UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analyses and descriptions of geochemical samples, western part of the Southern Nantahala Wilderness, Towns County, Georgia

by

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

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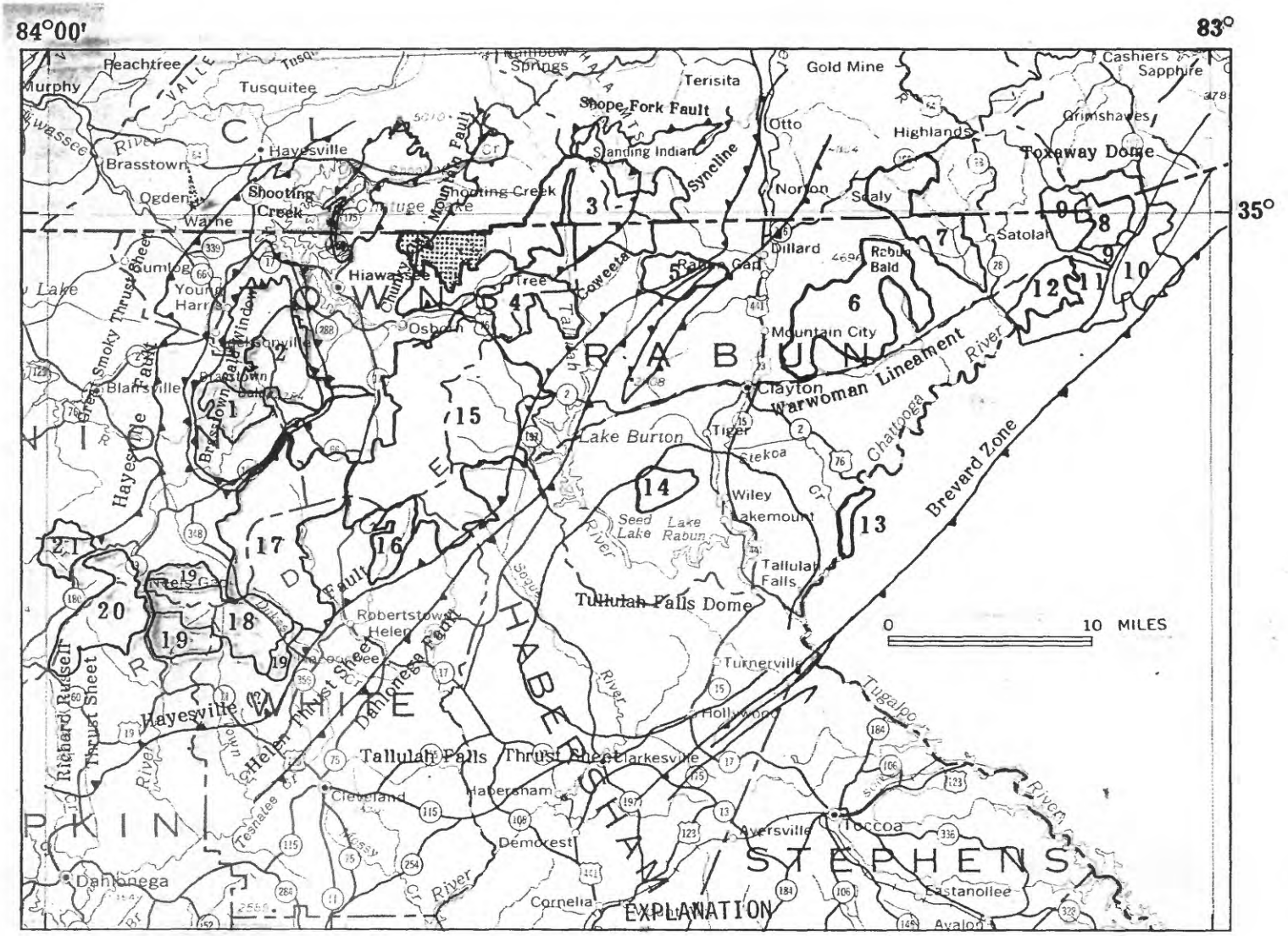
STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey (USGS) and the U.S. Bureau of Mines to survey certain areas on Federal lands in order to determine the mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the analytical results of a geochemical survey of the western part of the Southern Nantahala Wilderness, Towns County, Georgia. The area was classified as nonwilderness during the Second Roadless Area Review and evaluation (RARE II) by the U.S. Forest Service, January, 1979.

ABSTRACT

Semiquantitative spectrographic analyses for 31 elements on 67 stream sediments, 50 panned-concentrates, 47 rock, and 44 soil samples from the western part of the Southern Nantahala Wilderness, in Towns County, Georgia, are presented. Atomic absorption analyses for zinc, and for gold in selected samples, are also presented. Brief descriptions are given of rock samples analysed, which include originally sedimentary and igneous rocks which have since been metamorphosed. Sample locations are given in Universal Transverse Mercator (UTM) coordinates.



3. Southern Nantahala Wilderness

8. Ellicott Rock Wilderness

Roadless Areas

1. Wolf Pen 8-149
2. Brasstown 8-146
4. Buzzard Knob 8-223
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6. Rabun Bald 8-147
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Figure 1.-- Index map showing locations of wilderness and roadless areas and major structural features in northeastern Georgia and adjacent North and South Carolina. The area covered in this report is stippled. Number after roadless name is Forest Service identification number.

Introduction

The analyses presented in this report (Table 1) are of 65 stream sediments, 50 panned concentrates, 47 rock and 44 soil samples from the western part of the Southern Nantahala Wilderness, Georgia. These were collected by John P. D'Agostino and Mark K. Brown in November, 1985, and with John C. Jackson in April 1986. Stream-sediment samples and panned concentrates were taken from most of the small drainage basins in the study area. The stream sediment sample is a random collection of the finer sediment available at the sample site of the drainageway. At most of the stream sites sufficient water was available to obtain a heavy mineral concentrate by panning a sample of stream alluvium. A standard 14-inch diameter gold pan was used, with the lighter material discarded. Rock samples are briefly described in another section of this report. Most are chip samples taken across the bedding or layering; in places owing to the paucity of outcrops, single hand-specimens were taken. In a few places where rock outcrops were absent, float rock was taken. The samples represent the major and usual varieties of rock in the study area. Most of the rock is fresh; a few samples are partially weathered, and one is completely so. The soil samples, mostly taken where bedrock is lacking, are from holes dug through the rich organic A1 surface layer and into the deeper poorly developed B1 soil horizon. Maps showing sample localities and interpretation of the results of the analytical work are included in a report by Peper and others (in press).

Analytical Techniques

Each sample was analyzed semiquantitatively for 31 elements by means of a six-step D.C. (direct-current) arc, optical-emission spectrographic method (Grimes and Marranzino, 1968) by B. M. Adrian and Olga Erlich in the USGS Laboratories, Denver, Colorado. Most samples were also analyzed for zinc by an atomic-absorption technique (Ward and others, 1969, p. 20) by T. A. Roemer, USGS Laboratories, Denver, Colorado. T. A. Roemer also analyzed the panned concentrates for gold by atomic-absorption methods (Thompson and others, 1968). The semiquantitative spectrographic values are reported as six steps per order of magnitude (1, 0.7, 0.5, 0.3, 0.2, 0.15 or multiples of ten of these numbers) and are approximate midpoints of geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, etc. The expected precision is within one adjoining reporting interval on each side of the reported value 83 percent of the time and within two adjoining intervals 96 percent of the time (Motooka and Grimes, 1976).

The visual lower limits of determination for the 31 elements that were determined spectrographically are as follows:

For those given in percent:

Calcium	0.05	Magnesium	0.02
Iron	0.05	Titanium	0.002

For those given in ppm:

Antimony	100	Molybdenum	5
Arsenic	200	Nickel	5
Barium	20	Niobium	20
Beryllium	1	Scandium	5
Bismuth	10	Silver	0.5
Boron	10	Strontium	100
Cadmium	20	Thorium	100
Chromium	10	Tin	10
Cobalt	5	Tungsten	50
Copper	5	Vanadium	10
Gold	10	Yttrium	10
Lanthanum	20	Zinc	200
Lead	10	Zirconium	10
Manganese	10		

Geology

Bedrock throughout the Southern Nantahala Wilderness from its lowest elevation of 2400 feet to the highest peak at 4317 feet is Late Precambrian (Late Proterozoic Z) Richard Russell Formation, the name proposed for rocks in the Richard Russell thrust sheet by Nelson and Gillon (1985). They estimate the thickness of the Richard Russell Formation in this area as 6000 to 8000 ft. The unit is a small part of the crustal bedrock, several miles thick, that has been shoved horizontally westward for many miles over bedrock of younger age. These younger age rocks are the Late Precambrian (Late Proterozoic Z) Great Smoky Group, which outcrop to the west, and the similarly aged Helen Belt rocks which outcrop to the east. The economic potential of the deeply buried younger bedrock is unknown and can be ascertained only by costly deep drilling. The Richard Russell Formation has undergone a period of high-grade Barrovian metamorphism about 430 to 470 m.y. ago (Butler, 1977; Dallmeyer, 1975), and a locally greenschist metamorphic overprint about 344 to 375 m.y. ago (McElhaney and McSween, 1983). Four or more episodes of deformation also affected the bedrock of the wilderness area. Tectonic movement from the second event was dominant, being from the southeast and forming northeast-trending folds. Tectonic movement from an earlier event with forces from the northeast caused northwest-trending folds (Nelson, 1985).

