, plus 16 percent of the employee's basic pay • where a homogeneous class of personnel is used exclusively, at the rate of $2.50 per quarter hour for clerical time and $5.00 per quarter hour for supervisory or professional time.
Computer time for transferring data.	Estimated time X average staff cost of either of the following: • when feasible, at the salary rate of the employee conducting the search, plus 16 percent of the employee's basic pay • where a homogeneous class of personnel is used exclusively, at the rate of $2.50 per quarter hour for clerical time and $5.00 per quarter hour for supervisory or professional time. **Note:** Service Center computer time is calculated as staff cost according to **7 CFR Subtitle A.**
Cost of packaging, if applicable.	Actual cost rounded up to nearest $.50.
Mailing cost, if applicable.	Actual cost.

Charging for Data (Continued)

C Charging for Releasable Data

Use the following table to determine when to charge for releasable data.

WHEN a request is made by...	THEN the data is provided...
• farm operators, owners, or other producer on the farm when requesting only those CLU's in which they have an interest •***--**other Federal or State agencies, including individuals contracted by these agencies, to perform their official duties in making FSA program determinations • certified appraisers for performing appraisals of FSA direct and guaranteed farm loans**--*** • LA's for all crop insurance	at the Service Center and is free upon request.
• farm operators, owners, or other producers on the farm when requesting CLU for the entire county • Federal, State, or local agencies to perform official duties **not** related to making FSA program determinations • all others	at APFO and is $50 per CD for certified CLU.

Note: The partner agencies have access to data through CCE.

***--Example of CLU Metadata**

The following is an example of metadata for certified CLU. The metadata is FGDC compliant. Text in bold indicated metadata that would be county specific.

CLU Metadata

Metadata:
Identification_Information:
Citation:
Citation_Information:
Originator: USDA-FSA Aerial Photography Field Office
Publication_Date: 20020521
Title: clu_a_**ia015**; Common Land Unit for **Boone County, Iowa**
Edition: Version 1
Geospatial_Data_Presentation_Form: Vector Digital Data
Series_Information:
Series_Name: Common Land Units
Issue_Identification: Version 1.0
Publication_Information:
Publication_Place: USDA-FSA Aerial Photography Field Office
Publisher: USDA-FSA Aerial Photography Field Office
Online_Linkage: none
Description:
Abstract:
The common land unit (CLU) dataset consists of digitized farm, tract, and field boundaries with associated attribute data. The USDA Farm Service Agency (FSA) defines farm fields as agricultural land that is delineated by natural and man-made boundaries such as road ways, tree lines, waterways, fence lines, etc. Field boundaries are visible features that can be identified and delineated on aerial photography and digital imagery. Tracts are defined by FSA as sets of contiguous fields under single ownership. Common land units are used to administer USDA farm commodity support and conservation programs in a GIS environment.

The CLU data set was prepared by digitizing farm tracts and fields using 1:7920 scale rectified photomaps that have been maintained by FSA in USDA Field Service Centers. Using the photomaps as a reference, tract and field boundaries were digitized on-screen with digital orthophotography using ESRI's (Environmental Systems Research Institute) ArcView GIS Product. Each of the boundaries of the CLU was digitized to a tolerance of 3 meters (approximately 10 feet) from ground features visible on the digital orthophotography.

The base ortho imagery was produced by Mosaicking digital orthophoto quarter quads (DOQQ's) into a seamless county image. The CLU's were digitized from the mosaic. The mosaic process eliminates or minimizes any offset that would normally be present between standard USGS quarter quadrangles. CLU datasets are projected in the UTM coordinate system, NAD 83. In counties that are split by two UTM zones, the CLU will be projected in the single, predominant zone.

