Soil Survey
of
Glen Canyon
Glen Canyon National Recreation Area, Arizona

By

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in cooperation with

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Glen Canyon, Glen Canyon National Recreation Area, Arizona

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How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. The soil scientist observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of native plants growing on the soils; and the kinds of bedrock. He studied the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, the soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape. Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

The soil scientist recorded the characteristics of the soil profiles that he studied. He noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientist classified and named the soils in the

survey area, he compared the individual soils with similar soils in the same taxonomic class in other areas so that he could confirm data and assemble additional data based on experience and research.

While the soil survey was in progress, samples of some of the soils in the area were collected for laboratory analyses. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After the soil scientist located and identified the significant natural bodies of soil in the survey area, he drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately. Acerage extent and percent of survey area for each map unit are given in Table 1.

Data used to estimate soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages. Soil properties are determined by field examination of the soils and by some laboratory testing. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the field to determine texture, soil reaction, and other characteristics. Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. It is important to emphasize that many of the soil properties in the tables are estimated and not actually measured. Many of the estimates of properties are based on texture as determined in the field by the soil scientist. These estimates are useful guides in approximating soil behavior but should not be relied upon as an absolute value.

Engineering Index Properties

Table 2. gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. Information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. ""Loam,'' for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, ""gravelly.''

Soils are also classified according to the Unified soil classification system and the system adopted by the American Association of State Highway and Transportation Officials . The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter, and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 3. shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. Some of the estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil

texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils in other areas. The classes are low, a change of less than 3 percent; moderate, 3 to 6 percent; and high, more than 6 percent. If the shrink-swell potential is rated moderate to high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur

without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1.Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are very highly erodible, and vegetation is difficult to establish.

2.Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are highly erodible. Vegetation can be grown if intensive measures to control wind erosion are used.

3.Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are moderately highly erodible. Vegetation can be grown if intensive measures to control wind erosion are used.

4L.Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are moderately erodible. Vegetation can be grown if intensive measures to control wind erosion are used.

4.Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Vegetation can be grown if measures to control wind erosion are used.

5.Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Vegetation can be grown if measures to control wind erosion are used.

6.Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are slightly erodible. Vegetation can be grown if ordinary measures to control wind erosion are used.

7.Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are slightly erodible. Vegetation can be grown if ordinary measures to control wind erosion are used.

8.Soils that are very slightly subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 3, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for plants.

Soil and Water Features

Table 4. gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. None means that flooding is not probable; rare that it is unlikely but possible under unusual weather conditions; occasional that it occurs, on the average, once or less in 2 years; and frequent that it occurs, on the average, more than once in 2 years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days,

and long if more than 7 days. Probable dates are expressed in months.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as low, moderate, or high, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as low, moderate, or high. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 5. shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in "sol". An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (Aqu, meaning water, plus ent, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (Hapl, meaning minimal horizonation, plus aquent, the suborder of the Entisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral

content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series. A series family such as "Anthony family" consists of soils that are similar to the Anthony series but may have some characteristics that are outside of the specified range in characteristics for that series.

Soil Series Families and Their Morphology

In this section, each soil series family recognized in the survey area is described. The descriptions are arranged in alphabetic order. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series family in the survey area is described.

Anthony family

Depth class: very deep
Drainage class: well drained
Permeability: moderate
Landform: stream terraces
Parent material: mixed sandy alluvium
Slope range: 0 to 2 percent
Elevation: 3200 to 3500 feet
Mean annual precipitation: 8 to 10 inches
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days
Classification: Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents

Typical pedon

In an area of Anthony family very fine sandy loam, 0 to 2 percent slopes, about 3 miles southwest of Page by Nine Mile Draw; 3125 feet east and 1125 feet south of the northeast corner of section 10, T. 40 N., R. 8 E.; 36 degrees, 53 minutes, 10 seconds north latitude and 11 degrees, 32 minutes, 1 second west longitude; sample 24-1-(1-5).

A=0 to 4 inches; light brownish gray (10YR 6/2) very fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine interstitial pores; strongly effervescent; strongly alkaline (pH 8.6); clear wavy boundary.

C1=4 to 16 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 4/3) moist, weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine interstitial pores; violently effervescent; strongly alkaline (pH 8.6); clear wavy boundary.

C2=16 to 33 inches; light brownish gray (10YR 6/2) sandy loam, dark yellowish brown (10YR 3/4) moist; strong fine and medium subangular blocky structure; hard, very friable, slightly sticky and nonplastic; common very fine through medium roots; common fine tubular and interstitial pores; violently effervescent; strongly alkaline (pH 8.6); clear wavy boundary.

C3=33 to 47 inches; brown (10YR 5/3) fine sand, dark yellowish brown (10YR 3/4) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots; common fine interstitial pores; strongly effervescent; strongly alkaline (pH 8.6); clear wavy boundary.

Anthony family

C4=47 to 60 inches; light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; strongly effervescent; strongly alkaline (pH 8.6); clear smooth boundary.

Arizo family

Depth class: very deep
Drainage class: somewhat excessively drained
Permeability: very rapid
Landform: debris fans, alluvial fans, and washes
Parent material: sandstone colluvium and alluvium
Slope range: 2 to 120 percent
Elevation: 3200 to 3500 feet
Mean annual precipitation: 8 to 10 inches
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days
Classification: Sandy-skeletal, mixed, thermic Typic Torriorthents

Typical pedon

In an area of Arizo family extremely stony sand, 45 to 120 percent slopes, about 1 mile west of Page; 2438 feet west and 1500 feet north of the southeast corner of section 25, T. 21 N., R 8 E; 36 degrees, 55 minutes, 5 seconds north latitude and 111 degrees, 28 minutes, 40 seconds west longitude; sample 33-2-(1-4).

A=0 to 1 inch; reddish brown (5YR 5/4) extremely stony sand, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine roots; common fine tubular pores; 40 percent gravel, 70 percent cobble, 40 percent stones; noneffervescent; moderately alkaline (pH 8.0); clear wavy boundary.

C1=1 to 18 inches; yellowish red (5YR 5/6) extremely gravelly sand, yellowish red (5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; common fine roots; few fine tubular and common fine interstitial pores; 60 percent gravel, 10 percent cobble, 5 percent stones; noneffervescent; moderately alkaline (pH 8.0); clear wavy boundary.

C2=18 to 30 inches; reddish brown (5YR 5/4) extremely gravelly sand, yellowish red (5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine and few coarse roots; common very fine interstitial pores; 60 percent gravel, 10 percent cobble, 5 percent stones; noneffervescent; moderately alkaline (pH 8.0); clear wavy boundary.

C3=30 to 60 inches; yellowish red (5YR 5/6) extremely gravelly sand, yellowish red (5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; few fine roots, common very fine interstitial pores; 60 percent gravel, 10 percent cobble, 5 percent stones; noneffervescent; moderately alkaline (pH 8.0).

Brazito family

Depth class: very deep
Drainage class: well drained
Permeability: rapid
Landform: stream terraces
Parent material: mixed sandy alluvium
Slope range: 0 to 2 percent
Elevation: 3200 to 3500 feet
Mean annual precipitation: 8 to 10 inches
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days
Classification: Mixed, thermic Typic Torripsamments

Typical pedon

In an area of Brazito fine sand, 0 to 2 percent slopes, about 3 miles southwest of Page by Nine Mile Draw; 4375 feet west and 1125 feet south of the northeast corner of section 10, T. 40 N., R. 8 E.; 36 degrees, 53 minutes, 10 seconds north latitude and 111 degrees, 32 minutes, 5 seconds west longitude; sample 24-2-(1-5).

A=0 to 4 inches; light yellowish brown (10YR 6/4) fine sand, brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine interstitial pores; strongly effervescent; moderately alkaline (pH 8.0); clear wavy boundary.

C1=4 to 16 inches; pale brown (10YR 6/3) fine sand, yellowish brown (10YR 5/4) moist, weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine interstitial pores; strongly effervescent; moderately alkaline (pH 8.0); gradual wavy boundary.

C2=16 to 38 inches; light yellowish brown (10YR 6/4) fine sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; many very fine through medium roots; many very fine interstitial pores; strongly effervescent; moderately alkaline (pH 8.0); gradual wavy boundary.

C3=38 to 50 inches; light brownish gray (10YR 6/2) very fine sand, brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine roots; many very fine interstitial pores; strongly effervescent; moderately alkaline (pH 8.0); gradual wavy boundary.

C4=50 to 60 inches; pale brown (10YR 6/3) fine sand, brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; strongly effervescent; moderately alkaline (pH 8.0).

Cowan family

Depth class: very deep
Drainage class: somewhat excessively drained
Permeability: rapid
Landform: stream terraces
Parent material: mixed sandy alluvium
Slope range: 0 to 2 percent
Elevation: 3200 to 3500 feet
Mean annual precipitation: 8 to 10 inches
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days
Classification: Sandy, mixed, thermic Typic Torrifluvents

Typical pedon

In an area of Cowan family loamy sand, 0 to 2 percent slopes, about 2 miles southeast of Lees Ferry across from Water Holes Canyon; 36 degrees, 50 minutes, 45 seconds north latitude and 111 degrees, 33 minutes, 2 seconds west longitude; sample 9-1-(1-6).

A=0 to 4 inches; light brown (7.5YR 6/4) loamy sand, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine interstitial pores; strongly effervescent; strongly alkaline (pH 8.6); clear smooth boundary.

C1=4 to 19 inches; pink (7.5YR 6/4) loamy sand, brown (7.5YR 4/4) moist, weak fine and medium subangular blocky structures; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine interstitial pores; strongly effervescent; strongly alkaline (pH 8.6); clear wavy boundary.

C2=19 to 31 inches; light reddish brown (5YR 6/3) loamy sand, reddish brown (5YR 4/4) moist; single grain; loose, nonsticky and nonplastic; many very fine through medium roots; many very fine interstitial pores; violently effervescent; strongly alkaline (pH 8.6); clear wavy boundary.

C3=31 to 48 inches; reddish brown (5YR 5/4) loamy sand, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine roots; many very fine interstitial pores; few fine lime filaments; violently effervescent; strongly alkaline (pH 8.6); clear smooth boundary.

Cowan family

C4=48 to 56 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few fine tubular pores; common fine lime filaments; violently effervescent; strongly alkaline (pH 8.8); clear smooth boundary.

C5=56 to 60 inches; reddish brown (5YR 5/4) fine sand, reddish brown (5YR 4/4) moist; single grain; loose, nonsticky and nonplastic; many very fine interstitial pores; slightly effervescent; strongly alkaline (pH 8.8).

Gila family

Depth class: very deep
Drainage class: moderately well to very poorly drained
Permeability: moderate
Landform: stream terraces, return channels, and flood plains
Parent material: mixed alluvium
Slope range: 0 to 2 percent
Elevation: 3200 to 3500 feet
Mean annual precipitation: 8 to 10 inches
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days
Classification: Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents

Typical pedon

In an area of Gila family lomay fine sand, 0 to 2 percent slopes, about 2 miles northeast of Lees Ferry by Death Pockets; 4875 feet south and 1250 east of the northwest corner of section 8, T. 40 N., R. 8 E.; 36 degrees, 52 minutes, 34 seconds north latitude and 111 degrees, 33 minutes, 55 seconds west longitude; sample 15-1-(1-6).

A=0 to 4 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots; few fine tubular pores; slightly effervescent; moderately alkaline (pH 8.2); clear wavy boundary.

C1=4 to 14 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common fine and very fine tubular pores; slightly effervescent; moderately alkaline (pH 8.2); clear wavy boundary.

C2=14 to 25 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine through medium roots; common fine and medium tubular pores; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

C3=25 to 38 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; strong thin platy structure; hard, friable, sticky and plastic; few fine roots; few fine tubular pores; slightly effervescent; moderately alkaline (pH 8.0); abrupt wavy boundary.

Gila family

C4=38 to 50 inches; pale brown (10YR 6/3) fine sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; slightly effervescent; moderately alkaline (pH 8.2); abrupt wavy boundary.

C5=50 to 60 inches; pale brown (10YR 6/3) silt loam, dark yellowish brown (10YR 4/4) moist; moderately thick platy structure; hard, friable, nonsticky and nonplastic; few very fine and fine roots; few fine tubular pores; many medium distinct yellowish red (5YR 5/6) redoximorphic faeture; slightly effervescent; strongly alkaline (pH 8.6).

Vinton family

Depth class: very deep
Drainage class: somewhat excessively drained
Permeability: moderately rapid
Landform: stream terraces
Parent material: mixed sandy alluvium
Slope range: 0 to 2 percent
Elevation: 3200 to 3500 feet
Mean annual precipitation: 8 to 10 inches
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days
Classification: Sandy, mixed, thermic Typic Torrifluvents

Typical pedon

In an area of Vinton family fine sand, 0 to 2 percent slopes, about 2 miles southwest of Page across from Ferry Swale Canyon; 3875 feet north and 2000 feet west of the southeast corner of section 3, T. 40 N., R. 8 E.; 36 degrees, 54 minutes, 1 second, north latitude and 111 degrees, 31 minutes, 16 seconds west longitude; sample 27-2-(1-5).

A=0 to 2 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine interstitial pores; slightly effervescent; strongly alkaline (pH 8.6); clear smooth boundary.

C1=2 to 7 inches; brown (10YR 5/3) fine sand, brown (10YR 4/3) moist, weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine interstitial pores; strongly effervescent; strongly alkaline (pH 8.6); clear smooth boundary.

C2=7 to 20 inches; pale brown (10YR 6/3) very fine sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine tubular and interstitial pores; common fine lime filaments; violently effervescent; strongly alkaline (pH 8.6); clear wavy boundary.

C3=20 to 30 inches; brown (10YR 5/3) very fine sand, brown (10YR 4/3) moist; massive;; soft, very friable, nonsticky and nonplastic; few fine roots; common very fine interstitial pores; few fine lime filaments; strongly effervescent; strongly alkaline (pH 8.6); clear wavy boundary.

Vinton family

C4=30 to 60 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; few fine lime filaments; strongly effervescent; strongly alkaline (pH 8.6).

Detailed Soil Map Units

The map units on the detailed soil maps in this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils.''

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named. A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop and Riverwash are examples. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The

inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape. The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

1=Arizo family extremely stony sand, 45 to 120 percent slopes

Setting

Landform: debris fans
Slope range: 45 to 120 percent
Flooding: none
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Arizo family and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 1 inch=reddish brown extremely stony sand
1 to 18 inches=yellowish red extremely gravelly sand
18 to 30 inches=reddish brown extremely gravelly sand
30 to 60 inches=yellowish red extremely gravelly sand

Soil Properties and Qualities

Depth class: very deep
Drainage class: somewhat excessively drained
Permeability: very rapid
Runoff: slow
Available water capacity: very low
Potential rooting depth: greater than 60 inches
Depth to water table: greater than 6 feet
Hazard of water erosion: severe
Hazard of wind erosion: very slight
Shrink-swell potential: low
Salinity (mmhos/cm): 1 to 30 inches=less than 4; 30 to 60 inches=8 to 16
Sodium adsorption ratio: 1 to 30 inches=1 to 5; 30 to 60 inches=13 to 30
Calcium carbonate content: 0 to 10 percent
Corrosivity: steel(uncoated)=high; concrete=low;
Samples: 33-2-(1-4)

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with smaller amounts of rock fragments in the profile
*soils that are shallow or moderately deep to sandstone bedrock

Similar inclusions
*soils with gravelly or cobbly surfaces

2=Riverwash extremely bouldery sand, 0 to 2 percent slopes

Setting

Landform: flood plains and beaches
Slope range: 0 to 2 percent
Flooding: frequent
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Riverwash: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 20 inches=reddish brown extremely bouldery sand
20 to 60 inches=yellowish red extremely bouldery sand

Soil Properties and Qualities

Depth class: very deep
Drainage class: very poorly drained
Permeability: very rapid
Runoff: medium
Available water capacity: very low
Potential rooting depth: greater than 60 inches
Depth to water table: less than 2 feet
Hazard of water erosion: slight
Hazard of wind erosion: very slight
Shrink-swell potential: low
Salinity (mmhos/cm): less than 4
Sodium adsorption ratio: 1 to 5
Calcium carbonate content: 0 to 10 percent
Corrosivity: steel(uncoated)=high; concrete=low;

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with smaller amounts of rock fragments in the profile
*soils that are shallow or moderately deep to sandstone bedrock

Similar inclusions
*Riverwash with gravelly or cobbly surfaces

3=Riverwash sand, 0 to 2 percent slopes

Setting

Landform: flood plains, beaches, and sand bars
Slope range: 0 to 2 percent
Flooding: frequent
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Riverwash: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 6 inches=white sand
6 to 60 inches=very pale brown stratified sand and silt loam

Soil Properties and Qualities

Depth class: very deep
Drainage class: very poorly drained
Permeability: very rapid
Runoff: medium
Available water capacity: very low
Potential rooting depth: greater than 60 inches
Depth to water table: less than 1 foot
Hazard of water erosion: slight
Hazard of wind erosion: very slight
Shrink-swell potential: low
Salinity (mmhos/cm): less than 4
Sodium adsorption ratio: 1 to 5
Calcium carbonate content: 0 to 10 percent
Corrosivity: steel(uncoated)=high; concrete=low;

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with larger amounts of rock fragments in the profile
*soils that are shallow or moderately deep to sandstone bedrock

Similar inclusions
*Riverwash with gravelly or cobbly surfaces

4=Gila family loamy fine sand, 0 to 2 percent slopes

Setting

Landform: stream terraces
Slope range: 0 to 2 percent
Flooding: rare
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Gila family and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 4 inches=pale brown loamy fine sand
4 to 14 inches=brown silt loam
14 to 25 inches=pale brown silt loam
25 to 38 inches=pale brown silt loam
38 to 50 inches=pale brown fine sand
50 to 60 inches=pale brown silt loam

Soil Properties and Qualities

Depth class: very deep
Drainage class: moderately well drained
Permeability: moderate
Runoff: very slow
Available water capacity: high
Potential rooting depth: greater than 60 inches
Depth to water table: 4 to 6 feet
Hazard of water erosion: very slight to slight
Hazard of wind erosion: high
Shrink-swell potential: low
Salinity (mmhos/cm): 0 to 4 inches=8 to 16; 4 to 60 inches=greater than 16
Sodium adsorption ratio: 5 to 50
Calcium carbonate content: 5 to 15 percent
Corrosivity: steel(uncoated)=high; concrete=high;
Samples: 2-1-(1-5), 15-1-(1-6), 12-1-(1-6), 15-2-(1-5), 32-1-(1-5)

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils that are shallow or moderately deep to sandstone bedrock

Similar inclusions
*soils with silt loam surface textures
*soils with gravelly surfaces

5=Brazito family fine sand, 0 to 2 percent slopes

Setting

Landform: stream terraces
Flooding: none
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 275 days

Composition

Brazito family and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 4 inches=light yellowish brown fine sand
4 to 16 inches=pale brown fine sand
16 to 38 inches=light yellowish brown fine snad
38 to 50 inches=light brownish gray very fine sand
50 to 60 inches=pale brown fine sand

Soil Properties and Qualities

Depth class: very deep
Drainage class: well drained
Permeability: rapid
Runoff: very slow
Available water capacity: low
Potential rooting depth: greater than 60 inches
Hazard of water erosion: very slight to slight
Hazard of wind erosion: very high
Shrink-swell potential: low
Salinity (mmhos/cm): less than 4
Sodium adsorption ratio: 1 to 5
Calcium carbonate content: 5 to 15 percent
Corrosivity steel(uncoated)= high; concrete=low;
Samples: 2-2-(1-5), 15-3-(1-5), 24-2-(1-5), 27-1-(1-6), 32-3-(1-6)

Inclusions

Contrasting inclusions:
*soils that are shallow and moderately deep to sandstone bedrock
*soils with a larger amount of rock fragments on the surface and in the profile
*soils with a larger amount of silt and clay in the profile

Similar inclusions:
*soils with silt loam surfaces

6=Cowan family loamy sand, 0 to 2 percent slopes

Setting

Landform: stream terraces
Slope range: 0 to 2 percent
Flooding: none
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Cowan family and similar soils: 85 percent
Contrasting inclusions: 15 percent

Typical Profile

0 to 4 inches=light brown loamy sand
4 to 19 inches=pink loamy sand
19 to 31 inches=light reddish brown loamy sand
31 to 48 inches=reddish brown loamy sand
48 to 56 inches=light brown silt loam
56 to 60 inches=reddish brown fine sand

Soil Properties and Qualities

Depth class: very deep
Drainage class: somewhat excessively drained
Permeability: rapid
Runoff: very slow
Available water capacity: low
Potential rooting depth: greater than 60 inches
Depth to water table: greater than 6 feet
Hazard of water erosion: very slight to slight
Hazard of wind erosion: high
Shrink-swell potential: low
Salinity (mmhos/cm): less than 4
Sodium adsorption ratio: 1 to 5
Calcium carbonate content: 5 to 15 percent
Corrosivity: steel(uncoated)=high; concrete=low;
Samples: 9-1-(1-6), 27-3-(1-4), 28-1-(1-6)

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with larger amounts of rock fragments in the profile
*soils that are shallow or moderately deep to sandstone bedrock

Similar inclusions
*soils with gravelly surfaces

7=Riverwash extremely cobbly sand, 0 to 2 percent slopes

Setting

Landform: flood plains, beaches and sand bars
Slope range: 0 to 2 percent
Flooding: frequent
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Riverwash: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 6 inches=white extremely cobbly sand
6 to 60 inches=very pale brown stratifed sand and silt loam

Soil Properties and Qualities

Depth class: very deep
Drainage class: very poorly drained
Permeability: very rapid
Runoff: medium
Available water capacity: very low
Potential rooting depth: greater than 60 inches
Depth to water table: less than 1 foot
Hazard of water erosion: slight
Hazard of wind erosion: very slight
Shrink-swell potential: low
Salinity (mmhos/cm): less than 4
Sodium adsorption ratio: 1 to 5
Calcium carbonate content: 0 to 10 percent
Corrosivity: steel(uncoated)=high; concrete=low;

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with smaller amounts of rock fragments in the profile

Similar inclusions
*soils with gravelly or cobbly surfaces

8=Anthony family very fine sandy loam, 0 to 2 percent slopes

Setting

Landform: stream terraces
Slope range: 0 to 2 percent
Flooding: none
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Anthony family and similar soils: 85 percent
Contrasting inclusions: 15 percent

Typical Profile

0 to 4 inches=light brownish gray very fine sandy loam
4 to 16 inches=pale brown very fine sandy loam
16 to 33 inches=light brownish gray sandy loam
33 to 47 inches=brown fine sand
47 to 60 inches=light brown fine sand

Soil Properties and Qualities

Depth class: very deep
Drainage class: well drained
Permeability: moderate
Runoff: very slow
Available water capacity: moderate
Potential rooting depth: greater than 60 inches
Depth to water table: greater than 6 feet
Hazard of water erosion: slight to moderate
Hazard of wind erosion: very high
Shrink-swell potential: low
Salinity (mmhos/cm): 0 to 3 inches=less than 4; 3 to 60 inches=4 to 16
Sodium adsorption ratio: 0 to 3 inches=1 to 5; 3 to 60 inches=5 to 25
Calcium carbonate content: 5 to 15 percent
Corrosivity: steel(uncoated)=high; concrete=low;
Samples: 24-1-(1-5), 32-2-(1-6)