A major thrust fault, difficult to recognize in the area, is the Chunky Gal Mountain Fault, which trends north-south and cuts the Richard Russell Formation in the western part of the Southern Nantahala Wilderness. The amount of vertical and horizontal displacement along the fault is difficult to calculate since it is within similar-appearing schistose gneissic layers of the Richard Russell Formation. However, an amphibolite is cut by the fault and based on the assumption that the amphibolite is a continuous layer, measured displacement of the amphibolite indicates bedrock east of the fault has horizontally moved 0.4 miles northward relative to bedrock on the western side. A short fracture, filled with lavender quartz has been mapped in the northwestern part of the study area where it was traced by exposure. Further eastward, float breccia of another fault was seen but a specific bedrock source of the breccia was not found in outcrop.

The Richard Russell Formation occupies a structural depression, the Chattahoochee Basin, in a series of recumbent folds (Nelson, 1985). The western part of the Southern Nantahala Wilderness occupies the southwestern part of the basin; in this part there is a major recumbent fold with trend more easterly than the prevalent northeast.

The Richard Russell Formation is nearly all gneiss, though schistose or schist in places. A poorly outcropping amphibolite-bearing strata estimated at about 100 feet thick appears to be continuous and widespread. In addition small masses or thin layers of amphibolite are interspersed in the bedrock throughout the area. Small zones of altered calc-silicate rock are present in a few places. A few small pegmatites are also present; and thin sills and dikes of quartz-feldspar rock are omnipresent.

The gneiss is a metamorphosed sediment composed principally of fine quartz grains in layers commonly less than one inch thick, though some outcropping layers adjacent to the study area are about four feet thick. The common accessory minerals are biotite, muscovite, feldspar, sericite, and locally much garnet and pyrite, and minor specularite. Biotite is common and occurs as small disseminated flakes with quartz grains or as short discontinuous layers as much as 1/4 inch thick exhibiting foliation. The muscovite is less common than the biotite and occurs as large flakes disseminated with quartz grains or as massive local lenses several dozens of feet thick, and showing extreme foliation. In places sericite is intervened with biotite and muscovite. Feldspar is quite common, occurring in thin to thick layers with meager to large amounts of quartz grains and biotite.

Garnets are quite common, occurring as disseminated fractured crystals in thin zones within gneiss and schist layers. The garnets also occur in amphibolite and calc-silicate rocks. The color and the brecciated appearance of the garnet crystals reveal a history of geologic events -- initial deep burial to depths sufficient to cause garnet crystallization, tectonic movement to brecciate the initial crystals, continued metamorphism to cement fragmented garnets with a subsequent lighter garnet crystal, and again tectonic movement to rebrecciate the subsequent reheated garnets. The mineral history of crystallization, deformation, recrystallization and redeformation concurs with the bedrock history of two major episodes of high grade metamorphism and four folding events. The garnets are most abundant in schists and gneisses at lower elevations (older) (Nelson, oral comm., 1987) in the northeastern part of the Macedonia quadrangle area. They decrease in quantity in bedrock toward the southwest and at higher elevations (younger). The mafic constituents of the bedrocks show a similar decrease in abundance progressing to the southwest and to higher elevations. The garnets are in shades of lavender, red, and pink and appreciable quantities of fragments are present in stream alluvium. The garnets are either almandine or pyrope or a blend of the two; color is no consistent indicator of the variety.

Specularite is uncommonly seen in the bedrock; however, it is readily seen in abundance in many of the stream concentrates of the area. When seen in bedrock, it is usually as a flake in quartz grains in schistose rock. When seen in panned concentrate, the specularite occurs as blocky chunks or as thin rectangular blades as much as 1/4 inch in diameter. The pieces show signs of foliation.

Pyrite is a common accessory mineral in the bedrock. When seen, it appears as cubes, or as blebs and threads that have been granulated by tectonic movement. The pyrite occurs as disseminations in zones in both the quartzose and schistose gneisses, and with the amphibolites. Other sulfides occurring with the predominantly yellow pyrite are gray pyrrhotite and bright yellow chalcopyrite. The granulation of the pyrite is the probable cause for its absence in stream alluvium as its fine size allows for quick and thorough oxidation and solution in outcrops before its host rock is eroded to a stream sediment.

All samples in this report were taken within the Macedonia 1:24,000 scale topographic quadrangle. All samples are prefixed GA03 which is the identifying code number for samples taken from the Macedonia 1:24,000 scale topographic quadrangle.

Sample No.	Rock sample description
GA03-015R	1 m chip sample, feldspar-hornblende gneiss and muscovite-quartz pegmatite, tan and gray, foliated.
044R	1 m chip sample, biotite-quartz gneiss.
054R	hand specimen, feldspar-biotite gneiss, dark, layered and foliated.
090R	1 m chip sample, limonite-quartz amphibolite gneiss, rusty brown and white, well-banded.
098R	hand specimen, siliceous rock with sericite, garnets and fresh pyrite, and thin foliated layers of muscovite and biotite, white and gray, well-layered.
100R	1 m chip sample, muscovite-quartz-sericite-feldspar schist, silvery white, strongly foliated.
101R	hand specimens, biotite-sericite-feldspar-quartz schist, dark gray, layered and foliated.
102R	1 m chip sample, sericite-muscovite-biotite-feldspar-quartz schist, whitish, massive and foliated.
103R	1 m chip sample, sericite-muscovite-quartz-feldspar schist with some coarse biotite books, silvery white.
104R	1 m chip sample, sillimanite-biotite-quartz-feldspar schist, black and white layers, foliated.
105R	1 m chip sample, feldspar-hornblende amphibolite, white and black, massive.
106R	hand specimen, quartz-feldspar-biotite pegmatite breccia, grayish white.
107R	1 m chip sample, metaquartzite with garnets and biotite, white to orange, layered and foliated, and feldspar-biotite-muscovite pegmatite, light tan and black, foliated.
402R	hand specimen, biotite-quartz gneiss.
403R	1 m chip sample, muscovite-biotite-quartz-garnet gneiss, light gray, foliated thin schist layers.
404R	1 m chip sample, biotite-quartz gneiss.
424R	1 m chip sample, biotite-quartz gneiss.
426R	1 m chip sample, feldspar-hornblende-biotite-quartz-garnet gneiss, light gray, well-layered.
427R	hand specimen, feldspar-hornblende-quartz-biotite gneiss, grayish-whitish-tan, well-layered.
429R	1 m chip sample, biotite-quartz gneiss.

BA03-431R	1 m chip sample, sericite-biotite-quartz-garnet schist.
442R	1 m chip sample, sericite-feldspar-hornblende schist, silvery medium gray, well-banded.
447R	1 m chip sample, quartz-hornblende-feldspar gneiss, grayish white, well-banded.
462R	hand specimen, hornblende-feldspar amphibolite, dark, massive, float.
473R	hand specimen, quartzite with few biotite flakes, light tan.
475R	1 m chip sample, biotite-quartz-garnet gneiss, white, well-layered.
476R	1 m chip sample, hornblende-feldspar amphibolite, mottled black and white; with reddish-green amorphous schist layer.
477R	1 m chip sample, biotite-muscovite-quartz gneiss, white to grayish pink, minor foliation and poorly defined layering.
478R	1 m chip sample, biotite-feldspar-quartz gneiss with fresh pyrite, light gray, minor foliation and well-layered.
479R	1 m chip sample, biotite-muscovite-hornblende-feldspar-quartz-garnet gneiss, black and white, thin layers.
480R	hand specimen, garnetiferous sericite-biotite schist grading to garnetiferous hornblende-feldspar amphibolite, dark gray-black, foliated.
481R	hand specimen, hornblende-feldspar-garnet amphibolite, dull gray-black, massive.
482R	hand specimen, hornblende-feldspar-garnet amphibolite, dark, massive.
483R	hand specimen, feldspar, hornblende amphibolite with meager quartz, dark with white specks, massive.
484R	1 m chip sample, biotite-muscovite-quartz-garnet schist and gneiss, grayish to light brown, brecciated and foliated.
485R	hand specimen, muscovite-biotite-quartz-feldspar-specularite pegmatite, white, massive.
486R	1 m chip sample, muscovite-biotite-quartz garnet schist, white and black, foliated; also biotite-feldspar garnet gneiss, dark gray, much foliated.
487R	1 m chip sample, biotite-feldspar-quartz gneiss, light gray, well-layered, weakly foliated.
489R	1 m chip sample, biotite-quartz-garnet schist, medium gray, well-layered, foliated.
601R	1 m chip sample, biotite-quartz gneiss with thin quartz veins, thinly-bedded.
602R	hand specimen, muscovite-biotite-quartz-garnet schist; also biotite quartz gneiss.
603R	1 m chip sample, siliceous epidote-feldspar-hornblende calc-silicate, brown with rusty red.
604R	hand specimen, biotite-quartz gneiss.
605R	1 m chip sample, biotite-quartz gneiss.
606R	1 m chip sample, muscovite-bitote-quartz schistose gneiss.
607R	1 m chip sample, biotite-quartz gneiss; also muscovite pegmatite.

