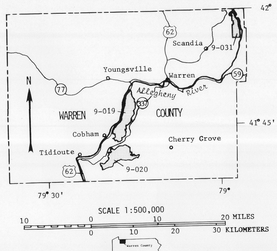


Figure 1.—Index map showing the location of the Cornplanter Roadless Area (9-031). Nearby areas of previous work include the Allegheny Front (9-019) and Hickory Creek (9-020) Roadless Areas (Schweinfurth 1982; Kinzua quadrangle (Lytle and Goth, 1970), and the Warren quadrangle Butts, 1910). Forest Service area designation numbers shown in parenthesis.

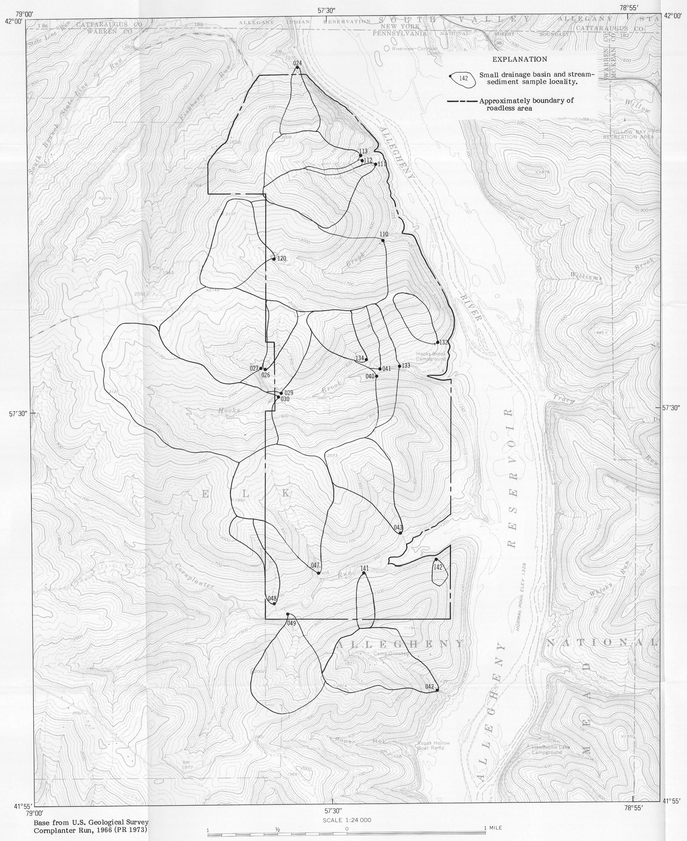


Figure 2.—Small drainage basins and localities of stream-sediment samples (see table 1).

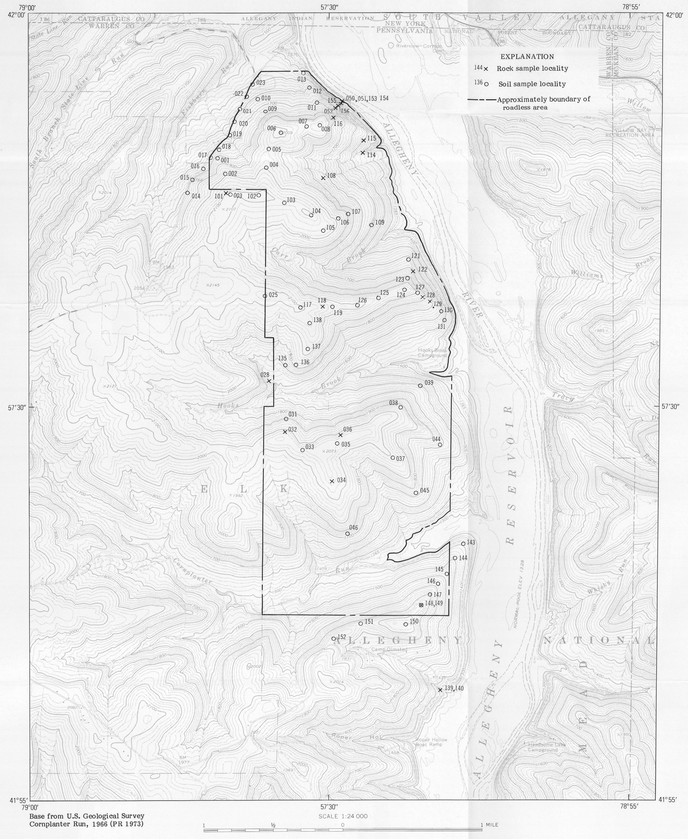


Figure 3.—Sample localities of rock samples (see tables 1 and 2).

