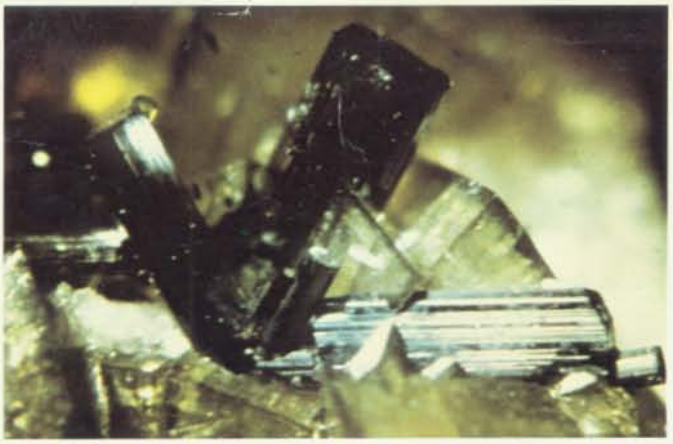
Mineral Collecting Sites in North Carolina

By W. F. Wilson and B. J. McKenzie



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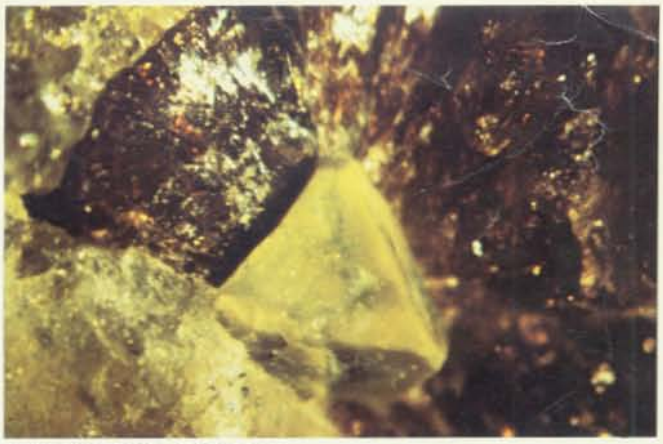

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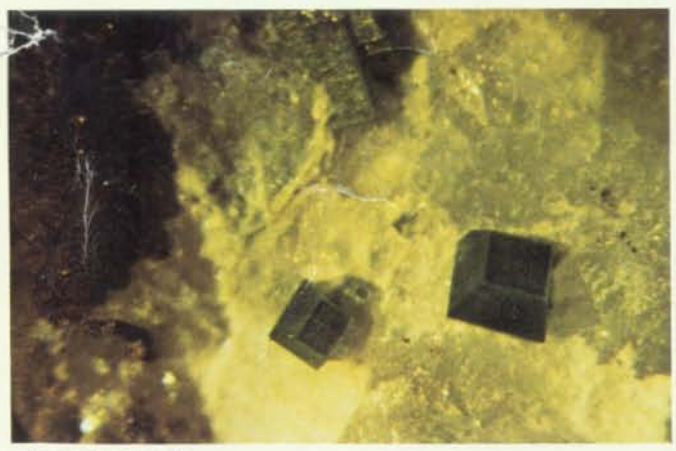

TORBERNITE

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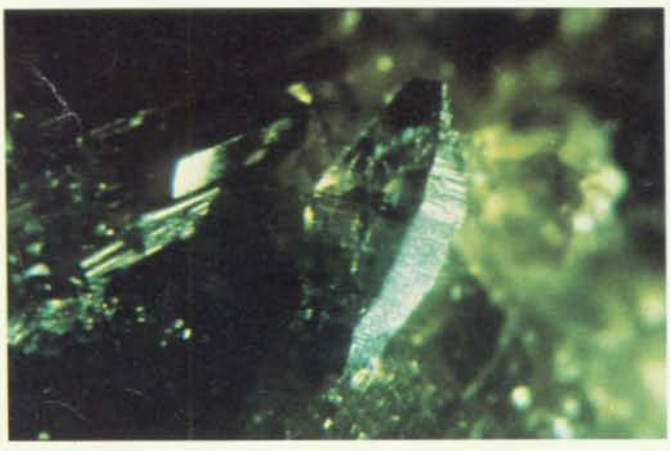

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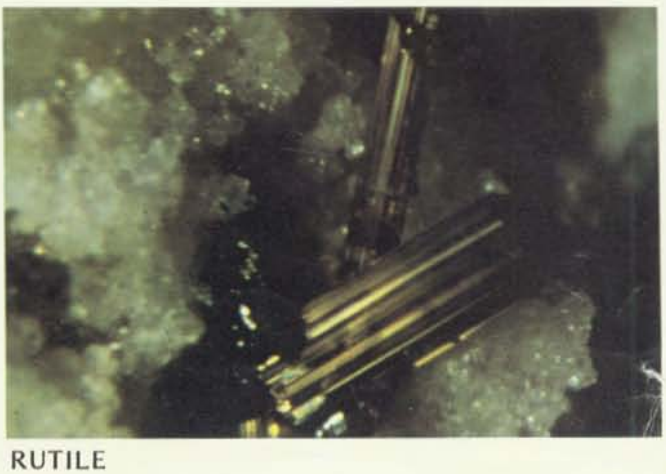

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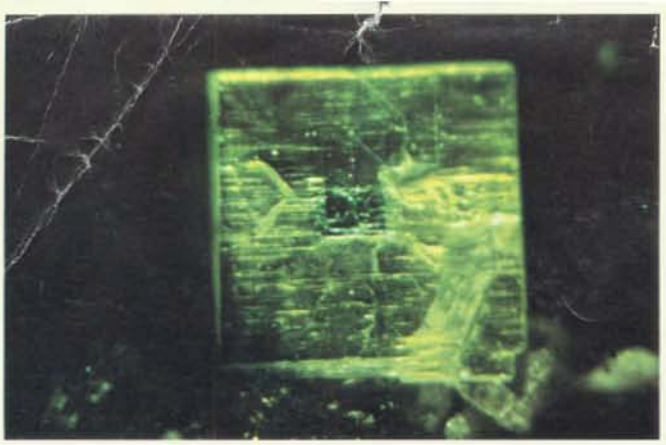


AUTUNITE AND TORBERNITE

THULITE AND PYRITE

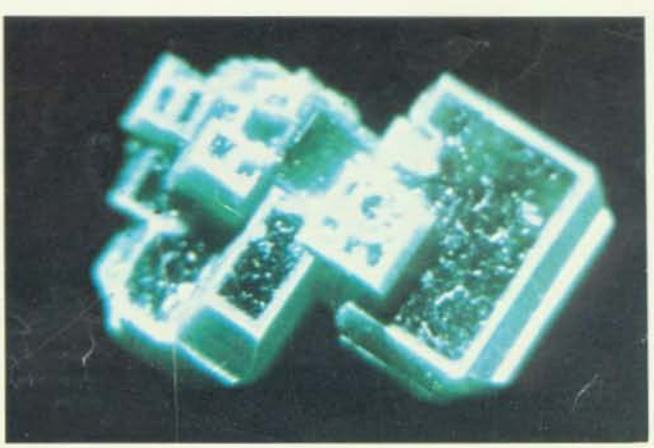
MONAZITE

EMERALD

CUPRITE

SMOKY QUARTZ

ZIRCON



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Information Circular 24

Mineral Collecting Sites in North Carolina

By W. F. Wilson and B. J. McKenzie

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GEOLOGICAL SURVEY SECTION

The Geological Survey Section shall, by law ". . .make such examination, survey, and mapping of the geology, mineralogy, and topography of the state, including their industrial and economic utilization as it may consider necessary."

In carrying out its duties under this law, the section promotes the wise conservation and use of mineral resources by industry, commerce, agriculture, and other governmental agencies for the general welfare of the citizens of North Carolina.

The Section conducts a number of basic and applied research projects in environmental resource planning, mineral resource exploration, mineral statistics, and systematic geologic mapping. Services constitute a major portion of the Sections's activities and include identifying rock and mineral samples submitted by the citizens of the state and providing consulting services and specially prepared reports to other agencies that require geological information.

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Eldon P. Allen, Chief Geologist

FRONT COVER PHOTO
Twinned emerald crystal from North Carolina,
photo from Smithsonian Institution (slide 78-10)
Cover Design – Gay Brantley

PREFACE

Information Circular 24 is a compendium of viable mineral collecting sites throughout North Carolina. Some sites are commercially operated during the spring, summer, and fall months for a collecting fee. Those not commercially operated are on private property and require permission from the property owner to visit the site and collect. Care should be taken not to abuse or misuse these collecting sites. The prospect of a continued privilege of collecting minerals should dictate a special emphasis on leaving the site in good condition.

The large variety of minerals found in North Carolina has attracted thousands of collectors, not only from within our state, but also from other states as well. The rarity, beauty, durability, and ever-increasing value of minerals and gem stones have made them sound financial investments.

The emerald, considered by many to be the most beautiful of all gem stones, was adopted in 1973 by the North Carolina Legislature as the State's official gem stone. North Carolina has the distinction of producing the largest emerald crystal in North America -- 1,438 carats. The most expensive cut emerald also comes from North Carolina. This is the 13.14 carat Carolina Emerald owned by Tiffany & Company of New York and valued at $100,000. First thought to be emerald but later identified as a chromium spodumene, the mineral hiddenite has become a valuable collector's item in its own right. North Carolina was known as the Golden State from 1820 to 1840 because more gold was produced from this state during that period than from all of the other states in the Nation. Between 1843 and 1893, while panning for placer gold, thirteen authentic diamonds were found in gold washings. Two commercially operated gold mines are still open to the public for a fee. While panning for gold, you just might find a diamond yourself! North Carolina has the beautiful rhodolite garnet named after the colorful purplish-pink rhododendron which grows wild in the mountains of western North Carolina. Ruby and sapphire of exceptional beauty are found in Cowee Valley in the Franklin County area of western North Carolina. Many of these gems exhibit asterism. Some of the more desirable semiprecious gem stones found in North Carolina include aquamarine, golden beryl, amethyst, almandite garnet, citrine, and smoky quartz.

It is hoped that this publication will find a place beside some of the more prized books on your bookshelf, not only because it will serve as a useful and helpful guide to the mineral sites of our state, but also because it contains fine color prints of some of these outstanding minerals.

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INTRODUCTION

North Carolina contains rocks ranging in age from Precambrian to Recent. Within this assemblage of rocks is located one of the most varied groups of minerals identified to date in any state in the Nation. These minerals range from clays to gem stones to valuable ores.

This publication was prepared to assist visitors to and citizens of North Carolina who are interested in mineral and gem stone collecting in our state.

The text begins with a short history of gem stones and a description of some of the more important gem stones found in North Carolina. The rest of the text consists of the mineral locality descriptions, which are listed by county. These localities are indicated on the maps in Appendix 1. For people who want to be sure of finding something of interest during their fieldtrips, a list of the museums which have mineral or earth science displays is included as Appendix 2. Appendices 3 and 4 contain the addresses of the mineral dealers and mineral clubs, respectively, in the state. Since time of year, weather conditions, and, sometimes, construction activity affect the condition of each locality, it may be useful to contact a mineral club in the area while planning your trip. To assist visitors to the Franklin and Spruce Pine areas, the physical characteristics of minerals frequently found there are given in Appendix 5. The inclusion of the state highway map in the back of the book should be of considerable assistance in planning field trips throughout the state.

The equipment needed for collecting minerals may be easily obtained at little expense. The basic tool is the prospector's pick or hammer. This consists of a hammer head with a pointed pick extension on the back of the head. Sledge hammers and cold chisels may be needed when working with large rocks. A magnifying glass is a necessity for identifying small crystals and examining sands. For field work, an inexpensive hand lens of 10 X magnification is just as useful for general work as a more expensive, corrected lens. Old newspapers are useful for wrapping specimens to avoid damage during transportation and storage. All specimens should be properly wrapped and their source identified.

The best places to look for mineral specimens are in working mines and old mine dumps. Railroad and highway cuts often contain some excellent mineral specimens, as do stream beds and banks. Many excellent specimens have also been found in freshly plowed fields.

The localities described in this report are places where minerals have been found and where at least some of the mentioned minerals may still be found. Some of them have been almost obliterated by time, vegetation, and man. It is not unusual to find that buildings, highways, and even towns and lakes now cover what were once good collecting sites. Specimens at some localities may be difficult to find, while other localities are well-preserved and specimens easily obtained.

Almost any place a collector goes will be on private property, and he should have the permission of the property owner or the mine operator to enter the locality and remove specimens. Inclusion of a locality in this book does not imply that the land owner will permit free access to the site.

This book represents a compilation of existing data and information provided by numerous individuals from throughout the state. Only a few of the localities were field-checked by the authors. Additions or corrections to the information contained herein should be sent to the address on the back cover. Comments on the usefulness of this book or on how it can be improved will be greatly appreciated.

ACKNOWLEDGEMENTS

A publication of this type is a difficult and complex undertaking. The interest, enthusiasm, and information provided by others was invaluable in the compilation of this book. Mrs. Helen M. Coe, Curator of the Franklin Gem and Mineral Museum at Franklin, North Carolina brought forth ideas and suggestions which were incorporated into this publications. We are grateful for her friendship. Mr. Carter Hudgen of Marion, North Carolina furnished over forty of his outstanding color slides of minerals, many of which appear in this book. We thank him for his generosity. Mr. Bob Orchard of Orchards Minerals, Raleigh, North Carolina shared his knowledge of the collecting sites which were too dangerous to visit and those that no longer contain specimens of collecting value. He also added numerous new collecting sites of which we were not aware. Mr. and Mrs. Dell Curtis of the Emerald Valley Mines at Hiddenite, North Carolina allowed us to visit their property and furnished pictures of emerald and hiddenite which appear in this publication. Dr. Ronald Yadusky, of the Piedmont Mineral and Gem Society, submitted additional mineral sites which were incorporated into the text. Individuals who furnished new mineral site information are acknowledged at the end of each site description.

We are also indebted to Mr. Dennis Walters of Reidsville, N. C.; the Colburn Museum of Asheville, N. C.; the Charlotte Gem and Mineral Club; the Gem and Mineral Society of Franklin, N. C.; the Catawba Valley Gem and Mineral Club, Hickory, N. C.; and Mr. Vernon Hoffman of the Foothills Mineral Society, Lincolnton, N. C.

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We thank and acknowledge Ms. Anne Vironț-Lazar of our staff for all the hours she spent on map preparation, and a special thanks to Mrs. Chris Bain for typing the manuscript and correcting our errors and misspellings. We also thank the entire staff of the North Carolina Geological Survey Section for their help, interest, and enthusiasm.

Also, acknowledgement is made of the liberal use of data provided by Information Circular 16, Mineral Localities of North Carolina, which was of considerable aid in preparation of this publication.

GEM STONES

History of Gems

For centuries precious gem stones and cut gems have been prized by mankind. Their qualities of beauty, rarity, value, and durability provide their owners with a lasting value and pride of ownership. They were once called noble stones, for only people of noble birth and wealth could afford their ownership. It has been written that even the beauty and color of the most magnificent flowers, the variegated greens of our majestic forests, and the glory and beauty of a golden sunset are forever changing. But the brilliance and color of gem stones are the same today as they have been for centuries.

The quest for gem stones of rare beauty and value has stimulated man's curiosity for centuries. This fascination caused the early explorers to sail to the New World in search of treasure and fortune for themselves and their rulers. Some rare gem treasures were found and became the crown jewels of kings and queens. Some were found only to become lost in the depths of the sea on the storm-treacherous journey homeward. The expectation of finding gem wealth almost always exceeded the fear of the long journeys and the difficulties experienced in early exploration. Even in the most adverse conditions, the thought that gem treasure may lie just beyond the next mountain would cause them to explore ever deeper into unknown and many times unfriendly territory.

Man's interest in gem stones goes beyond their use as jewels for personal adornment. Just as the brilliant beauty of gems captured the hearts and imagination of mankind, turn another facet, and we can delve into man's inherent sense of superstition and myths which involve the powers of gems. This is, in part, portrayed by the wearing of a certain gem at particular times for their supposed supernatural or mystical powers. Some gems were thought to protect the owner from the invasion of evil spirits into the body, while others might offer good fortune or good luck and also protection of the mind and body from sickness.

In ancient Egypt, there was an accepted custom of engraving symbols onto certain semi-precious gem stones which had been cut into various symbolical forms. These symbols were taken from a very ancient ritual composition called the Book of the Dead. The symbols were inscribed on exceptional pieces of emerald in matrix, green and red jasper, malachite, lapis-lazuli, feldspar, serpentine, turquoise, and carnelian. They were hand-carved in the form of heart-shaped amulets and beetle-shaped scarabs. The ancient symbols were usually inlaid with gold with ornamental gold surrounding the amulets and scarabs. These carved gems were usually placed around the neck of a mummy to assure safe passage of the soul of the deceased through the realm of the dead and to insure protection from all evil influences. One particular amulet called "uat" insured that the deceased would enjoy eternal youth in the realm of the dead. There were many other amulets and scarabs, each with their own unique supernatural powers.

Beginning in the First Century A.D., the writings of the Jewish historian Josephus (37-95 A.D.) set forth the belief that to each month of the year a special stone was dedicated and that the stone of the month was endowed with a particular virtue for those born in that month. This was called their "natal" stone, later to become known as birth stones. However, it was not until the Eighteenth Century in Poland that the wearing of natal or birth stones became an accepted custom. This disparity in time and custom may be attributed to the fact that the special virtues of the gem stone were customarily accepted. But it was centuries before what many believed to be a mystic bond between the stone of the month and the person born in that month was fully realized.

Each stone had particularly strong powers for the person born during its month. This belief grew from early studies of the Bible, in particular, the books of Exodus (28: 17-20) and Revelation (21: 19, 20). The following table gives the month and name of birth stones in Biblical times as compared to those of today.

Month	Exodus	Revelation	Today
January	Beryl	Jacinth (zircon)	Red Garnet
February	Jasper	Amethyst	Amethyst
March	Carnelian	Jasper	Aquamarine
April	Peridot	Sapphire	White Sapphire/Diamond
May	Emerald	Chalcedony	Green Spinel
June	Ruby	Emerald	Alexandrite
July	Lapis Lazuli	Sardonyx	Ruby
August	Onyx	Sardius (Carnelian)	Peridot
September	Sapphire	Chrysolite	Blue Sapphire
October	Agate	Beryl	Rose Zircon
November	Amethyst	Topaz	Golden Sapphire/Topaz
December	Topaz	Chrysophase	Zircon

Although the special powers of gem stones were generally accepted, the practice of wearing birth stones did not become a common custom until much later. This custom appears to have originated in Poland and is attributed to the influence of Jewish rabbis and gem traders who settled there.

Today, the wearing of birth stones is an accepted custom. They are worn now not for their supposed mythical powers, but rather because of their color, brilliance, and beauty.

Qualities of Gems

Gem stones are divided into three groups -- precious, semi-precious, and ornamental stones. Although there are many beautiful and rare gem stones, only four are considered precious. These are emerald, diamond, ruby, and sapphire. All other gem stones are classified as semi-precious. Ornamental stones are used for decorative objects such as vases, carved figurines, jewel containers, and hand-carved handles for silverware and some weapons such as swords and pistols.

About 100 minerals have been classed as gem stones. These must possess beauty, durability, and rarity. Fashion is also often a factor. The beauty of a gem stone may be in its color, play of colors, brilliance, or fire.

Brilliance and fire depend upon many factors. The color of the gem stone must be uniform, unless it is a bicolored gem. The stone should be translucent to transparent and free from foreign inclusions, veils, or fractures. If these conditions are present, the light rays that enter the stone will be reflected and refracted properly and will intensify its color, brilliance, and fire and enhance its beauty.

Rarity is essential for any material to be classed as a gem stone. It is obvious that no common or abundant thing can be highly prized. The blue-green muzo emeralds from Columbia, South America are rare and more highly valued than emeralds from any other source. Just as rarity is essential to the value of gem stones, so is durability. Durability and resistance to abrasion are essential, for a scarred or broken gem immediately loses its attractiveness and value.

For many years, there has been a tendency for the price of gem stones to increase. In the last few years, many varieties have doubled in price, while a few varieties have quadrupled in price. As a result, they are treated as investments in many quarters. They also serve as concentrated wealth that is easily hidden or transported during times of war, governmental policy changes, or inflation within the international gem market.

Gem stones and gem material occur in a large variety of rock and mineral deposits, usually as a small fraction of the total deposit. The origins are as varied as the occurrences. Their principal formation is by precipitation from aqueous solutions, by crystallization from magmas, or by metamorphic processes. The principal host rocks are igneous intrusions, pegmatites, gneisses, schists, and quartz veins.

About one third of the gem minerals are silicate minerals, nearly one fifth alumino silicates, and nearly one seventh oxides. The remaining compositional groups include sulfides, phosphates, borosilicates, and carbonates. The compositions of selected gem stones and gem materials are included in Table 1.

Table 1. -- Guide to Selected Gem Stones and Gem Materials Used in Jewelry *

Name	Composition	Color	Practical Size[1]	Cost[2]
Amber	Hydrocarbon	Yellow, red, green, blue	Any	Low to medium
Beryl:				
Aquamarine	Beryllium aluminum silicate	Blue-green to light blue	-do-	Medium
Emerald	-do-	Green	Medium	Very high
Emerald (synthetic)	-do-	-do-	Very small	High
Golden	-do-	Yellow to golden	Any	Medium
Morganite	-do-	Pink to rose	-do-	Low to medium
Calcite:				
Marble	Calcium carbonate	White, pink, red, blue, green, brown	Any	Low
Mexican onyx	-do-	-do-	-do-	-do-
Satin spar	-do-	-do-	-do-	-do-
Chrysoberyl:				
Alexandrite	Beryllium aluminate	Green by day, red by artificial light	Soviet (small) Ceylon (medium)	High
Catseye	-do-	Greenish to brownish	Small to large	-do-
Chrysolite	-do-	Yellow, green, brown	Medium	Medium
Coral	Calcium carbonate	Orange, red, white, black, green	Branching, medium	Low
Corundum:				
Ruby	Aluminum oxide	Rose to deep purplish red	Small	Very high
Sapphire	-do-	Blue	Medium	High
Sapphire (fancy)	-do-	Yellow, pink, white, orange, green, violet	Medium to large	Medium
Sapphire and ruby stars	-do-	Red, pink, violet, blue, gray	-do-	High to low
Sapphire or ruby (synthetic)	-do-	Yellow, pink, blue, red, white, green, violet	Up to 20 carats	Low
Diamond	Carbon	White, blue-white, yellow, brown, green, red, blue, pale	Any	High
Feldspar:				
Amazonstone	Alkali aluminum-silicate	Green	Large	Very low
Labradorite	-do-	Gray with blue sheen	-do-	-do-
Moonstone	-do-	White	-do-	-do-
Garnet	Variable silicate	Brown, black, yellow, green, ruby red	Small to medium	Low to medium
Jade:				
Jadeite	Complex silicate	Green, red, black, white, mauve	Large	Low to very high
Nephrite	Complex hydrous silicate	-do-	-do-	-do-

[1]Small -- up to 5 carats; medium -- up to 50 carats; large -- over 50 carats

[2]Low -- up to $5 per carat; medium -- up to $100 per carat; high -- over $100 per carat

*Clarke, Robert G., 1975 Edition, Gem stones, in Mineral facts and problems, Bicentennial Edition: U. S. Bureau of Mines Bulletin 667, p. 419-429.

Mohs' hardness	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characters
2.0-2.5	1.0 -1.1	Single	1.54	Synthetic or pressed	A fossil resin
7.5-8.0	2.63 -2.80	Double	1.58	Synthetic spinel, blue topaz	Double refraction, refractive index
7.5	2.63 -2.80	-do-	1.58	Soldered emerald, glass, tourmaline, peridot, green garnet	Emerald filter dichroism, refractive index
7.5-8.0	2.63 -2.80	-do-	1.58	Genuine emerald	Flaws, brilliant fluorescence in ultraviolet
7.5-8.0	2.63 -2.80	-do-	1.58	Quartz topaz, precious topaz, glass, doublets	Refractive index, double refraction
7.5-8.0	2.63 -2.80	-do-	1.58	Kunzite, tourmaline, pink sapphire	Refractive index
3.0	2.72	Double (strong)	1.5	Silicates	Translucent
3.0	2.72	-do-	1.6	Other onyx	-do-
3.0	2.72	-do-	1.6	Other spars	Sheen
8.5	3.50 -3.84	Double	1.75	Synthetic	Dichroism, inclusions in synthetic sapphire
8.5	3.50 -3.84	-do-	1.75	Quartz	Gravity and translucence
8.5	3.50 -3.84	-do-	1.75	Tourmaline, peridot	Refractive index, silky
3.5-4.0	2.6 -2.7			Imitations	Dull translucent
9.0	3.95 -4.10	Double	1.78	Synthetic	Inclusions and shape of flaws
9.0	3.95 -4.10	-do-	1.78	Synthetics including spinel	Inclusions, double refraction, dichroism
9.0	3.95 -4.10	-do-	1.78	Synthetics, glass, and doublets	Inclusions, double refraction, refractive index
9.0	3.95 -4.10	-do-		Star quartz, synthetic stars	Shows asterism, color on side view
9.0	3.95 -4.10	-do-	1.78	Synthetic spinel, glass	Double refraction, refractive index
10.0	3.516-3.525	Single	2.42	Zircon, titania	High index, dispersion, single refraction, hardness, cut, luster
6.0-6.5	2.54 -2.75			Jade	Cleavage sheen, vitreous to pearly, opaque
6.0-6.5	2.54 -2.75			Brazilian butterfly	-do-
6.0-6.5	2.54 -2.75		1.52	Glass or white onyx	Blue sheen, opalescent
6.5-7.5	3.15 -4.30	Double (strong)	1.79-1.98	Synthetics, spinel, glass	Double refraction, wear on facet edges, light-color varieties are transparent
6.5-7.0	3.3 -3.5		1.65-1.68	Onyx or glass	Luster of polished surface, translucent to opaque
6.0-6.5	2.96 -3.10		1.65-1.68	-do-	-do-

Table 1. -- Guide to Selected Gem Stones and Gem Materials Used in Jewelry

Name	Composition	Color	Practical Size[1]	Cost[2]
Olivine:				
Peridot	Iron magnesium silicate	Yellow, green	Any	Medium
Opal	Hydrous silica	Colors flash in white, gray, black, red, yellow	Large	Low to high
Pearl	Calcium carbonate	White, pink, black	Small	-do-
Quartz:				
Agate	Silica	Many colors	Large	Low
Amethyst	-do-	Purple	-do-	Medium
Cairngorm	-do-	Smoky	-do-	Low
Citrine	-do-	Yellow	-do-	-do-
Crystal (rock)	-do-	Colorless	-do-	-do-
Jasper	-do-	Uniform or spotted, red, yellow, brown, green, blue	-do-	-do-
Onyx	-do-	Many colors	-do-	-do-
Rose	-do-	Pink, rose red	-do-	-do-
Spinel	Magnesium aluminum	Red, blue, lilac, orange, yellow, purple, green	Medium	Low to medium
Spinel (synthetic)	-do-	Blue, white, light blue, yellow, gray, green, alexandrite colors	Up to 40 carats	Low
Spodumene:				
Kunzite	Lithium aluminum silicate	Pink to lilac	Any	Medium
Hiddenite	-do-	Yellow to green	-do-	-do-
Topaz (precious)	Complex silicate	White, blue, yellow, pink, red, green	White and blue any size Yellow and pink to medium	Low to medium
Tourmaline	-do-	Red, pink, green, blue, wine, brown, yellow	Green and red to 50 carats Others, medium	-do-
Turquoise	Copper aluminum phosphate	Blue to green	Large	Low
Zircon	Zirconium silicate	White, blue, brown, yellow, green	Small to medium	Low to medium

[1]Small -- up to 5 carats; medium -- up to 50 carats; large -- over 50 carats

[2]Low -- up to $5 per carat; medium -- up to $100 per carat; high -- over $100 per carat

Mohs' hardness	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characters
6.5-7.0	3.27 -3.37	Double (strong)	1.68	Tourmaline, chrysoberyl	Strong double refraction, low dichroism
5.5-6.5	1.9 -2.3	Single	1.45	Glass	Color changes
2.5-4.0	2.6 -2.85			Cultured and imitation	Luster and structure
7.0	2.58 -2.64			Glass	Crystalline, irregularly banded
7.0	2.65 -2.66	Double	1.55	-do-	Refractive index and double refraction, transparent
7.0	2.65 -2.66	-do-	1.55	-do-	-do-
7.0	2.65 -2.66	-do-		-do-	-do-
7.0	2.65 -2.66	-do-	1.55	-do-	-do-
7.0	2.58 -2.64			-do-	Opaque, vitreous
7.0	2.58 -2.64			-do-	Uniformly banded
7.0	2.65 -2.66	-do-	1.55	-do-	Refractive index and double refraction, transparent
8.0	3.5 -3.7	Single	1.72	Synthetic sapphire, garnet	Refractive index, single refraction, inclusions
8.0	3.5 -3.7	Double	1.73	Spinel, sapphire, aquamarine, topaz, alexandrite	Weak double refraction, lack of dichroism, refractive index
6.5-7.0	3.13 -3.20	Double	1.66	Pale amethyst, morganite	Refractive index, transparent
6.5-7.0	3.13 -3.20	-do-	1.66	Synthetic spinel	-do-
8.0	3.4 -3.6	-do-	1.62	Beryl, aquamarine, quartz, topaz	Refractive index
7.0-7.5	2.98 -3.20	-do-	1.63	Peridot, beryl, corundum, glass	Double refraction, refractive index
6.0	2.60 -2.83	-do-	1.63	Glass or composition	Difficult if matrix not present, matrix usually limonitic
6.0-7.5	4.0 -4.8	Double (strong)	1.79-1.98	Diamond, synthetics	Double refraction, wear on facet edges

Gem Stone Cutting and Polishing

Many species of gem stones have been endowed by nature with brilliant, lustrous faces which display scintillating reflections from their surfaces. However, in most instances, their form is never such as can reveal to full perfection the optical properties upon which their beauty depends. Because of irregularities of shape attributed to interference with crystal growth, the natural crystal faces are rarely perfect. Most crystals are usually stepped, pitted, and uneven in form. Many crystals are fractured either through movement of the host rock in which they were formed or in the course of extraction from the matrix in which they are found. Some may have been roughened by attrition against stones of equal or greater hardness, worn by the prolonged action of stream abrasion, or etched by aeolian processes.

The bright faces evident on many of the more regularly formed crystals and the crude polish given to stream-worn pebbles by being rubbed against one another in running water may well have been the incentive for early man to produce a polish on brightly colored minerals used for utility and decorative purposes. We are uncertain who first learned to polish the rough, irregular surfaces of the gem stones. The first attempts by man may have been to semipolish the irregular surfaces by rubbing one stone against another. The octahedral diamond crystal was probably polished in this manner. Grinding the stone to some sort of symmetrical shape evolved much later.

The earliest form of gem cutting simply gave a curved surface to the stone. This is known as the cabochon cut which probably originated in ancient Egypt before 5000 B.C. There are four types of cabochon cuts -- the simple cabochon, which has a dome-shaped upper surface and a flat base; the double cabochon, in which the base is also convex but less steep than the top; the hollow cabochon, in which the underside of the dome is hollowed out to form a concave depression; and the fourth, a very low dome with a flat base. These cuts are used for stones which are translucent or opaque such as malachite, jade, and turquoise. Gem stones exhibiting optical effects, such as asterism and chatoyance, are cut in the cabochon manner in order to reveal the star and cat's eye effects. Opal is also cut in cabochon to exhibit its beautiful play of colors or opalescence. Star rubies, sapphires, and enstatites are cut in a steep-domed, double cabochon cut to enchance the beauty of the asterated gem.

In early days, it was thought that the diamond, because of its extreme hardness, could not be cut. All that was done until the Fifteenth Century was to remove the gum or oil-like coating and polish the diamonds natural faces. The faceting of diamonds is thought to have originated in India sometime before the Sixteenth Century.

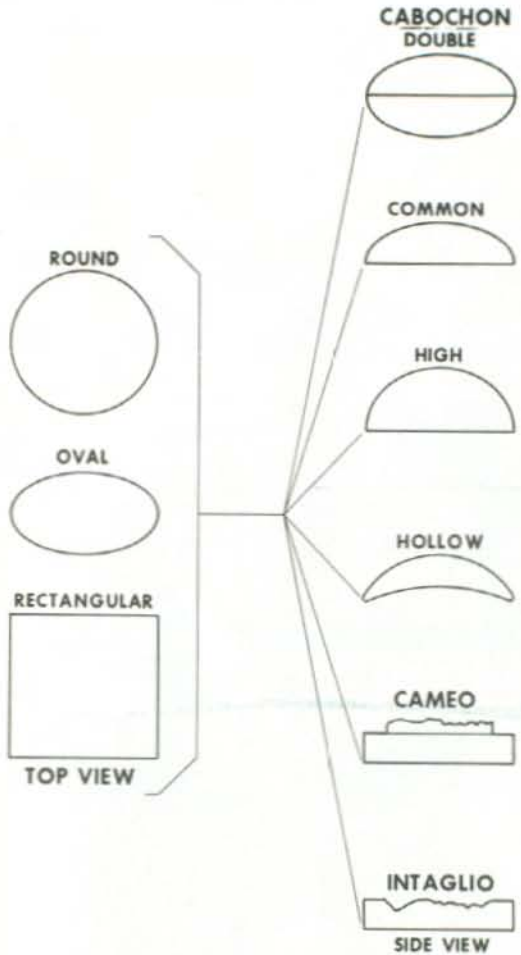
The first of the styles of cutting to employ flat facets is known as the rose cut because of the resemblance in the arrangement of the facets to those of an opening rosebud. The rose cut consisted of an upper faceted portion only, the underside being just a single large flat base. The round rose cut, the most common form of the rose cut, is used mostly for small cleavage fragments of diamond and in the cheaper selections of jewelry.

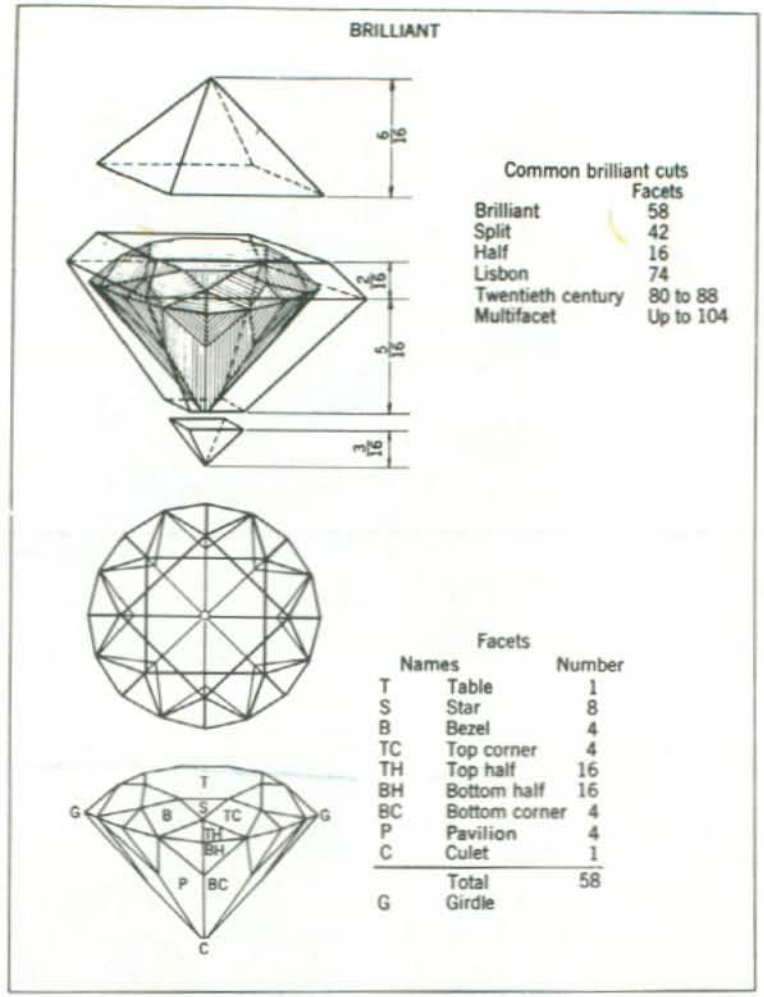
The round rose cut was later modified by the addition of more facets and became known as the double rose cut. From there the lapidary's artistic ability and self-expression created gem cuts of extreme beauty. These cuts were not only for diamond, but for other gem stones as well. A few of the more common cuts are the briolette, table, trap, emerald, marquise or novette, pendaloque, Swiss, zircon, king, miners, and brilliant.

The standard brilliant cut exhibits more fire and brilliance than any other cut. The cut has a total of 58 facets, 33 on the top or crown of the stone and 25 on the base or pavillion.

There are many other styles of cutting used for gem stones, the most common of which is called the mixed cut. This has a brilliant cut top and a step cut base. Some cuts, such as the Portuguese cut and the Scotch cut which are often used for citrine, have over 200 facets. If the stone is rather soft, as in fire opal, the table facet may be domed. Also a domed table may be seen in some peridots and amethysts.

principal forms of cryptocrystalline gem-stone cuts



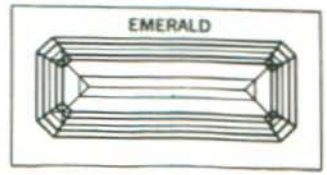


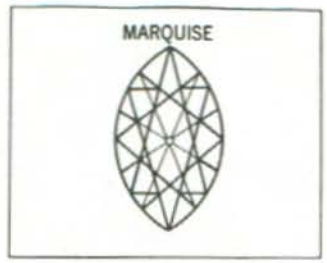
Common brilliant cuts

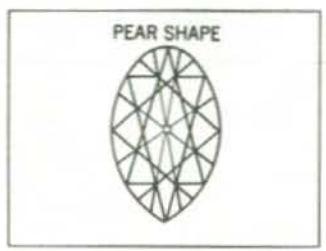
	Facets
Brilliant	58
Split	42
Half	16
Lisbon	74
Twentieth century	80 to 88
Multifacet	Up to 104

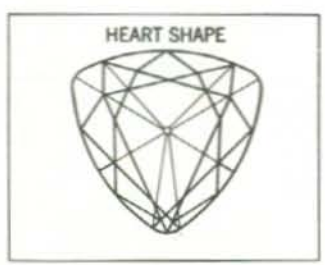
Facets

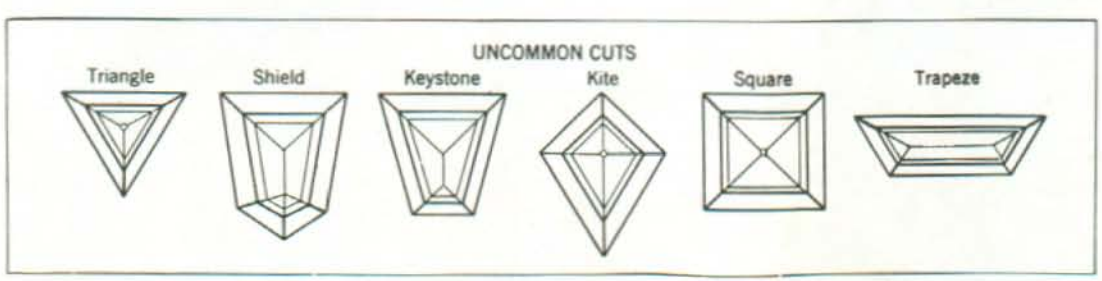
	Names	Number
T	Table	1
S	Star	8
B	Bezel	4
TC	Top corner	4
TH	Top half	16
BH	Bottom half	16
BC	Bottom corner	4
P	Pavilion	4
C	Culet	1
	Total	58
G	Girdle	

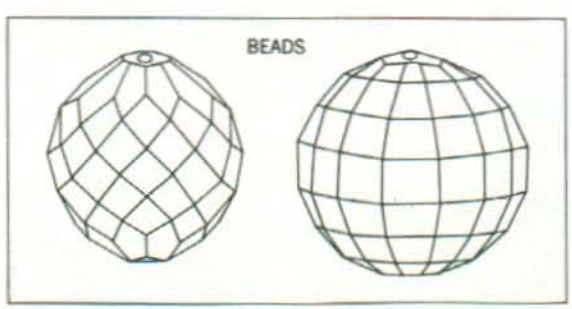










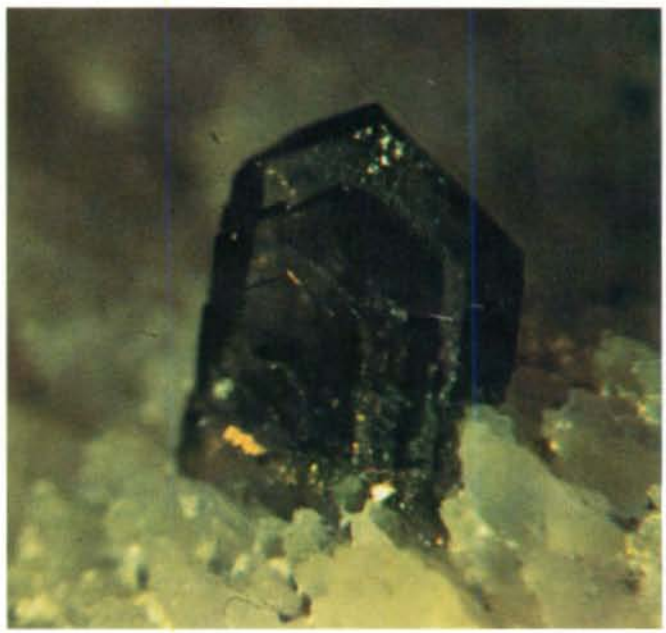


principal forms of crystalline gem-stone cuts

LIBETHENITE

RUTILE

URANOCIRCITE



EPIDOTE

SMOKY QUARTZ

Methods of Changing Color in Gem Stones

There are four major methods by which the color and brilliance of gem stones may be changed or their color and brilliance deepened or enhanced. These are surface painting or foiling the back of the gem, dying stones that are porous or contain minute fractures, applying heat in a controlled environment, and radiation.

Light-colored gems which are mounted in a closed setting are sometimes foiled either to increase their brilliance or to deepen their color. Most Victorian jewelery had foiled backs, particularly ruby, sapphire, topaz, and amethyst. Today, this method is primarily used to back the molded glass used in costume jewelry.

A common, unscrupulous practice in use today is to oil or dye flawed or porous light-colored rubies, sapphires, and emeralds with a suitably colored medium. The application of oils or dyes not only reduces the visibility of the flaws, but also adds color to the stone. However, if the gem is cleaned with an organic solvent, such as benzene, or even soaked in mild detergents, the oil or dye will be removed. This results in not only a loss of color, but will also lighten the fractures. They will become more readily apparent and will display, in most instances, a white surface. This method of coloration is easily exposed by rubbing the surface of the gem with a piece of cloth or blotting paper which has been saturated with benzene. Traces of dye should be immediately evident on the benzene-soaked applicator.

The colors and brilliance of many gem stones will change when heat is applied in a controlled environment. However, in many instances the color change is unstable, especially when the heat-treated gem is exposed to sunlight. Quartz, topaz, and zircon are the three gem stones to which heat is applied most commonly for color alteration. Amethyst, when heated, will produce fine yellow, brown, or reddish-brown gem stones. These colors are usually accepted as the citrine "group". Some amethyst from Montezuma, Brazil turns green upon the application of heat. This is not to say that all green quartz is treated, for Zambia is well-known for its naturally occurring green quartz. The yellowish-brown topaz from Brazil and some from Mexico have the curious property of becoming rose-pink when carefully heated in controlled conditions at temperatures between 300°C and 450°C. The application of heat to zircon produces a beautiful blue color not matched by any of the naturally occurring varieties of the species. Other gem stones which are commonly heat-treated are the greenish aquamarine which turns a beautiful sky-blue, dark-green tourmaline which turns emerald-green, and violet sapphire which turns pink.

Some gem stones, including diamond, have been artifically colored by bombarding them with radiation from radioactive isotopes, particularly cobalt^{60}. Diamonds have been colored to an emerald green through irradiation. All residual radiation is removed by successive washes in acid solutions.

Synthetic, Imitation, and Assembled Gem Stones

Ruby, emerald, sapphire, star ruby, star sapphire, spinel, quartz, and rutile are gem stones that have been successfully synthesized. A reddish-green stone known as synthetic alexandrite is actually synthetic corundum. A stone of simple chemical composition is generally more easily synthesized than one of complex composition. Although the diamond has the simplest composition of any gem stone (C), synthetic diamonds had never been produced until on February 15, 1955, the General Electric Company synthesized some very small industrial diamonds. The ruby has a simple composition of Al_2O_3, and synthetic gem star rubies and sapphires are made by growing a boule or pear-shaped mass by fusing aluminum oxide and titanium oxide powder in an oxidizing flame. This method is known as the Verneuil process and uses a Verneuil furnace. Boule is derived from the French word for "ball", for the small specimens first made by Verneuil in 1902 were ball-shaped.

Most synthetic gem ruby and sapphire today is grown by the Verneuil process. The furnaces can be automated in order to reduce labor costs. Factories in France, Germany, and Switzerland produce boules of synthetic ruby and sapphire the weight of which is measured in tons rather than carats. The cost of the rough synthetic is priced at a few cents per carat. Colors of synthetic corundum produced in this manner are highly varied and range from colorless to red, pink, orange, yellow, brown, green, blue, purple, and purple-green.

Sometimes the following distinctions can be made between synthetic and natural stones. Natural stones never contain inclusions that are spherical, while synthetic stones contain spherical inclusions and exhibit curved growth lines. The natural stones exhibit straight growth lines.

Gems made of glass are known as imitation stones. Unlike synthetics, the imitation stones resemble true gems only in color. Cheap imitations are produced from bottle glass or lead glass, while more exact imitations are made from special glass or paste.

Reconstructed or assembled gems are prepared from inferior gem material. Two types of assembled stones are the doublet and triplet. The doublet consists of two different or two like gem materials (with the exception of color) cemented together, usually at the girdle. The top (or table) of the stone may be quartz, and the bottom (or pavillion) may be glass; or the top may be sapphire of deficient color and the bottom section sapphire of a bright-blue color to compensate for the pale color of the top section. Care must be taken in the examination of this type stone, because the laminated doublet always displays the color of the darker of the two pieces. The hand lens (10x) usually reveals the line at the girdle at which the two pieces of material are bonded.

The triplet is an assembled stone which involves three different materials. A classic example is onyx bonded to black opal with an overlay of clear quartz. When these are laminated, cabed, polished, and mounted with a gold or silver backing, identification can be difficult. However, most doublets and triplets are easily detected by immersing them in an index oil, thereby seeing the separate layers. Also, by immersing the stone in boiling water, the canada balsam commonly used in laminating will dissolve, and the pieces will separate.

GEM STONES IN NORTH CAROLINA[1/]

History of Gem Mining

North Carolina is well-known and highly regarded today as one of the important gem stone producing states in America. This status is not due to the existence of major gem stone mines. Instead, it has resulted from the discovery and production of gem stones as a byproduct in other mining operations.

Mining for gem stones in North Carolina had its beginning in the finding of rolled crystals in gold mine washings, some of which were of gem quality. These included the gold itself, a few diamonds, and occasionally a zircon or an epidote crystal. With the development of mica mining about 1869, some beautiful beryls, garnets, and other minerals were found. The first systematic mining for gems was undertaken by C. E. Jenks in 1871, when he opened a mine for gem corundum at Corundum Hill, Macon County. A short time later, a mine was opened for gem corundum on Buck Creek in Clay County. Neither mine proved to be very profitable, and both were closed after a short time. J. A. D. Stephenson of Statesville, Iredell County, became interested in gem stones in the Piedmont region shortly after the Civil War and for 20 years or more tried to promote interest in establishing a gem stone mining industry in the state. About 1880 he interested W. E. Hidden in a property at Stoney Point, Alexander County. In 1881 after considerable prospecting, the Emerald and Hiddenite Mining Company was organized to carry on mining for emerald, hiddenite, and other minerals. Work was continued at irregular intervals until 1885 when it was abandoned because of legal disputes over the property. In 1894, mining for emeralds was started in a pegmatite on Crabtree Mountain in Mitchell County but continued for only a short period. About 1895, systematic mining was started to recover rubies from gravels in the Cowee Valley area of Macon County but was later discontinued. Today, this area offers a variety of gem stones for interested collectors. About the same time, rhodolite garnet was discovered in the area and was mined intermittently. In 1897, emerald was found near Earl, Cleveland County, south of Shelby. Pratt, in 1905, stated that the American Gem and Pearl Company of New York was mining beryl in Mitchell County, and the American Gem Mining Syndicate of St. Louis was mining rhodolite in Macon County. Prospecting and some mining was continued intermittently during the next few years. Pratt, in 1911, mentioned mining for aquamarine in Mitchell County by the Virginia-Carolina Gem Company of Shenandoah, Virginia. He also mentioned that the Connally amethyst mine in Macon County had been worked by the American Gem and Pearl Company of New York and the Rhodes amethyst mine in Macon County had been worked by the Passmore Gem Company of Boston. In 1919, Pratt mentioned that in 1913-1914 Consolidated Ruby Company of New York did prospecting work for ruby at In Situ Hill in Macon County. The last attempt at systematic mining for gem stones in North Carolina was in 1926 when B. S. Colburn of Asheville reopened the Hiddenite mine at Stony Point and secured approximately $7000 worth of hiddenite.

Beginning about 1910, there was a major decline in the gem stone industry of the country as a whole. There was a slight recovery in the mid-thirties, but it was not until after the close of World War II that the gem stone industry returned to normal conditions. In North Carolina there has been little systematic mining for gem stones in 50 years. There has been, however, a strong surge of interest in rocks and minerals in general that has resulted in the formation of mineral clubs and societies in many sections of the State.[2/] Many of the old mines and prospects have been opened to collectors for a fee and have become more valuable to owners than ever before.

Important Gem Stones

Diamond: The diamond, composed of pure carbon, is generally acknowledged to be the most precious of all gem stones. It crystallizes in the cubic system, has a hardness of 10, a specific gravity that ranges from 3.15 to 3.53, and a perfect octohedral cleavage which is of assistance in cutting. While the diamond is hard, it is also brittle and can be easily broken. A misconception seems to exist concerning the differences between

1/ Modified after Stuckey, 1965.

2/ See Appendix 4 for listing of mineral clubs.

hardness and strength. The diamond will cut any other gem stone, and the edge of a diamond crystal will cut another diamond. If, however, a diamond is placed on an anvil and struck with a hammer, it will shatter into worthless fragments. Unfortunately, this has happened with several North Carolina diamond finds. Most of the diamonds used as gems are colorless or nearly so, but different shades of yellow and brown are sometimes used. Stones with blue, red, and green colors are very rare. Gray, black, milky, and opalescent stones are occasionally found. On the basis of use, diamonds are classed as gem diamonds or industrial diamonds. Gem diamonds are cut and used as gems, while industrial diamonds are used as cutting and polishing materials.

The primary source of the diamond is in kimberlite pipes or other forms of ultramafic igneous intrusive rocks. A secondary source is stream and beach gravels.

Thirteen authentic diamonds have been found in North Carolina. The first was found near Brindletown, Burke County, in 1843. It weighed 1.33 carats and was valued at $100. The last recorded find was near Kings Mountain, Cleveland County, in 1893. Most of the stones weighed less than 2 carats each. The largest recorded from North Carolina was found near Dysartsville, McDowell County, in 1886 and weighed 4.33 carats. The diamond was a transparent, distorted, twinned hex-octahedron with a grayish-green color. The gem stone was sent to Tiffany & Co. of New York for verification and evaluation. It was appraised (uncut) at $100 to $150. The gem stone was later purchased for an undisclosed amount and placed in the Tiffany-Morgan collection of the American Museum of Natural History. The diamonds found in North Carolina were distributed as follows: three near Brindletown, Burke County; one near Kings Mountain, Cleveland County; three near Dysartsville, McDowell County; two from Rutherford County; one near Cottage Home, Lincoln County; one from Todd's Branch, Mecklenburg County; and two from the Portis mine in Franklin County.

These seven counties all lie in the Piedmont plateau and have essentially the same geological setting -- older gneisses and schists intruded by various igneous rocks. Six of these, Burke, McDowell, Rutherford, Cleveland, Lincoln, and Mecklenburg, are all adjacent and lie in the upper Piedmont plateau near the mountains and along the southern border of the state. Franklin County is north of Wake County and in the lower Piedmont plateau near the western border of the Coastal Plain.

No geologic evidence has been found which would indicate the primary source of these 13 diamonds. The possibility of locating other diamonds in alluvial gravels would probably be only by chance.

The North Carolina Handbook, Raleigh, 1886, p. 198, contains the following interesting statement relative to a diamond found in Todd's Branch, Mecklenburg County: "Dr. Andrews informed me, says Dr. Genth, that a very beautiful diamond of considerable size, like a small chincapin, and of black color had been found at the same locality by three persons, while washing for gold, In their ignorance, believing that it could not be broken, they smashed it to pieces. Dr. Andrews tested the hardness of a fragment, which scratched corundum with facility, proving it to be a diamond."

Corundum: Corundum, Al_2O_3, crystallizes in the hexagonal system and usually occurs in well-developed crystals of many sizes. It often occurs in large crystals that are sometimes rough or rounded, barrel shaped, and deeply striated. The mineral also occurs in compact, granular, and lamellar masses. Corundum has a conchoidal fracture but no cleavage. Basal and nearly rectangular rhombohedral partings are commonly present. Corundum has a hardness of 9, next to that of the diamond, a specific gravity of 3.9 to 4.1, and a vitreous luster. The most common color is gray, but various shades of brown, blue, red, and yellow are also found. In some cases corundum is colorless -- some specimens are multicolored. It may occasionally show asterism.

Common corundum and emery are used as abrasives. Common corundum consists of rather opaque crystals or masses with gray or dull colors. Emery is a black, granular mixture of corundum, magnetite, hematite, quartz, and spinel.

Ruby is a transparent, deep-red variety of corundum that is highly prized as a gem stone. The color of ruby varies from a rose through carmine to a dark, somewhat purplish, red often called pigeon-blood red. This dark, purplish-red is the most desirable color exhibited by natural rubies.

Precious corundum of all colors other than red is called sapphire. The true sapphire is blue, the color


A
Section of a sapphire crystal,
banded blue and yellow, Jenks Mine, Macon County,
North Carolina.
B
Asteriated sapphire,
Jackson County,
North Carolina.
C
Ruby,
Jenks Mine, Macon County,
North Carolina.
D
First sapphire found in matrix
Corundum Hill, Macon County,
North Carolina.
Restored to matrix after being cut
E
Sapphire (Brown)
Chatoyant.
Mc Dowell County,
North Carolina.
F
Ruby,
Cowee Valley,
Macon County, North Carolina.
G
Ruby,
Cowee Valley,
Macon County, North Carolina.

Kunz 1907.


A
Emerald.
Stony Point,
Alexander County,
North Carolina.
B
Aquamarine.
(Sea Green.)
Spruce Pine,
Mitchell County,
North Carolina.
C
Aquamarine. (Blue.)
Spruce Pine,
Mitchell County,
North Carolina.
D
Emerald Matrix.
Crabtree Mountain
Mitchell County,
North Carolina.
E
Beryl Cats Eye.
Spruce Pine,
Mitchell County,
North Carolina.
F
Hiddenite.
Stony Point,
Alexander County,
North Carolina.
G
Diamond.
Dysertville,
Mc Dowell County,
North Carolina.
A

Kunz 1907.

being a velvety, corn-flower blue called Kashmire blue. The colorless variety is called white sapphire; the yellow variety, yellow or golden sapphire; and the pale-pink variety, pink sapphire.

Most of the corundum found in North Carolina occurs in association with peridotites and dunites and in chlorite schists surrounding these ultramafic rocks. Small amounts occur in gneisses and schists such as mica gneiss, mica schist, and hornblende gneiss and schist. Some are found in pegmatites occurring in these rock types. Minor amounts have been obtained from stream gravels.

Between 1871 and 1900, when mining was first started at Corundum Hill in Macon County, North Carolina was the leading state in the production of corundum. For a number of years during that period, this state produced all the corumdun used in the United States. During this period, corundum was produced chiefly in Clay, Macon, Jackson, Transylvania, and Madison Counties. Other counties west of the Blue Ridge Mountains that are known to contain corundum deposits include Swain, Haywood, Buncombe, Yancey, and Mitchell. East of the Blue Ridge Mountains, corundum is found in Alexander, Iredell, Burke, Cleveland, McDowell, Gaston, and Guilford Counties, but the only commercial production in this area was in Iredell County in 1893.

The first mining at Corundum Hill in 1871 and later at Buck Creek was for gem-grade ruby and sapphire. These mines later became important producers of abrasive corundum, but gem-quality material continued to be found in small amounts as long as systematic mining was continued.

Ruby: The ruby, the most precious gem stone of the corundum species, has been produced in North Carolina at the Corundum Hill mine, the Caler Fork of Cowee Creek area, and the Mincey mine in Macon County. It has also been produced at the Buck Creek mine near Elf and on Shooting Creek in Clay County. The most important of these sites has been Caler Fork of Cowee Creek where excellent rubies have been obtained from alluvial gravels.

Pink corundum, not of ruby quality, occurs at a number of other localities including one near Green Hill School and one near Oak Springs Baptist Church in Rutherford County; near Bakersville and Hawk, Mitchell County; the Asbestos mine, Jackson County; the Ruby mine, Macon County; near Newfound Gap, Haywood County; and near Elf, Clay County. Smaragdite, a grass-green amphibole containing pink corundum, is present at two places in the Buck Creek corundum area. Pink corundum encased by the mineral margarite occurs in Iredell County.

Sapphire: The sapphire in the true sense is a transparent, blue corundum. Colorless corundum is called white sapphire; yellow corundum is called yellow or golden sapphire; and pale-pink corundum is called pink sapphire. A number of handsome cabinet specimens and gem stones have been obtained from the Corundum Hill mine in Macon County. Corundum of varying colors has been found at a number of localities other than Corundum Hill. The more important of these include the Sapphire Corundum mines in Jackson County; near Elf, Clay County; at the Watauga mine four miles east of Franklin, Macon County; at the Presley mine in Haywood County; and near Bakersville and Hawk, Mitchell County.

No corundum has been mined in North Carolina for several years, but many of the old mines and prospects are open to collectors -- some for the asking and others for a fee. The latter is especially true of the ruby mines on the Caler Fork of Cowee Creek in Macon County.

Beryl: Beryl, $Be_3Al_2Si_6O_{18}$, crystallizes in the hexagonal system and often occurs in long prismatic but very simple crystals. It also occurs in columnar, granular, compact masses, and in rounded grains. Some crystals of beryl from South America are of enormous size, exceeding a ton in weight.