EXPLANATION OF TABLE 1

Table 1 lists the results of analyses of samples. The last letter following a sample number designates the type of sample: "C" designates panned concentrate, "D" designates soils, "R" designates rocks, and "S" designates stream sediments.

The X and Y coordinates are Universe Mercator (UTM) grid, zone 17. The X coordinate is the easting value, in meters; the Y is the northing, in meters.

Iron, magnesium, calcium, and titanium concentrations are reported in percent (%); all others are in parts per million (ppm). Letters before chemical symbols indicate the method of analysis: "S" is for six-step semiquantitative spectrographic method; "AA" is for atomic absorption. Other symbols on the table are: <, not detected or amount detected is below the lower limit of determination, which is number shown; >, amount detected is above the upper limit of determination, which is number shown; --, not determined.

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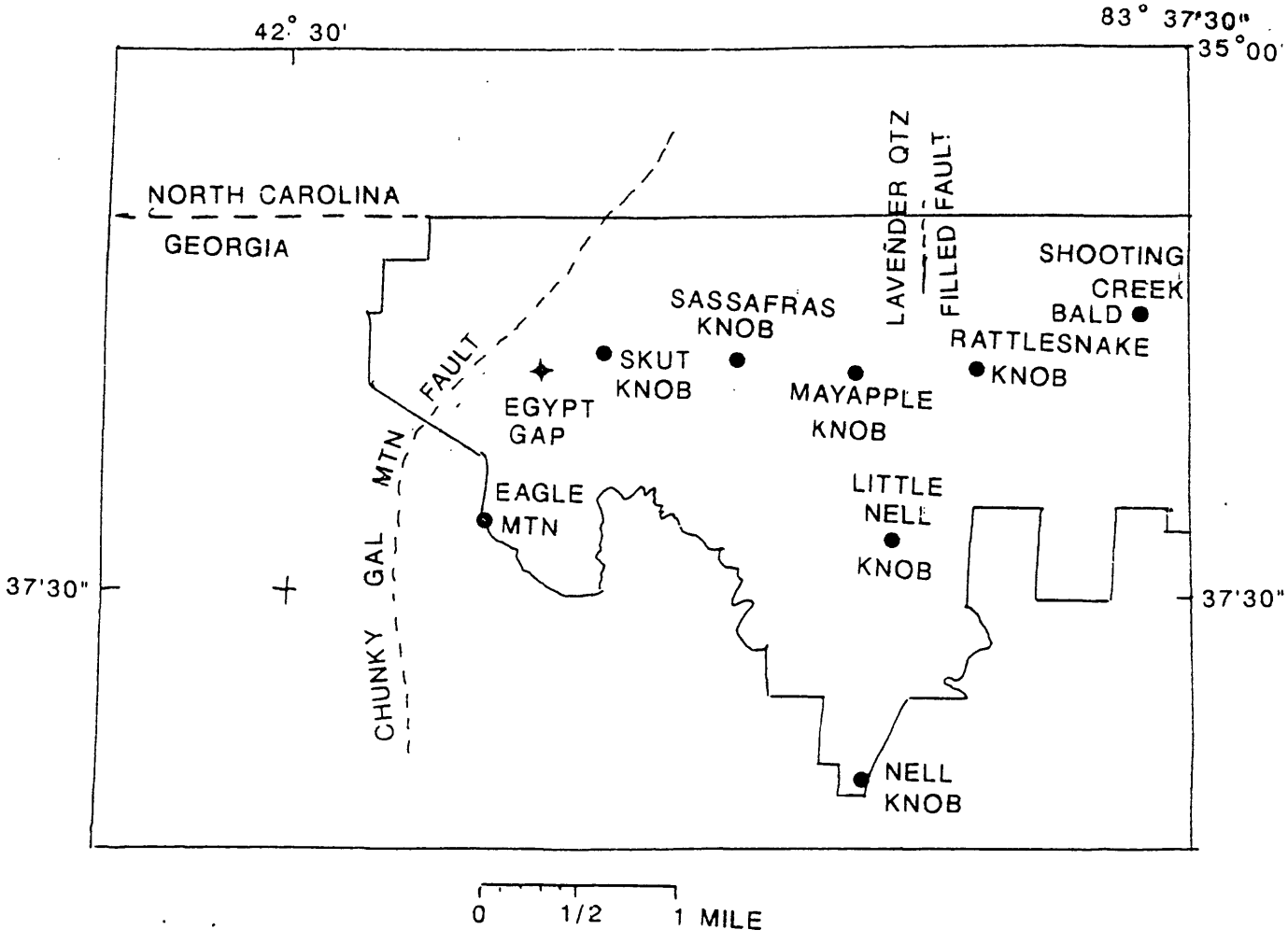

FIGURE 2.--MAP SHOWING LOCATION OF WESTERN PART OF SOUTHERN NANTAHALA WILDERNESS.

TABLE 1. ANALYSES OF STREAM-SEDIMENT, ROCK, SOIL, AND PANNED-CONCENTRATE SAMPLES, SOUTHERN NATAHALIA (Western part)