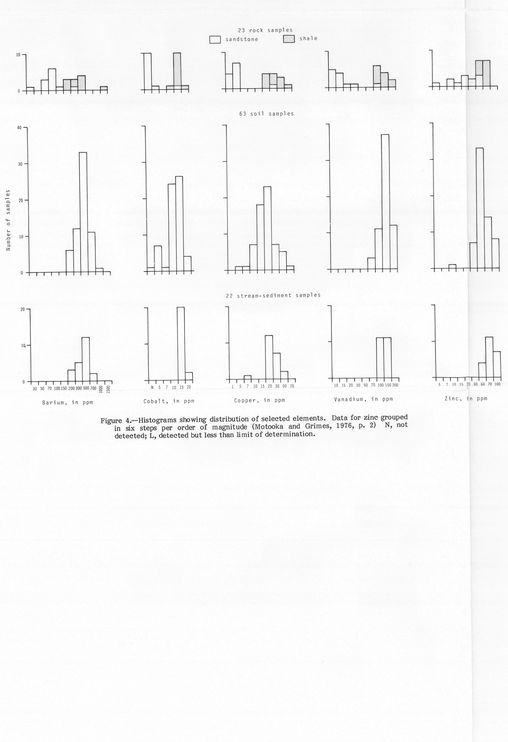
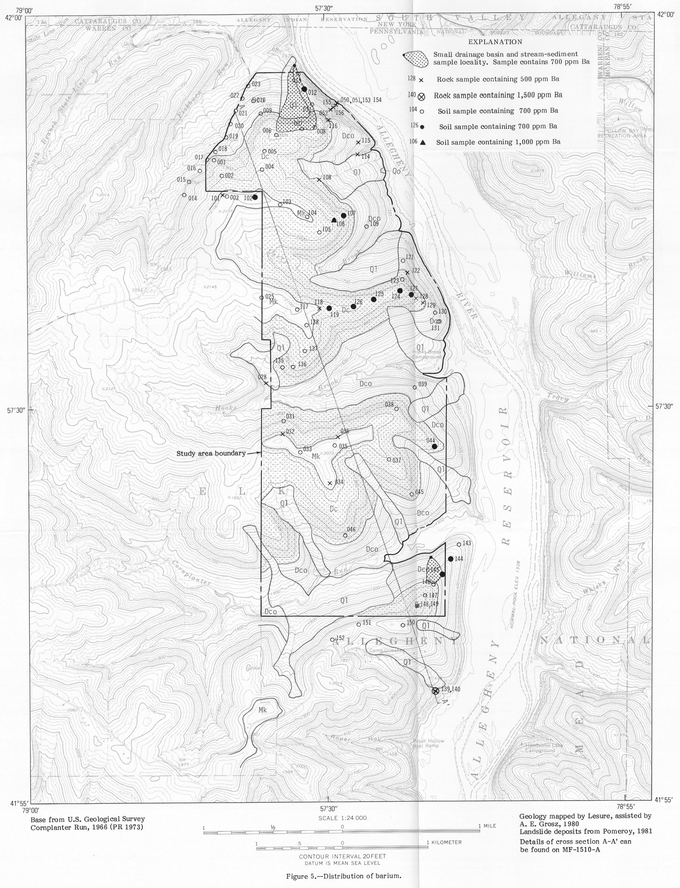


Figure 4.—Histograms showing distribution of selected elements. Data for zinc grouped in six steps per order of magnitude (Motooka and Grimes, 1976, p. 2). N, not detected; L, detected but less than limit of determination.



Geology mapped by Lesure, assisted by A. E. Grosz, 1980
Landslide deposits from Pomeroy, 1981
Details of cross section A-A' can be found on MF-1510-A

Figure 5.—Distribution of barium.