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with larger amounts of rock fragments in the profile
*soils that are shallow or moderately deep to sandstone bedrock

Similar inclusions
*soils with gravelly surfaces

9=Riverwash silt loam, 0 to 2 percent slopes

Setting

Landform: flood plains, and sand bars
Slope range: 0 to 2 percent
Flooding: frequent
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Riverwash: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 6 inches=yellowish brown silt loam
6 to 60 inches=very pale brown stratifed silt loam and sand

Soil Properties and Qualities

Depth class: very deep
Drainage class: very poorly drained
Permeability: moderately slow
Runoff: medium
Available water capacity: moderate
Potential rooting depth: greater than 60 inches
Depth to water table: less than 1 foot
Hazard of water erosion: slight
Hazard of wind erosion: very slight
Shrink-swell potential: low
Salinity (mmhos/cm): less than 4
Sodium absorption ratio: 1 to 5
Calcium carbonate content: 0 to 10 percent
Corrosivity: steel(uncoated)=high; concrete=low;

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with larger amounts of rock fragments in the profile

Similar inclusions
*Riverwash with gravelly or cobbly surfaces

10=Rock outcrop

Setting

Landform: Rock outcrop of Navajo Sandstone
Slope range: 2 to greater than 120 percent
Flooding: none
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

11=Vinton family fine sand, 0 to 2 percent slopes

Setting

Landform: stream terraces
Slope range: 0 to 2 percent
Flooding: none
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Vinton family and similar soils: 85 percent
Contrasting inclusions: 15 percent

Typical Profile

0 to 2 inches=brown fine sand
2 to 7 inches=brown fine sand
7 to 20 inches=pale brown very fine sand
20 to 30 inches=brown very fine sand
30 to 60 inches=brown silt loam

Soil Properties and Qualities

Depth class: very deep
Drainage class: somewhat excessively drained
Permeability: moderately rapid
Runoff: very slow
Available water capacity: low
Potential rooting depth: greater than 60 inches
Depth to water table: greater than 6 feet
Hazard of water erosion: very slight to slight
Hazard of wind erosion: very high
Shrink-swell potential: low
Salinity (mmhos/cm): 0 to 7 inches=less than 4; 7 to 40 inches=greater than 16; 40 to 60 inches=8 to 16
Sodium adsorption ratio: 0 to 7 inches=1 to 5; 7 to 60 inches=5 to 25
Calcium carbonate content: 5 to 15 percent
Corrosivity: steel(uncoated)=high; concrete=high;
Samples: 27-2-(1-5)

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with larger amounts of rock fragments in the profile
*soils that are shallow or moderately deep to sandstone bedrock
*eroded soils which are missing sandy surfaces

Similar inclusions
*soils with gravelly surfaces

12=Gila family silt loam, 0 to 2 percent slopes, flooded

Setting

Landform: flood plains and return channels
Slope range: 0 to 2 percent
Flooding: frequent
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Gila family and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 6 inches=brown silt loam
6 to 60 inches= brown stratified silt loam and fine sand

Soil Properties and Qualities

Depth class: very deep
Drainage class: very poorly drained
Permeability: moderate
Runoff: medium
Available water capacity: high
Potential rooting depth: greater than 60 inches
Depth to water table: less than 1 foot
Hazard of water erosion: very slight to slight
Hazard of wind erosion: slight
Shrink-swell potential: low
Salinity (mmhos/cm): 0 to 6 inches=8 to 16; 6 to 60 inches=4 to 8
Sodium adsorption ratio: 5 to 50
Calcium carbonate content: 5 to 15 percent
Corrosivity: steel(uncoated)=high; concrete=high;

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with larger amounts of rock fragments in the profile
*soils that are shallow or moderately deep to sandstone bedrock

Similar inclusions
*soils with gravelly or cobbly surfaces

13=Torripsamments, 15 to 100 percent slopes

Setting

Landform: sand dunes
Slope range: 15 to 100 percent
Flooding: none
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Torripsamments and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 6 inches=reddish brown sand
6 to 60 inches=reddish brown stratified sand and fine sand

Soil Properties and Qualities

Depth class: very deep
Drainage class: excessively drained
Permeability: very rapid
Runoff: very slow to slow
Available water capacity: very low
Potential rooting depth: greater than 60 inches
Depth to water table: greater than 6 feet
Hazard of water erosion: very severe
Hazard of wind erosion: very high
Shrink-swell potential: low
Salinity (mmhos/cm): less than 4
Sodium adsorption ratio: 1 to 5
Calcium carbonate content: 0 to 10 percent
Corrosivity: steel(uncoated)=high; concrete=low;

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with larger amounts of rock fragments in the profile
*soils that are shallow or moderately deep to sandstone bedrock

Similar inclusions
*soils with gravelly or cobbly surfaces

14=Arizo family very gravelly sand, 2 to 15 percent slopes

Setting

Landform: alluvial fans and washes
Slope range: 2 to 15 percent
Flooding: rare
Elevation: 3200 to 3500 feet
Mean annual soil temperature: 59 to 64 degrees F.
Frost free period: 180 to 274 days

Composition

Arizo family and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

0 to 1 inch=reddish brown very gravelly sand
1 to 60 inches=yellowish red stratified extremely gravelly sand and very gravelly sand

Soil Properties and Qualities

Depth class: very deep
Drainage class: somewhat excessively drained
Permeability: very rapid
Runoff: very slow
Available water capacity: very low
Potential rooting depth: greater than 60 inches
Depth to water table: greater than 6 feet
Hazard of water erosion: slight to moderate
Hazard of wind erosion: slight
Shrink-swell potential: low
Salinity (mmhos/cm): less than 4
Sodium adsorption ratio: 1 to 5
Calcium carbonate content: 5 to 15 percent
Corrosivity: steel(uncoated)=high; concrete=low;

Inclusions

Contrasting inclusions:
*soils with larger amounts of silt and clay in the profile
*soils with smaller amounts of rock fragments in the profile
*soils that are shallow or moderately deep to sandstone bedrock

Similar inclusions
*soils with sandy surfaces

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses. Information in this section can be used to plan the use and management of soils for recreation facilities. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties. It is important to emphasize that most of the soil properties in the tables are estimated and not actually measured. Many of the estimates of properties are based on texture as determined in the field by the soil scientist. These estimates are useful guides in approximating soil behavior but should not be relied upon as an absolute value.

The soils of the survey area are rated in table 6. according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 6. the degree of soil limitation is expressed as slight, moderate, or severe. Slight means that soil properties are generally favorable and that limitations are minor and easily overcome. Moderate means that limitations can be overcome or alleviated by planning, design, or special maintenance. Severe means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or

boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

TABLES

Table 1. MAP UNIT ACERAGE AND PROPORTIONAL EXTENT

Map Symbol	Percent	Map unit name
1		Arizo family extremely stony sand, 45 to 120 percent slopes.....
2		Riverwash extremely bouldery sand, 0 to 2 percent slopes.....
3		Riverwash sand, 0 to 2 percent slopes.....
4		Gila family loamy fine sand, 0 to 2 percent slopes.....
5		Brazito family fine sand, 0 to 2 percent slopes.....
6		Cowan family loamy sand, 0 to 2 percent slopes.....
7		Riverwash extremely cobbly sand, 0 to 2 percent slopes.....
8		Anthony family very fine sandy loam, 0 to 2 percent slopes.....
9		Riverwash silt loam, 0 to 2 percent slopes.....
10		Rock outcrop.....

11 Vinton family fine sand, 0 to 2 percent slopes.....

12 Gila family silt loam, 0 to 2 percent slopes, flooded.....

13 Torripsamments, 15 to 100 percent slopes.....

14 Arizo family very gravelly sand, 2 to 15 percent slopes.....

Table 2. ENGINEERING INDEX PROPERTIES

Soil name and Symbol	Depth inches	Texture Classification USDA	Unified	AASHTO	Rock Fragments >10" PCT	Rock Fragments 3"-10" PCT	Percentage Passing Sieve Number 4	10	40
1-Arizo fam.,	0-1	stx-s	SP, SW-SM	A-1	20-60	20-50	80-90	10-25	5-15
	1-30	grx-s	SP SW-SM	A-1	20-40	20-30	80-90	10-25	5-15
	30-60	grx-s	SP SW-SM	A-1	20-40	20-30	80-90	10-25	5-15
2-Riverwash	0-20	bdx-s	GP	A-1	60-90	10-30	90-100	10-15	5-10
	20-60	bdx-s	GP	A-1	60-90	10-30	90-100	10-15	5-10
3-Riverwash	0-6	s	SP	A-3	0-5	0-20	100	100	50-90
	6-60	s/sil	SP	A-3	0-5	0-20	100	100	50-90
4-Gila fam.	0-4	lfs	SP, SW-SM	A-3	0	0	100	100	75-100
	4-60	sil/fs	SM, ML	A-4	0	0	100	100	50-80
5-Brazito fam.	0-4	fs/vfs	SP	A-3	0	0	100	100	75-100
	4-60	fs	SP	A-3	0	0	100	100	75-100
6-Cowan fam.	0-4	ls	SM	A-3, A-2	0	0	100	100	50-90
	4-60	ls/sil	SM	A-1, A-2 A-3	0	0	100	100	10-90
7-Riverwash	0-6	cbx-s	SP	A-1	0-5	50-90	100	10-25	5-20
	6-60	s/sil	SP	A-1, A-3	0-5	0-90	100	10-100	5-90
8-Anthony fam.	0-4	vfsl	SM	A-2	0	0	100	100	60-90
	4-60	fs/sl	SM	A-2	0	0	100	100	60-90

Table 2. ENGINEERING INDEX PROPERTIES (continued)

Soil name and Symbol	Depth inches	Texture Classification USDA	Unified	AASHTO	Rock Fragments >10" PCT	3"-10" PCT	Percentage Passing Sieve Number 4	10	40
9-Riverwash	0-6	sil	ML	A-4	0-5	0-5	100	80-100	80-90
	6-60	sil/s	ML, SP	A-4, A-3	0-5	0-5	100	80-100	80-100
11-Vinton fam.	0-7	fs	SP	A-3	0	0	100	100	75-100
	7-30	vfs	SW, SP	A-3	0	0	100	100	75-100
	30-60	sil	ML	A-4	0	0	100	100	75-100
12-Gila fam.	0-6	sil	ML	A-4	0-10	0-10	100	80-100	80-90
	6-60	sil/fs	ML, SP	A-4, A-3	0-10	0-10	100	80-100	90-90
13-Torri-psamments	0-6	s	SP	A-3	0	0	100	100	90-100
	6-60	s/fs	SP	A-3	0	0	100	100	90-100
14-Arizo fam.	0-1	grv-s	SP	A-1	0-5	0-5	50-70	25-50	15-30
	1-60	grv-s	SP	A-1	0-5	0-5	50-70	25-50	15-30

Table 3. PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(Entries under "Wind erodibility group" apply only to the surface layer. Entries under "Erosion factors -T" and "shrink-swell potential" apply to the entire profile.)

Soil name and Symbol	Depth	Clay	Moist Density	Permeability	Avail. water	Soil reaction	Salinity	Shrink Swell Potent.	Erosion K	Organic
	inches	pct	G/cc	In/hr	In/in	pH	mmhos/cm			
1-Arizo fam.	0-1	0-2	1.5-1.6	>20	.02-.04	7.4-8.4	<4	LOW	.01	
	1-30	0-2	1.5-1.6	>20	.02-.04	7.4-8.4	<4		.01	
	30-60	0-2	1.5-1.6	>20	.02-.04	7.4-9.0	8-16		.01	
2-Riverwash	0-20	0-2	1.4-1.5	>20	.02-.04	7.9-8.4	<4	LOW	.01	
	20-60	0-2	1.2-1.4	>20	.02-.04	6.6-7.8	<4		.01	
3-Riverwash	0-6	0-2	1.3-1.4	>20	.02-.04	6.6-7.8	<4	LOW	.2	
	6-60	0-2	1.2-1.4	>20	.02-.04	6.6-7.8	<4		.2	
4-Gila fam.	0-4	2-5	1.5-1.6	6-20	.09-.10	7.9-9.0	8-16	LOW	.28	
	4-60	2-9	1.4-1.6	.6-2	.15-.18	7.9-9.0	>16		.55	
5-Brazito fam.	0-4	0-2	1.4-1.5	6-20	.05-.07	7.4-8.4	<4	LOW	.24	
	4-60	0-2	1.4-1.5	6-20	.06-.07	7.4-8.4	<4		.24	
6-Cowan fam.	0-4	2-5	1.5-1.6	6-20	.06-.08	7.9-9.0	<4	LOW	.24	
	4-60	2-5	1.5-1.6	6-20	.05-.08	7.9-9.0	<4		.24	
7-Riverwash	0-6	0-5	1.4-1.5	>20	.02-.04	6.6-7.8	<4	LOW	.01	
	6-60	0-5	1.2-1.3	>20	.02-.04	6.6-7.8	<4		.01	

8-Anthony c am.	0-4	2-5	1.5-1.6	.6-2	.06-.08	7.9-8.4	<4	LOW	.55
	4-60	2-5	1.5-1.6	.6-2	.08-.10	7.9-9.0	4-16		.55

Table 3 PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS (conti

(.tries under "Wind erodibility group" apply only to the surface layer. Entries factors -T" and "shrink-swell potential" apply to the entire profile.)

Soil name and Symbol	Depth inches	Clay pct	Moist Density G/cc	Permea bility In/hr	Avail water In/in	Soil reaction pH	Salinity mmhos/cm	Shrink Swell Potent.	Eros K	Organic
9-Riverwash	0-6	2-5	1.4-1.5	.2-.6.	.19-.21	6.6-7.8	<4	LOW	.55	1.0
	6-60	2-5	1.2-1.3	.2-.6	.05-.21	6.6-7.8	<4		.43	0.5
11-Vinton fam.	0-7	0-2	1.5-1.6	>20	.05-.07	7.9-8.4	<4	LOW	.24	1.0
	7-30	0-2	1.5-1.6	6-20	.05-.07	7.9-8.4	>16		.32	1.0
	30-60	2-10	1.5-1.6	2-6	.16-.21	7.9-9.0	8-16		.43	1.0
Gila fam.	0-6	2-5	1.4-1.5	.6-2	.05-.21	7.9-9.0	8-16	LOW	.55	1.0
	6-60	2-5	1.2-1.3	.6-2	.05-.21	6.6-7.8	4-8		.43	0.5
13-Torri-psamments	0-6	0-2	1.3-1.4	>20	.03-.05	7.9-8.4	<4	LOW	.22	
	6-60	0-2	1.3-1.4	>20	.03-.05	7.9-8.4	<4		.22	
14-Arizo fam.	0-1	0-2	1.4-1.5	>20	.03-.05	7.9-8.4	<4	LOW	.10	
	1-60	0-2	1.5-1.5	>20	.03-.05	7.9-8.4	<4		.10	

Table 4. SOIL AND WATER FEATURES

Soil name and Symbol	Hydo. Group	Flooding			Bedrock		Risk of Corrosion	
		Occur.	Duration	Months	Depth inches	Hardness	Steel	Concrete
1-Arizo f.	A	none			>60		high	low
2-Riverwash	D	freq	brief	Jan-Dec	>60		high	low
3-Riverwash	D	freq	brief	Jan-Dec	>60		high	low
4-Gila f.	A	rare			>60		high	high
5-Brazito f.	A	none			>60		high	low
6-Cowan f.	A	none			>60		high	low
7-Riverwash	D	freq	brief	Jan-Dec	>60		high	low
8-Anthony f.	A	none			>60		high	low
9-Riverwash	D	freq	brief	Jan-Dec	>60		high	low
11-Vinton f.	A	none			>60		high	high
12-Gila f.	D	freq	brief	Jan-Dec	>60		high	high
13-Torri-psamments	A	none	none		>60		high	low
14-Arizo f.	A	rare			>60		high	low

Table 5. CLASSIFICATION OF THE SOILS

Soil Name	Family or Higher Taxonomic Class
Anthony family	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Arizo family	Sandy-skeletal, mixed, thermic Typic Torriorthents
Brazito family	Mixed, thermic Typic Torripsamments
Cowan family	Sandy, mixed, thermic Typic Torrifluvents
Gila family	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Vinton family	Sandy, mixed, thermic Typic Torrifluvents
Torripsamments	Mixed, thermic Typic Torripsamments

Table 6. RECREATIONAL DEVELOPMENT

Soil name and Symbol	Camp Areas	Picnic Areas	Paths and trails
1-Arizo f.	Severe; slope, too stony	Severe; slope, too stony	Severe; slope, too stony
2-Riverwash	Severe; flooding	Severe; too stony	Severe; too stony
3-Riverwash	Severe; flooding	Severe; too sandy	Severe; too sandy
4-Gila f.	Severe; flooding	Slight	Slight
5-Brazito f.	Severe; too sandy	Severe; too sandy	Severe; too sandy
6-Cowan f.	Slight	Slight	Slight
7-Riverwash	Severe; flooding	Severe; too cobbly	Severe; too cobbly
8-Anthony f.	Severe; too sandy	Severe; too sandy	Severe; too sandy
9-Riverwash	Severe; flooding	Severe; wetness	Severe; wetness
11-Vinton f.	Severe; too sandy	Severe; too sandy	Severe; too sandy
12-Gila f.	Severe; flooding	Severe; wetness	Severe; wetness
13-Torri-psamments	Severe; slope; too sandy	Severe; slope; too sandy	Severe; slope, too sandy
14-Ariz f.	Severe; flooding	Slight	Slight

Glossary

1. Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

2. Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

3. Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

4. Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

5. Alluvial fan. The fanlike deposit of stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

6. Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without calf, for 1 month.

7. Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

8. Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

9. Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as=

Very low	0 to 2.5
Low	2.5 to 5.0
Moderate	5.0 to 7.5
High	7.5 to 10.0
Very high	more than 10.0

10. Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

11 Basalt. Igneous rock formed by the cooling and hardening of a magma associated with volcanic activity and emplaced at or near the earths surface

12. Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

13. Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

14. Bottom land. The normal flood plain of a stream, subject to flooding.

15. Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

16. Breaks. The steep to very steep broken land at the border of an upland summit that is dissected by ravines.

17. Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition of woody vegetation to allow understory grasses and forbs to recover, or to make conditions favorable for reseeding. It increases production of forage, which reduces erosion. Brush management may improve the habitat for some species of wildlife.

18. Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

19. Canopy. The leafy crown of trees or shrubs.

20. Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

21. Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

22. Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

23. Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

24. Channer. A thin, flat rock fragment as much as 6 inches along the longest axis

25. Channery soil material. A soil that is, by volume, 15 to 35 percent thin, flat rock fragments as much as 6 inches along the longest axis. Very channery soil material is 35 to 60 percent of theses rock fragments, and extremely channery soil material is more than 60 percent.

26. Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

27. Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

28. Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

29. Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

30. Coarse textured soil. Sand or loamy sand.

31. Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

32. Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

33. Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The

pattern and proportion of the soils are somewhat similar in all areas.

34. Compressible (in tables). Excessive decrease in volume of soft soil under load.

35. Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

36. Conglomerate. A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

37. Consistence, soil. The degree of cohesion among soil particles and the adhesion of soil to other substances. Consistence is described in term of resistence to cracking or breaking when force is applied, force required to deform but not rupture soil material, and degree to which soil material adhere to other objects.

Loose.=Noncoherent when dry or moist; does not hold together in a mass.

Friable.=When moist, crushes easily under gently pressure between thumb and forefinger and can be pressed together into a lump.

Firm.=When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.=When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a ""wire" when rolled between thumb and forefinger.

Sticky.=When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.=When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.=When dry, breaks into powder or individual grains under very slight pressure.

38. Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches nd 40 or 80 inches.

39. Corrosivity. The potential or risk of corrosion to uncoated steel or deterioration of concrete.

40. Cretaceous. The third portion of the Mesozoic Era of geologic time (from approximately 135 to 65 million years ago)

41. Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

42. Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

43. Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

44. Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

45. Depth to rock (in tables). Bedrock is too near the surface for the specified use.

46. Dip slope. A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

47. Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.=Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.=Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive

is lost as runoff. All are free of the mottling related to wetness.

Well drained.=Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.=Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.=Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.=Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.=Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

48. Drainage, surface. Runoff, or surface flow of water, from an area.

49. Draw. A small stream valley, generally more open and with broader bottom land than a ravine or gulch.

50. Duff. A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

51. Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

52. Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

53. Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

54. Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

55. Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

56. Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and produced by erosion or faulting.

57. Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

58. Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

59. Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

60. Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

61. Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

62. Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

63. Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

64. Fast intake (in tables). The rapid movement of water into the soil.

65. Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

66. Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called normal field capacity, normal moisture capacity, or capillary capacity.

67. Fine textured soil. Sandy clay, silty clay, and clay.

68. Flagstone. A thin flat rock fragment 6 to 15 inches (15 to 38 centimeters) long.

69. Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

70. Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

71. Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

72. Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (or 300 meters) and fringes a mountain range or high-plateau escarpment.

73. Foot slope. The geomorphic component that forms the inner inclined surface at the base of a hill. Foot slopes in profile are dominantly concave and may form transitions zones between upslope sites of erosion (back slope) and downslope sites of deposition (toe slope).

74. Forb. Any herbaceous plant not a grass or a sedge.

75. Formation (stratigraphy). The basic rock-stratigraphic unit in the local classification of rocks. A body of rock (commonly a sedimentary stratum or strata, but also igneous and metamorphic rocks) generally characterized by some degree of internal lithologic homogeneity or distinctive lithologic features such as chemical composition. structures, textures, or general kind of fossils.

76. Fragile (in tables). A soil that is easily damaged by use or disturbance.

77. Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

78. Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

79. Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter.

80. Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter. Very gravelly soil material is 35 to 60 percent of theses fragments, and extremely gravelly soil material is more than 60 percent.

81. Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

82. Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

83. Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

84. Hard rock. Rock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

85. Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

86. Holocene. The second epoch of the Quaternary Period of geologic time, extending from the end of the PLeistocene Epoch (about 10 to 12 thousand years ago) to the present.

87. Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.=An organic layer of fresh and decaying plant residue.

A horizon.=The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.=The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.=The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of

these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.=The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.=Soft, consolidated bedrock beneath the soil.

R layer.=Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

89. Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

90. Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

91. Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

92. Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

93. Impervious soil. A soil through which water,

air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

94. Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

95. Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

96. Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

97. Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

98. Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

99. Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

100. Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

101. Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are=

Border.=Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.=Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.=Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.=Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).=Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.=Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.=Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.=Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.=Water, released at high points, is allowed to flow onto an area without controlled distribution.

102. Jurassic. The second period of the Mesozoic Era of geologic time (from approximately 195 to 135 million years ago).

103. Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

104. Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

105. Leaching. The removal of soluble material from soil or other material by percolating water.

106. Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

107. Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

108. Low strength. The soil is not strong enough to support loads.

109. Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

110. Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

111. Mesa. A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

112. Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

113. Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

114. Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

115. Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

116. Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

117. Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

118. Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance=few, common, and many;

size=fine, medium, and coarse; and contrast=faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

119. Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

120. Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

121. Munsell notation. A designation of color by degrees of three simple variables=hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

122. Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

123. Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

124. Organic matter. Plant and animal residue in the soil in various stages of decomposition.

125. Parent material. The unconsolidated organic and mineral material in which soil forms.

126. Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

127. Pedon. The smallest volume that can be called ""a soil.'' A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

128. Percolation. The downward movement of water through the soil.

129. Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

130. Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
low	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

131. Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

132. pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

133. Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

134. Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

135. Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

136. Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

137. Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

138. Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

139. Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

140. Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

141. Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

142. Potential plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed. (See climax plant community.)

143. Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

144. Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

145. Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

146. Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

147. Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This increases the vigor and reproduction of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

148. Quaternary. The second period of the Cenozoic Era of geologic time, extending from the end of the Tertiary Period (about 2 million years ago) to the present, and comprising two epochs, the Pleistocene and the Holocene.