Purpose:
This CLU data will aid County Field Service Centers in identifying and delineating farm tracts and field boundaries as they administer USDA programs for their customers.
Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: **20020521**
Currentness_Reference: Inspection Status of Common Land Unit
Status:

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***--Example of CLU Metadata (Continued)**

Progress: **Certified**
Maintenance_and_Update_Frequency: On-going, regular updates.
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate**: -94.25**
East_Bounding_Coordinate**: -93.625**
North_Bounding_Coordinate**: 42.25**
South_Bounding_Coordinate**: 41.75**
Keywords:
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Aerial photograph
Theme_Keyword: Aerial photo
Theme_Keyword: rectified
Theme_Keyword: photo maps
Theme_Keyword: CLU
Theme_Keyword: Common Land Unit
Theme_Keyword: Field Boundaries
Theme_Keyword: Farm Tracts
Theme_Keyword: Digitizing
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: USA
Place_Keyword: **Boone**
Place_Keyword: **Iowa**
Place_Keyword: FSA
Place_Keyword: Field Service Center
Place_Keyword: **BOONE CO IA FSA**
Place_Keyword: **FIPS 19015**
Place_Keyword: Aerial Photography Field Office
Place_Keyword: APFO
Place_Keyword: USDA
Place_Keyword: United State Department of Agriculture
Access_Constraints: Access to all of the attributes in this digital data set is currently limited to FSA and Agency partnerships. A limited set of attributes is available to persons and entities outside of FSA and their Agency partners.
Use_Constraints:
If digitizing, use a scale of 1:4800 or 1 inch equals 300 feet. This will maintain proper digitizing accuracy.
Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: USDA-FSA Aerial Photography Field Office
Contact_Position: CLU Distribution Administrator
Contact_Address:
Address_Type: mailing and physical
Address: 2222 West 2300 South
City: Salt Lake City
State_or_Province: Utah
Postal_Code: 84119-2020
Contact_Voice_Telephone: 801-975-3500
Contact_Electronic_Mail_Address: clu@apfo.usda.gov
Native_Data_Set_Environment: ArcView GIS 3.x
Cross_Reference:
Citation_Information:

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***--Example of CLU Metadata (Continued)**

Originator: USDA Farm Service Agency Digitizing Centers or vendors.
Publication_Date: **20020521**
Title: Common Land Unit
Geospatial_Data_Presentation_Form: Vector Digital Data
Series_Information:
Series_Name: Common Land Units
Issue_Identification: Version 1.0
Publication_Information:
Publication_Place: **Boone County, Iowa FSA office**
Publisher: **Boone County, Iowa FSA office**
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
A sampling of field boundaries was checked to insure the boundary lines fell within the 3 meter (9.8 foot) criteria. Polygon attributes were checked for accuracy against original photomaps with original boundary and attribute information during Certification process in Service Center.

All attribute data was collected and transferred from the aerial photographs that are maintained by the county FSA office to the computerized attribute table. Certain attributes were verified using quality control procedures. The CLU layer is searched for duplicate CLU numbers, duplicate tract numbers, and acreage differences between system calculated acreage and acreage from original data source.
Logical_Consistency_Report:
Polygon and chain-node topology present, no additional checks for topological consistency were performed on this data set. Attribution of the digital data set includes polygon areas that define agricultural and non-agricultural lands.
Completeness_Report:
This digital CLU data set is complete with no required elements left undigitized, as depicted on the reference material.
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
All features digitized shall be within 3 meters of their locations as depicted on a display of the digital ortho-imagery. Positional accuracy standard is applicable only to delineated tract and field boundaries that follow visible features.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: USDA Farm Service Agency Digitizing Centers or vendors
Publication_Date: **20020521**
Title: **clu_a_ia015**; Common Land Unit (CLU) **Boone, Iowa**
Geospatial_Data_Presentation_Form: Vector Digital Data
Series_Information:
Series_Name: Common Land Units
Issue_Identification: Version 1.0
Publication_Information:
Publication_Place: State Digitizing Center
Publisher: State Digitizing Center Manager
Source_Scale_Denominator: 7920
Type_of_Source_Media: 24x24 inch rectified aerial photographs
Source_Time_Period_of_Content:
Time_Period_Information:

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*--Example of CLU Metadata (Continued)

Single_Date/Time:
Calendar_Date: **2000**
Source_Currentness_Reference:
Majority Year of rectified aerial photographs
Source_Citation_Abbreviation: NAPP
Source_Contribution:
County Photomaps (rectified black and white aerial photograph enlargements) measure 24 inch by 24 inch and are produced on sturdy photographic paper with labeled tract and field boundaries delineated with colored ink.
Process_Step:
Process_Description:
The process to digitize the CLU is quite uniform. The photomaps or a scanned replica are either sent to an in-house digitizing center or an outside vendor. The photomaps are organized into a linear order. A user will then take the photomap and match up the orthophotographic mosaic with the photomap and digitize the tract and field boundaries. When the digitization is complete, the following field attributes are updated with the proper attributes data.

STATECD - State Code
COUNTYCD - County Code
FARMNBR - Farm Number
TRACTNBR - Tract Number
CLUNBR - Common Land Unit Number
CALCACRES - CLU Calculated Acreage
HELTYPECD - Highly Erodible Land Type Code
CLUCLSCD - CLU Classification Code
FSA_ACRES - FSA Official Acres
CLUID - Common Land Unit Identifier

The naming convention of the CLU shapefile according to the "Manual for Managing Geospatial Datasets in Service Centers" Version 4.0 February, 2003 is as follows:
.shp - the file that stores the feature geometry.
.shx - the file that stores the index of the feature geometry.
.dbf - the dBase file that stores the attribute information of features. When a shapefile is added as a theme to a view, this file is displayed as a feature table.

clu - Theme Name (Common Land Unit)
a - Feature Type (Area)
st - State Code (two-letter US Postal Office abbreviations).
nnn - County Codes (three-digit FIPS number).

Example: Common Land Units of Boone County, Iowa.
clu_a_ia015.shp, clu_a_ia015.shx, clu_a_ia015.dbf

When the CLU has been digitized, the file is sent to the Service Center for Certification. This is a quality control process which includes: comparing the CLU to the source documentation, verifying attribute data, and removing polygon errors. After this quality control process is completed the file is electronically sent to the Aerial Photography Field Office in Salt Lake City, Utah via File Transfer Protocol (FTP) for storage and distribution.

Source_Used_Citation_Abbreviation: NAPP
Process_Date: 20025021
Spatial_Data_Organization_Information:
Indirect_Spatial_Reference:

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*--Example of CLU Metadata (Continued)

U.S. Department of Commerce, 1987, Codes for the Identification of the States, the District of Columbia and the Outlying areas of the United States, and Associated Areas (FIPS 5-2): Washington, D.C., National Institute of Standards and Technology.
Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: GT-polygon composed of chains
Point_and_Vector_Object_Count: **11921**
Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Grid_Coordinate_System:
Grid_Coordinate_System_Name: Universal Transverse Mercator
Universal_Transverse_Mercator:
UTM_Zone_Number: **15**
Transverse_Mercator:
Scale_Factor_at_Central_Meridian: **0.999600**
Longitude_of_Central_Meridian: **105W**
Latitude_of_Projection_Origin: **0.0**
False_Easting: **500000**
False_Northing: **0.0**
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: Coordinate Pair
Coordinate_Representation:
Abscissa_Resolution: **0.0000002472808**
Ordinate_Resolution: **0.0000002472808**
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System
Semi-major_Axis: **6378137.000000**
Denominator_of_Flattening_Ratio: **298.257222**
Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: **clu_a_ia015.dbf**
Entity_Type_Definition:
The dBase file that stores the attribute information of features. When a shapefile is added as a theme to a view, this file is displayed as a feature table.