Beryl has an indistinct basal cleavage and a conchoidal to uneven fracture, a hardness of 7.5 to 8, and a specific gravity of 2.6 to 2.8. Common beryl generally has a pale-green, yellowish, or grayish-white color that is often mottled. Other varieties are blue, green, yellow, rose, red, or colorless. The luster is vitreous. It may exhibit a weak yellow or pale-green fluorescence under ultraviolet light.

Beryl most commonly occurs in pegmatite dikes and is also often found in gneisses and schists that have been intruded by pegmatites. It has two important uses. One of these is as a source of beryllium. The other is as a gem stone.

The following varieties of beryl are used as gemstones. Emerald, the most highly prized variety, is transparent to translucent and has an emerald-green or blue-green color. Aquamarine is transparent and is usually blue or light green in color. Yellow or golden beryl is transparent and has a beautiful golden-yellow color. There are a few other varieties, but the emerald and aquamarine are by far the most important beryl gem stones. Emerald, aquamarine, and yellow or golden beryl have been found in North Carolina.

Emerald: The first reported emerald found in North Carolina was collected by J. A. D. Stephenson of Statesville, Iredell County in 1875 near Stony Point, now Hiddenite, Alexander County. During the next few years, other specimens were collected in the area. In 1880, W. E. Hidden began prospecting in the area, and in 1881, the Emerald and Hiddenite Mining Company was formed and began more systematic mining. The mine did not become a major producer, but a number of "pockets" containing valuable emerald crystals were found. One pocket contained 9 crystals, all excellent in color and partly transparent but more or less flawed. One of these, the largest found in the area, was 8.5 inches long and weighed nearly 9 ounces. One was 5 inches long. A number of other valuable emeralds were found in the area, but no large deposits were found. The largest single emerald crystal found in North America was found at the Rist mine at Hiddenite in 1969. The crystal has a weight of 1438 carats and is valued in excess of $50,000. The "Carolina Emerald", a 13.14 carat, emerald-cut gem, was found at the Rist mine but is now the property of Tiffany & Co. in New York. Tiffany has appraised this gem for $100,000. The emerald has been chosen by the North Carolina Legislature as the official gem stone of North Carolina.

In July 1894, J. L. Rorison and D. A. Bowman discovered emeralds in a pegmatite dike on Crabtree Mountain southwest of Spruce Pine, Mitchell County. This deposit produced a number of fine specimens suitable for cutting. The first emeralds recovered were small, generally 1 to 10 mm in diameter and 5 to 25 mm long, but some were found two or three times that size. These were perfect hexagonal prisms, generally well-terminated by basal planes, and with good color. Later, crystals of gem quality up to one inch in diameter and one inch long were found. In recent years most of the material produced at this mine has consisted of emerald in matrix, which is in demand by collectors.

In 1909, emeralds were discovered on the W. R. Turner property some 4 miles west of Patterson Springs in Cleveland County. After some prospecting, the property was acquired and worked until 1913 by the Emerald Company of America under the name of Old Plantation mine. It has been estimated that about 3000 carats of rough stones with a gross value of $15,000 were produced. The emeralds at this locality were found in a pegmatite dike.

Aquamarine: Aquamarine and golden beryl have been collected at a number of mines and prospects in North Carolina, some of which are still productive. The Littlefield mine on Tessentee Creek, Macon County, produced good specimens of clear aquamarine and golden beryl, varying from 3/4 inch in diameter to 2 or more inches. These crystals furnished very good gems as well as splendid cabinet specimens. Aquamarine and golden beryl have been obtained at the Ray mine near Burnsville, Yancey County. In the Spruce Pine area of Mitchell County, excellent specimens of aquamarine and golden beryl have been found at the Wiseman Mica mine and the Grassy Creek Emerald mine. Aquamarine and golden beryl have been found on the Joel Walker property on South Mountain, 8 miles south of Morganton, Burke County; near Ellenboro, Rutherford County; south of Shelby, Cleveland County; and at a number of prospects in Alexander County.

Spodumene: Spodumene, a lithium aluminum silicate, crystallizes in the monoclinic system and often occurs in crystals of great size. It has a perfect prismatic cleavage, an uneven fracture, a hardness of 6.5 to 7,

a specific gravity of 3.1 to 3.2, and a vitreous to pearly luster. The color is generally white, gray, green, lilac, pink, or purple (rarely). Ordinary white or gray spodumene is the chief source of lithium. The emerald-green variety is known as hiddenite, and the lilac-pink variety is known as kunzite.

Spodumene occurs in granitic pegmatites. In North Carolina, the Kings Mountain Tin-Spodumene belt, a pegmatite belt, extends from the South Carolina line near Grover across Cleveland and Gaston Counties to the center of Lincoln County near Lincolnton. The emerald-green variety of spodumene known as hiddenite has been found only at Hiddenite near Stony Point, Alexander County, to the north of the Kings Mountain belt. The discovery of hiddenite near Stony Point was described as follows. In 1879, Mr. J. A. D. Stephenson of Statesville received from the Stony Point locality some green crystals supposed to be diopside. Mr. Stephenson called the locality to the attention of Mr. W. E. Hidden in 1880. In July of that year, Mr. Hidden began prospecting and found a pocket containing a few emeralds and an emerald-green mineral in greater abundance. Some of these were sent to Dr. J. Laurence Smith of Louisville, Kentucky who found the mineral to be spodumene and named it hiddenite. The mine was not a big producer of hiddenite and was closed in 1885 because of legal disputes. Mr. B. S. Colburn reopened the mine about 1926 and recovered about $7000 worth of hiddenite which was only about half the cost of the work. The old pits and mine dumps are now open to collectors for a fee.

The pink variety of spodumene is known as kunzite. Its chief source is Pala, San Diego County, California. In the early 1930's, Mr. B. C. Burgess, while prospecting for feldspar at the Smith mine near Penland, Mitchell County, uncovered a pocket that contained about a pound of kunzite, much of which was poorly colored. Before the potential of the find was realized, the site was covered by a mine dump, and none has been found since.

Garnet: Garnet is the name applied to a group of minerals that are somewhat alike in physical properties, except for color, but vary widely in composition. Garnets crystallize in the cubic system and usually occur as well-developed crystals, but granular masses and rounded disseminated glassy grains are also found. It has a dodecahedral parting, a conchoidal to uneven fracture, a hardness of 6.5 to 7.5, and a specific gravity of 3.4 to 4.3. The color varies from red, orange-brown, yellow, green, and black to white or colorless. The luster is vitreous to resinous. In composition, garnets are silicates of calcium, magnesium, manganese, aluminum, iron, and chromium.

The garnet group consists of two solid solution series:

pyrope ($Mg_3Al_2Si_3O_{12}$)	uvarovite ($Ca_3Cr_2Si_3O_{12}$)
almandite ($Fe_3Al_2Si_3O_{12}$)	grossularite ($Ca_3Al_2Si_3O_{12}$)
spessartite ($Mn_3Al_2Si_3O_{12}$)	andradite ($Ca_3Fe_2Si_3O_{12}$)

Garnet is a very common mineral. It occurs in gneisses and schists, as a contact metamorphic mineral, as a constituent of igneous rocks and pegmatite dikes, in various ore deposits, and in sands and gravels. Its value as a gem stone is limited because of its common occurrence. Garnet is found in practically every county in the Piedmont Plateau and Appalachian Mountain regions of North Carolina. Varieties of gem stone quality known to occur in North Carolina include almandite, pyrope, spessartite, and rhodolite.

Spessartite, a hyacinth-red to brownish-red garnet, is rare in North Carolina (Kunz, 1907) but has been reported near Bakersville, Mitchell County, where plate-like crystals in mica are large enough to cut gems of a carat or more.

Almandite garnet occurs abundantly in Burke, Caldwell, Catawba, Jackson, and Madison Counties, to mention only a few of the many localities. Large quantities of this dark-red to black garnet have been found near Willets, Jackson County, and on Little Pine Creek, Madison County. Some of these have furnished attractive gems.

Pyrope is very similar in color to almandite, and it is nearly impossible to visually distinguish the two. Pyrope garnet of good gem stone quality has been obtained from the gold-washings of Burke, McDowell, and Alexander Counties.

Rhodolite is by far the most valuable variety of garnet found in North Carolina. It is of particular interest to North Carolinians in that it is found in no other state. Gem quality rhodolite also occurs in Brazil, Ceylon, and Africa. When first noticed, rhodolite was thought to be a brilliant, light-colored variety of almandite. A. M. Fields of Asheville first mentioned it in 1893. Hidden and Pratt (1898) studied the mineral in detail, established its formula as composed of two parts of pyrope and one part of almandite, and named it rhodolite because of its pale, rose-red and purple color resembling that of the rhodendron. Rhodolite occurs in the area between Mason Branch and Cowee Creek, east of West Mills and north of Franklin in Macon County. The crystals usually found are not large, but stones have been cut that weighed as much as 14 carats.

Andradite was named after the Portuguese mineralogist I'Andrada who, in 1800, described one of its subvarieties. The major subvarieties are demantoid (green), melanite (black), and topazolite (yellow).

Grossularite has the highest dispersion of the garnet group. Hessonite (essonite) is the brownish-yellow to brownish-orange variety, and transvaal jade is a compact, green variety with a waxy luster.

Uvarovite is a dark-green to emerald-green garnet. It is the rarest of garnets.

Rutile: Rutile crystallizes in the tetragonal system. Slender, acicular crystals are common, but rutile also occurs in compact granular masses. Prism faces on crystals are frequently striated vertically. Knee-shaped twins are often observed, while trillings, sixlings, and eightlings are not uncommon. Rutile has a hardness of 6 to 6.5, a specific gravity of 4.2 to 4.3, a metallic adamantine luster, and is opaque to transparent. The color is red brown to blood red to black. Blood-red rutile and rutilated quartz are used as gem stones.

Rutile is an oxide of titanium and occurs in granites, gneisses, and schists. It is widespread in the igneous and metamorphic rocks of the Piedmont and mountain regions. It occurs in splendent crystals at numerous places in the vicinity of Stony Point, Alexander County, and at Crowder's Mountain and near Alexis in Gaston County. Beautiful crystals have been found near Mebane, Orange County. Rutile occurs in stream gravels along Shooting Creek, Clay County and Brindle Creek near Brindletown, Burke County.

Quartz: Quartz is one of the most common minerals in the earth's crust. It occurs in nearly every type of rock -- igneous, sedimentary, or metamorphic -- and is found in geologic formations of all ages. Quartz crystal izes in the hexagonal system, and crystals are very common. They usually consist of a hexagonal prism, terminated by a positive and a negative rhombohedron so developed as to resemble the hexagonal bipyramid of the first order. Twins are quite common.

Quartz crystals often contain inclusions, some of which are solid and some liquid. Solid inclusions may be rutile, hematite, epidote, actinolite, mud, or organic matter. Liquid inclusions consist of water and liquid carbon dioxide. Carbon dioxide is also sometimes present as a gas.

Quartz has a distinct rhombohedral cleavage and a perfect conchoidal fracture. It has a hardness of 7, a specific gravity of 2.65, and a vitreous luster. Pure quartz is colorless, but, as a result of impurities, the mineral is found in practically every color, especially yellow, orange, pink, purple, green, blue, brown, and black. Many of these colors disappear on heating.

Quartz occurs in many varieties that are commonly classed as crystalline, cryptocrystalline, and clastic. Crystalline and cryptocrystalline varieties, some of which are valued as gem stones, occur in abundance at many localities in the Piedmont and mountain sections of North Carolina.

Rock crystal: Rock crystal is pure, colorless quartz that is usually but not always well crystallized. It is often cut into vases, crystal balls, beads, and ornaments. Quartz crystals are found in nearly every county in the Piedmont and mountain sections of North Carolina, but only a small portion of these qualify as rock crystal. Probably the finest quartz crystals ever discovered in North Carolina were found near Long Shoal Creek on a spur of Phoenix Mountain in Chestnut Hill Township, Ashe County. Other excellent specimens were found in the same community. Good crystals were obtained near Elkin, Surry County, at one time. Other local-

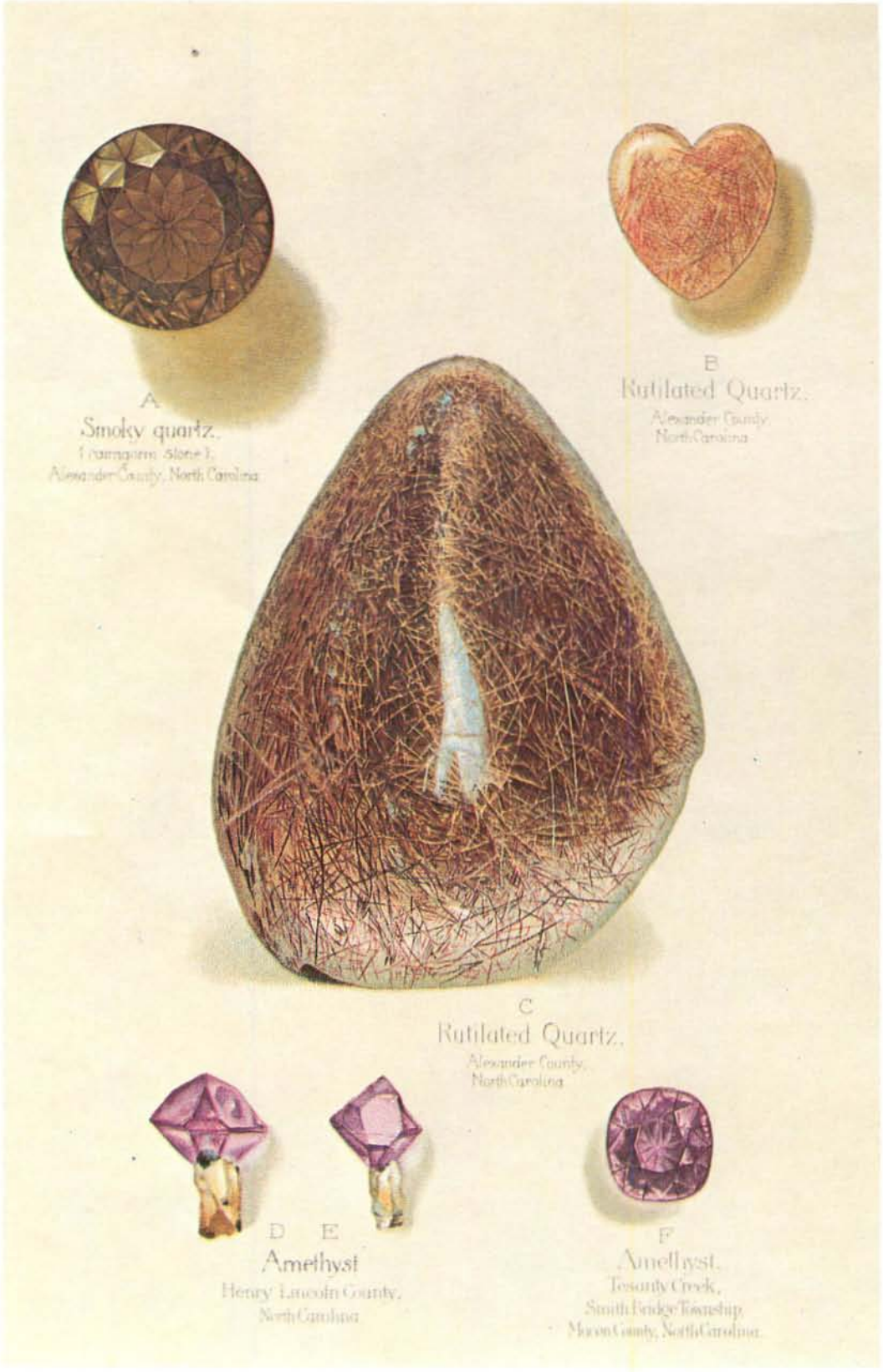
A
Cyanite,
Seven Mile Ridge, Mitchell County,
North Carolina.

B
Cyanite,
Seven Mile Ridge, Mitchell County,
North Carolina.

C
Rhodolite.
Cowee Valley,
Macon County, North Carolina.

D
Rhodolite.
Cowee Valley,
Macon County, North Carolina.

Kunz 1907.


A
Smoky quartz.
(Cairngorm Stone.)
Alexander County, North Carolina.
B
Rutilated Quartz.
Alexander County,
North Carolina.
C
Rutilated Quartz.
Alexander County,
North Carolina.
D E
Amethyst
Henry Lincoln County,
North Carolina.
F
Amethyst.
Tesonty Creek,
South Fridge Township,
Macon County, North Carolina.

Kunz 1907.

ities where quartz crystals partly of rock crystal quality have been found are in Alexander, Burke, Catawba, Cleveland, Stanly, and Transylvania Counties. Quartz crystals up to 18 inches long and 50 pounds in weight, in part clear, have been found on Horse Creek northeast of Raleigh in Wake County.

Amethyst: Amethyst is a well-crystallized, transparent variety of purple or violet quartz that is quite beautiful. It occurs at a number of well-known localities in North Carolina. Perhaps the best known of the North Carolina localities are along Tessentee Creek in Macon County. Two mines were worked for amethyst in this area in the early 1900's. These were the Connally mine, worked by the American Gem and Pearl Company of New York, and the Rhodes mine, worked by the Passmore Gem Company of Boston. There were a number of other small prospects in the same area. A number of other amethyst localities are known to occur in North Carolina, the most important of which are in Silver Creek at Brindletown, Burke County; near Centerville, Franklin County; near Amity Hill, Iredell County; southwest of Robbins, Moore County; at Copper Gap, Stokes County; near Iron Station, Lincoln County; and near Inez, Warren County.

The origin of the name of this mineral is told in Greek mythology. The god Bacchus, offended at some neglect that he had suffered, was determined to avenge himself and declared that the first person he should meet should be devoured by his tigers. Fate willed it that his luckless mortal was a beautiful and pure maiden named Amethyst, who was on her way to worship at the shrine of Diana. As the ferocious beasts sprang toward her, she sought the protection of the goddess and was saved from a worse fate by being turned into a pure white stone. Recognizing the miracle and repenting of his cruelty, Bacchus poured the juice of the grape as a libation over the petrified body of the maiden, thus giving the stone the beautiful violet hue.

Rose quartz: Rose quartz is generally massive, pink to rose-red in color, and transparent to translucent. It is in general light colored and of limited occurrence in North Carolina. The known occurrences are several localities in the general vicinity of Hiddenite, Alexander County; near Dan River, Stokes County; on Fox Mountain in the northwestern corner of Iredell County; northwest of Shelby, Cleveland County; in Cabarrus County; and near Ellenboro, Rutherford County. Probably the best-colored rose quartz found in North Carolina was a dark rose variety from Fox Mountain, Iredell County.

Smoky quartz: Smoky quartz is generally smoky-yellow to dark-brown or black in color. The best grade of smoky quartz generally occurs as crystals, but large amounts of massive smoky quartz are found in quartz veins and pegmatite dikes in North Carolina. The pegmatite dikes of the Spruce Pine district and those northeast of Falls in Wake County, to mention only two areas, contain large amounts of massive gray to smoky quartz. Quartz veins often contain massive smoky quartz. Several such veins may be seen in the road-cut south of the Emerald-Hiddenite mine at Hiddenite, Alexander County. Smoky quartz crystals have been found near Brindletown, Burke County; north of Looking Glass Falls, Transylvania County; at the Ray mine in Yancey County; and in Davidson County. Crystals of smoky quartz are to be found at many localities in the western half of the Piedmont plateau.

Rutilated quartz: Rutilated quartz or sagenite is rock crystal containing long, fine, light-brown needles of rutile or needle-like crystals of other minerals such as hornblende, actinolite, or tremolite. Rutilated quartz of excellent beauty has been found at several localities in the vicinity of Stony Point, Alexander County. Also in the same general area, quartz crystals have been found that contained what appears to be asbestos or byssalite. Excellent specimens of rutilated quartz have been found in Catawba, Burke, Iredell, and Jackson Counties. Quartz crystals containing chlorite have been found in Person County. In Randolph County, 4 miles west of Farmer, quartz crystals containing actinolite are found near Copper Hill. Rutilated quartz is found at three localities on and near Pilot Mountain, Randolph County.

Chalcedony: Chalcedony is a cryptocrystalline variety of quartz. It normally occurs as stalactites, in concretionary forms, or as a lining of cavities. Chalcedony of gem quality is a transparent to translucent, light-colored, white, gray, brown, or blue mineral with a waxy luster. With a very few exceptions, one of which is at Copper Gap in Stokes County, the chalcedony found in North Carolina is a weathering product of the peridotites west of the Blue Ridge Mountains. It occurs as irregular masses deposited in the joints and cracks of the rocks. The common colors in North Carolina are white to brown, but some specimens have been found that were of a delicate green color. A rich fawn- and salmon-colored chalcedony has been reported near Linville in Burke County.

Agate: Agate is chalcedony made up of strata or bands indicating successive stages of deposition. The layers may be differently colored or clouded. Moss agate contains visible inclusions, frequently dendritic or moss-like. The colors of agate are white, brown, red, and bluish. Agate occurs in geodes and in volcanic and sedimentary rocks. Agate is not a common mineral in North Carolina, but it has been reported as occurring in several localities. Fine agates have been reported near Concord and Harrisburg in Cabarrus County, near Caldwell in Mecklenburg County, and near Hester in Granville County. Moss agate has been found near Hillsborough in Orange County.

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SAFETY TIPS FOR ROCK AND MINERAL COLLECTORS

North Carolina contains one of the largest varieties of minerals and rocks of any state in the nation. Many of these minerals are prized as semi-precious and precious gem stones. Others are collectors' specimens and valuable ores. These gems and minerals are sought by Tar Heel and tourist rock and mineral collectors alike.

Mineral and gem collecting can be enjoyable, relaxing, and, at times, profitable. Many collectors in North Carolina have amassed rock and mineral collections which many museums would be proud to display. However, the hobby of "rockhounding" is not without its hazards. The intent of this section is to assist the inexperienced collector and to make the experienced collector more aware of the safety hazards involved in this enjoyable hobby.

There have been fatalities and serious injuries to rockhounds in North Carolina due to their failure to observe common-sense safety practices and procedures. This section points out some of the most common hazards in collecting and also some of the most important procedures which should be followed at all times. Please take the time to study these DOs and DON'Ts carefully. Following this common-sense advice may save your life!

FOR FURTHER INFORMATION ON MINE SAFETY CONTACT:

North Carolina Department of Labor
Mine and Quarry Division
501 N. Blount Street
Raleigh, North Carolina 27604
Phone: (919) 733-7428

DOs

1. DO plan your work in advance and follow your plan.
   Reason: Work that is carefully considered and planned in advance, considering all hazards, will be safer and more enjoyable.

2. DO wear personal protective equipment including safety glasses, hard-toed shoes, hard hat, and gloves.
   Reason: You may be exposed to flying fragments when hammering rocks; falling, dropping, and rolling material that could cause a head or foot injury; and sharp rocks that could cut hands and fingers.

3. DO obtain the service of a competent guide who is familiar with the area.
   Reason: Such a person can assist you in locating the proper places to hunt as well as protect you from dangerous conditions.

4. DO use extreme caution when hunting for specimens in an area where underground mining has been conducted.
   Reason: Caved workings and openings hidden by vegetation or debris can constitute a serious hazard.

5. DO let others know your schedule for each day (spouse, partner, property owner, etc.).
   Reason: The possibilities of getting lost in unfamiliar areas creates a hazard from overexposure and injuries. If someone knows where you are and you follow your day's plan, help can arrive quickly.

6. DO get the permission of the landowner before going onto his property.
   Reason: This shows respect to the landowner, as well as informing him of your whereabouts. Also, he may know of some hazards on his property that you would not know about.

7. DO get permission of the operator before going onto the property of an operating mine.
   Reason: Most mines use explosives to break the rock, and anyone who trespasses upon the property where blasting occurs is in considerable danger. There is danger also from mine-operating equipment, high walls, and falling rock. You should always be accompanied by a miner or mine official when at an operating mine.

8. DO know the area you are working in and how to get emergency aid, telephone locations, etc.
   Reason: If an emergency arises, such as a serious injury, knowing where to get emergency aid can mean the difference between life or death to you, your partner, or a member of your family.

* N. C. Department of Labor, Mine and Quarry Division

9. DO become a certified first aider and carry a first aid kit.
Reason: A person trained in first aid can render first aid to himself or others if injured. First aid training also makes a person more safety conscious.

10. DO watch out for and keep up with small children or inexperienced adults at all times.
Reason: Small children and some adults do not know the hazards involved around a mine and may endanger themselves or others if left unattended.

DON'Ts

1. DO NOT enter a trench, cut, or excavation unless the walls have been sloped to a safe angle. It is recommended that all such excavations over 42" in depth be dug on a 2 to 1 slope (four times as wide at the surface as deep). Any such cut or excavation less than 42" in depth should be on a 1 to 1 slope (twice as wide at the surface as deep).
Reason: Excavations in unconsolidated material are extremely hazardous because of the possibility of the wall caving without warning.

2. DO NOT work under or near high vertical walls in an abandoned open pit, mine, or quarry or any other place.
Reason: Most mine walls have fractured or loose materials that, when disturbed, such as by digging below, can cause them to fall without warning.

3. DO NOT dig into mine dumps creating a steep or vertical wall.
Reason: A steep or vertical wall in a mine dump can cave without warning and create a hazard from large falling or rolling material.

4. DO NOT enter any abandoned underground workings such as a mine shaft, raise, winze, or adit, no matter how safe it seems.
Reason: Unstable ground in the roof and walls may fall or cave. Also, there may be openings that are covered with decayed timber or bridged with loose material. Some underground workings can contain harmful gases and be deficient in oxygen.

5. DO NOT work or go near the edge of a high vertical wall.
Reason: The edge of the wall may cave or a slip may cause a serious injury or a fatal fall.

6. DO NOT attempt to extend any diggings underground unless you are well experienced in underground mining and follow all safe mining practices.
Reason: Underground workings are inherently hazardous. Many conditions must be considered, such as adequate ground control, ventilation, and adequate stabilization.

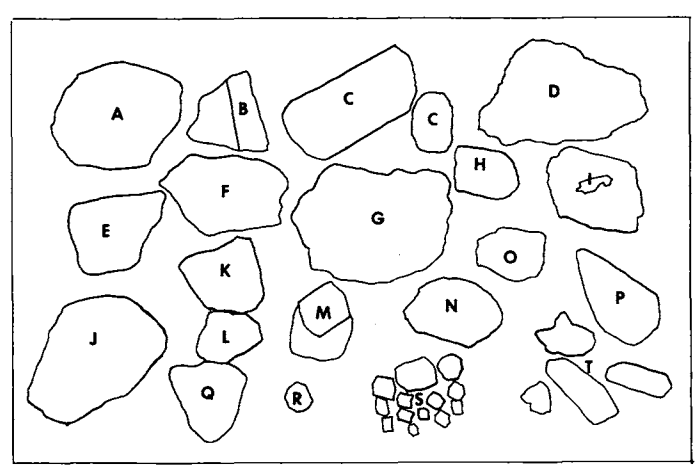
7. DO NOT pile dirt and rocks near the edge of any excavation. All such material should be placed a safe distance from the excavation.
Reason: Material that is piled at the edge of an excavation creates a greater hazard from caving material by adding weight at the edge of the excavation.

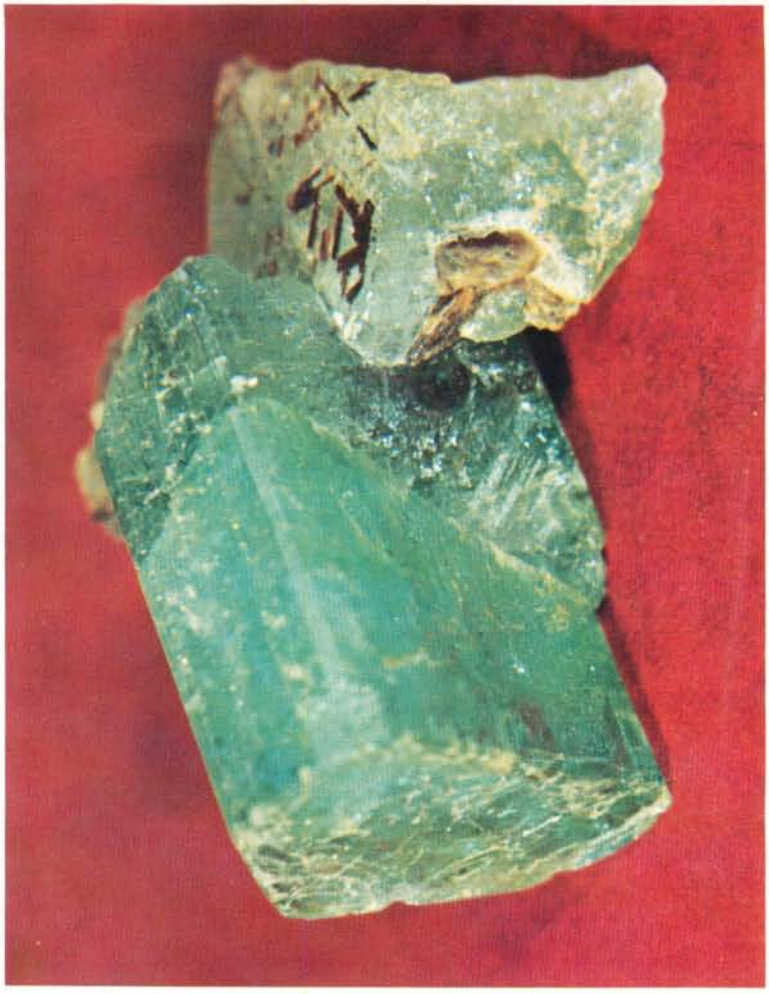
8. DO NOT use explosives unless you are thoroughly experienced in their use.
Reason: Explosives which are not used safely can cause death or serious injury to the user, as well as other persons not directly involved. This is a job for professionals.

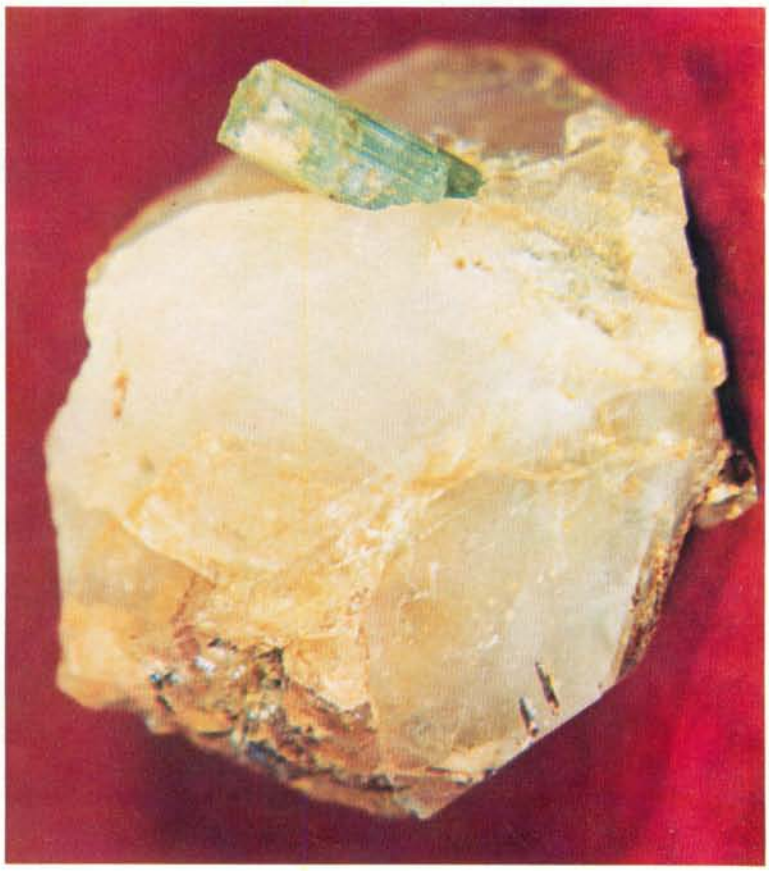
9. DO NOT work alone.
Reason: In the event of an accident that results in an injury, many times the difference between life and death is determined by having someone available to help.

10. DO NOT work around mines or excavations that have deep water unless an approved life preserver is used.
Reason: A slip or fall into deep water fully clothed can cause drowning unless a flotation device is worn.

A. torbernite
B. kyanite
C. beryl
D. pyrophyllite
E. tourmaline
F. radiating tourmaline
G. amethyst
H. malachite
I. zircon
J. uranophane
K. chalcopyrite and pyrite
L. kobellite and pyrite
M. garnet
N. actinolite in talc
O. azurite and malachite
P. smoky quartz
Q. chalcopyrite and pyrite
R. garnet
S. pyrite crystals
T. quartz crystals







MINERAL COLLECTING SITES OF NORTH CAROLINA BY COUNTIES

Alamance County

Pyrophyllite: Pyrophyllite occurs in Alamance County at the Snow Camp mine (Holman's Mill) located 2.7 miles southeast of the village of Snow Camp (see Map 37, locality 5). This deposit can be reached by following SR 1004 south of Snow Camp for 1.6 miles and turning east onto SR 2352 for approximately 1.9 miles. The mine lies north of the road on the side of a wooded hill, 0.2 mile from the road.

In addition to massive pyrophyllite, the following minerals also occur: diaspore, sericite, pyrite, chert, and ilmenite. Topaz has also been reported from this mine. It was noted that some years ago several doubly terminated, clear quartz crystals enclosing pyrite crystals were found in a quartz vein which crosses the southern part of this deposit.

Alexander County

Alexander County is a renowned mineral collecting area in North Carolina. Hiddenite, a rare and highly sought-after green variety of spodumene was first discovered and mined at Hiddenite in Alexander County. Emeralds have been found in at least three localities; some have been quite large and of fine quality. Reticulated rutile and gem-quality rutilated quartz are also well known from many localities. Also, very large and well-formed smoky quartz crystals may be found in Alexander County. At the present time, the Emerald Valley mine is open to the public for a collecting fee of $3.00 per person. There are several fields near the old mine workings which are plowed several times a year and may yield emerald, hiddenite, rutile, and quartz crystals.

The following are mineral collecting sites in Alexander County:

1) Emerald, rutilated quartz, smoky quartz, rose quartz, and hiddenite (uncommon); located 1.2 miles northeast of Hiddenite at the end of SR 1492 (see Map 26, locality 6).

2) Emerald, aquamarine beryl, rose quartz, and rutile; located at the Emerald Valley mine which is in the bottom of a small stream valley 0.5 mile north of the Hiddenite School. The mine is located on the east side of the road (see Map 26, locality 5).

3) Rutilated quartz; located on the McCoury farm approximately 2 miles northeast of Hiddenite on the road to Smith's Store (SR 1491) (see Map 26, locality 9).

4) Rutilated quartz; occurs as float 2 miles southeast of Taylorsville, just north of SR 1613 (see Map 26, localities 1 and 2).

5) Rutilated quartz; occurs 0.6 mile northeast of the preceding locality on the Payne property southwest of the intersection of SR 1610 and SR 1613 (see Map 26, locality 3).

6) Rutile, rutilated quartz, and rose quartz; occur on the property of Mr. George Lackey 4 miles north of Stony Point on SR 1456 (see Map 26, locality 10). These minerals occur in a field just north of the dwellings on this farm.

7) Rutilated quartz and smoky quartz; is reported to occur 3.2 miles north of Hiddenite, between the South Yadkin River and one of its tributaries (see Map 26, locality 8), as well as 0.4 mile south of this area between the South Yadkin River and the road to Hiddenite (see Map 26, locality 7).

8) Goethite and limonite; is reported to occur as float on the Isenhour farm on the hillside behind Mr. Isenhour's tenant house, 0.7 mile northeast of Payne's Store (see Map 26, locality 4).

9) Graphite veins have been reported on Barrett Mountain, 5.3 miles southwest of Taylorsville (see Map 25, locality 4).

◀— facing page - emeralds of the Emerald Valley Mines

Alleghany County

Manganese: A manganese deposit occurs in Alleghany County in the region south of Bald Knob, three miles north of Sparta (see Map 27, localities 7 and 8). Several mine shafts have been sunk on a small hill, known as Crouse Knob, south of Bald Knob. The minerals found in this deposit include alleghanyite, spessartite, tephroite, and galaxite. The area may be reached by taking N.C. Highway 18 northeast of Sparta for 2.9 miles and turning north onto SR 1416 which bifurcates at 0.6 mile. The mine lies on the right fork of this road, SR 1416, 0.3 mile from the road bifurcation. The mine dumps can be seen on both sides of the road at this point.

Barite: Barite veins lie north of N.C. Highway 93, 1.3 miles northwest of Amelia (see Map 27, locality 5).

Molybdenite, malachite, and sphalerite: The Maxwell copper mine, also known as the Peach Bottom mine, is located west of Stratford in the area between Stratford and Elk Creek (see Map 27, locality 6). In addition to molybdenite, sphalerite, and malachite, the ore vein carries pyrite, chalcopyrite, galena, and cuprite.

Ashe County

Copper minerals: The Ore Knob mine (see Map 27, locality 4) is located in east-central Ashe County on N.C. Highway 88, just northeast of the village of Ore Knob. The large dump at the mine contains the following minerals: biotite, actinolite, garnet, hornblende, siderite, chalcopyrite, pyrite, cuprite, native copper (in the biotite), arsenopyrite, malachite, and azurite. The mine was operated by Appalachian Sulphides, Incorporated until 1962 when mining was discontinued.

Mica and beryl: The Duncan mine, 1.2 miles southwest of West Jefferson, was worked for mica but also produced some beryl. The following minerals can be found at the Duncan mine: beryl, muscovite, biotite, garnet, feldspar, and quartz (see Map 23, locality 1).

Staurolite: Well-formed staurolite crystals are reported to occur in a muscovite-biotite gneiss in an area on the east side of the North Fork of the New River, approximately 0.5 mile east of Crumpler (see Map 27, locality 1).

Garnet, staurolite, and kyanite: A schist containing rhodolite garnet, staurolite, and kyanite may be found north of U.S. Highway 221, east of where it crosses the New River (see Map 27, locality 3). North from this locality, small specimens of malachite and azurite may be obtained (see Map 27, locality 2).

Avery County

Magnetite and epidote: The Cranberry Iron mine, located 1 mile south-southwest of Cranberry (see Map 18, locality 1), has produced magnetite with a gangue consisting of uralite, hornblende, epidote, and garnet. Some magnetite crystals have been found with faces up to 4 inches across. Some of the dump material was used in the construction of a now-abandoned railroad that carried ore from the mine. Epidote, which was part of the ballast of this railroad, has been found east of the mine and approximately 100 yards east of U.S. Highway 19-E. This material takes a good polish and has been used extensively for making cabochon cuts. A small dump is maintained for collectors near the main office.

Vermiculite, anthophyllite, and dunite: The Frank deposit is located 0.25 mile west of the Frank Post Office on U.S. Highway 19-E (see Map 18, locality 3). The vermiculite is associated with anthophyllite zones in a dunite mass approximately 1400 feet long and 400 feet wide. Frank is south of Cranberry on 19-E between Newland and Spruce Pine.

Epidote: The May-Meade quarry is located about 2.5 miles east of Banner Elk on SR 1337. Epidote, chlorite, tremolite, calcite, thulite, azurite, malachite, albite, and green quartz crystals have been found in this quarry. There is some massive green quartz with tremolite inclusions that has a chatoyancy similar to

moonstone; this can be cut into nice cabochons. To reach this location, take N.C. Highway 184 southeast from Banner Elk about 0.9 mile, turn left onto SR 1337, and go about 0.25 mile beyond where the pavement ends. The quarry is on the right and is not in operation at this time (see Map 18, locality 2) / Vernon Hoffman, Linconton.

Buncombe County

Garnet: Garnet has been found in Buncombe County at Potato Gap on the Blue Ridge Parkway, northeast of the Craggy Picnic Area (see Map 13, locality 6). Garnet also occurs in an area extending from the east shore of Bee Tree Reservoir south to Grovemont (see Map 12, locality 4) / Charles O. Hare, Tryon.

Corundum: Pink corundum has been mined 0.5 mile north of the Blue Ridge Parkway at Balsam Gap (see Map 13, locality 4). Corundum also occurs south of Swannanoa Gap at Ridgecrest (see Map 12, locality 7).

Kyanite: Kyanite can be found at several localities in the county. A deep sapphire-blue variety occurs 100 yards northwest of the Blue Ridge Parkway, 1.4 miles southeast of Balsam Gap (see Map 13, locality 5). Kyanite also is found at Lookout Mountain north of the town of Black Mountain (see Map 12, locality 6). A kyanite and sapphire corundum area lies northeast of Black Mountain and is located on the Levine property now being operated as the J. C. Dude Ranch (see Map 12, locality 5) / Claude Platz, Asheville.

Moonstone and associated minerals: The Goldsmith mine, located west of Democrat, contains moonstone, chalcedony, garnet, olivine, and vermiculite. The mine can be reached by taking N.C. Highway 197 west from Democrat for 0.8 mile and turning north on SR 2161 for 0.2 mile (see Map 13, locality 3). The mine is located in an open cut on the northeast side of the road bank / Robert A.Campbell, Asheville.

Burke County

Itacolumite: Itaculumite, or flexible sandstone, occurs as boulders weathered from the Erwin quartzite along SR 1236, 5.0 miles northwest of Bridgewater (see Map 17, locality 2). Boulders of itacolumite can also be found on N.C. Highway 126 on the north side of the road, 0.9 mile east of its junction with SR 1236 (see Map 17, locality 3). The itacolumite in this area is generally inferior to the Stokes County flexible sandstone.

Tourmaline: Black tourmaline crystals up to 1/2 inch in diameter have been found in a field southwest of Burke Chapel. The locality can be reached by taking SR 1736 south from Burke Chapel and turning west at 0.5 mile onto SR 1802 for approximately 0.6 mile (see Map 21, locality 4). The field lies south of the road and can be seen from the road. Another area where tourmaline, as well as quartz crystals, can be found is almost due north of this area, approximately 0.3 mile north of the road (see Map 21, locality 3). Quartz and tourmaline crystals occur on the north side of N.C. Highway 18, 8.5 miles southeast of Morganton (see Map 21, locality 1) / Adam Street, Valdese.

Garnet, pyrope, and rhodolite: Tweedy Garnet mine, located on the lefthand side of N.C. Highway 18, approximately 6 miles south of Interstate 40 (Morganton exit) is open to the public with a $2.00 per person charge (see Map 21, locality 2) / Robert Orchard, Raleigh.

Gold, monazite, and other minerals: Brindletown Creek, Silver Creek, and Hall Creek in the Brindletown area carry gold and monazite (see Map 17, locality 5). Genth and Kerr (1885, p. 98) describe the following list of minerals which have been identified in the sands of Brindletown Creek and the old J. C. Mills gold mine: gold, tetradymite, brookite, smoky quartz, chromite, anatase, beryl, tourmaline, black and green pyrope, zircon, epidote, sillimanite, columbite, samarskite, xenotime, monazite, montanite, fergusonite, rutherfordite, talc, tremolite, magnetite, limonite, ilmenite, hematite, tellurium, asbestos, kyanite, corundum, graphite, rutile, and actinolite. A small diamond was found by Dr. F. M. Stephenson at the Brindletown Creek Ford in 1843, and another small diamond was discovered in the same vicinity by Professor G. W. Featherstonhaught (Kunz, 1907, p. 6). Several other diamond finds have been reported from this region.

Cabarrus County

Minerals of the Cabarrus County mines: Cabarrus County contains many old mines including such famous ones as: the Cline mine, north of Mt. Pleasant (siderite, pyrite, scheelite, and chalcopyrite); the Snyder mine, 5.3 miles southeast of Concord (chalcopyrite, bornite, rhodochrosite, magnetite, malachite, siderite, and pyrite); the Silver Shaft, 8.3 miles northeast of Mt. Pleasant (pyrite, chalcopyrite, malachite, galena, and sphalerite); and the McMakin (Whitney) mine, southwest of Gold Hill (silver, argentite, galena, sphalerite, proustite, tetrahedrite (variety fibergite), pyrolusite, pyromorphite, barite, grossurlarite, rhodochrosite, and magnesite). These are a few of the many mines which have been operated in Cabarrus County (Genth and Kerr, 1885, pp. 99-100) (see Map 29, localities 1, 2, 3, and 4). Probably two of the more promising mines for collectors in the county are the Furniss and the Phoenix mines (see Map 29, locality 5).

Furniss mine: The Furniss mine was investigated by the Carolina Tungsten Company in 1956. The minerals occurring at this site include scheelite, siderite, malachite, barite, pyrite, chalcopyrite, and epidote. The mine can be reached by taking U.S. Highway 601 southeast from Concord for 0.9 mile beyond its intersection with N.C. Highway 49 and turning east on SR 1132 for 2.9 miles. The mine is located on the left fork of a farm road which enters the paved road at this point. The Phoenix mine, which carries a similar mineral assemblage, is located on the right fork of this farm road. This mine has not been operated in recent years.

Caldwell County

Garnet: Rhodolite garnet occurs in biotite schist 0.4 mile west of the Caldwell-Alexander County line, just east of the Little River on N.C. Highway 90. The garnets occur in shattered masses up to one inch in diameter (see Map 25, locality 1).

Marcasite: Marcasite occurs 0.4 mile west of the Caldwell-Alexander County line, just west of the Little River on N.C. Highway 90 (see Map 25, locality 2).

Sillimanite: Sillimanite is reported to occur within a mica schist in the southern part of Caldwell County. The schist occurs as a band and passes the towns of Oak Hill, Hudson, Saw Mills, and Baton. As reported in 1958, a good collecting site lies on the property of Gather Teague, 0.7 mile southwest of Dudley Shoals. This area can be reached from Dudley Shoals by following the Cedar Valley Road (SR 1002) southwest for 0.3 mile and turning south on SR 1746 for 0.5 mile. The deposit lies on the south side of the road (see Map 25, locality 3).

Anthophyllite asbestos and talc: A deposit of anthophyllite asbestos and talc occurs in western Caldwell County. This deposit is described by Conrad, Wilson, Allen, and Wright (1963, p. 42) as occurring 3.2 miles (airline) southwest of Colletsville on the east side of John's River. It can be reached by travelling on SR 1328 for 1.6 miles southeast of its intersection with SR 1335, 1.0 mile northeast of the Burke-Caldwell County line. The deposit is located near the crest of a steep hill 300 feet south of SR 1328 and 500 feet east of mine workings (see Map 22, locality 1).

Caswell County

Microcline and mica: A pegmatite dike 10 to 12 feet wide crops out in a roadcut on the north side of SR 1554, 0.35 mile northwest of its intersection with SR 1557 (see Map 40, locality 1). Subhedral crystals of perthitic microcline and various sized crystals of a light-greenish-yellow to clear muscovite mica are present. The pegmatite occurs on the property of J. M. Bryant of Yarbor, N.C.

Microcline and mica: A pegmatite 5 to 7 feet wide crops out on the east side of SR 1559, 0.4 mile southeast of the community of Semora (see Map 40, locality 2). The pegmatite is composed of intergrowths of quartz, microcline feldspar, and muscovite mica. The quartz occurs as irregularly shaped masses surrounded by subhedral to euhedral microcline feldspar and grayish to clear crystals of muscovite mica.

Catawba County

Beryl: The Bessie Hudson mine, located in southwestern Catawba County, is situated west of N.C. Highway 18, 0.4 mile east of the Burke-Catawba County line in an area between two tributaries of Jacob Creek (see Map 21, locality 5). The mine has produced beryl, and in the immediate vicinity of the mine, chalcopyrite and garnet have been found.

Soapstone: Soapstone occurs in southeastern Catawba County on South Creek, 0.4 mile south of the intersection of N.C. Highway 16 and SR 1003 (see Map 24, locality 2) and also 0.5 mile east of this location (see Map 24, locality 3). Soapstone can also be found on McLin Creek north of N.C. Highway 10, 2 miles east of the Newton city limits (see Map 24, locality 1).

Graphite: Graphite occurs in the southeastern part of the county in the area where N.C. Highway 16 crosses the south fork of South Creek (see Map 24, locality 4).

Corundum: Corundum is found 5 miles north of Conover. This locality can be reached by taking N.C. Highway 16 north from Conover for 5.9 miles and turning west on SR 1515 for 0.9 mile to a crossroad. The locality lies northeast of the crossroads (see Map 25, locality 5).

Chatham County

Limonite and Goethite: Limonite occurs at Ore Hill in Chatham County, 4.7 miles south of Siler City. Iron ore was mined here during the Revolutionary War and smelted in a nearby furnace. This locality can be reached by taking old U.S. Highway 421 south from Siler City for 5.2 miles to Mt. Vernon Springs and turning west on SR 1134 (see Map 36, locality 1). The old mine is on the south side of this road behind the old furnace, which is approximately 100 yards west of the Southern Railway tracks.

Cherokee County

Ottrelite: Ottrelite (chloritoid) occurs in several places in Cherokee County, but one of the better localities is south of Marble, in the area where the road to Peachtree (SR 1519) crosses the Valley River (see Map 1, locality 4) / Arthur Palmer, Marble.

Staurolite: Staurolite can be found 1.0 mile southeast of Marble on SR 1515 adjacent to the south bank of the Valley River between Parsons' Branch and Burnt Branch (see Map 2, locality 1). Staurolite also occurs 1.3 miles north of Marble in the stream beds of Hyatt Creek and its tributaries, Fishermare Branch and Allmon Creek (see Map 1, localities 1, 2, and 3) / Arthur Palmer, Marble.

Garnet: Garnet has been found in the Little Snowbird section, 2.6 miles south-southeast of Marble near the headwaters of Vengeance Creek in Big Cove (see Map 2, locality 2).

Sillimanite: Boulders containing sillimanite occur on the northwest side of U.S. Highway 19 south of Marble below Tomotla Bottoms (see Map 1, locality 5) / Arthur Palmer, Marble.

Talc: Talc has been mined in the Murphy area since 1859. The two largest mines in the area are those of the Hitchcock Corporation located 1.5 miles north of Murphy (see Map 1, locality 6) and approximately 4.2 miles southwest of Murphy on the north side of U.S. Highway 64 (see Map 1, locality 9). The predominant mineral at both operations is talc, but tremolite, sillimanite, and dravite (brown tourmaline) may also be found.

Limonite: Large limonite pseudomorphs after pyrite can be found east of U.S. Highway 64, 0.6 mile southwest of the center of Murphy (see Map 1, locality 7). Massive limonite ore occurs over a wide area in association with the marble beds of the Murphy Marble belt (Kerr and Hanna, 1887, p. 184). One of the areas, where iron ore was mined, is located near the end of a short dead-end road (SR 1613) which turns south off U.S. Highway 64, 2.7 miles southwest of Murphy (see Map 1, locality 8).

Clay County

Corundum: Clay County contains a number of peridotite and dunite bodies which have produced commercial corundum. Probably the largest of these in the State is located on Buck Creek, north of U.S. Highway 64 (see Map 2, locality 3). The corundum in the deposit varies from gray to pink and is associated with olivine, anorthite, picrolite, spinel, zoisite, augite, and smaragdite (Hadley, 1949, pp. 114-118). Several shafts were sunk into the deposit including the Big Shaft, located east of the U.S. Bureau of Mines buildings 0.5 mile north of U.S. Highway 64, and the Herbert mine, located 0.3 mile southwest of the Buck Creek Dude Ranch. Smaragdite and corundum occur on Corundum Knob, which lies approximately 0.5 mile west of the U.S. Bureau of Mines station. Picrolite can be found at a culvert 300 yards beyond the Buck Creek Campgrounds.

Pink corundum in mica schist occurs on the farm of Wymer Burrell. This area lies 3.0 miles northeast of the village of Shooting Creek on U.S. Highway 64, 0.2 mile above Muskrat Road (see Map 2, locality 5). It has also been found along the west shore of Lake Chatuge in the area north of Myers Chapel (see Map 2, locality 8). The Behr corundum mine, which lies west of Elf School, is now covered by Lake Chatuge except at low water level. In recent years, fine cabinet specimens have been collected from this mine when the lake level has been low.

Rutile: Water-worn rutile crystals have been recovered from Shooting Creek west of the village of Shooting Creek in the Spring Hollow section (see Map 2, locality 7) and on Lake Chatuge (see Map 2, locality 10).

Garnet: Almandine garnet occurs at Park Gap and in the stream bed of Little Buck Creek where it has washed down from its source (see Map 2, locality 4). The garnet in this creek is so plentiful that it has been used as an abrasive by local lapidarists for tumbling stones. Garnet crystals are also reported to occur north of old U.S. Highway 64, 0.5 mile west of Brasstown (see Map 1, locality 10) / Herman Estes, Brasstown.

Staurolite: An area containing staurolite in mica schist lies east of Brasstown. The area can be reached by taking SR 1128 north from Ogden School for 2.3 miles. The staurolite deposit lies to the southwest of the road at this point (see Map 2, locality 9).

Vermiculite: Vermiculite occurs at several places in Clay County. Much prospecting has been done near the Shooting Creek Post Office. The Rogers Prospect, 0.6 mile northeast of Shooting Creek (see Map 2, locality 6), has yielded specimens of vermiculite along with olivine and some pyroxenes. One mile from the mouth of Thumping Creek and 3 miles east of the Shooting Creek Post Office, vermiculite has also been prospected. Several prospect pits and shafts occur at both of these localities.

Cleveland County

Quartz crystals: Quartz crystals are reported at several localities in southern Cleveland County (Keith and Sterrett, 1931, Map 3). One of these is situated in a bend of Broad River 4.4 miles south of Shelby. The locality may be reached by taking N.C. Highway 18-150 south from Shelby to where the highways divide. Follow N.C. Highway 150 west for 1.8 miles to a crossroads and turn south onto SR 1127 for 0.4 mile. Quartz crystals occur in the fields both east and west of the road at this point (see Map 19, locality 7). Another quartz crystal locality may be reached by taking N.C. Highway 150 for 0.7 mile beyond the above mentioned crossroads to Sharon Church and turning south on SR 1219 for 0.9 mile. The locality lies 0.1 mile east of the road (see Map 19, locality 8). A third locality is reported 0.3 mile due north of the Stice Dam on Broad River (see Map 19, locality 12).

Corundum: According to Keith and Sterrett (1931, p. 13), gray and bronze corundum occurs as float in fields approximately 4 miles west of Earl. The corundum float is confined to a belt about 1.5 miles long and several hundred yards wide (see Map 19, localities 13 and 11). Black and gray corundum crystals enclosed in

sillimanite schist can be found on the west side of a farm road 0.4 mile northeast of Carpenters Knob. The corundum is reported to occur as grayish-blue, tapered crystals (see Map 21, locality 6).

Beryl: Gem-quality beryl is reported to occur in the region southwest of Shelby (Keith and Sterrett, 1931, p. 12), and emerald-green beryl has been reported from the Plantation Emerald mine and the Turner mine. The Plantation mine is located six miles south of Shelby on a bend in the Broad River approximately one mile northeast of the Stice Dam (see Map 19, locality 9). The Turner mine is located 1.5 miles due east of the Stice Dam and 0.2 mile east of N.C. Highway 18 (see Map 19, locality 10).

Aquamarine beryl occurs in pegmatite rock on a tributary of Buffalo Creek 1.3 miles east of Earl (see Map 20, locality 9).

Garnet: Garnet can be found between Buffalo Creek and N.C. Highway 198, 1.2 miles southeast of Earl (see Map 20, locality 10).

Spodumene: Spodumene and associated minerals occur in the Foote Mineral Company spodumeme mine near Kings Mountain. The following minerals have been identified and can be found at this mine: albite, microcline, eucryptite, bikitaite, prehnite, bavenite, spodumene, beryl, quartz, laumontite, holmquistite, apophyllite, chlorite, epidote, muscovite, biotite, tourmaline, cookeite, analcime, natrolite, axinite, bertrandite, bityite, fairfieldite, eosphorite, roscherite, apatite, vivianite, switzerite, lithiophilite, graphite, diadochite, laueite, xanthroxenite, mitridatite, neomesselite, rhodochrosite, siderite, cassiterite, autunite, columbite, sphalerite, pyrite, marcasite, bornite, chalcopyrite, pyrrhotite, dolomite, calcite, fluorite, magnetite, wickmanite, petalite, zinnwaldite, and eakerite. The mine may be reached by taking N.C. Highway 216 from Kings Mountain toward Mt. Olive and Gibson to the junction of N.C. Highway 216 and SR 2298. Turn left on SR 2298 and follow signs to Foote Mineral Company (see Map 20, locality 8).

Almandine garnet and moonstone: Gem-quality, almandine garnet as well as high-quality moonstone have been found in the alluvium of several creeks in west central Cleveland County. A few notable localities are as follows: the junction of Big Harris Creek and SR 1813 just south of Lawndale (see Map 19, locality 4); the junction of Big Harris Creek and SR 1809 just west of Double Shoals (see Map 19, locality 5); and the junction of Little Harris Creek and SR 1809 (see Map 19, locality 6) / Lewis Ormand, Kings Mountain.

Davidson County

Gold, silver, and copper: Davidson County contains several famous gold, silver, and copper mines including the Silver Hill, Silver Valley, Emmons, and Conrad Hill mines.

Silver Hill, located 5 miles southeast of Lexington on the east side of the Silver Hill Road 0.5 mile north of the village of Silver Hill (see Map 33, locality 3), has not been worked extensively since 1898. The mineral assemblage reported by Genth and Kerr (1885, p. 106) is as follows: native silver; argentite; argentiferous galena; sphalerite; chalcocite; melaconite; zoisite; orthoclase; calamine; pyromorphite; green, yellow, brown, black, and colorless wavellite; stolzite; anglesite; grossularite; chalcanthite; calcite; cerussite; malachite; and scheelite.

The Silver Valley mine is situated 6 miles southeast of Lexington and occupies the western side of the Flat Swamp Creek valley (Pogue, 1910, p. 104) north-northwest of the Silver Valley crossroads (see Map 33, locality 4). Genth and Kerr (1885, p. 106) record galena, sphalerite, and pyromorphite as having been found at the mine. Pogue (1910, 10. 106) adds to this list the minerals chalcopyrite, pyrite carrying gold, and silver.

The Emmons mine lies 12 miles southeast of Lexington and about 4 miles north of Denton (see Map 33, locality 5). The mine was worked primarily for copper, with the chief ore mineral being chalcopyrite. The mine also produced sphalerite and gold. The gangue minerals were pyrite, siderite, chlorite, and calcite.

The Conrad Hill mine, situated 6 miles east of Lexington (see Map 33, locality 2), was worked for the ore minerals chalcopyrite, auriferous pyrite, and malachite. The minerals were accompanied by a gangue of limonite, specular hematite, siderite, and chlorite (Pogue, 1910, p. 112).

Siderite may be found on the north side of SR 2226 about 0.3 mile from the intersection of SR 2226 and SR 2227 (see Map 33, locality 1).