149. Quartzite. Metamorphic rock formed from sandstone by heat, pressure, and strong silica cementation.

150. Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

151. Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

152. Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

153. Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are=

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

154. Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

155. Relief. The elevations or inequalities of a land surface, considered collectively.

156. Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

157. Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

158. Riparian. A term pertaining to plants and animals living on, or adjacent to, the bank or flood plain of an intermittent stream or perenial river.

159. Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

160. Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

161. Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

162. Root zone. The part of the soil that can be penetrated by plant roots.

163. Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

164. Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

165. Salinity. The degree to which a soil is affected by soluble salts in water. Salinity is expressed as the electrical conductivity (EC) of a saturated extract in mmhos/cm. The degrees of salinity are:

Nonsaline	Less than 2
Very slightly saline	2 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	More than 16

166. Salty water (in tables.) Water that is too salty for consumption by livestock.

167. Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

168. Sandstone. Sedimentary rock containing dominantly sand-sized particles.

169. Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

170. Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

171. Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

172. Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

173. Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

174. Shale. Sedimentary rock formed by the hardening of a clay deposit.

175. Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

176. Shoulder. The geomorphic component that forms the uppermost, inclined surface at the top of a hill. It is dominantly convex in profile, erosional in orgin, and comprises a transition zone between summits above, and backslopes below.

177. Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

178. Silica. A combination of silicon and oxygen. The mineral form is called quartz.

179. Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand

(0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

180. Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

181. Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

182. Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

183. Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

184. Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

	Percent
Nearly level	0 to 3
Gently sloping or undulating	3 to 7
Strongly sloping or rolling	7 to 15
Moderately steep or hilly	15 to 25
Steep	25 to 55
Very steep	55 and higher

185. Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

186. Slow intake (in tables). The slow movement of water into the soil.

187. Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

188. Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

189. Sodicity. The degree to which a soil is

affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na to Ca + Mg. The degrees of sodicity and their respective ratios are=

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

190. Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

191. Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

192. Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

193. Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

194. Stones. Rounded and angular fragments of rock 10 to 24 inches (25 to 60 centimeters) in diameter.

195. Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

196. Stratified. Arranged in strata, or layers. the term refers to either soil or geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

197. Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the dissected remnants of an abandoned flood plain, stream bed, or valley floor produced during a former stage of erosion and deposition. Older and higher stream terraces have a relatively flat summit surface (tread), built by stream deposition, and a steep descending slope (riser), graded to a lower base level of erosion.

198. Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are=platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

199. Structural bench. A platform-type, nearly level to gently inclined erosional platform developed on resistant strata in areas where geologic erosion has cut into alternating hard and soft rock layers with an essentially horizontal attitude. Their profiles are stair-stepped and angular, they commonly have summits of variable width, and are bounded both above and below, by hills or escarpemnts.

200. Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

201. Substratum. The part of the soil below the solum.

202. Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

203. Summit. A general term for the top, or highest area of a landform such as a butte, hill, mountain, structural bench, mesa, or plateau. Summits may or may not include distinct crest lines or high points that rise above their general level.

204. Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the ""plow layer,'' or the ""Ap horizon.''

205. Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

206. Taxadjuncts. Soils that cannot be classified

in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

207. Tertiary. The first period of the Cenozoic Era of geologic time (from approximately 65 to 2 million years ago).

208. Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

209. Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

210. Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying ""coarse,'' ""fine,'' or ""very fine.''

211. Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

212. Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

213. Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

214. Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

215. Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

216. Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

217. Triassic. The first period of the Mesozoic Era of geologic time (from approximately 230 to 195 million years ago).

218. Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

219. Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

220. Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

221. Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

222. Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

223. Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

APPENDIX 1.

RIVER
Lees Ferry
Abandoned
Cable Chair Crossing
Ferry
Cable
Gaging Sta
E.M.
3116
Cem
River
Colorado
West Base
East Base
Trans Line
Trans Line
NAVAJO INDIAN RESERVATION

INDIAN RESERVATION
COLORADO
GLEN CANYON
RIVER
CANYON
Horsley
Dead Horse Point
Bentley Rock
Glen Canyon Dam
Lake Powell
Navajo Mtn.
Rainbow Bridge
Monument
Valley
Kayenta
Tuba City
Page
Flagstaff
Cameron
Grand Canyon
Marble Canyon
Lees Ferry
Bryce Canyon
Zion Canyon
Zion Nat. Park
Hurricane
St. George
Las Vegas
Boulder City
Hoover Dam
Kingman
Williams
Prescott
Phoenix
Globe
Tucson
Nogales
Douglas
Bisbee
Tombstone
Benson
Willcox
Safford
Clifton
Morenci
Duncan
Lordsburg
Deming
Silver City
Las Cruces
Alamogordo
Carlsbad
Roswell
Artesia
Hobbs
Lovington
Tatum
Portales
Clovis
Tucumcari
Santa Rosa
Vaughn
Roswell
Fort Sumner
Socorro
Albuquerque
Gallup
Grants
Laguna
Acoma
Zuni
Ramah
Crownpoint
Thoreau
Shiprock
Farmington
Aztec
Bloomfield
Chaco Canyon
Bisti
Cuba
Bernalillo
Santa Fe
Los Alamos
Española
Taos
Chama
Dulce
Ojo Caliente
Abiquiu
Tierra Amarilla
Pagosa Springs
Durango
Cortez
Mesa Verde
Dolores
Telluride
Ouray
Silverton
Lake City
Gunnison
Montrose
Delta
Grand Junction
Fruita
Palisade
Clifton
Collbran
Mack
Rangely
Meeker
Craig
Steamboat Springs
Hayden
Yampa
Oak Creek
Hamilton
Baggs
Dixon
Savery
Encampment
Riverside
Walcott
Rawlins
Sinclair
Wamsutter
Rock Springs
Green River
Kemmerer
Diamondville
Cokeville
Afton
Star Valley
Alpine
Jackson
Moran
Dubois
Lander
Riverton
Shoshoni
Thermopolis
Worland
Hyattville
Basin
Greybull
Lovell
Cowley
Powell
Cody
Meeteetse
Ten Sleep
Buffalo
Kaycee
Midwest
Casper
Mills
Evansville
Douglas
Glenrock
Bill
Orin
Glendo
Wheatland
Guernsey
Hartville
Lingle
Torrington
Fort Laramie
Yoder
Chugwater
Cheyenne
Pine Bluffs
Carpenter
Hillsdale
Burns
Albin
Granite Canyon
Laramie
Rock River
Elk Mountain
Arlington
Saratoga
Encampment
Riverside
Hanna
Medicine Bow
Rawlins
Sinclair
Wamsutter
Baggs
Dixon
Savery
Hayden
Steamboat Springs
Craig
Meeker
Rangely
Oak Creek
Hamilton
Yampa
Kremmling
Granby
Grand Lake
Estes Park
Longmont
Boulder
Golden
Denver
Aurora
Littleton
Englewood
Parker
Castle Rock
Monument
Colorado Springs
Manitou Springs
Cripple Creek
Victor
Florence
Canon City
Penrose
Rye
Pueblo
Walsenburg
La Veta
Trinidad
Aguilar
Weston
Stonewall
Gardner
Huerfano
Colorado City
Rockvale
Beulah
Rye
Boone
Nepesta
Olney Springs
Ordway
Sugar City
Crowley
Las Animas
Hasty
Bristol
Wiley
Lamar
Granada
Holly
Two Buttes
Springfield
Campo
Eads
Kit Carson
Cheraw
Sugar City
Ordway
Rocky Ford
La Junta
Swink
Manzanola
Fowler
Hartman
Sheridan Lake
Arlington
Haswell
Kit Carson
Eads
Chivington
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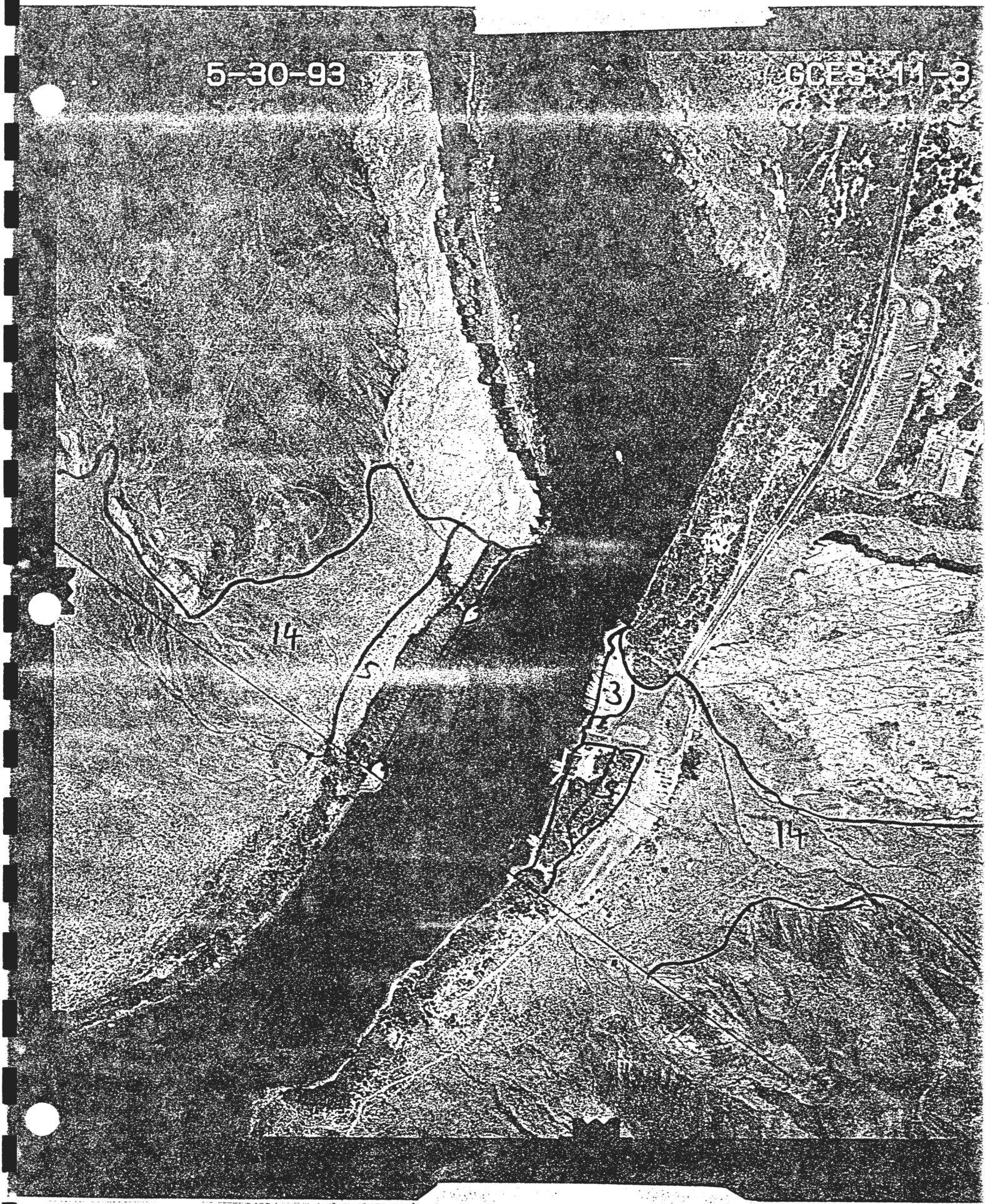
Ordway
Sugar City
Crowley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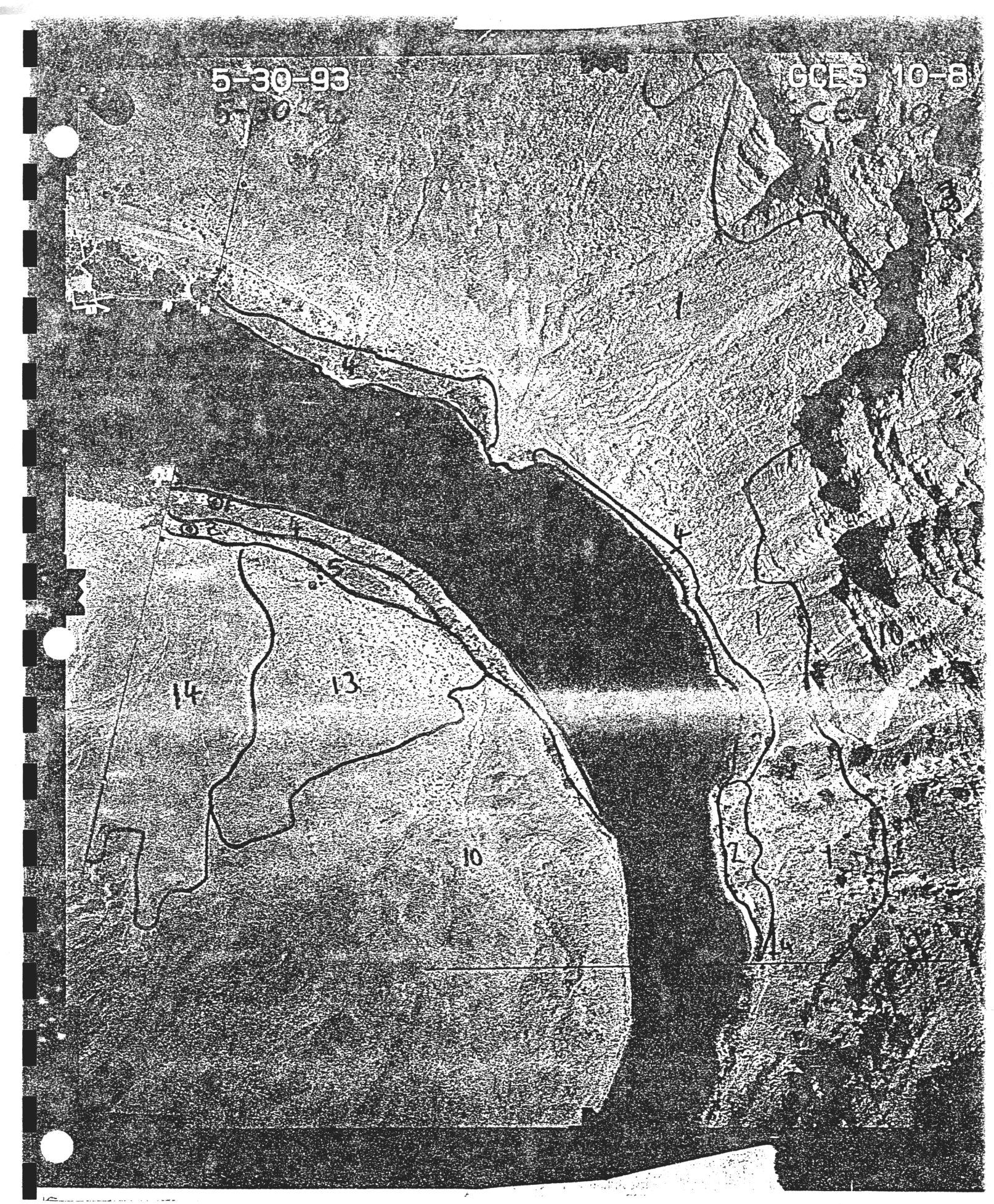
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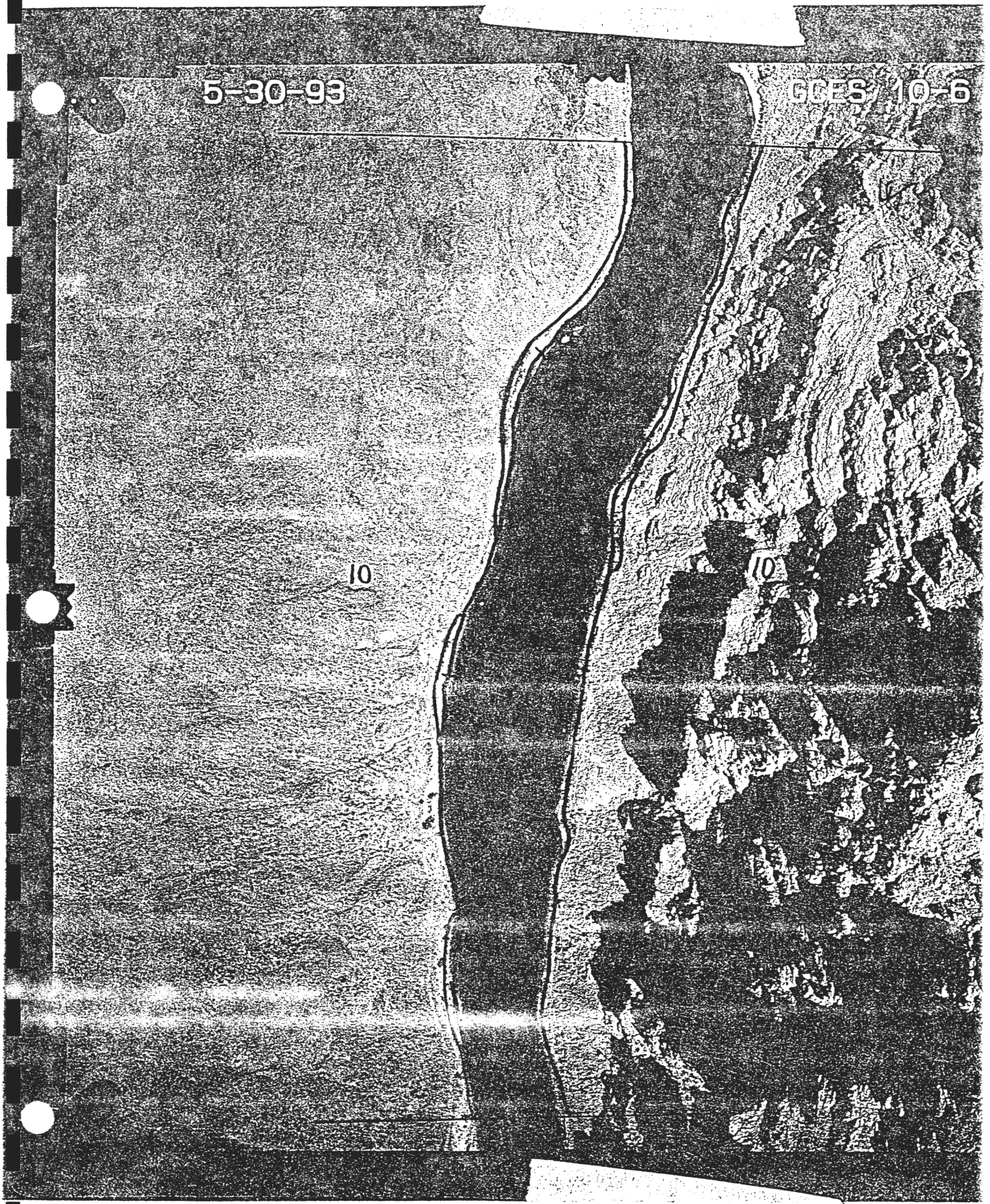
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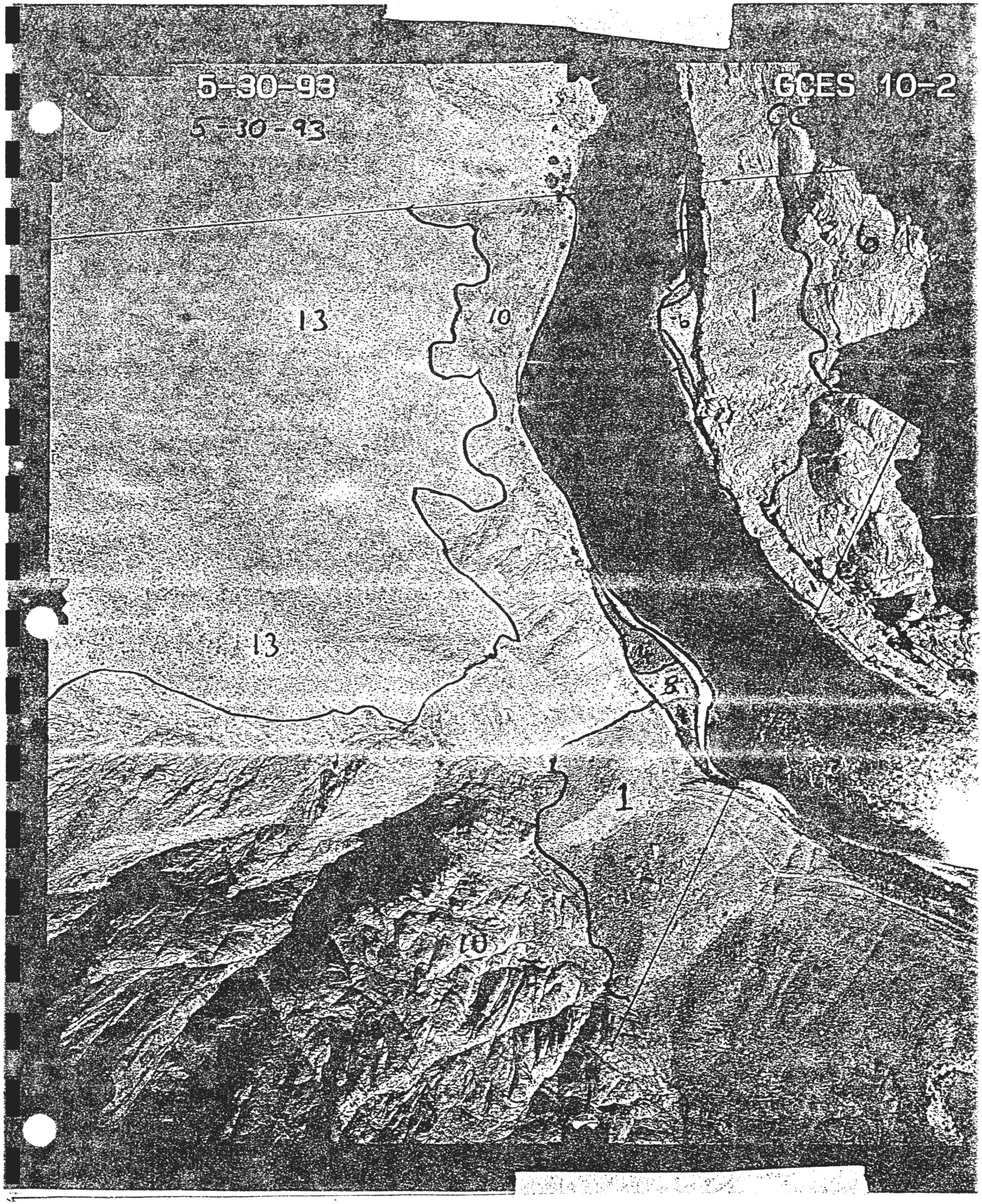
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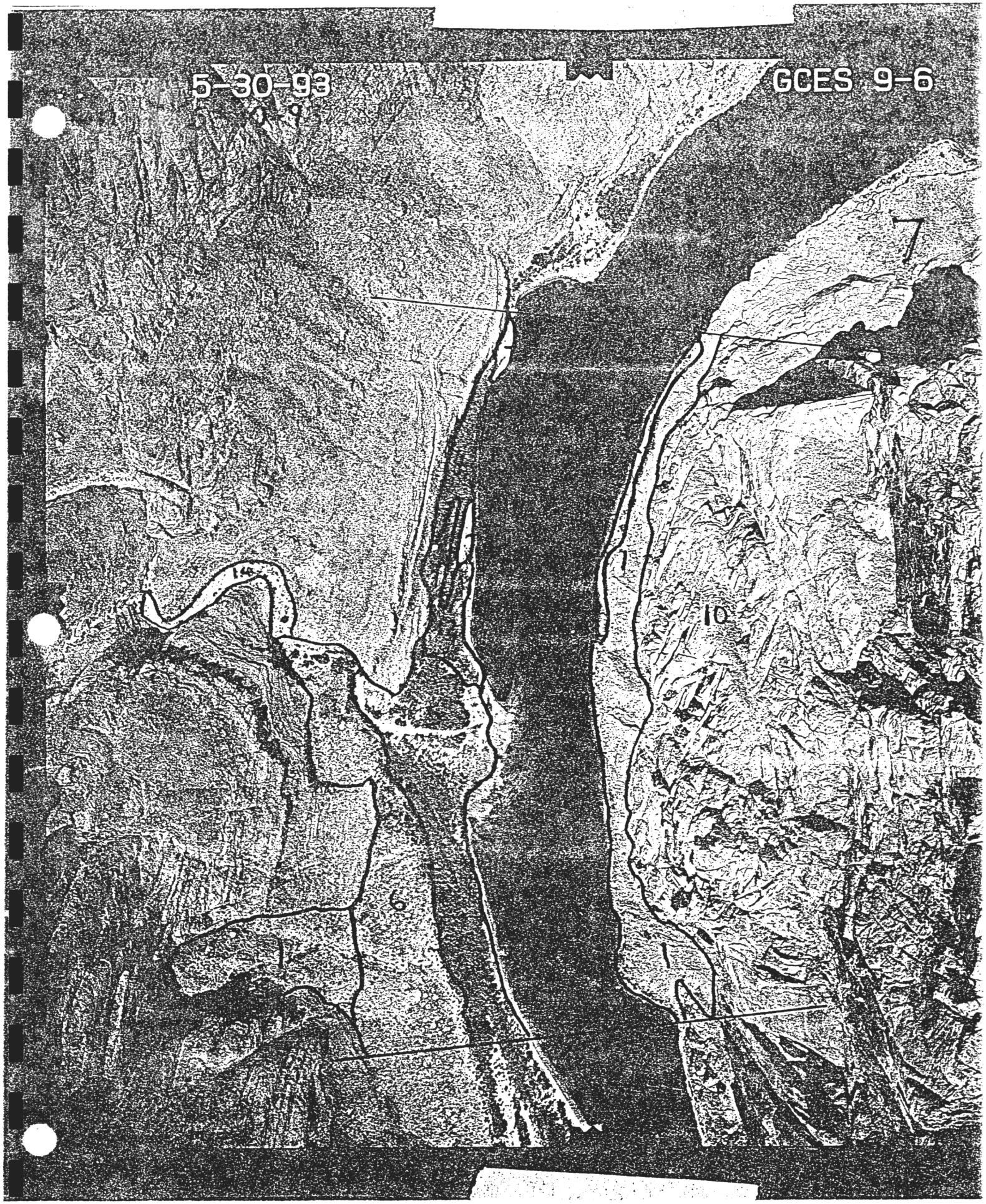
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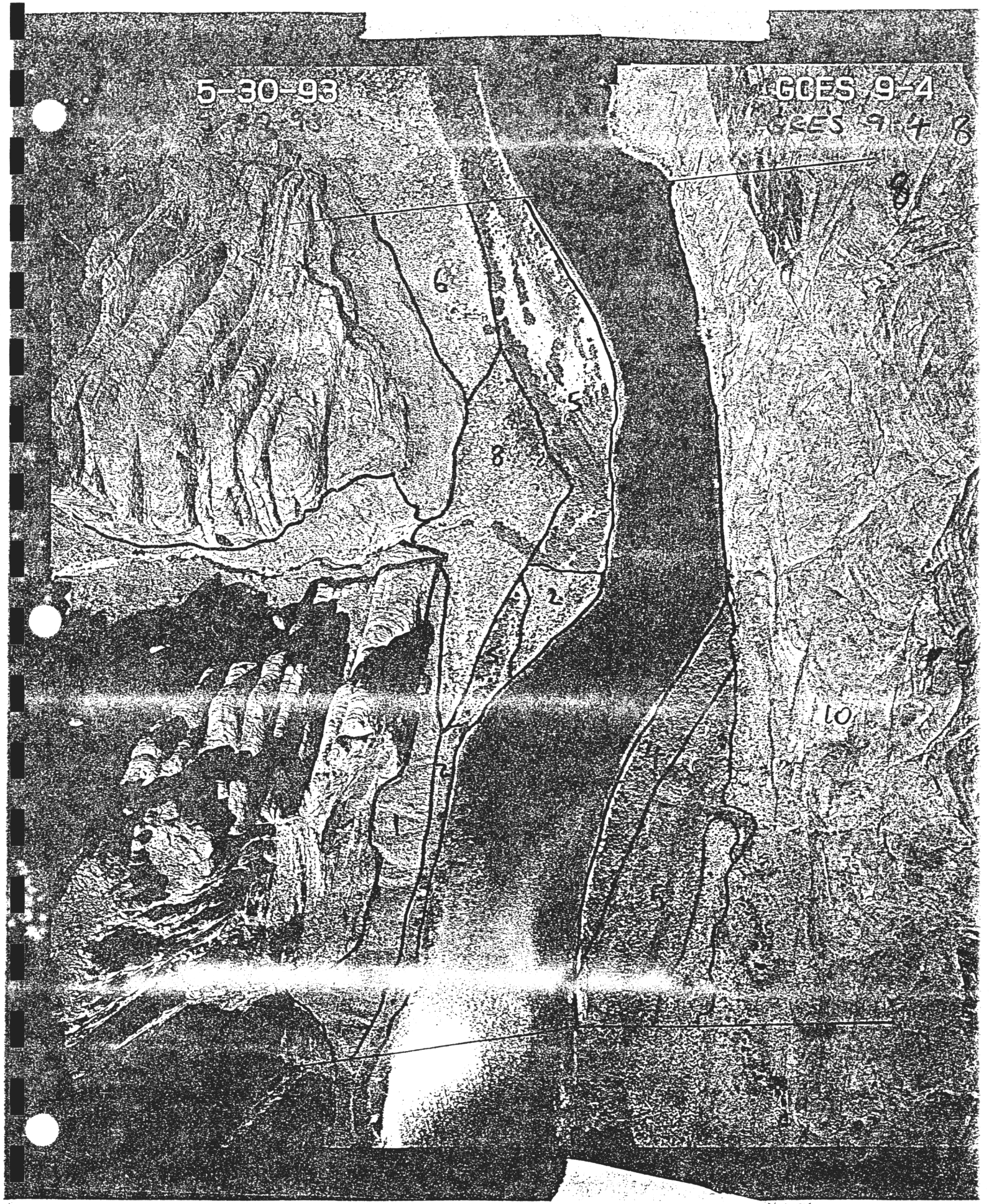
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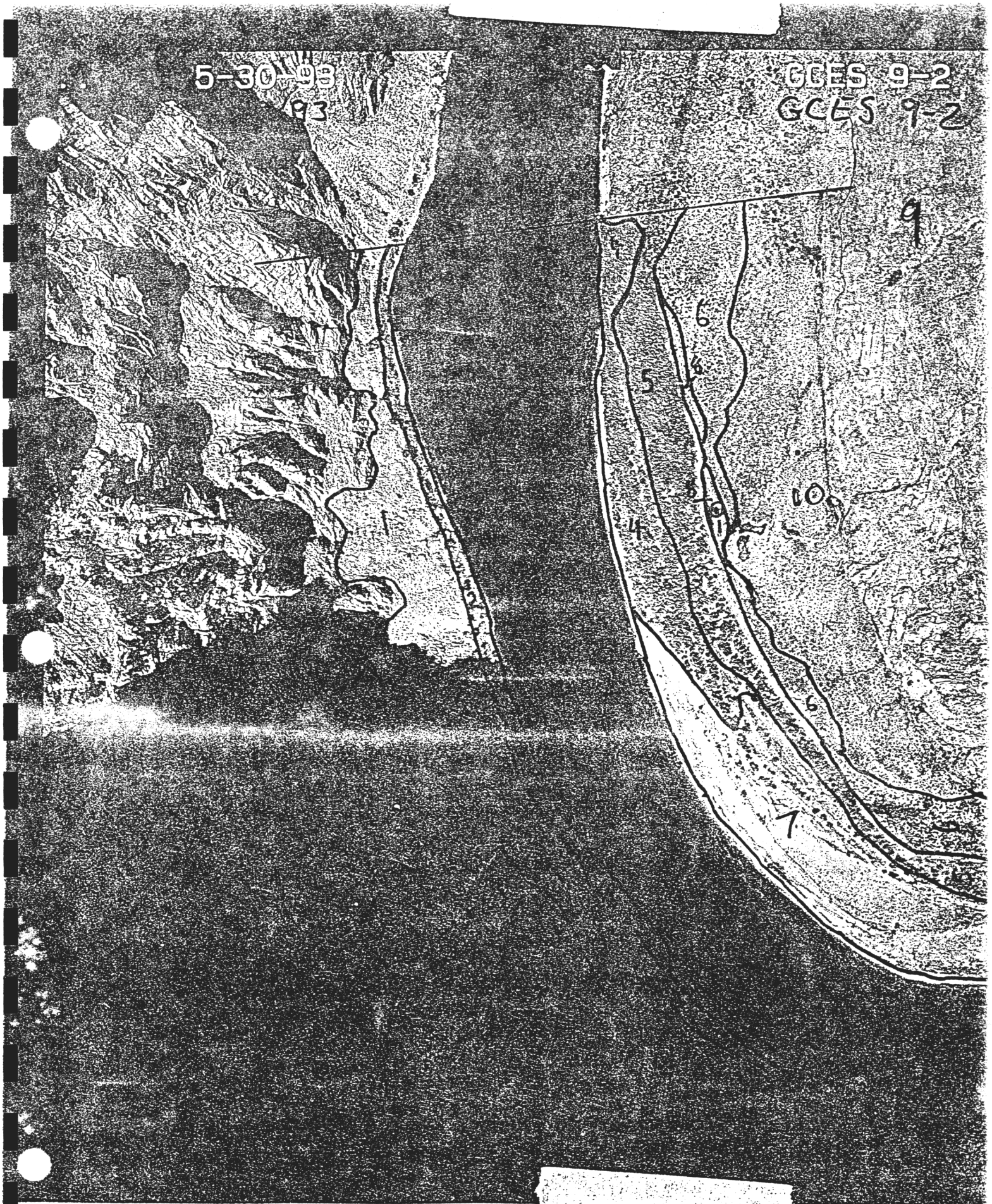
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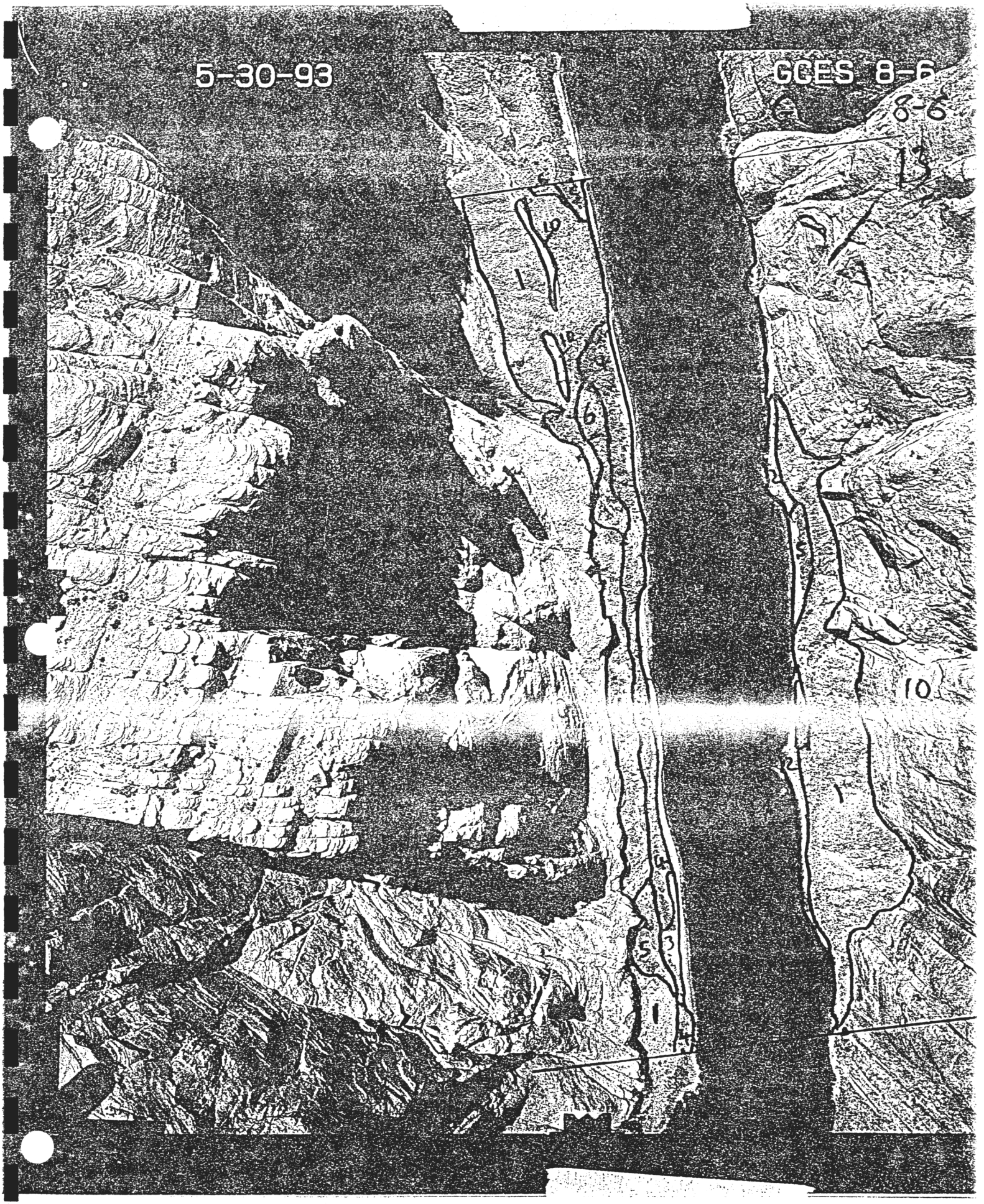
5-30-93
GOES 8-8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5-30-93

