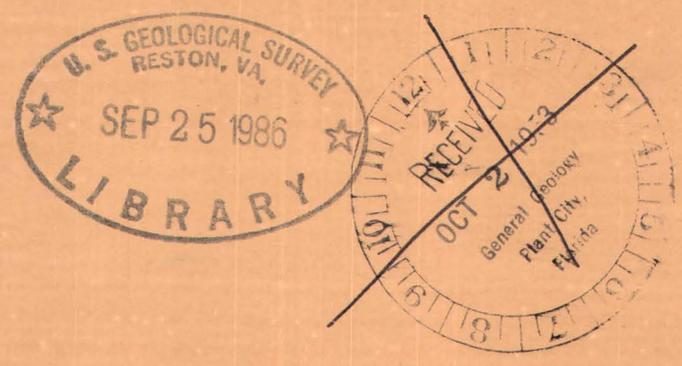


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Reconnaissance during 1952 for Uranium-Bearing Carbonaceous Rocks in Parts of Colorado, Utah, Idaho, and Wyoming

By J. D. Vine and R. F. Flege, Jr.

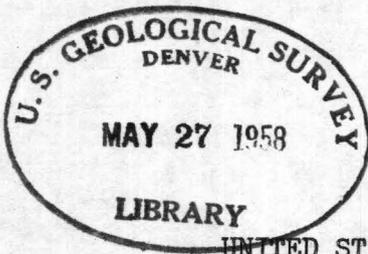


Trace Elements Investigations Report 336

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UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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Geology and Mineralogy

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Series A

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

RECONNAISSANCE DURING 1952 FOR URANIUM-BEARING CARBONACEOUS
ROCKS IN PARTS OF COLORADO, UTAH, IDAHO, AND WYOMING*

By

James D. Vine and Robert F. Flege, Jr.

June 1953

Trace Elements Investigations Report 336

This preliminary report is distributed without editorial and technical review for conformity with official standards and nomenclature. It is not for public inspection or quotation.

*This report concerns work done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

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RECONNAISSANCE DURING 1952 FOR URANIUM-BEARING CARBONACEOUS ROCKS
IN PARTS OF COLORADO, UTAH, IDAHO, AND WYOMING

By

James D. Vine and Robert F. Flege, Jr.

ABSTRACT

A reconnaissance for uranium-bearing carbonaceous rocks was made during the 1952 field season in 23 areas in Colorado, Utah, Idaho, and Wyoming. Uranium in small amounts occurs in several of the areas examined, but no deposits were found that might have commercial possibilities. As much as 0.03 percent uranium is in the ash of coal in the Caribou Mountain area in southeastern Idaho; 0.012 percent in the ash of coal in the Burnt Fork area of southwestern Wyoming; and 0.009 percent in the ash of coal from near Driggs in eastern Idaho. Seven additional areas were examined in which beds of coal or carbonaceous shale contained more than 0.002 but less than 0.007 percent uranium in the ash. Unweathered samples of bituminous sandstone from the Vernal area, Utah, contain minor quantities of uranium.

INTRODUCTION

A reconnaissance was done during the 1952 field season for uranium-bearing carbonaceous materials in 23 areas of Colorado, Utah, Idaho, and Wyoming by the U. S. Geological Survey on behalf of the Division of Raw Materials of the Atomic Energy Commission. This study was a continuation of the reconnaissance during the 1951 field season reported by Vine and Moore (1952).

Only those areas that may contribute to future studies on the occurrence of uranium in carbonaceous rocks are discussed in this report. A complete tabulation of all analytical data resulting from the work, however, is listed in the appendix. Chemical analyses and radioactivity measurements were made at U. S. Geological Survey Laboratories at Denver and Washington, D. C.

DESCRIPTION OF SELECTED AREAS EXAMINED

Salmon area, Lemhi County, Idaho

Coal in the Germer member of the Challis volcanics of probable Oligocene or Miocene age was examined at a mine about 2 miles west of Salmon, Lemhi County, Idaho (loc. 1, fig. 1). Openings have been made in two zones of coal and carbonaceous shale at this mine, but no significant radioactivity was detected in either zone. A grab sample (VI-1164) from the upper of two dumps at this mine contained 0.002 percent uranium in the ash and 41.0 percent ash. (See Appendix, table 1.) Because no radioactivity was detected at the mine entries no attempt was made to trace the coal beds laterally.