CORRELATION OF MAP UNITS

Ql	Holocene and Pleistocene	Quaternary	Cenozoic
Qo	Pleistocene		
Mk	Lower Mississippian	Mississippian	Paleozoic
UNCONFORMITY			
Dc	Upper Devonian	Devonian	
Dco	Upper Devonian		

DESCRIPTION OF MAP UNITS

Ql Landslides and colluvium (Holocene and Pleistocene)—Areas of extensive hummocky ground caused by earthflow and earth and rock slump. Landslide areas from Pomeroy (1981), modified slightly after field observations but based mostly on interpretation of aerial photographs

Qo Outwash (Pleistocene)—Small area of gravel on the toe of one landslide mass. Consists of pebbles, cobbles, and boulders of quartzite, granite, garnet amphibolite, anorthosite, pegmatite, and other exotic rock types derived from areas to the north in New York and Canada. Much of deposit already removed from small gravel pit

Mk Knapp Formation (Lower Mississippian)—Conglomerate and conglomeratic sandstone, yellowish-gray to grayish-orange; mostly flat, ellipsoidal, white quartz pebbles as much as 0.5 m (13 mm) long in a fine- to coarse-grained quartz-sand matrix. Generally massive and crossbedded. In part friable but forms massive blocks 3-9 ft (1-3 m) thick that mantle the upper slopes. Areas of many large blocks locally called "rock cities." Only the lower part of formation is preserved in the study area

Dc Conewango Formation (Upper Devonian)—Poorly exposed sequence of interlayered fine-grained greenish-gray sandstone, siltstone and shale. Upper part fossiliferous. Sandstone generally very fine to fine grained except in lower 120-140 ft (36-43 m) which contains conglomeratic sandstone lenses in several zones. Some reddish-brown shale present locally as float. Conglomeratic sandstone part probably corresponds to Venango Formation of Lesley (1892) and upper shaly part to the Oswayo Formation. Also includes part of what Butts (1910) mapped as Conewango Formation and what Lytle and Goth (1970, p. 13) describe as Cattaraugus Formation. Lack of exposures precludes mapping any of these units

Dco Conneaut Group of Chadwick (1935) (Upper Devonian)—Poorly exposed greenish-gray and locally brown or reddish-brown thinly bedded shaly siltstone, very fine grained sandstone, and shale. Section well exposed near lake level is fossiliferous. Corresponds to Chemung Formation of former usage, lower part of Conewango Formation as mapped by Butts (1910), and the Chadakoin Formation as used by Edmunds (1977)

Contact, approximately located

Studies Related To Wilderness

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Cornplanter Roadless Area (09-031) in the Allegheny National Forest, Warren County, Pa. The area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

INTRODUCTION

The U.S. Geological Survey (USGS) made a reconnaissance geochemical survey of the Cornplanter Roadless Area (fig. 1) to test for indistinct or unexposed mineral deposits that might be recognized by their geochemical halos or patterns formed by the distribution of trace elements. Lesure, assisted by Andrew E. Grosz, collected 22 stream-sediment, 63 soil, and 23 rock samples from within and near the study area during October 1980. All samples were analyzed for 31 elements using semi-quantitative spectrographic methods by Day in USGS laboratories, Denver, Colo. (table 1). In addition, the samples were also analyzed for zinc by means of an atomic absorption method by B. F. Arbogast and W. C. Martin, USGS laboratories, Denver, Colo. A few samples were reanalyzed spectrographically by M. S. Erickson, USGS, Denver, Colo. J. T. Hanley and P. G. Schruben formatted the analytical data by computer methods for table 1.

PROCEDURES

Most of the small drainage basins in the study area and some adjacent to it were sampled by collecting at random a few handfuls of the finest-grained sediment available at the sample site in the stream (fig. 2). After drying in the laboratory, the samples were sieved to minus 80-mesh (0.177 mm) and then pulverized to minus 140-mesh (0.004 in. or 0.105 mm) for analysis.

The rock samples (fig. 3) consist of a few chips taken across the bedding over a measured thickness (table 2). The samples are representative of the major rock types exposed in the area. Most of the rock is partly weathered, but the freshest material available was generally sampled. Rock samples were crushed to approximately 0.25 inch (6 mm) and pulverized to minus 140-mesh (0.004 in or 0.105 mm) in a vertical grinder with ceramic plates.