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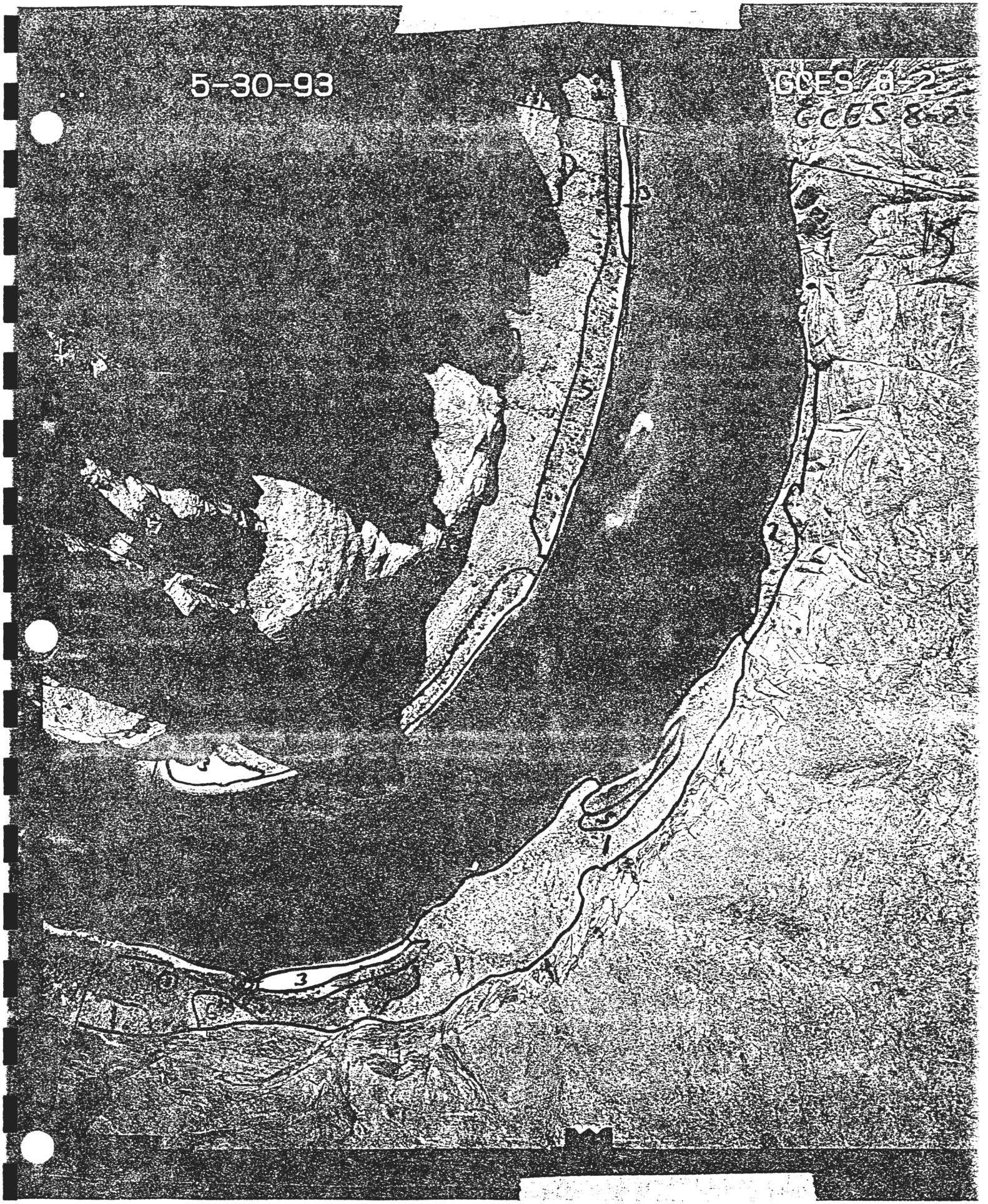
GOES 8-4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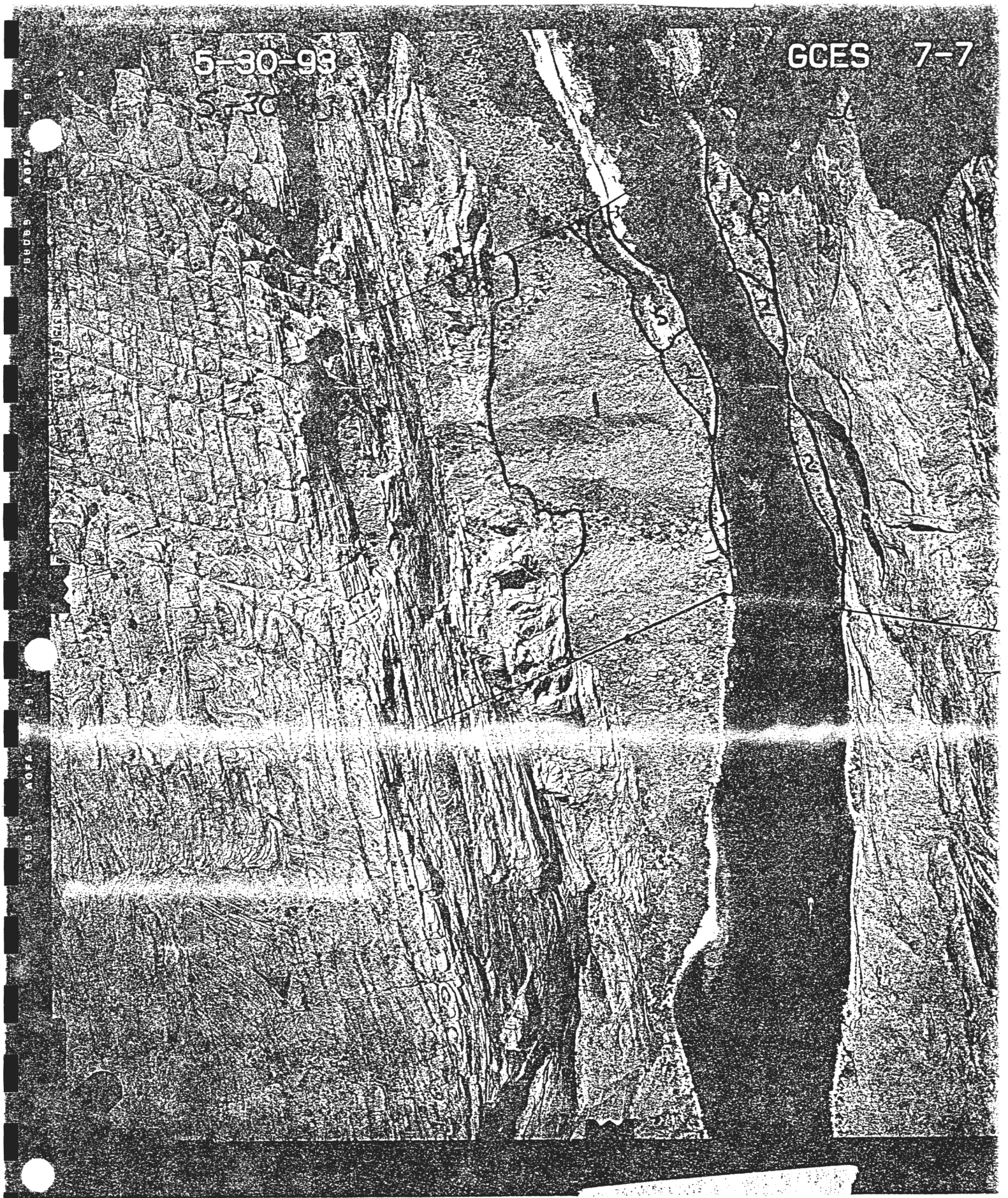
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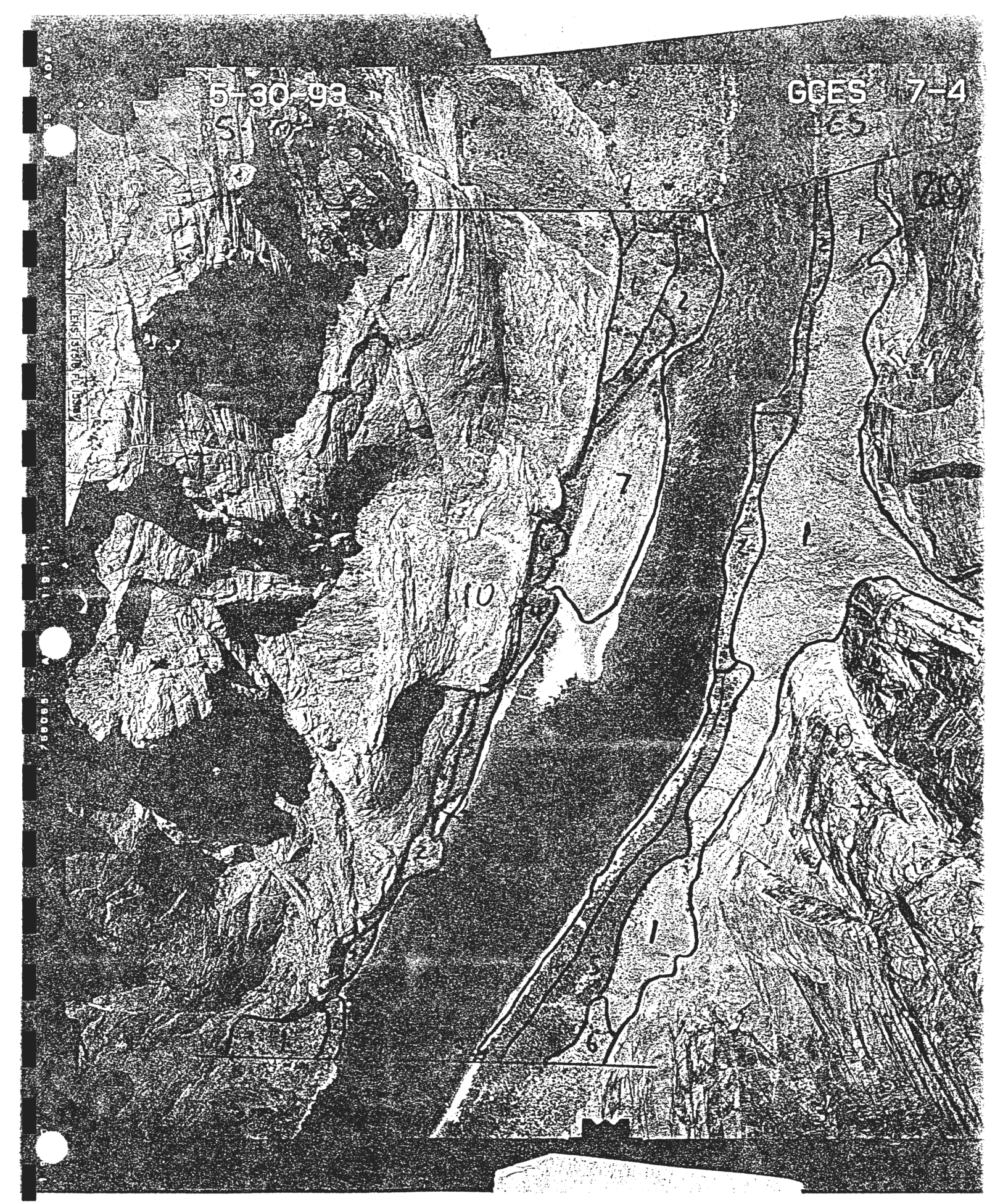
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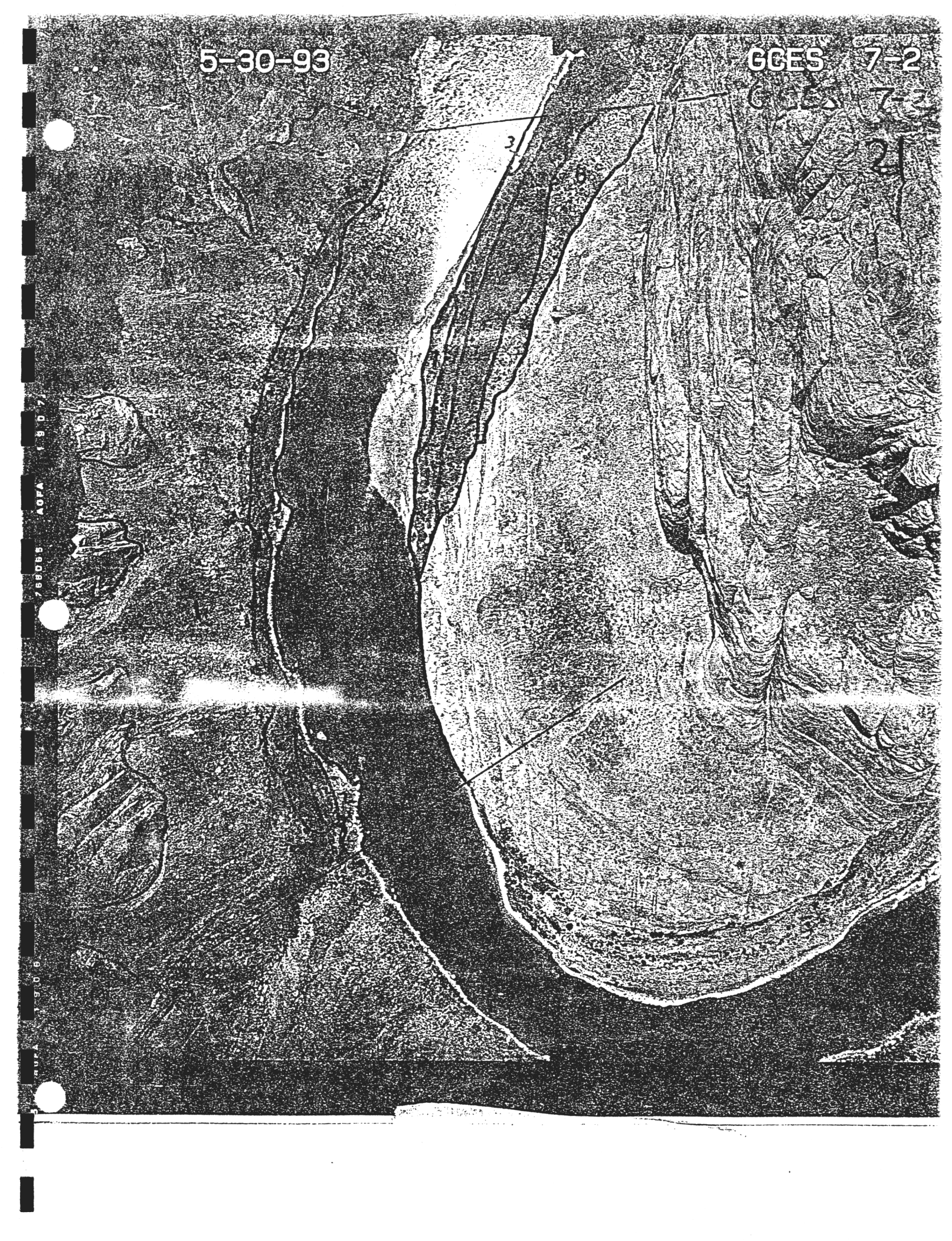
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GOES 6-2
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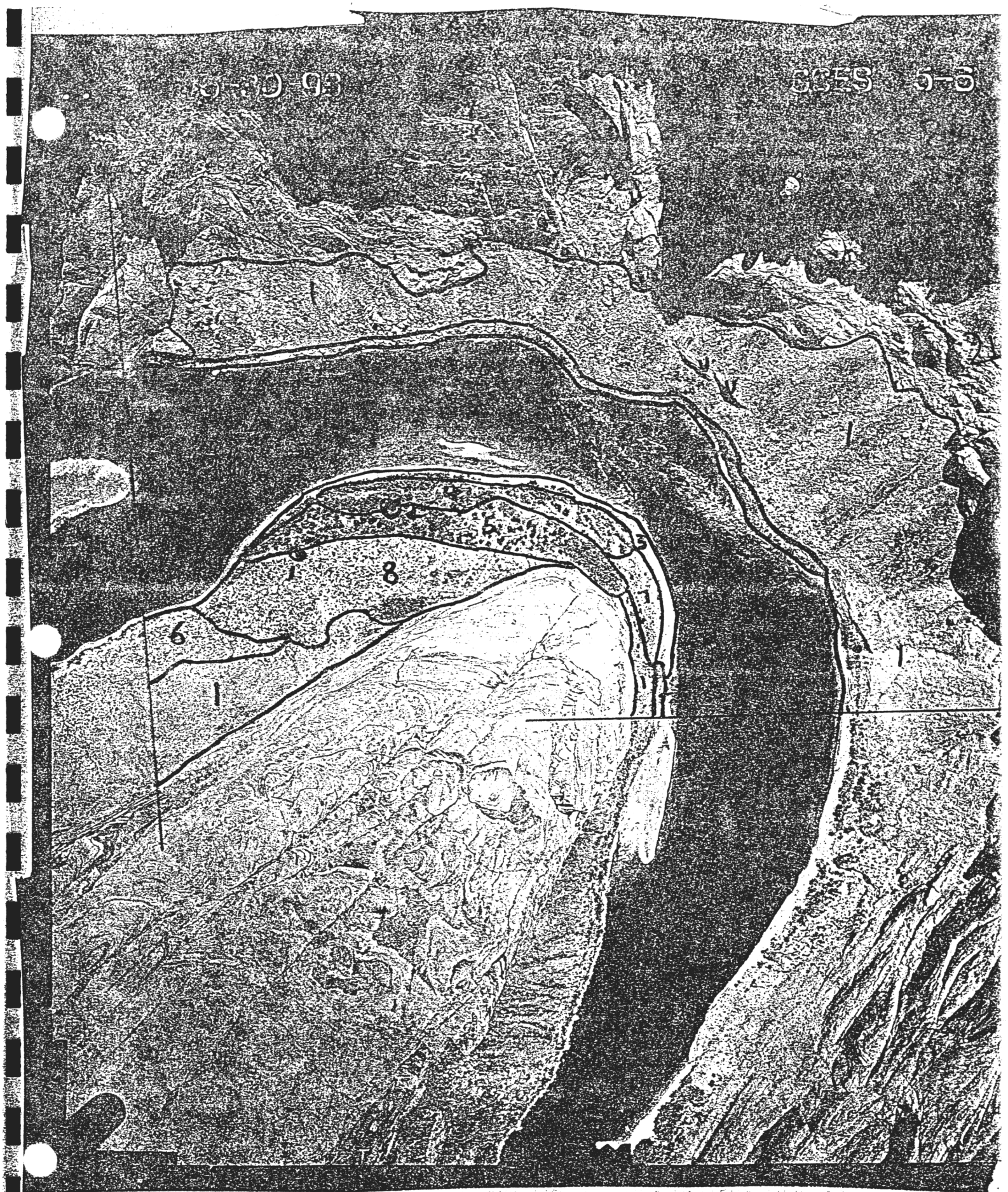
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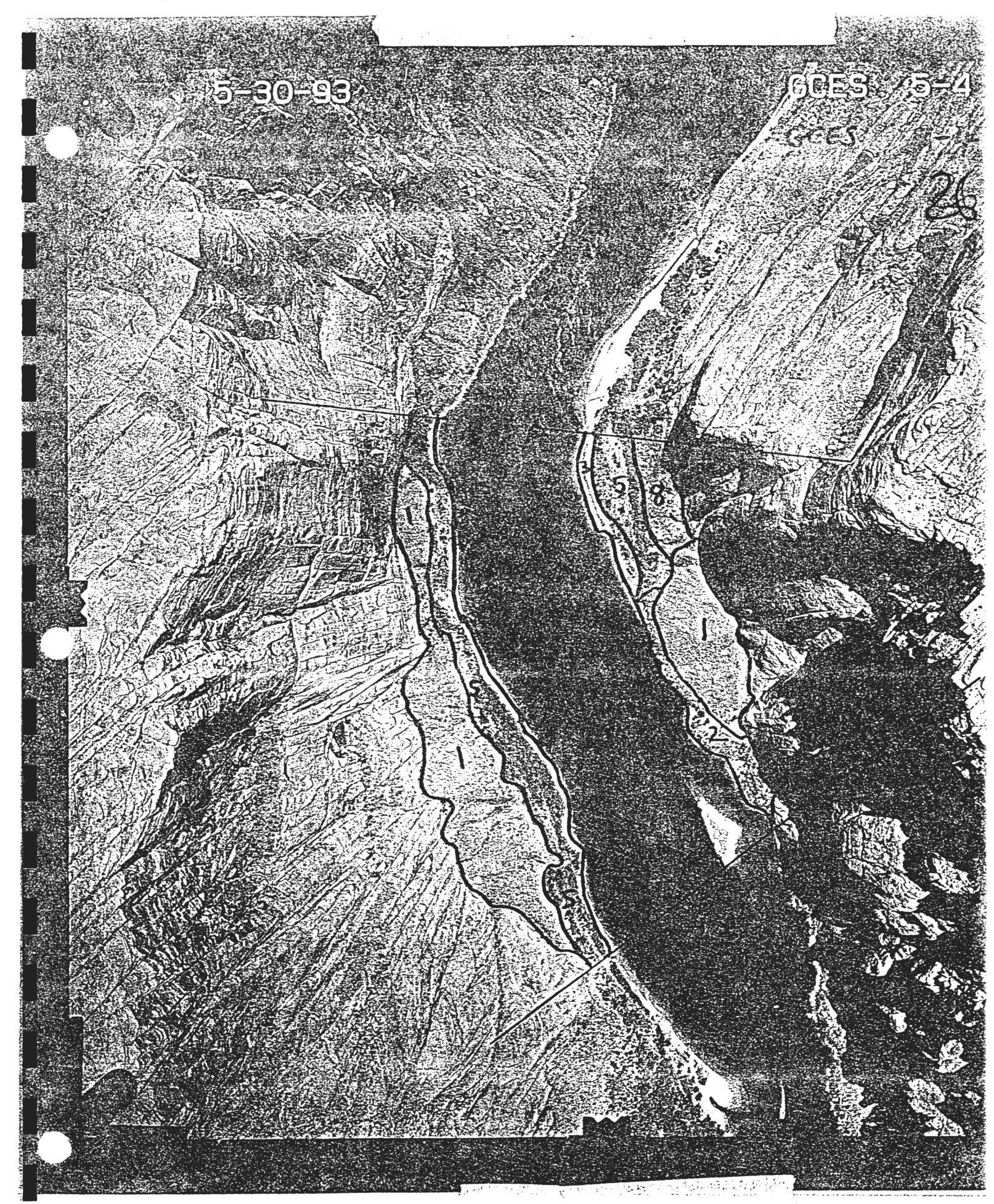