Driggs area, Teton and Bonneville Counties, Idaho

Coal believed to be from the Bear River formation of Cretaceous age and containing small quantities of uranium, was collected at two localities in the Driggs area, Teton and Bonneville Counties, Idaho. A sample of coal (sample VI-1153) from the dump of an abandoned mine in the Horseshoe district about 12 miles west of Driggs contained 0.003 percent uranium, 36.2 percent ash, and 0.009 percent uranium in the ash. A sample of coal (sample VI-1149) from the dump of an abandoned mine on Pine Creek Pass about 13 miles southwest of Driggs contained 0.002 percent uranium, 50 percent ash, and 0.003

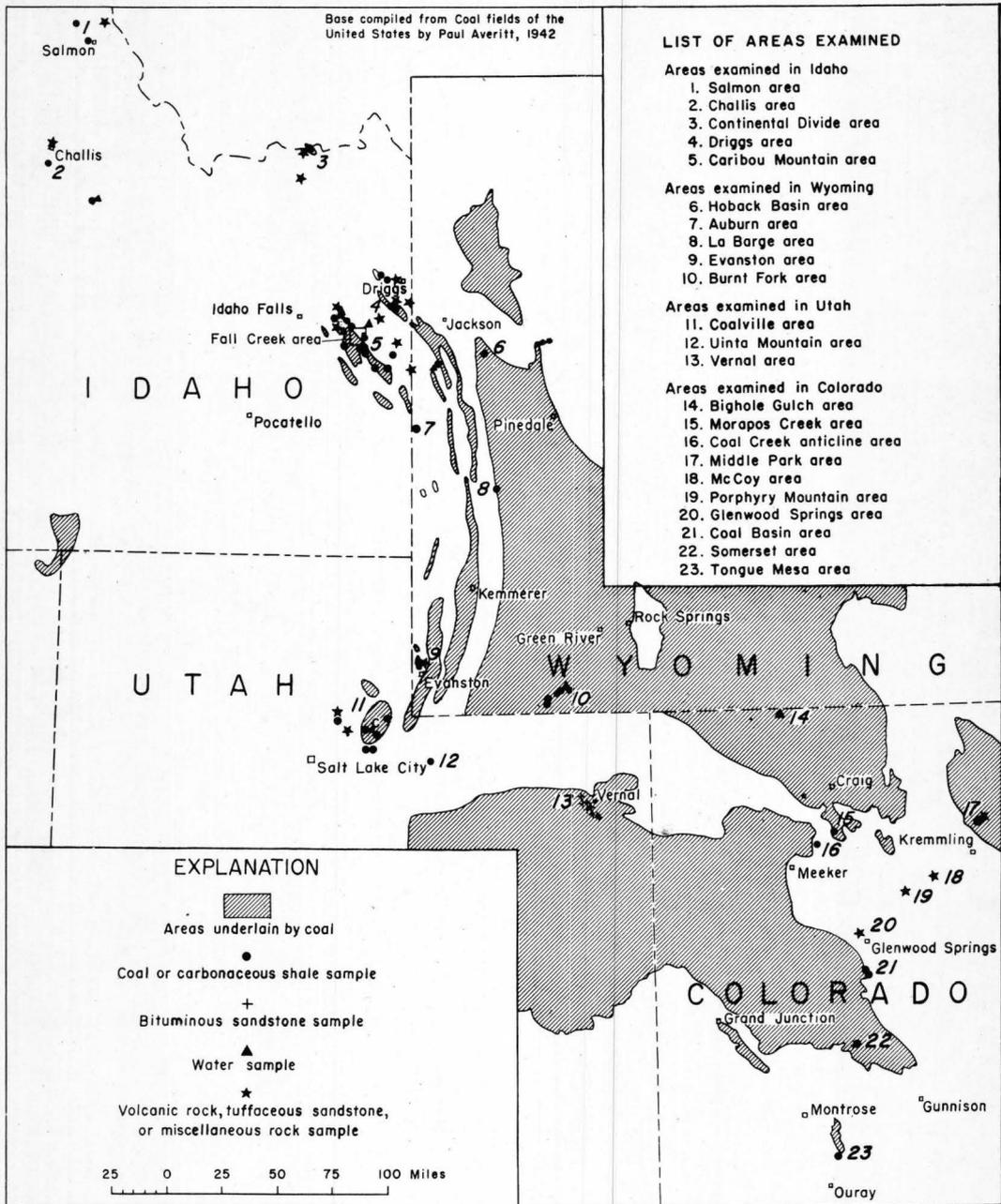


FIGURE I. LOCALITIES EXAMINED DURING RECONNAISSANCE FOR URANIUM IN CARBONACEOUS ROCKS IN PARTS OF COLORADO, UTAH, IDAHO, AND WYOMING 1952

percent uranium in the ash.

Coal believed to be in the Frontier formation of Cretaceous age was sampled at an abandoned coal prospect on Rainy Creek about 2 miles southeast of the Pine Creek Pass locality. A grab sample of coal from the dump (sample VI-1150) contained 0.001 percent uranium in the sample, 33.9 percent ash, and 0.003 percent uranium in the ash.

Caribou Mountains and adjacent areas, Bonneville County,
Idaho and Lincoln County, Wyoming