Davie County

Columbite and autunite: Three pegmatites which contain columbite and autunite are located in northeastern Davie County. Some of the columbite exhibits crystalline form. One of these localities can be reached by taking N.C. Highway 801 east from Farmington for 2.0 miles and turning north on SR 1458 for 0.4 mile and then turning east on SR 1457 for 0.4 mile. The mine lies near the end of SR 1457 (see Map 30, locality 2). The second locality is reached by continuing north on SR 1458 for an additional 0.8 mile and turning east on SR 1455, 1.4 miles to the second bridge. The deposit lies south of the bridge (see Map 30, locality 1).

Orbicular diorite: Orbicular diorite occurs on the Cooleemee Plantation in southern Davie County. The rock's appearance is that of a white rock with green spheres throughout and was once used as an ornamental stone. The orbicules are hornblende set in a groundmass of albite. Some of the orbicules contain monazite crystals up to 1/4" by 1/4". The locality may be reached by taking U.S. Highway 64 east from Fork for 2.4 miles and then taking a logging road south. The old quarry lies 300 yards southeast of U.S. Highway 64 and 100 yards north of the old logging road (see Map 30, locality 3).

Durham County

Petrified wood: Petrified wood, or wood replaced by silica, is found in many places in the Triassic rocks of Durham County. It can be found in the area one mile north of Weaver, along the Eno River (see Map 42, locality 5).

Hematite and pyrite: A banded ironstone occurrence is located along the power line right-of-way 0.3 mile northwest from where the power line crosses SR 1680 (see Map 42, locality 4).

Hornblende and epidote: Hornblende crystals, epidote, apophyllite, and other zeolites may be found at the Nello Teer quarry located at the end of SR 1641. The quarry may be reached by taking SR 1641 northeast from its intersection with U.S. Highway 501 (Business) at Mill Grove (see Map 42, locality 6).

Franklin County

Amethyst: Small pieces of tumbling-quality amethyst occur on the property of Hollis Taylor 0.3 mile east of the Centerville crossroads on N.C. Highway 561. Gem-quality amethyst has also been found on this property (see Map 48, locality 3).

Gaston County

Cassiterite and spodumene: The tin-spodumene belt (Broadhurst, 1956) extends through Gaston County. There are many pegmatites carrying cassiterite and spodumene within this belt; a few of the more notable ones are mentioned here: (1) the southeast corner of the intersection of SR 1401 and 1402, 1.5 miles west of Bessemer City (see Map 20, locality 6) - cassiterite, feldspar, mica, garnet, beryl, spodumene, and apatite; (2) between Little Beaverdam Creek and Beaverdam Creek on SR 1624 in a road cut on a divide between the two creeks (see Map 20, localities 1 and 2) - cassiterite, mica, feldspar, garnet, and spodumene; (3) in exposed cuts north of the junction of Beaverdam Creek and SR 1620 (see Map 20, localities 3 and 4) - cassiterite, mica, and feldspar.

Kyanite, tourmaline, and rutile: Kyanite, tourmaline, and rutile occur in a roadcut on SR 1820 just west of the intersection of SR 1820 and SR 1902, 2.2 miles east of Alexis (see Map 24, locality 7). Lazulite is also reported from this locality.

Goethite: Goethite is reported to occur 0.8 mile due south of the center of Bessemer City in the area known as the Devil's Workshop (see Map 20, locality 7).

Uraninite and garnet: Pegmatites carrying uraninite, garnet, mica, and feldspar are exposed on N.C. Highway 216 just north of its intersection with SR 1409 (see Map 20, locality 5). Beryl was reported in the general vicinity of this location at the Bess mine.

Granville County

Pyrophyllite: Pyrophyllite occurs in Granville County 1.5 miles south of Oak Hill and also 3.0 miles southeast of Oak Hill on Mountain Creek (see Map 43, locality 5). Pyrophyllite is found on the crest and the northeastern slope of Bowling's Mountain, 2.7 miles west of Stem and approximately 5.0 miles northwest of Butner (see Map 42, locality 7). The minerals found in this deposit are massive and radiating pyrophyllite, massive topaz, chert, andalusite, diaspore, malachite, ilmenite, hematite, and sericite. Other deposits occur in the area of Long Mountain, north of Bowling's Mountain.

Copper: Several abandoned copper mines and prospect pits are located in northwestern Granville County, including the Holloway mine and the Blue Wing mine. The Holloway mine, located 2 miles south and 1 mile west of Virgilina (see Map 43, locality 2) was first opened in 1885 and operated intermittently until the early 1900's. The ore minerals of this mine were chalcocite, bornite, malachite, azurite, argentite, cuprite, native copper, and native silver. The ore was accompanied by a gangue of quartz, epidote, chlorite, hematite, and pink orthoclase (Laney, 1917, pp. 114-121). Chrysocolla has also been found here / Robert Orchard, Raleigh.

The Blue Wing mine is located 1.5 miles south of Virgilina and lies several hundred yards north of Blue Wing Church (see Map 43, locality 1). This mine was also operated during the later part of the nineteenth and early twentieth centuries. The ore minerals of the mine were bornite, chalcocite, azurite, malachite, and argentite. They were accompanied by a gangue consisting of quartz, calcite, chlorite, epidote, and hematite (Laney, 1917, pp. 102-114).

A Copper prospect containing malachite and specularite lies across the road from the Blue Wing Church and almost due south of the Blue Wing mine.

Molybdenite: Molybdenite filling fractures in granite can be found in an abandoned state highway quarry 2 miles east of Wilton. This quarry can be reached by taking N.C. Highway 56 east from Wilton for 2.6 miles, turning north on SR 1625 for 0.4 mile to a bifurcation, and taking the west fork (SR 1629) of the road for 0.9 mile. The quarry site is located on the southwest side of this road (see Map 46, locality 1).

Lepidolite: Lepidolite float occurs in a field owned by C. V. Evans 2 miles north of Pocomoke on the Granville-Franklin County line, just inside Granville County (see Map 46, locality 2). Very minute crystals of rubellite are also found at this locality.

Guilford County

Gold and copper: Guilford County contains several abandoned gold mines which have produced a variety of minerals. The Gardner Hill mine, located 8 miles southwest of Greensboro (see Map 35, locality 3), was worked for gold, bornite, chalcopyrite, chrysocolla, and malachite (Genth and Kerr, 1885, p. 109). The Fisher Hill mine, located 5 miles southwest of Greensboro (see Map 35, locality 4), contained the minerals gold, pyrite, chalcopyrite, magnetite, hematite, ilmenite, limonite, pseudomalachite, and siderite (Genth and Kerr,

1885, p. 109). The McCullough (North State) mine, located 2 1/4 miles south of Jamestown, on the north side of U.S. Highway 29, 0.5 mile northeast of Kivett Drive (see Map 35, locality 2), produced the following minerals: native copper, cuprite in acicular crystals, pyrite, chalcopyrite, siderite, and malachite.

Sagenite: Green quartz with asbestos inclusions has been found near Gibsonville (Kunz, 1907, p. 34). Dr. Kunz (1885, p. 725) states that a green stone found by James M. Smith of Gibsonville was pronounced by a local expert to be a genuine emerald containing several diamonds. The stone weighed 9 ounces and was valued at several thousands of dollars. The owner supposedly refused $1000 for it. Mr. Smith, not trusting the mail service, carried the stone to New York, where it was identified as a greenish quartz crystal containing liquid cavities that glistened in the sun, which led to the diamond theory. As $5 was the best offer made, the stone was returned to North Carolina.

Iron: Iron ores have been mined at several places in Guilford County. One of the larger deposits is the Tuscarora iron mine. This deposit is located on the west side of N.C. Highway 68, approximately 1 mile north of Friendship (see Map 35, locality 1). The ores include magnetite and ilmenite.

Hornblende: Hornblende and radiating hornblende crystals occur in the Buchanan quarry of Central Rock Company on SR 3317, just off U.S. Highway 421 south of Greensboro. The locality may be reached by taking U.S. Highway 421 south from the Greensboro city limits for 1.4 miles and turning left onto SR 3317 and then continuing for 0.4 mile. The quarry lies on the left (see Map 35, locality 5).

Halifax County

Hematite: Specular hematite occurs in the Gaston Ore Banks in northwestern Halifax County. The deposit lies on the south side of the Roanoke River approximately 2 miles north of Roanoke Rapids (see Map 49, locality 1). The ore is granular for the most part and contains some magnetite.

Molybdenite: Molybdenite, in association with pyrite, chalcopyrite, and sericite, is found south of Brinkleyville on the Boy Scout-Jones properties in southwestern Halifax County (Broadhurst, 1955, p. 23). The area can be reached by taking N.C. Highway 48 south from Brinkleyville for 2 miles, turning west onto SR 1002 for 1.1 miles, and turning north onto SR 1323 for 0.8 mile. The deposit is at the end of this secondary road (see Map 48, locality 2). It occurs in veins enclosed by schists and volcanic rocks.

Gold, lead, and zinc: Gold, lead, and zinc ores were mined at the H and H mine on the House property, which is located 4 miles south-southeast of Hollister. The mine is 0.2 mile east of the intersection of SR 1327 and SR 1335 (see Map 48, locality 4).

Harnett County

Rutile, ilmenite, and microcline: Rutilated ilmenite occurs in small pegmatites carrying smoky quartz and pink microcline at Raven Rock on the west bank of the Cape Fear River north of Lillington and east of Raven Rock Church (see Map 41, locality 2). Raven Rock is an outcroping of schists, gneisses, and quartzites. Milky quartz, smoky quartz, muscovite, biotite, microcline, orthoclase, sericite, and chalcopyrite may be observed at this locality.

Magnetite and garnet: Magnetite and garnet occur in northern Harnett County at the old Battle's mine on the east bank of the Cape Fear River, 3 miles south of Buckhorn Dam and north of Kipling (see Map 41, locality 1). During the Civil War, the mine was operated for magnetite which was hauled upstream by barge where it was smelted at the Endor Iron Furnace on Deep River in Lee County. Several tons of this ore are still piled beside the furnace. The magnetite occurs in crystalline masses and contains disseminated almandite garnet. It is strongly magnetic, and some of the crystalline masses are natural lodestone.

Haywood County

Copper: Several copper prospects are located in Haywood County. One of the most extensive is the Redmond mine, located 0.4 mile north of the southern end of Waterville Lake (see Map 8, locality 1). The ores of this mine include arsenopyrite, pyrite, and chalcopyrite, as well as some galena and sphalerite.

Corundum: Although there are several corundum localities in Haywood County, probably the two most interesting are the Edmondson property and the Presley mine. The J. H. Edmondson property at Retreat, on the Pigeon River, 6 miles southeast of Waynesville (see Map 7, locality 5), contains small pegmatites enclosed by vermiculite containing disseminated corundum which is associated with kyanite and garnet. The Presley mine (fee charged) (see Map 8, locality 2) is situated in pegmatites which cut through dark green amphibolite country rock. Corundum specimens of excellent color have been found at this locality (Pratt and Lewis, 1905, pp. 188-189 and p. 257). The Presley mine may be reached by taking Newfound St. (SR 1004) from Canton northeast to the fork at Hominy Grove Church. Take the left fork (SR 1606) to the next fork to the left. Pay fee at the second house on the left (S. C. Woods). The mine is at the end of the next road on the left.

Henderson County

Zircon and other rare earth minerals: Rare-earth-bearing pegmatites occur in the area around Tuxedo and contain the following minerals (according to Olson, 1952, pp. 18-20): anatase, sphene, zircon, auerlite, xenotime, polycrase, apatite, serpentine, epidote, garnet, microcline, quartz, allanite, monazite, crytolite, stilbite, vermiculite, and muscovite. These minerals occur collectively at the following localities: the Freeman mine, 0.5 mile west of Tuxedo on SR 1118 (see Map 11, locality 1); the Jones mine, 0.5 mile east of Tuxedo on SR 1856 (see Map 11, locality 2); the Pace mine, 1.8 miles southwest of Tuxedo; on the Price farm, 3 miles southwest of the Freeman mine; and the Davis farm, 4 miles from the Green River Post Office on the road to Greenville by way of Poinsett Springs. The Jones mine is reported to contain more zircon than the other localities mentioned.

Epidote: Epidote veins occur in gneiss in the west bank on N.C. Highway 9, 0.8 mile north of Bat Cave. Epidote also occurs disseminated through pink granite in a deep road cut on N.C. Highway 9, 0.4 mile north of the above locality (see Map 12, locality 8).

Iredell County

Corundum: Pratt and lewis (1905, p. 2) located eight occurrences of corundum in Iredell County. The Belts Bridge deposit, on the south bank of the South Yadkin River 4.8 miles south of Harmony and 2.8 miles southeast of Turnersburg, contains gray corundum crystals, many of them encased in margarite (see Map 28, locality 1).

The Acme (Collins) mine, located west of Statesville, produced abrasive as well as gray astirated corundum (see Map 28, locality 2). The old mine dumps are now destroyed because of the construction of the Klein Outdoor Theater over the deposit. Some corundum has been found in a small stream which flows behind the theater.

Rough corundum crystals occur 0.6 mile north of the Prison Camp located on U.S. Highway 21 north of Statesville (see Map 28, locality 3).

Zircon: Zircon occurs in an area approximately 5 miles west of Statesville in the vicinity of the old Statesville airport (see Map 28, locality 4).

Sagenite: Mud and water inclusions in quartz crystals are found on the Campbell, Shoemaker, and Burton farms which lie west and southwest of Rhyne's store on N.C. Highway 115, 14 miles northwest of Statesville (see Map 26, locality 11).

Rose quartz: Massive, dark rose quartz has been found approximately 0.4 mile north of Rhyne's Store on the property of John Duncan on Fox Mountain near the southern edge of Love Valley (see Map 26, locality 13) / W. R. Rhyne, Love Valley.

Rutile: Rutile crystals occur as float on the old Jolly property in the general vicinity of Fox Mountain near the southern edge of Love Valley (see Map 26, locality 12). The owner has specified no collecting during tobacco season; collecting for rutile is permitted in November.

Jackson County

Ultramafic minerals: The town of Webster in west-central Jackson County is in part built on an ultramafic ring dike (see Map 4, locality 1). This dike contains the minerals bronzite (enstatite), annabergite, mitchellite, opaline chalcedony, magnesite, greenish druzy quartz, talc, serpentine, geothite, chromite, chrysotile, chrysolite (olivine), diopside, tremolite, marmolite, anthophyllite, actinolite, garnierite, and genthite. The deposit also contains websterite which is an aggregate of diopside and bronzite. The best exposures are south of the town of Webster in roadcuts along the southeast bank of the Tuckasegee River.

Several peridotite bodies are located in northern Jackson County, 2 miles southwest of Willits (see Map 7, localities 2 and 3). The chief minerals of these peridotites are enstatite, chromite, talc, and olivine. The olivine is noteworthy because of the unusually large size of some of the crystals. Many of these crystals measure over five inches in diameter.

Corundum: Corundum in peridotite is found on the north side of U.S. Highway 64 between Fairfield Lake and a tributary of Horsepasture River 4.5 miles east of Cashiers (see Map 6, locality 7). A peridotite body carrying corundum crosses U.S. Highway 64, 0.3 mile east of this locality and extends northward toward Little Hogback Mountain (see Map 6, locality 5). Sapphire corundum is reported to occur south of U.S. Highway 64 on the Jackson-Transylvania County line (see Map 6, locality 6). Sapphire and abrasive corundum were mined by the Sapphire Mining Company on the south shore of Sapphire Lake.

Garnet: Between 1900 and 1926, rhodolite garnet was mined for abrasives on Sugarloaf Mountain approximately 1 mile southwest of the village of Willets (see Map 7, locality 4). The garnet occurs in a mica schist and ranges in size from 1/16 to 1/4 of an inch in diameter (Broadhurst, 1955, p. 31).

Pegmatite minerals: The L. M. McCall feldspar and mica mine, which lies southeast of Pinhook Gap, produced the minerals cyrtolite, garnet, uraninite, pyrrhotite, oligoclase, quartz, muscovite, and biotite (see Map 6, locality 1). Garnet, tourmaline, beryl, and samarskite occur in an unnamed prospect southwest of Toxaway Mountain, just north of the Jackson-Transylvania County line, and about 0.3 mile northwest of U.S. Highway 64 (see Map 6, locality 8). Gem-quality beryl has been reported from the Rice mine located approximately 1 mile south of Sapphire Lake on the Jackson-Transylvania County line. The Sheepcliff mine on Sheepcliff Mountain, 3 miles north of Cashiers, was operated for beryl (see Map 5, locality 8). The pegmatite is composed of microperthite, quartz, plagioclase, muscovite, beryl, garnet, and samarskite. The quartz found in the pegmatite is milky, smoky, gray, and rose in color. The beryl ranges in color from yellow to bluish-green (Olsen, 1952, pp. 12-13).

Johnston County

Kyanite and quartz: A northeast-trending kyanite-quartz outcrop is located on the east side of U.S. Highway 70, approximately 100 feet from the highway. The locality is known as the Corbett prospect and is owned by Albert A. Corbett. This site is located about 5 miles northwest of Smithfield and 2 miles southwest of Wilson Mills (see Map 45, locality 1).

Limonite: Limonite was mined from the Wilson Iron Mine for the first 6 months of 1903. The ore body was reported to be large, and the mine closed only because the smelter using it closed. The mine is 4.7 miles

northwest of Smithfield and 6.8 miles southeast of Clayton. It is east of U.S. Highway 70 approximately 1.0 mile north of the intersection of U.S. Highway 70 with SR 1501 (see Map 45, locality 2).

Calcite and epidote: The Princeton Nello Teer quarry contains orange calcite which may fluoresce a bright orange-red and epidote veins of radiating crystals. White and tea-colored calcite, hematite, and chalcopyrite also occur. The quarry is located between the Little River and the intersection of SR 2316 and SR 2371 (see Map 45, locality 3).

Lee County

Chrysocolla, malachite, and bornite: The Clegg mine in northern Lee County contains chrysocolla, malachite, and bornite along with chalcopyrite, pyrite, azurite, chalcocite, quartz crystals, sphalerite, galena, calcite crystals, siderite, and limonite. The mine lies just off U.S. Highway 1 north of Sanford, 0.3 mile behind Deep River School and the Flat Springs Baptist Church (see Map 38, locality 1).

Gold: Gold nuggets occur in the creek that flows out of the reservoir at the Sanford Water Works and Pumping Station northeast of Sanford. Many local people have panned gold in this creek. The largest nuggets found are about twice the size of an average pinhead. The location can be reached by taking SR 1521 from Sanford and turning right on the Pumping Station Road (see Map 38, localities 3 and 4).

Fossils: Fossils of Triassic age occur in the dumps of the old Egypt coal mine on Deep River. Phytosaur teeth and bone fragments may be found along with pith cast of neocalamites and, of course, some real North Carolina coal.

The locality may be reached by taking U.S. Highway 421 north from Sanford for 5 miles and turning right on the Cumnock road (SR 1400). The mine lies southeast 300 yards from the intersection of the Cumnock road and Deep River at the overhead bridge on the Lee County side of the river (see Map 38, locality 2).

Lincoln County

Kyanite: Kyanite occurs 1 mile west of Mariposa on a hill (Chubb Mountain) south of Branch Creek. The locality is accessible east of SR 1403 (see Map 24, locality 6). Lazulite also occurs sparingly at this locality.

Tourmaline, muscovite, smoky quartz, and biotite: Tourmaline, muscovite, smoky quartz, and biotite occur as float in a field on the eastern corner of the junction of SR 1146 and SR 1140, 0.6 mile west of Flay. Beryl from the Brown mine and the Carbine mine is reported from approximately the same location (see Map 21, locality 7).

Iron: Lincoln County contains considerable iron ore in the form of magnetite, limonite, and hematite. The Big Ore Bank, located approximately one mile southeast of Pumpkin Center (see Map 24, locality 5), was mined during the Revolutionary and Civil Wars (Kerr and Hanna, 1887, p. 155).

Macon County

Macon County has several corundum deposits which were originally worked primarily for abrasives and secondarily for gemstones. With the replacement of corundum by artificial abrasives soon after the turn of the century, mining of these deposits ceased. As interest in mineral collecting increased, the deposits were reexamined, especially as a source of rubies, sapphires, and garnets. The Cowee Creek area, in particular, abounds with mines where the rockhound may go in search of these and other minerals. These mines are generally open during the summer daylight hours, although some may remain open year-round or as weather permits. Fees

for collecting at these mines vary, but $3.00 for adults and $2.00 for children may be considered the average. Because of the variable hours, rates, and open days, it is best to contact each mine in advance. The following list contains most of the fee-basis mines in Macon County:

1) Bonanza Mine: Ruby, sapphire / Box 625, Franklin, N. C. 28734 (see Map 4, locality 12).
2) Caler Creek Mine: Ruby, sapphire, garnet / Rt. 28, Cowee Valley; Franklin, N. C. 28734 (see Map 4, locality 14.
3) Cherokee Ruby Mine: Ruby, sapphire, garnet / Box 483, Franklin, N. C. 28734 (see Map 4, locality 20).
4) Dale and Demko's Mine: Ruby, sapphire / Box 460, Franklin, N. C. 28734 (see Map 4, locality 11).
5) Rose Creek Star Garnet Mine: Star garnet, sapphire, moonstone / Rose Creek Rd., Franklin, N. C. 28734 (see Map 4, locality 5).
6) Gibson's Ruby Mine: Ruby, sapphire / Box 470, Franklin, N. C. 28734 (see Map 4, locality 15).
7) Gregory's Ruby Mine: Ruby, sapphire / Cowee Valley Rd., Franklin, N. C. 28734 (see Map 4, locality 16).
8) Holbrook Ruby Mine: Ruby, sapphire, garnet / Box 471, Franklin, N. C. 28734 (see Map 4, locality 19).
9) Houston's Sapphire Mine: Sapphire, garnet /Box 171, Franklin, N. C. 28734 (see Map 4, locality 4).
10) Jacobs Ruby Mine: Ruby, sapphire, garnet / Cowee Valley Rd., Franklin, N. C. 28734 (see Map 4, locality 13).
11) Jones Ruby Mine: Ruby, sapphire / Box 977, Franklin, N. C. 28734 (see Map 4, locality 17).
12) Mason's Sapphire Mine: Ruby, sapphire / Box 796; Franklin, N. C. 28734 (see Map 4, locality 2).
13) Mason Mountain Rhodolite Mine: Rhodolite, garnet, moonstone, ruby, sapphire / Box 742, Franklin, N. C. 28734 (see Map 4, locality 8).
14) McCook Rhodolite Mine: Rhodolite, sapphire / Rt. 28N, Franklin, N. C. 28734 (see Map 4, locality 6).
15) Mincy Mine: Bronze sapphire / 139 W. Main St., Franklin, N. C. 28734 (see Map 4, locality 21).
16) Rockhound Haven Rhodolite Mine: Rhodolite / Box 592, Franklin, N. C. 28734 (see Map 4, locality 7).
17) Sheffield Mine: Ruby, sapphire, garnet / Box 724, Franklin, N. C. 28734 (see Map 4, locality 9).
18) Shuler's Ruby Mine: Ruby, sapphire, garnet / Box 479, Franklin, N. C. 28734 (see Map 4, locality 18).
19) Yukon Mine: Ruby, sapphire / Box 452, Franklin, N. C. 28734 (see Map 4, locality 10).

Some of the rubies found in this area have been of the valued pigeon-blood color and are said to equal the Burma rubies in color and brilliancy. In addition to the minerals listed for each mine, the following may also occur: sillimanite, staurolite, iolite, monazite, gold, pyrite, chalcopyrite, pyrrhotite, sphalerite, ilmenite, rutile, bronzite, hornblende, zircon, and kyanite.

Corundum: Corundum, in association with rutile, asbestos, and vermiculite, is reported in the vicinity of Bernette Lake in the Scaly Community 3.4 miles southwest of Highlands (see Map 5, locality 4).

Garnet: Garnet occurs in several localities in Macon County including the rhodolite deposit located near the summit of Masons' Mountain (on its southern slope) 1.6 miles east-southeast of Wests Mills and 1 mile south of Cowee Creek (see Map 4, locality 3). Associated with the rhodolite garnet are the minerals: gedrite, hypersthene, and biotite (Henderson, 1931, pp. 563-569). Almandite garnet occurs in southeastern Macon County on the road to Whiteside Mountain at the Macon-Jackson County line (see Map 5, locality 7) and also in a region 2.3 miles southwest of Dry Falls (see Map 5, locality 3).

Beryl and tourmaline: Golden beryl and black tourmaline occur in pegmatites on U.S. Highway 64-A at the northern city limits of Highlands (see Map 5, locality 6).

Amethyst has been reported from the Ammons mine 4.7 miles southeast of Highlands (see Map 5, locality 2) and the Waggoner mine, which lies south of N.C. Highway 106, 4.7 miles southwest of Highlands on Abes Creek (see Map 5, locality 5).

Madison County

Allanite: Allanite occurs in at least three areas in Madison County. One of the areas is 0.5 mile south of Lemon Gap on East Fork Creek (see Map 9, locality 4). Another area is near the headwaters of Paw Paw Creek 5 miles west-southwest of Marshall (see Map 9, locality 7). The third area is near Pine Creek Church on Little Pine Creek 5.6 miles southwest of Marshall (see Map 9, locality 8).

Barite: Barite has been mined on Spring Creek approximately 0.9 mile northeast of Bluff (see Map 9, locality 3). The barite occurs in large crystals and crystalline masses in veins (Keith ,1904, p. 9). These barite veins trend in a northeast-southwest direction and pass through the village of Stackhouse where barite has also been mined extensively.

Unakite: Unakite, a granite composed of yellow-green epidote, pink feldspar, and quartz, is used as an ornamental stone. It is found as dikes which cut the country rock on Roaring Fork Creek a short distance above its entrance into Meadow Creek Fork 2.8 miles southwest of Bluff (Watson, Laney and Merrill, 1906, p. 172) (see Map 9, locality 5). It is also reported to occur just north of Bluff (see Map 9, locality 2).

Garnet: Garnet occurs just north of Redmon above the Southern Railway tracks (see Map 9, locality 6) and at the Little Pine garnet mine (see Map 9, locality 9). The variety of garnet found at both localities is almandite. Some gem-quality material has been produced in each deposit.

Monazite: Monazite crystals and massive monazite have been removed from a pegmatite near Bull Creek 1.5 miles south of Petersburg.

Corundum and ultramafic minerals: Pink and white corundum, serpentine, olivine, chromite, and greenish-black spinel are found at the Carter mine north of Democrat. This mine, located on the headwaters of Holcombe Branch (see Map 13, locality 2) can be reached by taking the secondary road north from Democrat for 1.7 miles to SR 1544, turning east beyond the Pleasant Gap Methodist Church, and following this road east for 0.4 mile to a lone barn on the north bank of the road. The old mine workings lie several hundred yards north of the barn on a small tributary to Holcombe Branch.

Jasperoid and calcite: Jasperoid occurs on the north bank of the French Broad River 1200 feet northwest of the Montaqua Hotel in Hot Springs in unaltered dolomite and limestone (see Map 9, locality 1). Associated with the jasperoid are calcite crystals that are up to 1/2 inch in length (Oriel, 1950, p. 11).

McDowell County

Diamond: The Dysartsville area in southeastern McDowell County was placer mined for gold before the Civil War and mining continued for some time afterwards. During these mining operations, three diamonds were found near the headwaters of South Muddy Creek in the vicinity of where N.C. Highway 226 crosses the creek 0.3 mile north of Dysartsville (see Map 17, locality 7).

Zircon and corundum: Zircon and corundum were discovered during gold placer mining in a small tributary of South Muddy Creek on the Mary Mills property located approximately 2 miles southeast of Dysartsville on the north side of SR 1773 (see Map 17, locality 8).

Corundum is found 1.5 miles southwest of Dysartsville on the north side of SR 1802, which lies between Dysartsville and U.S. Highway 221 (see Map 17, locality 6). The corundum occurs as float in the fields around an old farmhouse in this vicinity.

Calcite and quartz: Dog-tooth calcite crystals occur in the Shady dolomite at the Woodlawn limestone quarry at Woodlawn (see Map 17, locality 1). Small quartz crystals, some of which contain phantoms, are found a few hundred yards north of the Woodlawn limestone quarry.

Quartz crystals were discovered at Nebo in a field on the west side of N.C. Highway 126, 1000 yards north of the Southern Railway tracks, in the center of the village (see Map 17, locality 4) / Adam Street, Valdese.

Graphite and kyanite: A graphite zone crosses the western edge of McDowell County from west of Laurel

Knob to west of Graphiteville (see Map 12, locality 3). West of this is located a kyanite zone which parallels the graphite zone but extends further south into Buncombe County, crossing U.S. Highway 70 between Ridgecrest and Black Mountain (see Map 12, locality 2). The graphite is disseminated through mica schist, but in places pure graphite is associated with vein quartz. The kyanite occurs in mica schist, but at some places in the region, it appears as the chief constituent of the rock. It varies in color from pale-blue to almost sapphire-blue.

Pegmatite minerals: Beryl, garnet, samarskite, and columbite have been reported to occur in a pegmatite on the old Mount Mitchell toll road near the McDowell-Buncombe County line (see Map 12, locality 1).

Mecklenburg County

Epidote: Epidote crystals in quartz veins, as well as massive epidote, occurs 0.75 mile east of the U.S. Highway 21 exit on Interstate 85, in a good exposure of granite which crops out on the banks of Irvin Creek. The locality is accessible from a two-lane road that runs parallel to Interstate 85 in that area.

Mitchell County

Pegmatite minerals: The Spruce Pine Mining District is one of the chief mica- and feldspar-producing areas in the United States. A few of the more interesting of these deposits are described below. (For a more complete listing of the mines of the district, see Olsen, 1944, Part 2, pl. 2.)

The Southers Branch mine, located 1.7 miles northwest of Spruce Pine (see Map 15, locality 11), contains the minerals garnet, pink orthoclase, and hyalite in stalactitic forms over two inches in length. The mine can be reached by taking N.C. Highway 226 west of the center of Spruce Pine for 1.4 miles and turning north on SR 1150, which will dead end at the mine dumps 0.6 mile from the highway.

The Hawk mine, located 1.2 miles north of Hawk (see Map 15, locality 5), contains the minerals garnet, apatite, epidote, allanite, black tourmaline, pyrite, thulite, and glass-clear oligoclase.

Rare doubly-terminated epidote crystals and albite crystals occur in pegmatite dikes on the property of Clarence E. Wilson 1.5 miles northeast of Bakersville (see Map 15, locality 4).

Orthoclase feldspar, which gives a sunstone sheen, is found on the property of Benton McKinney, which lies at the end of SR 1159, 0.5 mile east of N.C. Highway 261, 2.4 miles northeast of Glen Ayers (see Map 15, locality 3).

The Emerald mine on Crabtree Mountain, located 2.5 miles southwest of Spruce Pine and southeast of the Brush Creek Road (SR 1156) (see Map 15, locality 14), has produced a few emeralds large enough for cutting, but most of the crystals are too small to be of value. The material from this mine is sometimes cut as an ornamental stone and sold as emerald-in-matrix. This mine has produced many facet-grade emeralds and is open to the public for a small fee of $3.00 for adults and $1.50 for children.

Aquamarine occurs in mica schist across from the old Wiseman mine in the same vein as the mine (see Map 15, locality 21) / Robert Orchard, Raleigh.

The Old 20 mine, located 5 miles southwest of Spruce Pine on the west side of the road to Little Switzerland (SR 1002) (see Map 15, locality 18), contains, in addition to feldspar and mica, the minerals beryl, apatite, hyalite, cyrtolite, uraninite, autunite, torbernite, and gummite.

The McKinney mine, located approximately 1.6 miles south of the Old 20 mine (see Map 15, locality 20), contains the minerals samarskite, autunite, torbernite, columbite, hyalite, amazonite, bornite, covellite, chalcopyrite, malachite, sphalerite, massive beryl, feldspar, and mica.

The mine, located on English Knob, on the east side of the road from Spruce Pine to Ingalls (SR 1138) 0.4

mile from the Mitchell-Avery County line (see Map 15, locality 13) has produced the minerals pitchblende, gummite, torbernite, samarskite, autunite, monazite, columbite, and cyrtolite.

The Deer Park mine in the horseshoe bend of the North Toe River 0.1 mile east of Penland (see Map 15, locality 10) is located in pegmatite which carries the minerals feldspar, mica, thulite, hyalite, and monazite.

Uranium minerals occur in the pegmatite across the road from the sign "Pete Crest Farm" on N.C. Highway 261, 0.3 mile south of Carvers Gap (see Map 15, locality 1).

Corundum: Corundum, described as ruby and sapphire, is reported on the Panel Farm 1.2 miles southeast of Bakersville (see Map 15, locality 7). Blue corundum associated with kyanite and tremolite is also reported to occur on the Dillinger farm 2.6 miles east of Hawk (see Map 15, locality 6).

Actinolite and talc: A deposit of actinolite and talc lies northeast of Spruce Pine on the road to Ingalls. The deposit occurs on the east side of the road approximately 1 mile north of its junction with U.S. Highway 19E (see Map 15, locality 12).

Unakite: Unakite occurs on the Rex Peake property east of N.C. Higheay 261, 3 miles south of Carvers Gap (see Map 15, locality 2) / Roby Buchanan, Hawk. A poor-quality unakite can be found on the north bank of the road to Roan High Peak approximately 1.5 miles west of Carvers Gap / Clarence Wilson.

Montgomery County

Gold, silver, and copper: The Coggins mine, located 1.5 miles north-northeast of Eldorado, has produced gold and silver, In addition to these ores, the deposit contains the minerals quartz, pyrite, and chalcopyrite. The mine is located 100 feet southeast of the intersection of SR 1301 and SR 1302 (see Map 32, locality 1).

The Eldorado mine, located 1.5 miles south of the Coggins mine and east of the village of Eldorado behind the old school house, contains the minerals azurite, malachite, hydrozincite, and sphalerite (see Map 32, locality 2).

The Star mine is 3.1 miles west of Star and can be reached by travelling north on SR 1340 for 0.5 mile from Little River. Turn west onto a gravel-surface road for 0.25 mile to the mine. Minerals at the mine include pyrite, chalcopyrite, bornite, chalcocite, molybdenite, and ferrimolybdite (see Map 34, locality 4).

Pyrophyllite: Radiating pyrophyllite associated with quartz occurs on Cotton Stone Mountain north of Troy (see Map 34, locality 1). Go north from Troy about 3.5 miles on N.C. Highway 134 to a deep road cut. Follow the old trail at the top of the roadcut for about 0.75 mile west. The pyrophyllite and quartz crops out on both sides of the trail. Permission should be obtained from L. T. Richardson who lives on the east side of N.C. Highway 134 at the road cut.

Massive pyrophyllite is known to occur near Wadeville, southeast of the intersection of N.C. Highway 134 and SR 1311, west of Steed, and northeast of Asbury, in the northeastern corner of the county. Considerable prospecting has been done at these four localities.

Moore County

Massive and radiating pyrophyllite: Moore County contains several pyrophyllite deposits including the Glendon (Ward mine) deposit, located 1.8 miles north of Glendon (see Map 36, localities 2 and 3), and the Standard Mineral Company deposit on Cabin Creek, 2.0 miles southwest of Robbins (see Map 34, locality 2). These deposits carry, in addition to pyrophyllite, the minerals lazulite, ottrelite (chloritoid), ilmenite, specularite, sericite, pyrite, fluorite, and hematite. The Glendon deposit contains pyrite cubes and small crystals of fluorite.

Clear and amethyst quartz crystals: Clear and amethyst quartz crystals occur on the property of Mrs.

Nesom Moore, 2.7 miles southwest of Robbins. The locality lies 0.4 mile southeast of where Dry Creek flows into Cabin Creek and 0.8 mile southwest of the Standard Mineral Company (see Map 34, locality 3).

Zircon and monazite: Zircon and monazite sands are found at various localities on Little River. Localities are too numerous to mention, but at almost any accessible spot along Little River in southeastern Moore County, these minerals can be panned with fair success.

Copper: The copper prospect on the Haw Branch Road 1.6 miles northeast of Glendon has produced cabinet specimens of azurite, malachite, and calcite. This deposit can be reached by taking SR 1006 north from Glendon for 0.9 mile and turning east on SR 1619, 1.3 miles. At this point, a logging road turns north. After a short distance, the logging road forks at a sawdust pile, and the right fork leads to the old diggings 100 feet beyond the sawdust pile (see Map 36, locality 4).

Orange County

Pyrophyllite, lazulite, andalusite, and topaz: These minerals occur in the Piedmont Minerals Company mine at Hillsborough. This area is just south of the city limits and beside the Southern Railway (see Map 39, locality 1). The pyrophyllite occurs as rosettes that measure up to 1 1/2 inches in diameter and make excellent specimens. Some topaz is also found at this locality.

Radiating pyrophyllite crystals occur four miles due north of Teer on the south side of SR 1117 on the Saline Sykes property, which lies north of the Jesse Sykes Long Meadow Dairy (see Map 39, locality 3).

Hematite: Hematite occurs at the Chapel Hill iron mine on Iron Mine Hill 0.2 miles west of SR 1759 and 1 mile southwest of the intersection of N.C. Highway 86 and SR 1760 (Allen and Wilson, 1968) (see Map 39, locality 4).

Barite: Barite veins are located in central Orange County south of Hillsborough. The locality is west of the intersection of SR 1130 and SR 1129 (see Map 39, locality 2).

Person County

Sagenite: Quartz crystals containing chlorite and hematite occur on SR 1717 between Surl and Mt. Tirzah in southeastern Person County. The locality is situated on the west side of the road, across from a church, approximately 1.9 miles north of Mt. Tirzah (see Map 42, locality 1) / J. A. Price, Durham.

Pyrite and limonite: Pyrite crystals up to 1 inch in diameter occur in the road banks and the surrounding fields on SR 1715 between Mt. Tirzah and Moriah, approximately 1 mile east of Mt. Tirzah. Limonite pseudomorphs after pyrite are found on SR 1715 approximately 0.3 mile west of Mt. Tirzah (see Map 42, locality 2).

Pyrophyllite and kyanite: Kyanite and pyrophyllite in radiating rosettes are found in association with vein quartz on the southern end of Hager's Mountain northwest of Longhurst. The locality can be reached by taking SR 1326 between Longhurst and Woodsdale north from Longhurst for 1.9 miles. The locality lies west of the road at this point, between the road and Marlowe Creek (see Map 40, locality 3).

Limonite: Limonite pseudomorphs are found south of SR 1715 approximately 0.5 mile southeast of Mr. Tirzah (see Map 42, locality 3).

Malachite, bornite, azurite, specular hematite: Malachite and bornite occur at the Durgy mine in the east-central part of the county. The mine is 300 feet N. 70° W. from the front of Poole's Store on SR 1542,

0.13 mile south of the intersection of SR 1542 and SR 1559 (see Map 43, locality 4).

Malachite and chalcocite: Malachite, chalcocite, and cuprite may be found at the Copper World mine. To reach the mine, travel 0.9 mile north on SR 1542 from the intersection of SR 1542 and SR 1556. At the Adolphus Jones residence, go S. 80° E. for 800 feet from the south side of the southernmost white frame house to a walnut tree in the back pasture. From the tree, go 650 feet N. 45° E. to an old road in the woods. Follow the old road through a fence to an old railroad bed. From the railroad bed, continue across an old road 2750 feet east and then S. 80° E. to the mine (see Map 43, locality 3).

Polk County

Epidote: Epidote occurs in biotite gneiss south of Melrose on SR 1102 in southwestern Polk County. The outcrop is located in a stream under the bridge on SR 1102 and in the stream below the bridge. This locality may be reached by taking U.S. Highway 176 east from Saluda toward Tryon for approximately 4.5 miles and turning right on SR 1102. Follow SR 1102 from this point for approximately 1.8 miles to the bridge (see Map 11, locality 3). The epidote is in an outcrop in the creek.

Hornblende: Small crystals of hornblende occur in the road where SR 1136 intersects Horse Creek on the south side of White Oak Mountain (see Map 11, locality 4).

Randolph County

Hornblende and epidote: Radiating hornblende, feldspar, and epidote crystals occur in glomeroporphyry north of U.S. Highway 64, 6 miles west of Asheboro. The locality can be reached by turning north from U.S. Highway 64 onto SR 1411 and following this road for 0.6 mile. The material is located in an abandoned highway quarry on the east side of SR 1411 (see Map 33, locality 6).

Pyrophyllite and associated minerals: Pyrophyllite, ottrelite, diaspore, lazulite, andalusite, and pyrite occur at the old Carolina pyrophyllite mine 4.5 miles west of Staley (see Map 37, locality 1). A quartz crushing plant now occupies the quarry. However, many quartz crystals, some large, can be found in this material.

Actinolite in quartz: Quartz crystals and olive-green crystals of actinolite in vein quartz occur on the property of Walter Johnson near Copper Hill. The locality is situated south of the road between Denton and Farmer and lies 4.2 miles west of Farmer (see Map 33, locality 7). There is a fee for digging, and the findings may be poor. This is one of the few areas where actinolite in vein quartz has been reported in the state.

Quartz crystals: Quartz crystals have been reported in the Staley area. Some few were found in the plowed fields in the area around Staley (see Map 37, localities 2, 3, and 4).

Rockingham County

Petrified wood: Petrified wood occurs on the property of Raymond H. Gallaher on SR 1759. Here, petrified wood can be found in abundance along a small stream leading into the Dan River (see Map 50, locality 1).

Rutherford County

Garnet: Garnet occurs in Stoney Creek at Thermal City in the area between Stoney Creek Methodist Church and U.S. Highway 221 (see Map 16, locality 2). Some rough crystals showing dodecahedral faces over 12 inches in diameter have been recovered from this area, but most of the garnet is massive.

Garnet in granite gneiss is found on Marlin's knob east of U.S. Highway 64, 4 miles north of Westminster (see Map 16, locality 4). Garnet also occurs on SR 1007 between Ellenboro and Westminster, 0.4 mile northwest of the Puzzle Creek bridge (see Map 16, locality 10).

Beryl and quartz: Golden beryl and asteriated quartz have been mined on the Roy McFarland property on the Duncans Creek road (SR 1749) 2 miles east of SR 1006 (see Map 16, locality 5). Beryl and rose quartz occur approximately 1 mile north of Ellenboro at the Dycus mine (see Map 19, locality 2). Beryl is also found on the Martin property (see Map 19, locality 1) and on the Fred Toney property (see Map 19, locality 3) in the vicinity of the Dycus mine north of Ellenboro.

Box quartz, sometimes containing water inclusions, and blue banded quartz occur on the Callaham property and in the stream gravel of Hollands Creek 0.6 mile northwest of the Rutherfordton city limits (see Map 16, locality 9).

Milky quartz crystals are found at an old gold mine dump in the woods a few hundred yards across the road from the Sandy Level Church 3.1 miles northwest of Sunshine (see Map 16, locality 6).

Galena: A galena prospect pit is located on the east side of the Shingle Hollow Raod (SR 1328) 0.8 mile northwest of the Welcome Home Church, approximately 8 miles northwest of Gilkey (see Map 16, locality 1). In addition to galena, the minerals pyrite, chalcopyrite, and bornite can be found at this locality.

Fuchsite and corundum: A pegmatite carrying fuchsite and pink corundum is located on the west side of the Blacksmith Shop road (SR 1177) 1.4 miles south of the Green Hill Grade School (see Map 16, locality 8). This deposit was originally worked by Wards Natural Science Establishment for specimen material. Also, a mica schist composed of fuchsite, sericite, and lenticular masses of pink corundum occurs on the property of Rural Groves. The deposit lies several hundred yards south of the Oak Springs Baptist Church (see Map 16, locality 7).

Diamond: In 1854, a diamond weighing 1 1/3 carats was found in the gold washings of the J. D. Twitty gold mine located on Cane Creek 2 miles south of the Rutherford-McDowell County line (see Map 16, locality 3). A smaller stone was recovered from gold washings on the property of C. Leventhrope and was acquired by Professor Charles U. Shepard (Kunz, 1907, p. 6).

Stanly County

Gold: Gold has been mined in northern Stanly and Montgomery Counties, and the Cotton Patch mine southeast of New London is presently in operation. This mine is open to the public for a fee of $2.00 per day for panning alluvial gravels and screening and panning dump material. The mine is located 2 miles southeast of New London at the intersection of Mountain Creek and SR 1520 (see Map 32, locality 3).

Limonite pseudomorphs: Limonite pseudomorphs after pyrite have been found on the Glen Mabry farm. Take U.S. Highway 52 south from Albemarle to SR 1914. Go 0.1 mile on SR 1914 and turn left on SR 1918. The Mabry farm is approximately 1 mile south of the intersection of SR 1918 and SR 1914 (see Map 32, locality 4). Pay fee of $1.00 at the last house on the left before the road crosses the railroad tracks.

Stokes County

Itacolumite: Itacolumite is found in Stokes County on the Tommy East property. Take N.C. Highway 66 to Gap, turn left on Taylor Road. At the first right, follow the road to the East property. Dig only behind the trailer and along the woods (see Map 31, locality 1). Stay out of the fields if they are planted. Itacolumite also occurs on Hanging Rock Mountain 3 miles southwest of Danbury.

Swain County

Pegmatite minerals: Approximately 36 pegmatites are concentrated in a band striking northeast-southwest, north of Bryson City and continuing from north of Deep Creek Church to north of Franklin Grove Church. These dikes contain the minerals feldspar, quartz, muscovite and biotite mica, garnet, pyrite, allanite, samarskite, and magnetite.

The Carson mines, located 2900 feet northwest of Deep Creek Church (see Map 3, locality 2), have been worked for clay and feldspar. The south (or No. 4) pegmatite of this group contains graphic granite (feldspar and quartz intergrowths), biotite and muscovite mica, quartz, feldspar, pyrite, and thulite (Cameron, 1951, p. 51).

The Cox No. 1 mine, located north of the Toot Hollow Branch (see Map 3, locality 1), was mined for feldspar. It also contains garnet, biotite, pyrite, allanite, samarskite, and magnetite (Cameron, 1951, p. 82).

Kyanite: Kyanite and staurolite are found in a graphitic schist on the hillside north of the Deep Creek camp site 1.5 miles north of Bryson City (see Map 3, locality 3).

Transylvania County

Quartz: Smoky quartz crystals have been found east of U.S. Highway 276 above the Pink Beds recreation area, north of Looking Glass Falls. The area can be reached from the recreation area by following the Carolina Power and Light Company high-tension line up the mountain for approximately 1 mile. The smoky quartz occurs in a vein which crosses a sharp bend of a now-abandoned road (see Map 10, locality 1) / D. C. Dills, Brevard.

Quartz crystals occur northwest of Rosman. This area can be reached by taking the Balsam Grove Road (N. C. Highway 215) north from Rosman for 0.9 mile and turning west onto SR 1322 which crosses the North Fork of the French Broad River. The quartz crystals occur on the south side of the road 0.2 mile west of the river, past a saw mill, and down a hill towards a small stream which is a tributary to the North Fork of the French Broad River (see Map 6, locality 3).

Doubly-terminated quartz crystals occur as float in a pasture on the Raymond Hogsed property on the west side of SR 1326, 2.2 miles west-southwest of Balsam Grove (see Map 6, locality 2) / D. C. Dills, Brevard.

Corundum and enstatite: Corundum and enstatite occur in dunite which crops out on the east slopes of the Great Hogback Mountain north of Oakland (see Map 6, locality 4).

Pyrite and garnet: Pyrite and garnet can be found in float along the Carolina Power and Light Company line north of SR 1560 between the villages of Cedar Mountain and Blue Ridge (see Map 10, locality 3). Garnet can also be found 2.3 miles southeast of Looking Glass Falls on the north bank of U.S. Highway 276 in a grove of black pines (see Map 10, locality 2) / D. C. Dills, Brevard.

Calcite: Dog-tooth calcite crystals occur north of the Girl Scout Camp east of Rosman near the farm of Porter Tinsley (see Map 10, locality 4). The locality is reached by taking N.C. Highway 178 south from Rosman for 1 mile, then turning east on SR 1107 for 3 miles to the intersection of SR 1107 and SR 1103. Continue 1.1 miles north on SR 1103.

Vance County

Minerals of the Hamme Tungsten district: The Hamme Tungsten district is located in the northeast part of the county in the area lying between Big Island Creek and Little Island Creek (see Map 47, locality 1). The tungsten ores occur in vein deposits. The chief ore is huebnerite, but the veins also carry the minerals scheelite, pyrite, rhodochrosite, sphalerite, tetrahedrite, chalcopyrite, galena, apatite, fluorite, sericite, and molybdenite (White, 1945, pp. 97-110). The Hamme mine at Tungsten was closed in 1962 because foreign com-

panies could produce tungsten at a lower price. Mining by Ranchers Exploration and Development Corp. started in 1970 but terminated in the fall of 1971 after a sharp drop in the price of tungsten. The following minerals, in addition to those above, may be found at this mine: siderite, blue quartz, and limonite. Under the water tower magnetite, scheelite, and powellite can also be found.

Rutile and sillimanite: Rutile and sillimanite occur in phyllite gneiss northeast of Henderson. This area can be reached by taking U.S. Highway 158 north from Henderson to its intersection with SR 1319 which turns north and should be followed for 4.8 miles to the locality. The locality lies west of the road, between the road and the Kerr Reservoir (see Map 47, locality 2).

Wake County

Soapstone and actinolite: Several soapstone bodies carrying actinolite occur near Bayleaf in Wake County. These deposits are located on SR 1834 west of Bayleaf where Barton's Creek crosses the road (see Map 44, locality 8), at the crossroads north of Bayleaf (see Map 44, locality 3), in the large meander of the Neuse River northeast of Bayleaf (see Map 44, locality 4), where Buckhorn Creek enters Newlight Creek northeast of Bayleaf (see Map 44, locality 1) and on SR 2004 (see Map 44, locality 5).

Corundum: Corundum is reported to occur 1.9 miles northwest of Bayleaf (see Map 44, locality 2).

Beryl and allanite: Beryl and allanite are reported to occur in pegmatite on the Thompson farm 2.5 miles south of Purnell between Horse Creek and SR 1923, which intersects N.C. Highway 98 (see Map 44, locality 7).

Graphite: One, and in places two, bands of graphite cross central Wake County west of Raleigh. One of these bands starts near Macedonia and extends northward, crossing U.S. Highway 1 near Meredith College (see Map 44, localities 12 and 16). The other band is encountered near the State Fairgrounds and is traceable northward almost to Six Forks (see Map 44, localities 10, 13, and 15). This vein has been mined for graphite, and abandoned mine workings can be found off U.S. Highway 70 northwest of Raleigh in the vicinity of Mine Creek.

Kyanite: Kyanite occurs in a mica-garnet schist along SR 1922 both north and south of Horse Creek in northern Wake County. The garnet occurs in well formed crystals as much as 0.5 inch in diameter. Small amounts of graphite, sphene, and zircon are also present (see Map 44, locality 6). Kyanite also occurs west of the Crabtree Creek bridge on SR 1820. The kyanite lies 3.6 miles up this road (see Map 44, locality 9).

Kobellite, pyrite, chalcopyrite, jamesonite, smoky quartz crystals, aikinite, green siderite, and magnesite: These rare minerals and others occur in fractures and joints in the Nello Teer Crabtree Creek Quarry northwest of Raleigh (see Map 44, locality 11). The quarry has produced many cabinet specimens of kobellite, jamesonite, green siderite, coated magnesite crystals, calcite, muscovite crystals, smoky and milky quartz crystals, hornblende, and tetrahedrite. One piece of chalcopyrite weighing over 100 pounds has been found.

Banded agate: Agate occurs as float and in the creek that passes between new N.C. Highway 54 and Lake Boone Trail and also in the creek in front of the Palms Apartments east and west of the Raleigh Beltline and south of Lake Boone Trail (see Map 44, locality 14).

Warren County

Lepidolite, smoky quartz, and amethyst: Lepidolite and tumbling-quality smoky quartz and amethyst occur approximately 2.5 miles southeast of Inez on the property of Martin Fowler. The Fowler residence is located west of SR 1629, 0.2 mile south of the intersection of SR 1629 and SR 1640 (see Map 48, locality 1).

Watauga County

Copper: The locality within a radius of three miles of Elk Knob, 8 miles north of Boone, has been worked for copper (see Map 23, locality 2). The main copper ores mined in this area were chalcopyrite, azurite, and

malachite accompanied by pyrite.

Calcite: Calcite occurs in several quartz veins which cross secondary roads between Boone and Blowing Rock (see Map 23, locality 3). The best locality is on SR 1539 leading to the Appalachian Ski Mountain from U.S. Highway 221. This calcite fluoresces under ultraviolet light.

Wilkes County

Pyrrhotite, pyrite, and chalcopyrite: An area near Trap Hill in the northeastern part of the county on the east side of Bryan's Knob contains quartz veins carrying pyrrhotite, pyrite, and chalcopyrite (Kerr and Hanna, 1887, p. 231).

Galena: Argentiferous galena occurs in veins on the Laurel Spur of Flint Knob. This area is located in the western part of the county 6 miles east of Deep Gap (Kerr and Hanna, 1887, p. 202).

Sillimanite: Sillimanite occurs in road cuts on N.C. Highway 16 on the north side of Brush Mountain in Wilkes County.

Yancey County

Pegmatite minerals: The Spruce Pine Pegmatite District crosses eastern Yancey County east of Burnsville. Some of the many mines of this district are the Presnell mine, the Old Charles mine, and the Ray mine. The Presnell mine, located on the Toe River 2 miles north of Micaville (see Map 15, locality 8) contains the minerals quartz, mica crystals, feldspar, almandite, apatite, and columbite. The Fanny Gouge mine, located 2.5 miles southeast of Micaville (see Map 15, locality 15), contains the minerals quartz, mica, feldspar, thulite, pitchblende, and secondary uranium minerals. The Spec mine, which lies on a mountain ridge several hundred yards south of the Fanny Gouge mine (see Map 15, locality 16), contains, in addition to quartz, mica, and feldspar, the minerals almandite and aquamarine beryl. The Little Gibbs mine on the South Toe River 1.5 miles northeast of Celo (see Map 15, locality 17) contains a glass-clear oligoclase feldspar which can be cut into faceted gem stones / Floyd Wilson, Micaville. The Old Charles mine, which lies 2.4 miles northeast of Micaville (see Map 15, locality 9), contains thulite and blue apatite crystals. The Ray mica mine on Hurricane Mountain 3.8 miles south-southeast of Burnsville (see Map 14, locality 4) contains golden and aquamarine beryl, apatite crystals, clear oligoclase, amazonite and thulite. Genth and Kerr (1885, p. 127) state that "the minerals fluorite in pseudomorphs after apatite, yttrocerite, garnet, zircon, rutile, tourmaline, columbite, monazite, autunite, kyanite and smoky quartz were found at this mine."

Corundum: Corundum has been mined at the Hayes (Egypt) mine on the western slopes of Sampson Mountain, 9 miles northwest of Burnsville (see Map 14, locality 1). The corundum at this locality varies from white to mottled blue in color and usually is found as well-formed crystals. Corundum crystals are sometimes found in a weathered gneiss on Celo Ridge near the South Toe River east of the village of Celo (see Map 15, locality 19) (Pratt and Lewis, 1905, p. 259).

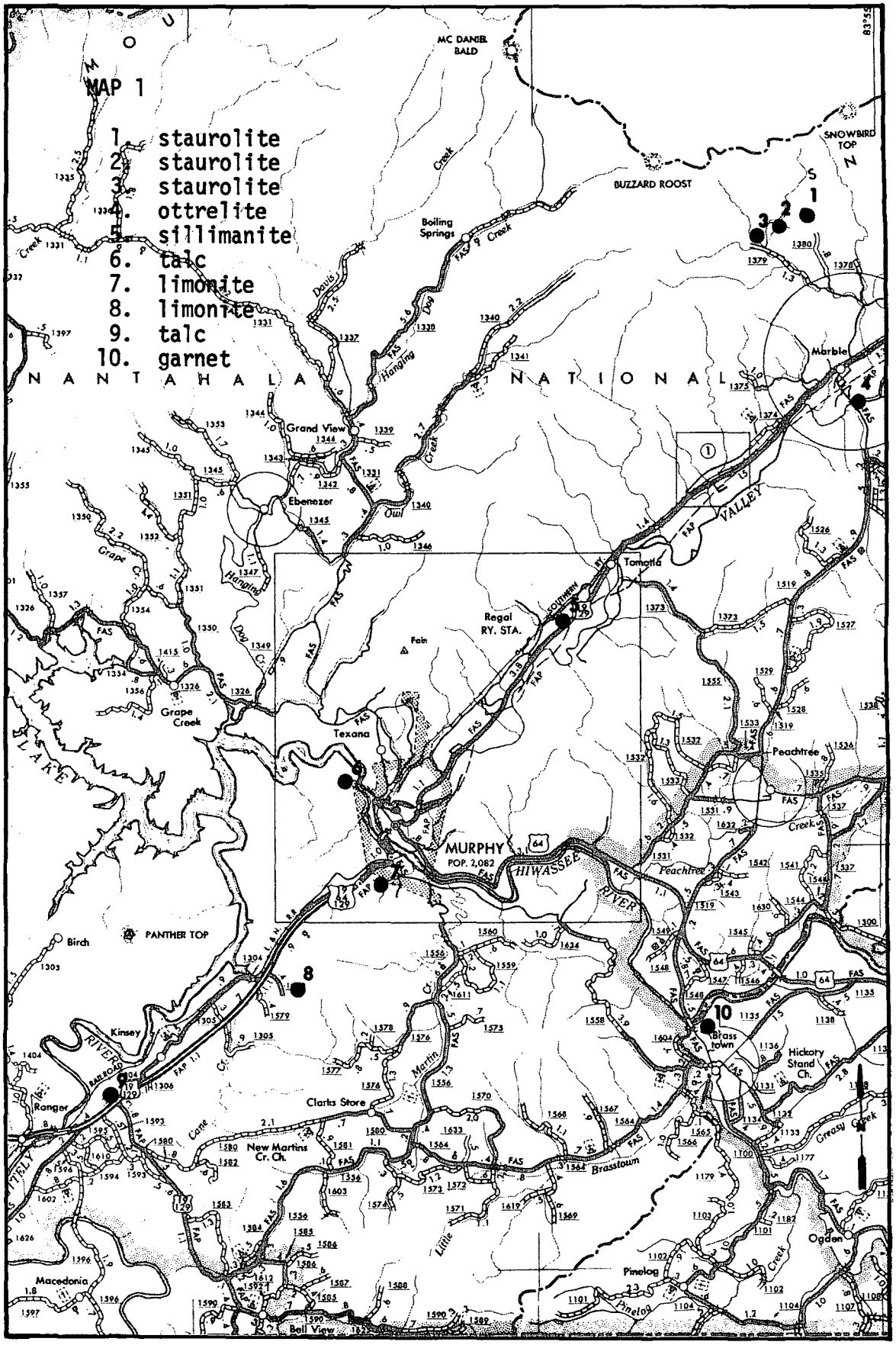
Olivine, anthophyllite, tremolite, vermiculite, chromite, garnierite, and bronzite: These minerals occur in the area around Day Book, 4.4 miles north of Burnsville (see Map 14, localities 2 and 3).