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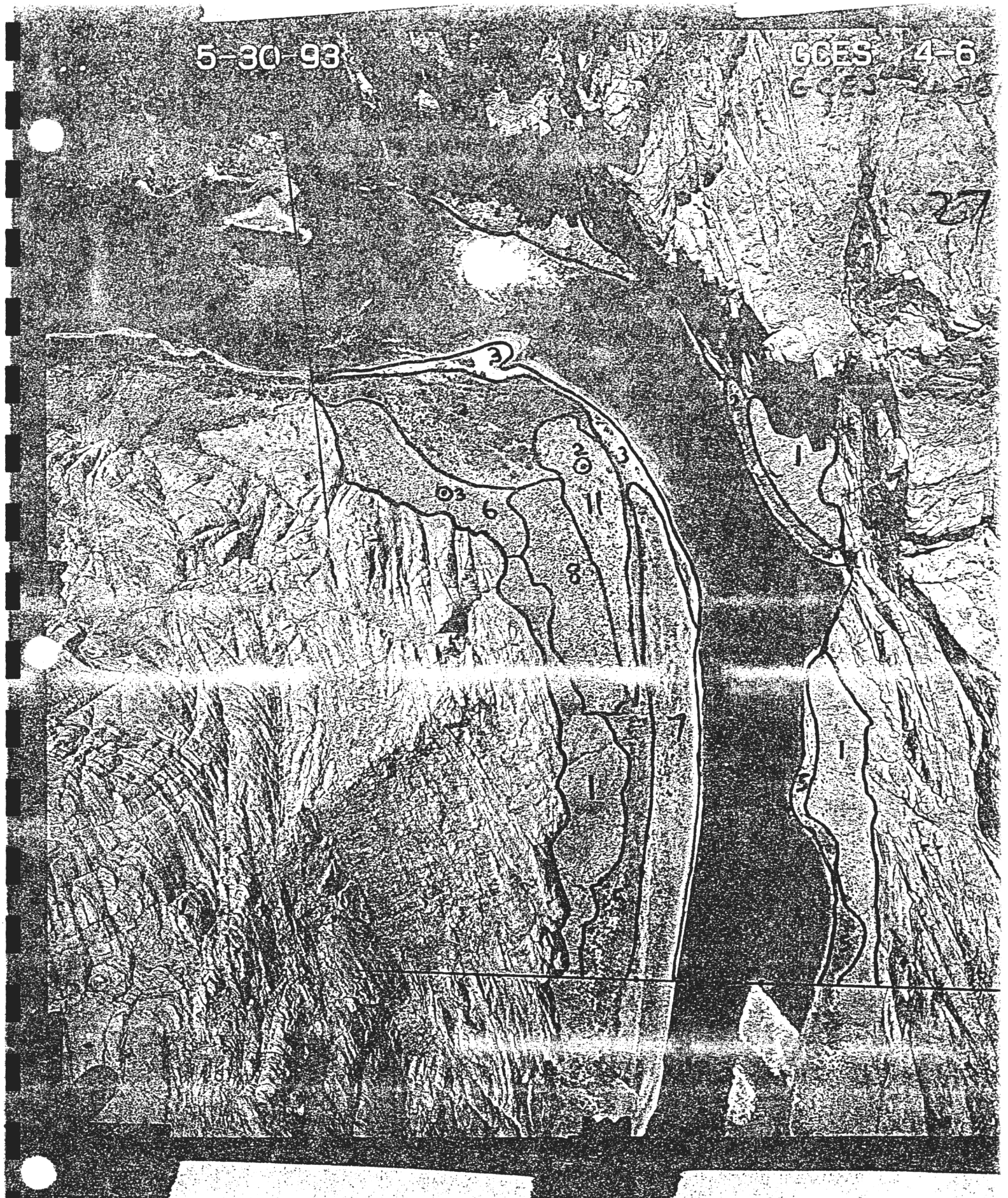
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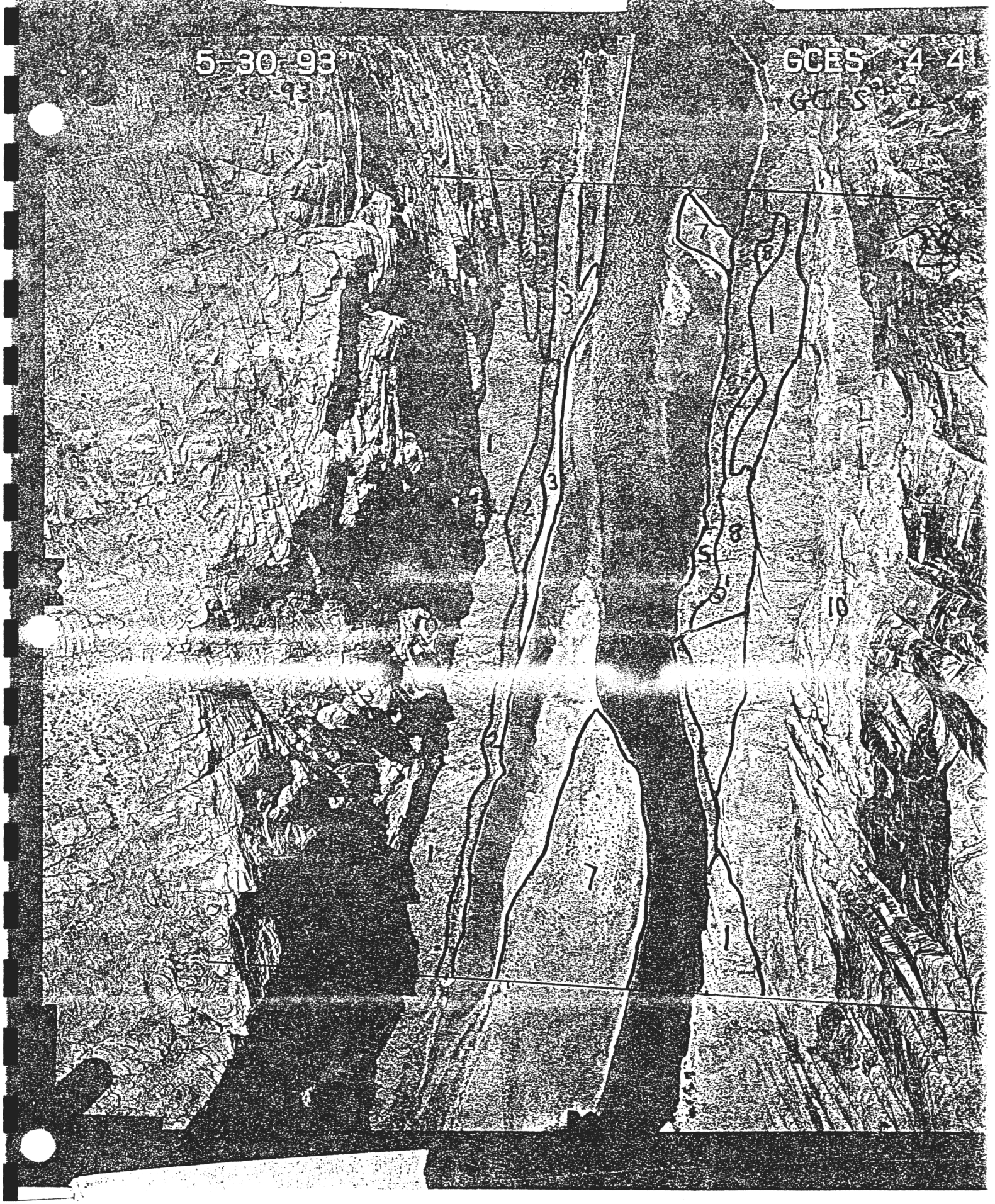
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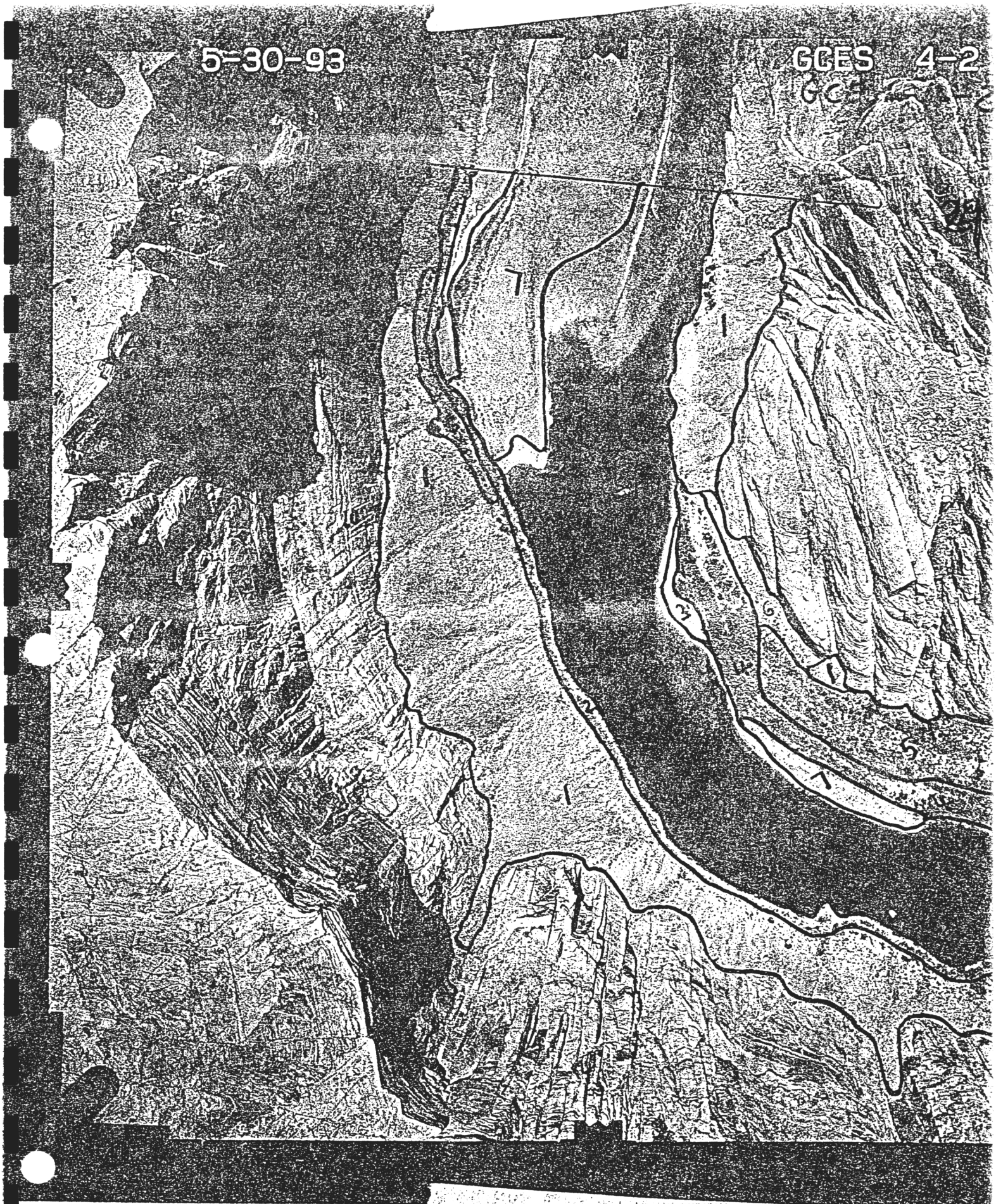
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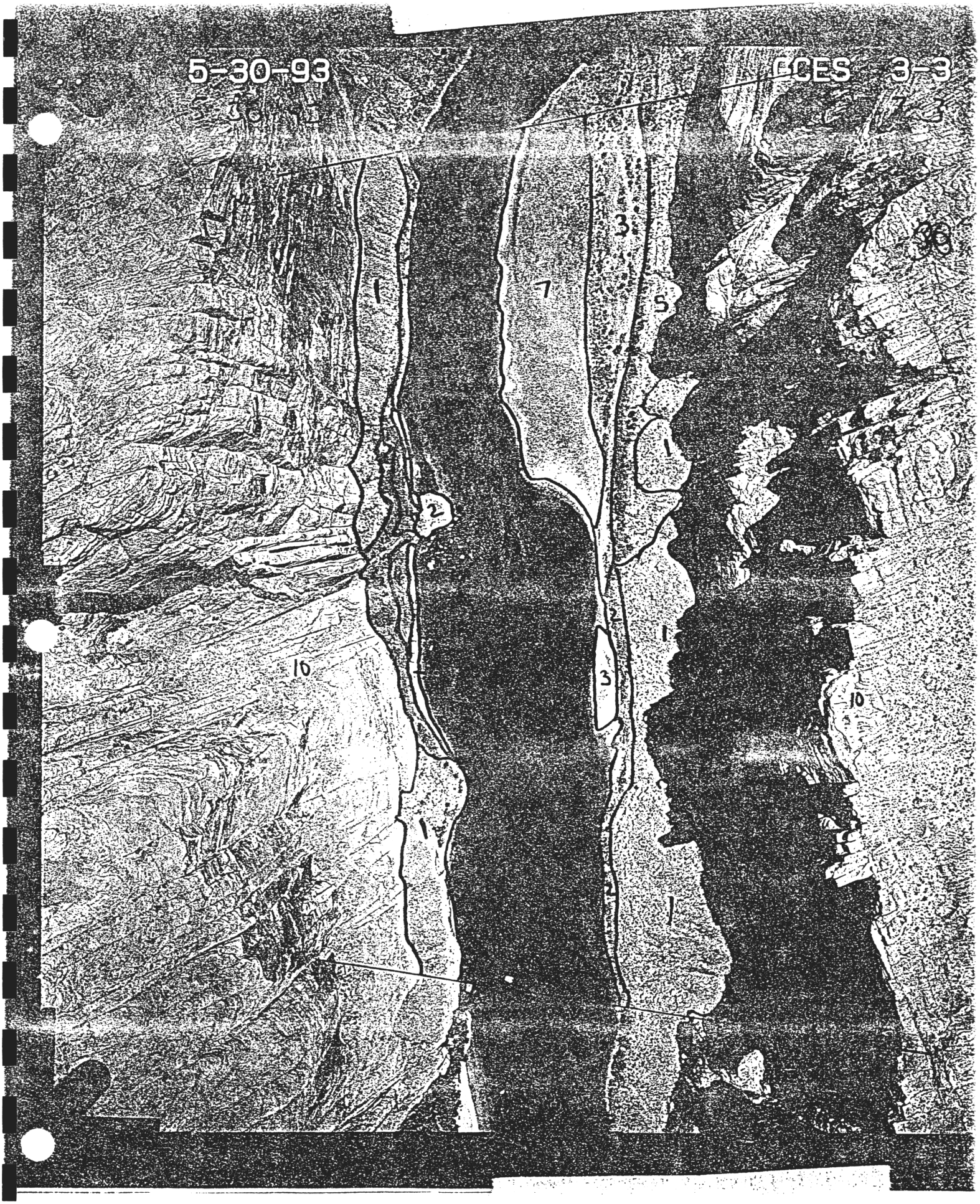
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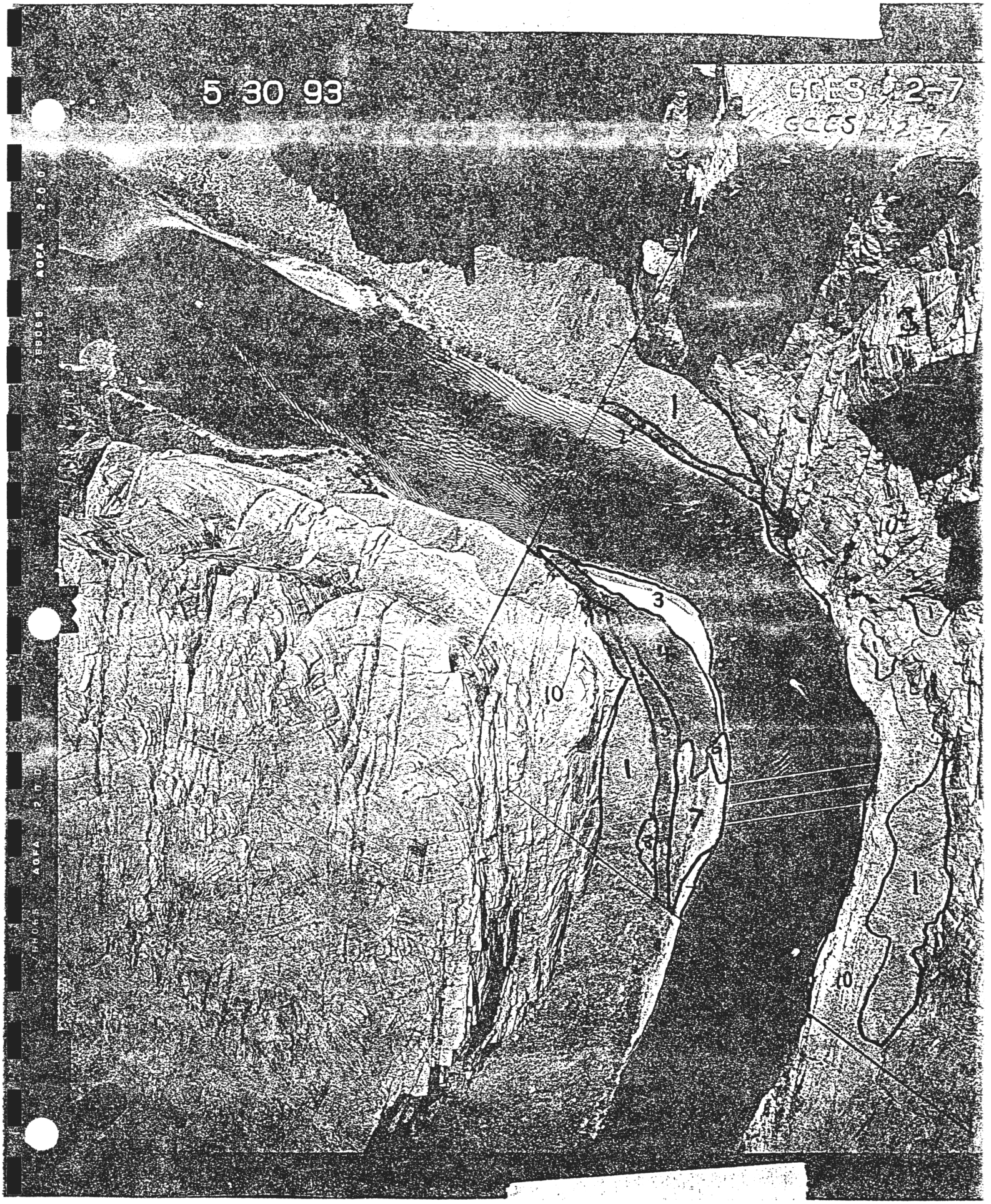
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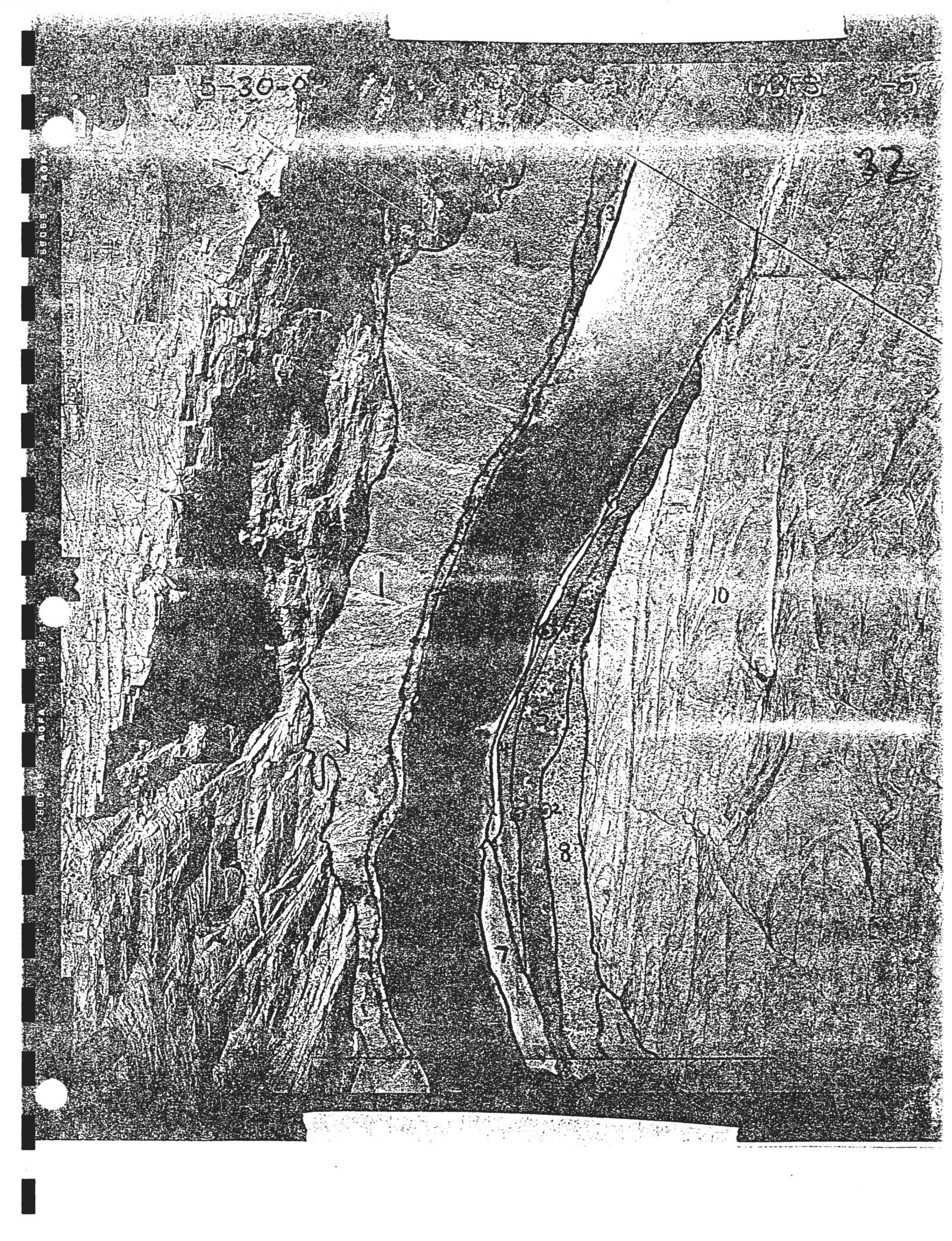
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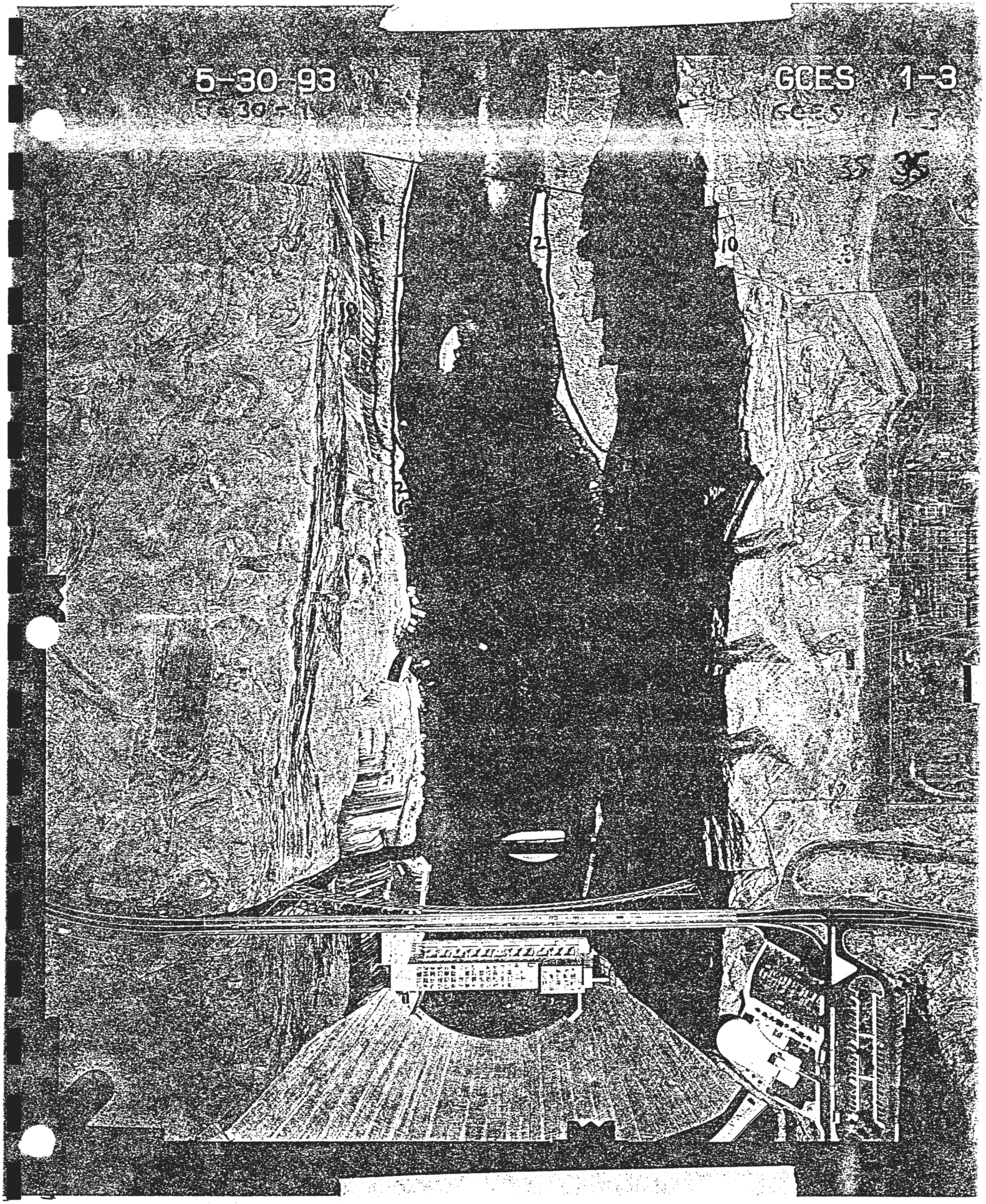
5-30-93

