
chapter five

Farm Assessment and Inventory

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Farm Inventory

The first step to writing a plan is to collect information about the operation for which the plan is going to be developed. The three basic methods for initiating information collection are:

- Producer/Operator interview,
- Visual inspection and
- Utilization of aerial photographs or farm sketches that delineate field boundaries so that a field identification scheme can be developed or adopted.

Usually all three steps can be initiated simultaneously with an initial farm visit. An initial “sit down” visit with the producers and operators is usually the most constructive first step as they will have much of the initial information that you will need including:

- Farm Contact information
- Producer’s purpose and/or regulatory requirements
- Site/Operation inventory
- Animal and crop production
- Current Waste Management procedures
- Environmental Objectives of Operation
- Production Goals of Operation

To help facilitate the gathering of this information the Farm Inventory form (Appendix D) can be used as a basis for conducting an interview with the producers. You can either ask the questions or leave the form with the producer to fill out.

Farm Contact information includes:

- Farm name and Producer/Operator name
- Farm address and driving directions to operation
- Any permit and registration numbers
- Poultry Registration number
- Farm phone and Producer/Operator phone numbers

This information goes onto Section 1 of the plan.



You will need to know why the producer is obtaining a plan and what legal requirements that the plan is fulfilling. Questions and information such as the following will be needed:

1. Is it located in Nutrient Surplus Area?
2. Is it for compliance with State Regulation 5?
3. Is it for compliance with State Act 1060?
4. Is it for compliance with Federal AFO/CAFO?
5. Is it to qualify for Federal Conservation Incentive Programs?
6. Is it voluntary?

Answers to these questions should be included in Section 3 of the plan.

Site and operation information includes:

- Land information – should include the size of the farm, the nature of ownership (i.e., owned or leased), the size of fields with the respective land use, and the number of acres that are included in permits.
- Animal production structures – should include the type (i.e., poultry houses, swine houses, milking parlors, etc.), number and capacity of facilities, and other structures such as barns, manure or litter storage units, etc.

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- Water and geographical features – the location of ponds, streams, drainage patterns, wells, wetlands, springs, etc. and geographical features such as sinkholes, caves, and rock outcroppings, etc.
- Critical land areas – should include location of heavy-use areas, eroded sites, extreme slopes, areas void of vegetation, and areas of extreme compaction.
- Wildlife habitat – should include wooded or forested areas, unique wildlife areas, endangered species habitat, etc. that are located on the farm.
- Adjacent land – should include information about residential locations, roads, public lands and waters, or other sensitive features.

Animal information such as the number of chickens grown yearly will be needed for planning purposes. Animal information should include details such as the type of animal (for example for poultry: broilers, laying hens, turkeys, etc.), and target production weight per animal.

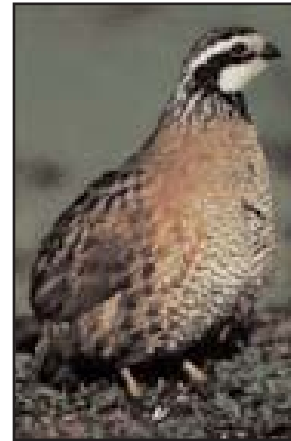
Crop information should include the type of crop, typical yield derived from farm records, yield goals, and management information. For example, if the land is in pasture, is it used for grazing, haying, or both.

Manure and dead animal management information should include the type of manure management system (wet or dry), land application method (spreader truck, irrigation method, etc.), and storage options (stacking sheds, lagoons, underground tanks, etc.). Dead animal disposal methods (freezing, incineration, etc.) should also be documented.

All of the information discussed above can be collected with the questionnaire form in Appendix D and should be placed in Section 1 or 3 as specified.