Reconnaissance for uranium-bearing coal in the Caribou Mountains and adjacent areas was done in an attempt to extend the area of known uranium-bearing rocks described at the Fall Creek coal prospect by Vine and Moore (1952). Slight radioactivity was detected at most localities where the zone of carbonaceous rocks containing uranium at the Fall Creek coal prospect could be recognized. Considerable difficulty was encountered, however, in finding fresh exposures of this zone for sampling. At some localities it was possible only to collect samples of dark radioactive soils or boulders of carbonaceous limestone float believed to be derived from the same zone of radioactive carbonaceous rocks exposed at the Fall Creek prospect. These samples, including the soil samples, are useful in determining the distribution of the radioactive strata. Carbonaceous limestone (sample VI-1045) containing 0.005 percent uranium was found near the northern end of the Caribou Mountains. Coal exposed in a fresh road cut on Elk Creek (sample VI-1173) contains 0.0033 percent uranium. Selected coal on the dump of the abandoned Croley coal prospect (sample VI-1140) contains 0.007 percent uranium in the sample, 21.7 percent ash, and 0.03 percent uranium in the ash. The top 9 inches of impure coal (sample VI-1066) from a 36-inch carbonaceous

zone exposed along a road cut north of Grays Lake contains 0.013 percent uranium, 69.9 percent ash, and 0.019 percent uranium in the ash. These analyses indicate that the carbonaceous rocks of the Bear River formation contain small quantities of uranium over a widespread area.