Sample Number	X-COORD.	Y-COORD.	S-Fe %	S-Mg %	S-Ca %	S-Ti %	S-Mn ppm	S-B ppm	S-Ba ppm	S-Be ppm	S-Co ppm	S-Cr ppm	S-Cu ppm	S-La ppm
						STREAM SEDIMENTS								
GA03005S	253440	3874990	5	0.5	0.2	>1.	2000	<10	300	<1	10	50	10	150
GA03007S	253490	3874370	10	1	0.7	>1.	1500	<10	300	<1	20	100	15	300
GA03009S	253530	3874420	7	1	1.5	>1.	3000	<10	500	<1	10	50	10	100
GA03011S	253100	3873990	5	1	0.5	>1.	1500	<10	700	<1	10	70	15	70
GA03014S	253030	3873020	3	0.7	0.3	1	1500	<10	700	<1	10	30	10	70
GA03015S	253010	3872850	3	0.7	0.2	1	1000	<10	700	<1	10	30	10	70
GA03016S	255610	3872270	5	1	1.5	1	1500	<10	700	1	10	50	10	100
GA03017S	255670	3871880	7	0.3	0.2	>1.	1500	<10	300	<1	7	100	10	500
GA03019S	256010	3871600	7	0.7	0.7	>1.	1500	<10	500	<1	7	100	7	150
GA03021S	255070	3874600	2	0.5	0.15	1	1000	10	700	<1	10	50	5	150
GA03023S	255120	3874625	5	0.7	1	>1.	2000	<10	700	1	7	70	10	300
GA03025S	255960	3874580	3	0.5	1	1	1000	<10	500	1	7	50	5	300
GA03027S	258150	3870480	5	0.5	0.15	1	1000	<10	700	<1	10	100	5	200
GA03028S	259390	3872920	3	1.5	1	1	1000	<10	300	1	20	100	7	150
GA03030S	259250	3872960	3	1	0.5	1	1000	10	300	1	10	100	10	100
GA03032S	259240	3872960	10	1.5	1.5	1	1500	<10	300	1	30	100	10	50
GA03034S	258970	3872670	2	0.7	0.15	1	1000	<10	700	1	20	70	10	200
GA03036S	258230	3872200	2	0.7	0.2	1	1000	<10	700	1	10	70	10	100
GA03038S	258650	3872460	3	0.7	0.2	1	1000	<10	700	1	10	70	7	100
GA03040S	258800	3871790	5	1	0.5	0.7	1500	<10	700	<1	10	50	15	50
GA03041S	258690	3871140	5	0.7	0.1	1	1000	10	700	<1	10	70	15	200
GA03047S	256340	3874290	2	0.5	0.7	0.7	1000	<10	700	1	7	50	15	<20
GA03049S	256350	3874220	1.5	0.5	2	0.2	1000	<10	700	1.5	7	50	7	<20
GA03050S	256825	3874240	3	0.7	2	0.5	1000	<10	700	<1	10	50	10	50
GA03052S	256970	3874200	2	0.7	2	0.5	1000	<10	700	1	7	50	7	<20
GA03055S	257790	3874240	2	0.5	0.2	0.5	1500	10	500	1	10	50	15	70
GA03056S	258040	3874100	3	0.7	0.2	1	1500	<10	700	1	10	50	10	150
GA03058S	259710	3874180	7	1	1	0.7	1500	10	200	1	20	70	20	<20
GA03060S	259520	3874370	5	1	0.7	1	1500	<10	200	1	20	70	10	100
GA03062S	259420	3874400	10	1.5	1.5	1	1500	<10	100	1.5	20	50	10	<20
GA03067S	258610	3874350	5	1	1.5	1	1000	<10	200	1.5	10	70	7	70
GA03069S	258260	3874740	3	1.5	1.5	0.5	1000	<10	300	1	10	70	10	50
GA03071S	258390	3874510	3	0.7	0.05	1	1500	15	700	1	20	100	10	200
GA03073S	258440	3874540	3	1	1.5	0.7	1500	<10	300	1	10	70	7	70
GA03076S	259780	3871770	7	0.7	0.15	1	1000	<10	700	1	7	100	10	200
GA03079S	259880	3871680	7	0.7	0.1	1	1000	<10	700	1	7	100	10	500
GA03081S	256760	3869910	3	0.5	0.15	0.7	1000	<10	500	1	5	70	5	100
GA03083S	257080	3871970	3	0.7	0.3	0.5	1000	<10	700	1	10	70	10	70
GA03085S	257110	3871680	3	0.5	0.07	0.7	1000	<10	700	1	15	70	15	70
GA03086S	257130	3871410	10	0.5	0.1	1	1500	<10	500	<1	10	100	5	500
GA03087S	257110	3871090	3	0.7	0.2	1	1500	<10	500	1	10	50	5	100
GA03088S	257245	3870950	5	0.7	0.15	1	1000	<10	700	1	7	70	<5	200
GA03089S	257310	3871300	5	0.7	0.05	1	1000	<10	700	1	7	70	7	100
GA03091S	252620	3873280	5	0.5	0.1	>1.	1500	10	300	<1	7	50	10	100
GA03093S	255770	3873350	3	1	1.5	0.5	1500	<10	700	1.5	7	50	15	50
GA03095S	255870	3873010	3	0.7	2	0.3	1000	<10	700	1.5	7	50	7	<20
GA03096S	255880	3872920	1.5	0.7	1.5	0.3	1000	<10	700	1.5	7	20	7	<20
GA03097S	255875	3872730	2	0.7	2	0.5	1000	<10	700	1	7	20	10	<20
GA03099S	256060	3872300	7	0.5	1	1	1500	<10	700	1	7	50	10	50
GA03100S	255800	3872160	5	1	0.2	1	1000	<10	700	<1	7	50	7	100
GA03406S	255400	3872320	5	0.7	0.5	1	1500	<10	700	<1	10	70	15	200
GA03408S	255470	3872220	3	0.5	0.3	1	1500	<10	700	<1	7	50	7	200
GA03410S	255750	3871970	7	0.5	0.3	1	1000	10	700	<1	7	100	7	100
GA03412S	256020	3871520	10	0.7	0.5	1	1500	<10	700	<1	7	100	5	200

TABLE 1. ANALYSES OF STREAM-SEDIMENT, ROCK, SOIL, AND PANNED-CONCENTRATE SAMPLES, SOUTHERN NATAHALIA (Western part)

Sample Number	S-Mo ppm	S-Nb ppm	S-Ni ppm	S-Pb ppm	S-Sc ppm	S-Sn ppm	S-Sr ppm	S-V ppm	S-Y ppm	S-Zn ppm	S-Zr ppm	S-Th ppm	AA-Au ppm	AA-Zn ppm
							STREAM SEDIMENTS							
GA03005S	<5	20	15	<10	<5	<10	150	70	50	<200	1000	<100	-	60
GA03007S	<5	20	20	15	20	<10	200	100	100	<200	500	<100	-	60
GA03009S	<5	30	15	10	20	<10	<100	100	50	<200	1000	<100	-	50
GA03011S	<5	<20	20	10	15	<10	100	70	50	<200	500	<100	-	55
GA03014S	<5	20	15	10	<5	<10	150	50	30	<200	700	<100	-	50
GA03015S	<5	20	15	10	<5	<10	150	50	30	<200	700	<100	-	65
GA03016S	<5	<20	20	15	15	<10	200	70	50	<200	500	<100	-	45
GA03017S	<5	30	10	10	15	<10	100	100	150	<200	1000	<100	-	25
GA03019S	<5	<20	15	10	<5	<10	<100	200	70	<200	1000	<100	-	50
GA03021S	<5	20	15	10	<5	<10	100	50	50	<200	1000	<100	-	45
GA03023S	<5	20	15	10	<5	<10	<100	150	100	<200	1000	<100	-	55
GA03025S	<5	20	10	20	<5	<10	200	50	70	<200	1000	<100	-	55
GA03027S	<5	20	15	20	<5	<10	100	100	70	<200	1000	<100	-	45
GA03028S	<5	<20	30	10	20	<10	100	150	50	<200	500	<100	-	30
GA03030S	<5	<20	20	15	<5	<10	100	70	50	<200	500	<100	-	55
GA03032S	<5	<20	20	15	20	<10	100	300	30	<200	500	<100	-	40
GA03034S	<5	20	20	30	<5	<10	100	70	70	<200	700	<100	-	80
GA03036S	<5	<20	20	30	<5	<10	100	50	50	<200	700	<100	-	65
GA03038S	<5	<20	20	15	<5	<10	100	50	70	<200	700	<100	-	60
GA03040S	<5	<20	15	20	<5	<10	<100	100	70	<200	700	<100	-	90
GA03041S	<5	<20	15	15	<5	<10	<100	70	150	<200	300	<100	-	60
GA03047S	<5	<20	15	20	<5	<10	200	30	30	<200	500	<100	-	55
GA03049S	<5	<20	15	30	<5	<10	500	30	30	<200	300	<100	-	45
GA03050S	<5	<20	15	20	<5	<10	500	50	50	<200	300	<100	-	50
GA03052S	<5	<20	15	20	<5	<10	300	30	30	<200	100	<100	-	50
GA03055S	<5	<20	20	50	<5	<10	<100	50	50	<200	200	<100	-	90
GA03056S	<5	30	15	10	<5	<10	100	50	50	<200	300	<100	-	65
GA03058S	<5	<20	30	30	20	<10	150	200	50	<200	150	<100	-	55
GA03060S	<5	<20	20	15	<5	<10	150	150	50	<200	200	<100	-	40
GA03062S	<5	<20	30	10	20	<10	150	300	50	<200	100	<100	-	25
GA03067S	<5	20	20	10	20	<10	150	200	70	<200	150	<100	-	25
GA03069S	<5	<20	20	10	20	<10	150	200	50	<200	150	<100	-	40
GA03071S	<5	30	30	15	<5	<10	<100	70	100	<200	500	<100	-	70
GA03073S	<5	<20	20	10	20	<10	150	150	50	<200	300	<100	-	35
GA03076S	<5	<20	20	20	<5	<10	100	100	100	<200	1000	<100	-	55
GA03079S	<5	<20	20	30	<5	<10	100	100	150	<200	1000	<100	-	60
GA03081S	<5	<20	10	20	<5	<10	100	70	100	<200	1000	<100	-	40
GA03083S	<5	<20	20	30	<5	<10	100	70	50	<200	700	<100	-	90
GA03085S	<5	<20	30	20	<5	<10	100	70	100	<200	500	<100	-	95
GA03086S	<5	<20	15	10	<5	<10	<100	150	150	<200	1000	<100	-	50
GA03087S	<5	<20	15	15	<5	<10	100	70	30	<200	300	<100	-	55
GA03088S	<5	<20	10	15	<5	<10	100	100	70	<200	300	<100	-	60
GA03089S	<5	<20	15	15	<5	<10	100	70	50	<200	500	<100	-	50
GA03091S	<5	20	15	10	<5	<10	<100	50	30	<200	1000	<100	-	35
GA03093S	<5	<20	15	20	<5	<10	300	70	50	<200	300	<100	-	55
GA03095S	<5	<20	15	15	<5	<10	300	50	50	<200	1000	<100	-	40
GA03096S	<5	<20	10	15	<5	<10	200	30	30	<200	200	<100	-	55
GA03097S	<5	<20	10	20	<5	<10	300	50	30	<200	1000	<100	-	50
GA03099S	<5	<20	10	15	<5	<10	200	100	50	<200	500	<100	-	45
GA03100S	<5	<20	15	10	<5	<10	100	100	30	<200	500	<100	-	70
GA03406S	<5	20	20	10	15	<10	100	100	70	<200	1000	<100	-	60
GA03408S	<5	20	15	10	<5	<10	100	70	50	<200	1000	<100	-	55
GA03410S	<5	<20	15	15	<5	<10	100	200	500	<200	1000	<100	-	50
GA03412S	<5	<20	15	<10	<5	<10	<100	300	70	<200	700	<100	-	55