Environmental objectives of the operation should be defined by the operator and clearly stated in Section 1 of the plan. Some examples of objectives include:

- To meet the environmental requirements of state and federal agencies for the production of swine, poultry, and cattle on the farm.
- To protect ground and surface water quality, soils, and public health from impairment as a result of land-applying swine and poultry manure and organic by-products.
- To implement conservation practices and management activities to ensure that minimal soil erosion, increased grass production and environmental objectives are achieved.
- To maintain and improve the economic return for the swine, poultry and cattle operation and production of grass for hay and grazing.
- To apply nutrients (swine manure, wastewater, poultry litter, and commercial fertilizer) to obtain maximum nutrient benefit for grass production while minimizing nutrient losses due to leaching, runoff, denitrification, and volatilization.
- To maintain sufficient storage to facilitate optimum utilization of nutrients in manure and organic by-products.
- To maintain and improve wildlife habitat on the farm.
- To minimize impacts of odors from application areas and production sites.



Farm Sketches and Aerial Photographs for Field Boundary Delineation and Field Identification Scheme

In many cases, the producer will have either a farm sketch or an aerial photograph that visually indicates the lay-out of the field boundaries on the farm. It is extremely important that you adopt a field designation scheme that is agreeable between you and the farmer. If necessary, make a cross reference table linking field designation schemes to avoid miscommunication. It will be necessary to gather new aerial photographs to use in the planning process.

Aerial Photographs and Maps

A product necessary for a NMP is aerial photographs and maps that delineate resource concerns, soil test P, water features, and management information. Aerial photographs can serve as an effective “base-map” on which other information mentioned above can be overlain on top. Maps that depict data such as soil test P levels are known as thematic maps. Thematic maps can provide a quick visual inventory of the operation and its land resource base, especially if it is overlain on an aerial photograph.

Aerial photographs can be either in hard copy (paper or mylar) or digital. Hard copy photographs can be used in manual construction of thematic farm maps while digital ortho (corrected) photographs can be used in computer software programs to create thematic farm maps. The advantage of manual construction of thematic maps is that it doesn't require computers and geographic software; only hard copies of aerial photographs, colored pencils, and a ruler. The advantage of computer generated thematic maps is that they can be easily updated without having to reconstruct the theme and they are generally more accurate in terms of scale.

Hard copy aerial photographs can be obtained from:

- FSA
- NRCS
- the Producer

Digital aerial photographs can be obtained from:

- NRCS
- Arkansas' GEOSTOR internet site
- USGS internet site
- Other internet sources

If thematic maps are going to be constructed with geographic software, then ortho-corrected photographs should be used.



On-Farm Data Collection

Data specific to the individual operation will need to be collected for the purposes of the plan. This includes soil test information for each field, manure sampling, and ground cover information for each field.

Soil Sampling and Testing

The University of Arkansas offers free soil testing services for Arkansas residents. Soil samples can be submitted through a county Extension office. Lab results and recommendations are mailed to the user. Proper sampling is critical to ensure results that accurately characterize the plant-available nutrient status of the soil being tested.

Soil testing is the most reliable method for estimating amounts of soil nutrients that are readily available for plant growth. Soil test procedures use chemicals to extract nutrients from soil samples. Different extractants vary in their ability to remove nutrients and will produce different soil test results. Soil test results from different labs cannot be compared unless the same extraction method and identical analytical procedures are used. One should also note that fertilizer recommendations can vary from lab to lab.

Extractants do not perfectly mimic the plant's ability to remove nutrients from the soil. To overcome this, soil-test results are correlated to crop yield through field research. Fertilizer recommendations are subsequently developed based on crop response.

The University of Arkansas Soil Test Lab uses the Mehlich 3 universal extractant and a quality assurance program to ensure that errors due to laboratory analysis are minimized. A check sample is analyzed every 12 samples to detect equipment error. Even if an error is not detected, the equipment is automatically recalibrated before each batch of 96 samples.

Recommendations for Collecting Soil Samples

The first step in soil testing is to collect a representative sample from a defined sampling area. **Sampling procedures can influence the accuracy of results more than any other step of soil testing.** The objective is to obtain a small sample of soil that accurately describes the entire area that it represents. This can be difficult due to the fact that soil nutrient levels can vary across a given area. Variability naturally occurs but can be increased by agricultural practices, such as grazing, fertilizing, liming and the land application of animal wastes.