Auburn area, Lincoln County, Wyoming

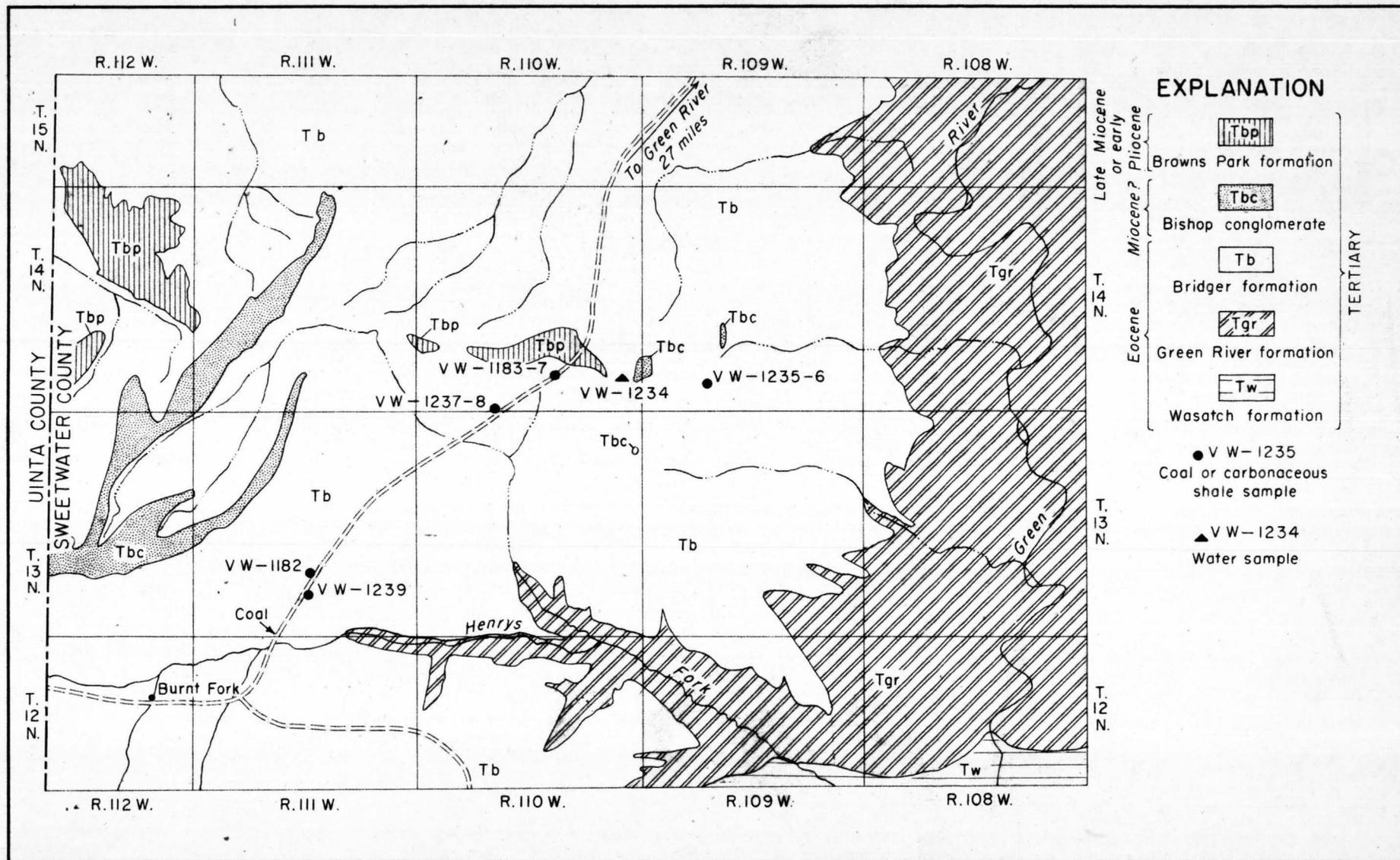
Coal on the dump at an abandoned prospect believed to be in the Bear River formation was examined and sampled about a mile west of Auburn, Lincoln County, Wyo. A grab sample (VW-1190) contained 0.0035 percent uranium in the sample, 88.01 percent ash, and 0.0053 percent uranium in the ash.

Evanston area, Uinta County, Wyoming

A thin bed of carbonaceous shale from the Evanston formation of Paleocene age was examined about a mile east of Almy. A grab sample (VW-1180) contained 0.005 percent equivalent uranium and 0.004 percent uranium.

Burnt Fork area, Sweetwater County, Wyoming

A reconnaissance was made for uranium-bearing carbonaceous rocks in the Bridger formation of Eocene age near Burnt Fork in southwestern Sweetwater County, Wyo. (See fig. 2.) Four coal beds ranging in thickness from 6 to 24 inches were examined in the north bank of Henrys Fork, but they were not radioactive. Stratigraphically above these main coal beds, however, a thin zone of radioactive coaly shale was found. Thin lenses of powdery coal or coaly shale as much as 2 inches thick, interbedded with carbonaceous shale and clay, formed a radioactive zone as much as 3 feet thick. This zone was traced for a distance of about 12 miles in the hope of finding a locality