Entity_Type_Definition_Source: ESRI Online Help
Attribute:
Attribute_Label: shape
Attribute_Definition: The representation of the entity in the data.
Attribute_Definition_Source: Farm Service Agency
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: polygon
Enumerated_Domain_Value_Definition: 2-dimensional element.
Enumerated_Domain_Value_Definition_Source: ESRI GIS software
Attribute:
Attribute_Label: statecd
Attribute_Definition: Standard Code used to identify states, this is the state where the CLU is located.
The 2-character FIPS code of the State or State equivalent.

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***--Example of CLU Metadata (Continued)**

Attribute_Definition_Source: FIPS Pub 5-2
Attribute_Domain_Values:
Codeset_Domain:
Codeset_Name:
Codes for the identification of the states, the District of Columbia and the outlying areas of the United States, and associated areas, FIPS 5-2.
Codeset_Source:
U.S. Department of Commerce, National Institute of Standards and Technology
Attribute:
Attribute_Label: countycd
Attribute_Definition: Standard code used to identify physical Counties, unique only when combined with Statecd. The 3-character FIPS code of the County or County equivalent.
Attribute_Definition_Source: FIPS Pub 6-4
Attribute_Domain_Values:
Codeset_Domain:
Codeset_Name:
Codes for the Identification of Counties, FIPS Pub 6-4.
Codeset_Source:
U.S. Department of Commerce, National Institute of Standards and Technology
Attribute:
Attribute_Label: farmnbr
Attribute_Definition: Identifier attached to all land units under the control of a particular operator.
Attribute_Definition_Source: Farm Service Agency
Attribute_Domain_Values:
Unrepresentable_Domain: Range 1 - 9999999
Attribute:
Attribute_Label: tractnbr
Attribute_Definition: Identifier given to a collection of land units under the same ownership, unique to a farm number, State and County code.
Attribute_Definition_Source: Farm Service Agency
Attribute_Domain_Values:
Unrepresentable_Domain: Range 1 - 9999999
Attribute:
Attribute_Label: clunbr
Attribute_Definition: FSA assigned number to identify CLU for Agencies in a specific Service Center, assist in effective communication with the farmer and customers and provide a link to previous historical tabular data.
Attribute_Definition_Source: Farm Service Agency
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum: 0
Range_Domain_Maximum: 999
Attribute:
Attribute_Label: calcacres
Attribute_Definition: GIS system calculated acreage.
Attribute_Definition_Source: Farm Service Agency
Attribute_Domain_Values:
Unrepresentable_Domain: Numeric Field value assigned based on irregular shaped field boundary.
Attribute:
Attribute_Label: heltypecd
Attribute_Definition: Highly Erodible Land Type Designation.
Attribute_Definition_Source: Farm Service Agency (6-CP)