The soil samples (fig. 3) are grab samples from the A_0 or upper B soil zone, just below the dark, organic surface soil (A_1 zone). Soils were dried, sieved to minus 80-mesh (0.177 mm), and then pulverized to minus 140-mesh (0.004 in. or 0.105 mm).

DISCUSSION

The distribution of five elements that are economically important are shown for the these sample types (fig. 4); these are good examples of what the whole data set shows. The histograms for rock clearly illustrate the chemical differences between sandstone and shale, which are also shown in table 3. The elements in stream-sediment and soil samples have distribution patterns normal for areas underlain by unmineralized marine clastic sedimentary rocks.

Of the five elements chosen, only barium has any unusually high concentration. Sample no. 140 (fig. 3), a shale, contains 1,500 ppm barium, five times the median value of barium in all the shale samples and three times the average for shale in general (table 3). Samples of soil or stream sediment containing 700 ppm or more barium (fig. 5) are scattered throughout the area and are not concentrated in any one stratigraphic horizon.

Isolated high concentrations of barium are common in Middle and Upper Devonian shales from western New York to Virginia (J.F. Pepper, USGS, 1964, written commun.; Lesure, 1957, p. 55). In general, these high barium concentrations are in the form of barite concretions, but locally barite forms small secondary veins or replaces fossil material. No barite concretions were found in the Cornplanter area, and none are known to have been reported from this area.

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Table 1.—*Analyses of 22 stream-sediment, 63 soil, and 23 rock samples from Cornplanter Roadless Area, Warren County, Pa.*

All samples analyzed by a six-step direct-current arc, optical emission spectrographic method (Grimes and Marranzino, 1968) by G. W. Day, USGS laboratories, Denver, Colo. Zinc also determined by an atomic absorption method (Ward, Nakagawa, Harms, and Van Sickle, 1969) by B. F. Arbogast and W. C. Martin, USGS laboratories, Denver, Colo. 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 10 of these numbers and are approximate geometric midpoints of the concentration ranges. The reported precision is within one adjoining reporting interval on each side of the reported value 83 percent of the time and within two adjoining reporting intervals 96 percent of the time (Motooka and Grimes, 1976). Elements analyzed but not detected: Antimony (ITTRI grid, zone 7). The X coordinate in the easting value is meters; the Y is the northing value in meters. Symbols used: part, percent; ppm, parts per million; N, semiquantitative spectrographic analysis; sa, atomic absorption; >, greater than value shown; less than value shown N, not detected. Elements looked for spectrographically but not found and their lower limits of detection in ppm are: Ag (0.5); As (500); Au (10); Bi (10); Cd (20); Sb (10); Bi (10); Sn (10); Th (100); and W (50).