GOES - 1-5

34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GOES 1-3
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19

Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	
ADDRESS:	SOIL CONSERVATION BRUCE LINDSAY PO# :
GROWER:	
LAB NO.:	GLEN CANYON 93AS13051

SOIL FERTILITY REPORT

SAMPLE MARKING	2-1-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	15.0	EXCHANGEABLE SODIUM PERCENTAGE	37.8

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.7					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A			TOPDRESS		lbs/A
–	8			STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	34			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	332	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	384	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	1880					
EXCHANGEABLE SODIUM, ppm	1872					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

PLEASE NOTE SPECIAL COMMENTS ON BACK

Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13052

SOIL FERTILITY REPORT

SAMPLE MARKING	2-1-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.4	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	46.0	EXCHANGEABLE SODIUM PERCENTAGE	34.3

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	1.0				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS		lbs/A
	22		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	10		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	300	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	1152	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3032				
EXCHANGEABLE SODIUM, ppm	3040				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13053

SOIL FERTILITY REPORT

SAMPLE MARKING	2-1-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	64.0	EXCHANGEABLE SODIUM PERCENTAGE	45.1

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.8						lbs/A
ORGANIC NITROGEN	ppm	lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A			TOPDRESS		lbs/A
	26				STARTER		lbs/A
					FERTIGATION		lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	9				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	174		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	1476		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3752						
EXCHANGEABLE SODIUM, ppm	5920						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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5861 South Kyrene, Suite 15 Tempe, Arizona 85283
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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13054

SOIL FERTILITY REPORT

SAMPLE MARKING	2-1-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.4	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	50.0	EXCHANGEABLE SODIUM PERCENTAGE	38.8

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	1.1					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 34			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	7			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	114	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	800	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3376					
EXCHANGEABLE SODIUM, ppm	3456					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13055

SOIL FERTILITY REPORT

SAMPLE MARKING	2-1-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	5.0	EXCHANGEABLE SODIUM PERCENTAGE	4.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	1.3				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 19		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	9	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	157	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	547	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	4260				
EXCHANGEABLE SODIUM, ppm	262				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13056

SOIL FERTILITY REPORT

SAMPLE MARKING	2-2-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.0	EXCHANGEABLE SODIUM PERCENTAGE	1.3

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.6					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 19			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	74			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	344	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	150	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2027					
EXCHANGEABLE SODIUM, ppm	38					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13057

SOIL FERTILITY REPORT

SAMPLE MARKING	2-2-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.8	EXCHANGEABLE SODIUM PERCENTAGE	2.1

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth, in.	ppm	lbs/A		TOPDRESS			lbs/A
	7			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	39				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	992		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth, in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	179		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3148						
EXCHANGEABLE SODIUM, ppm	96						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13058

SOIL FERTILITY REPORT

SAMPLE MARKING	2-2-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.0	EXCHANGEABLE SODIUM PERCENTAGE	2.5

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 35			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	18			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	1320	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	294	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3308					
EXCHANGEABLE SODIUM, ppm	129					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13059

SOIL FERTILITY REPORT

SAMPLE MARKING	2-2-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.0	EXCHANGEABLE SODIUM PERCENTAGE	4.6

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.3				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 9		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	7	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	448	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	186	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2544				
EXCHANGEABLE SODIUM, ppm	171				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		
SOIL TEXTURE		% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13060

SOIL FERTILITY REPORT

SAMPLE MARKING	2-2-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.6	EXCHANGEABLE SODIUM PERCENTAGE	2.9

LAB TESTS		RESULT		SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %		0.3					lbs/A
ORGANIC NITROGEN		ppm	lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN	Depth. in.	ppm	lbs/A		TOPDRESS		lbs/A
		7			STARTER		lbs/A
					FERTIGATION		lbs/A
AVAILABLE NITROGEN				N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS	BRAY P1, ppm			P_2O_5	lbs/A	BROADCAST	
	BICARBONATE P, ppm	7			lbs/A		
EXCHANGEABLE POTASSIUM, ppm		452		K_2O	lbs/A		
SULFATE - SULFUR, ppm	Depth. in.			S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm		182		MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm		2776					
EXCHANGEABLE SODIUM, ppm		113					
AVAILABLE ZINC, ppm				Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm				Cu	lbs/A		
AVAILABLE IRON, ppm				Fe	lbs/A		
AVAILABLE MANGANESE, ppm				Mn	lbs/A		
AVAILABLE BORON, ppm				B	lbs/A		
LIME REQUIREMENT				Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT				Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13061

SOIL FERTILITY REPORT

SAMPLE MARKING	9-1-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	12.0	EXCHANGEABLE SODIUM PERCENTAGE	10.0

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 5			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	7			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	231	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	237	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3172					
EXCHANGEABLE SODIUM, ppm	472					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13062

SOIL FERTILITY REPORT

SAMPLE MARKING	9-1-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.4	EXCHANGEABLE SODIUM PERCENTAGE	2.0

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.3				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN (Depth. in.)	ppm / lbs/A: 5		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	14		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	536	K_2O	lbs/A		
SULFATE - SULFUR, ppm (Depth. in.)		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	291	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3092				
EXCHANGEABLE SODIUM, ppm	88				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13063

SOIL FERTILITY REPORT

SAMPLE MARKING	9-1-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	6.0	EXCHANGEABLE SODIUM PERCENTAGE	10.5

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.3						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	7			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	13				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	816		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	134		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3544						
EXCHANGEABLE SODIUM, ppm	564						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13064

SOIL FERTILITY REPORT

SAMPLE MARKING	9-1-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.6	EXCHANGEABLE SODIUM PERCENTAGE	0.7

LAB TESTS		RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %		0.4						lbs/A
ORGANIC NITROGEN		ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN	Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
		15			STARTER			lbs/A
					FERTIGATION			lbs/A
AVAILABLE NITROGEN				N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS	BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
	BICARBONATE P, ppm	37				lbs/A		
EXCHANGEABLE POTASSIUM, ppm		204		K_2O		lbs/A		
SULFATE - SULFUR, ppm	Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm		332		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm		2976						
EXCHANGEABLE SODIUM, ppm		29						
AVAILABLE ZINC, ppm				Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm				Cu		lbs/A		
AVAILABLE IRON, ppm				Fe		lbs/A		
AVAILABLE MANGANESE, ppm				Mn		lbs/A		
AVAILABLE BORON, ppm				B		lbs/A		
LIME REQUIREMENT				Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT				Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13065