Geology after W. H. Bradley
1936

FIGURE 2.--SKETCH MAP SHOWING LOCATIONS OF SAMPLES FROM THE BURNT FORK AREA, SWEETWATER COUNTY, WYOMING

0 5 10 Miles

where it would be thicker and higher in grade. Ten samples (VW-1183 to 1187 and 1235 to 1239) were collected from the radioactive zone. The highest uranium content of any of these samples was a selected grab sample that contained 0.007 percent equivalent uranium, 0.007 percent uranium, 54.8 percent ash, and 0.012 percent uranium in the ash. This deposit has no commercial possibilities but is noteworthy because of the geologic setting and may provide encouragement for further search in adjoining areas. This radioactive zone is the stratigraphically highest zone of carbonaceous material below the Bear Mountain erosion surface of Bradley (1936), which is overlain by the tuffaceous sandstones of the Browns Park formation. The Browns Park formation in the Miller Hill area, Wyo. (Love, 1953) contains deposits of uranium and is believed to contain potential source beds for uranium.

Vernal area, Uintah County, Utah

A sample of bitumen collected in 1951 from an abandoned bituminous sandstone quarry west of Vernal, Utah, gave sufficiently encouraging results (Vine and Moore, 1952, p. 18) that the area was revisited in 1952 to collect a representative suite of samples. Twelve samples were collected from eight localities at various points along the greater part of the length of Asphalt Ridge described by Spieker (1930). Most of the samples were collected from abandoned prospect pits, abandoned quarries, or natural outcrops where the bituminous material has been oxidized to a black nearly solid mass with the viscosity of a cold tar. One unweathered sample was collected from the working face of the Uintah County Highway quarry. At the working face the sandstone is friable, and the mass is easily molded in the hand. Each sand grain is loosely held in place by the bituminous material which has the

consistency of a heavy grease. In order to obtain uniform and comparable results, Wendell P. Tucker of the U. S. Geological Survey laboratory in Washington, D. C. extracted the oil from the inorganic material in each sample by a process of continuous leaching with carbon disulfide. The uranium content of samples thus treated ranges from 0.00002 to 0.0006 percent uranium in the oil and from 0.00048 to 0.026 percent uranium in the ash of the oil. Some of the weathered samples contain the most uranium, indicating perhaps that the concentration of uranium may be a surface phenomena, and that the lower concentrations may be more representative of the bituminous sandstone. The unweathered sample obtained from the working face of the county highway quarry was one of the lowest in uranium content having only 0.00004 percent uranium in the oil and 0.00048 percent uranium in the ash.

CONCLUSIONS

No new deposits of commercial size and grade were found in any of the 23 areas examined. In many of the areas, exposures of bedrock were so poor as to make an appraisal difficult. Coal and carbonaceous materials commonly are exposed in old prospect pits or can be seen only on abandoned mine dumps, thus providing little opportunity to sample the carbonaceous rocks where geologic relationships seem most favorable for the concentration of uranium. Of the areas investigated, therefore, few can be definitely ruled out as having no further potentialities for uranium.

Uranium-bearing carbonaceous rocks in the Bear River formation were examined and sampled over a widespread area in southeastern Idaho and adjacent parts of Wyoming and in the Bridger formation in the Burnt Fork area of southwestern Wyoming. The small amounts of uranium found may indicate that

deposits of higher grade are present in these areas.

The bituminous sandstone examined near Vernal, Utah contains minor quantities of uranium.

PLANS

Further investigations of these occurrences are not planned at the present time. However, additional reconnaissance of the Bear River formation in Idaho and Wyoming will be made at the first opportunity.

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UNPUBLISHED REPORTS

- Love, J. D., 1953, Preliminary report on the uranium deposits in the Miller Hill area, Carbon County, Wyoming: U. S. Geol. Survey Trace Elements Inv. Rept. 315.
- Vine, J. D. and Moore, G. W., 1952, Reconnaissance for uranium-bearing carbonaceous rocks in northwestern Colorado, southwestern Wyoming, and adjacent parts of Utah and Idaho: U. S. Geol. Survey Trace Elements Inv. Rept. 281.