Soil sampling recommendations can vary from state to state and from lab to lab. It is imperative to use the proper sampling scheme as set forth by the respective lab or testing program. To obtain an accurate sample in Arkansas, follow the recommendations in Table 5-1. The logic behind these recommendations is explained in the following sections.

Table 5-1. Recommendations for Collecting Soil Samples From Pastures Amended with Animal Manures

1. Determine representative sampling areas that are uniform in soil and previous management history. Individual pastures make good representative areas if the above uniformity conditions are reasonably met.
2. If a representative area has been determined, proceed to Step 3. If a representative area has not been determined, refer to the section entitled “Defining Multiple Sampling Areas Within Pastures.”
3. Use a random zigzag pattern (Figure 5-1) to collect 15 to 20 individual 4-inch deep subsamples for an area up to 20 acres. Avoid locations such as livestock feeding and loafing areas if these areas comprise less than 10 percent of the total sampling area. If using a shovel, avoid a wedge-shaped soil sample volume (Figure 5-2).
4. Combine individual subsamples in a clean plastic bucket and mix thoroughly to form a composite sample that represents the entire area. Remove enough of the sample to completely fill the soil sample box (about a pint). Remove any plant debris and rocks before placing in box.
5. Repeat steps 3 and 4 for a given sampling area at least every three years during the same time of year.

Defining a Sampling Area

To reduce variability, a sampling area should be chosen that is relatively uniform in soil and management properties. Select and separate fenced areas, hillsides, creek bottoms or other well-defined features for accurate and representative soil sampling.

Individual pastures should be further subdivided if more than one soil series or texture exists or the pasture has been managed differently on greater than 25 percent of the area. Differences in soil types can be detected by either using the N-R-C-S county soil survey report or by delineating observed differences in soil properties, such as color, texture and slope.

If differences in management or soil properties are known or suspected to exist, then refer to the section entitled “Defining Multiple Sampling Areas Within a Pasture” for instructions on how to further subdivide the area.

Sampling Pattern

The zigzag pattern (Figure 5-1) was chosen because it provides the most representative sample with the fewest number of individual subsamples. For example, the average STP of all individual samples in Figure 5-1 is 265 pounds per acre compared to 257 pounds per acre for the zigzag pattern. It is the most widely recommended sampling pattern.

Other zigzag patterns may produce different results, but generally these differences are not large enough to affect the resulting recommendation. However, any sampling pattern can include individual locations with high or low soil test values. These can bias a sample, particularly if only a few locations are sampled.

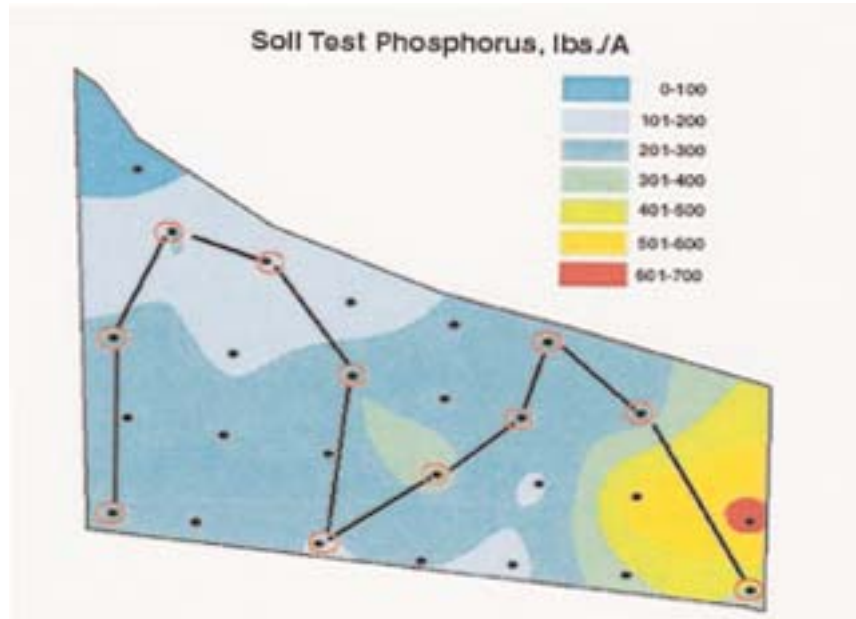
Adjusting for Extreme High or Low Values