TABLE 1. ANALYSES OF STREAM-SEDIMENT, ROCK, SOIL, AND PANNED-CONCENTRATE SAMPLES, SOUTHERN NATAHALIA (Western part)

Sample Number	X-COORD.	Y-COORD.	S-Fe %	S-Mg %	S-Ca %	S-Ti %	S-Mn ppm	S-B ppm	S-Ba ppm	S-Be ppm	S-Co ppm	S-Cr ppm	S-Cu ppm	S-La ppm
						STREAM SEDIMENTS								
GA03414S	256100	3871200	5	0.5	0.05	1	1000	<10	700	<1	15	50	15	100
GA03416S	256890	3870400	5	0.3	0.2	1	1000	10	700	1	7	70	7	100
GA03418S	255110	3874630	10	1	1	1	1500	<10	500	<1	10	70	10	70
GA03420S	255070	3874600	7	0.5	1	1	1500	<10	500	1	7	50	7	200
GA03432S	259400	3872750	5	1	1	1	1000	10	500	1.5	15	100	10	50
GA03434S	259420	3872980	7	2	2	>1.	2000	<10	300	<1	20	100	10	200
GA03437S	258510	3872290	2	0.7	0.5	0.7	1000	<10	700	1	10	50	15	100
GA03438S	258640	3871790	7	1	0.3	1	1500	<10	700	<1	10	70	15	100
GA03445S	257140	3874150	3	0.7	1	1	1500	10	700	1.5	7	50	7	70
GA03449S	259890	3874080	5	0.7	0.5	1	1000	<10	300	1	10	50	10	100
GA03453S	259920	3872260	2	0.5	0.5	1	1500	10	500	1	7	50	7	70
GA03204S	254130	3874230	7	0.7	2	>1	1500	15	200	<1	7	100	5	70
GA03206S	253900	3874320	3	1	0.5	>1	1000	10	500	<1	7	70	5	50
						ROCKS								
GA03015R	253010	3872850	1.5	0.5	0.5	0.2	300	<10	300	<1	5	15	<5	<20
GA03044R	256170	3874000	5	1	0.3	0.3	700	<10	1000	<1	20	50	30	100
GA03054R	257370	3874570	7	1.5	0.3	0.3	700	<10	1000	1	20	50	20	70
GA03090R	257310	3871300	5	0.05	0.2	0.5	700	10	<20	2	7	100	50	<20
GA03098R	255890	3872480	1.5	1	0.7	0.2	1000	10	1000	1.5	7	15	15	50
GA03100R	255800	3872160	0.3	0.1	0.5	0.05	100	10	700	1	<5	<10	<5	50
GA03101R	257140	3871000	2	1	0.15	0.2	1000	20	1000	<1	7	30	15	50
GA03102R	259980	3871820	0.7	0.5	1	0.1	300	20	1500	1	5	<10	5	70
GA03103R	259980	3871820	5	1.5	0.2	0.7	1000	10	1000	<1	20	50	5	50
GA03104R	257530	3874920	10	2	1	0.5	5000	<10	700	<1	20	50	70	50
GA03105R	259650	3874420	5	3	5	0.5	1000	<10	100	<1	50	100	70	<20
GA03106R	258040	3874040	1.5	0.5	1.5	0.2	100	10	500	<1	7	10	<5	<20
GA03107R	258040	3874040	1.5	0.7	1	0.2	1500	10	500	1.5	<5	20	<5	70
GA03402R	254230	3872200	2	1	0.7	0.5	1000	10	1000	<1	7	30	10	50
GA03403R	254690	3871820	3	1	0.7	0.3	2000	<10	1000	<1	7	50	20	70
GA03404R	254950	3871640	1	0.7	0.7	0.3	200	<10	200	<1	7	15	15	70
GA03424R	254660	3873110	1	0.7	0.7	0.2	300	10	500	<1	5	15	5	70
GA03426R	254800	3873350	2	0.7	1	0.3	1000	10	300	<1	7	10	<5	70
GA03427R	255140	3873575	1.5	1	1	0.3	300	<10	500	<1	7	20	7	100
GA03429R	256110	3874380	3	1	0.7	0.5	1000	<10	700	<1	10	50	30	70
GA03431R	255780	3874280	10	2	0.2	0.5	2000	<10	700	<1	20	70	30	50
GA03442R	256630	3873500	2	2	1	0.3	1500	15	1000	<1	10	50	7	<20
GA03447R	258620	3874400	2	0.5	1	0.2	1000	<10	150	1.5	5	<10	<5	50
GA03462R	256380	3872980	1	1	1.5	0.15	500	<10	700	1.5	5	10	10	<20
GA03473R	256670	3873540	2	0.5	1	0.3	700	30	300	1	7	30	20	50
GA03474R	257260	3873270	3	1	1.5	1	700	10	300	1.5	7	70	<5	70
GA03475R	258610	3872250	1.5	0.5	0.7	0.2	500	10	300	<1	7	30	<5	70
GA03476R	258990	3873600	5	7	3	0.2	700	20	70	<1	50	700	100	<20
GA03477R	259770	3873620	3	1.5	0.5	0.3	700	15	700	<1	7	70	15	70
GA03478R	260080	3873770	2	1	0.7	0.3	200	15	500	1	7	50	<5	70
GA03479R	257600	3869940	3	2	0.7	0.5	500	10	1500	<1	10	100	<5	100
GA03480R	257690	3870380	5	2	0.2	0.5	500	10	1000	<1	20	100	30	100
GA03481R	257860	3870720	3	1	0.5	0.3	500	10	300	1.5	10	50	<5	100
GA03482R	258060	3871300	5	3	2	0.7	2000	30	200	1	30	200	<5	<20
GA03483R	258460	3871320	5	5	7	1	1000	30	<20	1.5	30	150	10	<20
GA03484R	257230	3812780	5	2	0.5	0.5	700	10	1000	<1	20	100	15	200
GA03485R	257360	3872470	0.5	0.5	0.7	0.07	100	30	300	2	<5	<10	<5	<20
GA03486R	257520	2872320	5	2	0.2	0.7	1500	10	500	<1	20	100	50	100
GA03487R	257770	3870950	3	1.5	1	0.5	300	10	500	1	10	100	<5	100

TABLE 1. ANALYSES OF STREAM-SEDIMENT, ROCK, SOIL, AND PANNED-CONCENTRATE SAMPLES, SOUTHERN NATAHALIA (Western part)