APPENDIX

Chemical analyses and radioactivity measurements were by G. W. Boyes, J. Budinsky, M. Delevaux, R. Dufour, S. P. Furman, C. A. Horr, C. Hoy, H. Levine, S. Lundine, B. A. McCall, W. Mountjoy, W. W. Niles, A. Pietsch, H. Peterson, and W. P. Tucker.

TABULATION OF ANALYTICAL DATA

Table 1.--Samples of coal, carbonaceous shale, and carbonaceous limestone

Field number	Serial number	Thickness (inches)	Equivalent uranium (percent)	Uranium (percent)	Uranium in ash (percent)	Ash (percent)	Location Sec., T., R.
Salmon area, Lemhi County, Idaho							
VI-1164	95493	Grab	0.003	0.001	0.002	41.0	11-21N-21E
VI-1165	95494	Grab	0.005	0.003	0.004	66.8	26-23N-20E
Challis area, Custer County, Idaho							
VI-1160	95490	Grab	0.000	--	--	77.8	7-12N-19E
VI-1161	95491	Grab	0.000	--	--	6.2	28-10N-22E
VI-1162	95492	Grab	0.002	--	--	95.3	"
Continental Divide area, Clark County, Idaho							
VI-1078	90183	18"	0.002	--	--	86.7	11-14N-38E
VI-1079	90184	18"	0.000	--	--	42.1	"
Driggs area, Teton and Bonneville Counties, Idaho							
VI-1093	90189	Grab	0.003	--	--	63.5	25-3N-44E
VI-1094	90199	Grab	0.001	--	--	58.5	"
VI-1095	90200	Grab	0.001	--	--	--	"
VI-1149	95484	Grab	0.002	0.002	0.003	50.0	"
VI-1150	95485	Grab	0.001	0.001	0.003	33.9	5-2N-45E
VI-1153	95486	Grab	0.003	0.003	0.009	36.2	32-5N-44E
VI-1154	95487	Grab	0.000	--	--	79.0	"
VI-1155	95488	Grab	0.003	--	--	88.1	25-5N-43E
VI-1156	95489	Grab	0.000	--	--	9.4	"

Table 1.--Samples of coal, carbonaceous shale, and carbonaceous limestone (cont.)

Field number	Serial number	Thickness (inches)	Equivalent uranium (percent)	Uranium (percent)	Uranium in ash (percent)	Ash (percent)	Location Sec., T _p ., R.
Caribou Mountains and adjacent areas, Bonneville County, Idaho and Lincoln County, Wyoming							
VI-1044	87721	Grab	0.003	--	--	61.7	13-1N-41E
VI-1045	87722	Grab	0.006	0.005	0.008	59.6	2-1N-41E
VI-1046	87723	Grab	0.002	--	--	81.6	"
VI-1065	88016	Grab	0.000	--	--	--	17-2S-43E
VI-1066	88017	top 9"	0.011	0.013	0.019	69.9	23-3S-43E
VI-1067	88108	9"	0.006	0.006	0.007	81.6	"
VI-1068	88109	9"	0.005	0.005	0.006	83.1	"
VI-1069	88110	bottom 9"	0.006	0.007	0.009	79.9	"
VI-1070	88111	12"	0.001	--	--	82.4	24-3S-44E
VW-1082	90187	Grab	0.003	--	--	--	4-37N-117W
VW-1083	90188	12"	0.001	--	--	91.9	"
VW-1084	90189	14"	0.000	--	--	85.7	"
VI-1098	90203	Grab	0.000	--	--	--	7-1S-43E
VI-1140	95476	Grab	0.005	0.007	0.030	21.7	27-1S-41E
VI-1141	95477	Grab	0.003	0.002	0.004	48.6	"
VI-1170	95499	Grab	0.001	--	--	70.1	34-2N-40E
VI-1171	D74323	Grab	0.003	0.0015	0.0012	74.65	"
VI-1172	D74324	Grab	0.003	0.0019	--	--	"
VI-1173	D74325	Grab	0.004	0.0033	0.0042	77.53	18-2S-45E
VI-1174	D74326	Grab	0.002	0.0011	--	--	"
Hoback Basin area, Sublette County, Wyoming							
VW-1178	D74330	12"	0.003	0.0015	0.0013	90.85	20-38N-113W
Auburn area, Lincoln County, Wyoming							
VW-1190	D74342	Grab	0.004	0.0035	0.0053	88.01	5-32N-119W
LaBarge area, Sublette County, Wyoming							
VW-1177	D74329	12"	0.000	0.0016	0.0028	36.87	1-28N-114W
Evanston area, Uinta County, Wyoming							
VW-1180	D74332	Grab	0.005	0.0040	0.0068	79.45	30-16N-120W