STREAM-SEDIMENT SAMPLES

Sample	X coordinate	Y coordinate	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	B-ppm s	Ba-ppm s	Be-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Ni-ppm s	Pb-ppm s	Sc-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Zn-ppm sa
024	668,180	4,659,860	3	.7	.20	.5	2,000	150	700	1	20	50	20	70	20	70	20	10	N	150	30	N	300	85
025	668,610	4,647,480	3	.5	.20	.5	3,000	100	500	1	20	50	20	70	20	70	20	10	N	150	30	N	300	73
027	668,910	4,647,180	3	.5	.20	.5	2,000	150	500	1	20	50	20	70	20	70	20	7	N	150	30	200	300	110
029	664,440	4,647,180	3	.5	.30	.5	1,500	50	300	1	15	50	20	70	20	70	20	7	N	150	30	N	300	100
030	668,630	4,647,070	3	.5	.15	.5	1,500	70	300	1	15	50	20	70	20	70	20	7	N	150	30	N	300	110
040	669,740	4,647,380	3	.7	.20	.5	1,500	70	500	1	15	50	20	70	20	70	20	10	N	150	30	N	300	110
041	669,790	4,647,480	3	.7	.20	.5	2,000	70	500	1	15	50	20	70	20	70	20	10	N	150	30	N	300	110
042	670,210	4,647,480	3	.7	.20	.7	1,500	70	500	1	15	70	20	70	20	70	20	10	N	150	30	N	300	80
043	670,060	4,645,180	3	.7	.70	.5	2,000	70	500	1	15	70	20	70	20	70	20	10	N	150	30	N	300	65
047	669,210	4,645,080	3	.7	.20	.5	1,000	70	500	1	15	50	20	70	20	70	20	10	N	150	30	N	300	55
048	668,610	4,644,680	3	.5	.20	.5	2,000	70	500	1	15	50	20	70	20	70	20	10	N	150	30	N	300	80
049	668,410	4,644,480	3	.5	.20	.5	1,500	70	500	1	15	50	20	70	20	70	20	10	N	150	30	N	300	65
110	664,840	4,649,980	3	.5	.20	.5	1,500	50	500	1	15	50	20	70	20	70	20	7	N	150	30	N	300	55
111	669,890	4,649,880	3	.7	.50	.5	2,000	50	500	1	15	50	20	70	20	70	20	7	N	150	30	N	700	55
112	669,590	4,649,870	3	.5	.15	.5	1,000	70	300	1	15	50	20	70	20	70	20	7	N	150	30	N	700	55
113	669,340	4,649,980	3	.5	.20	.5	2,000	70	500	1	15	70	20	70	20	70	20	7	N	150	30	N	300	65
131	670,460	4,647,180	3	.5	.20	.5	1,500	70	300	1	15	50	20	70	20	70	20	7	N	150	30	N	300	75
132	670,460	4,647,370	3	.5	.20	.5	1,500	70	300	1	15	30	20	70	20	70	20	7	N	150	30	N	300	75
133	670,460	4,647,580	3	.5	.20	.5	1,500	70	300	1	15	30	20	70	20	70	20	7	N	150	30	N	300	75
134	669,840	4,647,080	3	.5	.20	.5	1,000	70	300	1	15	50	20	70	20	70	20	10	N	150	30	N	300	50
141	669,630	4,645,050	3	.5	.20	.5	1,500	70	500	1	15	70	20	70	20	70	20	10	N	150	30	N	300	70
142	670,590	4,643,210	3	.7	.50	.7	3,000	70	700	1	15	70	20	70	20	70	20	15	N	150	30	N	300	75

ROCK SAMPLES