Sample Number	S-Mo ppm	S-Nb ppm	S-Ni ppm	S-Pb ppm	S-Sc ppm	S-Sn ppm	S-Sr ppm	S-V ppm	S-Y ppm	S-Zn ppm	S-Zr ppm	S-Th ppm	AA-Au ppm	AA-Zn ppm
STREAM SEDIMENTS														
GA03414S	<5	20	30	20	<5	<10	<100	50	50	<200	500	<100	-	85
GA03416S	<5	<20	10	15	<5	<10	100	100	100	<200	700	<100	-	60
GA03418S	<5	<20	20	20	<5	<10	<100	150	50	<200	300	<100	-	70
GA03420S	<5	<20	15	15	<5	<10	200	100	50	<200	1000	<100	-	55
GA03432S	<5	20	20	20	<5	<10	100	100	50	<200	200	<100	-	60
GA03434S	<5	20	30	10	20	<10	<100	200	50	<200	500	<100	-	35
GA03437S	<5	<20	15	20	<5	<10	150	50	50	<200	500	<100	-	65
GA03438S	<5	<20	15	20	<5	<10	<100	150	50	<200	700	<100	-	80
GA03445S	<5	20	15	30	<5	<10	200	50	50	<200	300	<100	-	70
GA03449S	<5	<20	15	20	15	<10	150	100	50	<200	700	<100	-	55
GA03453S	<5	<20	15	15	<5	<10	150	30	50	<200	1000	<100	-	60
GA03204S	<5	20	10	15	30	<10	200	150	50	<200	500	<100		45
GA03206S	<5	20	10	20	15	<10	150	70	50	<200	1000	<100		60
ROCKS														
GA03015R	<5	<20	5	<10	5	<10	150	30	15	<200	200	<100	-	30
GA03044R	<5	<20	20	50	15	<10	100	70	50	<200	100	<100	-	90
GA03054R	<5	<20	20	20	15	<10	100	70	30	<200	50	<100	-	65
GA03090R	<5	<20	15	<10	15	<10	<100	150	15	<200	150	<100	-	20
GA03098R	<5	<20	15	15	7	<10	200	30	20	<200	70	<100	-	25
GA03100R	<5	<20	<5	30	<5	<10	150	10	10	<200	10	<100	-	5
GA03101R	<5	<20	7	20	10	<10	100	30	30	<200	70	<100	-	80
GA03102R	<5	<20	7	30	<5	<10	200	20	70	<200	<10	<100	-	25
GA03103R	<5	<20	30	20	10	<10	100	100	30	<200	70	<100	-	90
GA03104R	<5	<20	20	10	70	<10	150	100	150	<200	500	<100	-	85
GA03105R	<5	<20	70	10	30	<10	150	200	20	<200	70	<100	-	5
GA03106R	<5	<20	10	10	5	<10	500	50	<10	<200	150	<100	-	40
GA03107R	5	<20	10	20	7	<10	100	30	50	<200	50	<100	-	55
GA03402R	<5	<20	15	15	10	<10	200	50	30	<200	150	<100	-	55
GA03403R	<5	<20	15	15	10	<10	150	70	50	200	200	<100	-	140
GA03404R	<5	<20	5	10	<5	<10	100	30	15	<200	300	<100	-	35
GA03424R	<5	<20	5	<10	5	<10	200	30	15	<200	70	<100	-	35
GA03426R	<5	<20	10	<10	7	<10	200	50	30	<200	200	<100	-	55
GA03427R	<5	<20	7	10	5	<10	200	50	20	<200	200	<100	-	35
GA03429R	<5	<20	10	20	15	<10	200	70	50	<200	100	<100	-	100
GA03431R	<5	<20	20	15	20	<10	150	100	70	<200	100	<100	-	90
GA03442R	<5	<20	15	20	10	<10	<100	50	10	200	30	<100	-	70
GA03447R	<5	<20	<5	<10	10	<10	300	10	50	<200	300	<100	-	15
GA03462R	<5	<20	<5	<10	5	<10	200	30	15	<200	50	<100	-	55
GA03473R	<5	20	10	20	10	<10	200	50	30	<200	700	<100		60
GA03474R	<5	20	7	20	15	<10	200	100	50	<200	300	<100		45
GA03475R	<5	<20	5	15	7	<10	200	70	30	<200	200	<100		30
GA03476R	<5	<20	500	10	30	<10	100	200	15	<200	50	<100		5
GA03477R	<5	20	10	30	15	<10	200	100	30	<200	150	<100		80
GA03478R	<5	20	10	20	10	<10	500	70	20	<200	700	<100		60
GA03479R	<5	<20	30	70	15	<10	500	100	50	<200	200	<100		85
GA03480R	<5	<20	30	30	20	<10	100	100	50	<200	200	<100		130
GA03481R	<5	<20	15	20	10	<10	150	70	50	<200	200	<100		100
GA03482R	<5	<20	100	15	50	<10	150	200	30	<200	150	<100		15
GA03483R	<5	<20	50	20	50	<10	700	300	50	<200	100	<100		5
GA03484R	<5	30	30	50	20	<10	500	150	70	<200	150	<100		80
GA03485R	<5	<20	<5	50	<5	<10	500	20	<10	<200	20	<100		20
GA03486R	<5	<20	30	20	30	<10	150	150	70	<200	150	<100		140
GA03487R	<5	<20	20	30	15	<10	300	100	50	<200	300	<100		85

TABLE 1. ANALYSES OF STREAM-SEDIMENT, ROCK, SOIL, AND PANNED-CONCENTRATE SAMPLES, SOUTHERN NATAHALIA (Western part)

Sample Number	X-COORD.	Y-COORD.	S-Fe %	S-Mg %	S-Ca %	S-Ti %	S-Mn ppm	S-B ppm	S-Ba ppm	S-Be ppm	S-Co ppm	S-Cr ppm	S-Cu ppm	S-La ppm
						ROCKS								
GA03489R	258080	3871480	5	2	<0.05	0.5	500	30	1000	1	30	100	150	500
GA03601R	254410	3874100	2	1	1.5	0.2	300	10	300	<1	7	50	<5	70
GA03602R	254970	3873980	5	1.5	1	0.7	700	10	300	<1	10	100	20	100
GA03603R	254740	3874270	5	2	10	0.15	2000	10	100	1.5	20	50	10	100
GA03604R	254560	3874650	3	0.7	1	1	700	10	700	<1	5	30	7	30
GA03605R	254430	3874490	1	0.5	0.3	0.3	200	30	700	<1	5	20	<5	30
GA03606R	254220	3874490	5	5	1.5	1	1000	10	1000	<1	10	70	7	50
GA03607R	254320	3873580	3	1.5	0.5	0.5	700	10	1000	1	7	50	<5	50
						SOILS								
GA03043D	256170	3874000	5	1	0.1	1	500	20	700	<1	15	100	100	150
GA03045D	256120	3874275	2	0.3	0.05	0.7	1500	20	500	<1	7	50	50	100
GA03046D	256230	3874280	1.5	0.5	0.2	0.5	1000	15	500	1	7	50	20	70
GA03064D	259000	3874600	2	0.5	<0.05	0.5	100	15	500	<1	10	50	20	100
GA03065D	258950	3874400	5	0.7	0.7	0.7	1000	10	200	2	15	15	10	100
GA03066D	258830	3874340	2	0.5	0.5	0.5	1000	10	200	1.5	7	30	5	100
GA03075D	259620	3871820	5	1	0.1	0.7	2000	20	700	1	20	70	100	100
GA03078D	259600	3871700	5	0.2	<0.05	0.7	1000	30	500	<1	10	70	50	150
GA03401D	254260	3872195	2	0.3	0.2	0.7	700	10	200	<1	<5	30	20	100
GA03405D	254950	3871610	3	0.7	0.15	1	300	<10	300	<1	10	70	30	<20
GA03422D	254420	3872700	2	0.5	0.1	0.5	1500	10	500	1	7	70	30	50
GA03423D	254660	3873110	1	0.15	0.3	0.3	2000	<10	700	<1	<5	10	20	<20
GA03425D	254740	3873300	2	0.7	0.5	0.5	2000	10	700	1	7	150	50	50
GA03427D	255140	3873575	1.5	0.7	0.7	0.3	1500	<10	200	1.5	7	30	30	70
GA03428D	256110	3874380	2	0.7	0.5	0.7	1000	15	500	1	7	100	50	50
GA03430D	255780	3874280	1.5	0.5	0.2	0.5	1500	10	500	<1	7	70	15	70
GA03436D	258870	3872490	5	1	<0.05	0.5	500	<10	700	1	30	70	70	100
GA03440D	257180	3873530	2	0.5	0.5	0.2	1000	10	300	1.5	20	50	50	100
GA03441D	256630	3873500	5	1	0.7	0.5	1000	<10	300	1.5	10	70	30	50
GA03443D	257390	3873240	3	0.5	0.2	0.5	500	<10	500	1.5	10	50	50	100
GA03444D	257630	3873680	5	0.7	<0.05	1	700	30	700	1	20	100	30	100
GA03448D	260310	3874300	3	0.7	<0.05	0.7	500	<10	500	<1	10	50	15	100
GA03450D	258880	3873850	3	1	0.7	0.7	700	10	200	1	20	150	70	70
GA03451D	258380	3873850	10	1	1	0.5	1000	<10	100	1	50	70	150	<20
GA03452D	260120	3872060	7	1	0.1	0.5	1000	<10	700	1	20	50	70	150
GA03454D	254420	3872700	3	0.7	0.1	0.7	1500	15	500	<1	7	50	20	50
GA03455D	254090	3872910	7	1	0.15	0.7	1000	10	700	<1	20	70	70	100
GA03456D	253800	3873090	10	1	0.2	0.7	1000	<10	700	<1	20	50	70	100
GA03457D	253550	3873310	5	0.7	0.2	1	1000	20	1000	<1	10	50	15	100
GA03458D	256190	3873090	5	1	1	0.7	1000	50	500	1.5	20	70	30	70
GA03459D	256300	3872890	3	0.7	0.5	0.5	700	50	500	1	10	50	20	50
GA03460D	256460	3872600	10	1	<0.05	0.7	1000	10	200	1.5	30	150	70	100
GA03461D	256610	3872300	2	0.7	<0.05	0.2	300	10	300	1.5	30	50	30	150
GA03463D	255950	3873040	1.5	0.2	0.1	0.5	500	50	500	<1	7	50	15	50
GA03464D	255880	3872570	3	0.5	0.15	0.7	200	10	300	1	20	70	50	100
GA03465D	256010	3872380	5	1	0.2	0.7	700	20	700	1	30	100	100	70
GA03466D	254360	3872220	5	1.5	1	0.7	500	10	500	1	20	70	5	100
GA03468D	254950	3874000	5	0.7	<0.05	0.7	300	15	300	1	10	100	7	100
GA03469D	254740	3874270	5	2	1.5	0.5	700	10	300	2	30	150	100	100
GA03470D	254560	3874650	7	1.5	<0.05	0.5	500	15	500	1	30	100	<5	200
GA03471D	254430	3874700	3	1	0.05	0.7	300	10	500	<1	10	70	15	150
GA03472D	254220	3874490	5	1.5	0.07	0.3	700	10	500	1	15	100	20	70
GA03203D	254150	3874370	5	1	0.3	0.3	1000	15	500	1	15	70	20	150