Table 1.--Samples of coal, carbonaceous shale, and carbonaceous limestone (cont.)

Field number	Serial number	Thickness (inches)	Equivalent uranium (percent)	Uranium (percent)	Uranium in ash (percent)	Ash (percent)	Location Sec., Tp., R.
Burnt Fork area, Sweetwater County, Wyoming							
VW-1182	D74334	Grab	0.003	0.0013	0.0026	89.16	28-13N-111W
VW-1183	D74335	top 4"	0.004	0.0032	0.0055	70.78	27-14N-110W
VW-1184	D74336	6"	0.007	0.0018	--	--	"
VW-1185	D74337	11"	0.003	0.0038	0.0048	86.03	"
VW-1186	D74338	bottom 11"	0.005	0.0034	0.0047	88.23	"
VW-1187	D74339	Grab	0.005	0.0053	0.0081	82.16	"
VW-1235	101059	Grab	0.003	--	--	86.4	32-14N-109W
VW-1236	101060	Grab	0.007	0.007	0.012	54.8	"
VW-1237	101061	12"	0.004	0.002	0.003	63.8	33-14N-110W
VW-1238	101062	Grab	0.002	0.003	0.008	33.0	"
VW-1239	101063	Grab	0.002	--	--	58.9	27-13N-111W
Coalville area, Summit and Morgan Counties, Utah							
VU-1022	85726	Grab	0.002	0.001	0.003	30.9	33-1N-5E
VU-1023	85727	18"	0.000	--	--	21.5	33-1N-5E
VU-1024	87701	Grab	0.003	--	--	84.1	26-2N-5E
VU-1025	87702	Grab	0.003	--	--	86.6	18-2N-5E
VU-1027	87704	Grab	0.003	--	--	94.0	31-3N-3E
VU-1029	87706	Grab	0.002	--	--	65.5	26-3N-6E
Morapos Creek area, Rio Blanco County, Colorado							
VC-1009	85725	Grab	0.003	--	--	60.2	24-3N-91W
Coal Creek anticline area, Rio Blanco County, Colorado							
VC-1006	85722	Grab	0.086	0.12	0.16	71.1	22-2N-92W
VC-1007	85723	Grab	0.06	0.064	--	--	"
Middle Park area, Grand County, Colorado							
VC-1188	D74340	Grab	0.001	0.0007	0.0027	16.78	4-3N-80W
Coal Basin area, Pitkin County, Colorado							
VC-1225	101057	Grab	0.002	--	--	82.5	34-8S-89W
VC-1226	101058	Grab	0.001	0.001	0.003	26.6	28-8S-89W
Somerset area, Gunnison County, Colorado							
VC-1003	85719	Grab	0.000	--	--	3.7	11-13S-90W

Table 1.--Samples of coal, carbonaceous shale, and carbonaceous limestone (cont.)

Field number	Serial number	Thickness (inches)	Equivalent uranium (percent)	Uranium (percent)	Uranium in ash (percent)	Ash (percent)	Location Sec., Tp., R.
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Tongue Mesa area, Ouray County, Colorado

VC-1001	85717	Grab	0.000	--	--	53.1	22-46N-7W
VC-1002	85718	Grab	0.000	--	--	12.4	"

Table 2.--Samples of bituminous sandstone

Field number	Serial number	Oil in sample (percent)	Uranium in oil (percent)	Ash in oil (percent)	Uranium in ash (percent)	Location Sec., Tp., R.
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Vernal area, Uintah County, Utah