Sample	X coordinate	Y coordinate	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	B-ppm s	Ba-ppm s	Be-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Ni-ppm s	Pb-ppm s	Sc-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Zn-ppm sa
028	668,310	4,647,210	.7	.82	>.05	.05	700	10	100	N	N	N	<5	N	N	5	N	N	N	10	N	200	70	45
032	666,710	4,646,640	2.0	.82	>.05	.05	150	<10	100	N	N	N	N	N	N	5	N	N	N	10	N	200	70	45
034	665,350	4,647,070	.5	.82	>.05	.05	150	<10	100	N	N	N	1	N	N	5	N	N	N	10	N	N	200	30
036	669,330	4,646,020	.7	.95	>.05	.10	100	10	70	N	N	N	1	N	N	5	N	N	N	15	N	200	150	30
038	669,380	4,646,340	3.0	.70	.50	.30	500	100	500	1	15	70	30	30	N	50	10	7	100	100	30	N	500	50
051	669,070	4,650,320	3.0	.70	3.00	.50	1,000	700	200	2	15	70	30	30	70	50	<10	7	150	100	50	N	700	50
100	667,860	4,649,480	1.5	.15	.05	.15	500	10	150	N	N	N	<5	N	N	5	N	<10	N	10	N	200	70	30
101	667,860	4,649,480	1.5	.05	>.05	.10	300	<10	70	N	N	N	<5	N	N	5	N	N	N	10	N	N	200	30
108	669,860	4,649,620	.5	.05	>.05	.05	300	<10	70	N	N	N	<5	N	N	5	N	N	N	15	N	200	150	30
114	669,530	4,649,980	3.0	.70	.30	.30	700	100	500	1	15	70	30	30	N	50	10	7	100	100	30	N	500	50
115	669,330	4,650,070	3.0	.70	3.00	.50	2,000	100	300	2	15	50	20	70	20	20	10	7	150	100	50	N	700	55
116	669,180	4,650,280	3.0	.70	.50	.30	1,000	150	500	1	15	70	20	100	20	70	<10	7	150	100	30	200	700	55
117	670,210	4,648,120	1.5	.15	.05	<.05	10	<10	10	N	N	N	<5	N	N	5	N	N	N	10	N	<200	100	15
118	670,210	4,648,320	1.5	.10	.20	.10	1,000	<10	150	N	N	N	N	N	N	5	N	N	N	15	20	<200	150	15
119	670,310	4,648,220	1.5	.15	.05	.15	500	10	150	N	N	N	N	N	N	5	N	<10	N	N	N	<200	100	15
130	670,560	4,647,880	3.0	.70	1.00	.50	700	100	300	1	15	70	20	70	20	50	<10	10	100	100	30	N	700	55
140	670,560	4,645,680	3.0	.70	.50	.50	700	100	1,500	1	15	70	20	70	20	50	<10	10	100	100	30	N	700	55
143	670,210	4,645,680	3.0	.70	.50	.50	1,000	100	300	1	15	70	20	70	20	50	<10	10	100	100	30	N	700	55
150	669,280	4,650,540	3.0	.70	2.00	.50	700	100	300	1	15	70	20	70	20	50	<10	10	100	150	50	N	700	60
154	668,780	4,650,320	3.0	.70	1.00	.50	1,000	100	300	1	15	70	20	70	20	50	<10	10	100	150	30	N	700	70
155	669,230	4,650,480	7.0	.70	.30	.70	700	100	500	1	15	100	30	70	20	70	<10	15	100	200	50	<200	300	75
156	669,230	4,650,480	3.0	.70	.30	.70	500	100	500	1	15	70	20	70	20	30	<10	15	100	150	70	N	700	65