SOIL FERTILITY REPORT

SAMPLE MARKING	9-1-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	17.0	EXCHANGEABLE SODIUM PERCENTAGE	21.8

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2						lbs/A
ORGANIC NITROGEN	ppm	lbs/A				SIDEDRESS	lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A				TOPDRESS	lbs/A
	6					STARTER	lbs/A
						FERTIGATION	lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	5				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	280		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	111		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3484						
EXCHANGEABLE SODIUM, ppm	1216						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13066

SOIL FERTILITY REPORT

SAMPLE MARKING	9-1-6	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	17.0	EXCHANGEABLE SODIUM PERCENTAGE	14.1

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN
ORGANIC MATTER, %	0.1			lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS	lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A 14		TOPDRESS	lbs/A
			STARTER	lbs/A
			FERTIGATION	lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	**BROADCAST**
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	7		lbs/A	
EXCHANGEABLE POTASSIUM, ppm	185	K_2O	lbs/A	
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A	
EXCHANGEABLE MAGNESIUM, ppm	435	MgO	lbs/A	
EXCHANGEABLE CALCIUM, ppm	2784			
EXCHANGEABLE SODIUM, ppm	676			
AVAILABLE ZINC, ppm		Zn	lbs/A	**STARTER**
AVAILABLE COPPER, ppm		Cu	lbs/A	
AVAILABLE IRON, ppm		Fe	lbs/A	
AVAILABLE MANGANESE, ppm		Mn	lbs/A	
AVAILABLE BORON, ppm		B	lbs/A	
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A	
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A	

SOIL TEXTURE	% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13067

SOIL FERTILITY REPORT

SAMPLE MARKING	12-1-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.9	EXCHANGEABLE SODIUM PERCENTAGE	1.1

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 5		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	12	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	224	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	232	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1631				
EXCHANGEABLE SODIUM, ppm	27				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13068

SOIL FERTILITY REPORT

SAMPLE MARKING	12-1-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.7	EXCHANGEABLE SODIUM PERCENTAGE	0.9

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth, in.	ppm / lbs/A 7		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	9		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	179	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth, in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	117	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2045				
EXCHANGEABLE SODIUM, ppm	25				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13089

SOIL FERTILITY REPORT

SAMPLE MARKING	12-1-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	11.0	EXCHANGEABLE SODIUM PERCENTAGE	25.3

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	5			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	6				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	123		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	125		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2884						
EXCHANGEABLE SODIUM, ppm	1224						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13070

SOIL FERTILITY REPORT

SAMPLE MARKING	12-1-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	60.0	EXCHANGEABLE SODIUM PERCENTAGE	43.0

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.4						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	31			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	9				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	103		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	476		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3884						
EXCHANGEABLE SODIUM, ppm	4096						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13071

SOIL FERTILITY REPORT

SAMPLE MARKING	12-1-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	42.0	EXCHANGEABLE SODIUM PERCENTAGE	10.8

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	1.0				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 16		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	8	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	206	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	1564	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3748				
EXCHANGEABLE SODIUM, ppm	892				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

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ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13072

SOIL FERTILITY REPORT

SAMPLE MARKING	12-1-6	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.8	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.0	EXCHANGEABLE SODIUM PERCENTAGE	7.8

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A 11		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	7	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	175	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	231	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	4528				
EXCHANGEABLE SODIUM, ppm	488				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		
SOIL TEXTURE		% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13078

SOIL FERTILITY REPORT

SAMPLE MARKING	15-1-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.6	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.0	EXCHANGEABLE SODIUM PERCENTAGE	1.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	1.0				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 6		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	65		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	229	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	103	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2616				
EXCHANGEABLE SODIUM, ppm	39				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13079

SOIL FERTILITY REPORT

SAMPLE MARKING	15--1-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.8	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.1	EXCHANGEABLE SODIUM PERCENTAGE	3.1

LAB TESTS		RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %		0.9						lbs/A
ORGANIC NITROGEN		ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.		ppm	lbs/A		TOPDRESS			lbs/A
		27			STARTER			lbs/A
					FERTIGATION			lbs/A
AVAILABLE NITROGEN				N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS	BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
	BICARBONATE P, ppm	26				lbs/A		
EXCHANGEABLE POTASSIUM, ppm		179		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.				S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm		166		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm		3240						
EXCHANGEABLE SODIUM, ppm		132						
AVAILABLE ZINC, ppm				Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm				Cu		lbs/A		
AVAILABLE IRON, ppm				Fe		lbs/A		
AVAILABLE MANGANESE, ppm				Mn		lbs/A		
AVAILABLE BORON, ppm				B		lbs/A		
LIME REQUIREMENT				Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT				Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13080

SOIL FERTILITY REPORT

SAMPLE MARKING	15-1-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.9	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.4	EXCHANGEABLE SODIUM PERCENTAGE	15.0

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.8				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 94		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	17		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	133	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	147	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3192				
EXCHANGEABLE SODIUM, ppm	708				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE	% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13081

SOIL FERTILITY REPORT

SAMPLE MARKING	15-1-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.9	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	9.0	EXCHANGEABLE SODIUM PERCENTAGE	22.9

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.9				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A 54		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	12		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	169	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	254	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3604				
EXCHANGEABLE SODIUM, ppm	1400				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13082

SOIL FERTILITY REPORT

SAMPLE MARKING	15-1-5	CROP		DATE RECEIVED	09/22/93		
		YIELD GOAL		DATE REPORTED	09/29/93		
SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	7.0
EXCHANGEABLE SODIUM PERCENTAGE	19.4						

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 7		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	5		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	32	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	311	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2062				
EXCHANGEABLE SODIUM, ppm	716				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

PLEASE NOTE SPECIAL COMMENTS ON BACK

Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13083

SOIL FERTILITY REPORT

SAMPLE MARKING	15-1-6	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	3.5	EXCHANGEABLE SODIUM PERCENTAGE	7.5

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.7						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	24			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	7				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	63		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	876		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3304						
EXCHANGEABLE SODIUM, ppm	444						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13089

SOIL FERTILITY REPORT

SAMPLE MARKING	15-2-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	9.0	EXCHANGEABLE SODIUM PERCENTAGE	7.5

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	1.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 25		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	67	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	728	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	300	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2508				
EXCHANGEABLE SODIUM, ppm	316				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13090

SOIL FERTILITY REPORT

SAMPLE MARKING	15-2-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.9	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	24.0	EXCHANGEABLE SODIUM PERCENTAGE	18.7

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	1.4				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A 100		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	23	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	616	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	578	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3070				
EXCHANGEABLE SODIUM, ppm	1144				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13091

SOIL FERTILITY REPORT

SAMPLE MARKING	15-2-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.0	EXCHANGEABLE SODIUM PERCENTAGE	4.9

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	1.0						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	14			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	22				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	404		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	203		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2790						
EXCHANGEABLE SODIUM, ppm	195						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13092

SOIL FERTILITY REPORT

SAMPLE MARKING	15-2-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	3.8	EXCHANGEABLE SODIUM PERCENTAGE	11.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.7					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 17			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	10			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	100	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	321	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3206					
EXCHANGEABLE SODIUM, ppm	548					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13093

SOIL FERTILITY REPORT

SAMPLE MARKING	15-2-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.8	EXCHANGEABLE SODIUM PERCENTAGE	6.3

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.9						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	10			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	16				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	75		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	377		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3152						
EXCHANGEABLE SODIUM, ppm	292						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13073

SOIL FERTILITY REPORT

SAMPLE MARKING	15-3-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.8	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.9	EXCHANGEABLE SODIUM PERCENTAGE	0.5

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.7				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 7		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	51		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	186	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	1136	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1874				
EXCHANGEABLE SODIUM, ppm	24				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13074

SOIL FERTILITY REPORT

SAMPLE MARKING	15-3-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.4	EXCHANGEABLE SODIUM PERCENTAGE	0.4

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A			TOPDRESS		lbs/A
	5			STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	13			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	105	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	788	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	1993					
EXCHANGEABLE SODIUM, ppm	15					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13075

SOIL FERTILITY REPORT

SAMPLE MARKING	15-3-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.8	EXCHANGEABLE SODIUM PERCENTAGE	0.7

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A			TOPDRESS		lbs/A
	6			STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
BICARBONATE P, ppm	12			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	174	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	102	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2193					
EXCHANGEABLE SODIUM, ppm	21					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13076

SOIL FERTILITY REPORT

SAMPLE MARKING	15-3-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.8	EXCHANGEABLE SODIUM PERCENTAGE	0.7

LAB TESTS		RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %		0.3					lbs/A
ORGANIC NITROGEN		ppm / lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN	Depth, in.	ppm / lbs/A 7		TOPDRESS			lbs/A
				STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS	BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
	BICARBONATE P, ppm	11			lbs/A		
EXCHANGEABLE POTASSIUM, ppm		78	K_2O		lbs/A		
SULFATE - SULFUR, ppm	Depth, in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm		93	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm		2480					
EXCHANGEABLE SODIUM, ppm		23					
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		
SOIL TEXTURE				% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13077

SOIL FERTILITY REPORT

SAMPLE MARKING	15-3-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.8	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.6	EXCHANGEABLE SODIUM PERCENTAGE	0.9

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS		lbs/A
	13		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	12		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	63	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	106	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3040				
EXCHANGEABLE SODIUM, ppm	33				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13084

SOIL FERTILITY REPORT

SAMPLE MARKING	24-1-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.8	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.8	EXCHANGEABLE SODIUM PERCENTAGE	0.5

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	1.2					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 12			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	77			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	312	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	391	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3056					
EXCHANGEABLE SODIUM, ppm	23					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE	% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13085

SOIL FERTILITY REPORT

SAMPLE MARKING	24-1-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.6	EXCHANGEABLE SODIUM PERCENTAGE	0.5

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	10			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	16				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	632		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	536		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2852						
EXCHANGEABLE SODIUM, ppm	22						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13086

SOIL FERTILITY REPORT

SAMPLE MARKING	24-1-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.8	EXCHANGEABLE SODIUM PERCENTAGE	2.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.4				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth, in.	ppm / lbs/A: 67		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	23	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	736	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth, in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	422	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3554				
EXCHANGEABLE SODIUM, ppm	119				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE	% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13087

SOIL FERTILITY REPORT

SAMPLE MARKING	24-1-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.0	EXCHANGEABLE SODIUM PERCENTAGE	1.6

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.3				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth, in.	ppm / lbs/A 26		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	9		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	452	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth, in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	288	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3024				
EXCHANGEABLE SODIUM, ppm	69				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13088

SOIL FERTILITY REPORT

SAMPLE MARKING	24-1-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.2	EXCHANGEABLE SODIUM PERCENTAGE	1.5

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	30			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	7				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	261		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	254		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2640						
EXCHANGEABLE SODIUM, ppm	57						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13126

SOIL FERTILITY REPORT

SAMPLE MARKING	24-2-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.2	EXCHANGEABLE SODIUM PERCENTAGE	2.1

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 10		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	34		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	160	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth, in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	155	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1360				
EXCHANGEABLE SODIUM, ppm	42				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13127

SOIL FERTILITY REPORT

SAMPLE MARKING	24-2-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.0	EXCHANGEABLE SODIUM PERCENTAGE	0.9

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A 10		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	11		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	302	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	139	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1617				
EXCHANGEABLE SODIUM, ppm	20				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13128

SOIL FERTILITY REPORT

SAMPLE MARKING	24-2-3	CROP		DATE RECEIVED	09/22/93		
		YIELD GOAL		DATE REPORTED	09/29/93		
SATURATION PERCENTAGE		SOIL pH	8.6	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.8
EXCHANGEABLE SODIUM PERCENTAGE	1.2						

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS		lbs/A
	6		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	28		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	464	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	102	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1812				
EXCHANGEABLE SODIUM, ppm	30				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13129

SOIL FERTILITY REPORT

SAMPLE MARKING	24-2-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.0	EXCHANGEABLE SODIUM PERCENTAGE	1.0

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN (Depth. in.)	ppm / lbs/A: 10		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	36		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	684	K_2O	lbs/A		
SULFATE - SULFUR, ppm (Depth. in.)		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	120	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2304				
EXCHANGEABLE SODIUM, ppm	32				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE	% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# : 6
GROWER:	GLEN CANYON
LAB NO.:	93AS13130

SOIL FERTILITY REPORT

SAMPLE MARKING	24-2-5	CROP		DATE RECEIVED	09/22/93		
		YIELD GOAL		DATE REPORTED	09/29/93		
SATURATION PERCENTAGE		SOIL pH	7.9	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.8
EXCHANGEABLE SODIUM PERCENTAGE	2.9						

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 20			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL		lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST		
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	6		lbs/A			
EXCHANGEABLE POTASSIUM, ppm	43	K_2O	lbs/A			
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A			
EXCHANGEABLE MAGNESIUM, ppm	99	MgO	lbs/A			
EXCHANGEABLE CALCIUM, ppm	1862					
EXCHANGEABLE SODIUM, ppm	69					
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER		
AVAILABLE COPPER, ppm		Cu	lbs/A			
AVAILABLE IRON, ppm		Fe	lbs/A			
AVAILABLE MANGANESE, ppm		Mn	lbs/A			
AVAILABLE BORON, ppm		B	lbs/A			
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A			
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A			

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13100

SOIL FERTILITY REPORT

SAMPLE MARKING	27-1-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.0	EXCHANGEABLE SODIUM PERCENTAGE	0.6

LAB TESTS		RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %		0.8						lbs/A
ORGANIC NITROGEN		ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN	Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
		11			STARTER			lbs/A
					FERTIGATION			lbs/A
AVAILABLE NITROGEN				N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS	BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
	BICARBONATE P, ppm	37				lbs/A		
EXCHANGEABLE POTASSIUM, ppm		350		K_2O		lbs/A		
SULFATE - SULFUR, ppm	Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm		113		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm		1855						
EXCHANGEABLE SODIUM, ppm		15						
AVAILABLE ZINC, ppm				Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm				Cu		lbs/A		
AVAILABLE IRON, ppm				Fe		lbs/A		
AVAILABLE MANGANESE, ppm				Mn		lbs/A		
AVAILABLE BORON, ppm				B		lbs/A		
LIME REQUIREMENT				Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT				Gypsum (100% basis)		Tons/A		
SOIL TEXTURE					% SAND		% SILT	% CLAY

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13101

SOIL FERTILITY REPORT

SAMPLE MARKING	27-1-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.4	EXCHANGEABLE SODIUM PERCENTAGE	0.4

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.4				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth, in.	ppm / lbs/A		TOPDRESS		lbs/A
	5		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	19		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	154	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth, in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	164	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2484				
EXCHANGEABLE SODIUM, ppm	12				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13102

SOIL FERTILITY REPORT

SAMPLE MARKING	27-1-3	CROP		DATE RECEIVED	09/22/93		
		YIELD GOAL		DATE REPORTED	09/29/93		
SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.5
EXCHANGEABLE SODIUM PERCENTAGE	0.4						

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.3					lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth, in.	ppm	lbs/A		TOPDRESS		lbs/A
	4			STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN			N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm			P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	12			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	246		K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth, in.			S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	188		MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2610					
EXCHANGEABLE SODIUM, ppm	15					
AVAILABLE ZINC, ppm			Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu	lbs/A		
AVAILABLE IRON, ppm			Fe	lbs/A		
AVAILABLE MANGANESE, ppm			Mn	lbs/A		
AVAILABLE BORON, ppm			B	lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)	Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13103

SOIL FERTILITY REPORT

SAMPLE MARKING	27-1-4	CROP		DATE RECEIVED	09/22/93		
		YIELD GOAL		DATE REPORTED	09/29/93		
SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.7
EXCHANGEABLE SODIUM PERCENTAGE	2.8						

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.7				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 5		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	13	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	472	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	334	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3102				
EXCHANGEABLE SODIUM, ppm	127				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		
SOIL TEXTURE		% SAND		% SILT	% CLAY

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ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13104

SOIL FERTILITY REPORT

SAMPLE MARKING	27-1-5	CROP		DATE RECEIVED	09/22/93		
		YIELD GOAL		DATE REPORTED	09/29/93		
SATURATION PERCENTAGE		SOIL pH	8.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.2
EXCHANGEABLE SODIUM PERCENTAGE	10.5						

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.3				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A 5		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	10		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	330	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	278	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2948				
EXCHANGEABLE SODIUM, ppm	482				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT	% CLAY

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ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13105

SOIL FERTILITY REPORT

SAMPLE MARKING	27-1-6	CROP		DATE RECEIVED	09/22/93		
		YIELD GOAL		DATE REPORTED	09/29/93		
SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	8.0
EXCHANGEABLE SODIUM PERCENTAGE	10.7						

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 6			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL		lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST		
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	11		lbs/A			
EXCHANGEABLE POTASSIUM, ppm	235	K_2O	lbs/A			
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A			
EXCHANGEABLE MAGNESIUM, ppm	227	MgO	lbs/A			
EXCHANGEABLE CALCIUM, ppm	2765					
EXCHANGEABLE SODIUM, ppm	448					
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER		
AVAILABLE COPPER, ppm		Cu	lbs/A			
AVAILABLE IRON, ppm		Fe	lbs/A			
AVAILABLE MANGANESE, ppm		Mn	lbs/A			
AVAILABLE BORON, ppm		B	lbs/A			
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A			
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A			

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13117

SOIL FERTILITY REPORT

SAMPLE MARKING	27-2-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.2	EXCHANGEABLE SODIUM PERCENTAGE	0.6

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	1.0						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
Depth. in. NITRATE - NITROGEN	ppm	lbs/A		TOPDRESS			lbs/A
	22			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	66				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	302		K_2O		lbs/A		
Depth. in. SULFATE - SULFUR, ppm			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	196		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2734						
EXCHANGEABLE SODIUM, ppm	23						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13118

SOIL FERTILITY REPORT

SAMPLE MARKING	27-2-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.0	EXCHANGEABLE SODIUM PERCENTAGE	4.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	1.0				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth, in.	ppm / lbs/A: 77		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	98		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	396	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth, in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	247	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2764				
EXCHANGEABLE SODIUM, ppm	171				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13119

SOIL FERTILITY REPORT

SAMPLE MARKING	27-2-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	28.0	EXCHANGEABLE SODIUM PERCENTAGE	13.8

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.7				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 192		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	15	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	2304	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	297	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3332				
EXCHANGEABLE SODIUM, ppm	920				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13120

SOIL FERTILITY REPORT

SAMPLE MARKING	27-2-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.9	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.6	EXCHANGEABLE SODIUM PERCENTAGE	18.7

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.3						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	96			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	7				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	132		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	441		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2952						
EXCHANGEABLE SODIUM, ppm	992						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

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SUBMITTED BY:	
ADDRESS:	SOIL CONSERVATION BRUCE LINDSAY PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13121

SOIL FERTILITY REPORT

SAMPLE MARKING	27-2-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	17.0	EXCHANGEABLE SODIUM PERCENTAGE	18.6

LAB TESTS		RESULT		SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %		0.8					lbs/A
ORGANIC NITROGEN		ppm	lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth, in.		ppm	lbs/A		TOPDRESS		lbs/A
		78			STARTER		lbs/A
					FERTIGATION		lbs/A
AVAILABLE NITROGEN				N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS	BRAY P1, ppm			P_2O_5	lbs/A	BROADCAST	
	BICARBONATE P, ppm	6			lbs/A		
EXCHANGEABLE POTASSIUM, ppm		49		K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth, in.				S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm		976		MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm		3034					
EXCHANGEABLE SODIUM, ppm		1224					
AVAILABLE ZINC, ppm				Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm				Cu	lbs/A		
AVAILABLE IRON, ppm				Fe	lbs/A		
AVAILABLE MANGANESE, ppm				Mn	lbs/A		
AVAILABLE BORON, ppm				B	lbs/A		
LIME REQUIREMENT				Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT				Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13137

SOIL FERTILITY REPORT

SAMPLE MARKING	27-3-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.0	EXCHANGEABLE SODIUM PERCENTAGE	2.0

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS		lbs/A
	5		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	13		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	75	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	52	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1485				
EXCHANGEABLE SODIUM, ppm	37				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE	% SAND		% SILT		% CLAY	

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13138

SOIL FERTILITY REPORT

SAMPLE MARKING	27-3-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.7	EXCHANGEABLE SODIUM PERCENTAGE	0.5

LAB TESTS		RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %		0.3				lbs/A
ORGANIC NITROGEN		ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.		ppm / lbs/A		TOPDRESS		lbs/A
		5		STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN			N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS	BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
	BICARBONATE P, ppm	6		lbs/A		
EXCHANGEABLE POTASSIUM, ppm		90	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm		314	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm		3422				
EXCHANGEABLE SODIUM, ppm		25				
AVAILABLE ZINC, ppm			Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu	lbs/A		
AVAILABLE IRON, ppm			Fe	lbs/A		
AVAILABLE MANGANESE, ppm			Mn	lbs/A		
AVAILABLE BORON, ppm			B	lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13139

SOIL FERTILITY REPORT

SAMPLE MARKING	27-3-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	3.8	EXCHANGEABLE SODIUM PERCENTAGE	9.4

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A 27		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	6		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	38	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	210	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1976				
EXCHANGEABLE SODIUM, ppm	278				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13140

SOIL FERTILITY REPORT

SAMPLE MARKING	27-3-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.7	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	5.4	EXCHANGEABLE SODIUM PERCENTAGE	33.4

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A			TOPDRESS		lbs/A
	18			STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	6			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	146	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	140	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3002					
EXCHANGEABLE SODIUM, ppm	1904					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13094

SOIL FERTILITY REPORT

SAMPLE MARKING	28-1-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.6	EXCHANGEABLE SODIUM PERCENTAGE	0.6

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
				TOPDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		STARTER			lbs/A
	7			FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	33				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	152		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	184		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3008						
EXCHANGEABLE SODIUM, ppm	22						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13095

SOIL FERTILITY REPORT

SAMPLE MARKING	28-1-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.8	EXCHANGEABLE SODIUM PERCENTAGE	2.4

LAB TESTS		RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %		0.7					lbs/A
ORGANIC NITROGEN		ppm / lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.		ppm / lbs/A: 8		TOPDRESS			lbs/A
				STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS	BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
	BICARBONATE P, ppm	14			lbs/A		
EXCHANGEABLE POTASSIUM, ppm		408	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm		230	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm		3368					
EXCHANGEABLE SODIUM, ppm		114					
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13096

SOIL FERTILITY REPORT

SAMPLE MARKING	28-1-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.8	EXCHANGEABLE SODIUM PERCENTAGE	7.8

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 6			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	17			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	478	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	228	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2968					
EXCHANGEABLE SODIUM, ppm	350					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE	% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13097

SOIL FERTILITY REPORT

SAMPLE MARKING	28-1-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.4	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	3.2	EXCHANGEABLE SODIUM PERCENTAGE	3.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 21			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	13			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	1056	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	241	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3380					
EXCHANGEABLE SODIUM, ppm	163					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13098

SOIL FERTILITY REPORT

SAMPLE MARKING	28-1-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.9	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.4	EXCHANGEABLE SODIUM PERCENTAGE	1.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.3				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 4		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	12		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	234	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	202	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	3098				
EXCHANGEABLE SODIUM, ppm	48				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13099