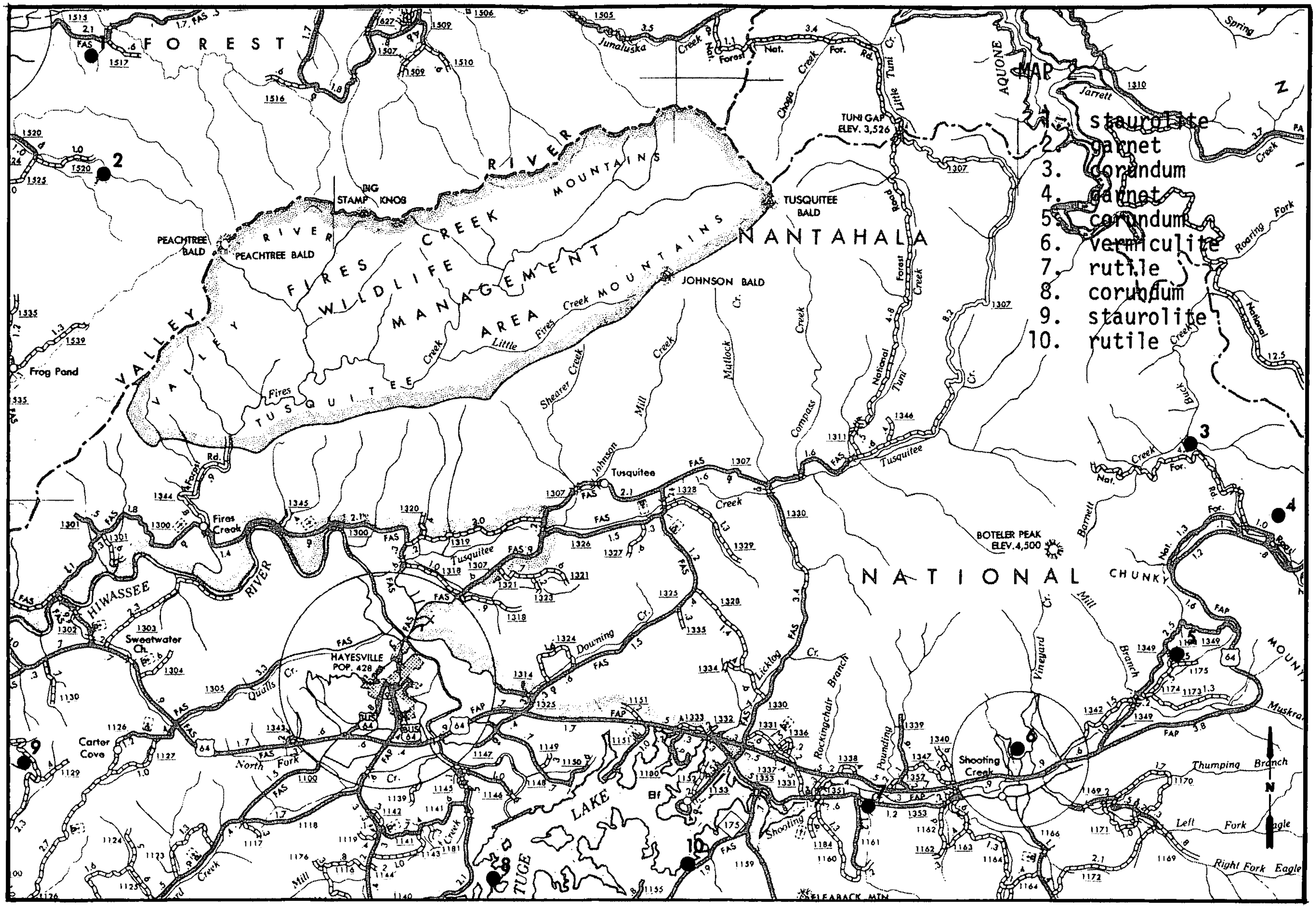
APPENDIX 1 - Mineral Locality Maps

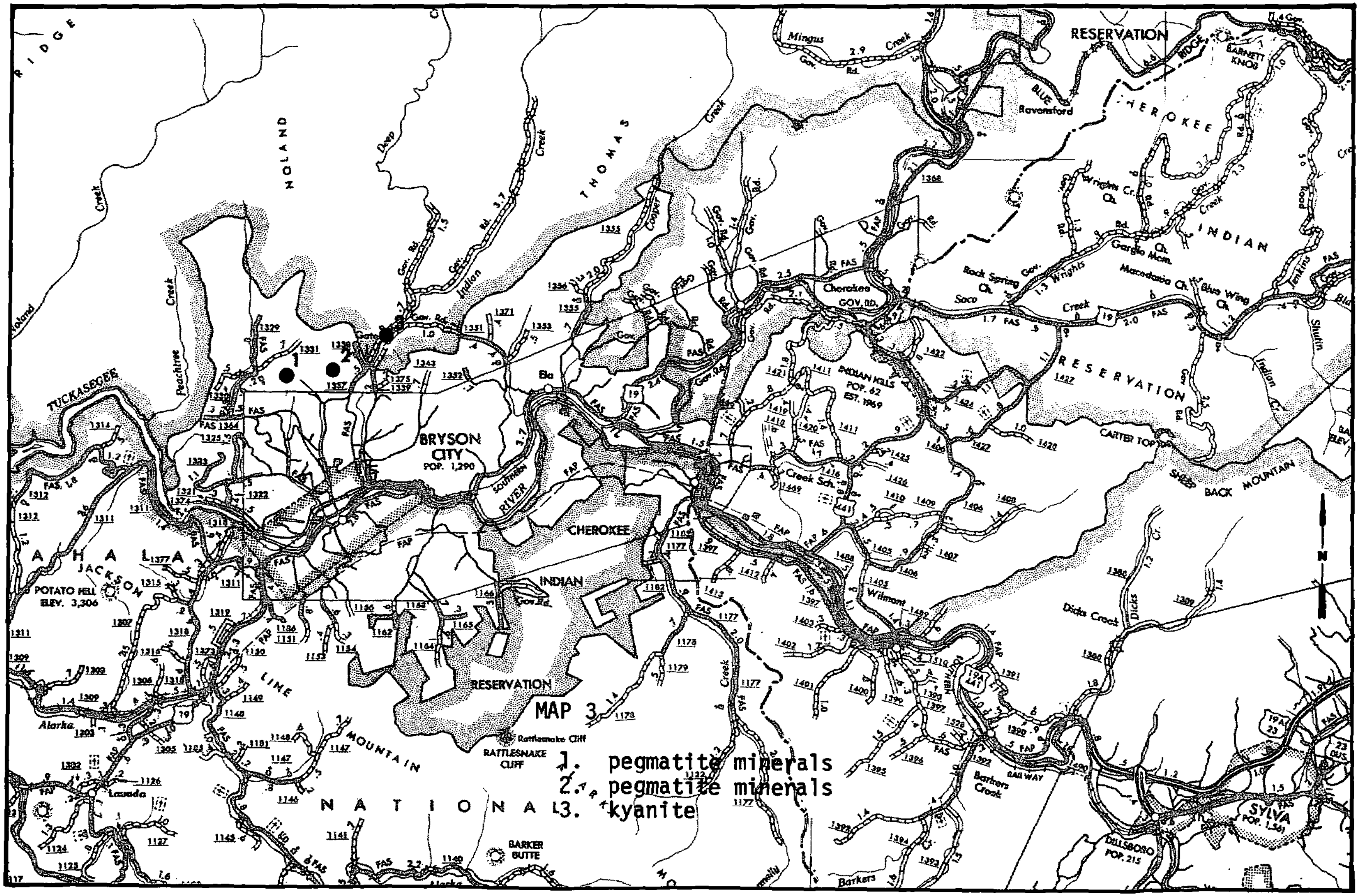
The following maps are at a scale of 1" = 2 miles and were prepared from N. C. Department of Transportation county highway maps. The county highway maps show all state-maintained roads within a county. County maps may be ordered at scales of 1" = 1 mile, 1" = 2 miles, and 1" = 4 miles, either individually or in bound books that cover the entire state. Ordering information and prices may be obtained from:

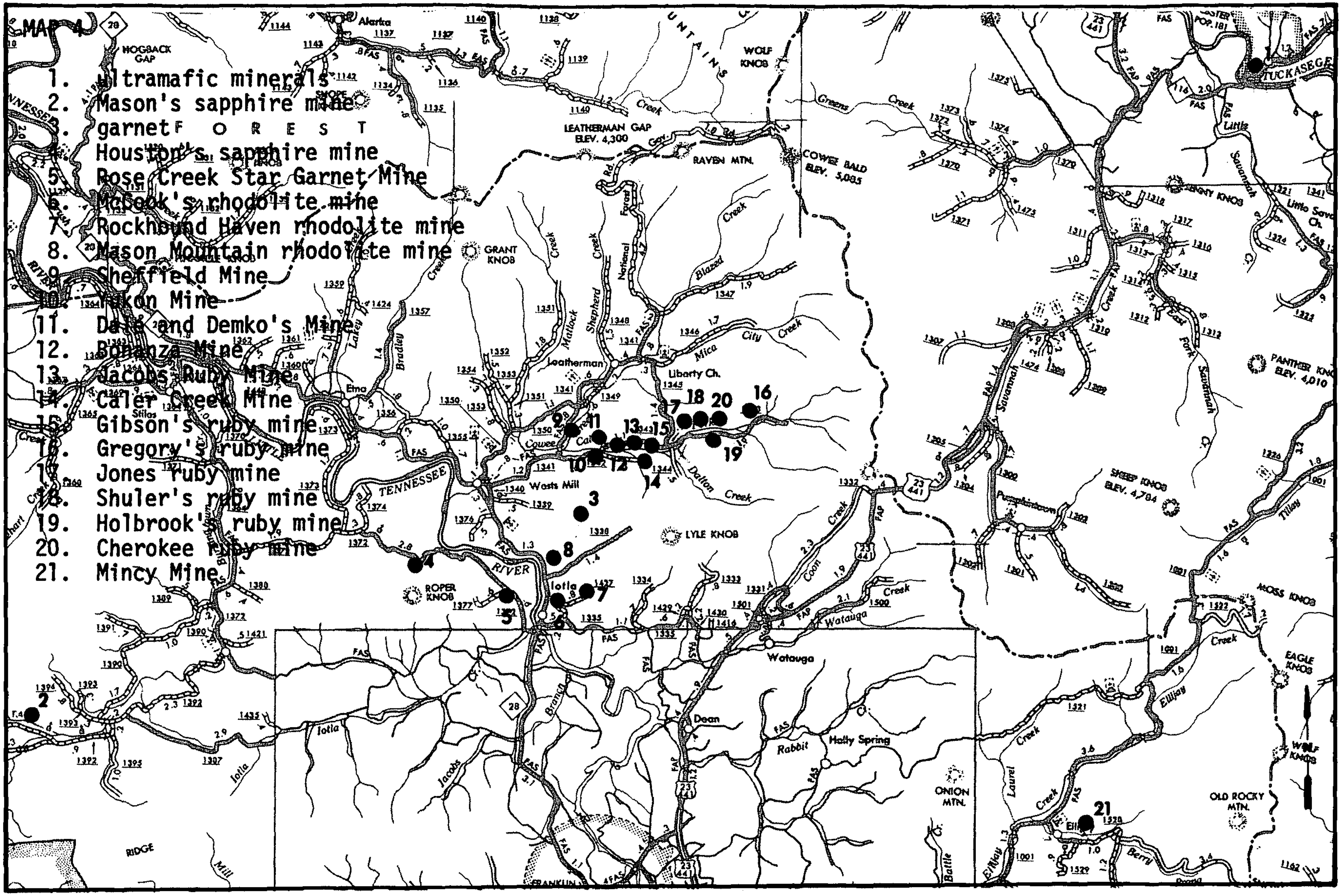
Maps, N. C. Department of Transportation
Division of Highways
Raleigh, North Carolina 27611.

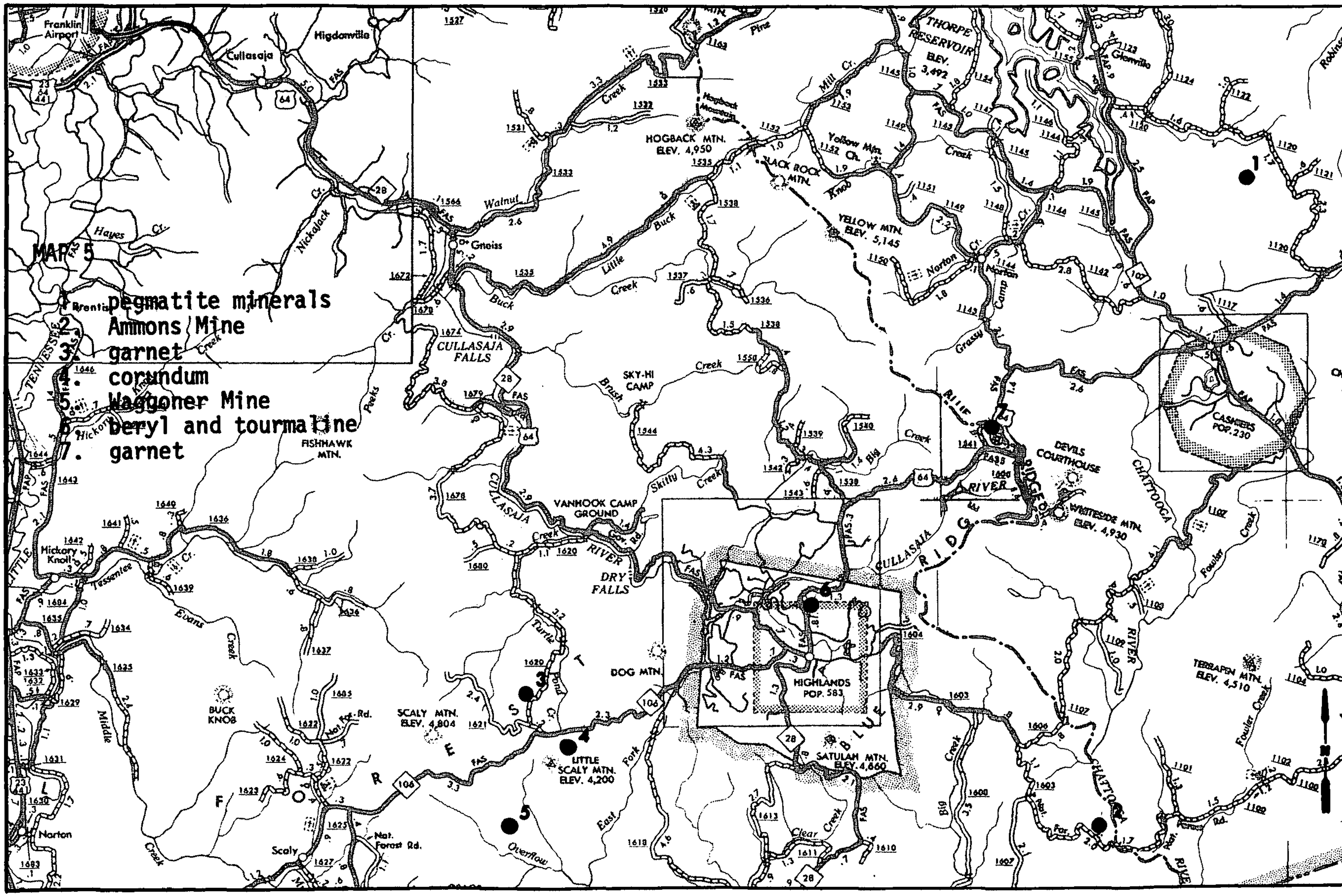
Another type of map that may be useful to the mineral collector is the topographic map. Topographic maps graphically represent selected natural and man-made features in their relative position and elevation. They are published at 1:24,000 (1" = 2000'), 1:62,500 (1" = 1 mile), 1:250,000 (1" = 4 miles), and 1:500,000 (1" = 8 miles). Published and advance copies of topographic maps may be purchased from the Branch of Distribution, U. S. Geological Survey, 1200 South Eads Street, Arlington, Virginia 22202. Many of the published maps are also stocked and sold by private dealers throughout the state.

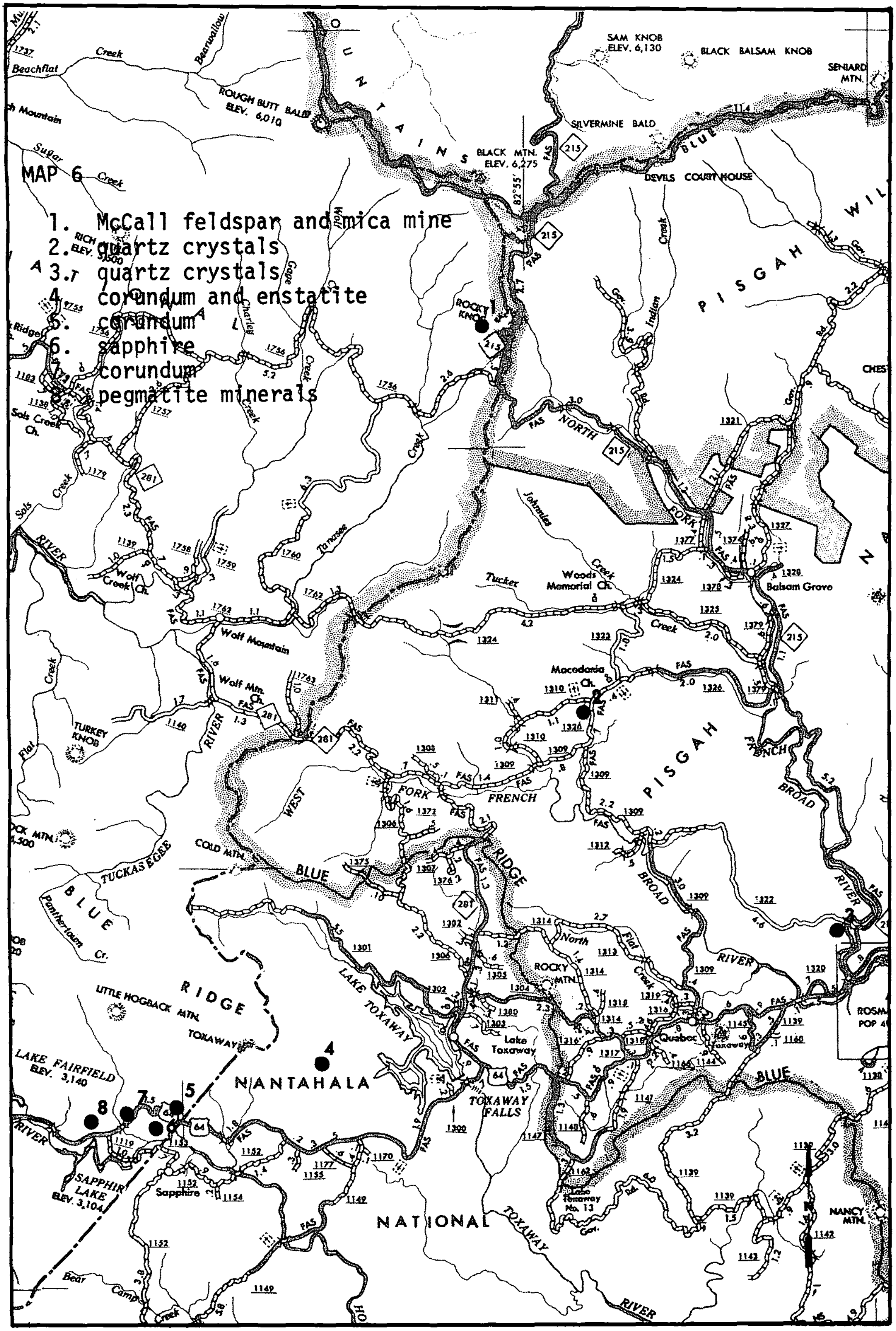

MAP 1
1. staurolite
2. staurolite
3. staurolite
4. ottrelite
5. sillimanite
6. talc
7. limonite
8. limonite
9. talc
10. garnet
NANTAHALA NATIONAL
MURPHY
POP. 2,082
MC DANIEL BALD
SNOWBIRD TOP
BUZZARD ROOST
Boiling Springs
Grand View
Ebenezer
Grape Creek
Regal
RY. STA.
Tomotla
Texana
Peachtree
Marble
VALLEY
HIWASSEE
RIVER
PANTHER TOP
Birch
Kinsey
Ranger
Clarks Store
New Martins Cr. Ch.
Brasstown
Hickory Stand Ch.
Greasy Creek
Ogden
Pinelog
Macedonia
Bell View
Fain

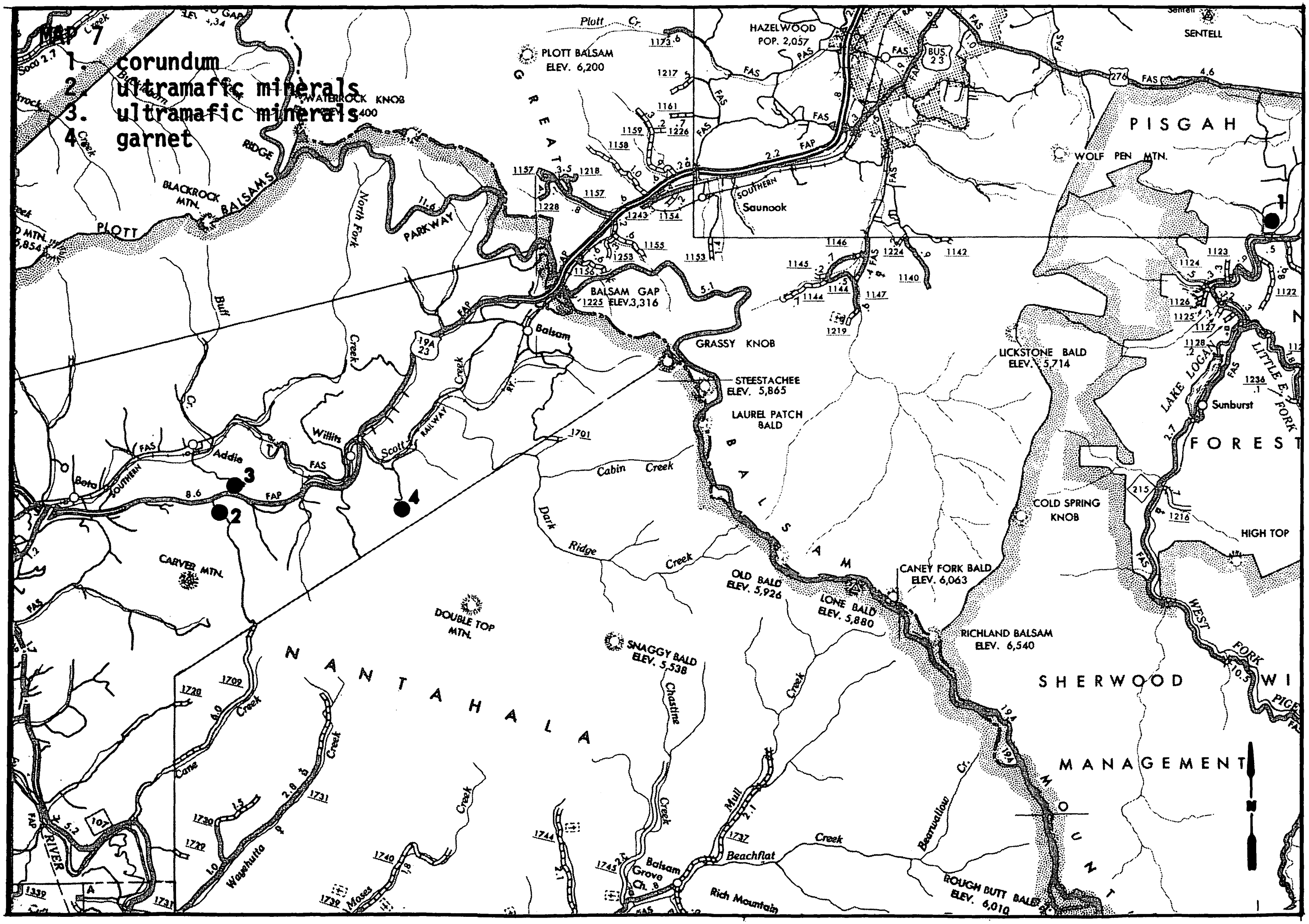

MAP
1. staurolite
2. garnet
3. corundum
4. garnet
5. corundum
6. vermiculite
7. rutile
8. corundum
9. staurolite
10. rutile
FOREST
NANTAHALA
NATIONAL
VALLEY RIVER
FIRES CREEK WILDLIFE MANAGEMENT AREA
TUSQUITEE MOUNTAINS
VALLEY RIVER MOUNTAINS
PEACHTREE BALD
BIG STAMP KNOB
TUSQUITEE BALD
JOHNSON BALD
TUNI GAP ELEV. 3,526
BOTELER PEAK ELEV. 4,500
AQUONE
HIWASSEE RIVER
HAYESVILLE POP. 428
Frog Pond
Sweetwater Ch.
Carter Cove
Tusquitee
Fires Creek
Shooting Creek
CHUNKY
LAKE
TUGE
LEABACK MTN

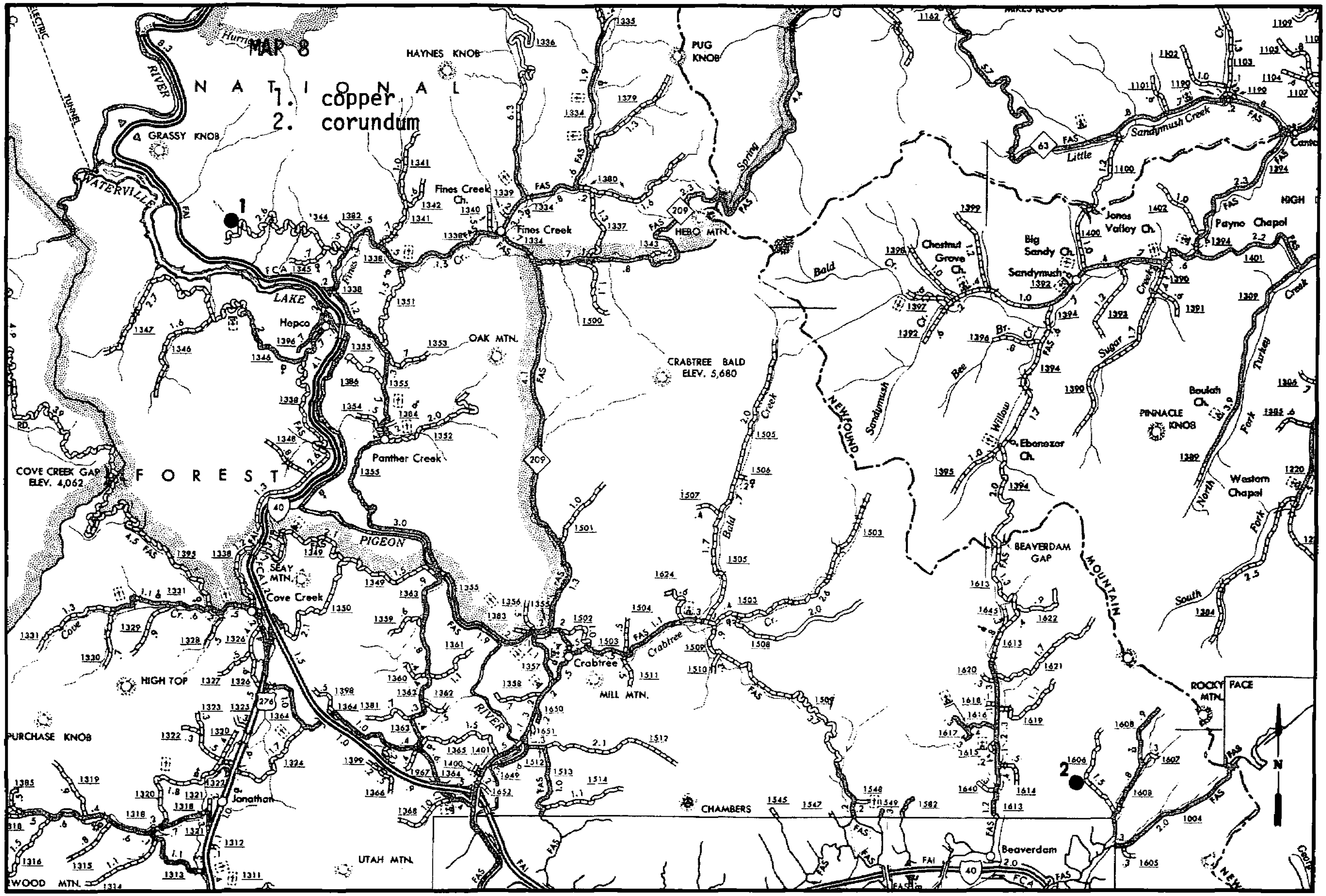

MAP 3
1. pegmatite minerals
2. pegmatite minerals
3. kyanite
BRYSON CITY
POP. 1,290
CHEROKEE
INDIAN
RESERVATION
INDIAN HILLS
POP. 62
EST. 1969
Cherokee
TUCKASEGEE
NOLAND
THOMAS
RIDGE
RESERVATION
CHEROKEE
INDIAN
RESERVATION
SYLVA
POP. 1,561
DILLSBORO
POP. 215
Wilmont
Ravensford
CARTER TOP
BACK MOUNTAIN
LINE
MOUNTAIN
NATIONAL
RATTLESNAKE CLIFF
BARKER BUTTE
POTATO HILL
ELEV. 3,306
Alarka
Lauada
Deep Creek
Indian Creek
Peachtree Creek
Dicks Creek
Barkers Creek
SOUTHERN RIVER
N

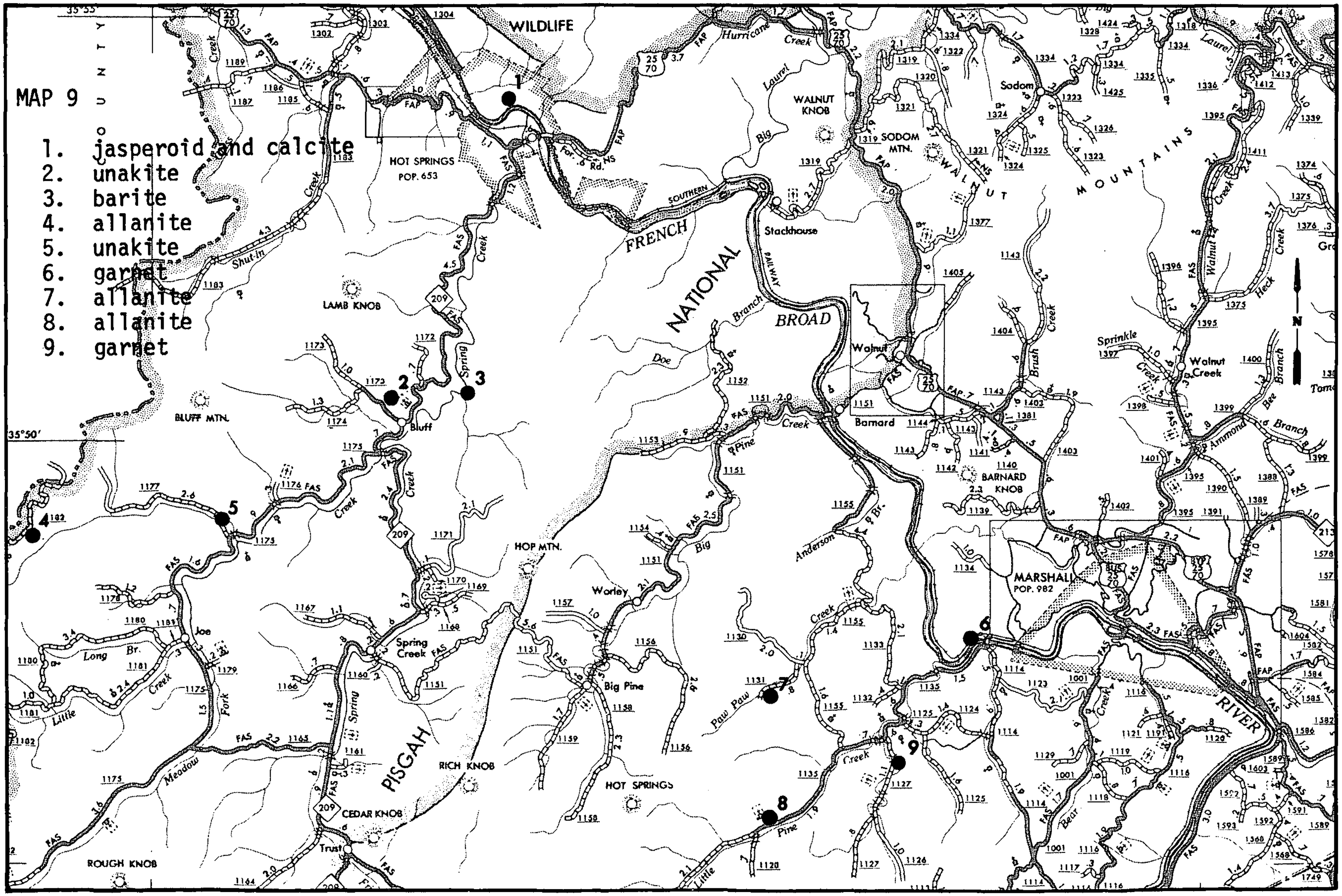

MAP 4
1. ultramafic minerals
2. Mason's sapphire mine
3. garnet
4. Houston's sapphire mine
5. Rose Creek Star Garnet Mine
6. McCook's rhodolite mine
7. Rockhound Haven rhodolite mine
8. Mason Mountain rhodolite mine
9. Sheffield Mine
10. Yukon Mine
11. Dale and Demko's Mine
12. Bonanza Mine
13. Jacobs Ruby Mine
14. Caler Creek Mine
15. Gibson's ruby mine
16. Gregory's ruby mine
17. Jones ruby mine
18. Shuler's ruby mine
19. Holbrook's ruby mine
20. Cherokee Ruby mine
21. Mincy Mine
HOGBACK GAP
Alarka
WOLF KNOB
LEATHERMAN GAP ELEV. 4,300
RAVEN MTN.
COWEE BALD ELEV. 5,085
TUCKASEGEE
GRANT KNOB
Leatherman
Liberty Ch.
Etna
Stiles
Wests Mill
TENNESSEE
RIVER
LYLE KNOB
ROPER KNOB
Iotla
SHEEP KNOB ELEV. 4,784
PANTHER KNOB ELEV. 4,010
MOSS KNOB
EAGLE KNOB
Watauga
Dean
Holly Spring
ONION MTN.
OLD ROCKY MTN.
RIDGE
FRANKLIN

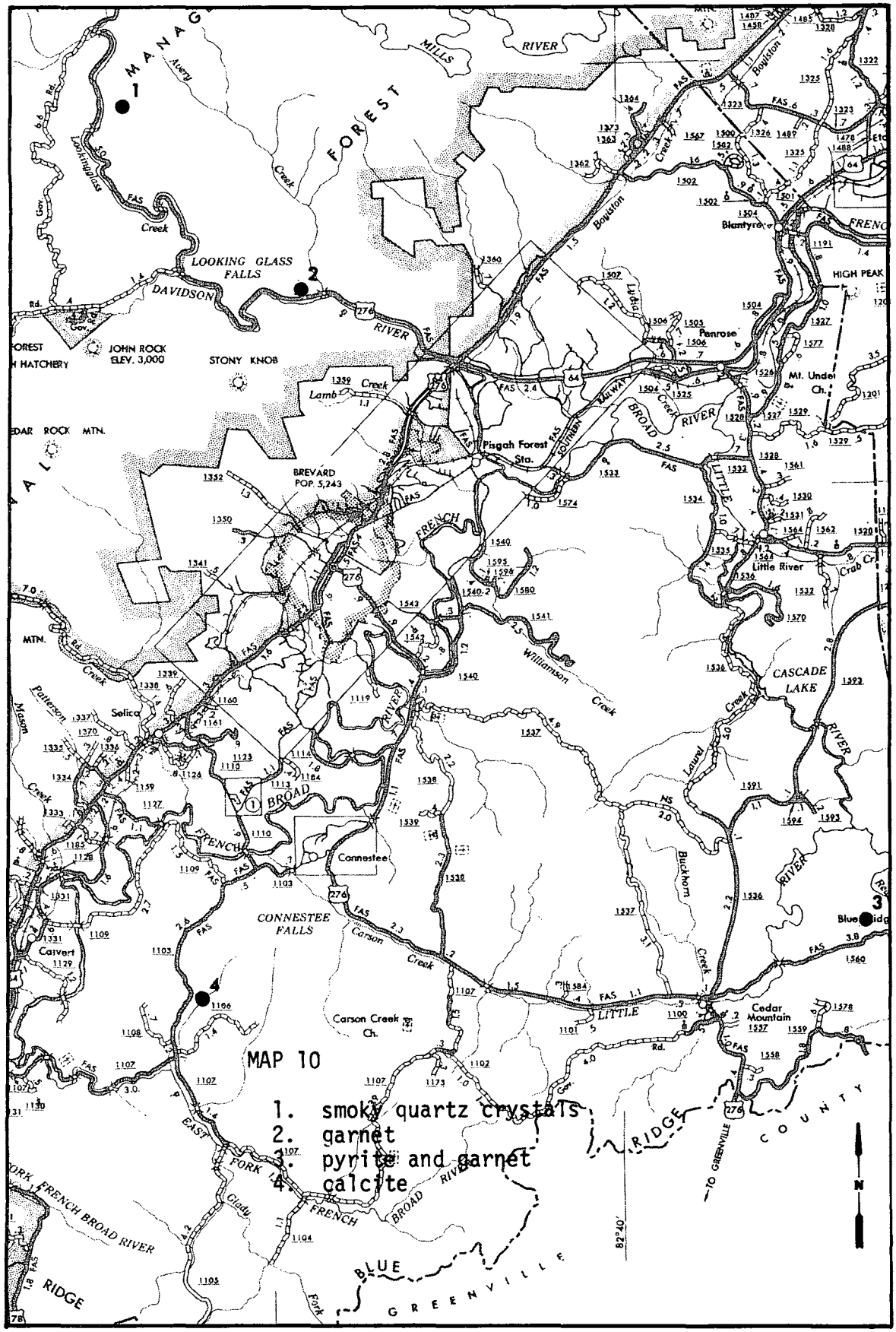

MAP 5
1. pegmatite minerals
2. Ammons Mine
3. garnet
4. corundum
5. Waggoner Mine
6. beryl and tourmaline
7. garnet
Franklin Airport
Cullasaja
Higdonville
Gneiss
CULLASAJA FALLS
FISHHAWK MTN.
SKY-HI CAMP
VANHOOK CAMP GROUND
DRY FALLS
HOGBACK MTN. ELEV. 4,950
BLACK ROCK MTN.
YELLOW MTN. ELEV. 5,145
THORPE RESERVOIR ELEV. 3,492
Glenville
CASHIERS POP. 230
DEVILS COURTHOUSE
WHITESIDE MTN. ELEV. 4,930
HIGHLANDS POP. 583
SATULAH MTN. ELEV. 4,660
DOG MTN.
SCALY MTN. ELEV. 4,804
LITTLE SCALY MTN. ELEV. 4,200
BUCK KNOB
TERRAPIN MTN. ELEV. 4,510
Hickory Knoll
Norton
Scaly
CHATTOOGA RIVER
CULLASAJA RIVER

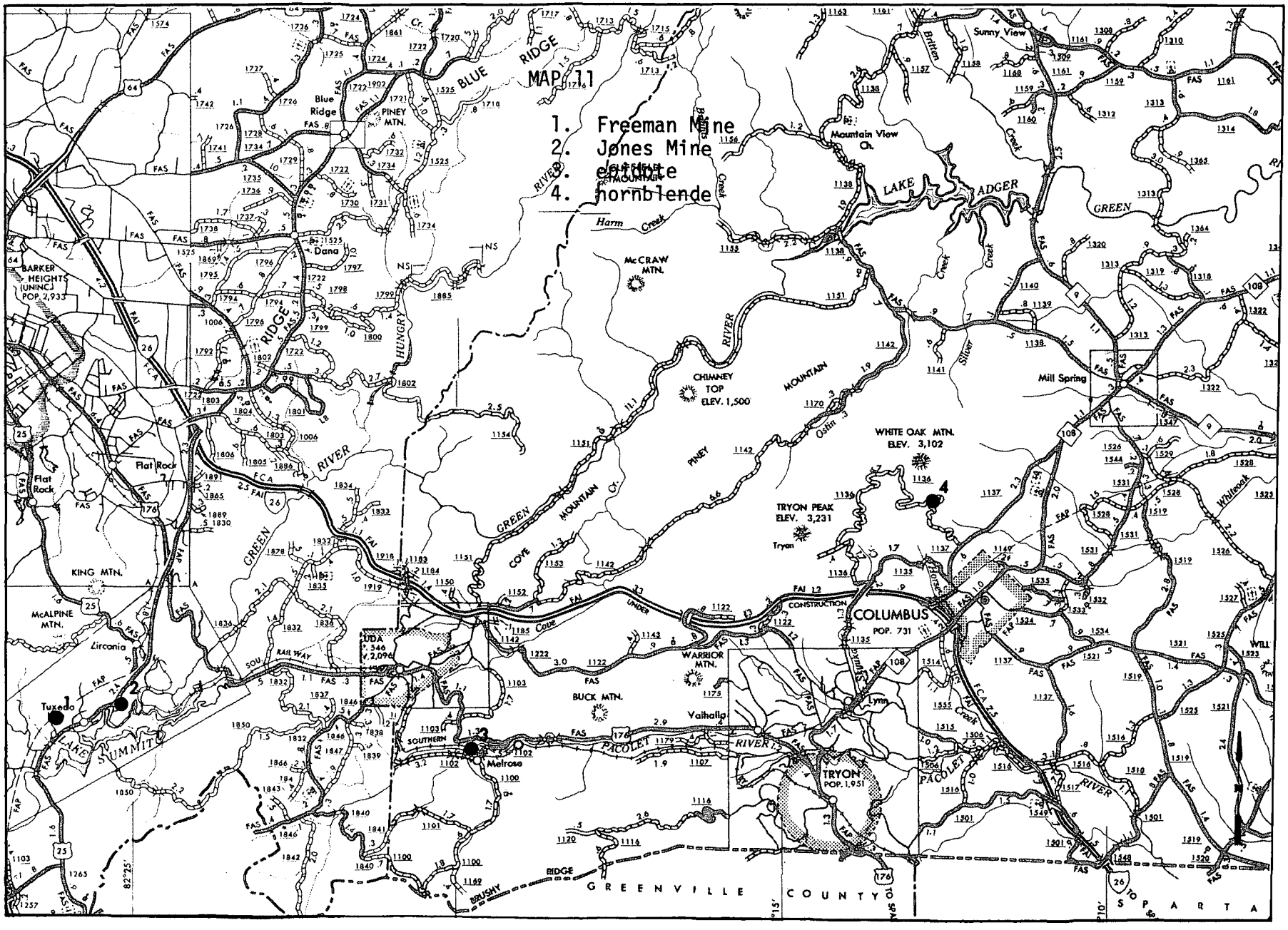

MAP 6
1. McCall feldspar and mica mine
2. quartz crystals
3. quartz crystals
4. corundum and enstatite
5. corundum
6. sapphire
7. corundum
8. pegmatite minerals
PISGAH
NANTAHALA
NATIONAL
BLUE RIDGE
Lake Toxaway
Sapphire
Quebec
Balsam Grove
ROCKY KNOB
SAM KNOB ELEV. 6,130
BLACK BALSAM KNOB
ROUGH BUTT BALD ELEV. 6,010
BLACK MTN. ELEV. 6,275
SILVERMINE BALD
DEVILS COURTHOUSE
LAKE FAIRFIELD ELEV. 3,140
SAPPHIRE LAKE ELEV. 3,104
TOXAWAY FALLS
TUCKASEGEE
LITTLE HOGBACK MTN.
TURKEY KNOB
NANCY MTN.

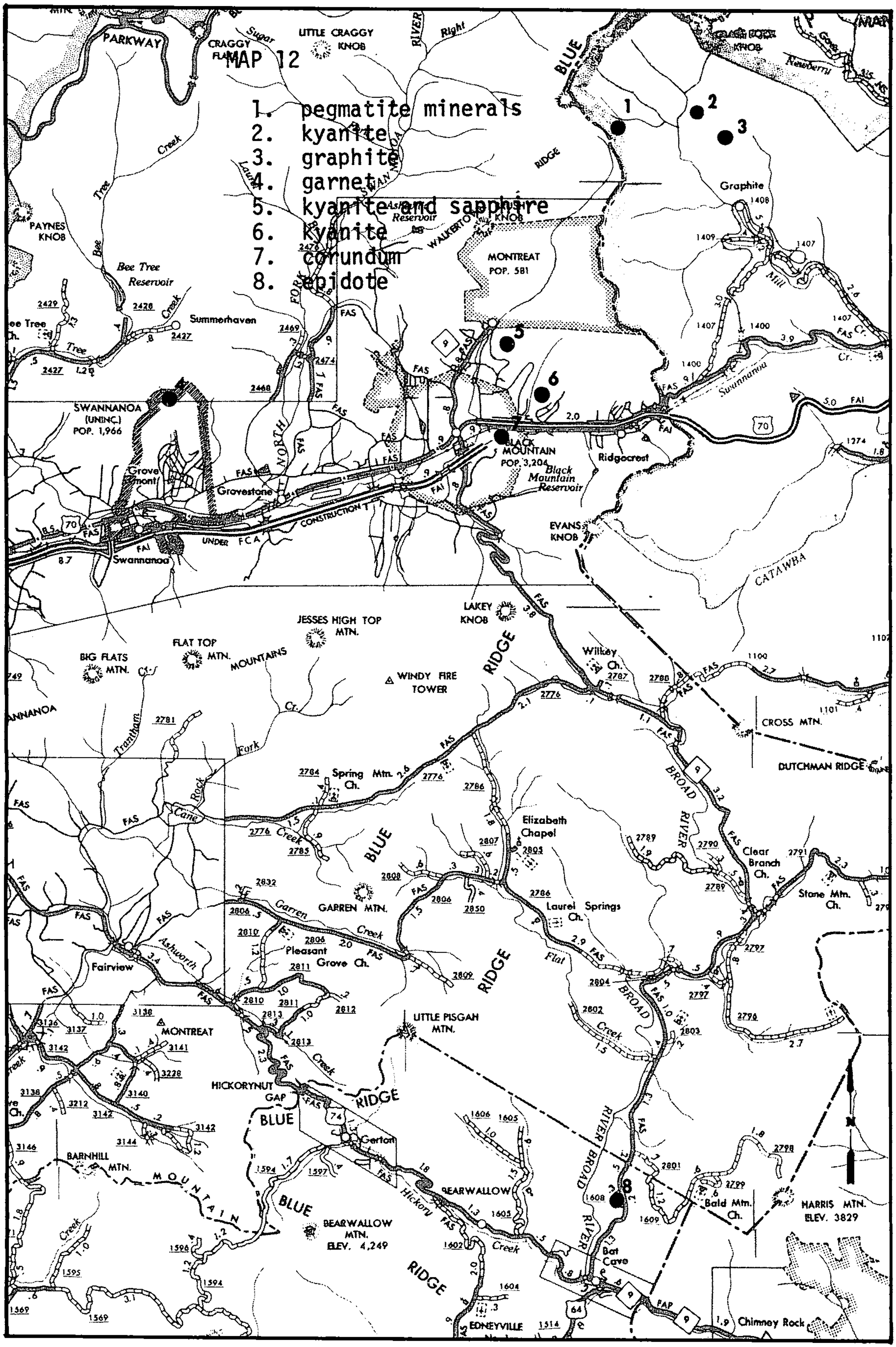

MAP 7
1. corundum
2. ultramafic minerals
3. ultramafic minerals
4. garnet
PLOTT BALSAM ELEV. 6,200
HAZELWOOD POP. 2,057
SENTELL
PISGAH
WOLF PEN MTN.
WATEROCK KNOB
BLACKROCK MTN.
PLOTT BALSAMS
PARKWAY
Saunook
BALSAM GAP ELEV.3,316
Balsam
GRASSY KNOB
STEESTACHEE ELEV. 5,865
LAUREL PATCH BALD
LICKSTONE BALD ELEV. 5,714
LAKE LOGAN
Sunburst
FOREST
COLD SPRING KNOB
HIGH TOP
Addie
Beta
Willits
CARVER MTN.
DOUBLE TOP MTN.
NANTAHALA
SNAGGY BALD ELEV. 5,538
OLD BALD ELEV. 5,926
LONE BALD ELEV. 5,880
CANEY FORK BALD ELEV. 6,063
RICHLAND BALSAM ELEV. 6,540
SHERWOOD
MANAGEMENT
Balsam Grove Ch.
Beachflat
Rich Mountain
ROUGH BUTT BALD ELEV. 6,010

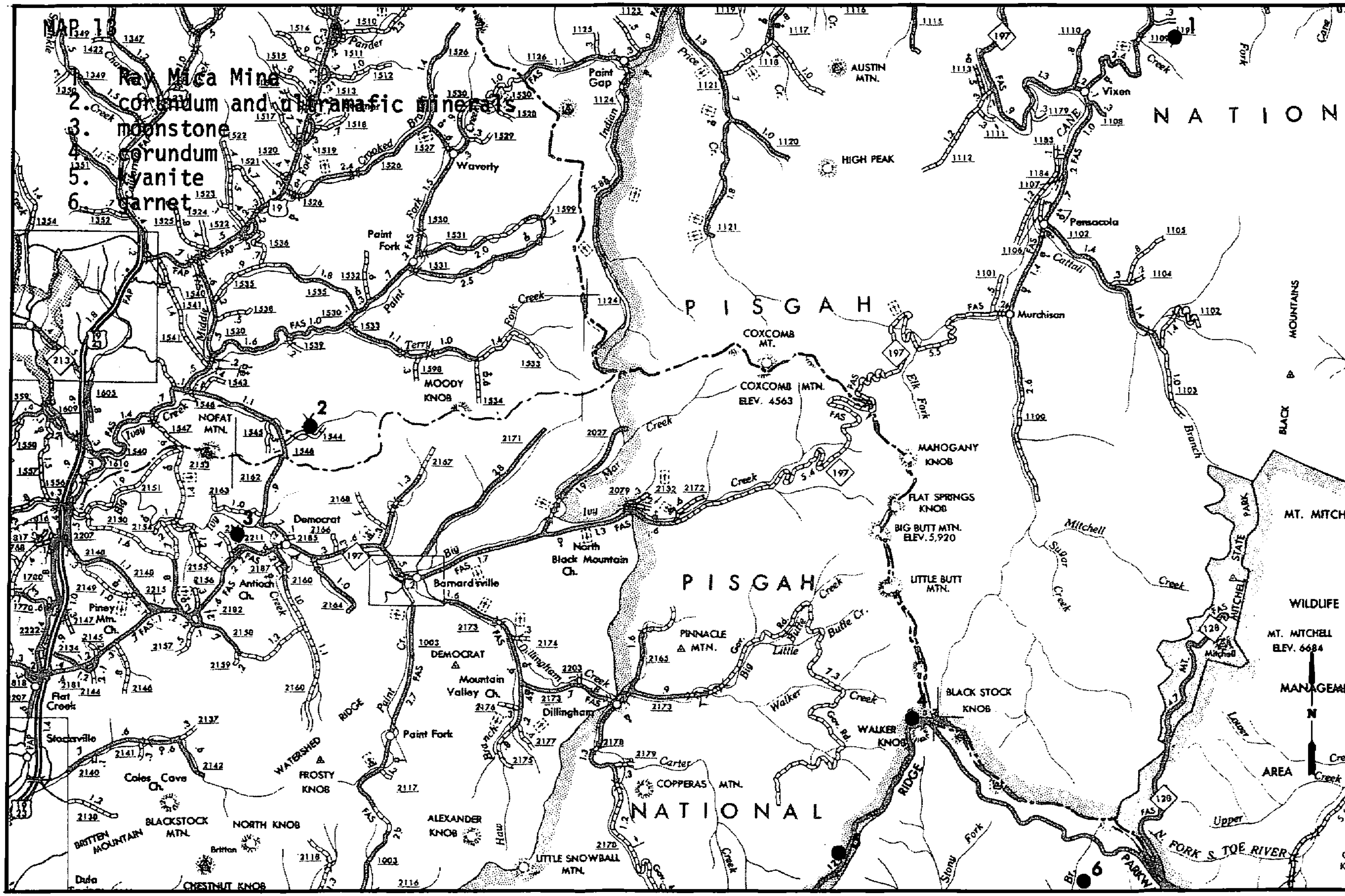

MAP 8
1. copper
2. corundum
NATIONAL
FOREST
HAYNES KNOB
PUG KNOB
GRASSY KNOB
WATERVILLE LAKE
Fines Creek Ch.
Fines Creek
HEBO MTN.
Hepco
OAK MTN.
CRABTREE BALD ELEV. 5,680
Panther Creek
COVE CREEK GAP ELEV. 4,062
PIGEON
SEAY MTN.
Cove Creek
HIGH TOP
PURCHASE KNOB
Jonathan
UTAH MTN.
Crabtree
MILL MTN.
CHAMBERS
Chestnut Grove Ch.
Big Sandy Ch.
Sandymush
Jones Valley Ch.
Payne Chapel
Ebenezer Ch.
PINNACLE KNOB
Beulah Ch.
Western Chapel
BEAVERDAM GAP
NEWFOUND MOUNTAIN
ROCKY FACE MTN.
Beaverdam
Sandymush Creek
N

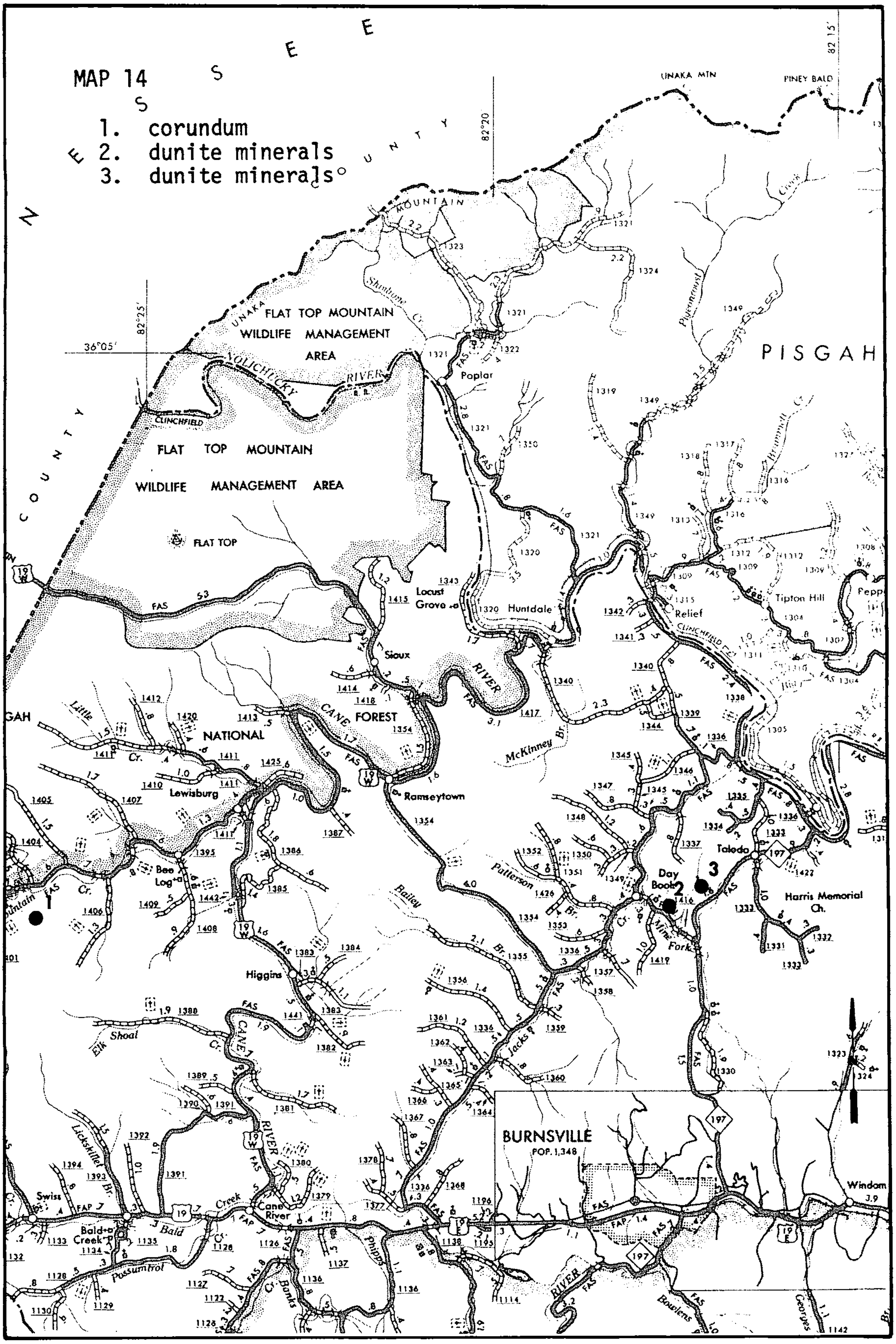

MAP 9
1. jasperoid and calcite
2. unakite
3. barite
4. allanite
5. unakite
6. garnet
7. allanite
8. allanite
9. garnet
WILDLIFE
HOT SPRINGS
POP. 653
FRENCH
NATIONAL
BROAD
RIVER
PISGAH
WALNUT MOUNTAINS
WALNUT KNOB
SODOM MTN.
Sodom
Stackhouse
Walnut
Barnard
BARNARD KNOB
MARSHALL
POP. 982
Walnut Creek
LAMB KNOB
BLUFF MTN.
Bluff
HOP MTN.
Worley
Big Pine
Joe
Spring Creek
RICH KNOB
HOT SPRINGS
CEDAR KNOB
Trust
ROUGH KNOB
35°50'