SOIL SAMPLES

Sample	X coordinate	Y coordinate	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	B-ppm s	Ba-ppm s	Be-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Ni-ppm s	Pb-ppm s	Sc-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Zn-ppm sa
									Soil samples															
001	667,870	4,649,820	3	.7	.07	1.0	700	100	500	1	10	70	15	50	20	10	20	7	N	150	50	N	700	55
002	667,860	4,649,820	3	.7	.07	1.0	700	100	500	1	5	70	15	50	20	10	20	10	N	150	50	N	700	30
003	668,910	4,649,410	3	.5	.20	.7	3,000	100	500	1	10	50	15	50	20	10	20	7	N	150	50	N	700	30
004	664,420	4,649,720	3	.5	.10	1.0	1,500	100	500	1	10	70	15	100	20	10	15	10	N	150	50	N	700	55
005	669,430	4,649,980	3	.5	.10	1.0	1,500	100	500	1	10	70	20	100	20	10	15	10	N	150	50	N	700	50
006	668,080	4,650,140	3	.5	.07	1.0	700	100	500	1	10	50	15	50	20	10	20	10	N	150	50	N	700	45
007	668,870	4,650,220	3	.5	.10	1.0	700	100	500	1	10	50	20	50	20	10	20	10	N	150	50	N	700	45
008	668,660	4,650,420	3	.5	.10	1.0	700	100	500	1	10	50	15	50	20	10	100	15	N	150	50	N	700	30
009	668,460	4,650,620	3	.5	.10	1.0	700	100	500	1	10	50	15	70	20	10	15	10	N	150	50	N	700	45
010	668,210	4,650,540	3	.7	.10	1.0	300	100	500	1	10	70	20	50	20	10	15	15	N	150	50	N	700	45
012	668,060	4,650,020	3	.7	.07	.7	700	100	500	1	10	70	20	50	20	20	20	10	N	150	50	N	500	50
013	668,060	4,649,820	3	.7	.07	.5	700	100	500	1	10	70	20	50	20	15	20	10	N	150	50	N	700	50
014	667,860	4,649,620	3	.7	.07	.5	700	100	500	1	10	70	20	50	20	15	20	10	N	150	50	N	700	50
015	667,070	4,649,340	3	.5	.15	1.0	1,500	100	500	1	15	70	20	70	20	20	20	7	N	150	50	N	700	45
							Soil samples																	
016	667,780	4,649,710	3	.7	.10	1.0	700	100	500	1	10	70	20	70	20	10	20	10	N	150	50	N	700	45
017	667,780	4,649,920	3	.7	.20	1.0	700	100	500	1	20	70	20	50	20	15	30	10	N	150	50	N	700	60
018	667,780	4,650,120	3	.7	.20	.7	2,000	100	500	1	20	70	20	50	20	15	30	10	N	150	50	N	700	60
019	668,080	4,650,120	3	.5	.20	.7	1,500	100	500	1	20	70	20	50	20	15	30	10	N	150	50	N	700	60
020	668,310	4,650,220	3	.5	.30	.7	700	100	500	1	15	70	20	50	20	15	20	7	N	150	50	N	700	50
021	668,110	4,650,420	3	.7	.10	1.0	500	150	500	1	15	100	20	70	20	50	20	15	<200	200	50	N	500	55
022	668,080	4,650,620	3	.7	.10	1.0	500	100	500	1	15	70	20	50	20	20	20	10	N	150	50	N	500	45
023	668,240	4,650,720	3	.5	.10	1.0	700	70	500	1	15	70	20	70	20	15	20	10	N	150	50	N	500	50
025	668,740	4,650,720	3	.5	.05	1.0	150	70	500	1	5	50	20	50	20	10	20	7	N	150	50	N	500	45
031	668,720	4,646,780	3	.5	.15	1.0	2,000	70	300	1	7	50	15	50	20	10	20	7	N	100	30	N	700	65
033	668,820	4,646,420	3	.5	.15	1.0	1,500	50	300	1	10	50	15	50	20	10	20	5	N	100	20	N	300	65
035	669,210	4,646,110	3	.5	.10	.7	1,000	70	200	1	5	30	10	50	15	5	10	7	N	70	50	N	1,000	45
037	670,010	4,646,880	3	.5	.10	.7	1,500	50	300	1	5	30	10	50	15	5	10	7	<100	70	30	N	300	45
038	670,210	4,646,980	3	.5	.15	.7	1,000	50	200	1	5	20	10	50	20	10	15	7	N	100	30	N	300	45
039	670,330	4,647,180	3	.5	.10	.5	700	50	300	1	5	10	15	50	10	10	10	7	N	70	30	N	300	45
044	670,680	4,645,020	3	.5	.15	.7	1,000	70	300	1	15	50	20	50	20	20	20	7	N	100	30	N	700	45
045	670,230	4,645,940	3	.5	.10	.7	1,500	70	300	1	5	30	10	50	20	10	15	7	N	100	30	N	700	45
046	670,470	4,645,430	3	.5	.10	.7	700	100	300	1	5	30	10	50	20	10	15	7	N	100	30	N	700	45
102	668,240	4,649,480	3	.5	.10	.7	5,000	100	700	1	15	70	20	50	20	15	30	10	N	200	50	200	500	30
103	668,040	4,649,320	3	.5	.10	.7	150	100	300	1	5	30	7	50	20	5	10	7	N	150	50	N	500	40
104	668,860	4,649,180	3	.5	.10	.7	1,000	100	300	1	15	50	20	50	20	20	10	7	N	200	70	200	500	110
105	668,660	4,649,020	3	.7	.07	.7	1,000	100	500	1	15	70	20	50	20	20	20	10	N	150	50	N	500	65
106	668,270	4,649,220	3	.7	.07	.7	1,000	100	500	1	15	70	20	70	20	20	20	10	N	150	50	N	500	60
107	669,260	4,649,220	3	.7	.07	.7	500	100	500	1	15	70	20	100	20	20	20	10	N	150	50	N	500	55
109	669,040	4,649,080	3	.5	.15	.7	500	100	300	1	15	70	15	50	20	10	15	10	N	150	50	N	1,000	33
117	668,860	4,648,880	3	.5	.07	.7	700	100	300	1	15	50	15	70	20	10	20	10	N	150	50	N	500	35
119	670,060	4,648,480	3	.5	.10	.7	1,500	100	300	1	15	70	20	70	20	10	20	10	N	150	50	N	500	45
121	670,070	4,648,080	3	.5	.10	.7	1,500	100	300	1	15	70	20	50	20	15	20	10	N	150	50	N	500	40
122	670,460	4,648,280	3	.5	.10	.7	1,500	100	300	1	15	70	20	50	20	15	20	10	N	150	50	N	500	40
124	670,410	4,648,280	3	.5	.10	.7	1,000	100	300	1	15	70	20	70	20	15	20	10	N	150	50	N	700	50
125	669,740	4,648,220	3	.5	.10	.7	2,000	100	700	1	15	70	20	70	20	20	10	10	N	150	70	N	700	55
126	669,280	4,648,120	3	.5	.15	.7	1,500	100	300	1	15	70