TABLE 1. ANALYSES OF STREAM-SEDIMENT, ROCK, SOIL, AND PANNED-CONCENTRATE SAMPLES, SOUTHERN NATAHALIA (Western part)

Sample Number	S-Mo ppm	S-Nb ppm	S-Ni ppm	S-Pb ppm	S-Sc ppm	S-Sn ppm	S-Sr ppm	S-V ppm	S-Y ppm	S-Zn ppm	S-Zr ppm	S-Th ppm	AA-Au ppm	AA-Zn ppm
						ROCKS								
GA03489R	<5	20	50	50	20	<10	150	100	100	<200	100	<100		40
GA03601R	<5	<20	7	30	10	<10	200	50	30	<200	200	<100		70
GA03602R	<5	20	15	30	20	<10	100	100	50	<200	150	<100		65
GA03603R	<5	<20	20	20	10	15	1000	150	50	<200	100	<100		20
GA03604R	<5	<20	5	30	7	<10	150	70	20	<200	300	<100		30
GA03605R	<5	<20	<5	20	<5	<10	200	30	<10	<200	70	<100		30
GA03606R	<5	20	20	20	20	<10	150	150	50	<200	200	<100		105
GA03607R	<5	<20	10	30	10	<10	150	100	50	<200	200	<100		70
						SOILS								
GA03043D	<5	<20	30	50	15	<10	<100	100	70	<200	500	<100	-	110
GA03045D	<5	<20	20	50	10	<10	<100	70	50	<200	300	<100	-	110
GA03046D	<5	<20	15	30	10	<10	100	30	50	<200	1000	<100	-	95
GA03064D	<5	<20	15	20	10	<10	<100	50	50	<200	500	<100	-	35
GA03065D	<5	<20	5	10	20	<10	200	30	100	<200	200	<100	-	45
GA03066D	<5	<20	15	10	10	<10	100	70	50	<200	200	<100	-	40
GA03075D	<5	<20	30	20	15	<10	<100	50	100	<200	300	<100	-	120
GA03078D	<5	<20	20	20	15	<10	<100	100	70	<200	700	<100	-	60
GA03401D	<5	<20	10	30	10	<10	150	50	30	<200	700	<100	-	85
GA03405D	<5	<20	20	30	15	<10	100	100	50	<200	>1000	<100	-	110
GA03422D	<5	<20	15	30	10	<10	100	100	30	<200	150	<100	-	100
GA03423D	<5	<20	5	50	<5	<10	100	20	20	<200	1000	<100	-	200
GA03425D	<5	<20	50	20	15	<10	100	70	70	<200	1000	<100	-	130
GA03427D	<5	<20	15	30	7	<10	150	50	50	<200	200	<100	-	110
GA03428D	<5	<20	20	50	7	<10	100	100	30	<200	300	<100	-	130
GA03430D	<5	<20	10	20	7	<10	100	50	30	<200	500	<100	-	120
GA03436D	<5	<20	50	50	15	<10	<100	70	100	<200	300	<100	-	110
GA03440D	<5	<20	15	50	15	<10	<100	50	70	<200	500	<100	-	100
GA03441D	<5	<20	20	20	10	<10	100	70	50	<200	500	<100	-	75
GA03443D	<5	<20	15	20	10	<10	100	70	70	<200	200	<100	-	140
GA03444D	<5	<20	30	30	15	<10	<100	100	100	<200	300	<100	-	100
GA03448D	<5	<20	20	30	15	<10	<100	50	70	<200	300	<100	-	65
GA03450D	<5	<20	50	20	15	<10	100	150	50	<200	300	<100	-	60
GA03451D	<5	<20	50	20	30	<10	100	300	50	<200	100	<100	-	55
GA03452D	<5	<20	30	50	15	<10	<100	70	70	<200	700	<100	-	110
GA03454D	<5	<20	15	15	10	<10	<100	70	50	<200	300	<100	-	120
GA03455D	<5	<20	20	20	15	<10	100	70	70	<200	500	<100	-	130
GA03456D	<5	<20	20	20	15	<10	100	100	70	<200	500	<100	-	100
GA03457D	<5	<20	15	10	15	<10	100	100	30	<200	1000	<100	-	80
GA03458D	<5	<20	30	20	15	<10	100	100	50	<200	100	<100	-	100
GA03459D	<5	<20	20	20	15	<10	100	100	70	<200	700	<100	-	100
GA03460D	<5	<20	70	50	30	<10	<100	150	100	<200	150	<100	-	75
GA03461D	<5	<20	50	30	15	<10	<100	70	50	<200	150	<100	-	130
GA03463D	<5	<20	15	30	10	<10	100	70	30	<200	500	<100	-	50
GA06464D	<5	<20	30	20	15	<10	<100	100	50	<200	300	<100	-	75
GA03465D	<5	<20	50	30	20	<10	100	100	50	<200	500	<100	-	100
GA03466D	<5	20	30	50	20	<10	<100	100	70	<200	1000	<100		145
GA03468D	<5	20	30	30	15	<10	<100	150	50	<200	500	<100		105
GA03469D	<5	<20	50	20	15	<10	300	150	70	<200	300	<100		150
GA03470D	<5	20	50	30	20	<10	<100	100	100	<200	500	<100		200
GA03471D	<5	20	20	30	15	<10	<100	100	70	<200	1000	<100		90
GA03472D	<5	<20	30	30	15	<10	<100	100	50	<200	300	<100		110
GA03203D	<5	<20	30	30	15	<10	150	100	70	<200	1000	<100		135

TABLE 1. ANALYSES OF STREAM-SEDIMENT, ROCK, SOIL, AND PANNED-CONCENTRATE SAMPLES, SOUTHERN NATAHALIA (Western part)