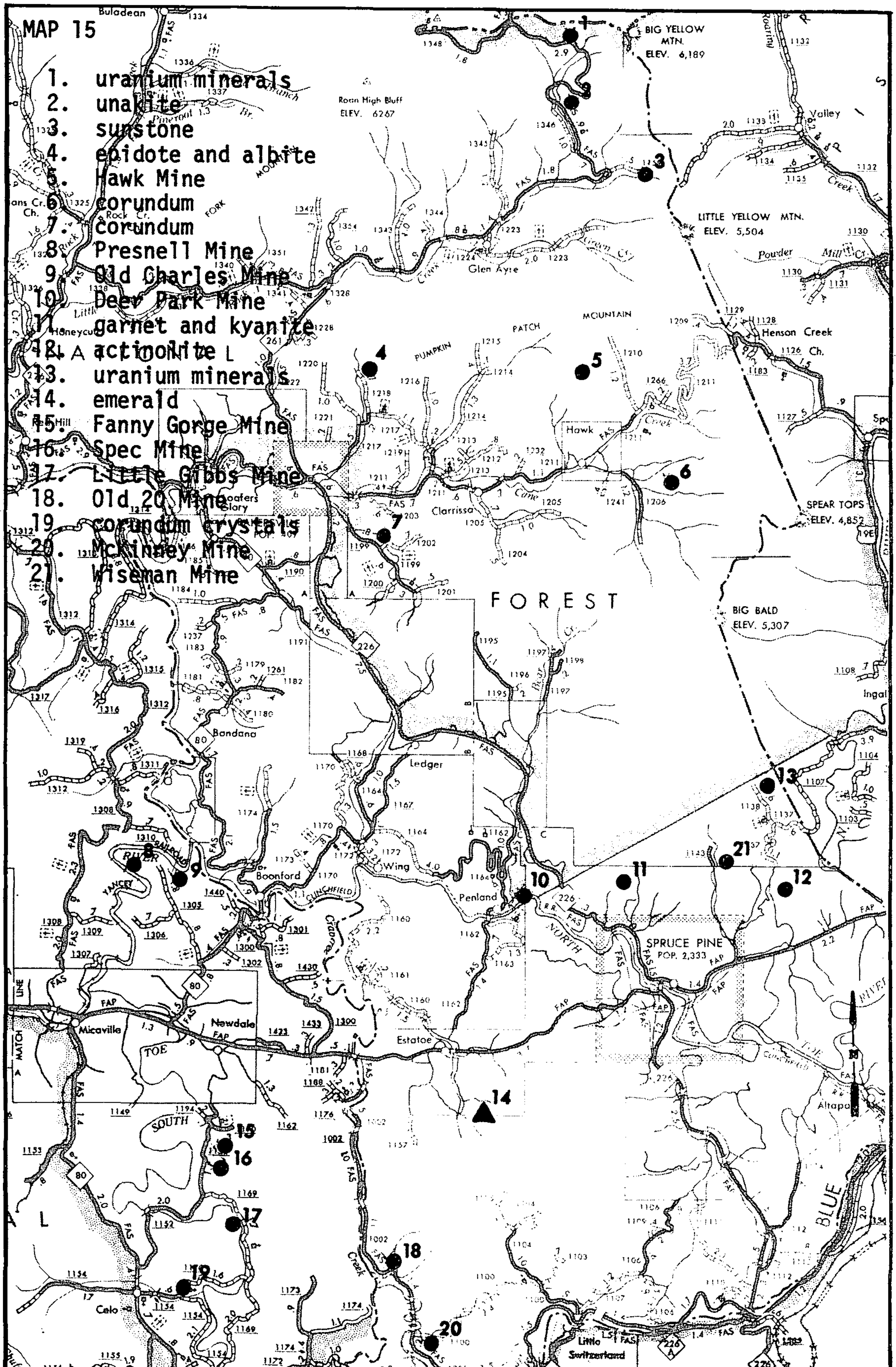

MAP 10
1. smoky quartz crystals
2. garnet
3. pyrite and garnet
4. calcite
LOOKING GLASS FALLS
DAVIDSON RIVER
JOHN ROCK
ELEV. 3,000
STONY KNOB
BREVARD
POP. 5,243
Pisgah Forest Sta.
Penrose
Blantyre
HIGH PEAK
Mt. Undel Ch.
Little River
CASCADE LAKE
Selica
Calvert
Connestee
CONNESTEE FALLS
Carson Creek Ch.
Cedar Mountain
BROAD RIVER
FRENCH BROAD RIVER
EAST FORK FRENCH BROAD RIVER
BLUE RIDGE
TO GREENVILLE COUNTY
82°40'
N


MAP 11
1. Freeman Mine
2. Jones Mine
3. epidote
4. hornblende
Tuxedo
Flat Rock
Dana
Blue Ridge
Sunny View
Mountain View Ch.
Mill Spring
McCRAW MTN.
CHIMNEY TOP ELEV. 1,500
WHITE OAK MTN. ELEV. 3,102
TRYON PEAK ELEV. 3,231
KING MTN.
McALPINE MTN.
Zircania
Melrose
Valhalla
Lynn
WARRIOR MTN.
BUCK MTN.
COLUMBUS POP. 731
TRYON POP. 1,951
BARKER HEIGHTS (UNINC.) POP. 2,933
LAKE SUMMIT
LAKE ADGER
BLUE RIDGE
HUNGRY RIDGE
PINEY MTN.
GREEN RIVER
PACOLET RIVER
GREENVILLE COUNTY
TO SPARTA

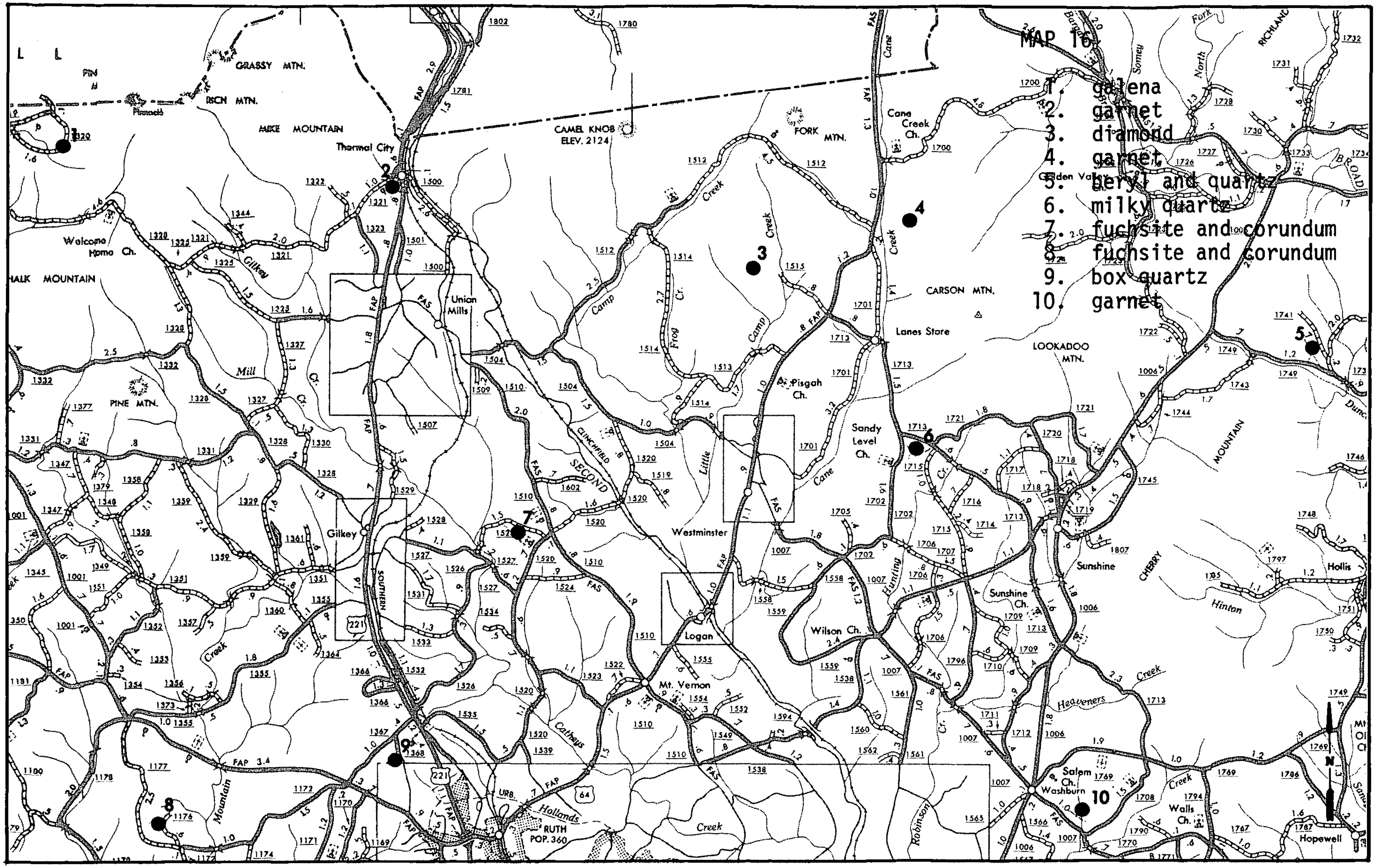

MAP 12
1. pegmatite minerals
2. kyanite
3. graphite
4. garnet
5. kyanite and sapphire
6. Kyanite
7. corundum
8. epidote
PARKWAY
LITTLE CRAGGY KNOB
PAYNES KNOB
Bee Tree Reservoir
Summerhaven
MONTREAT POP. 581
Graphite
SWANNANOA (UNINC.) POP. 1,966
BLACK MOUNTAIN POP. 3,204
Black Mountain Reservoir
Ridgecrest
Grovestone
Swannanoa
EVANS KNOB
LAKEY KNOB
JESSES HIGH TOP MTN.
FLAT TOP MTN.
BIG FLATS MTN.
WINDY FIRE TOWER
CATAWBA
CROSS MTN.
DUTCHMAN RIDGE
Spring Mtn. Ch.
Elizabeth Chapel
Clear Branch Ch.
Stone Mtn. Ch.
GARREN MTN.
Laurel Springs Ch.
Pleasant Grove Ch.
Fairview
LITTLE PISGAH MTN.
MONTREAT
HICKORYNUT GAP
Gerton
BARNHILL MTN.
BEARWALLOW
BEARWALLOW MTN. ELEV. 4,249
Bald Mtn. Ch.
HARRIS MTN. ELEV. 3829
Bat Cave
EDNEYVILLE
Chimney Rock
BLUE RIDGE
BROAD RIVER

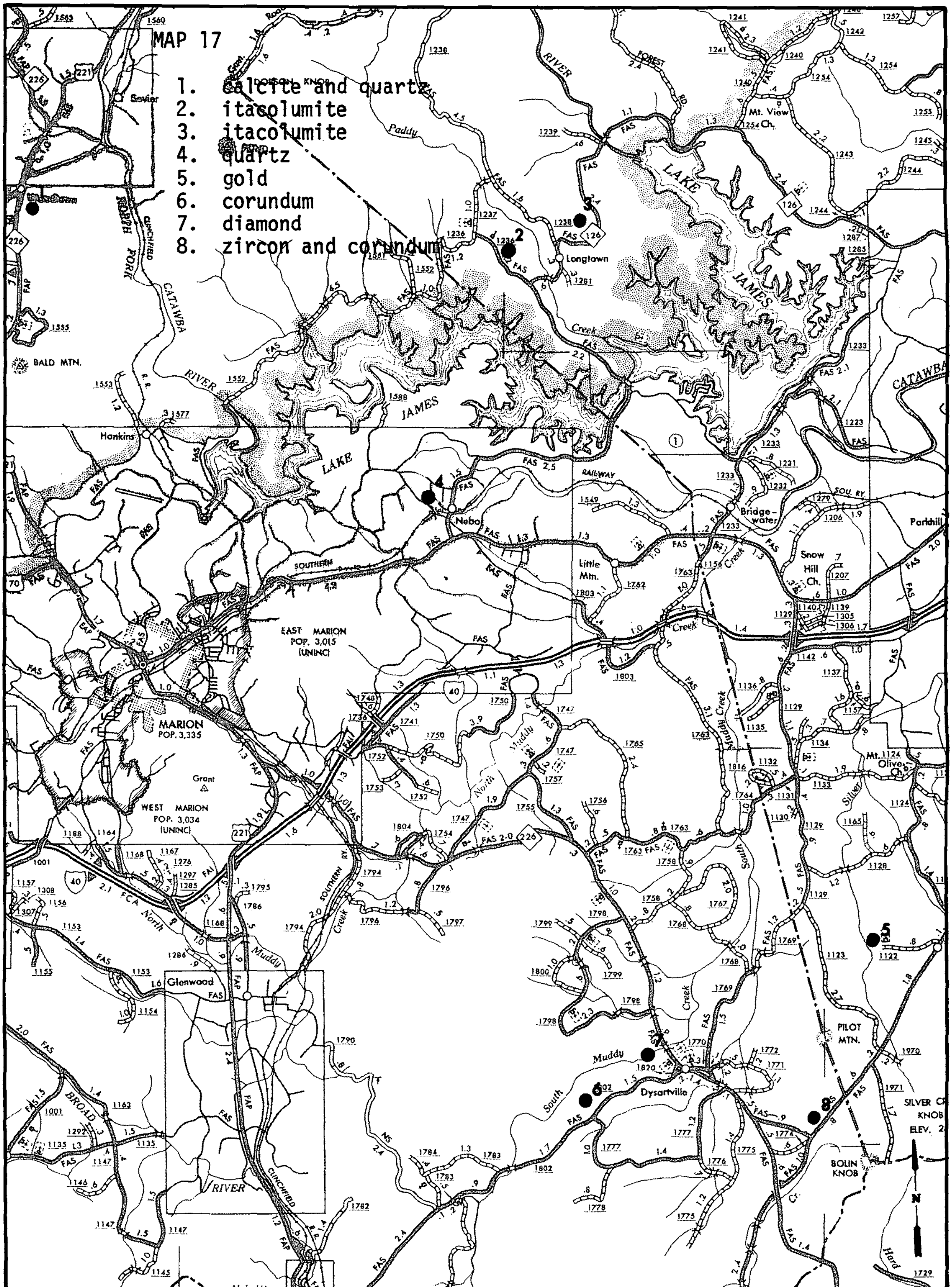

MAP 13
1. Ray Mica Mine
2. corundum and ultramafic minerals
3. moonstone
4. corundum
5. kyanite
6. garnet
NATION
PISGAH
PISGAH
NATIONAL
Paint Gap
AUSTIN MTN.
HIGH PEAK
Vixen
Pensacola
Murchison
Waverly
Paint Fork
COXCOMB MT.
COXCOMB MTN. ELEV. 4563
MOODY KNOB
NOFAT MTN.
MAHOGANY KNOB
FLAT SPRINGS KNOB
BIG BUTT MTN. ELEV. 5,920
LITTLE BUTT MTN.
Democrat
Barnardsville
North Black Mountain Ch.
Antioch Ch.
Piney Mtn. Ch.
Flat Creek
Stocksville
Coles Cove Ch.
BLACKSTOCK MTN.
NORTH KNOB
BRITTEN MOUNTAIN
CHESTNUT KNOB
WATERSHED RIDGE
FROSTY KNOB
ALEXANDER KNOB
DEMOCRAT
Mountain Valley Ch.
Dillingham
PINNACLE MTN.
COPPERAS MTN.
LITTLE SNOWBALL MTN.
BLACK STOCK KNOB
WALKER KNOB
MT. MITCHELL ELEV. 6684
MT. MITCHELL STATE PARK
WILDLIFE MANAGEMENT AREA
BLACK MOUNTAINS
N. FORK S. TOE RIVER
Mitchell Creek
Sugar Creek
Ivy Creek
Big Ivy
Crooked Creek
Terry Fork Creek
Elk Fork
Carter Creek
Stony Fork
Walker Creek
Little Butte Cr.
Upper Creek
N

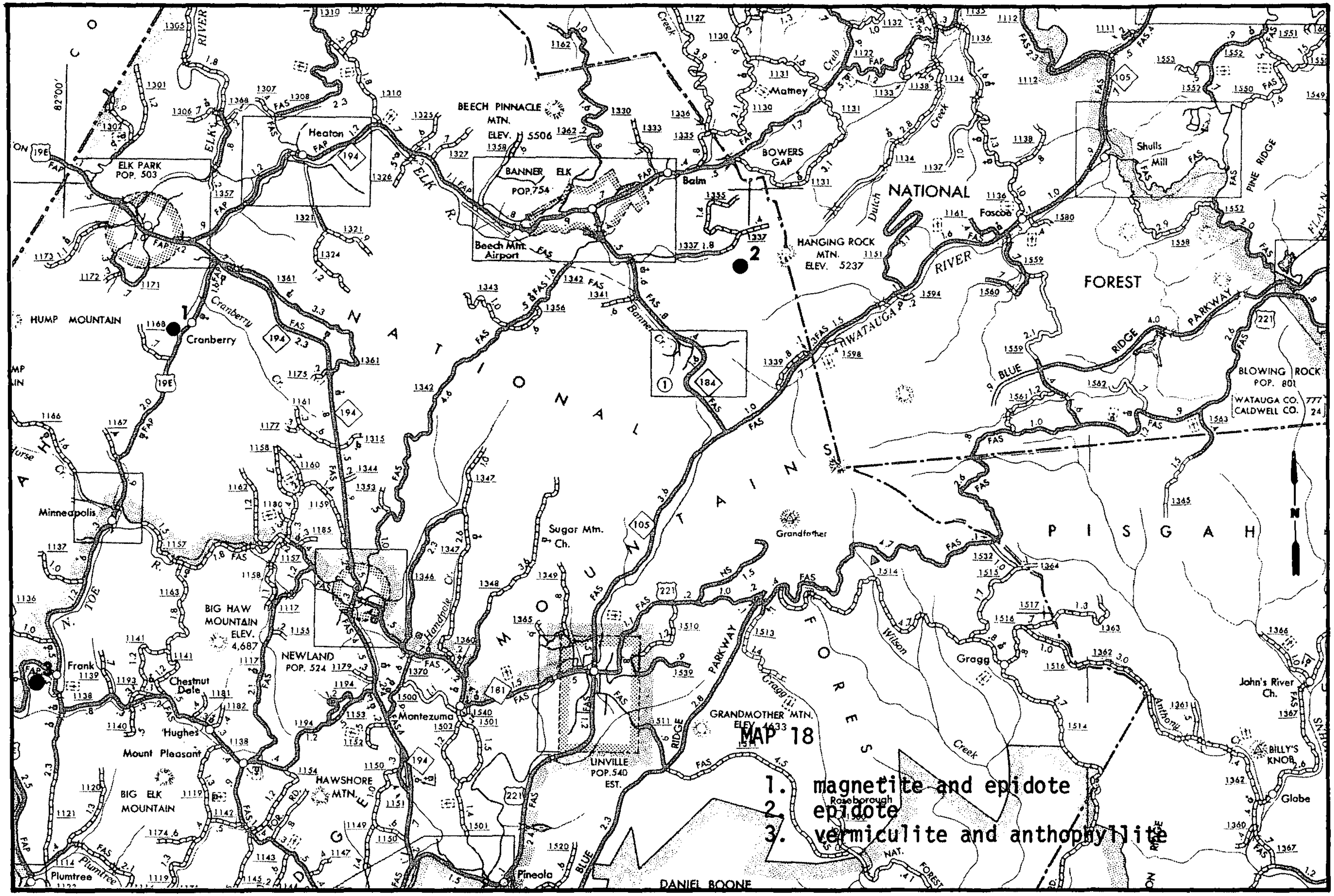

MAP 14
1. corundum
2. dunite minerals
3. dunite minerals
TENNESSEE
YANCEY COUNTY
MITCHELL COUNTY
UNAKA MTN
PINEY BALD
82°15'
82°20'
82°25'
36°05'
UNAKA MOUNTAIN
FLAT TOP MOUNTAIN
WILDLIFE MANAGEMENT
AREA
NOLICHUCKY RIVER
CLINCHFIELD
FLAT TOP MOUNTAIN
WILDLIFE MANAGEMENT AREA
FLAT TOP
PISGAH
PISGAH NATIONAL FOREST
CANE RIVER
Poplar
Locust Grove
Huntdale
Relief
Tipton Hill
Sioux
Ramseytown
Lewisburg
Bee Log
Higgins
Day Book
Toledo
Harris Memorial Ch.
McKinney Br.
Patterson Br.
Bailey Br.
Mine Fork
Jacks Cr.
Elk Shoal Cr.
Lickskillet Br.
Swiss
Bald Creek
Cane River
Possumtrot
Banks Cr.
Phipps
BURNSVILLE
POP. 1,348
Windom
Bowlens
Georges
Shoal Cr.
Little Cr.

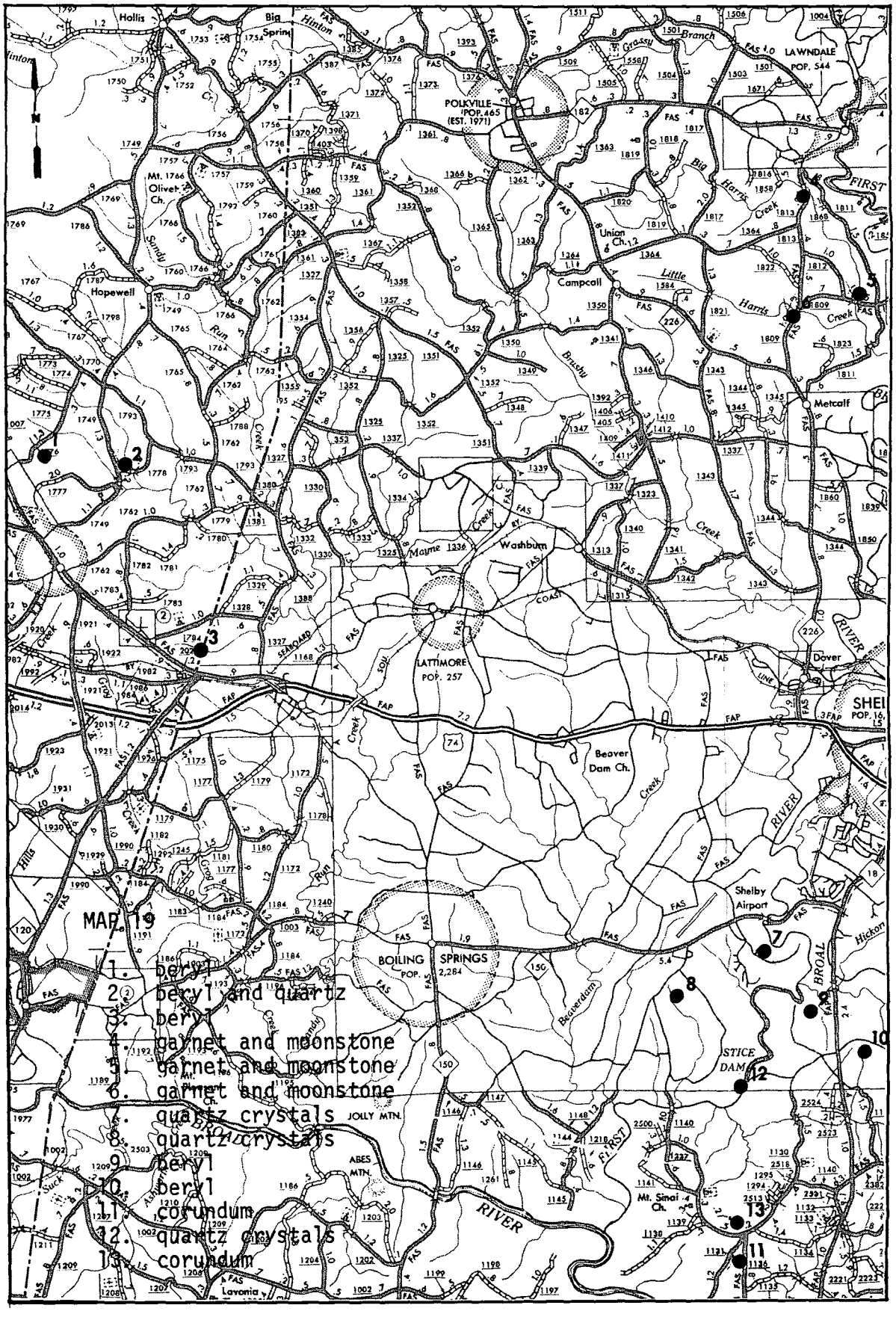


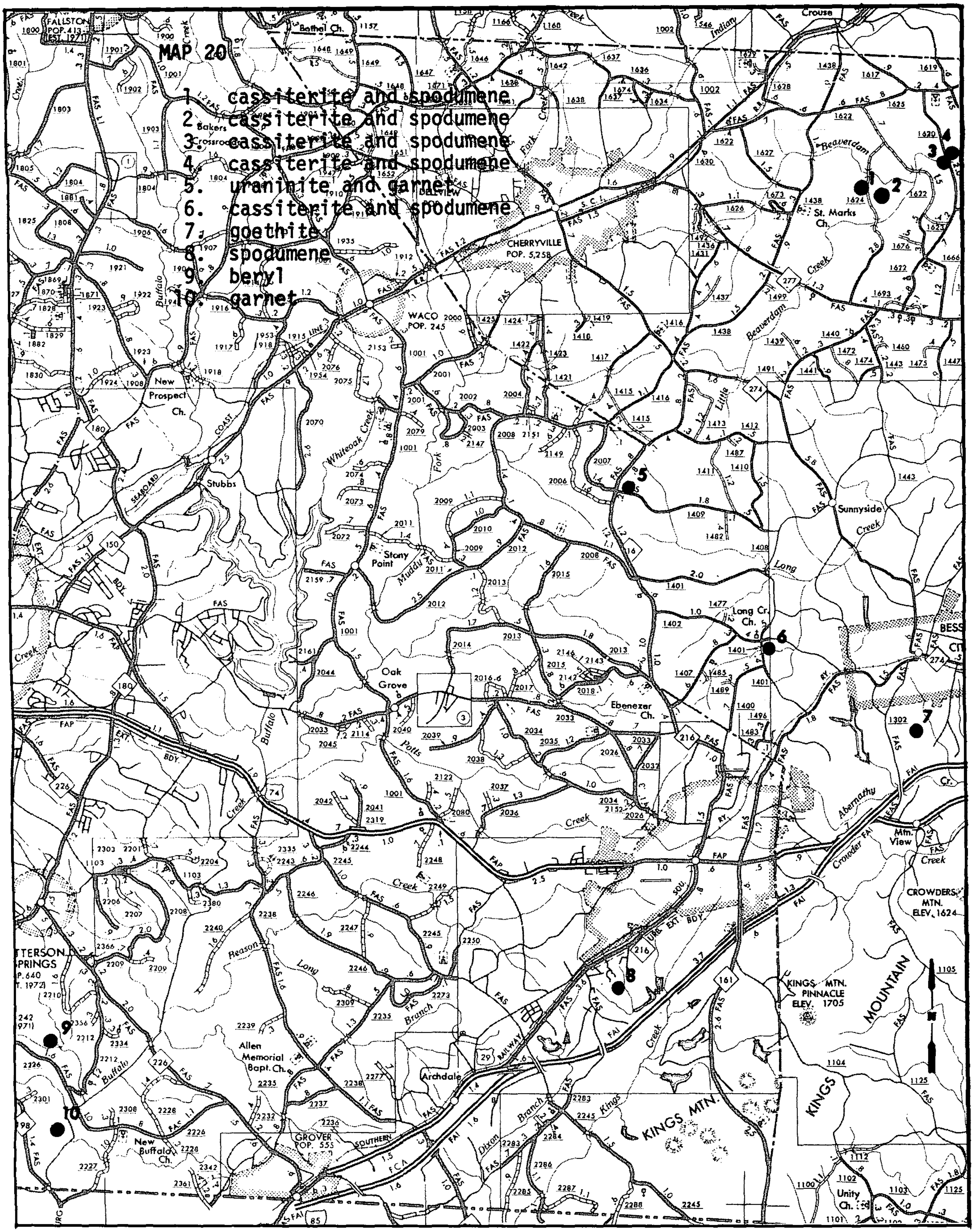
MAP 15
1. uranium minerals
2. unakite
3. sunstone
4. epidote and albite
5. Hawk Mine
6. corundum
7. corundum
8. Presnell Mine
9. Old Charles Mine
10. Deer Park Mine
11. garnet and kyanite
12. actinolite
13. uranium minerals
14. emerald
15. Fanny Gorge Mine
16. Spec Mine
17. Little Gibbs Mine
18. Old 20 Mine
19. corundum crystals
20. McKinney Mine
21. Wiseman Mine
BIG YELLOW MTN. ELEV. 6,189
Roan High Bluff ELEV. 6267
LITTLE YELLOW MTN. ELEV. 5,504
Glen Ayre
Henson Creek
PUMPKIN PATCH MOUNTAIN
Hawk
Clarrissa
SPEAR TOPS ELEV. 4,852
FOREST
BIG BALD ELEV. 5,307
Bandana
Ledger
Wing
Boonford
Penland
SPRUCE PINE POP. 2,333
Micaville
Newdale
Estatoe
Celo
Little Switzerland
Altapass

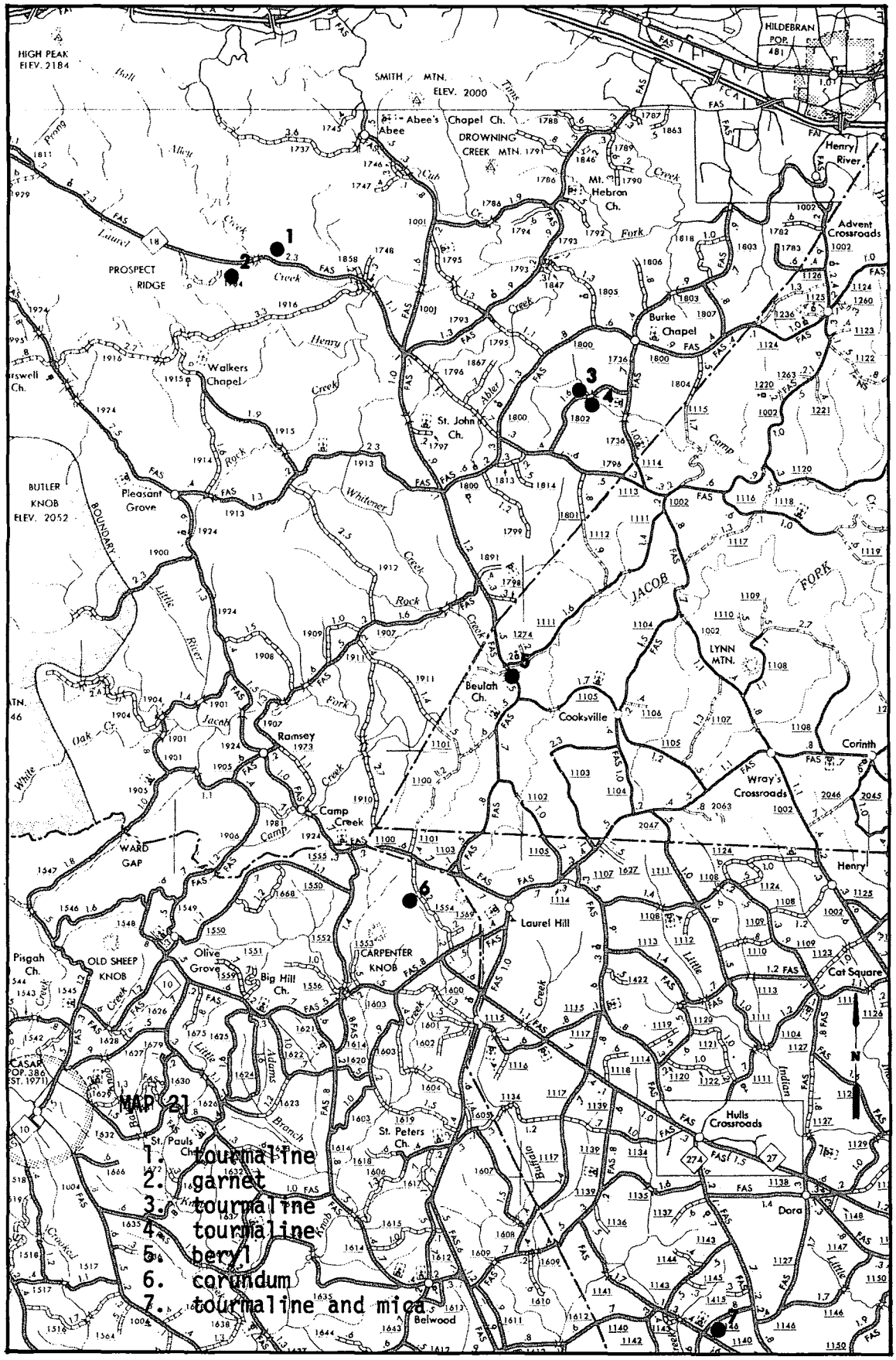

MAP 16
1. galena
2. garnet
3. diamond
4. garnet
5. beryl and quartz
6. milky quartz
7. fuchsite and corundum
8. fuchsite and corundum
9. box quartz
10. garnet
GRASSY MTN.
MIKE MOUNTAIN
Thermal City
CAMEL KNOB ELEV. 2124
FORK MTN.
Cane Creek Ch.
CARSON MTN.
Lanes Store
LOOKADOO MTN.
Union Mills
Gilkey
Westminster
Logan
Mt. Vernon
Sandy Level Ch.
Sunshine
Wilson Ch.
Salem Ch.
Washburn
Walls Ch.
Hopewell
Hollis
RUTH POP. 360
PINE MTN.
Welcome Home Ch.
Mt. Pisgah Ch.
Sunshine Ch.

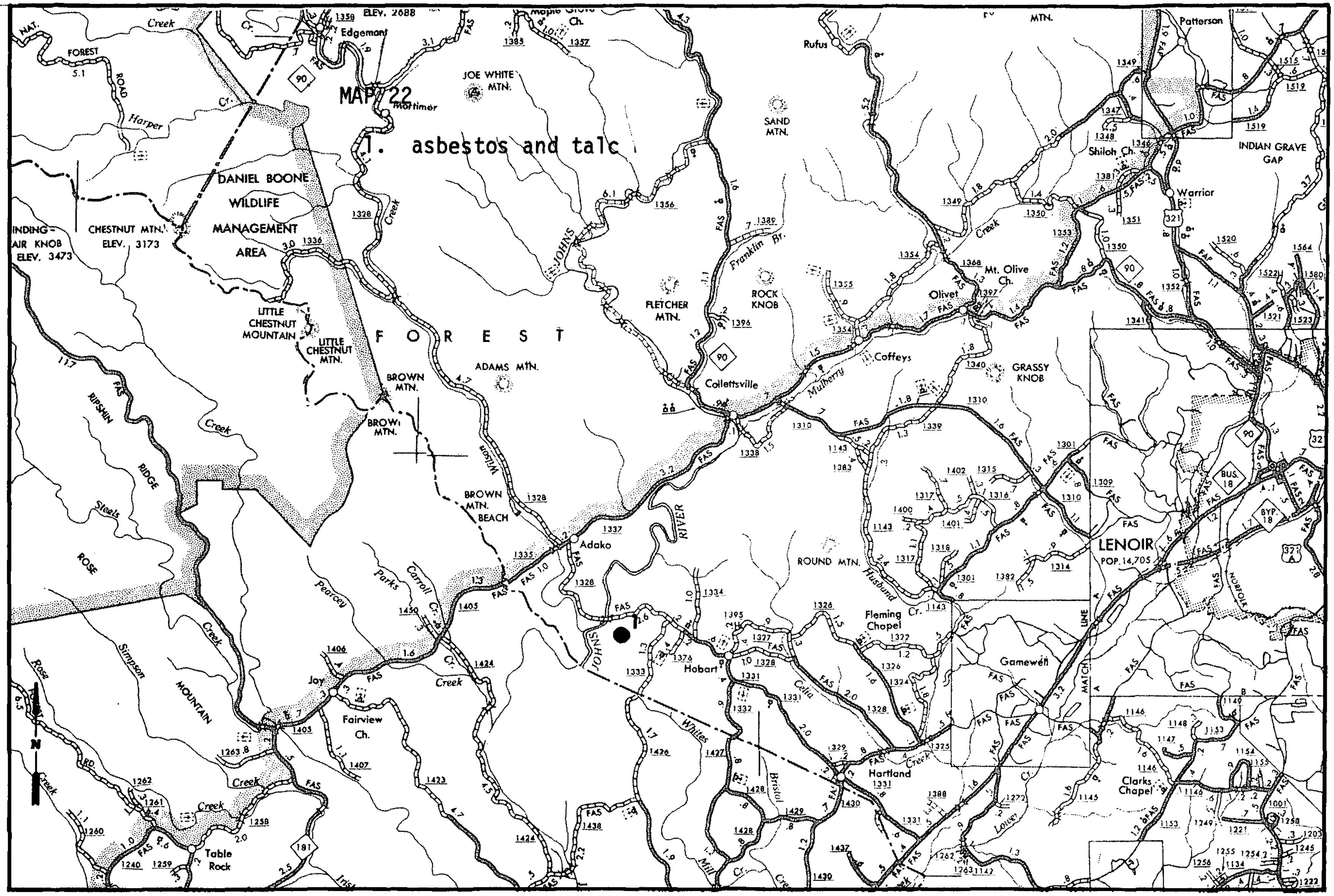

MAP 17
1. calcite and quartz
2. itacolumite
3. itacolumite
4. quartz
5. gold
6. corundum
7. diamond
8. zircon and corundum
Sevier
BALD MTN.
Hankins
Longtown
Mt. View Ch.
LAKE JAMES
Nebo
Bridge-water
Little Mtn.
Snow Hill Ch.
Parkhill
EAST MARION POP. 3,015 (UNINC)
MARION POP. 3,335
WEST MARION POP. 3,034 (UNINC)
Grant
Glenwood
Mt. Olive Ch.
PILOT MTN.
Dysartville
BOLIN KNOB
CATAWBA
NORTH FORK
CLINCHFIELD
SOUTHERN RAILWAY
Muddy Creek
North Muddy
South Muddy
Silver
BROAD RIVER
N

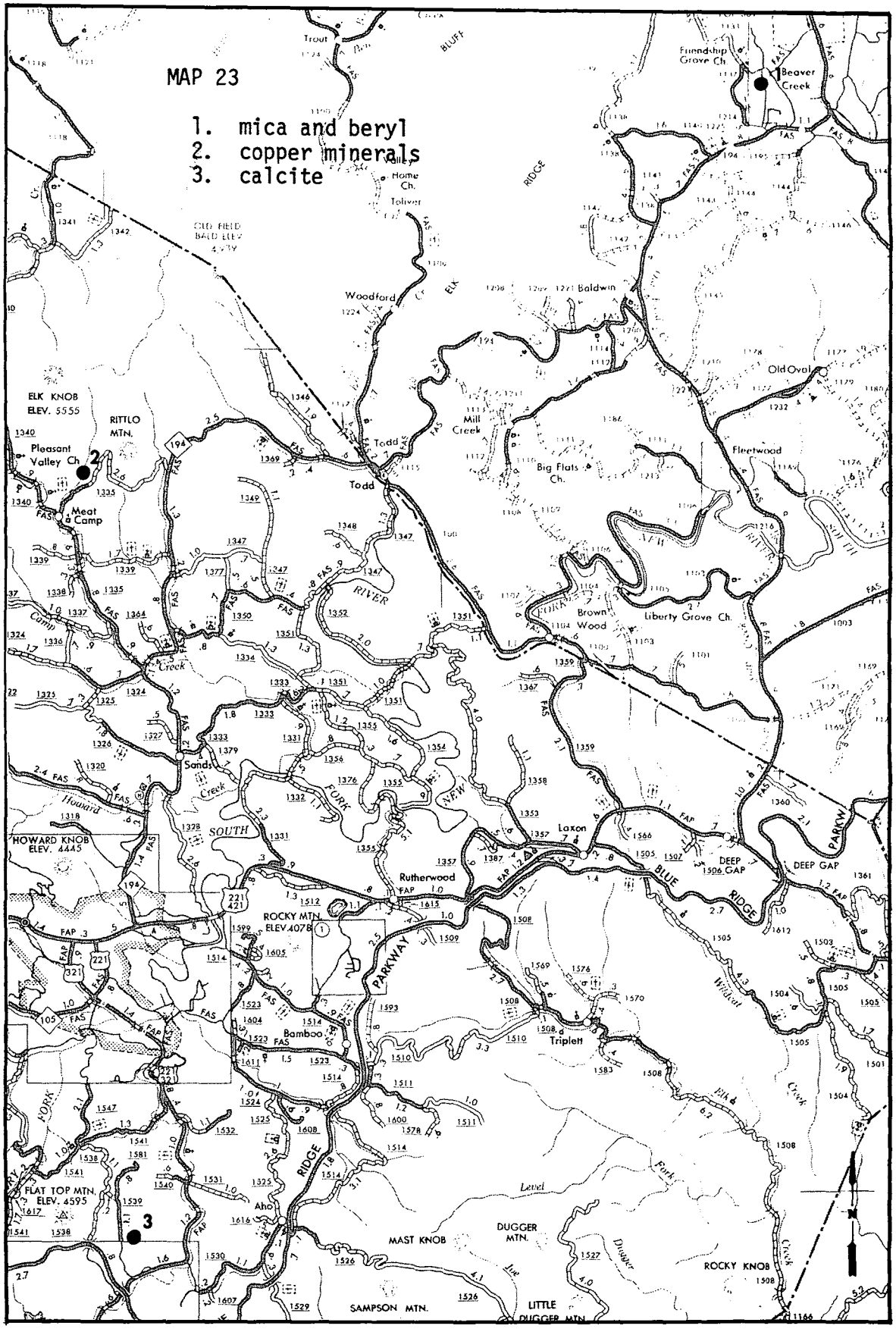

MAP 18
1. magnetite and epidote
2. epidote
3. vermiculite and anthophyllite
ELK PARK
POP. 503
Heaton
BEECH PINNACLE
MTN.
ELEV. 5506
BANNER ELK
POP. 754
Beech Mtn. Airport
Balm
BOWERS
GAP
Mattney
NATIONAL
HANGING ROCK
MTN.
ELEV. 5237
Foscoe
Shulls
Mill
PINE RIDGE
FOREST
HUMP MOUNTAIN
Cranberry
WATAUGA RIVER
BLUE RIDGE PARKWAY
BLOWING ROCK
POP. 801
WATAUGA CO.
CALDWELL CO.
Minneapolis
Sugar Mtn.
Ch.
Grandfather
P I S G A H
BIG HAW
MOUNTAIN
ELEV.
4,687
NEWLAND
POP. 524
Frank
Chestnut
Dale
Hughes
Mount Pleasant
Montezuma
Gragg
John's River
Ch.
GRANDMOTHER MTN.
LINVILLE
POP. 540
EST.
BILLY'S
KNOB
Globe
BIG ELK
MOUNTAIN
HAWSHORE
MTN.
Roseborough
Plumtree
Pineola
DANIEL BOONE
N A T I O N A L
M O U N T A I N S
F O R E S T
Wilson
Creek
82°00'

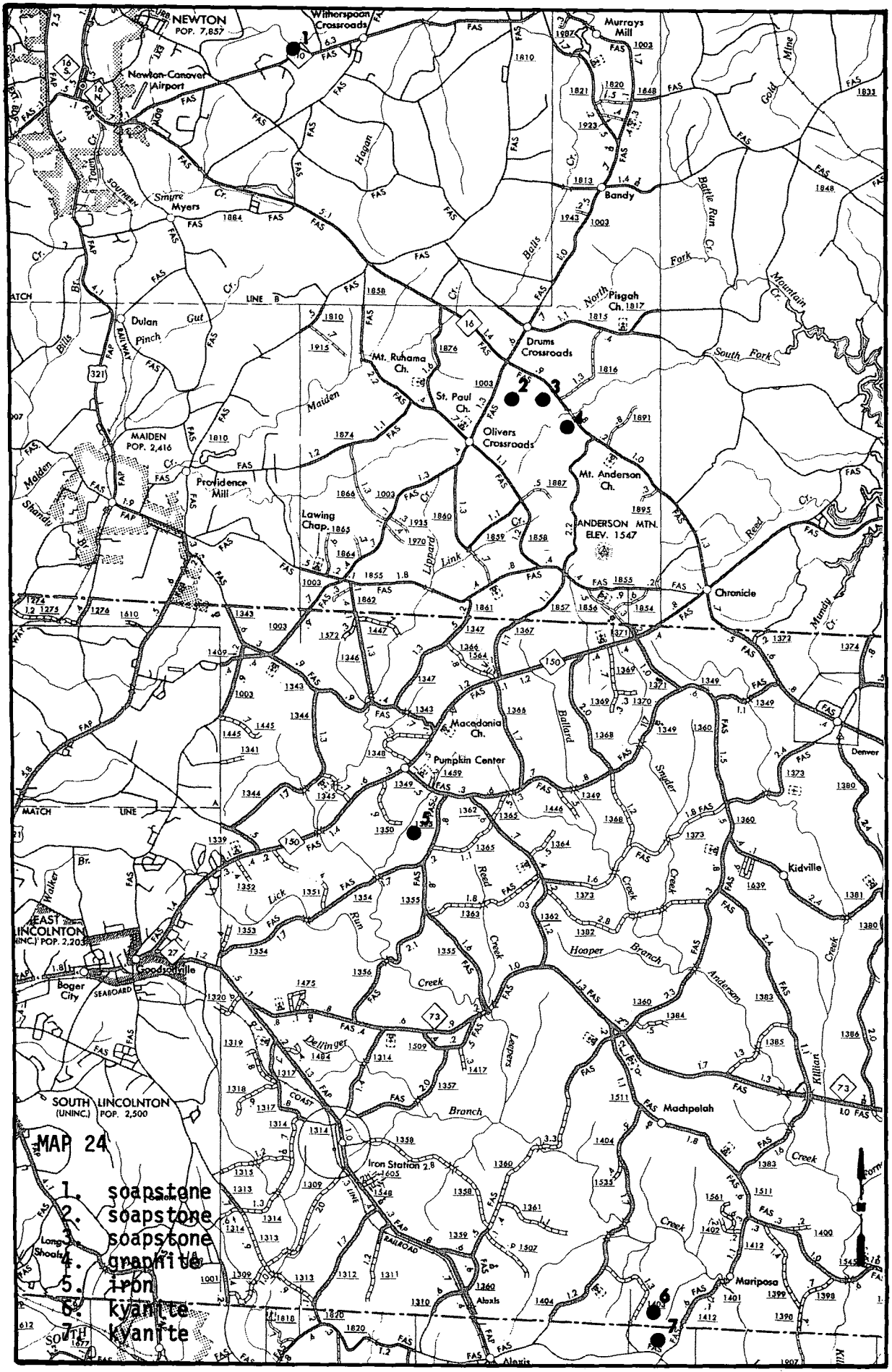

MAP 19
1. beryl
2. beryl and quartz
3. beryl
4. garnet and moonstone
5. garnet and moonstone
6. garnet and moonstone
7. quartz crystals
8. quartz crystals
9. beryl
10. beryl
11. corundum
12. quartz crystals
13. corundum
POLKVILLE POP. 465 (EST. 1971)
LAWNDALE POP. 544
Hopewell
Campcall
Metcalf
Washburn
LATTIMORE POP. 257
Dover
BOILING SPRINGS POP. 2,284
Shelby Airport
Mt. Sinai Ch.
JOLLY MTN.
ABES MTN.
Lavonia
Beaver Dam Ch.
Union Ch.
Mt. Olivet Ch.
RIVER
Creek

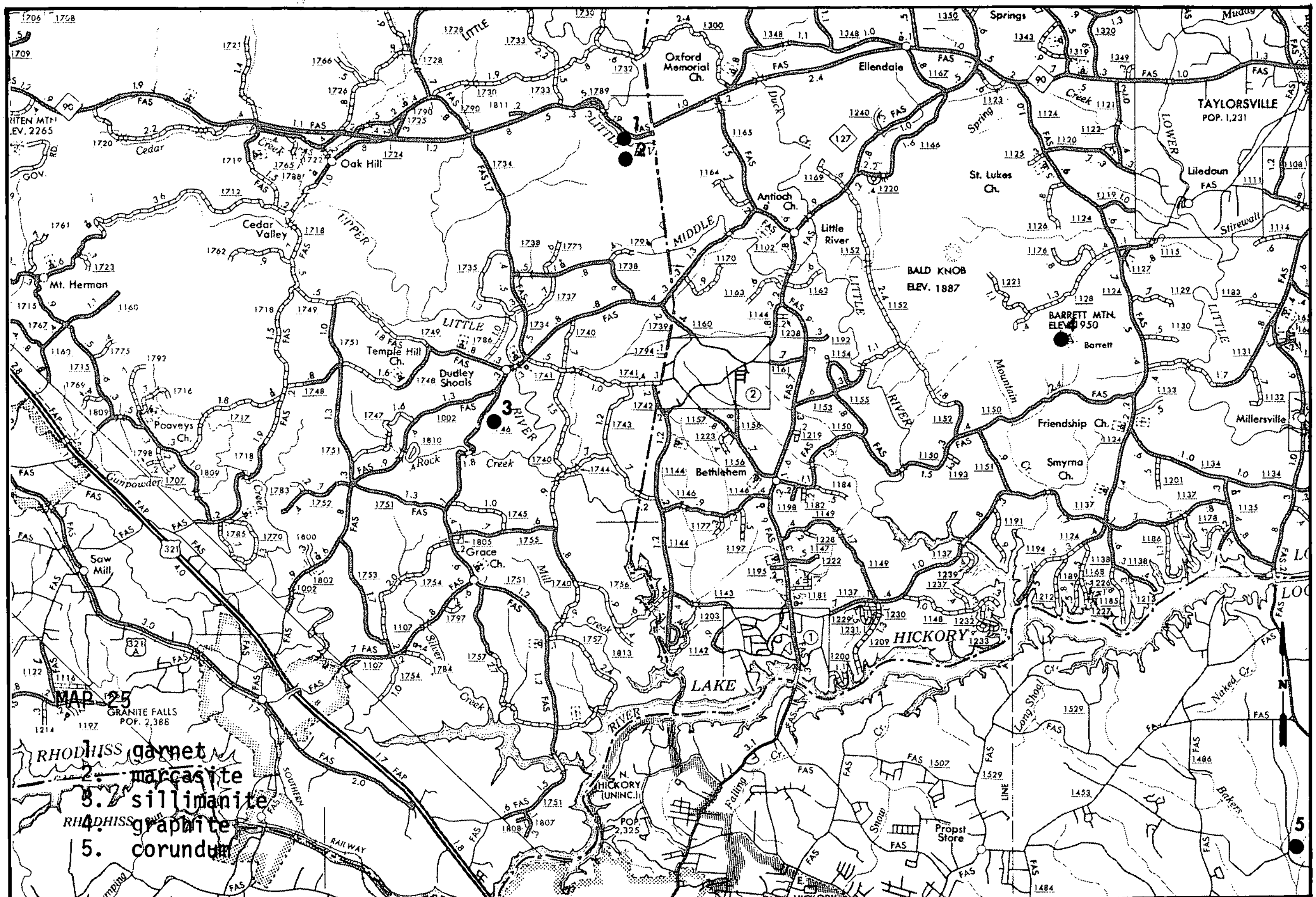

MAP 20
1. cassiterite and spodumene
2. cassiterite and spodumene
3. cassiterite and spodumene
4. cassiterite and spodumene
5. uraninite and garnet
6. cassiterite and spodumene
7. goethite
8. spodumene
9. beryl
10. garnet
CHERRYVILLE POP. 5,258
WACO POP. 245
FALLSTON POP. 413
Stony Point
Oak Grove
Stubbs
New Prospect Ch.
Sunnyside
Long Cr. Ch.
Ebenezer Ch.
St. Marks Ch.
Allen Memorial Bapt. Ch.
Archdale
GROVER POP. 555
New Buffalo Ch.
Unity Ch.
Mtn. View
CROWDERS MTN. ELEV. 1624
KINGS MTN. PINNACLE ELEV. 1705
KINGS MOUNTAIN
KINGS MTN.
Crouse


HIGH PEAK
ELEV. 2184
SMITH MTN.
ELEV. 2000
HILDEBRAN
POP. 481
Abee's Chapel Ch.
Abee
DROWNING CREEK MTN.
Mt. Hebron Ch.
Henry River
Advent Crossroads
PROSPECT RIDGE
Walkers Chapel
Burke Chapel
St. John Ch.
BUTLER KNOB
ELEV. 2052
Pleasant Grove
BOUNDARY
Beulah Ch.
Cooksville
LYNN MTN.
JACOB FORK
Ramsey
Camp Creek
WARD GAP
Corinth
Wray's Crossroads
Henry
Laurel Hill
Pisgah Ch.
OLD SHEEP KNOB
Olive Grove
Big Hill Ch.
CARPENTER KNOB
Cat Square
CASAR
POP. 386
ST. 1971
St. Pauls Ch.
St. Peters Ch.
Hulls Crossroads
Dora
Belwood
MAP 21
1. tourmaline
2. garnet
3. tourmaline
4. tourmaline
5. beryl
6. corundum
7. tourmaline and mica

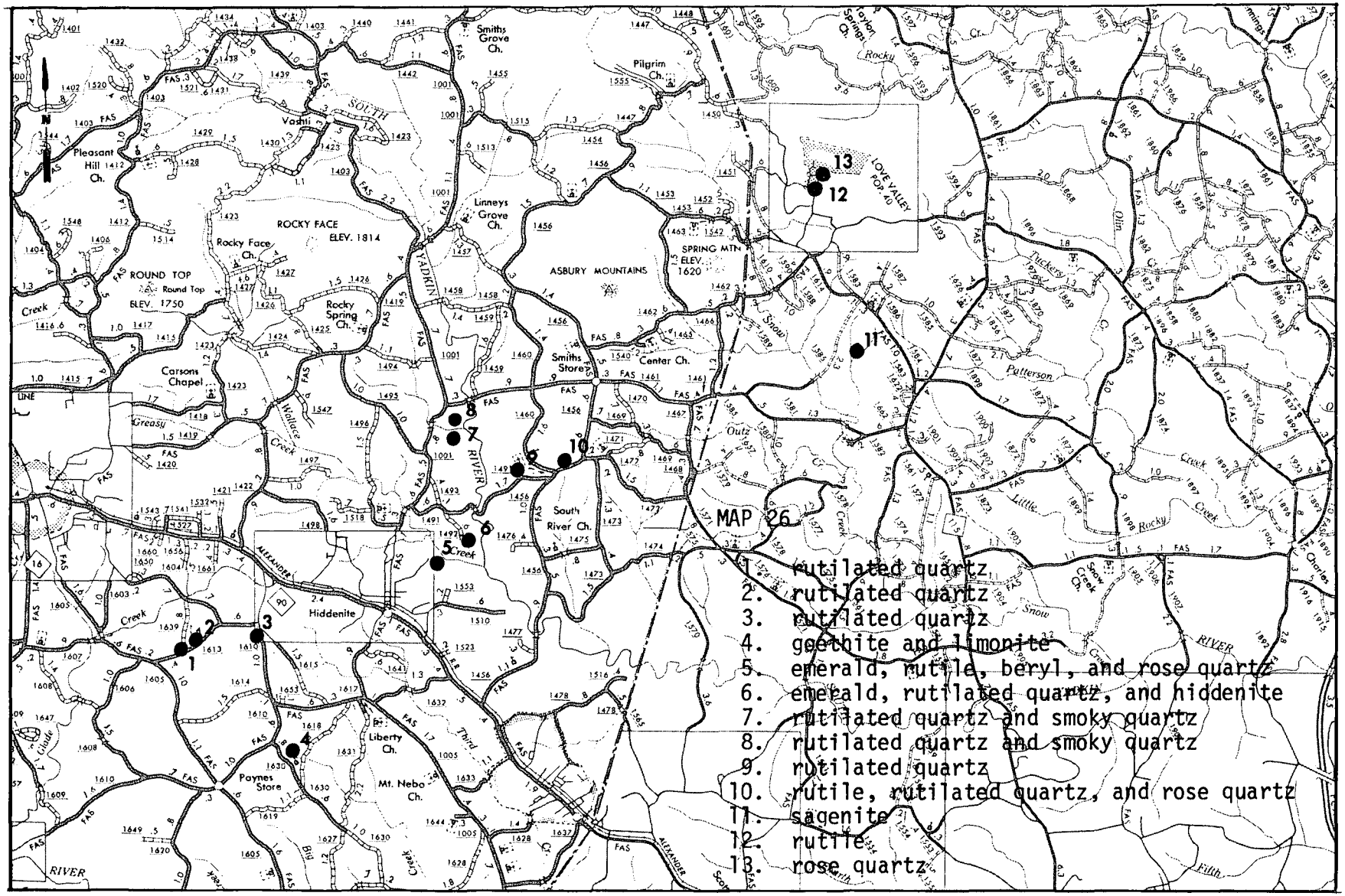

MAP 22
1. asbestos and talc
DANIEL BOONE
WILDLIFE
MANAGEMENT
AREA
F O R E S T
Edgemont
ELEV. 2688
Mortimer
JOE WHITE MTN.
SAND MTN.
Rufus
Patterson
INDIAN GRAVE GAP
Shiloh Ch.
Warrior
CHESTNUT MTN. ELEV. 3173
LITTLE CHESTNUT MOUNTAIN
LITTLE CHESTNUT MTN.
BROWN MTN.
ADAMS MTN.
FLETCHER MTN.
ROCK KNOB
Olivet
Mt. Olive Ch.
Collettsville
Coffeys
GRASSY KNOB
BROWN MTN. BEACH
Adako
ROUND MTN.
LENOIR
POP. 14,705
Fleming Chapel
Hobart
Gamewell
RIPSHIN RIDGE
ROSE
Simpson
MOUNTAIN
Joy
Fairview Ch.
Hartland
Clarks Chapel
Table Rock
JOHNS RIVER
Wilson Creek
Mulberry
Franklin Br.
Husband Cr.
Harper Cr.
Steels Creek
Parks
Pearcey
Carroll Cr.
Celia
Whites
Bristol
Lower Cr.
Mill
NAT. FOREST ROAD
FAS

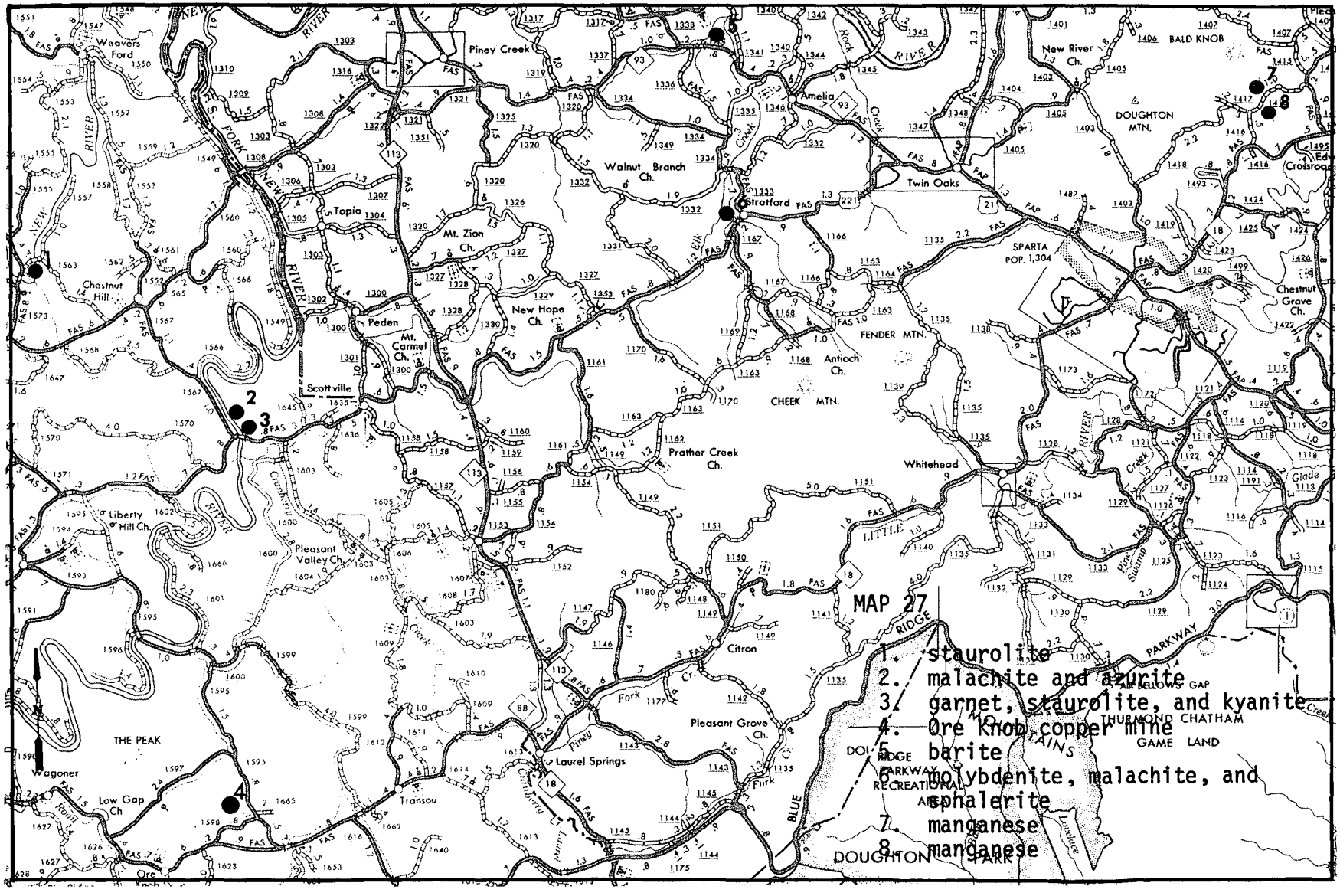

MAP 23
1. mica and beryl
2. copper minerals
3. calcite
Trout
BLUFF
Friendship Grove Ch.
Beaver Creek
RIDGE
Valley Home Ch.
Toliver
OLD FIELD BALD ELEV. 4579
Woodford
ELK
Baldwin
Old Oval
ELK KNOB ELEV. 5555
RITTLO MTN.
Pleasant Valley Ch.
2
Todd
Mill Creek
Big Flats Ch.
Fleetwood
Meat Camp
RIVER
Brown
Wood
Liberty Grove Ch.
Camp Creek
Sands
Howard Creek
SOUTH FORK NEW
HOWARD KNOB ELEV. 4445
Laxon
DEEP GAP
BLUE RIDGE PARKWAY
Rutherwood
ROCKY MTN. ELEV. 4078
Bamboo
Triplett
Wildcat
Creek
FLAT TOP MTN. ELEV. 4595
3
Aho
MAST KNOB
DUGGER MTN.
Level
Fork
Dugger
Creek
ROCKY KNOB
SAMPSON MTN.
LITTLE DUGGER MTN.