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***--Example of CLU Metadata (Continued)**

```
        Attribute_Domain_Values:
         Enumerated_Domain:
          Enumerated_Domain_Value: E
          Enumerated_Domain_Value_Definition: Exempt
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: Y
          Enumerated_Domain_Value_Definition: Highly Erodible
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
       Attribute:
        Attribute_Label: cluclscd
        Attribute_Definition: Primary classification of land unit type.
        Attribute_Definition_Source:
         FSA Handbook 8-CM, revision 1
        Attribute_Domain_Values:
         Enumerated_Domain:
          Enumerated_Domain_Value: 0
          Enumerated_Domain_Value_Definition: None
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: 1
          Enumerated_Domain_Value_Definition: Urban CLU
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: 2
          Enumerated_Domain_Value_Definition: Cropland CLU
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: 4
          Enumerated_Domain_Value_Definition: Forest CLU
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: 5
          Enumerated_Domain_Value_Definition: Water Body CLU
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: 6
          Enumerated_Domain_Value_Definition: Barren Land CLU
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: 7
          Enumerated_Domain_Value_Definition: Tundra CLU
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: 8
          Enumerated_Domain_Value_Definition: Range Land CLU
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: 9
          Enumerated_Domain_Value_Definition: Mined Land CLU
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
         Enumerated_Domain:
          Enumerated_Domain_Value: 10
          Enumerated_Domain_Value_Definition: Other Agricultural CLU
          Enumerated_Domain_Value_Definition_Source: Farm Service Agency
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```

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*--Example of CLU Metadata (Continued)

Attribute:
Attribute_Label: fsa_acres
Attribute_Definition: Recorded FSA Acreage (from County Office producer records)
Attribute_Definition_Source: Farm Service Agency
Attribute_Domain_Values:
Unrepresentable_Domain: Numeric Field
Attribute:
Attribute_Label: cluid
Attribute_Definition: Each CLU defined in the GIS database will be automatically identified and tracked, for national purposes, with an ID number assigned by the automated system, This GUID (global unique identifier) is not visible to the user, will be unique to the Nation and will never be reused.
Attribute_Definition_Source: Farm Service Agency
Attribute_Domain_Values:
Unrepresentable_Domain: Mixed Character Field/Numeric Field
Attribute:
Attribute_Label: comments
Attribute_Definition: For County Office Corrections.
Attribute_Definition_Source: Farm Service Agency
Attribute_Domain_Values:
Unrepresentable_Domain: Character Field
Overview_Description:
Entity_and_Attribute_Overview:

SCIMS Name	GIS Name	Type	Length	Precision	Scale
State_Code	STATECD	String	2	0	0
County_Code	COUNTYCD	String	3	0	0
Farm_Number	FARMNBR	Long	7	7	0
Tract_Number	TRACTNBR	Long	7	7	0
Common_Land_Unit_Number	CLUNBR	Long	7	7	0
CLU_Calculated_Acreage	CALCACRES	Float	8	7	2
Highly_Erodible_Land_ Type_Code	HELTYPECD	String	1	0	0
Common_Land_Unit_ Classification_Code	CLUCLSCD	String	2	2	0
FSA_Official_Acres	FSA_ACRES	Float	8	7	2
Common_Land_Unit_ Identifier	CLUID	String	36	0	0
Unknown	COMMENTS	String	80	0	0

Entity_and_Attribute_Detail_Citation:
FSA Handbook 8-CM, revision 1, Common Land Unit Instruction
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Anita Jo Stevens
Contact_Organization: USDA-FSA Aerial Photography Field Office
Contact_Address:
Address_Type: mailing address
Address: 2222 West 2300 South
City: Salt Lake City
State_or_Province: Utah
Postal_Code: 84119-2020
Contact_Voice_Telephone: 801-975-3500

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***--Example of CLU Metadata (Continued)**

```
      Contact_Facsimile_Telephone: 801-975-3529
      Contact_Electronic_Mail_Address: clu@apfo.usda.gov
    Distribution_Liability:
     In no event shall the creators, custodians, or distributors of this information be liable for any
damages arising out of its use (or the inability to use it).
  Metadata_Reference_Information:
    Metadata_Date: 20020521
    Metadata_Contact:
     Contact_Information:
      Contact_Person_Primary:
       Contact_Person: David Davis
       Contact_Organization: USDA-FSA Aerial Photography Field Office
      Contact_Address:
       Address_Type: mailing address
       Address: 2222 West 2300 South
       City: Salt Lake City
       State_or_Province: Utah
       Postal_Code: 84119-2020
      Contact_Voice_Telephone: 801-975-3500
      Contact_Electronic_Mail_Address: clu@apfo.usda.gov
    Metadata_Standard_Name: FGDC Content Standards for Digital
                  Geospatial Metadata
    Metadata_Standard_Version: FGDC-STD-001-1998
    Metadata_Security_Information:
     Metadata_Security_Classification_System: None
     Metadata_Security_Classification: Unclassified
     Metadata_Security_Handling_Description: None

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