Sample Number	X-COORD.	Y-COORD.	S-Fe %	S-Mg %	S-Ca %	S-Ti %	S-Mn ppm	S-B ppm	S-Ba ppm	S-Be ppm	S-Co ppm	S-Cr ppm	S-Cu ppm	S-La ppm
						PANNED-CONCENTRATES								
GA03006C	253440	3874990	0.5	<0.05	<0.1	2	100	20	<50	<2	10	150	<10	150
GA03008C	253490	3871375	0.5	0.05	0.1	>2.	50	20	<50	<2	<10	150	<10	<50
GA03010C	253530	3874420	0.7	0.07	0.2	>2.	100	20	<50	<2	<10	200	<10	300
GA03012C	253100	3873990	0.5	0.05	<0.1	1.5	100	20	<50	<2	<10	150	<10	<50
GA03014C	253030	3873020	0.15	<0.05	<0.1	2	100	20	<50	<2	<10	<20	<10	1000
GA03015C	253010	3872850	0.3	<0.05	0.3	>2.	150	20	<50	<2	<10	30	<10	150
GA03016C	255610	3872270	1	0.1	1	2	200	20	<50	<2	<10	150	<10	500
GA03018C	255670	3871880	0.5	0.05	0.1	2	150	20	100	<2	<10	100	<10	150
GA03020C	256010	3871600	0.5	0.05	0.2	0.5	150	20	300	<2	<10	20	<10	150
GA03022C	255070	3874600	0.5	<0.05	0.2	>2.	150	20	<50	<2	<10	100	<10	500
GA03024C	255120	3874625	0.7	0.1	0.1	1	100	20	<50	<2	<10	150	<10	<50
GA03026C	255960	3874580	1	0.1	0.5	0.7	200	20	<50	<2	<10	200	<10	150
GA03027C	258150	3870480	0.7	0.05	0.2	2	150	20	150	<2	10	20	<10	500
GA03029C	259390	3872920	0.5	0.07	0.2	>2.	150	20	<50	<2	<10	100	<10	100
GA03031C	259250	3872960	0.5	0.05	0.1	>2.	50	20	<50	<2	<10	100	<10	100
GA03033C	259240	3872960	0.5	0.05	0.15	>2.	70	20	<50	<2	<10	100	<10	100
GA03035C	258970	3872670	0.7	0.07	<0.1	>2.	100	20	<50	<2	10	150	<10	200
GA03037C	258230	3872200	1	0.1	0.3	2	300	20	<50	<2	10	150	10	150
GA03039C	258650	3872460	0.7	0.1	0.1	>2.	70	30	<50	<2	10	150	<10	150
GA03042C	258690	3871140	0.7	0.1	<0.1	0.5	70	20	<50	<2	<10	150	<10	200
GA03048C	256340	3874290	0.5	<0.05	1	2	100	20	<50	<2	<10	100	<10	200
GA03051C	256825	3874240	1.5	<0.05	7	2	700	20	<50	<2	<10	30	<10	150
GA03053C	256970	3874200	2	0.05	10	>2.	700	20	<50	<2	<10	50	<10	500
GA03057C	258040	3874100	0.7	0.1	0.1	>2.	150	20	<50	<2	<10	150	<10	150
GA03059C	259710	3874180	1	0.5	1	>2.	500	20	<50	<2	<10	70	10	100
GA03061C	259520	3874370	0.5	0.05	0.15	>2.	70	70	<50	<2	<10	200	<10	500
GA03063C	259420	3874400	0.7	0.1	1	0.5	150	20	<50	<2	<10	<20	<10	<50
GA03068C	258610	3874350	0.7	0.1	0.7	>2.	300	20	<50	<2	<10	70	<10	150
GA03070C	258260	3874740	0.7	0.05	0.15	>2.	100	20	<50	<2	<10	100	<10	100
GA03072C	258390	3874510	0.7	0.07	<0.1	>2.	200	20	<50	<2	10	200	<10	200
GA03074C	258440	3874540	0.5	0.1	0.3	>2.	100	20	100	<2	10	100	<10	150
GA03077C	259780	3871770	0.7	0.1	<0.1	0.2	70	20	100	<2	<10	70	<10	150
GA03080C	259880	3871680	1	0.07	0.2	0.5	150	20	200	<2	<10	20	<10	200
GA03082C	256760	3869910	1	0.05	0.3	1.5	200	20	100	<2	<10	20	10	1000
GA03084C	257080	3871970	1	0.07	0.7	2	150	50	<50	<2	<10	100	<10	150
GA03090C	257310	3871300	0.5	0.05	<0.1	0.15	70	20	70	<2	<10	50	<10	100
GA03092C	252620	3873280	0.3	<0.05	<0.1	>2.	70	20	<50	<2	<10	100	<10	<50
GA03094C	255770	3873350	1.5	0.05	5	>2.	500	20	<50	<2	<10	100	<10	100
GA03407C	255400	3872320	1	0.07	0.1	>2.	100	20	<50	<2	<10	100	<10	300
GA03409C	255470	3872220	0.7	0.05	0.1	>2.	200	20	<50	<2	<10	100	<10	200
GA03411C	255750	3871970	1.5	0.15	0.3	0.5	200	20	150	<2	<10	100	<10	300
GA03413C	256020	3871520	1	0.1	<0.1	0.7	100	30	200	<2	<10	70	<10	150
GA03415C	256100	3871200	1	0.05	<0.1	0.15	100	20	<50	<2	<10	70	<10	150
GA03417C	256890	3870400	1	0.05	0.2	2	100	20	<50	<2	10	100	<10	150
GA03419C	255110	3874630	1	0.1	0.2	1	100	20	<50	<2	10	200	<10	100
GA03421C	255070	3874600	1	0.1	0.2	0.7	100	20	<50	<2	10	200	<10	<50
GA03433C	259400	3872750	1	0.1	<0.1	2	100	20	<50	<2	10	150	<10	100
GA03435C	259420	3872980	1	0.15	0.5	>2.	200	20	100	<2	10	100	<10	200
GA03439C	258640	3871790	1	0.1	<0.1	2	70	20	<50	<2	<10	150	<10	150
GA03446C	257140	3874150	0.5	<0.05	3	>2.	200	20	70	<2	<10	100	<10	150

TABLE 1. ANALYSES OF STREAM-SEDIMENT, ROCK, SOIL, AND PANNED-CONCENTRATE SAMPLES, SOUTHERN NATAHALIA (Western part)

Sample Number	S-Mo ppm	S-Nb ppm	S-Ni ppm	S-Pb ppm	S-Sc ppm	S-Sn ppm	S-Sr ppm	S-V ppm	S-Y ppm	S-Zn ppm	S-Zr ppm	S-Th ppm	AA-Au ppm	AA-Zn ppm
PANNED-CONCENTRATES														
GA03006C	<10	50	<10	<20	<10	<20	<200	100	70	<500	>2000	<200	<0.1	5
GA03008C	<10	<50	<10	<20	<10	<20	<200	100	200	<500	>2000	<200	<0.71	<7
GA03010C	<10	50	<10	<20	<10	<20	<200	100	150	<500	>2000	<200	<1	<10.2
GA03012C	<10	50	<10	<20	<10	<20	<200	70	20	<500	>2000	<200	<0.34	5
GA03014C	<10	<50	10	50	70	<20	<200	20	700	<500	>2000	<200	<2.3	<30.6
GA03015C	<10	<50	10	20	50	<20	<200	70	700	<500	>2000	<200	<2	<10
GA03016C	<10	<50	<10	<20	<10	<20	<200	70	150	<500	>2000	<200	<1.4	<10.1
GA03018C	<10	50	<10	<20	<10	<20	<200	70	50	<500	>2000	<200	<0.31	8
GA03020C	<10	<50	<10	<20	<10	<20	<200	50	50	<500	>2000	<200	<0.36	9
GA03022C	<10	<50	<10	20	30	<20	<200	100	300	<500	>2000	<200	<1.5	<10.4
GA03024C	<10	<50	<10	<20	<10	<20	<200	70	30	<500	>2000	<200	<0.48	10
GA03026C	<10	<50	<10	<20	<10	<20	<200	100	70	<500	>2000	<200	<0.83	12
GA03027C	<10	<50	<10	<20	<10	<20	<200	50	200	<500	>2000	<200	<0.71	13
GA03029C	<10	100	<10	<20	<10	<20	<200	100	70	<500	>2000	<200	<6.3	<30
GA03031C	<10	<50	<10	<20	<10	300	<200	100	20	<500	>2000	<200	<2.9	<10.5
GA03033C	<10	<50	<10	<20	<10	<20	<200	100	300	<500	>2000	<200	<20.5	<80
GA03035C	<10	100	<10	<20	<10	<20	<200	150	70	<500	>2000	<200	<0.37	12
GA03037C	<10	70	<10	<20	<10	<20	<200	100	100	<500	>2000	<200	<1.4	15
GA03039C	<10	200	<10	<20	<10	<20	<200	150	30	<500	>2000	<200	<0.51	12
GA03042C	<10	<50	<10	<20	<10	<20	<200	70	20	<500	2000	<200	<0.13	7
GA03048C	<10	<50	<10	<20	<10	<20	200	50	300	500	>2000	<200	<0.25	<9
GA03051C	<10	<50	<10	30	<10	<20	1000	70	300	<500	>2000	<200	<1.9	<10.1
GA03053C	<10	50	<10	30	<10	20	700	100	300	<500	>2000	<200	<1.7	<9
GA03057C	<10	150	<10	<20	50	<20	<200	150	30	<500	2000	<200	<0.2	11
GA03059C	<10	50	10	20	50	20	<200	100	300	<500	>2000	<200	<20.5	-
GA03061C	<10	100	<10	<20	<10	30	<200	200	300	<500	>2000	<200	<2.9	<30.2
GA03063C	<10	<50	<10	<20	<10	<20	500	30	20	<500	2000	<200	<0.81	<7
GA03068C	<10	200	<10	<20	<10	<20	200	100	100	<500	>2000	<200	<4.2	<100
GA03070C	<10	100	<10	<20	<10	<20	<200	100	100	<500	>2000	<200	<1.9	<20.7
GA03072C	<10	200	<10	<20	<10	<20	<200	150	20	<500	700	<200	<0.09	10
GA03074C	<10	150	<10	<20	<10	<20	200	150	100	<500	>2000	<200	<1.4	<30
GA03077C	<10	<50	<10	<20	<10	<20	<200	50	20	<500	2000	<200	<0.71	10
GA03080C	<10	<50	<10	50	<10	<20	<200	30	150	<500	>2000	<200	<0.63	<9
GA03082C	<10	<50	10	50	50	<20	<200	30	500	<500	>2000	<200	<0.96	<20.5
GA03084C	<10	<50	<10	<20	<10	<20	200	70	150	<500	>2000	<200	<0.77	<10.3
GA03090C	<10	<50	<10	<20	<10	<20	<200	30	30	<500	2000	<200	<0.14	6
GA03092C	<10	<50	<10	<20	20	<20	<200	70	300	<500	>2000	<200	<0.64	<6
GA03094C	<10	<50	<10	20	20	<20	200	100	500	<500	>2000	<200	<1.7	<10.9
GA03407C	<10	<50	<10	<20	<10	<20	<200	70	300	<500	>2000	<200	<0.3	<10.1
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GA03417C	<10	<50	<10	<20	<10	<20	<200	70	70	<500	>2000	<200	<1.1	<10
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GA03421C	<10	<50	<10	<20	<10	<20	<200	70	70	<500	>2000	<200	<0.5	9
GA03433C	<10	70	<10	<20	<10	<20	<200	70	70	<500	>2000	<200	<1.3	<10.9
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GA03446C	<10	70	<10	<20	<10	<20	200	100	200	<500	>2000	<200	<20.3	<20.4