NEWTON
POP. 7,857
Witherspoon Crossroads
Murrays Mill
Newton-Conover Airport
Bandy
Smyre Myers
Dulan
Gut
Pinch
Mt. Ruhama Ch.
Drums Crossroads
North Pisgah Ch. 1817
St. Paul Ch.
Olivers Crossroads
MAIDEN
POP. 2,416
Providence Mill
Mt. Anderson Ch.
Lawing Chap. 1865
ANDERSON MTN.
ELEV. 1547
Chronicle
Macedonia Ch.
Pumpkin Center
Denver
Kidville
EAST LINCOLNTON (UNINC.) POP. 2,203
Boger City
SOUTH LINCOLNTON (UNINC.) POP. 2,500
Iron Station
Madipelah
Mariposa
Alexis
MAP 24
1. soapstone
2. soapstone
3. soapstone
4. graphite
5. iron
6. kyanite
7. kyanite

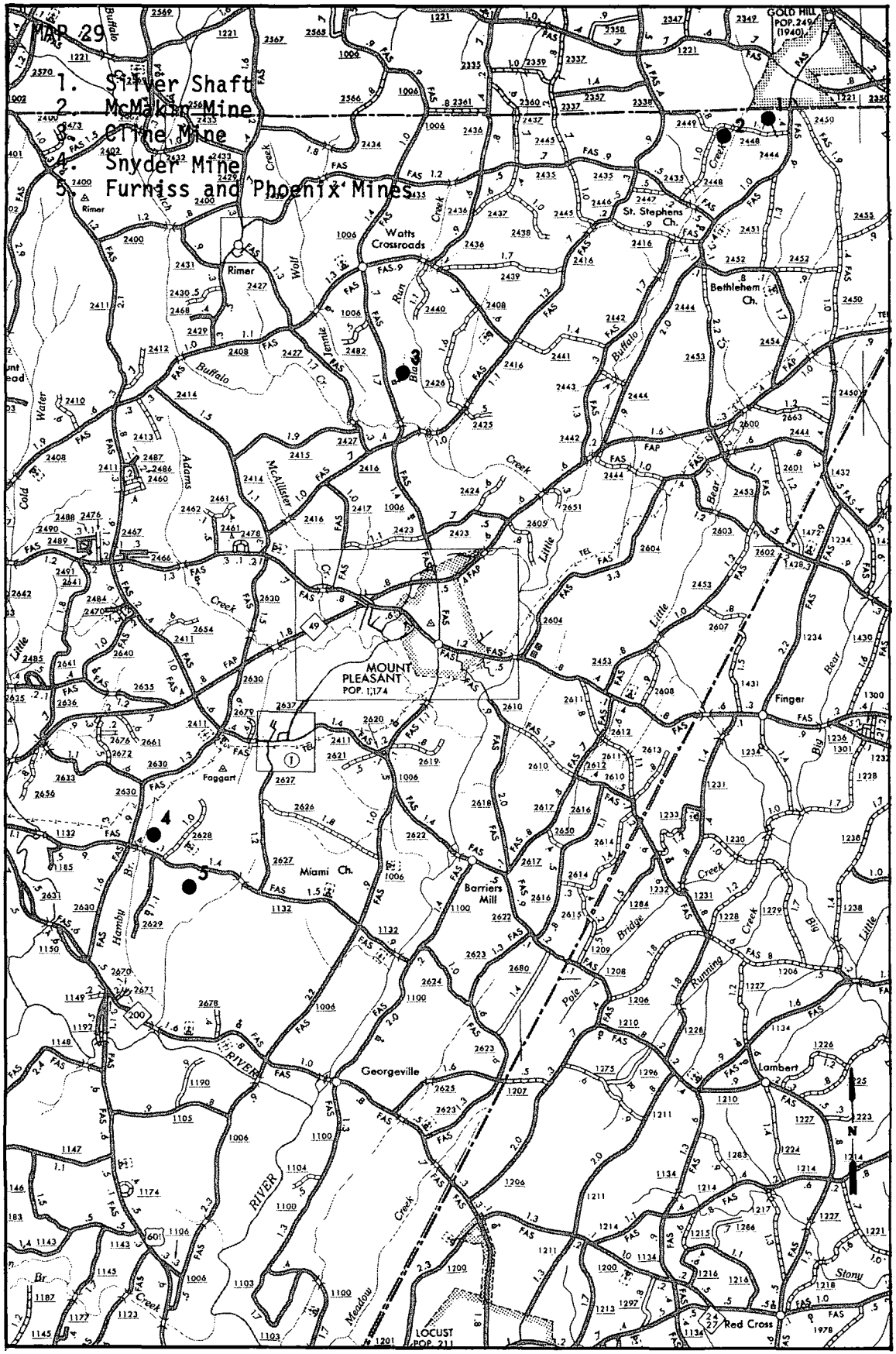


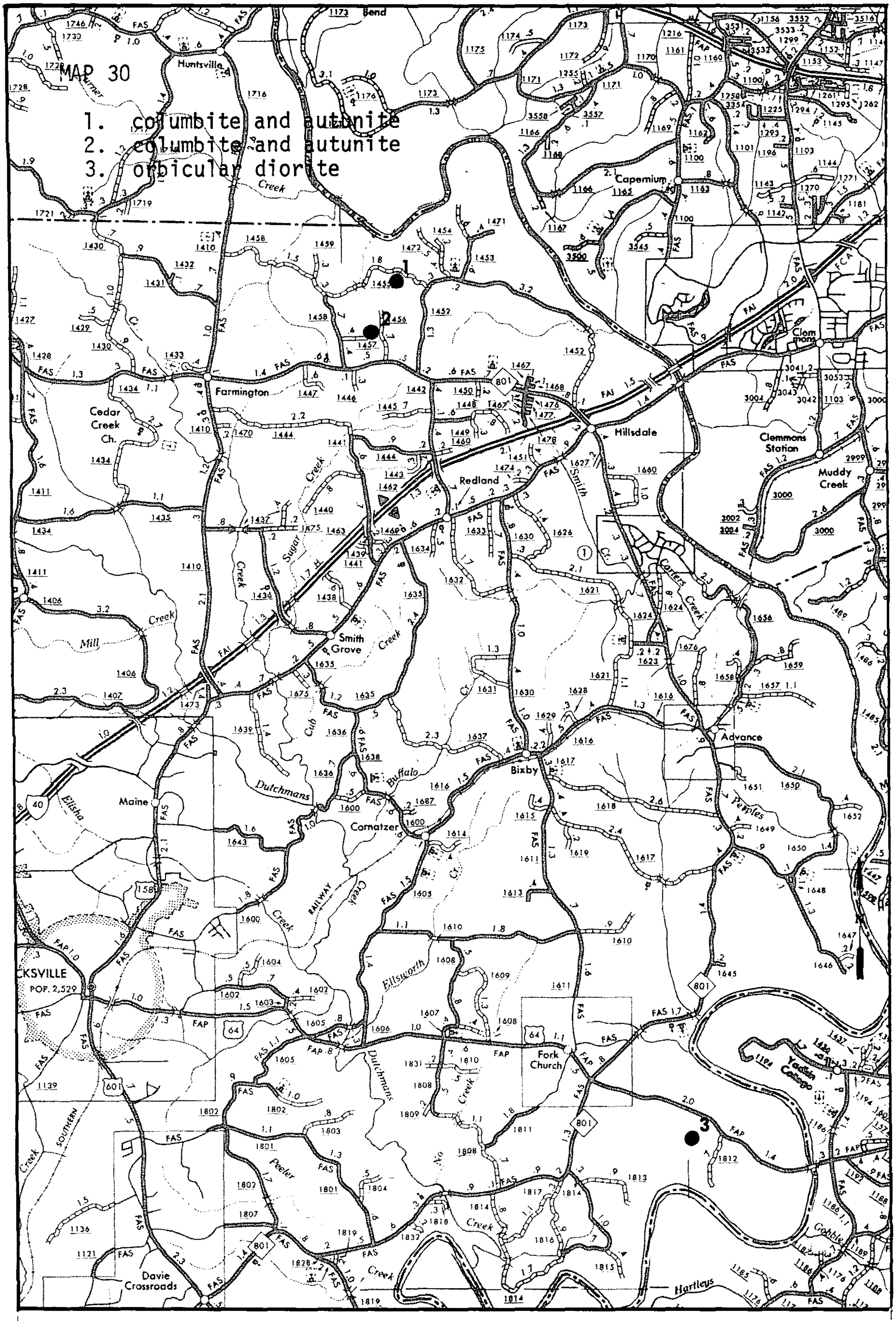
MAP 25
1. garnet
2. marcasite
3. sillimanite
4. graphite
5. corundum
TAYLORSVILLE
POP. 1,231
HICKORY
LAKE
Oak Hill
Cedar Valley
Mt. Herman
Temple Hill Ch.
Dudley Shoals
Pooveys Ch.
Grace Ch.
Saw Mill
GRANITE FALLS
POP. 2,388
Oxford Memorial Ch.
Ellendale
Antioch Ch.
Little River
St. Lukes Ch.
BALD KNOB
ELEV. 1887
BARRETT MTN.
Barrett
Friendship Ch.
Smyrna Ch.
Millersville
Liledoun
Bethlehem
N. HICKORY (UNINC.)
POP. 2,325
Propst Store

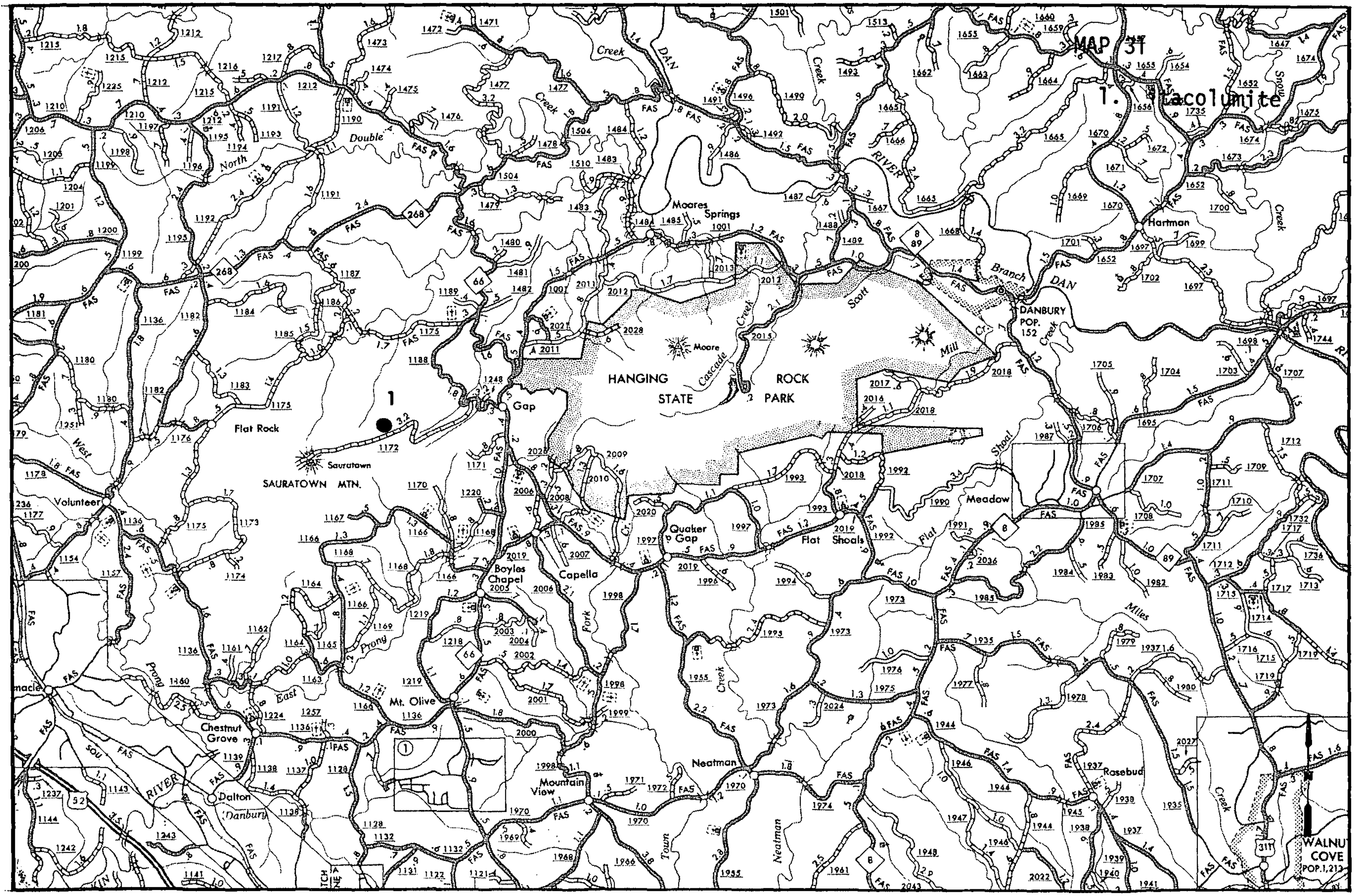

MAP 26
1. rutilated quartz
2. rutilated quartz
3. rutilated quartz
4. goethite and limonite
5. emerald, rutile, beryl, and rose quartz
6. emerald, rutilated quartz, and hiddenite
7. rutilated quartz and smoky quartz
8. rutilated quartz and smoky quartz
9. rutilated quartz
10. rutile, rutilated quartz, and rose quartz
11. sagenite
12. rutile
13. rose quartz

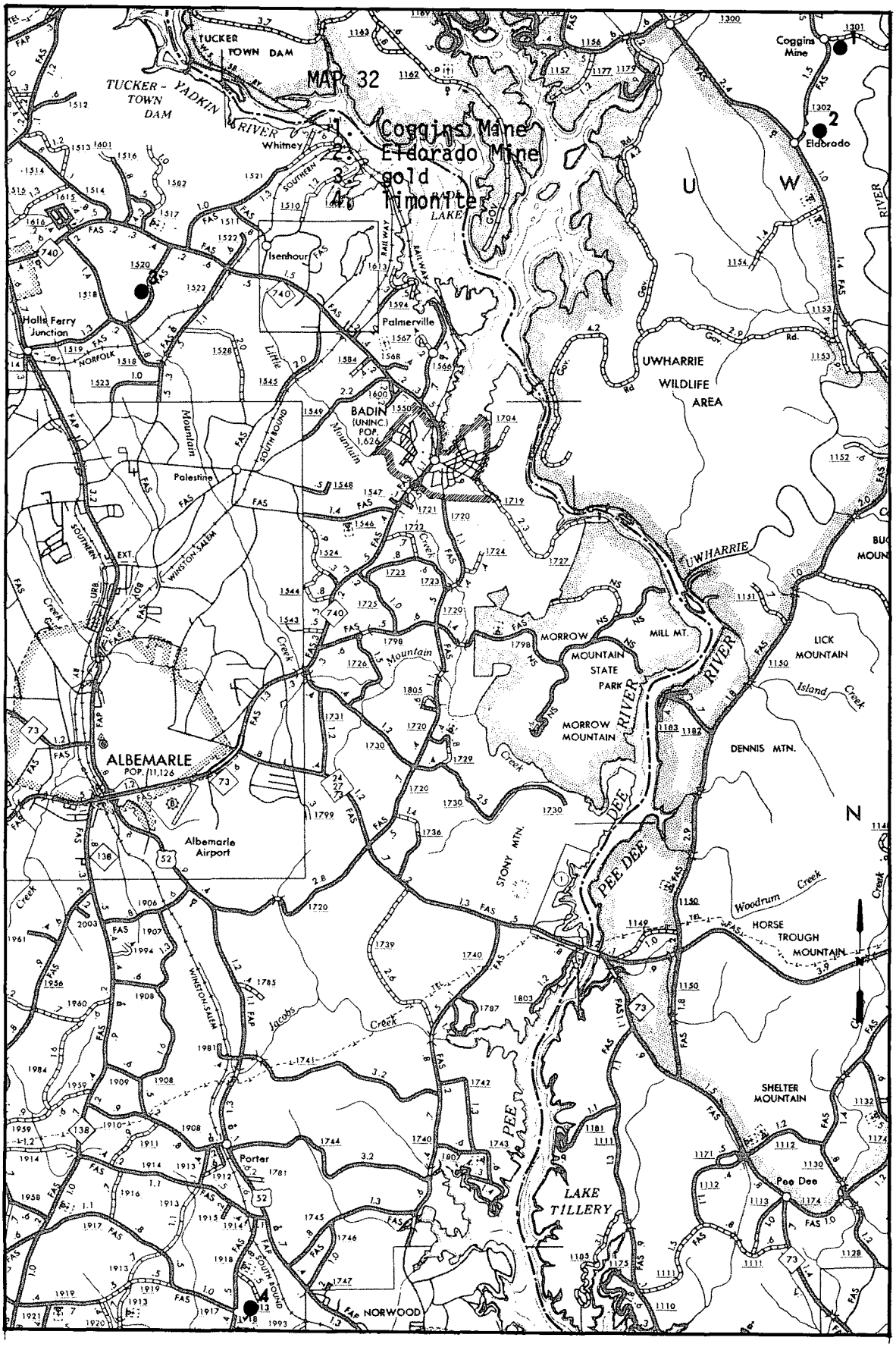

MAP 27
1. staurolite
2. malachite and azurite
3. garnet, staurolite, and kyanite
4. Ore Knob copper mine
5. barite
6. molybdenite, malachite, and sphalerite
7. manganese
8. manganese
Weavers Ford
Piney Creek
Amelia
New River Ch.
BALD KNOB
DOUGHTON MTN.
Twin Oaks
Stratford
Walnut Branch Ch.
Topia
Mt. Zion Ch.
SPARTA POP. 1,304
Chestnut Hill
Peden
New Hope Ch.
Mt. Carmel Ch.
FENDER MTN.
Antioch Ch.
CHEEK MTN.
Scottville
Prather Creek Ch.
Whitehead
Chestnut Grove Ch.
Liberty Hill Ch.
Pleasant Valley Ch.
Citron
Pleasant Grove Ch.
Laurel Springs
THE PEAK
Wagoner
Low Gap Ch
Transou
Ore Knob
THURMOND CHATHAM
GAME LAND
DOUGHTON PARK
BLUE RIDGE PARKWAY
NEW RIVER
LITTLE RIVER

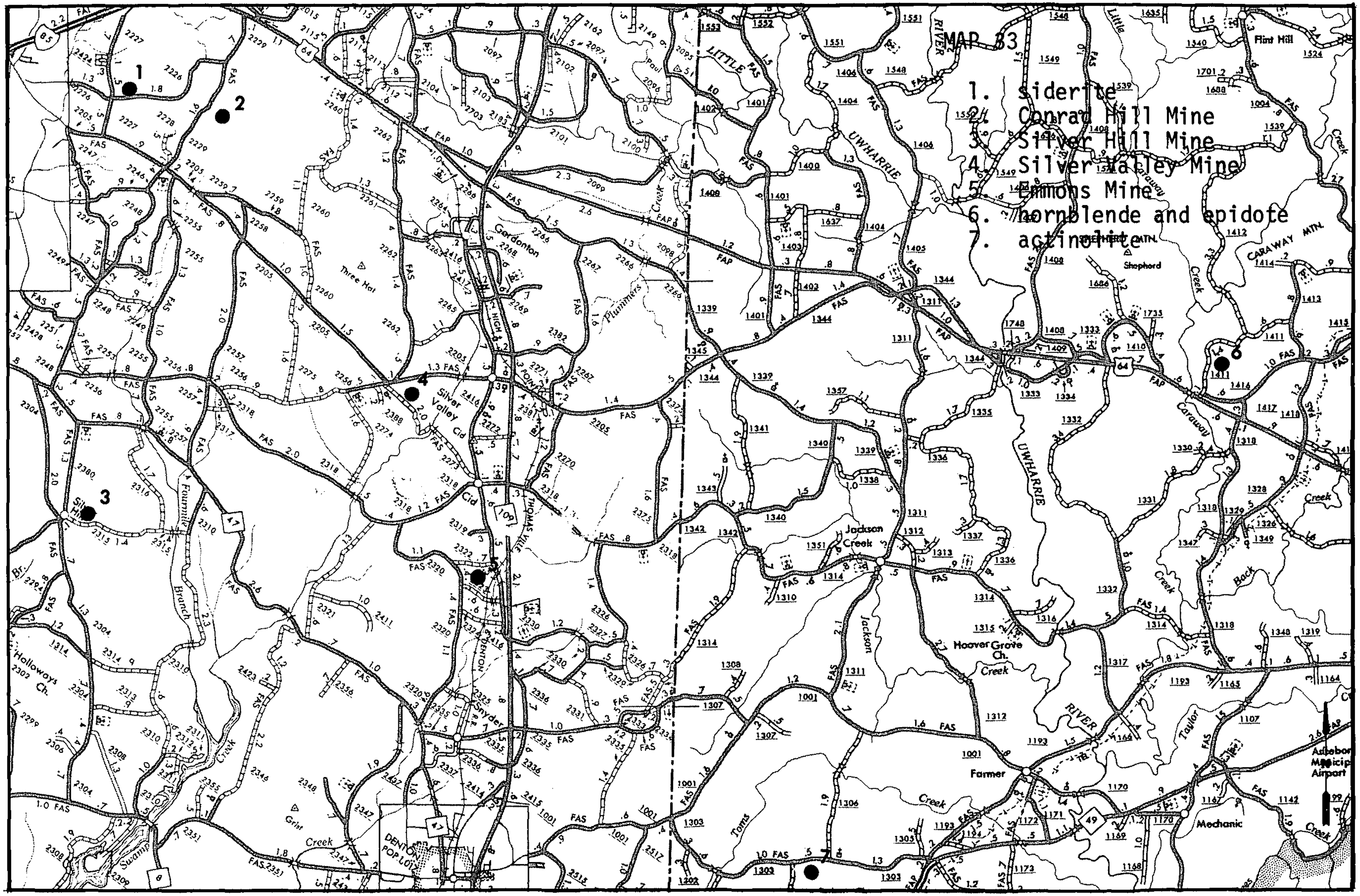

MAP 28
1. corundum
2. corundum
3. corundum
4. zircon
SOUTH YADKIN RIVER
YADKIN RIVER
STATESVILLE POP. 19,996
WEST STATESVILLE (UNINC) POP. 1,905
Statesville Municipal Airport
Snow Creek
Fourth Creek
Fifth Creek
Third Creek
Jack Cr.
Beaver Cr.
Morrison Creek
Brady Br.
Bradford Crossroads
Celeste Hinkle
Cool Springs
Society Ch.
Turnersburg
Hebron Ch.
Fairmont Ch.
Charles
Elmwood
Vance
Loray
Scotts
MATCH LINE
RAILROAD
RAILWAY

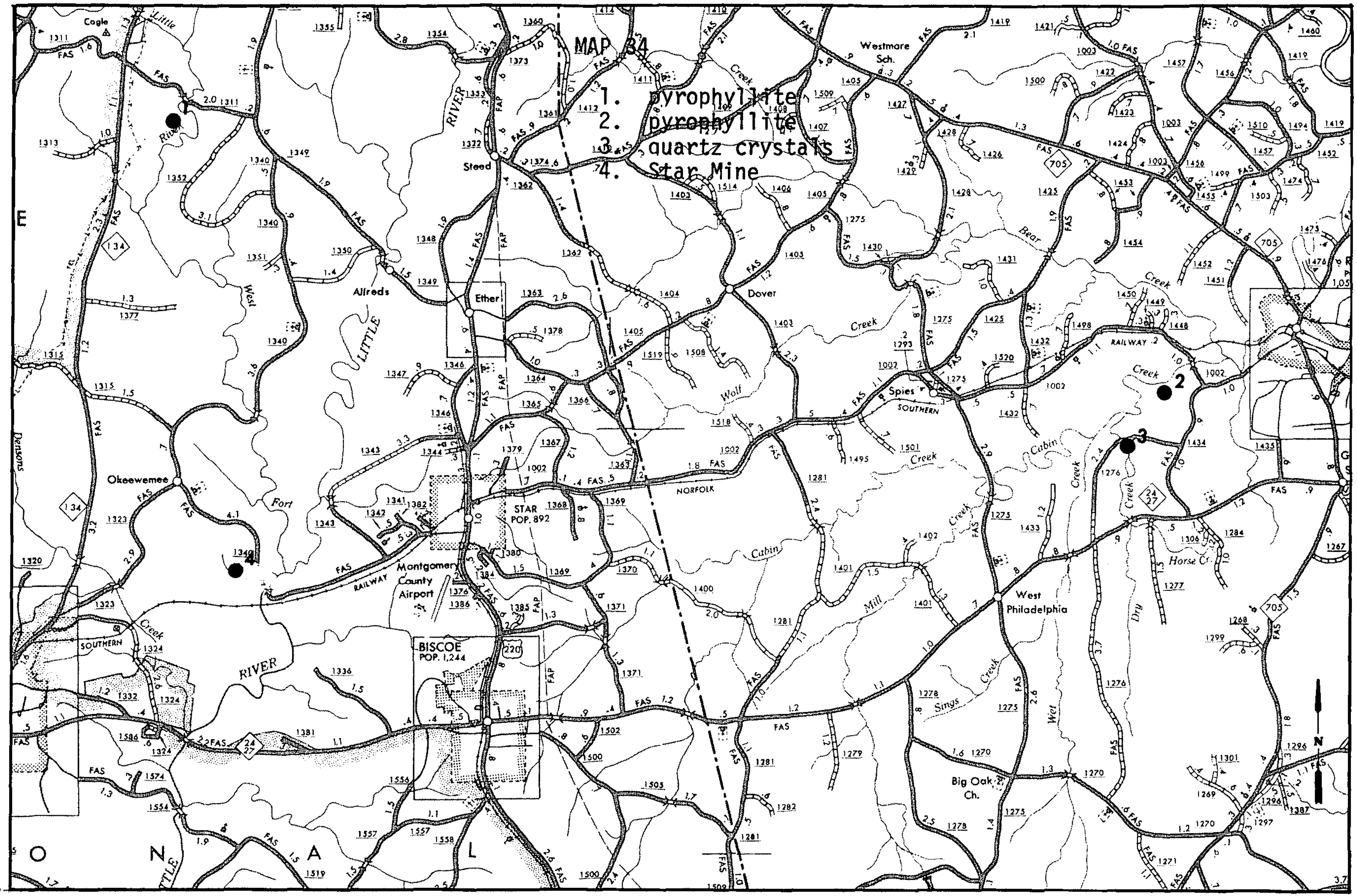

MAP 29
1. Silver Shaft
2. McMakin Mine
3. Crane Mine
4. Snyder Mine
5. Furniss and Phoenix Mines
MOUNT PLEASANT
POP. 1,174
GOLD HILL
POP. 249
(1940)
Watts Crossroads
St. Stephens Ch.
Bethlehem Ch.
Rimer
Faggart
Miami Ch.
Barriers Mill
Georgeville
Lambert
Finger
Red Cross
LOCUST
POP. 211
Buffalo Creek
Water Cold Creek
Adams Creek
McAllister Creek
Little Bear Creek
Hamby Br.
RIVER
Meadow Creek
Pole Bridge Creek
Running Big Little Stony Creek
FAS
FAP
N

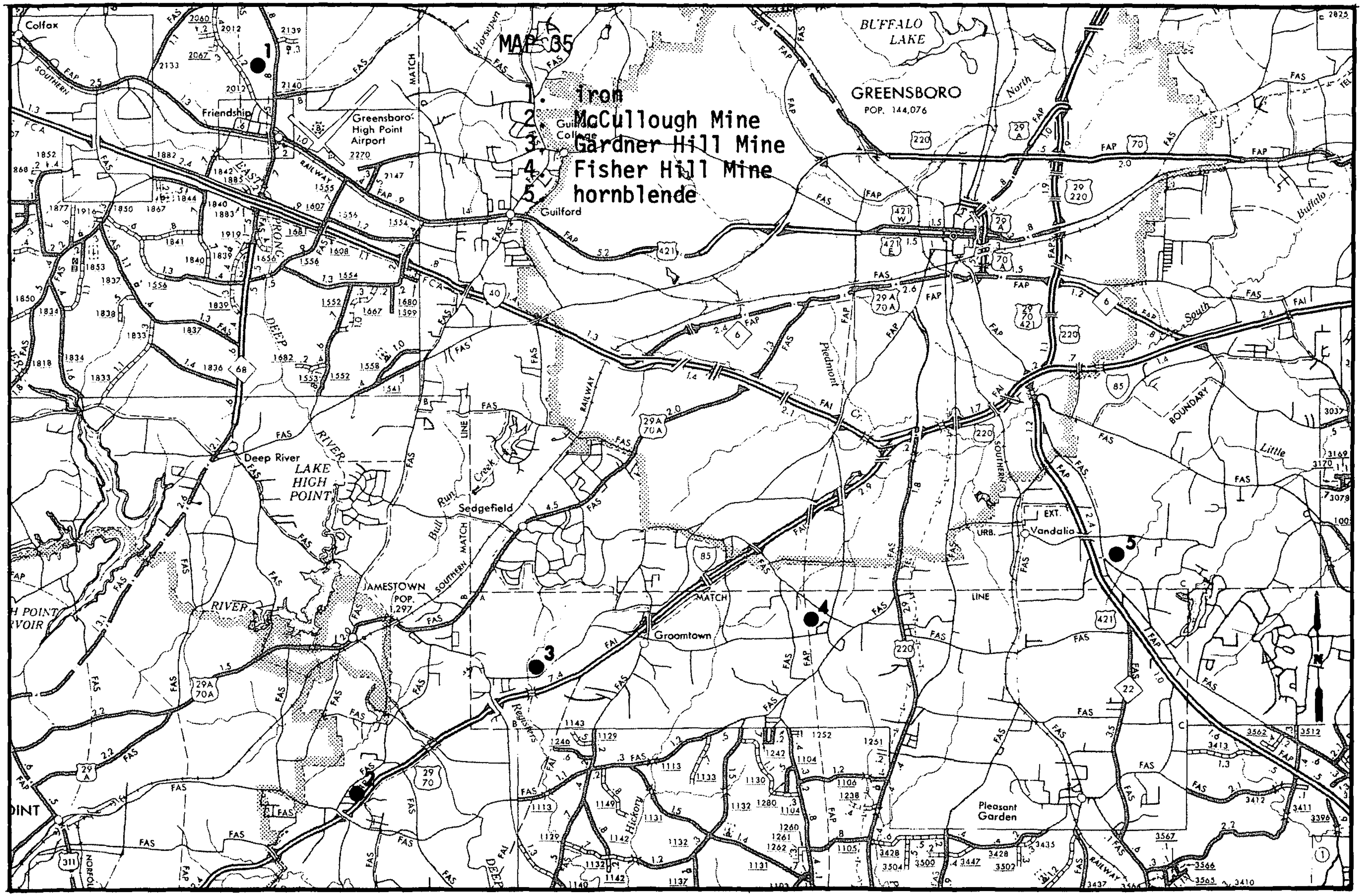

MAP 30
1. columbite and autunite
2. columbite and autunite
3. orbicular diorite
Bend
Huntsville
Farmington
Cedar Creek Ch.
Hillsdale
Redland
Smith Grove
Clemmons
Clemmons Station
Muddy Creek
Advance
Bixby
Maine
Cornatzer
Fork Church
Davie Crossroads
CKSVILLE
POP. 2,529
Yadkin College

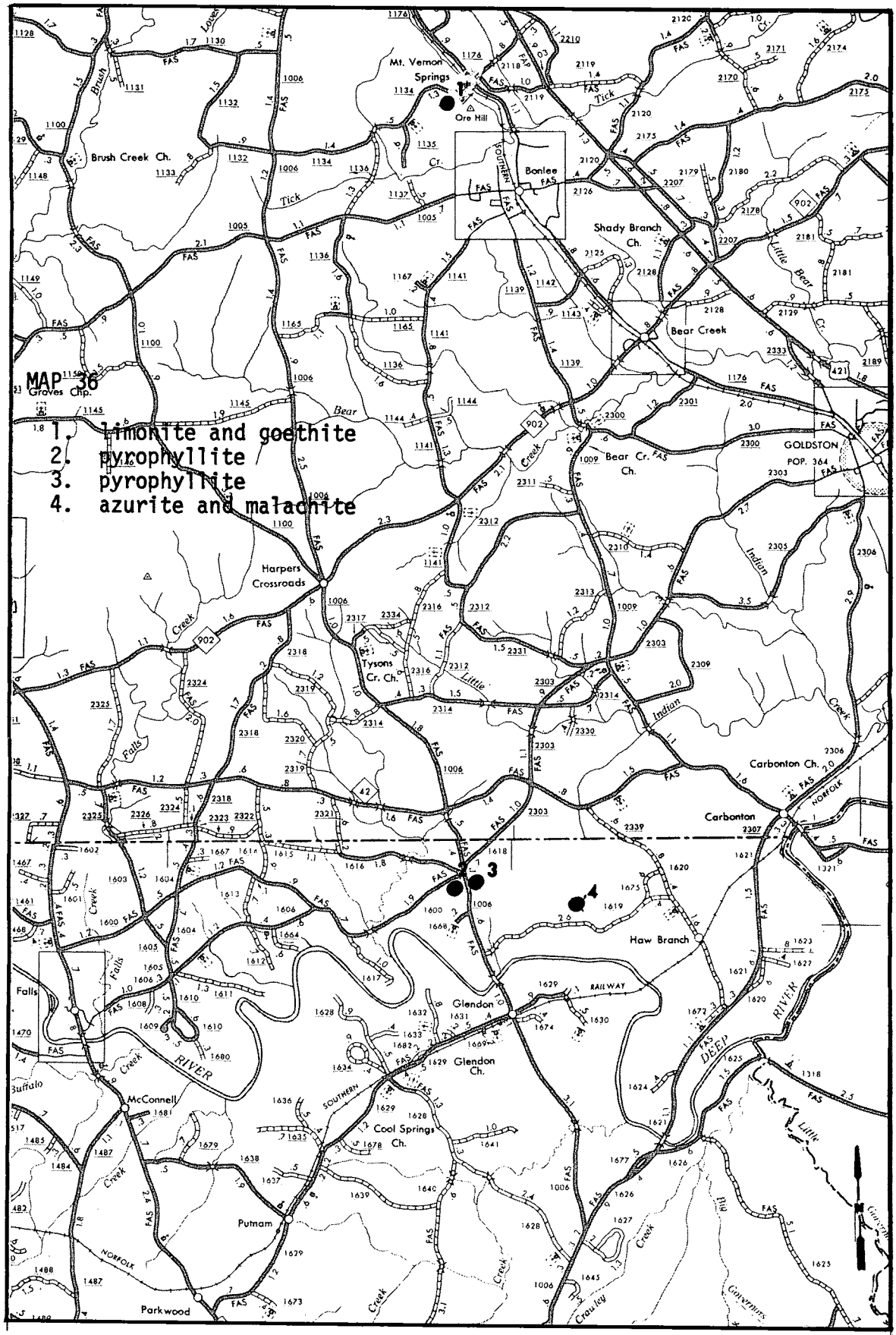

MAP 31
1.
1
HANGING ROCK STATE PARK
SAURATOWN MTN.
Sauratown
Moore
DANBURY POP. 152
Moores Springs
Hartman
Gap
Flat Rock
Volunteer
Quaker Gap
Flat Shoals
Meadow
Capella
Boyles Chapel
Mt. Olive
Chestnut Grove
Dalton
Danbury
Neatman
Mountain View
Rosebud
WALNUT COVE POP. 1,213
DAN RIVER

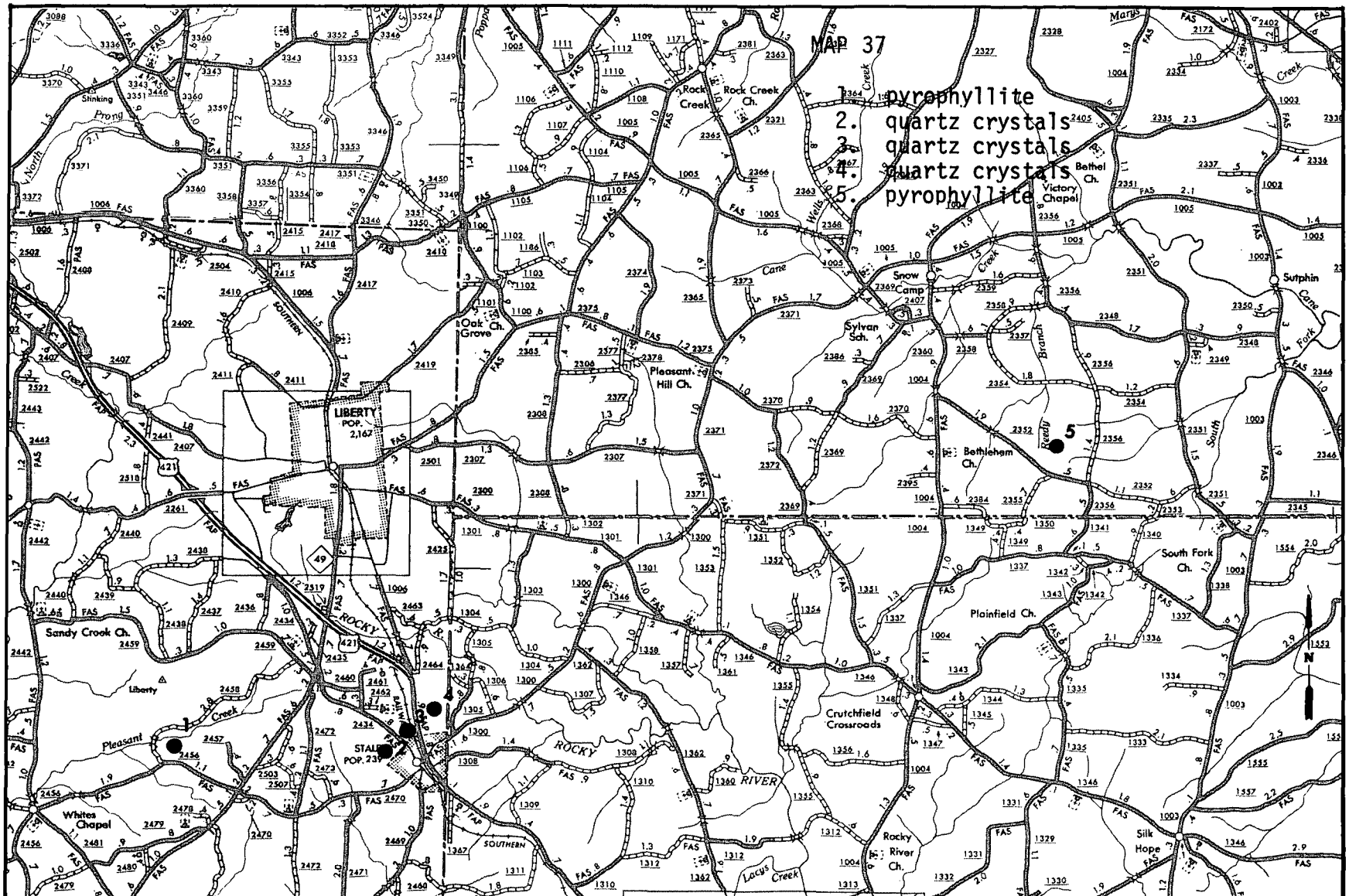

MAP 32
1. Coggins Mine
2. Eldorado Mine
3 gold
4 limonite
TUCKER TOWN DAM
TUCKER - YADKIN TOWN DAM
YADKIN RIVER
Whitney
Coggins Mine
Eldorado
Isenhour
Halls Ferry Junction
Palmerville
BADIN (UNINC.) POP. 1,626
Palestine
ALBEMARLE POP. 11,126
Albemarle Airport
Porter
NORWOOD
LAKE TILLERY
UWHARRIE WILDLIFE AREA
UWHARRIE RIVER
MORROW MOUNTAIN STATE PARK
MORROW MOUNTAIN
MILL MT.
LICK MOUNTAIN
DENNIS MTN.
STONY MTN.
PEE DEE RIVER
HORSE TROUGH MOUNTAIN
SHELTER MOUNTAIN
Pee Dee
Woodrum Creek
Island Creek
Jacobs Creek
Little Mountain
SOUTHERN RAILWAY
WINSTON-SALEM SOUTHBOUND RAILWAY
NORFOLK SOUTHERN
U
W
N

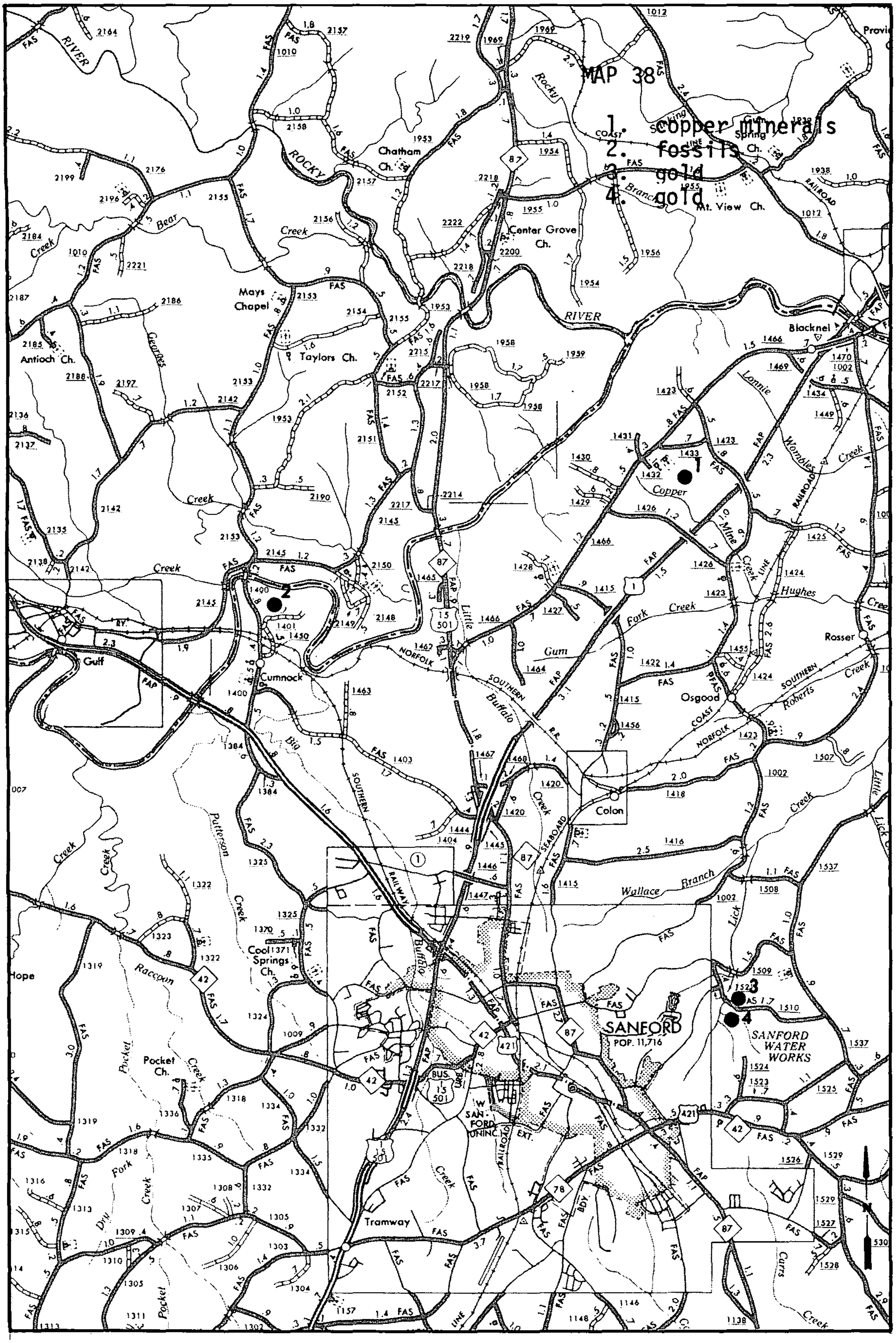

MAP 33
1. siderite
2. Conrad Hill Mine
3. Silver Hill Mine
4. Silver Valley Mine
5. Emmons Mine
6. hornblende and epidote
7. actinolite
Flint Hill
Gordonton
Three Hat
Silver Valley
Cid
Shepherd
CARAWAY MTN.
Jackson Creek
Hoover Grove Ch.
Farmer
Mechanic
Snyder
DENTON
Holloways Ch.
UWHARRIE
LITTLE RIVER
Caraway Creek
Plummers Creek
Fourmile Branch
Back Creek
Taylor Creek
Toms Creek
Grist
Swamp Creek
Asheboro Municipal Airport

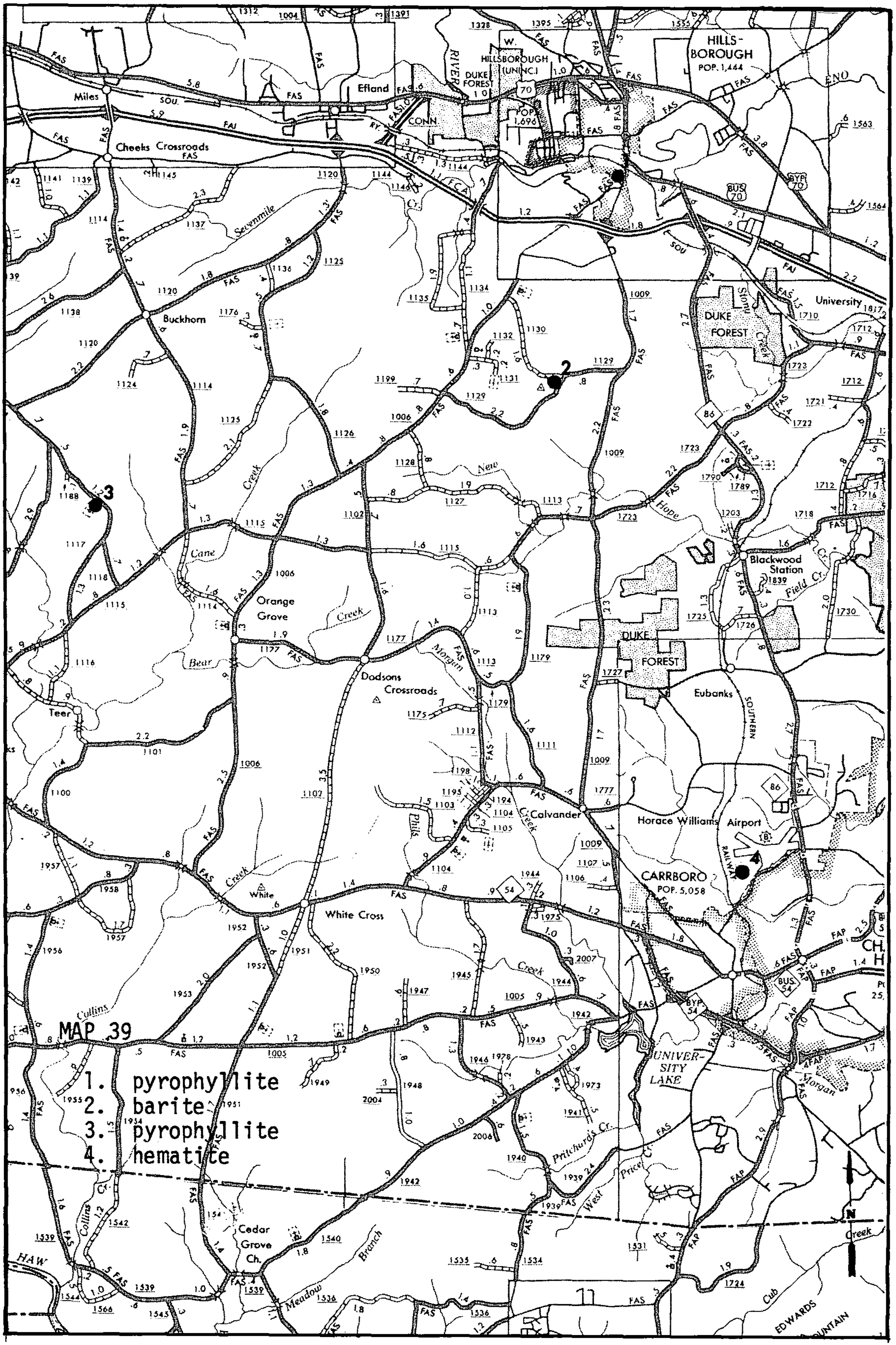

MAP 34
1. pyrophyllite
2. pyrophyllite
3. quartz crystals
4. Star Mine
Cagle
Little River
West Fort Little River
Steed
Allreds
Ether
Dover
Westmore Sch.
Spies
Okeewemee
STAR POP. 892
Montgomery County Airport
BISCOE POP. 1,244
West Philadelphia
Big Oak Ch.
Bear Creek
Wolf Creek
Cabin Creek
Mill Creek
Sings Creek
Wet Creek
Dry Creek
Horse Cr.
Densons Creek
SOUTHERN RAILWAY
NORFOLK
RIVER

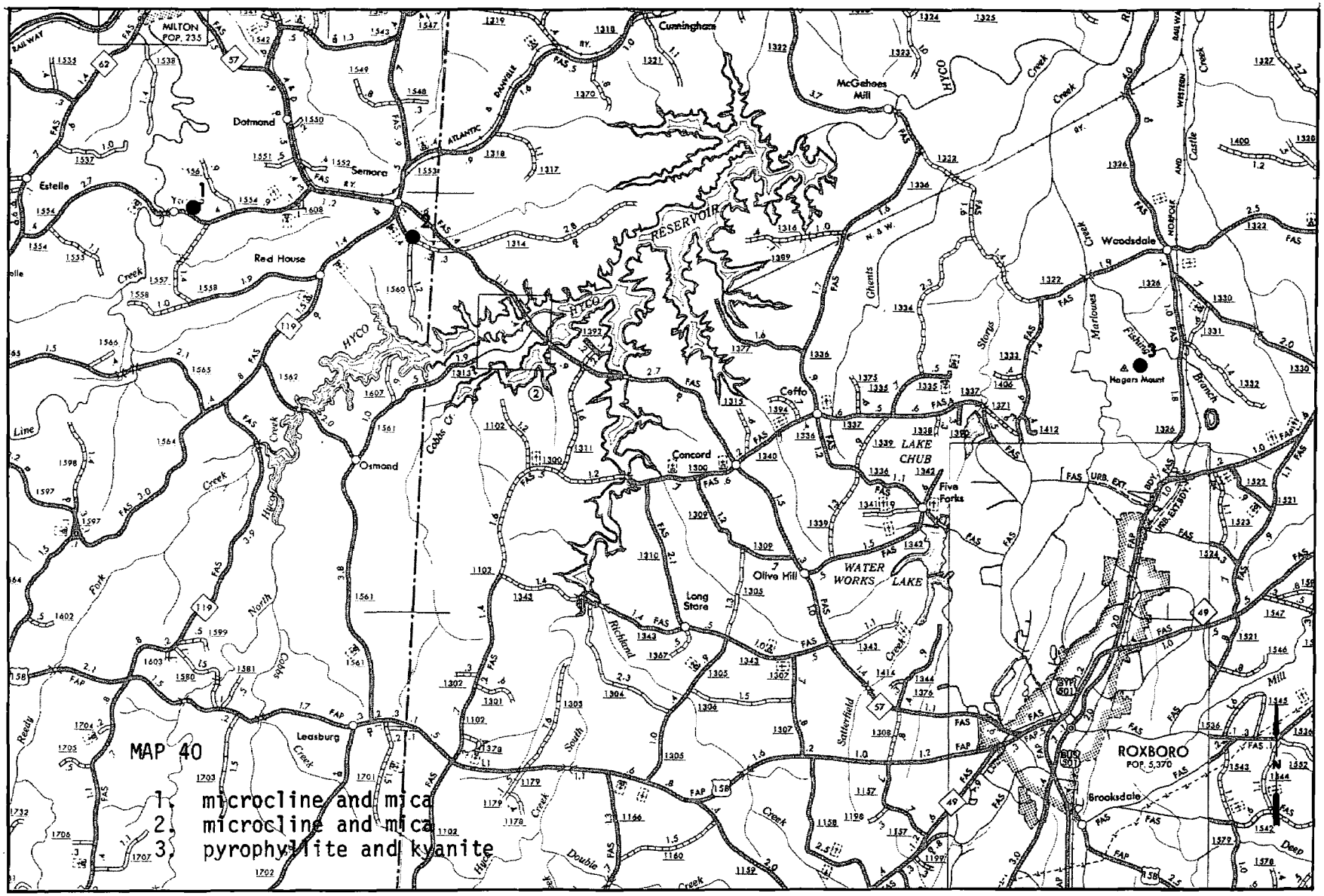

MAP 35
1. iron
2. McCullough Mine
3. Gardner Hill Mine
4. Fisher Hill Mine
5. hornblende
GREENSBORO
POP. 144,076
BUFFALO LAKE
Colfax
Friendship
Greensboro-High Point Airport
Guilford College
Guilford
Deep River
LAKE HIGH POINT
Sedgefield
JAMESTOWN POP. 1,297
Groomtown
Vandalia
Pleasant Garden

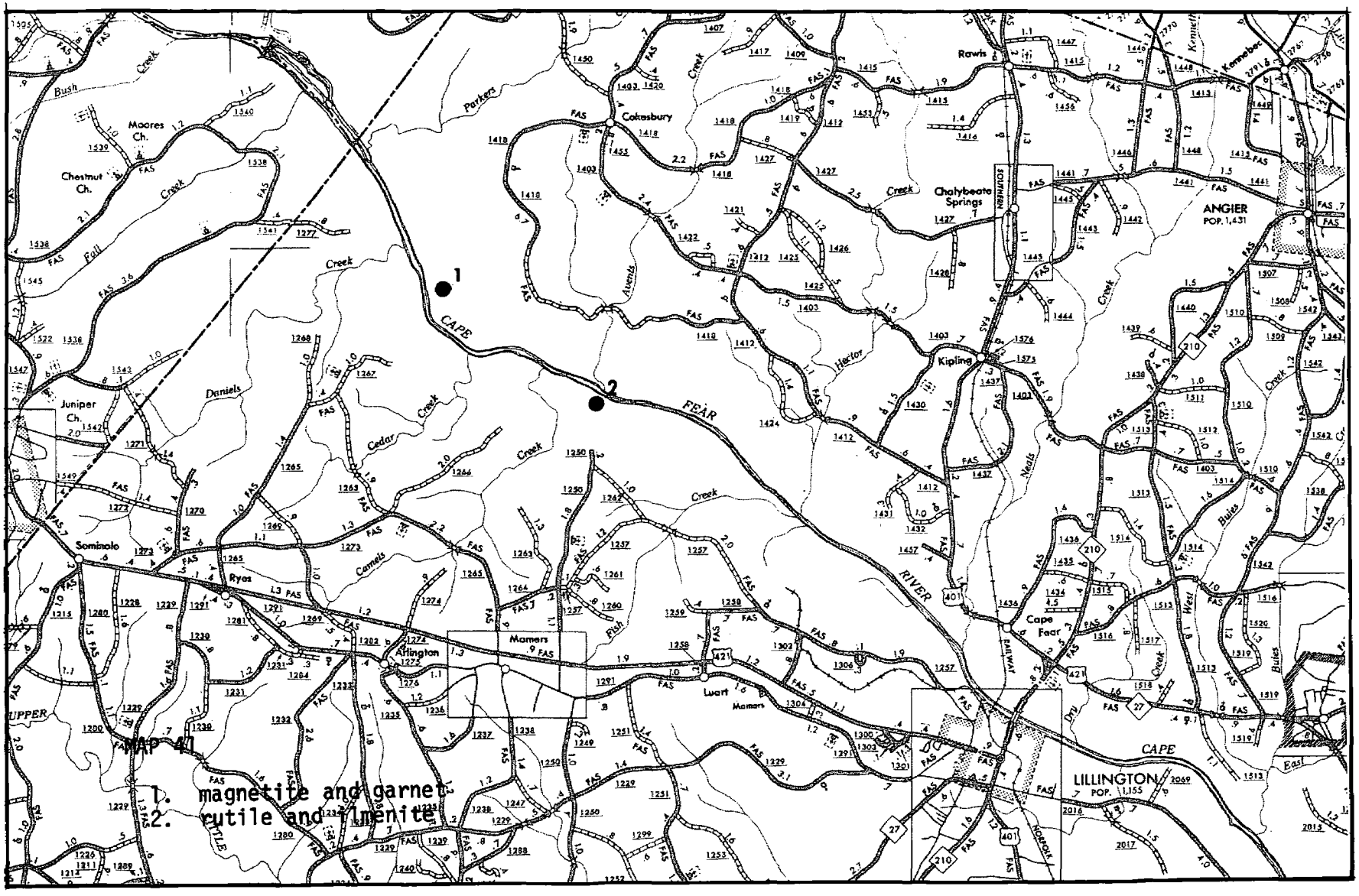

MAP 36
1. limonite and goethite
2. pyrophyllite
3. pyrophyllite
4. azurite and malachite
Mt. Vernon Springs
Ore Hill
Brush Creek Ch.
Bonlee
Shady Branch Ch.
Bear Creek
Graves Chp.
Harpers Crossroads
Tysons Cr. Ch.
Bear Cr. Ch.
GOLDSTON
POP. 364
Carbonton Ch.
Carbonton
Haw Branch
Glendon
Glendon Ch.
Cool Springs Ch.
McConnell
Falls
Putnam
Parkwood
RIVER
DEEP
Brush Creek
Tick Creek
Bear Creek
Little Bear Cr.
Indian Creek
Little Falls Creek
Buffalo Creek
Big Crawley Creek
SOUTHERN RAILWAY
NORFOLK SOUTHERN
FAS
902
42
421