SOIL FERTILITY REPORT

SAMPLE MARKING	28-1-6	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.1	EXCHANGEABLE SODIUM PERCENTAGE	2.2

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.3						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	5			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	8				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	111		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	245		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2982						
EXCHANGEABLE SODIUM, ppm	89						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13106

SOIL FERTILITY REPORT

SAMPLE MARKING	32-1-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.5	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	3.8	EXCHANGEABLE SODIUM PERCENTAGE	5.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.6					lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth: in.	ppm / lbs/A		TOPDRESS			lbs/A
	19		STARTER			lbs/A
			FERTIGATION			lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	66			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	554	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth: in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	148	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	1537					
EXCHANGEABLE SODIUM, ppm	130					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

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Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13107

SOIL FERTILITY REPORT

SAMPLE MARKING	32-1-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.5	EXCHANGEABLE SODIUM PERCENTAGE	4.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS		lbs/A
	6		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	7		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	152	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	94	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1280				
EXCHANGEABLE SODIUM, ppm	76				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13108

SOIL FERTILITY REPORT

SAMPLE MARKING	32-1-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	10.0	EXCHANGEABLE SODIUM PERCENTAGE	14.4

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.8					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A			TOPDRESS		lbs/A
	12			STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N			TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	10			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	152	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	484	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2586					
EXCHANGEABLE SODIUM, ppm	660					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13109

SOIL FERTILITY REPORT

SAMPLE MARKING	32-1-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.8	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.1	EXCHANGEABLE SODIUM PERCENTAGE	11.2

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.7					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A 17			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	10			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	98	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	495	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2928					
EXCHANGEABLE SODIUM, ppm	548					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13110

SOIL FERTILITY REPORT

SAMPLE MARKING	32-1-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.9	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	14.0	EXCHANGEABLE SODIUM PERCENTAGE	26.6

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	1.5					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 111			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	11			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	170	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	1552	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	3508					
EXCHANGEABLE SODIUM, ppm	2560					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	
ADDRESS:	SOIL CONSERVATION BRUCE LINDSAY PO# :
GROWER:	
LAB NO.:	GLEN CANYON 93AS13111

SOIL FERTILITY REPORT

SAMPLE MARKING	32-2-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.4	EXCHANGEABLE SODIUM PERCENTAGE	1.6

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	1.7						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth, in.	ppm	lbs/A		TOPDRESS			lbs/A
	15			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	76				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	1056		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth, in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	412		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	1683						
EXCHANGEABLE SODIUM, ppm	55						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13112

SOIL FERTILITY REPORT

SAMPLE MARKING	32-2-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.4	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.1	EXCHANGEABLE SODIUM PERCENTAGE	0.9

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.7				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 7		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	26		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	1520	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	249	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2662				
EXCHANGEABLE SODIUM, ppm	38				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE	% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13113

SOIL FERTILITY REPORT

SAMPLE MARKING	32-2-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	2.0	EXCHANGEABLE SODIUM PERCENTAGE	1.1

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	1.0					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 10			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	34			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	1416	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	267	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2440					
EXCHANGEABLE SODIUM, ppm	48					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13114

SOIL FERTILITY REPORT

SAMPLE MARKING	32-2-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.0	EXCHANGEABLE SODIUM PERCENTAGE	10.5

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	7			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	11				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	430		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	303		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2746						
EXCHANGEABLE SODIUM, ppm	466						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13115

SOIL FERTILITY REPORT

SAMPLE MARKING	32-2-5	CROP		DATE RECEIVED	09/22/93		
		YIELD GOAL		DATE REPORTED	09/29/93		
SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	20.0
EXCHANGEABLE SODIUM PERCENTAGE	20.3						

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %						lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS	lbs/A		lbs/A
Depth, in. NITRATE - NITROGEN	ppm / lbs/A: 10		TOPDRESS	lbs/A		lbs/A
			STARTER	lbs/A		lbs/A
			FERTIGATION	lbs/A		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	10			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	274	K_2O		lbs/A		
Depth, in. SULFATE - SULFUR, ppm		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	610	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2730					
EXCHANGEABLE SODIUM, ppm	1136					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		
SOIL TEXTURE			% SAND		% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13116

SOIL FERTILITY REPORT

SAMPLE MARKING	32-2-6	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	15.0	EXCHANGEABLE SODIUM PERCENTAGE	17.1

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	6			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	10				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	390		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	339		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2848						
EXCHANGEABLE SODIUM, ppm	856						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13131

SOIL FERTILITY REPORT

SAMPLE MARKING	32-3-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.6	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.2	EXCHANGEABLE SODIUM PERCENTAGE	6.3

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN
ORGANIC MATTER, %	1.4				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A 6		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	**BROADCAST**
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	29			lbs/A	
EXCHANGEABLE POTASSIUM, ppm	468	K_2O		lbs/A	
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A	
EXCHANGEABLE MAGNESIUM, ppm	212	MgO		lbs/A	
EXCHANGEABLE CALCIUM, ppm	1911				
EXCHANGEABLE SODIUM, ppm	192				
AVAILABLE ZINC, ppm		Zn		lbs/A	**STARTER**
AVAILABLE COPPER, ppm		Cu		lbs/A	
AVAILABLE IRON, ppm		Fe		lbs/A	
AVAILABLE MANGANESE, ppm		Mn		lbs/A	
AVAILABLE BORON, ppm		B		lbs/A	
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A	
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A	

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

PLEASE NOTE SPECIAL COMMENTS ON BACK

Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13132

SOIL FERTILITY REPORT

SAMPLE MARKING	32-3-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	3.2	EXCHANGEABLE SODIUM PERCENTAGE	4.5

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	1.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN, Depth. in.	ppm / lbs/A: 7		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	19	P_2O_5	lbs/A		
EXCHANGEABLE POTASSIUM, ppm	776	K_2O	lbs/A		
SULFATE - SULFUR, ppm, Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	244	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2872				
EXCHANGEABLE SODIUM, ppm	200				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		
SOIL TEXTURE		% SAND	% SILT	% CLAY	

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13133

SOIL FERTILITY REPORT

SAMPLE MARKING	32-3-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.8	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	7.8	EXCHANGEABLE SODIUM PERCENTAGE	8.1

LAB TESTS	RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	1.8						lbs/A
ORGANIC NITROGEN	ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm	lbs/A		TOPDRESS			lbs/A
	8			STARTER			lbs/A
				FERTIGATION			lbs/A
AVAILABLE NITROGEN			N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS BICARBONATE P, ppm	23				lbs/A		
EXCHANGEABLE POTASSIUM, ppm	332		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.			S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	297		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2798						
EXCHANGEABLE SODIUM, ppm	350						
AVAILABLE ZINC, ppm			Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm			Cu		lbs/A		
AVAILABLE IRON, ppm			Fe		lbs/A		
AVAILABLE MANGANESE, ppm			Mn		lbs/A		
AVAILABLE BORON, ppm			B		lbs/A		
LIME REQUIREMENT			Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT			Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13134

SOIL FERTILITY REPORT

SAMPLE MARKING	32-3-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	4.4	EXCHANGEABLE SODIUM PERCENTAGE	6.8

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.5				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth, in.	ppm / lbs/A		TOPDRESS		lbs/A
	5		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	9		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	140	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth, in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	215	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2814				
EXCHANGEABLE SODIUM, ppm	272				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13135

SOIL FERTILITY REPORT

SAMPLE MARKING	32-3-5	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	3.0	EXCHANGEABLE SODIUM PERCENTAGE	5.3

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.7					lbs/A
ORGANIC NITROGEN	ppm / lbs/A			SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A: 6			TOPDRESS		lbs/A
				STARTER		lbs/A
				FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	9			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	104	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	206	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	2986					
EXCHANGEABLE SODIUM, ppm	215					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE	% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13136

SOIL FERTILITY REPORT

SAMPLE MARKING	32-3-6	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.8	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	5.0	EXCHANGEABLE SODIUM PERCENTAGE	5.1

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	1.0				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS		lbs/A
	5		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	8		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	166	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	232	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	2083				
EXCHANGEABLE SODIUM, ppm	157				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13122

SOIL FERTILITY REPORT

SAMPLE MARKING	33-1-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.9	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.7	EXCHANGEABLE SODIUM PERCENTAGE	0.9

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in. –	ppm / lbs/A: 5		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	**BROADCAST**
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	10			lbs/A	
EXCHANGEABLE POTASSIUM, ppm	91	K_2O		lbs/A	
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A	
EXCHANGEABLE MAGNESIUM, ppm	110	MgO		lbs/A	
EXCHANGEABLE CALCIUM, ppm	1860				
EXCHANGEABLE SODIUM, ppm	22				
AVAILABLE ZINC, ppm		Zn		lbs/A	**STARTER**
AVAILABLE COPPER, ppm		Cu		lbs/A	
AVAILABLE IRON, ppm		Fe		lbs/A	
AVAILABLE MANGANESE, ppm		Mn		lbs/A	
AVAILABLE BORON, ppm		B		lbs/A	
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A	
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A	

SOIL TEXTURE	% SAND	% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13123

SOIL FERTILITY REPORT

SAMPLE MARKING	33-1-2	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.0	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.2	EXCHANGEABLE SODIUM PERCENTAGE	1.0

LAB TESTS		RESULT		SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %		0.2						lbs/A
ORGANIC NITROGEN		ppm	lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.		ppm	lbs/A		TOPDRESS			lbs/A
		5			STARTER			lbs/A
					FERTIGATION			lbs/A
AVAILABLE NITROGEN				N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS	BRAY P1, ppm			P_2O_5		lbs/A	BROADCAST	
	BICARBONATE P, ppm	9				lbs/A		
EXCHANGEABLE POTASSIUM, ppm		66		K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.				S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm		210		MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm		2564						
EXCHANGEABLE SODIUM, ppm		34						
AVAILABLE ZINC, ppm				Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm				Cu		lbs/A		
AVAILABLE IRON, ppm				Fe		lbs/A		
AVAILABLE MANGANESE, ppm				Mn		lbs/A		
AVAILABLE BORON, ppm				B		lbs/A		
LIME REQUIREMENT				Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT				Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13124

SOIL FERTILITY REPORT

SAMPLE MARKING	33-1-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.8	EXCHANGEABLE SODIUM PERCENTAGE	1.7

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth, in.	ppm / lbs/A		TOPDRESS		lbs/A
	4		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	3			lbs/A	
EXCHANGEABLE POTASSIUM, ppm	22	K_2O		lbs/A	
SULFATE - SULFUR, ppm Depth, in.		S		lbs/A	
EXCHANGEABLE MAGNESIUM, ppm	77	MgO		lbs/A	
EXCHANGEABLE CALCIUM, ppm	1205				
EXCHANGEABLE SODIUM, ppm	26				
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER
AVAILABLE COPPER, ppm		Cu		lbs/A	
AVAILABLE IRON, ppm		Fe		lbs/A	
AVAILABLE MANGANESE, ppm		Mn		lbs/A	
AVAILABLE BORON, ppm		B		lbs/A	
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A	
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A	
SOIL TEXTURE			% SAND	% SILT	% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13125

SOIL FERTILITY REPORT

SAMPLE MARKING	33-1-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.1	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.1	EXCHANGEABLE SODIUM PERCENTAGE	1.7

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS		lbs/A
	4		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	18		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	20	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	86	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1608				
EXCHANGEABLE SODIUM, ppm	35				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13141

SOIL FERTILITY REPORT

SAMPLE MARKING	33-2-1	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.9	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	1.1

EXCHANGEABLE SODIUM PERCENTAGE: 6.1

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.4				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN (Depth. in.)	ppm / lbs/A: 9		TOPDRESS		lbs/A
			STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	14		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	123	K_2O	lbs/A		
SULFATE - SULFUR, ppm (Depth. in.)		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	82	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	111				
EXCHANGEABLE SODIUM, ppm	23				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

PLEASE NOTE SPECIAL COMMENTS ON BACK

Laboratory Consultants, Ltd.

5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13142

SOIL FERTILITY REPORT

SAMPLE MARKING	33-2-2	CROP		DATE RECEIVED	09/22/93		
		YIELD GOAL		DATE REPORTED	09/29/93		
SATURATION PERCENTAGE		SOIL pH	8.3	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.7
EXCHANGEABLE SODIUM PERCENTAGE	1.1						

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS			FERTILIZATION PLAN	
ORGANIC MATTER, %	0.2					lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS			lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS			lbs/A
	8		STARTER			lbs/A
			FERTIGATION			lbs/A
AVAILABLE NITROGEN		N		lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5		lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	4			lbs/A		
EXCHANGEABLE POTASSIUM, ppm	161	K_2O		lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S		lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	36	MgO		lbs/A		
EXCHANGEABLE CALCIUM, ppm	760					
EXCHANGEABLE SODIUM, ppm	12					
AVAILABLE ZINC, ppm		Zn		lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu		lbs/A		
AVAILABLE IRON, ppm		Fe		lbs/A		
AVAILABLE MANGANESE, ppm		Mn		lbs/A		
AVAILABLE BORON, ppm		B		lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)		Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)		Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY	

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BY: _____

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SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13143

SOIL FERTILITY REPORT

SAMPLE MARKING	33-2-3	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	8.2	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	0.8

EXCHANGEABLE SODIUM PERCENTAGE: 2.0

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN
ORGANIC MATTER, %	0.1			lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS	lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS	lbs/A
	5		STARTER	lbs/A
			FERTIGATION	lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	2		lbs/A	
EXCHANGEABLE POTASSIUM, ppm	61	K_2O	lbs/A	
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A	
EXCHANGEABLE MAGNESIUM, ppm	86	MgO	lbs/A	
EXCHANGEABLE CALCIUM, ppm	683			
EXCHANGEABLE SODIUM, ppm	20			
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER
AVAILABLE COPPER, ppm		Cu	lbs/A	
AVAILABLE IRON, ppm		Fe	lbs/A	
AVAILABLE MANGANESE, ppm		Mn	lbs/A	
AVAILABLE BORON, ppm		B	lbs/A	
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A	
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A	

SOIL TEXTURE		% SAND		% SILT		% CLAY

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BY: _____

PLEASE NOTE SPECIAL COMMENTS ON BACK

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5861 South Kyrene, Suite 15 Tempe, Arizona 85283
Telephone (602) 491-9655

SUBMITTED BY:	SOIL CONSERVATION
ADDRESS:	BRUCE LINDSAY
	PO# :
GROWER:	GLEN CANYON
LAB NO.:	93AS13144

SOIL FERTILITY REPORT

SAMPLE MARKING	33-2-4	CROP		DATE RECEIVED	09/22/93
		YIELD GOAL		DATE REPORTED	09/29/93

SATURATION PERCENTAGE		SOIL pH	7.7	FREE LIME	YES	ELECTRICAL CONDUCTIVITY mmhos/cm	12.0	EXCHANGEABLE SODIUM PERCENTAGE	21.4

LAB TESTS	RESULT	SUGGESTED RECOMMENDATIONS		FERTILIZATION PLAN	
ORGANIC MATTER, %	0.1				lbs/A
ORGANIC NITROGEN	ppm / lbs/A		SIDEDRESS		lbs/A
NITRATE - NITROGEN Depth. in.	ppm / lbs/A		TOPDRESS		lbs/A
	207		STARTER		lbs/A
			FERTIGATION		lbs/A
AVAILABLE NITROGEN		N	lbs/A	TOTAL	lbs/A
AVAILABLE PHOSPHORUS — BRAY P1, ppm		P_2O_5	lbs/A	BROADCAST	
AVAILABLE PHOSPHORUS — BICARBONATE P, ppm	2		lbs/A		
EXCHANGEABLE POTASSIUM, ppm	47	K_2O	lbs/A		
SULFATE - SULFUR, ppm Depth. in.		S	lbs/A		
EXCHANGEABLE MAGNESIUM, ppm	77	MgO	lbs/A		
EXCHANGEABLE CALCIUM, ppm	1119				
EXCHANGEABLE SODIUM, ppm	398				
AVAILABLE ZINC, ppm		Zn	lbs/A	STARTER	
AVAILABLE COPPER, ppm		Cu	lbs/A		
AVAILABLE IRON, ppm		Fe	lbs/A		
AVAILABLE MANGANESE, ppm		Mn	lbs/A		
AVAILABLE BORON, ppm		B	lbs/A		
LIME REQUIREMENT		Ag - Lime (60% effectiveness)	Tons/A		
GYPSUM REQUIREMENT		Gypsum (100% basis)	Tons/A		

SOIL TEXTURE		% SAND		% SILT		% CLAY

VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH

BY: _____

PLEASE NOTE SPECIAL COMMENTS ON BACK

AGREEMENT NO. IA-1440-3-00
SCS Agreement No. 69-9457-3-683

INTERAGENCY AGREEMENT

between the

UNITED STATES DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE

GLEN CANYON NATIONAL RECREATION AREA

and the

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

ARTICLE I. BACKGROUND AND OBJECTIVES

WHEREAS, under the provisions of Public Law 74-46, the [illegible] Soil Conservation Service (hereinafter referred to as SCS), is authorized to enter into an agreement with another Federal agency, the National Park Service (hereinafter referred to as NPS), to provide natural resource information. The authority for the NPS to enter into this agreement is the Economy Act 1932, 31 U.S.C. 1535.

ARTICLE II. STATEMENTS OF WORK

The NPS needs soil survey information on the Glen Canyon National Recreation Area that is not available. Therefore, the NPS is willing to reimburse the SCS for the cost to obtain this information within the time period specified in this agreement. This information will provide additional data needed to make environmental evaluations and sound decisions on planning and management.

The work will entail soil sampling to determine types and characteristics, mapping the soils, and preparing a report to describe findings. Field testing will consist of taking samples with an auger, which is 3 inches wide by 60 inches long. An 18 inch spade may be used in some localities to facilitate testing. Soil will be returned to the testing hole.

NOW THEREFORE, in consideration of the premises and of the several promises to be faithfully performed by the parties hereto as set forth, the NPS and the SCS do hereby agree as follows:

THE NPS AGREES:

1. To provide aerial photography of the area.

2. To provide archaeological review and clearance of sites for soil disturbance during mapping operations according to Section 106 of the National Historic Preservation Act (NHPA). Park staff will assist SCS staff if there are questions about proposed testing locations.

3. To provide environmental clearance according to the National Environmental Protection Act (NEPA).

4. To review the draft report and map and provide written comments for the final.

5. To provide an operator and boat for access to the area during the survey.

6. To reimburse SCS for actual costs incurred to survey and map the soils of the area for a product as stated below. Includes salary, travel, per diem and laboratory analyses for Nitrogen, Phosphorus and Potassium of select sites. Reimbursement is not to exceed $15,000.

7. The NPS will prepare a Categorical Exclusion to comply with the National Environmental Protection Act. Non-destructive data collecting is covered by the Department of the Interior categorical exclusions 516 DM, appendix 1, number 6.

THE SCS AGREES:

1. To provide a soil scientist to survey and map about 1200 acres of soils in the Glen Canyon Recreation Area.

2. To provide for classification, correlation, and quality control in accordance with National Cooperative Soil Survey standards.

3. To provide laboratory data in the format received from the test facility.

4. To provide a high intensity soil survey map on NPS furnished aerial photography. The map will be accompanied by a copy of the identification legend, each mapping unit description, each taxonomi unit description, other tables as listed below, and a conventional and special symbol legend.

5. To provide a written report of the soil survey that has tables of interpretations for the following; definitions of the interpretatic components will be included:

a. Acreage and Proportionate Extent of the Soils {map unit symbol, soil name, acres, percent}

b. Recreational Development {soil name, map unit symbol, camp areas, picnic areas, paths, trails}

c. Engineering Properties and Classifications {soil name, map unit symbol, parent material, depth, USDA texture, classification (unified, AASHTO), fragments >3 inches, percentage passing sieve number (numbers 4, 10, 40, 200), liquid limit, plasticity}

d. Physical and Chemical Properties of Soils {soil name, map unit symbol, depth, clay <2 mm, moist bulk density, permeability, available water capacity, soil reaction, salinity, shrink-swell potential, erosion factors (K,T), wind erodibility group, organi matter}

e. Soil and Water Features {soil name, map unit symbol, hydrologic group, flooding (frequency, duration, months), high water table (depth, kind, months), bedrock (depth, hardness), cemented pan (depth, hardness), risk of corrosion (uncoated, steel, concrete)

f. Classification of the Soils {soil series, family or higher taxonomic class}

IT IS MUTUALLY AGREED:

1. The SCS and the NPS intend to fulfill their obligations stated in thi Agreement, but commitments in excess of appropriated funds authorized by law and administratively made available cannot be made. If the SC and the NPS cannot fulfill their obligations because of appropriation this Agreement will be suspended and reimbursement will be made for work completed.

2. This Agreement may be modified at any time by amendment duly executed by the NPS and the SCS provided such modifications do not extend the Agreement beyond the close of the fiscal year in which the work is completed.

3. Each party will designate a project leader for this Agreement who wil serve as the contact for all exchanges of information and requests. The project leaders for this Agreement are: John Ritenour, NPS, commercial (602) 645-2471, and Philip Camp, SCS, commercial (602)280-8837.

ARTICLE III. TERM OF AGREEMENT

This Agreement shall be effective on the date the last signature is obtained and remain in effect through September 30, 1993.

Extension of this Agreement will require renewal by the parties through an exchange of correspondence until the purposes of the Agreement are complete, but no later than the fiscal year in which the work is completed.

ARTICLE IV. KEY OFFICIALS

The Superintendent of the Glen Canyon Recreation Area or his delegat shall be the Key Official for the National Park Service and shall direct

operations and measures agreed to in this instrument and have final approval of products.

John O. Lancaster, Superintendent
Glen Canyon National Recreation Area

This Agreement is subject to the conditions of the Soil Conservation Service. The State Conservationist or his delegate shall be the Key Official and shall comply with the regulations of the Secretary of the Interior and others applicable as outlined herein.

Humberto Hernandez, State Conservationist
Soil Conservation Service

ARTICLE V. PAYMENT

Upon approval by the National Park Service, the NPS agrees to reimburse the Soil Conservation Service for actual costs outlined in Article II (NPS AGREES TO) of this Agreement.

If the SCS and the NPS cannot fulfill their obligations because of appropriations, this Agreement will be suspended and reimbursement will be made for work completed.

Bills are to be submitted using Standard Form SF-1080. Bills are to be forwarded to:

Contracting Officer
National Park Service
Glen Canyon Recreation Area
P.O. Box 1507
Page, AZ 86040

ARTICLE VI. PROPERTY MANAGEMENT AND DISPOSITION

SCS property and equipment will be used. The SCS will procure and provide all specified or required materials and services except as outline in Article II (NPS AGREES).

ARTICLE VII. PRIOR APPROVAL

Not applicable.

ARTICLE VIII. MAP AND REPORT

The SCS will provide soil survey information as outlined in Article I (SCS AGREES).

ARTICLE IX. TERMINATION

This Agreement may be terminated at any time upon giving thirty (30) days notice in writing to the other party.

SIGNATURES

State Conservationist
U.S. Department of Agriculture
Soil Conservation Service

Gary R. Severson Acting
(Signature)

7/28/93
(Date)

Superintendent
U.S. Department of Interior
National Park Service
Glen Canyon National Recreation Area

John O. Lancaster
(Signature)

8/1/93
(Date)

Contracting Officer RM137
U.S. Department of Interior
National Park Service
Glen Canyon National Recreation Area

Buck Hawkins
(Signature)

8/12/93
(Date)