Individual samples from each grid location in Figure 5-1 were analyzed separately so that the distribution of STP levels across the pasture could be shown on a map. Soil test results reflect how the pasture has been managed over years of use. The area greater than 500 pounds per acre STP next to the eastern boundary is where cattle had been fed for many years because it was the only dry location during most winters. The area less than 100 pounds STP per acre in the extreme northwest corner is usually too wet for the litter spreader truck and had not received as much litter as other parts of the field.

Both of these areas represent less than 5 percent of the field. However, because their STP results represent extreme high or low values as compared to the rest of the pasture, subsamples collected from these areas can influence the STP value that represents the entire sampling area.

For example, including subsamples from locations within the area greater than 500 pounds STP per

Figure 5-1. Soil phosphorus map for a 6-acre pasture developed from 26 separate samples taken at grid points (*). The black line indicates zig-zag pattern where grid points encircled in red were composited into one sample to represent the entire field.



acre results in a value of 306 pounds STP per acre while the same zigzag pattern that excludes these values results in a value of 244 pounds STP per acre. Although this difference is relatively small, inclusion of the high areas resulted in an STP value that exceeds a potential threshold of 300 pounds per acre.

Exclude known livestock feeding or loafing areas near gates from the zigzag pattern if this area represents less than 10 percent of the total sampling area. When areas like this are sampled accidentally in a zigzag pattern, they can bias the results toward the extreme value.

Following recommendations regarding the number of samples reduces the influence of any one sample location with high or low values. As the number of individual subsamples decreases, the more severely an extreme high or low value will bias the result if included in the sampling pattern.

Defining Multiple Sampling Areas Within a Pasture

Although a zigzag pattern generally produces a representative sample, it does not identify differences in soil test results within a sampling area. If you

suspect that an area of pasture has higher or lower STP values compared to the remainder of the pasture, it may be best to sample it separately. Use grid soil sampling where separate samples from each grid point are collected and tested separately (Figure 5-1). It is necessary to do grid sampling only once to show obvious differences that help subdivide the field into more uniform sampling areas. Apply the zigzag pattern separately to each newly defined sampling area.

Sample Depth and Size

The depth of sampling can significantly affect soil test results. Nutrients are generally stratified in soils that are not tilled annually and have low to medium soil nutrient levels with the highest soil nutrients occurring near the soil surface and decreasing with soil depth (Figure 5-2). The University of Arkansas now bases its pasture and forage production fertilizer and lime recommendations on soil samples collected from the 0- to 4-inch soil depth. The 4-inch soil depth represents a large portion of the active root zone for forages and most accurately depicts surface soil pH on soils that are seldom tilled. This depth refers to the mineral portion of the soil. Remove all surface debris such as thatch and other plant material from

the soil surface before inserting the soil probe to collect the sample. Surface soil samples should be collected once every two to four years to monitor soil nutrients for accumulation or depletion, unless specified otherwise by nutrient management plans or crop production recommendations.

Occasionally, once every 6 to 8 years for established forages or when pastures will be renovated, soil samples should also be collected from the 0- to 4-inch plus the 4- to 8- or 10-inch depth to monitor subsoil pH and nutrient concentrations.

The previous recommendation for soil sample depth (0- to 6-inch depth) was changed for a number of reasons including monitoring of soil pH and ease of sampling in rocky soils. For some soils, the STP may be slightly greater in a soil sample taken from the 0- to 4-inch depth compared with the 0- to 6-inch depth. Research has shown that when STP is relatively high, soil sample depth will have little influence on STP. Phosphorus applied to the soil surface tends to be adsorbed by soil particles at the surface. However, when the adsorption sites become saturated with phosphorus, the phosphorus will move deeper into the soil profile until unoccupied adsorption sites are encountered. It should be noted that phosphorus adsorption capacities vary with different soil textures. For example, sandy-textured soils adsorb much less phosphorus as clayey soils.