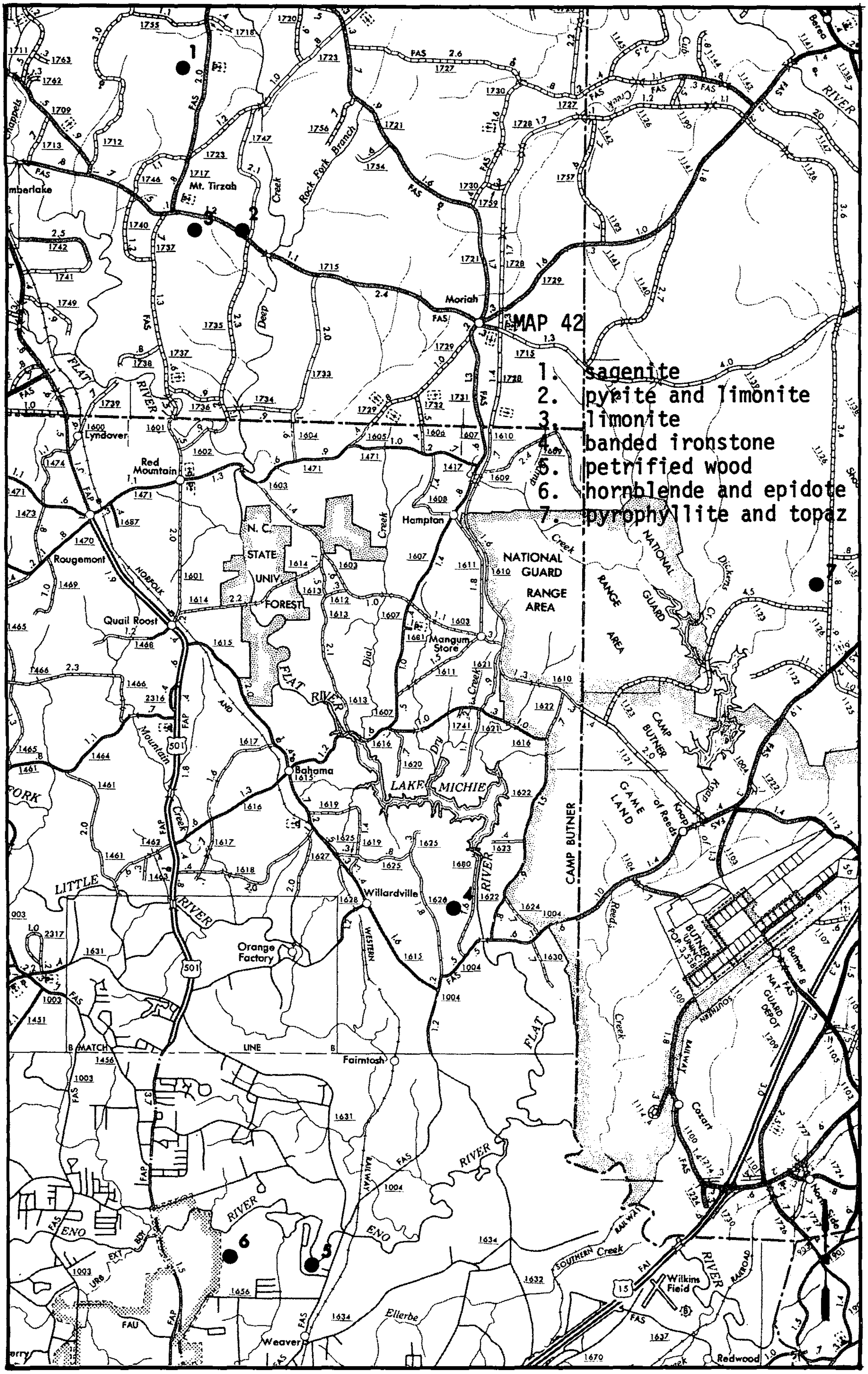

MAP 37
1. pyrophyllite
2. quartz crystals
3. quartz crystals
4. quartz crystals
5. pyrophyllite
LIBERTY
POP. 2,167
STALEY
POP. 239
Sandy Crook Ch.
Whites Chapel
Rock Creek Ch.
Oak Grove
Pleasant Hill Ch.
Sylvan Sch.
Snow Camp
Bethel Ch.
Victory Chapel
Sutphin
Bethlehem Ch.
South Fork Ch.
Plainfield Ch.
Crutchfield Crossroads
Rocky River Ch.
Silk Hope
ROCKY RIVER
SOUTHERN
Cane Creek
Reedy Branch
Lacys Creek
N

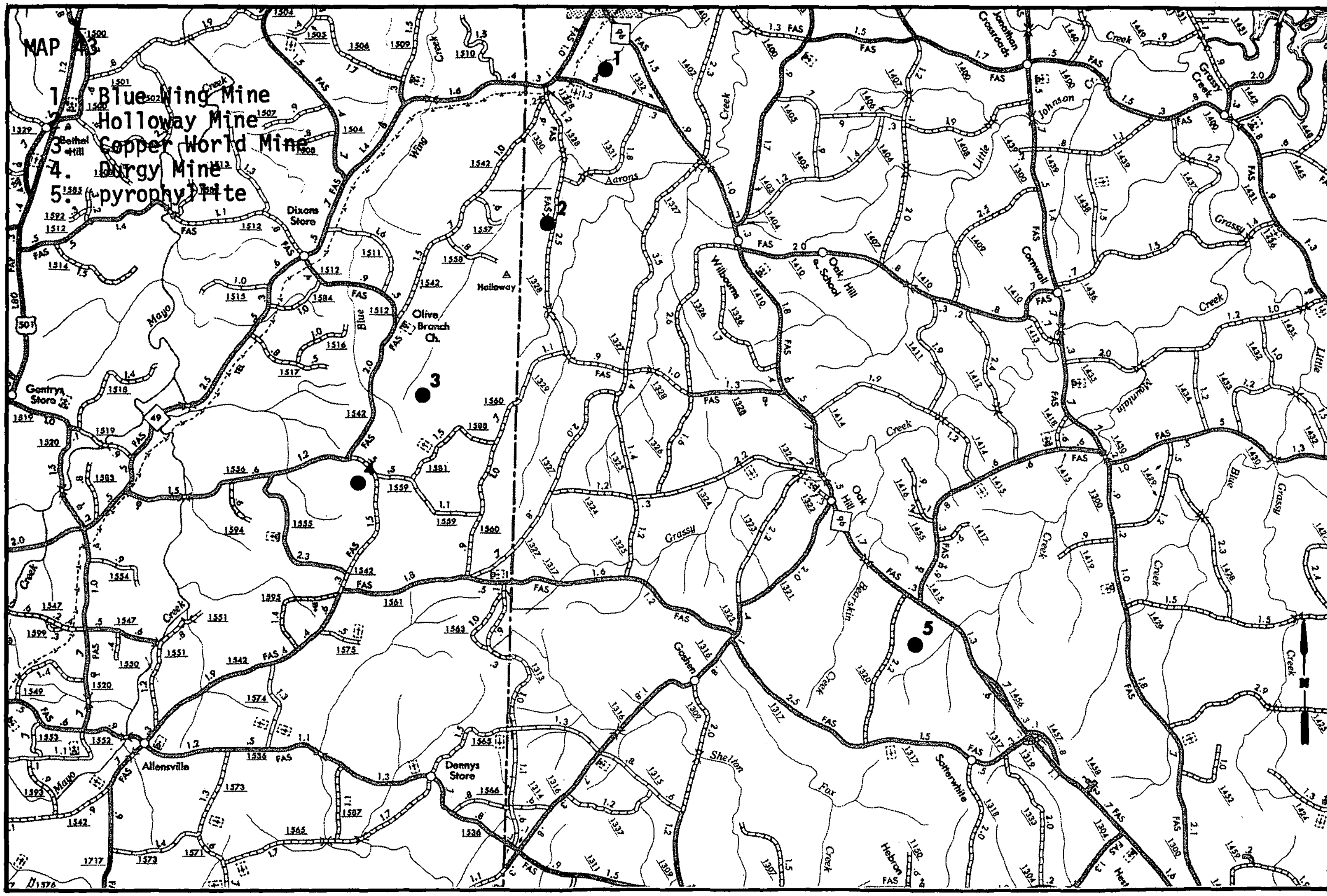

MAP 38
1. copper minerals
2. fossils
3. gold
4. gold
SANFORD
POP. 11,716
SANFORD WATER WORKS
Chatham Ch.
Center Grove Ch.
Mt. View Ch.
Mays Chapel
Taylors Ch.
Antioch Ch.
Blacknel
Rosser
Osgood
Colon
Cumnock
Gulf
Cool Springs Ch.
Pocket Ch.
Hope
Tramway
W. SAN-FORD (UNINC.)
RIVER
ROCKY
Bear Creek
Copper Mine Creek
Fork Creek
Gum
Buffalo
Big
Little
Hughes
Roberts Creek
Wallace Branch
Lick
Patterson Creek
Raccoon
Pocket Creek
Dry Fork Creek
Carrs Creek
SOUTHERN
NORFOLK
SEABOARD
COAST LINE
RAILROAD

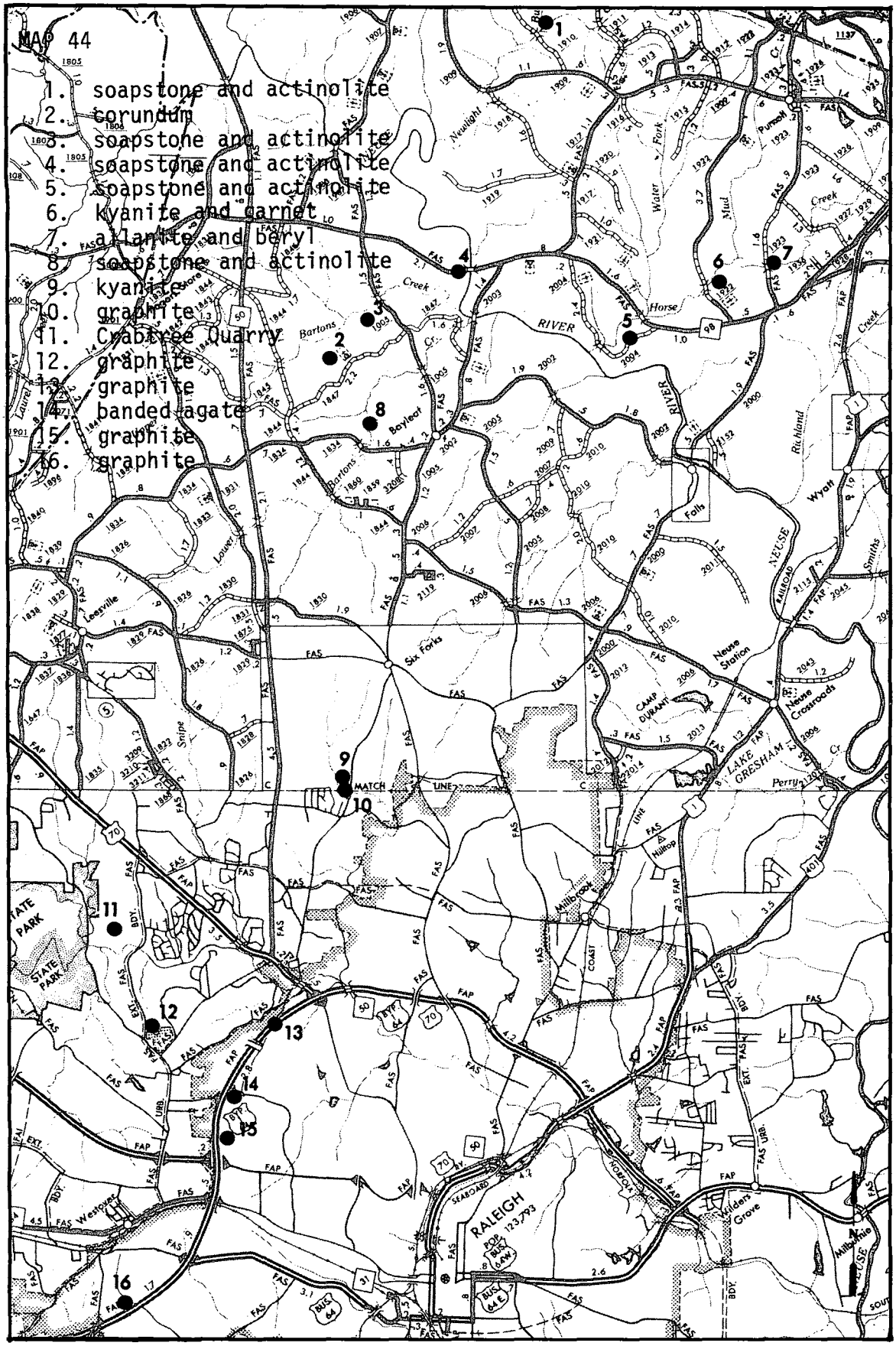

MAP 39
1. pyrophyllite
2. barite
3. pyrophyllite
4. hematite
HILLSBOROUGH
POP. 1,444
W. HILLSBOROUGH (UNINC.)
Efland
Miles
Cheeks Crossroads
Buckhorn
DUKE FOREST
University
Orange Grove
Dodsons Crossroads
Teer
Blackwood Station
Eubanks
Calvander
Horace Williams Airport
CARRBORO
POP. 5,058
White Cross
UNIVERSITY LAKE
Cedar Grove Ch.
ENO
HAW

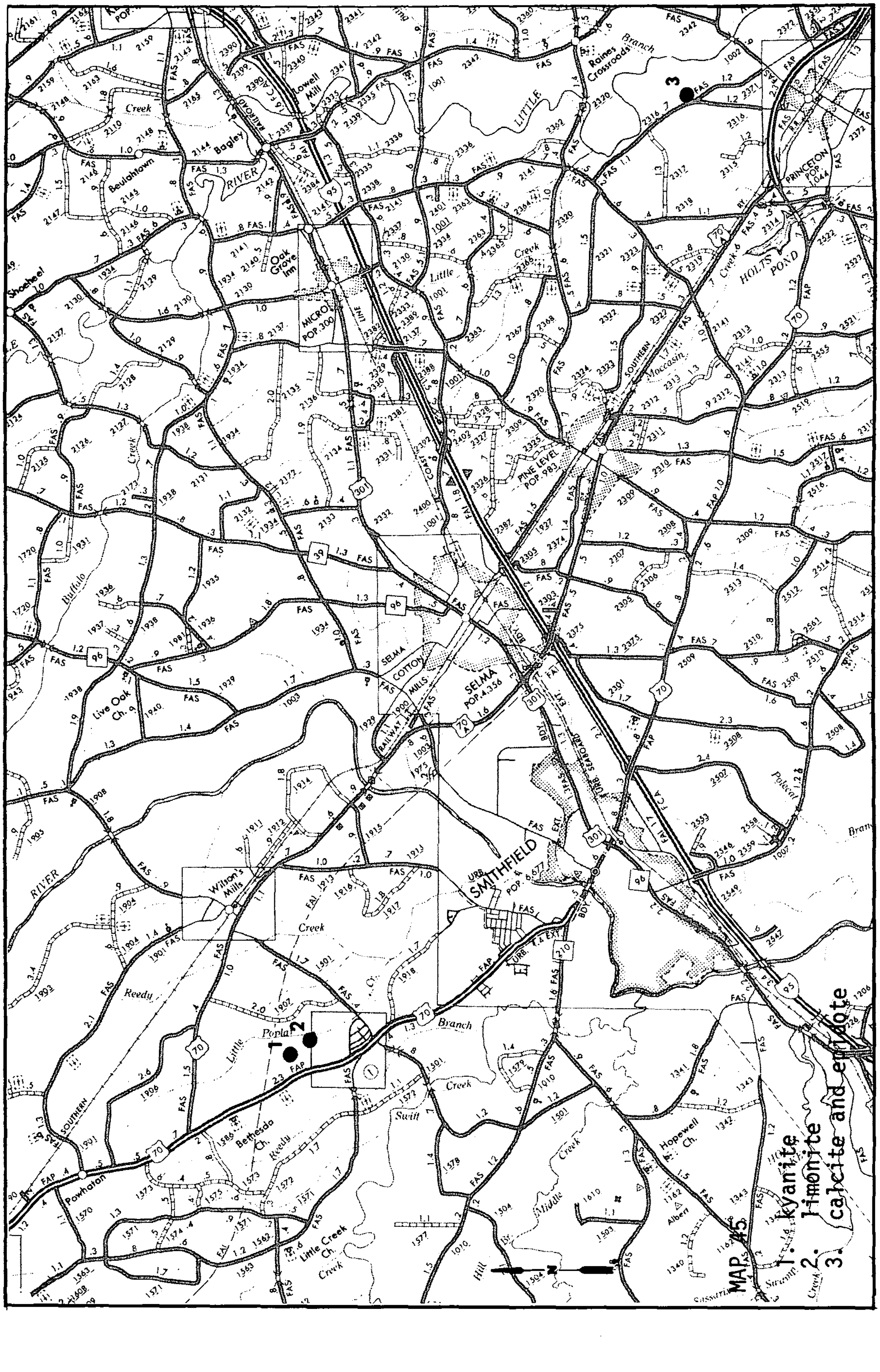

MILTON
POP. 235
Dotmond
Semora
Estelle
Red House
Osmond
Cunningham
McGehees Mill
RESERVOIR
Woodsdale
Hagers Mount
Coffo
Concord
Five Forks
LAKE CHUB
WATER WORKS LAKE
Olive Hill
Long Store
Leasburg
ROXBORO
POP. 5,370
Brooksdale
MAP 40
1. microcline and mica
2. microcline and mica
3. pyrophyllite and kyanite

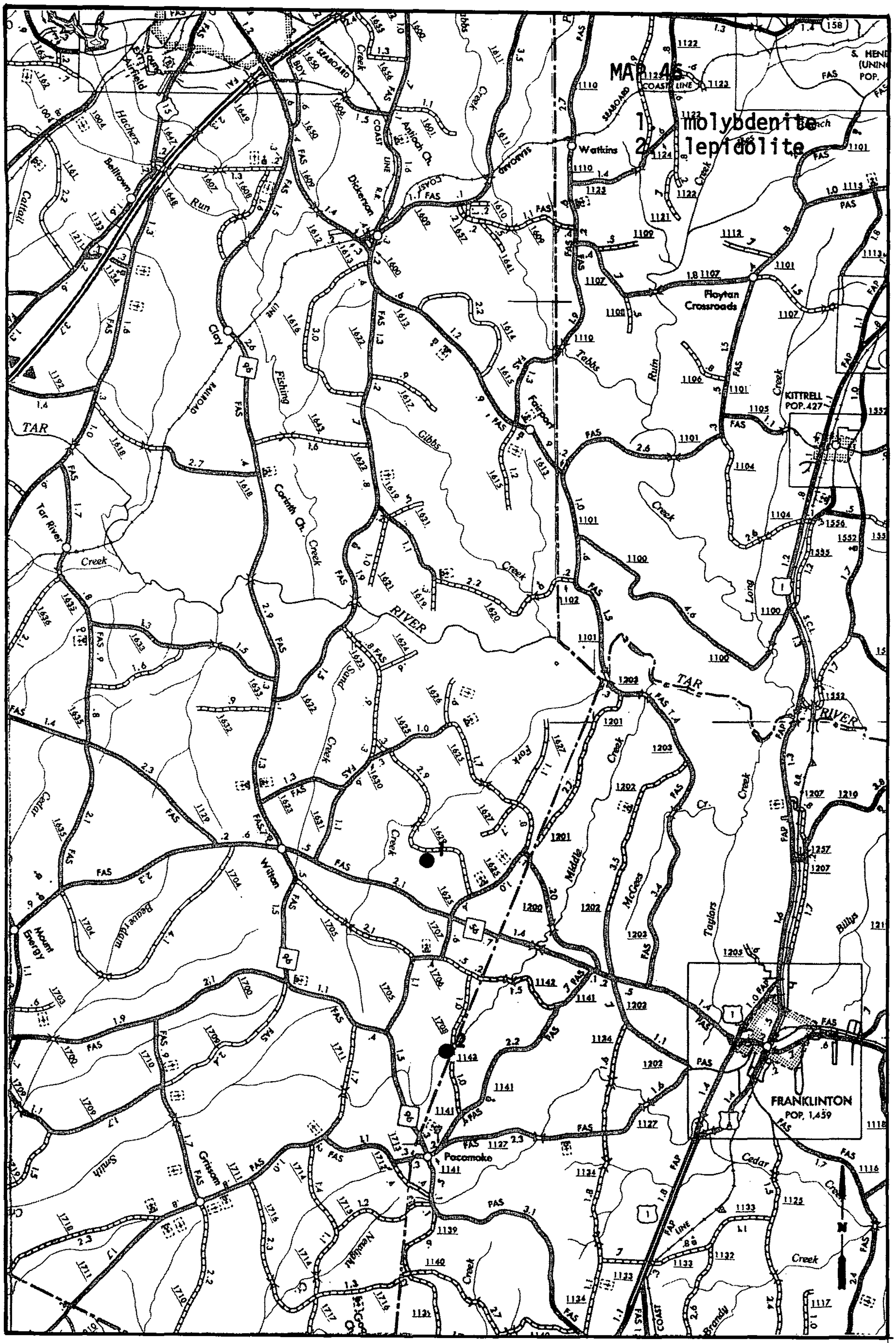

1
2
CAPE FEAR RIVER
Rawls
Cokesbury
Chalybeate Springs
ANGIER
POP. 1,431
Kipling
Sominole
Ryes
Juniper Ch.
Chestnut Ch.
Moores Ch.
Arlington
Mamers
Lwart
Cape Fear
LILLINGTON
POP. 1,155
Bush Creek
Parkers Creek
Fall Creek
Daniels Creek
Cedar Creek
Camels Creek
Fish Creek
Avents Creek
Hector Creek
Neuls Creek
West Buies Creek
East Buies Creek
Dry Creek
Kennebec
UPPER
CAPE
MAP 41
1. magnetite and garnet
2. rutile and ilmenite

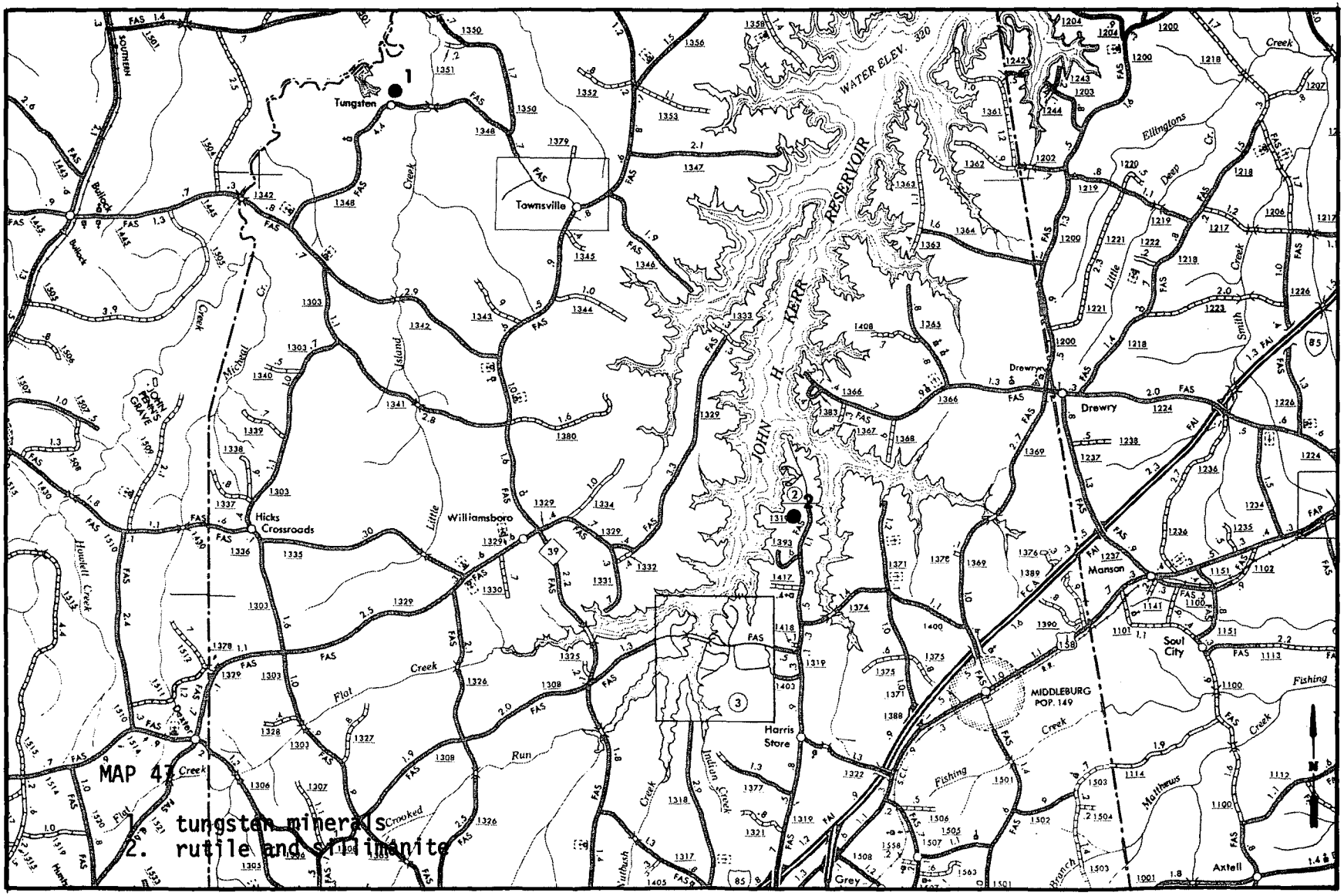

MAP 42
1. sagenite
2. pyrite and limonite
3. limonite
4. banded ironstone
5. petrified wood
6. hornblende and epidote
7. pyrophyllite and topaz
Mt. Tirzah
Moriah
Lyndover
Red Mountain
Rougemont
Hampton
N. C. STATE UNIV. FOREST
NATIONAL GUARD RANGE AREA
Quail Roost
Mangum Store
Bahama
LAKE MICHIE
Willardville
Orange Factory
CAMP BUTNER
GAME LAND
BUTNER
NAT. GUARD DEPOT
Fairntosh
Cozart
Weaver
Wilkins Field
Redwood
FLAT RIVER
LITTLE RIVER
ENO RIVER

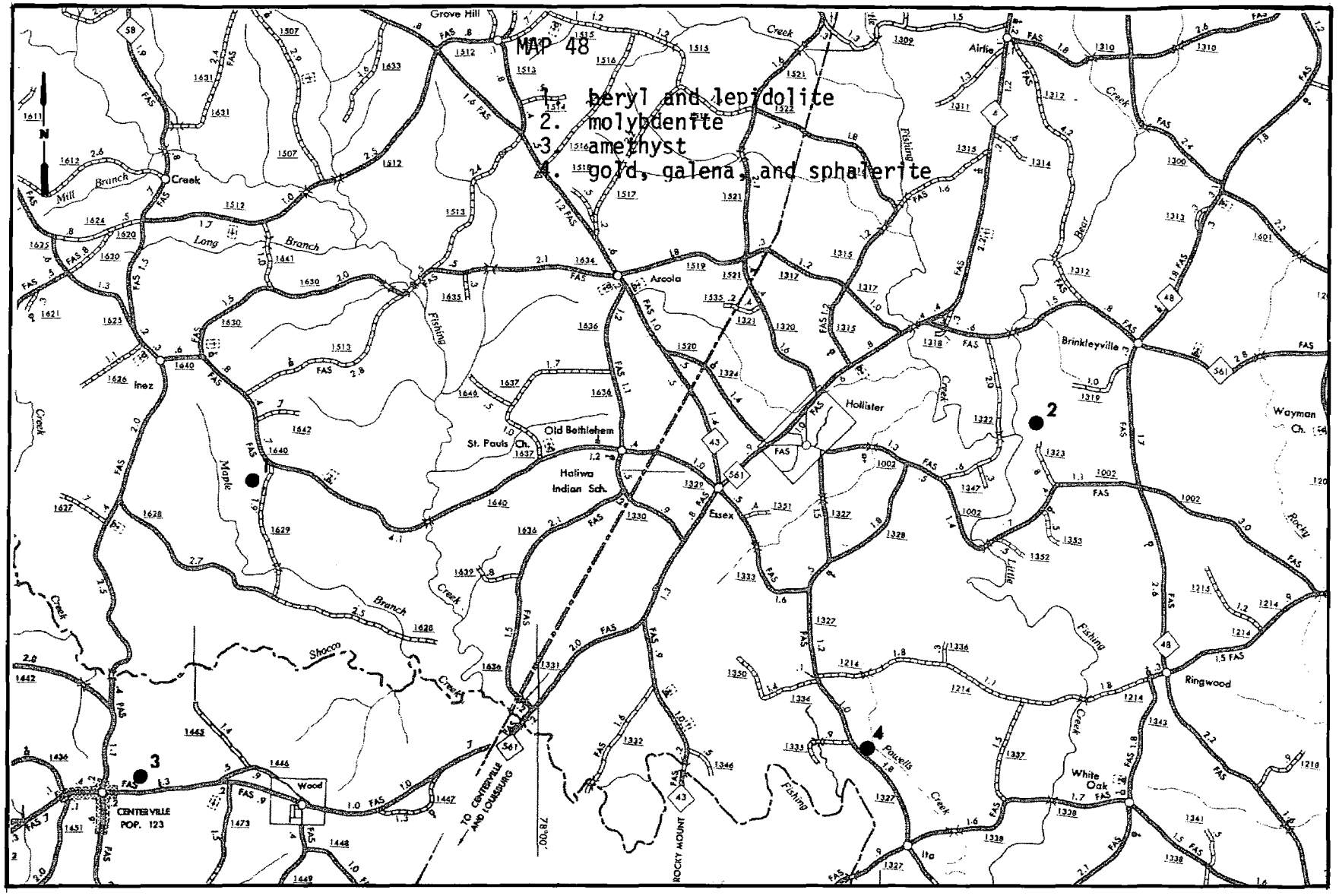

MAP 43
1. Blue Wing Mine
2. Holloway Mine
3. Copper World Mine
4. Durgy Mine
5. pyrophyllite
Bethel Hill
Dixons Store
Holloway
Olive Branch Ch.
Gentrys Store
Allensville
Dennys Store
Oak Hill School
Oak Hill
Goshen
Satterwhite
Jonathan Crossroads
Aarons
Wilbourns
Cornwall
Mayo
Blue Wing
Grassy Creek
Little Creek
Johnson
Mountain
Shelton
Fox Creek
Hebron
Beerskin
Blue
Heat


MAP 44
1. soapstone and actinolite
2. corundum
3. soapstone and actinolite
4. soapstone and actinolite
5. soapstone and actinolite
6. kyanite and garnet
7. allanite and beryl
8. soapstone and actinolite
9. kyanite
10. graphite
11. Crabtree Quarry
12. graphite
13. graphite
14. banded agate
15. graphite
16. graphite
MATCH LINE
RALEIGH
POP 123,793
Six Forks
Falls
Neuse Station
Neuse Crossroads
CAMP DURANT
LAKE GRESHAM
Wilders Grove
Millbrook
Leesville
Barton's
Bayleaf
Horse
RIVER
Richland
Wyatt
Perry
Hilltop
STATE PARK
Westgate
SEABOARD
COAST
NORFOLK
RAILROAD


MAP 45
1. kyanite
2. limonite
3. calcite and epidote
SMITHFIELD
SELMA
PINE LEVEL
PRINCETON
MICRO
Wilson's Mills
Powhatan
Oak Grove Inn
Bagley
Beulahtown
Raines Crossroads
Live Oak Ch.
Bethesda Ch.
Hopewell Ch.
Little Creek Ch.
HOLTS POND


MAP 45
1. molybdenite
2. lepidolite
Watkins
Flaytan Crossroads
KITTRELL POP. 427
Fairport
Clay
Corinth Ch.
Tar River
TAR
RIVER
Fishing
Gibbs
Creek
Tabbs
Ruin
Long
Sand
Fork
Middle
McGees
Taylors
Billys
Cedar
Mount Energy
Wilton
Pacomoke
Grissom
Smith
FRANKLINTON POP. 1,459
Belltown
Hachers
Run
Dickerson
Antioch Ch.
SEABOARD
COAST LINE
RAILROAD
Brandy
N


Tungsten
Townsville
Williamsboro
Hicks Crossroads
Drewry
Manson
Soul City
Harris Store
MIDDLEBURG POP. 149
Grey
Axtell
JOHN H. KERR RESERVOIR
WATER ELEV. 320
JOHN PENN'S GRAVE
MAP 47
1. tungsten minerals
2. rutile and sillimanite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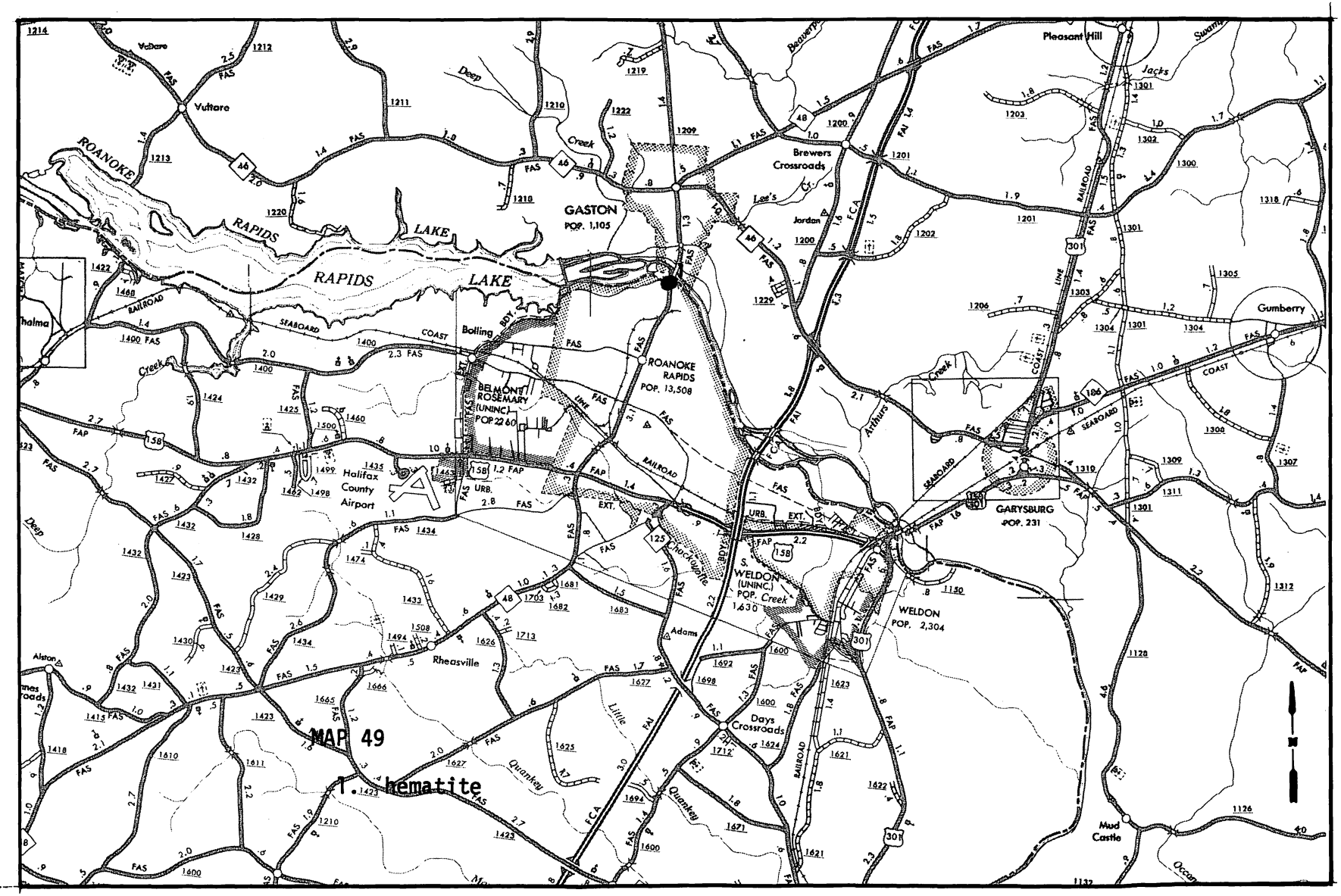
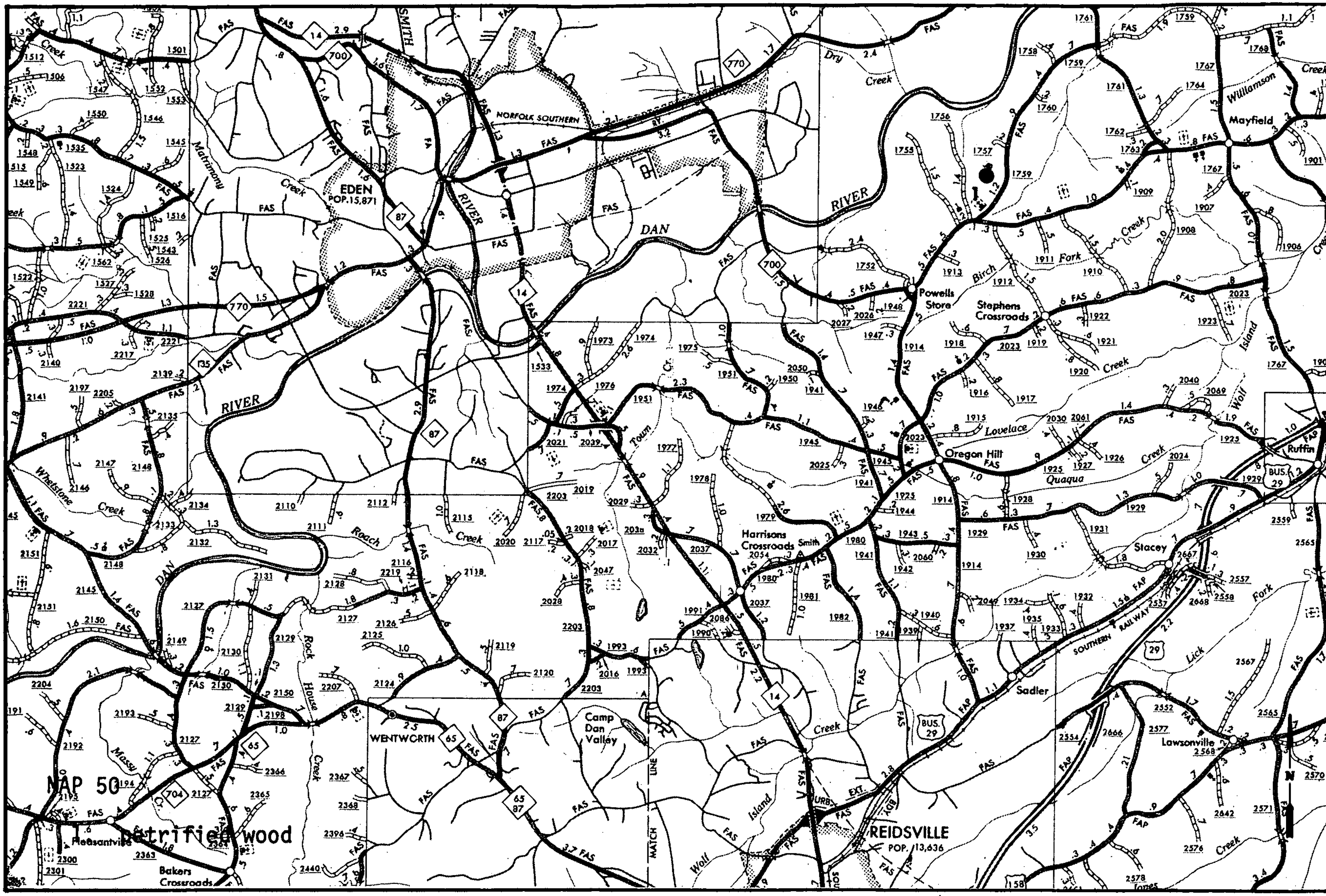
1. beryl and lepidolite
2. molybdenite
3. amethyst
4. gold, galena, and sphalerite
Grove Hill
Airlie
Creek
Mill Branch
Long Branch
Arcola
Fishing Creek
Bear Creek
Brinkleyville
Inez
Hollister
Old Bethlehem
St. Pauls Ch.
Haliwa Indian Sch.
Essex
Wayman Ch.
Rocky Creek
Maple Creek
Shocco Creek
Branch
Little Fishing Creek
Ringwood
White Oak
Powells Creek
Ita
Wood
CENTERVILLE POP. 123
TO CENTERVILLE AND LOUISBURG
ROCKY MOUNT
78.00'
1
2
3
4


ROANOKE RAPIDS LAKE
GASTON
POP. 1,105
ROANOKE RAPIDS
POP. 13,508
BELMONT-ROSEMARY (UNINC.) POP. 2260
Halifax County Airport
Brewers Crossroads
Lee's
Jordan
Pleasant Hill
Gumberry
GARYSBURG
POP. 231
S. WELDON (UNINC.) POP. 1630
WELDON
POP. 2,304
Days Crossroads
Rheasville
Alston
Vultare
Thalma
Bolling
Adams
Arthurs
Mud Castle
Deep Creek
Little Quankey
Jacks Swamp
SEABOARD COAST LINE RAILROAD
MAP 49
T. Hematite


EDEN
POP. 15,871
REIDSVILLE
POP. 13,636
MAP 50
petrified wood
DAN RIVER
SMITH RIVER
NORFOLK SOUTHERN
SOUTHERN RAILWAY
Powells Store
Stephens Crossroads
Mayfield
Oregon Hill
Ruffin
Harrisons Crossroads
Stacey
Sadler
Lawsonville
WENTWORTH
Camp Dan Valley
Pleasantville
Bakers Crossroads
Matrimony Creek
Dry Creek
Williamson Creek
Birch Fork Creek
Lovelace Creek
Quaqua Creek
Wolf Island Creek
Lick Fork Creek
Whetstone Creek
Roach Creek
Rock House Creek
Massy Creek
Town Cr.
Jones Creek
MATCH LINE
FAS
FAP

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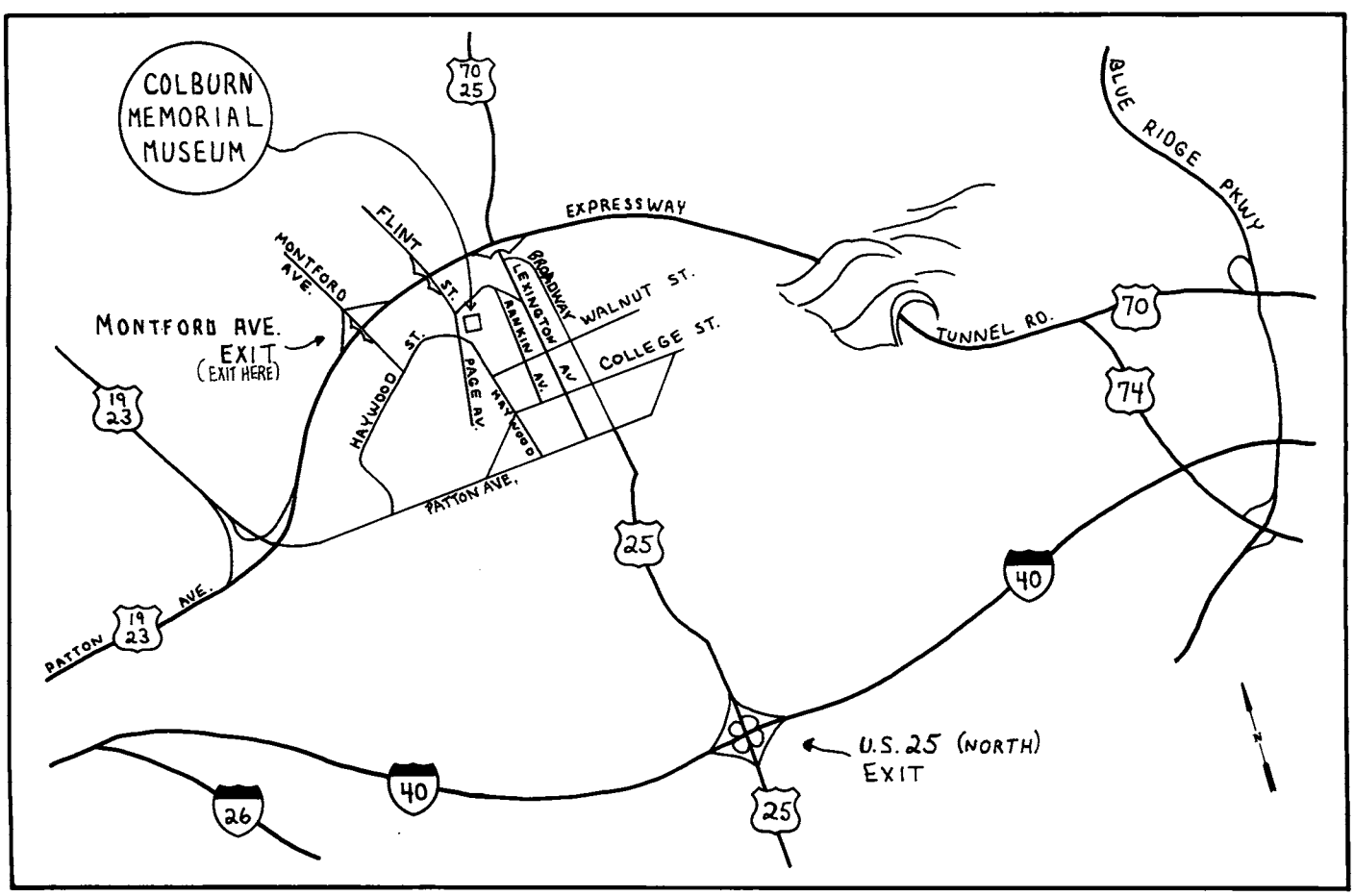
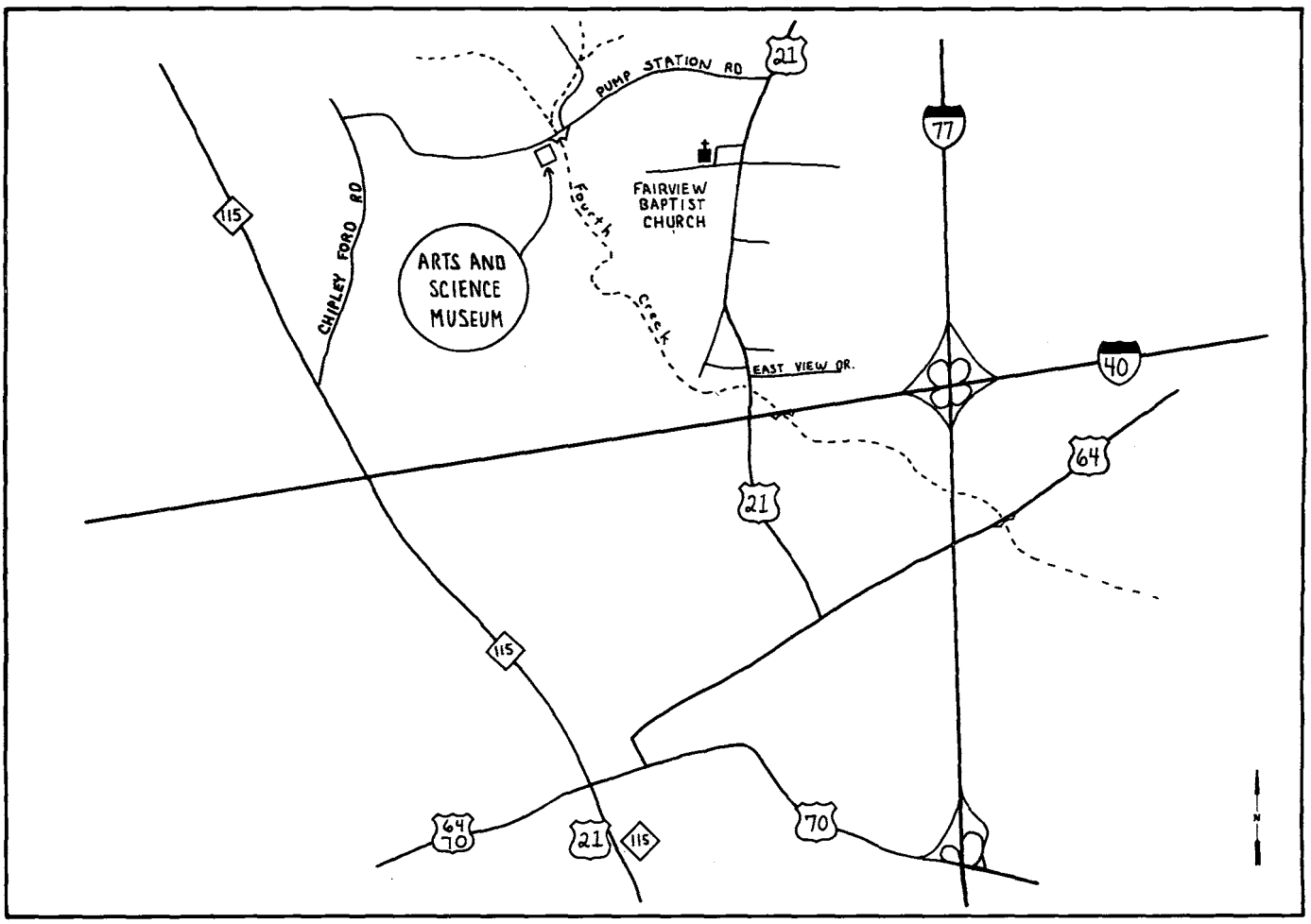
APPENDIX 2 - A Guide to Museums with Mineral or Earth Science Displays[1/]

The museums are indicated on the State Highway Map by the circles with numbers inside. The following list describes particular features of each museum:

A	Conducted tours for school groups by appointment	H	Rocks and/or mineral exhibits
B	Local geomorphology or geology exhibits	I	Invertebrate fossil exhibits
C	Museum open by appointment only	J	Vertebrate fossil exhibits
D	Printed museum guide available	K	Geophysics (solid earth) exhibits
E	Special teacher's guide available	L	Mining geology exhibits
F	Earth science publications for sale	M	Petroleum geology exhibits
G	Special public education program and/or classes offered	N	Astronomy exhibits
		O	Meteorology exhibits
		P	Oceanography exhibits

[1/] Modified from Mineral, Fossil and Rock Exhibits and Where to see Them, compiled by W. H. Matthews, III, AGI.

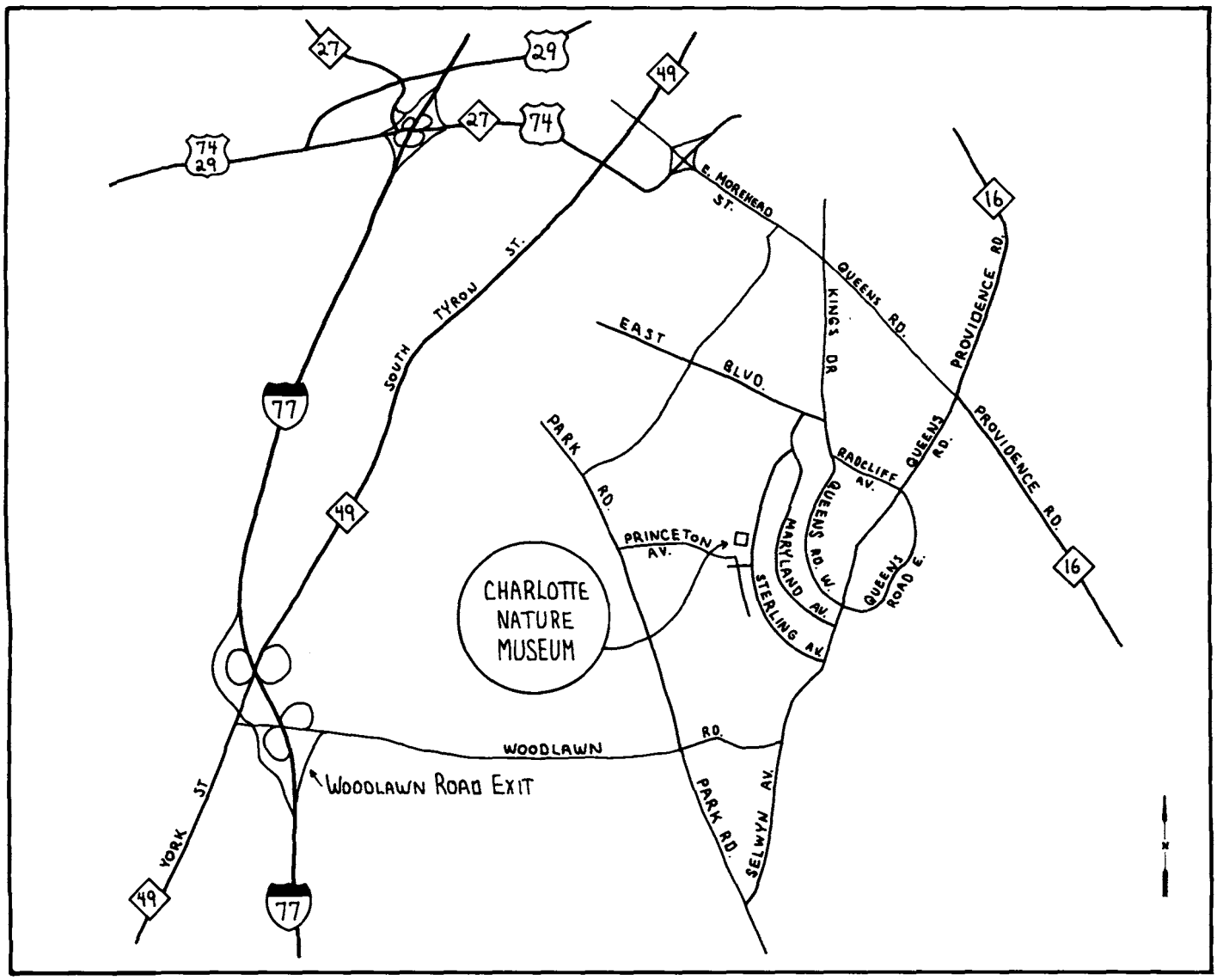




1 Arts and Science Museum: P. O. Box 585, Pump Station Rd. / Statesville, N. C. 28677 (704-872-7576); open Tuesday through Sunday, 2 P.M. to 5 P.M.; admission free; A, B, C, H.

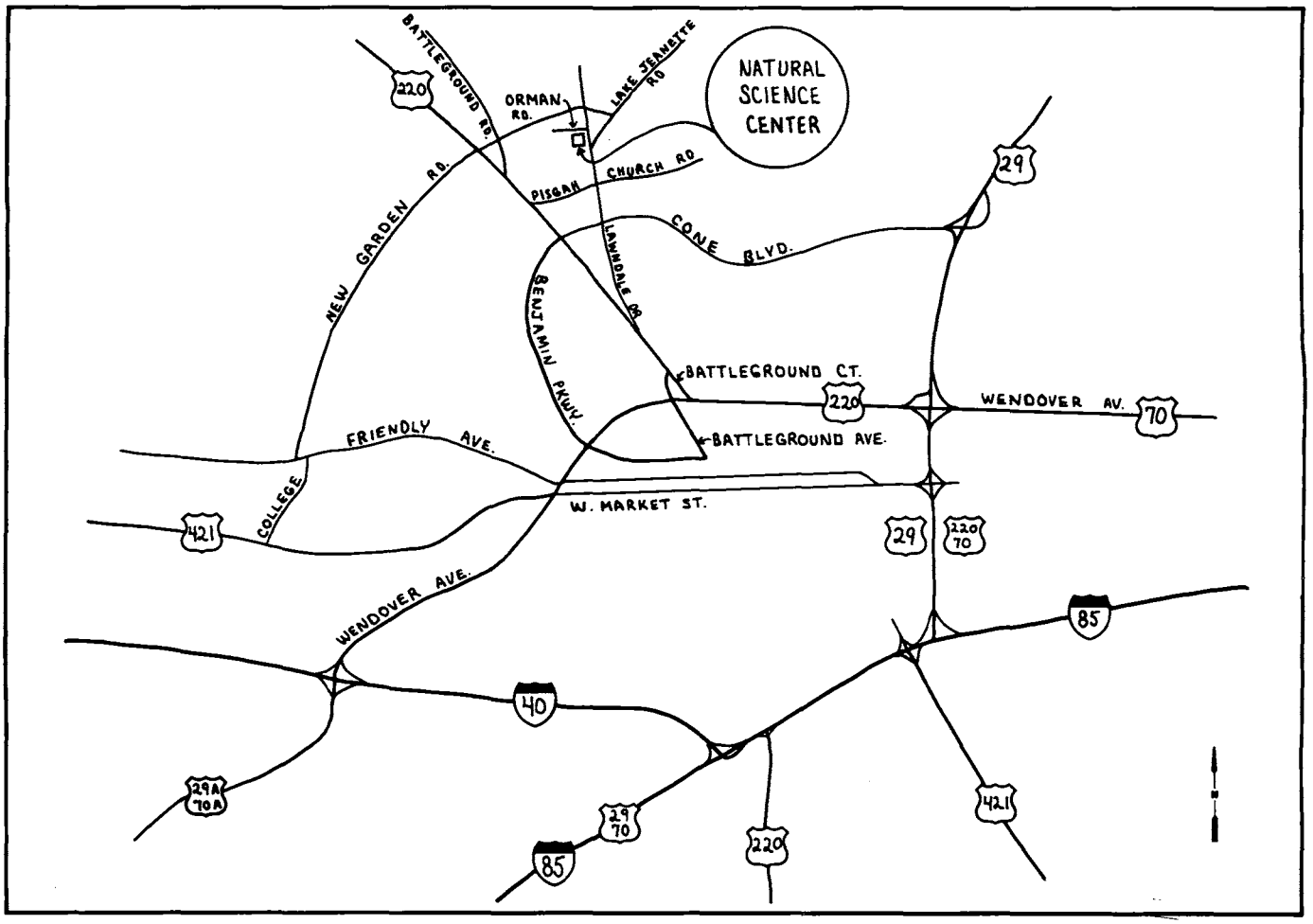
2 Colburn Memorial Museum: Civic Center / Haywood St. / Asheville, N. C. 28801 (704-254-7162); open Tuesday through Friday, 10 A.M. to 5 P.M., Saturday and Sunday, 1 P.M. to 5 P.M., closed Mondays; admission free.