The tool used to collect a soil sample can also affect soil-test results if a uniform volume of soil is not collected. A cylindrical soil sampling tube collects a uniform volume of soil with depth and helps control the depth of sampling. The use of a shovel can create a wedge-shaped sample (Figure 5-2) that can bias the soil-test results. In soils with stratified P levels, wedge-shaped samples taken with a shovel had P levels closer to the two-inch sample than the full

6-inch sample (Figure 5-2). Soil sample probes can be purchased from a number of different suppliers for a reasonable price. Although a number of common tools can be used to collect soil samples, soil probes made of stainless steel (to minimize contamination) are highly recommended. Auger type soil samplers may facilitate collection of more uniform soil samples in rocky soils.

Sample Time

The time of year that a sample is taken affects the mobile nutrients (nitrate and sulfate) more than the less mobile nutrients (P and K). However, results can vary with seasons in row crop situations. Less is known about seasonal variability in pastures. To reduce seasonal differences, samples should be taken from the same sampling area during the same time of year at least every two to three years.

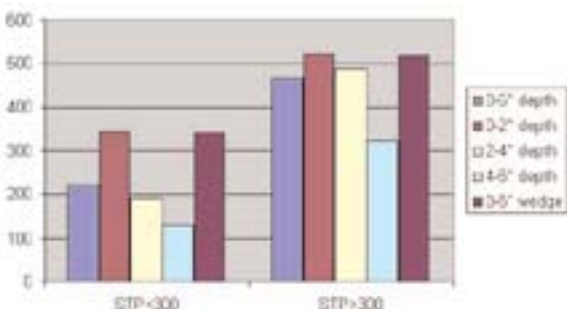
Other factors related to time of year such as weather and rainfall can affect how easy it is to collect samples. In rainy periods, soils can be water-logged and difficult to sample while during summer months, soils can be hard to sample to 6 inches due to dry conditions.

Frequency of soil sampling is dependent on the goals of the land owner as well as regulations. The University of Arkansas Cooperative Extension Service recommends soil samples be taken a minimum of once every three years. For more precise and intensive management, samples should be taken every year. The minimum sampling frequency required by new regulations is once every five years in nutrient surplus areas.

Submitting Soil Samples

Once soil samples are collected, they should be taken to the local county Extension office. A soil test information form (Appendix E) must be filled out with field specific information such as field ID, acreage, yield goals, as well as land owner information. Soil sample analysis is a free service offered by the University of Arkansas Cooperative Extension Service. Once samples are analyzed, copies of the soil report will be filed at the Extension office and sent to the land owner, and plan writer. The fertilizer application recommendations are based on the plant available nutrients found in the soil as well as the specified yield goals. Therefore, it is important to set yield goals that are realistic to the field's capabilities. Useful tools for determining the yield capacity of a field are the soil survey, past yield records for the field, and the local county Extension agent.

Figure 5.2. The effect of sampling depth on soil phosphorus values.



Litter Sampling

The goal of litter sampling is to obtain a representative sample of the plant nutrients that will be applied to pastures. There are usually only two types of litter storage: in house storage (litter that is land applied to pastures directly from the poultry house) and intermediate storage (litter that is stacked and stored until land applied or transported off farm). Each of these storage types follows the same sampling principles but sampling details differ.

When sampling inside a poultry house, 15 to 20 sub-samples will be collected to make a composite sample. The sub-samples should be collected in a zigzag pattern down the length of the house (Figure 5-3). Sub-samples can be collected using a soil probe if litter has high moisture content or a spade if litter is dry. Sample shape should be cylindrical (even diameter from top to bottom) and go the depth of the litter. Be careful not to include any floor pad material in sample. Sample size will be dependent on sampling tool used and diameter size needed to collect a proper sample shape. Once all of the sub-samples are collected, they should be mixed as thoroughly as possible to make a composite sample. When several houses are being sampled, a composite sample should be made for each house individually, then the samples from each house should be combined and mixed thoroughly to obtain a final composite sample for all the houses.

Like litter samples collected from the house, stacks or piles are done by sub-sampling. The number of sub-samples collected depends on the size of the litter stack. Enough samples should be collected to create a representative sample when composited. Scattered samples should be collected at different locations around the stack as well as different depths (Figure 5-4). Grab samples can be taken by hand using long exam gloves or by using a scoop attached to a rod. If using the scoop, push the scoop upside down into the stack to the desired depth and then rotate the scoop to the upright position to collect the sample and withdraw the scoop from the stack. Collect all of the sub-samples in a container and mix thoroughly and composite into one sample.

Figure 5-4. Litter sampling pattern for stacked litter grab sampling.

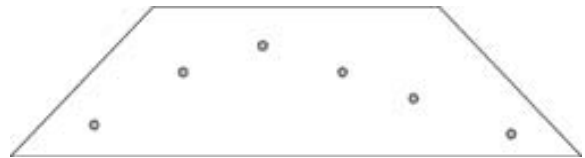
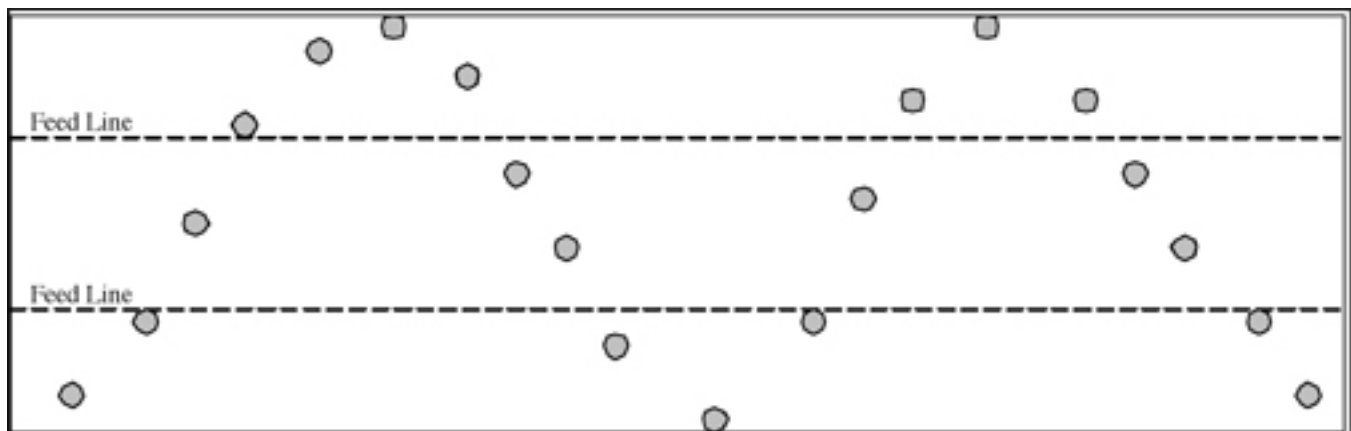


Figure 5-3. Litter sampling pattern for in-house core samples.



Soils and Natural Resource Inventory

Once field boundaries have been ascertained and a field identification scheme has been established with the producer, one should consult the following to obtain previously established information about the soils resources on the farm:

- County Soil Survey
- NRCS' electronic Field Office Technical Guide or, eFOTG (http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=AR)
- RUSLE Handbook for Arkansas

County soil surveys were constructed and published by NRCS and can be obtained locally at the local USDA Farm Service Center or the local Conservation District office. Soil surveys contain the following:

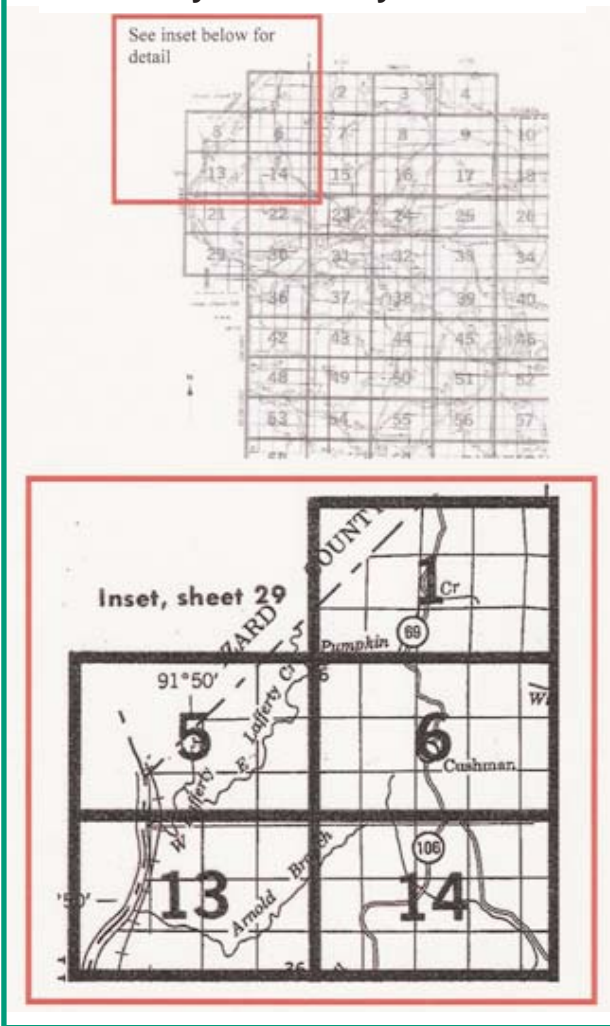
- Description of Soil Series and Soil Associations
- Tables that describe different properties of the soil series
- Maps depicting soils series for a given slope class (mapping unit) boundaries overlain on aerial photographs

To determine the soil series that are located within a field, you will need to utilize the County Soil Survey in the following manner:

1. Use a road map to get a "general" feel where the farm and fields are relative to landmarks such as roads and water features.
2. Use the Index to map sheets (Figure 5-5) to locate the general proximity of the farm on the index to maps sheet. Note the map number from the index (Note: you may have to go through this process a couple of times to find the right map number especially if the property is close to a map index boundary.)



Figure 5-5. The map index sheet of the County Soil Survey



3. Go to the corresponding map sheet (Figure 5-6; aerial photograph overlain with soil series boundaries, water and cultural features, etc.) and look for landmark features that help identify the property of interest.

(Note: if you cannot find your property of interest, then return to the index to maps sheet and repeat for another sheet in close proximity.) Note the date that the aerial photograph was taken in order to better define landmarks that you are looking for.

4. Once you find your property of interest, copy the sheet or sheets needed to delineate the property. Outline the property and field boundaries. For

Figure 5-6. Aerial photograph overlain with soil mapping units.



each field, determine the soil mapping unit number or three letter description (Figure 5-6) that is overlain on the field boundary. If the field has more than one mapping unit, make note of all mapping units, and decide which one is predominant based on land area relative to other mapping unit or units.

5. Go back to the index to map sheets and turn to the page to the back of the index sheet and find the soil mapping unit key. A mapping unit consists of two pieces of information: the soil series name and the slope class. If a mapping unit is designated by a number, then soil series with differing slope classes will have different numbers. If a mapping unit is designated by three letters, then the first two letters are an abbreviation of the soil series name while the third letter designates the slope class as either:

- A 0-1% slope
- B 1-3% slope
- C 3-8% slope
- D 8-15% slope

6. Once the predominant soil series and slope class are determined for each field, then find the soil series description. From the soils series description, develop a brief description of soil properties such as flooding, depth, drainage, slope, landscape position, soil fertility - general, permeability, etc.

Once the soil series are determined, there will be certain information that you will need to collect from tables in the survey.

Soils data needed in planning can also be found online at the State of Arkansas NRCS homepage at <http://www.ar.nrcs.usda.gov/>. To access the data complete the following steps:

- Select the gray “Technical Resources” box at the top of the webpage by pointing and clicking with your mouse.
- From the drop down list of blue items in the center of the screen, select the Arkansas eFOTG (electronic Field Office Technical Guide) by pointing and clicking with your mouse.
- Use the map on this page to select the county where the plan is being written by using the mouse to point and click on the desired county on the map.