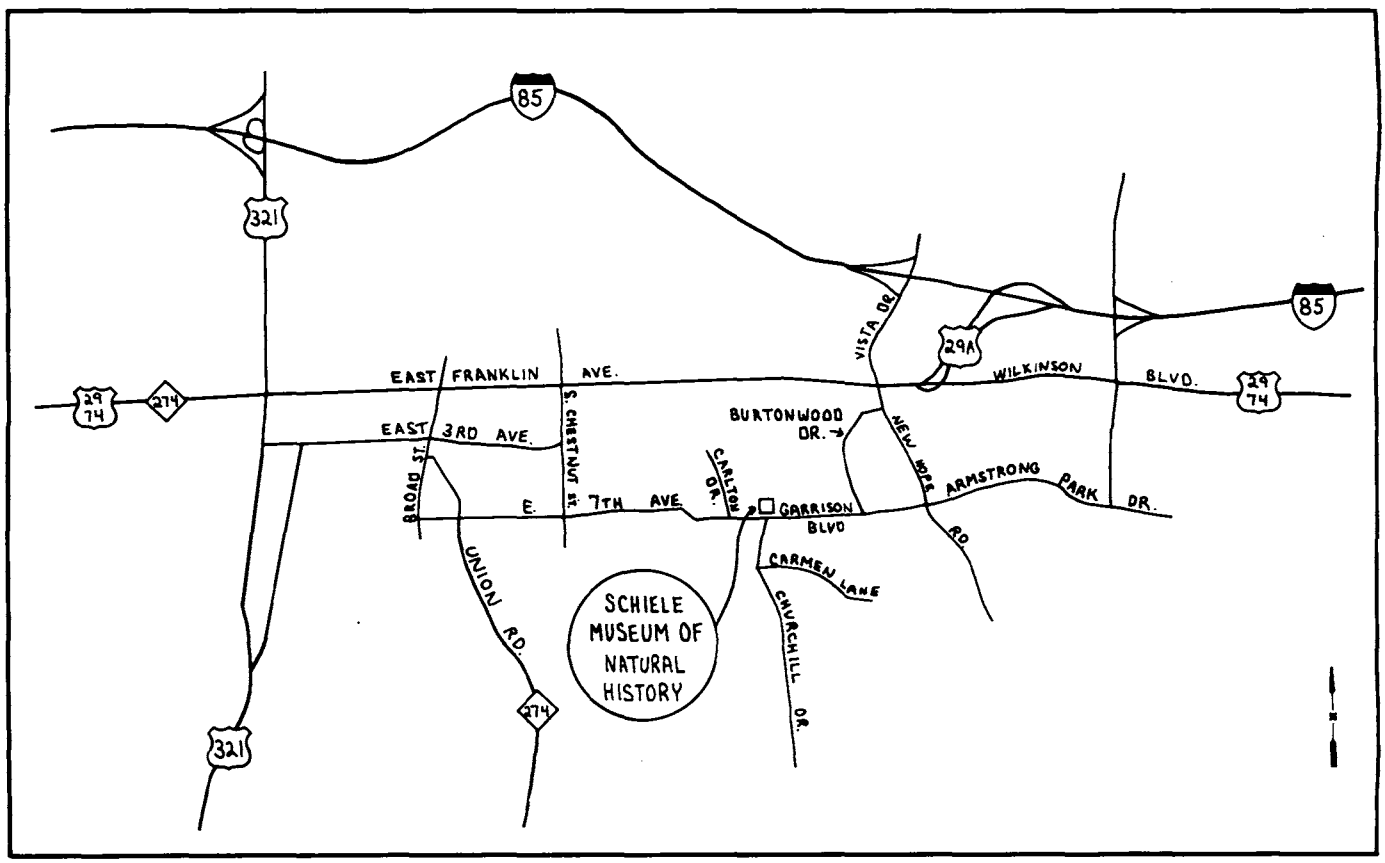
3 Natural Science Center of Greensboro: 4301 Lawndale Dr. / Greensboro, N. C. 27408 (919-288-3769); open Monday through Saturday, 9 A.M. to 5 P.M., Sunday, 2 P.M. to 5 P.M.; admission (to planetarium) $1.50, (to zoo) adults 50¢, children 25¢, (to museum) free; A, F, G, H, I, J, N, O, P.



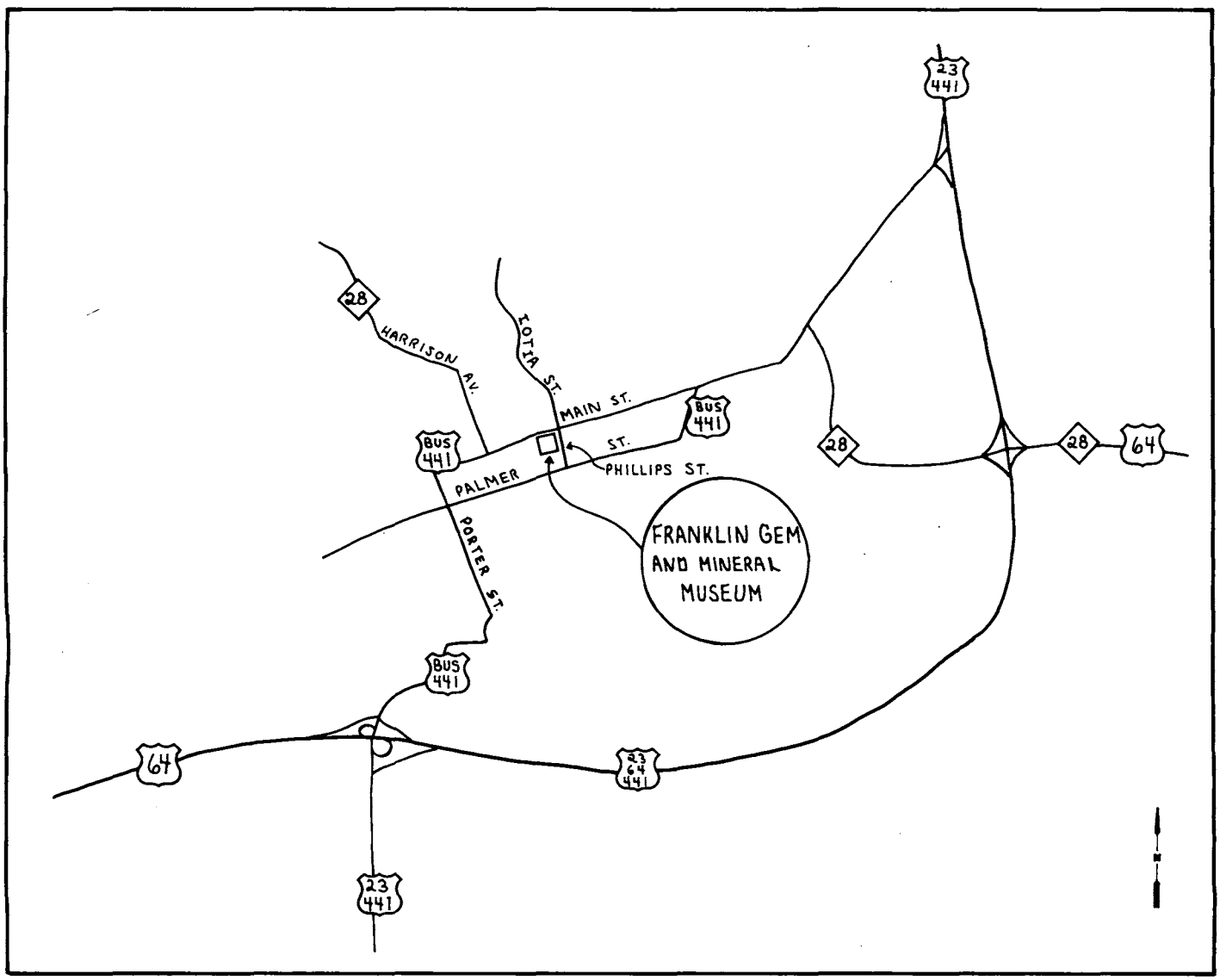
4 Charlotte Nature Museum: 1658 Sterling Rd. / Charlotte, N. C. 28209 (704-333-0506); open Monday through Saturday, 9 A.M. to 5 P.M.; admission free; A, E, F, G, H, N.

5 Schiele Museum of Natural History and Planetarium: 1500 Garrison Blvd. / Gastonia, N. C. 28052 (704-864-3962); open Tuesday through Friday, 9 A.M. to 5 P.M., weekends, 2 P.M. to 5 P.M.; admission free; A, D, E, F, H, I, J, L, M, P.


NATURAL SCIENCE CENTER
BATTLEGROUND RD.
220
ORMAN RD.
LAKE JEANETTE RD.
CHURCH RD.
PISGAH
NEW GARDEN RD.
LAWNDALE DR.
BENJAMIN PKWY.
CONE BLVD.
29
BATTLEGROUND CT.
220
WENDOVER AV.
70
BATTLEGROUND AVE.
FRIENDLY AVE.
COLLEGE
421
W. MARKET ST.
29
220
70
WENDOVER AVE.
85
40
29A
70A
29
70
85
220
421

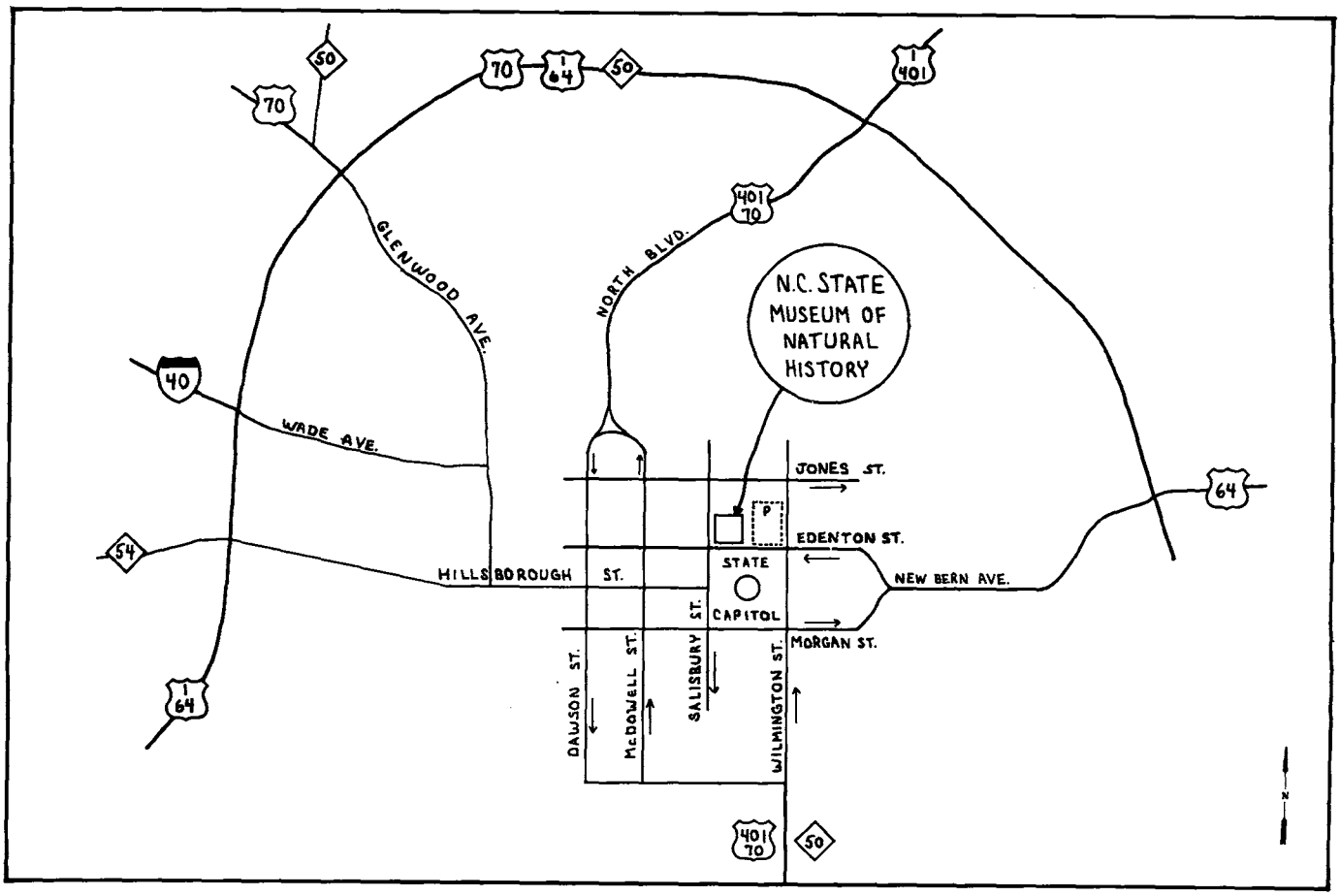

85
321
85
29A
VISTA DR.
EAST FRANKLIN AVE.
WILKINSON BLVD.
29
74
274
29
74
EAST 3RD AVE.
S. CHESTNUT ST.
BURTONWOOD DR.
NEW HOPE RD.
BROAD ST.
CARLTON DR.
E. 7TH AVE.
GARRISON BLVD
ARMSTRONG PARK DR.
CARMEN LANE
UNION RD.
SCHIELE MUSEUM OF NATURAL HISTORY
CHURCHILL DR.
274
321

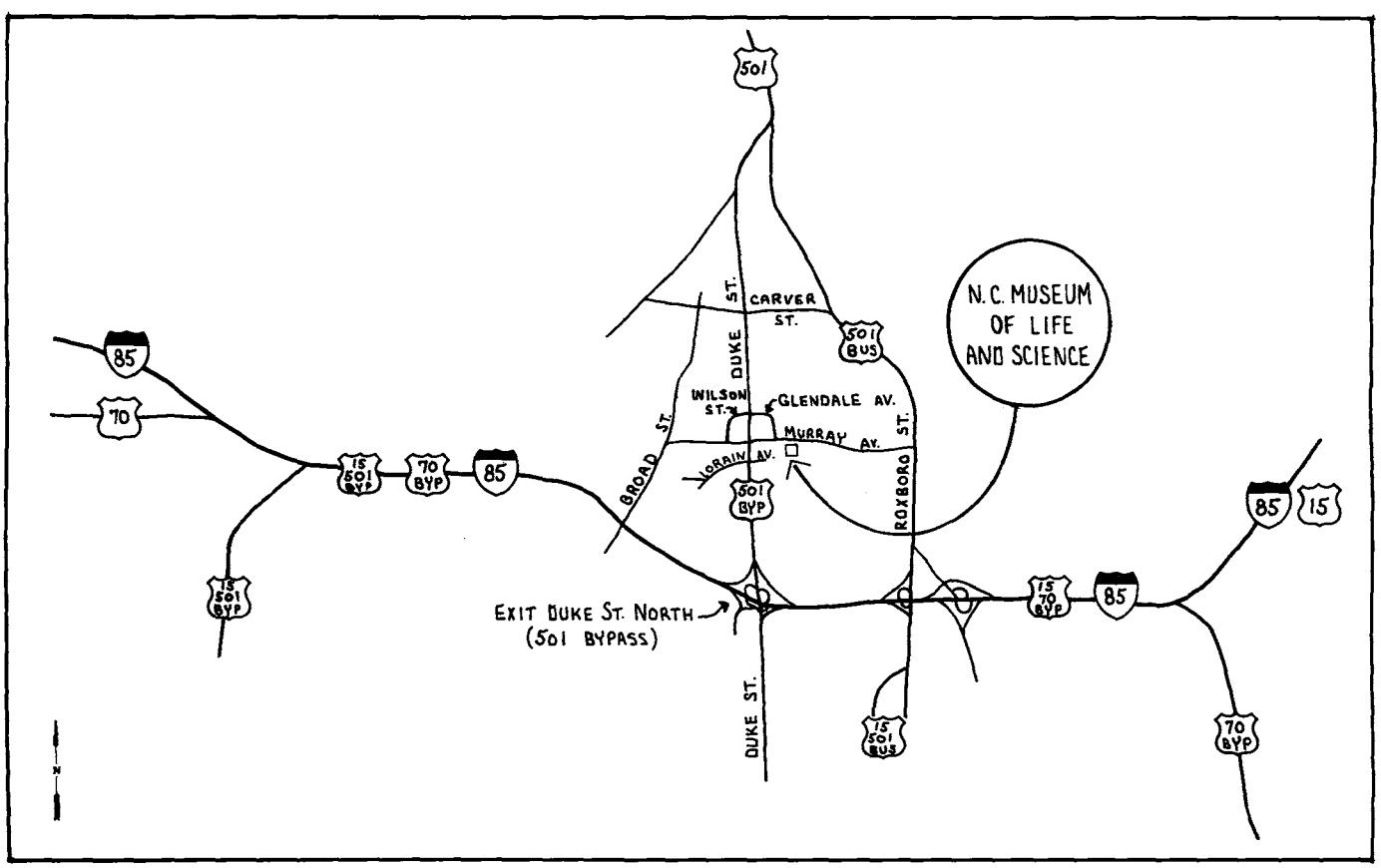
6 North Carolina State Museum of Natural History: 101 Halifax St. / Raleigh 27609 (919-733-7450); open Monday through Saturday, 9 A.M. to 5 P.M., Sunday, 2 P.M. to 5 P.M.; admission free; A, B, D, F, G, H, I, J, K, O.



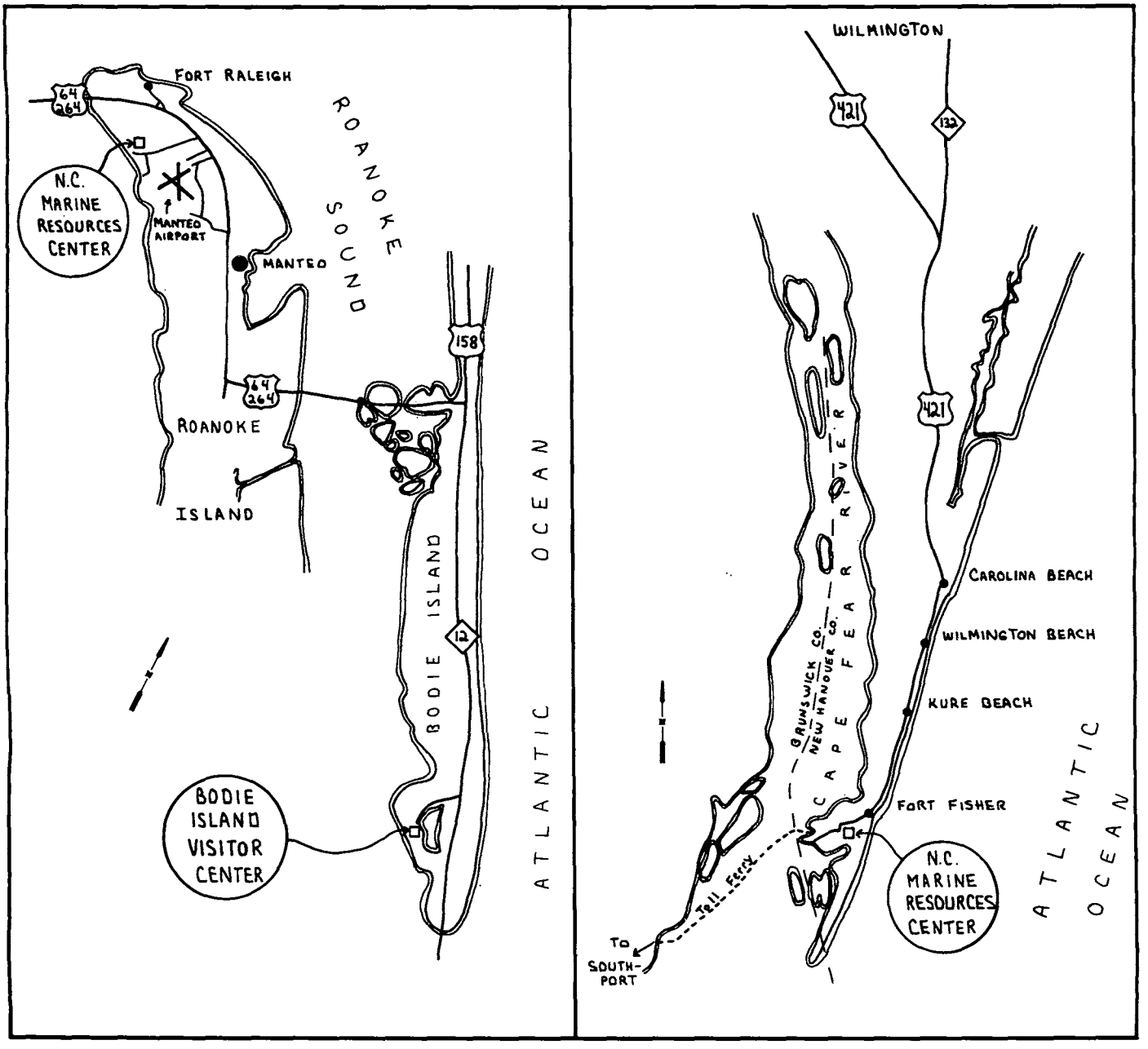
7 Franklin Gem and Mineral Museum: 2 West Main St. / Franklin, N. C. 28734 (704-524-7585); open May 15 to November 1, Monday through Saturday 10 A.M. to 4 P.M.; admission free; H.

8 North Carolina Museum of Life and Science: 433 Murray Ave. / Durham, N. C. 27704 (919-477-0431); open Tuesday through Saturday, 10 A.M. to 5 P.M., Sunday, 2 P.M. to 5 P.M., closed major holidays; admission - adults 75¢, students 50¢, children under 5 free; A, D, F, G, H, I, J.


50
70
70
I 64
50
I 401
401 70
GLENWOOD AVE.
NORTH BLVD.
N.C. STATE MUSEUM OF NATURAL HISTORY
40
WADE AVE.
54
HILLSBOROUGH ST.
JONES ST.
P
EDENTON ST.
STATE CAPITOL
NEW BERN AVE.
64
MORGAN ST.
DAWSON ST.
McDOWELL ST.
SALISBURY ST.
WILMINGTON ST.
I 64
401 70
50

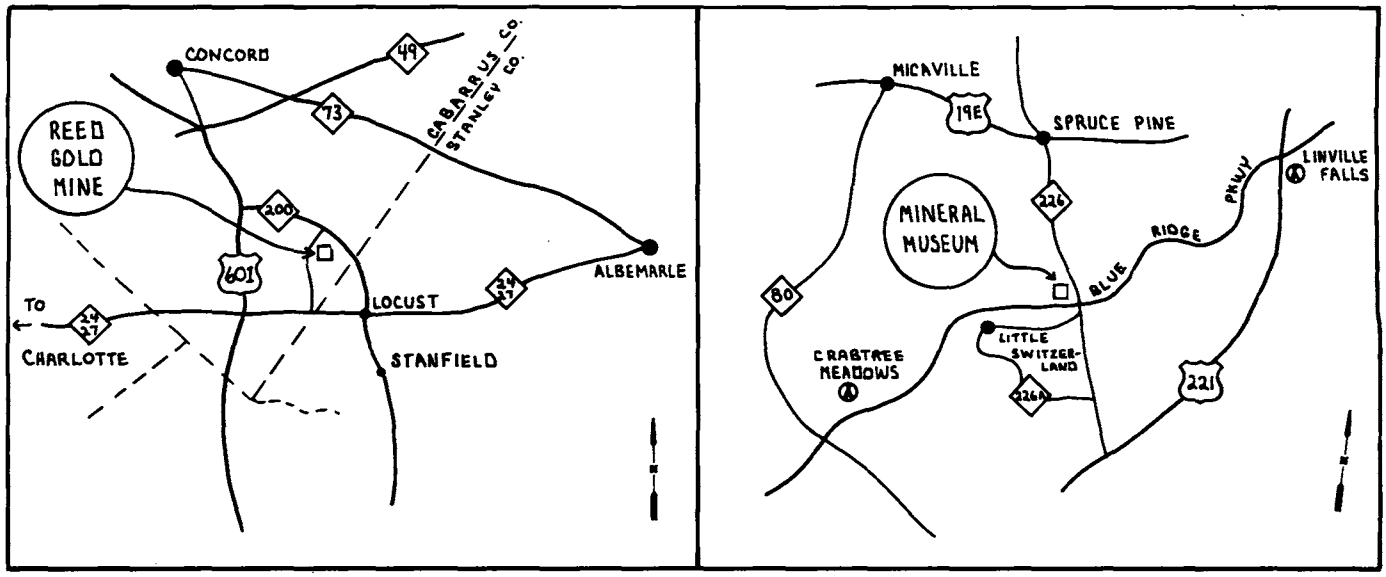

501
N.C. MUSEUM OF LIFE AND SCIENCE
CARVER ST.
DUKE ST.
501 BUS
WILSON ST.
GLENDALE AV.
MURRAY AV.
LORRAIN AV.
BROAD ST.
ROXBORO ST.
501 BYP
85
70
15 501 BYP
70 BYP
85
EXIT DUKE ST. NORTH
(501 BYPASS)
DUKE ST.
15 501 BUS
15 70 BYP
85
15
70 BYP

9 Bodie Island Visitor Center: P. O. Box 675 / Manteo, N. C. 27948 (919-441-5711); open 9 A.M. to 6 P.M. during Summer, 9 A.M. to 5 P.M. during Spring and Fall, closed during Winter; admission free; A, B, F, I, O.



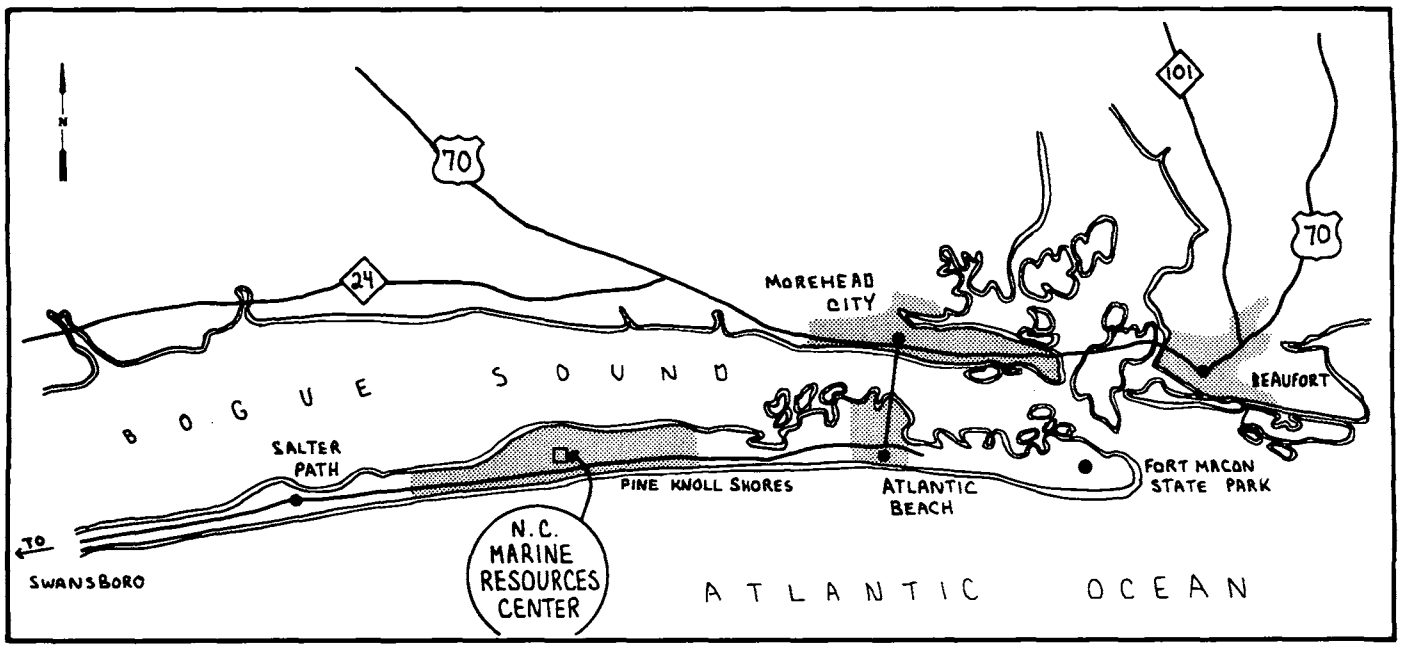
10 N. C. Marine Resources Center: Box 967 / Manteo, N. C. 27954 (919-473-3493); open Monday through Friday 9 A.M. to 5 P.M., Saturday, 10 A.M. to 4 P.M., Sunday, 1 P.M. to 5 P.M.; admission free; B, F, I, J, O, P.

11 N. C. Marine Resources Center: General Delivery / Kure Beach, N. C. 28449 (919-458-8257); open Monday through Friday, 9 A.M. to 5 P.M., Saturday, 10 A.M. to 4 P.M., Sunday, 1 P.M. to 5 P.M.; admission free; B, F, I, J, P.



12 Reed Gold Mine: Route 2, Box 101 / Stanfield, N. C. 28163 (704-786-8337); open Tuesday through Saturday, 9 A.M. to 5 P.M., Sunday, 1 P.M. to 5 P.M.; admission free; A, D, F, G, H.

13 Mineral Museum: Gillespie Gap, Blue Ridge Parkway / Spruce Pine, N. C. 28777 (704-765-2761); open daily 9 A.M. to 5 P.M.; admission free; A, B, F, H, L.



14 N. C. Marine Resource Center: Rt. 1, Roosevelt Dr. / Morehead City, N. C. 28557 (919-726-0121); open Monday through Friday, 9 A.M. to 5 P.M., Saturday, 10 A.M. to 5 P.M., Sunday, 1 P.M. to 5 P.M.; admission free; B, F, I, J, P.

APPENDIX 3 - North Carolina Mineral Dealers

Alexander Gem & Minerals
1829 Highway 64-70 South-West
Hickory, N. C. 28601

Allisons Rocks & Novelties
1811 Cheek Road
Durham, N. C. 27704

Bracketts Racket
P. O. Box 326
Murphy, N. C. 28906

Bullard's
4702 Brentwood Road
Durham, N. C. 27713

Carolina Lapidary
1105B South Chapman Street
Greensboro, N. C. 27403

Cavney Creations
Rt. 1, Box 533
Pineville, N. C. 28134

Cherokee Gem & Rock Shop
Box 57
Cherokee, N. C. 28719

Cowee Gem Shop
Route 4
Franklin, N. C. 28734

Daltons Gift Shop
Box 68
Chimney Rock, N. C. 28720

Doug & Dot's Rocks
Rt. 1, Box 245
Dillard, Georgia
(mailing address only)

Fort Shuford Mineral Shop
P. O. Box 177
Arden, N. C. 28704

The Gem Mart
P. O. Box 1448
Wilmington, N. C. 28407

Gem Shop
Rt. 2, Box 88
Spruce Pine, N. C. 28777

Gems by Roby
Rt. 4, Box 219
Bakersville, N. C. 28705

Gift Corner
P. O. Box 2765
Durham, N. C. 27701

Gorgarama Rock Shop
Bryson City, N. C. 28713

Gouge Paint & Glass
119 South Main Street
Marion, N. C. 28752

Henry's Rock Shop
Rt. 5, Box 50
Franklin, N. C. 28734

Highlands Gem Shop
P. O. Box 554
Highlands, N. C. 28741

His & Her Rock Shop
721 Haywood Rd.
Asheville, N. C. 28806

Jones Rock Shop
P. O. Box 126
Lake Junaluska, N. C. 28745

June's Gems
2407 Cypress Street
Greensboro, N. C. 27405

Kelly's Gem Shop
Rt. 2, Box 76
Taylorsville, N. C. 28681

Ken Kyte
P. O. Box 6487
Asheville, N. C. 28816

Lapidary Workshop
Rt. 7, Box 101
Hendersonville, N. C. 28739

Lee's Mineral Shop
P. O. Box 553
Spruce Pine, N. C. 28777

Longview Rock Shop
2544 First Ave., Southwest
Hickory, N. C. 28601

Lynch's Mineral & Jewelry
Rt. 6 - 117 Doris Avenue
Mt. Airy, N. C. 27030

Mart Craft Industries
818 Second St. Pl. Northeast
Hickory, N. C. 28601

N I H Lapidary
Rt. 4, Box 158
Morresville, N. C. 28115

Orchard's Minerals
3408 Allendale Drive
Raleigh, N. C. 27604

R & D Mineral & Gem Shop
4454 Old Winston Road
Kernersville, N. C. 27284

Rag Doll Craft Shop
Highway 25 South
Flat Rock, N. C. 28731

Raleigh Rock Shop
115 W. Maynard Road
Cary, N. C. 27511

Roger's Rocks
2216 Prince Street
Durham, N. C. 27707

Ruby City
280 East Main
Franklin, N. C. 28734

Rust Craft Shop
4334 Cinderella Road
Charlotte, N. C. 28213

Science Hobbies
2615 Central Avenue
Charlotte, N. C. 28205

Sig's Rock Shop
126 Lawing Street
Lincolnton, N. C. 28029

Sophie's Gift Shop
Long Beach Road
Southport, N. C. 28461

Tom's Coin & Jewelry
P. O. Box 68
Gold Hill, N. C. 28071

Tow's Wirecraft & Rocks
720 Haywood Road
Asheville, N. C. 28806

Uharrie Gem & Craft
924 Redding Road
Asheboro, N. C. 27203

Watauga Handcraft Center
108 Hardin Street
Boone, N. C. 28607

Webb's Rock Shop
Box 95
Linville, N. C. 28646

Wilson's Mineral Shop
Box 65
Micaville, N. C. 28755

APPENDIX 4 - North Carolina Gem and Mineral Clubs

Catawba Valley Gem & Mineral Club
P. O. Box 84
Hickory, North Carolina 28666

Central North Carolina Mineral Club
744 Tinkerbell Road
Chapel Hill, North Carolina 27514

Charlotte Gem and Mineral Club
5811 Cherrycrest Lane
Charlotte, North Carolina 28210

Foothills Mineral Society
Route 5, Box 151
Lincolnton, North Carolina 28092

Forsyth Gem and Mineral Club, Inc.
P. O. Box 11633
Winston-Salem, North Carolina 27106

The Gem and Mineral Society of
Franklin, N. C., Inc.
Route 3, Box 43
Franklin, North Carolina 28734

Greensboro Gem and Mineral Club
C/O Mr. Dwight Fickling, Editor
405 Westover Terrace
Greensboro, North Carolina 27403

High Point Mineral Club
Mr. Don R. Charlton
716 North Avenue
High Point, North Carolina 27260

Mountaineer Lapidary Guild
1027 East Street
Waynesville, North Carolina 28786

North Carolina Rock and Mineral Society
Box 303
Rutherford College, North Carolina 28671

The Piedmont Mineral and Gem Society
Dr. Robert M. Babb, Secretary/Treasurer
903 Avery Place
Greensboro, North Carolina 27403

Piedmont Mineral and Gem Society of Fayetteville
P. O. Box 35252
Fayetteville, North Carolina 28303

Rockingham County Mineral Club
Route 3, Box 12
University Estates
Reidsville, North Carolina 27320

Southern Appalachian Mineral Society
1617 Hendersonville Road
Asheville, North Carolina 28803

Sylvanite Mineral Club
Route 2, Box 38
Brevard, North Carolina 28712

Tar Heel Gem and Mineral Club, Inc.
7409 Barberry Court
Raleigh, North Carolina 27609

Tar Heel Mineral Society, Inc.
509 Brooklyn Avenue
Hendersonville, North Carolina 28739

Winston-Salem Mineral Club
C/O Nature-Science Center
Reynolds Road
Winston-Salem, North Carolina 27106

APPENDIX 5 - Physical Properties of Minerals in the Franklin and Spruce Pine Areas

The following list gives the more prominent physical properties, as well as some history, of minerals which may be found at the fee-basis mines in the Franklin and Spruce Pine areas. It should be kept in mind that many of the uranium minerals can be positively identified only through detailed analysis. Also, while color may be diagnostic, it is often variable due to impurities or weathering.

Allanite (orthite):

$(Ca, Ce, Fe, La)_2(Al, Fe)(SiO_4)_3$; occurs as tabular or long, slender, prismatic crystals, also massive or granular; H = 5.5-6; brittle; uneven to subconchoidal fracture; SG = 3-4.2; submetallic, pitchy, or resinous luster; greenish-gray to brown streak; brown to black color.

Miscellaneous: attacked slowly by concentrated hydrochloric acid; occasionally has rusty-looking halos or cracks around it in the host rock; named after T. Allan, discoverer of the mineral; occurs in small grains as accessory mineral in granite and granite pegmatites.

Apatite:

$(Ca(F, Cl)Ca_4(PO_4)_3$; occurs as long, prismatic or tabular crystals, massive, granular to compact, globular and reniform; H = 4.5-5; brittle, conchoidal to uneven fracture; SG = 3.17-3.23; vitreous to subresinous luster; white streak; sea green, blue, or white color.

Miscellaneous: dissolves in hydrochloric and nitric acids; possible fluorescence in yellowish brown to brownish orange, especially after heating strongly; named from Greek word meaning "to deceive" as the older mineralogists sometimes confused it with aquamarine, fluorite, chrysolite, tourmaline, etc.; occurs in hydrothermal veins, pegmatites, and in many igneous and metamorphic rocks.

Autunite (lime uranite):

$Ca(UO_2)_2P_2O_8$ $10\text{-}12H_2O$; occurs as thin, tabular micaceous crystals, also earthy or foliated; H = 2-2.5; brittle; one good cleavage; SG = 3.1; pearly to subadamantine luster; yellowish streak; lemon to sulfur-yellow to pale-green in color.

Miscellaneous: fluoresces bright-yellow or apple-green; soluble in nitric and hydrofluoric acids; use of any liquid in cleaning should be avoided but generally it is safe to gently rinse with distilled water; occurs as a secondary uranium mineral in pegmatites, shear zones, and gossans of lode deposits.

Calcite (spar, calc spar):

$CaCO_3$; thin, tabular to long, prismatic crystals, also fibrous, lamellar, stalactitic, nodular; H = 3; brittle; cleavage well-developed in three directions; conchoidal fracture; SG = 2.71; vitreous to earthy luster; white streak; color variable depending on impurities.

Miscellaneous: effervesces in hydrochloric acid; possible red, pink, blue, white, or orange fluorescence; occurs in sediments, veins, and fractures -- commonly as a cementing agent.

Varieties:

1) ordinary -- crystals, dog tooth spar; color and crystal form variable.
2) fibrous and lamellar -- satin spar.
3) granular (massive to cryptocrystalline) -- marble, limestone, chalk.
4) stalactitic or travertine -- the alabaster of ancient writers; also called onyx due to the banding.

Chromite:

$FeCr_2O_4$; octahedral crystals, also massive or fine-granular to compact; H = 5.5; brittle; uneven fracture; SG = 4.1-4.9; submetallic to metallic luster; brown streak; iron-black to brownish-black color.

Miscellaneous: unaffected by acids; sometimes feebly magnetic; alters to limonite; name alludes to presence of chromium in its composition; occurs in peridotites and serpentines.

Columbite:

(Fe, Mn)Nb_2O_6; occurs as short, prismatic crystals or massive; H = 6; brittle; one fairly distinct cleavage; subconchoidal to uneven fracture; SG = 5.3-7.3; submetallic to subresinous luster; dark-red to black streak; iron-black to brownish-black color.

Miscellaneous: partially soluble in hydrochloric acid; frequently iridescent; named after Columbia where first specimen was found; occurs in granitic rocks and pegmatites.

Epidote (pistacite):

$Ca_2Fe(Al_2O)(OH)(Si_2O_7)(SiO_4)$; may occur as prismatic or acicular crystals, often longitudinally striated, also granular or massive; H = 6-7; brittle; uneven fracture; SG = 3.25-3.5; vitreous luster; uncolored to grayish streak; pistachio-green, yellowish-green to greenish-black to gray.

Miscellaneous: partially soluble in hydrochloric acid; alters from garnet, hornblende, augite, etc.; named from the Greek meaning "increase"; part of solid solution series with clinozoisite, zoicite, and allanite; occurs in metamorphic rocks.

Feldspar (group name):

Basically aluminum silicates arranged with various cations; feldspars are the most abundant rockforming minerals; North Carolina has been the leading feldspar producer in the U. S. since 1916; feldspar is used in glass manufacture, ceramics, enamels, and mild abrasives.

Plagioclase Series:

The plagioclase series consists of a solid solution series with albite and anorthite as end-members. The other subdivisions are oligoclase, andesine, labradorite, and bytownite. These minerals are similar in physical characteristics and are defined by the relative proportions of albite and anorthite.

Albite:

$NaAlSi_3O_8$; tabular or elongated crystals, twinning common, also massive; H = 6-6.5; brittle; two well-developed and one poorly developed cleavage directions; uneven to conchoidal fracture; SG = 2.60-2.62; vitreous to pearly luster; white streak; generally white color but occasionally bluish-gray, red, or green.

Miscellaneous: alters to kaolin; moderately to rapidly attacked by hydrofluoric acid; occasionally fluorescent (white) under long-wave ultraviolet light; named from Latin for "white"; iron stain may be removed by washing in lukewarm oxalic acid; dilute sulfuric acid may remove organic stains; commonly occurs in igneous rocks, gneisses, and pegmatites.

Varieties:

1) moonstone -- displays a bluish sheen
2) aventurine -- displays reddish reflections from certain planes within the rock
3) mudstone -- golden-brown color with sheen similar to moonstone
4) peristerite -- albite with a white iridescence

Anorthite (indianite):

$CaAl_2Si_2O_8$; commonly intergrown with amphiboles and pyroxenes; H = 6-6.5; brittle; two well-developed and one poorly developed cleavage directions; conchoidal to uneven fracture; SG = 2.74-2.76; vitreous to pearly luster; uncolored streak; generally white color but also grayish or reddish.

Miscellaneous: decomposed by hydrochloric acid; possible long-wave fluorescence; named from

Greek meaning "oblique" because of its crystal shape; occurs in basic igneous rocks such as andesite, diorite, gabbro, etc. and in metamorphic rocks.

Potassium Feldspars:

Microcline:

$KAlSi_3O_8$; massive to granular compact; H = 6-6.5; brittle; two well-developed cleavage directions about 90° apart; uneven fracture; SG = 2.54-2.57; vitreous to pearly luster; uncolored streak; white to pale-yellow, red, or green in color.

Miscellaneous: common polysynthetic twinning; occasional blue-white fluorescence; difficult to distinguish from orthoclase without use of a microscope;occurs in granites and similar rocks.

Varieties:

1) amazonite -- bluish or greenish-blue color
2) moonstone -- microcline with tiny crystals of albite arranged in layers which cause a blue or white sheen (adularescence)

Orthoclase:

$KAlSi_3O_8$; prismatic crystals, massive, lamellar; H = 6; brittle; two well-developed directions of cleavage; conchoidal to uneven fracture; SG = 2.56-2.58; vitreous to pearly luster; uncolored streak; colorless to white, gray, pink, or yellow.

Miscellaneous: alters to kaolin by carbonated or alkaline water; possible weak reddish-orange, dull white, or greenish fluorescence; occurs commonly in granite, gneiss, syenite, pegmatites, etc.; used in porcelain manufacture.

Fluorite (fluorspar): CaF_2; cubic or octahedral crystals, massive; H = 4; brittle; octahedral cleavage; flat conchoidal to splintery fracture; SG = 3.01-3.25; vitreous luster; white streak; may be colorless, white, violet, brown, or a pastel color.

Miscellaneous: decomposed by hydrosulfuric acid; slightly soluble in hot hydrochloric acid; fluorescence may be lost from continued exposure to sunlight; occasionally may be phosphorescent, thermoluminescent or triboluminescent; name means to flow -- alluding to the fact that it melts easily and is frequently used as a flux; the term "fluorescence" is derived from the mineral name because fluorite shows the effect so markedly; occurs as a vein material associated with lead, zinc, and silver ores; also found in sedimentary rocks.

Gummite (hydrous uraninite):

$UO_3 \cdot nH_2O$; rounded or flattened pieces, amorphous masses or crusts; H = 2.5-5; brittle; conchoidal to uneven fracture; SG = 3.9-6.4; greasy, waxy, dull, or resinous luster; yellow, brownish, or olive-green streak; reddish-yellow to orange, red, or reddish-brown in color.

Miscellaneous: named after its gumlike appearance; alteration product of uraninite; commonly associated with pitchblende.

Kaolinite:

$H_4Al_2Si_2O_9$; thin plates or scales; compact, friable, or mealy masses; H = 2-2.5; flexible, elastic; SG = 2.60-2.63; pearly to dull earthy luster; white or pastel color.

Miscellaneous: name is from Kaoling, which has been a Chinese center for pottery production for centuries; usually smooth and greasy to the touch; plastic; used in the manufacture of porcelain, china, pottery, bricks, etc.; forms from the decomposition of aluminous minerals, especially the feldspars in granites and gneissoid rocks.

Kunzite:

$LiAlSi_2O_6$; elongated prismatic crystals with vertical striations; H = 6.5-7; splintery fracture; SG = 3; glassy luster; lilac or pinkish color.

Miscellaneous: occasionally fluoresces orange to yellow; usually strong phosphorescence with an orange-pink color when exposed to ultraviolet or X-rays.

Kyanite (cyanite, disthene):

Al_2SiO_5; long bladed crystals, rarely terminated, columnar to subfibrous; H = 5 parallel to crystal length, 7 at right angles to crystal length; brittle; two well-developed directions of cleavage; SG = 3.56-3.67; vitreous to pearly luster; uncolored streak; blue, white, gray, green, or black color.

Miscellaneous: alters to talc; gelatinizes in hydrochloric acid; occasionally fluoresces red, pink, cream, or white; kyanite is from the Greek word for blue, disthene is derived from Greek meaning "two kinds" which alludes to the differing hardness; occurs in gneiss and mica schist; occasionally associated with garnet, staurolite, or corundum.

Mica (group name):

The mica minerals are characterized by perfect cleavage which allows the mineral to be split into thin flexible sheets; vitreous to pearly luster, and horizontally striated, tabular crystals. The name comes from the Latin micare meaning "to shine". Because of its low thermal conductivity and high electrical resistance, mica is used in vacuum tubes, condensers, and heating equipment. It is also used in roof shingles, lubricants, and as a filler in various products. The principal varieties are biotite and muscovite.

Biotite: $H_2K(Mg, Fe)_3Al(SiO_4)_3$; H = 2.5-3.0; SG = 2.7-3.1; green to black -- often deep black in color.

Miscellaneous: decomposed by sulfuric acid; occurs in various igneous rocks and is a product of metamorphism.

Muscovite: $H_2KAl_3(SiO_4)_3$; H = 2.0-2.25; SG = 2.76-3.0; colorless to gray to yellowish in color.

Miscellaneous: alters by hydration; not decomposed by acids; muscovite has been mined in Yancey, Mitchell, Jackson, and Macon Counties. Notable occurrences are the Ray Mine, Yancey County and the Flat Rock Mine, Mitchell County.

Monazite:

(Ce, La, Th, Y)(PO_4); small, often flattened, elongated crystals, massive; H = 5-5.5; brittle; one good direction of cleavage; conchoidal to uneven fracture; SG = 4.9-5.3; resinous luster; white streak; hyacinth, red, clove-brown, reddish- to yellowish-brown color.

Miscellaneous: slightly soluble in hydrochloric acid; does not fluoresce but is often associated with zircon which does; under short-wave ultraviolet, dull green specks may appear. This is not a true fluorescence but is an optical effect due to the presence of neodymium -- a rare earth mineral which absorbs yellow and most of the blue and violet light while reflecting the green; named from the Greek meaning "to be solitary" in allusion to its supposed rare occurrence; chief source of thorium oxide; occurs in granites, gneisses, and pegmatites and may be locally concentrated in detrital sands.

Olivine (chrysolite, peridot):

$(Mg, Fe_2)SiO_4$; H = 6.5-7; brittle; conchoidal fracture; SG = 3.26-3.40; vitreous luster; dark, yellowish-green to olive-green in color.

Miscellaneous: alters to serpentine; may occasionally fluoresce a dull, pale-orange; occurs in mafic igneous rocks; associated with augite, bronzite, and hypersthene; peridot is a pale-green gem variety.

Phosphuranylite:

Hydrated phosphate of calcium and uranium of uncertain composition; tabular crystals; earthy, scaly coatings; H = 2.5; SG = variable; pearly luster; pale-yellow streak; deep, lemon-yellow to golden-yellow color.

Miscellaneous: easily soluble; occasionally fluorescent; name alludes to the chemical composition; occurs as a secondary mineral associated with autunite and uranophane, typically in the weathered zones of granite pegmatites containing uraninite.

Pitchblende:

A massive variety of uraninite which contains 76-91% U_3O_8; massive, amorphous, botryoidal; H = 5-6; curved to conchoidal fracture; SG = 6.5-8.5; greasy to resinous luster; greenish or grayish-black streak; grayish, brownish, or black color.

Miscellaneous: soluble in nitric and sulfuric acids; does not fluoresce; named from German "blende" which means deceptive; pitchblende was so called because the bubbly surface of some samples was reminescent of boiling pitch; most important source of uranium.

Opal:

$SiO_2(N)H_2O$; amorphous form of quartz; may form pseudomorphs; often fluorescent; considered to be an unlucky stone -- this idea probably started among gemcutters as they were held responsible for the stones and opal is fragile and very easily broken.

Variety: hyalite -- usually clear or light-blue or green botryoidal crusts.

Samarskite:

$(Fe, Ca, UO_2)_3(Ce, Y)_2(Nb, Ta)_6O_{21}$; may form flattened grains, rectangular prisms with rough faces, massive; H = 5-6; brittle; conchoidal fracture; SG = 5.6-5.8; vitreous to resinous, splendent luster; dark, reddish-brown streak; black color.

Miscellaneous: partially soluble in hydrochloric acid; associated with columbite and other uranium minerals.

Scheelite:

$CaWO_4$; pyramidal, tabular crystals, massive; H = 4-5.5; brittle; uneven to subconchoidal fracture; SG = 5.9-6.1; vitreous to adamantine luster; white streak; white to brownish to reddish color.

Miscellaneous: decomposed by hydrochloric or nitric acid; fluorescent; may resemble limestone; named after Karl Wilhelm Scheele, a Swedish chemist, who proved the existence of tungstic oxide in scheelite in 1781; used as a tungsten ore.

Sphalerite (zinc blende):

ZnS; tetrahedrons, cubes, massive, botryoidal masses; H = 3.5-4; brittle; SG = 3.9-4.1; resinous to adamantine luster; brownish to white streak; yellow, brown, or black color.

Miscellaneous: dissolves in hydrochloric acid with evolution of hydrogen sulfide; occasionally fluorescent; the color becomes darker with increasing iron content; named blende from the German for "deceptive" because while resembling galena in shape, it yielded no lead; most common zinc mineral.

Spinel:

$MgAl_2O_4$; octahedrons, rolled grains, massive; H = 8; brittle; conchoidal fracture; SG = 3.5-4.1; vitreous, splendent to nearly dull luster; color may be various shades of blue, red, green, yellow, or black.

Miscellaneous: insoluble; the natural stone rarely fluoresces while the artificial stone fluoresces strongly; believed to prevent hemorrhage, anger, and discord.

Talc (potstone):

$H_2Mg_3(SiO_3)_4$; foliated, massive, compact, H = 1-1.5; sectile, flexible in thin laminae; irregular fracture; SG = 2.7-2.8; pearly luster; may be apple-green, silvery-white, gray, or brown in color.

Miscellaneous: insoluble; has a greasy feel; may be fluorescent; used in talcum powder, paints, ceramics, laboratory equipment, and as primitive cooking pots; associated with serpentine, pyroxenes, and amphiboles.

Tantalite:

(Fe, Mn)(Nb, Ta)$_2O_6$; short, prismatic or thin, tabular crystals, massive; H = 6-6.5; brittle; subconchoidal to uneven fracture; SG = 5.3-7.3; submetallic to subresinous luster; dark-red to black streak; iron-black to grayish or brownish-black color.

Miscellaneous: insoluble; end member of solid solution series with columbite; frequently iridescent; named after Tantalus in allusion to the (tantalizing) difficulties encountered in making a solution of the mineral for analysis; occurs in pegmatites.

Thorite:

$ThSiO_4$; octahedral crystals, massive; H = 4.5-5; brittle; conchoidal fracture; SG = 4.5-5; vitreous luster when fresh, resinous to greasy when altered; light-orange to dark-brown streak; orangish-yellow to black in color.

Miscellaneous: gelatinizes in hydrochloric acid; radioactive; may fluoresce; may be found in placers, granites, and pegmatites.

Torbernite (copper uranite, chalcolite):

$Cu(UO_2)_2P_2O_8 \cdot 8\text{-}12H_2O$; very thin, square, tabular crystals, micaceous, massive; H = 2-2.5; brittle; SG = 3.2; pearly to subadamantine luster; pale-green streak; emerald or grass-green color.

Miscellaneous: soluble in nitric acid; occasionally fluoresces; named after the Swedish chemist Torbern Bergmann; metatorbernite is a pale-green variety, pale color due to lower water content; associated with autunite and other uranium minerals.

Tourmaline:

$Na(Mg, Fe, Mn, Li, Al)_3Al_6(Si_6O_{18})(BO_3)_3 \cdot (ON,F)_4$; slender to acicular crystals with strongly striated faces, rounded triangular cross section, massive; H = 7-7.5; brittle; subconchoidal to uneven fracture; SG = 2.9-3.2; vitreous to resinous luster; black to various shades of blue, green, or red in color.

Miscellaneous: strongly dichroic, pyroelectric; sometimes fluorescent; tourmaline showing dichroism and rubellite are almost never free of inclusions; occurs in granites, pegmatites, or gneisses.

Varieties:

1) rubellite -- pink or red
2) dravite -- brown; magnesium-rich
3) schorl -- very black; iron-rich
4) elbaite -- blue, green, yellow, red, white; lithium-rich
5) watermelon -- green outside, red inside
6) indicolite -- indigo blue to blue-green

Uralite:

Pyroxene altered to amphibole -- retains the pyroxene crystal form but developes the amphibole cleavage.

Uraninite:

Uranate of U, Pb, Th, Z; octahedrons, massive, botryoidal; H = 5.5; brittle; conchoidal to uneven fracture; SG = 9.0-9.7; submetallic, greasy, pitchy, or dull luster; brownish-black or grayish-green streak; grayish, greenish, brownish, or black in color.

Miscellaneous: alters to gummite, uranophane; soluble in sulfuric, nitric, and hydrofluoric acids; not fluorescent; name alludes to composition; strongly radioactive; it is the crystalline form of pitchblende.

Uranite:

Old group name for torbernite and autunite.

Uranophane (uranotil, uranium ocher):

$CaU_2O_3Si_2O_8 \cdot 7H_2O$; radiated aggregates, fibrous, minute acicular prisms, massive; H = 2-3; SG = 3.8-3.9; vitreous to pearly to greasy luster; yellow color.

Miscellaneous: gelatinizes in acid; occasionally fluorescent; alteration product of gummite, pitchblende, etc.

Uranothallite:

$2CaCO_3U(CO_3)_2 \cdot 10H_2O$; scaly, granular, minute crystals; H = 2.5-3; vitreous to pearly luster; siskin-green in color.

Xenotine (xenotime):

YPO_4; rolled grains, pyramidal to prismatic; H = 4-5; brittle; uneven to splintery fracture; SG = 4.45-4.56; resinous to vitreous luster; pale-brown or reddish streak; yellowish-brown, reddish-brown, or grayish-white color.

Miscellaneous: insoluble; name means "vain honor" in reference to the fact that the yttrium in it had been mistaken for a new element.

Yttrocerite:

$(Ca, Y, Ce)F_2$; granular, earthy, massive; H = 4-5; uneven fracture; SG = 3-4; vitreous to pearly luster; violet, blue, gray, or reddish-brown color.

Zippeite:

$(UO_2)_2(SO_4)O \cdot nH_2O$; lath-shaped crystals, earthy, crusts, acicular rosettes; H = 3; SG = 3.2; dull to silky luster; yellowish color.

Miscellaneous: fluoresces green; named after Franz Zippe, an Austrian mineralogist; alters from uraninite.

Zircon:

$ZrSiO_4$; tetragonal, grains; H = 7.5; brittle; conchoidal fracture; SG = 4.68-4.70; adamantine luster; colorless to yellow, gray, or reddish-brown color.

Miscellaneous: insoluble; possible orange to golden-yellow fluorescence; a blue color has been created by heat treatment; occurs as an accessory mineral in igneous rocks, locally concentrated in placers; used as a source for zirconium.

Variety:

hyacinth -- orange or reddish, transparent

Zoisite:

$Ca_2Al(Al_2O)(OH)(Si_2O)(SiO_4)$; prismatic, rarely terminated crystals with deep, vertical striations,

massive; H = 6-6.5; brittle; one good cleavage; uneven to subconchoidal fracture; SG = 3.25-3.37; vitreous to pearly luster; grayish-white, yellowish-brown, apple-green, or reddish color.
Miscellaneous: insoluble; possible pale-brown fluorescence; named after Baron von Zois.
Varieties:

thulite -- rose-red; may fluoresce orange or yellow; named after Thule (ancient name for Norway)

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Eldon P. Allen, Chief Geologist

Information Circular 24

Mineral Collecting Sites in North Carolina

By W. F. Wilson and B. J. McKenzie

NORTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF LAND RESOURCES
GEOLOGICAL SURVEY SECTION

Raleigh 1978