VU-1010	85728	16.0	0.00004	1.77	0.0023	25-4S-20E
VU-1011	85729	11.4	0.00005	5.90	0.00085	"
VU-1012	85730	3.1	0.0002	0.96	0.021	"
VU-1013	85731	12.3	0.00007	6.31	0.0011	11-4S-20E
VU-1014	85732	13.0	0.00018	3.82	0.0047	"
VU-1015	85733	10.8	0.00024	3.68	0.0066	30-4S-21E
VU-1016	85734	11.6	0.00004	8.42	0.00048	31-4S-21E
VU-1017	85735	6.6	0.00036	1.35	0.026	"
VU-1018	85736	10.0	0.00002	2.66	0.00075	4-5S-21E
VU-1019	85737	7.4	0.00017	3.45	0.0049	9-5S-21E
VU-1020	85738	8.0	0.00047	2.75	0.017	23-5S-21E
VU-1021	85739	9.4	0.0006	3.24	0.0018	25-5S-21E

Table 3.--Samples of volcanic and miscellaneous rock types

Field number	Serial number	Description	Equivalent uranium (percent)	Uranium (percent)	Location Sec., Tp., R.
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Salmon area, Lemhi County, Idaho

VI-1163	D73717	Psilomelane	0.001	0.0004	27-23N-22E
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Challis area, Custer County, Idaho

VI-1157	D73714	Challis volcanics (green)	0.003	0.0002	29-14N-19E
VI-1158	D73715	Challis volcanics (white)	0.004	0.0004	"
VI-1159	D73716	Challis volcanics (brown)	0.003	0.0003	"

Table 3.--Samples of volcanic and miscellaneous rock types (cont.)

Field number	Serial number	Description	Equivalent uranium (percent)	Uranium (percent)	Location Sec., Tp., R.
Continental Divide area, Clark County, Idaho					
VI-1076	90181	Silicic volcanic rock	0.004	0.001	19-12N-38E
VI-1077	90182	Silicic volcanic rock	0.002	0.000	11-14N-38E
Driggs area, Teton and Bonneville Counties, Idaho					
VI-368a	D84780	Tuff	0.004	0.0012	25-5N-44E
VI-1096	D84787	Rhyolite	0.004	0.0010	19-3N-46E
VI-1152	D73713	Tuffaceous sandstone	0.001	0.0004	25-3N-44E
Caribou Mountains and adjacent areas, Bonneville County, Idaho and Lincoln County, Wyoming					
VI-366a	D84779	Rhyolitic tuff	0.003	0.0007	11-1N-40E
VI-369a	D84781	Tuffaceous sand	0.004	0.0010	16-1S-45E
VI-1081	D84786	Rhyolitic tuff	0.004	0.0012	8-1S-42E
VI-1085	90190	Tuffaceous sand	0.004	--	16-3S-46E
VI-1086	90191	Tuff	0.001	--	"
VI-1148	D73711	Pumiceous loess	0.001	0.0003	25-2N-43E
VI-1151	D73712	Tuff	0.002	0.0005	1-2N-40E
Evanston area, Uinta County, Wyoming					
VW-1181	D74333	Tuffaceous sandstone	0.001	0.0007	28-16N-120W
Coalville area, Summit and Morgan Counties, Utah					
VU-1026	87703	Norwood tuff	0.004	--	12-3N-2E
VU-1028	87705	Fowkes fm., tuffaceous ss.	0.003	--	4-2N-3E
Uinta Mountains area, Duchesne County, Utah					
VU-1179	D74331	Red soil from Uinta Mts.	0.004	0.0015	34-1S-9E
Coal Creek anticline area, Rio Blanco County, Colorado					
VC-1005	85721	"Carnotite type" ore	0.22	0.23	22-2N-92W
VC-1008	85724	"Carnotite type" ore	0.3	0.22	21-2N-92W
Middle Park area, Grand County, Colorado					
VC-1189	D74341	Tuffaceous sandstone	0.002	0.0010	4-3N-80W

Table 3.--Samples of volcanic and miscellaneous rock types (cont.)

Field number	Serial number	Description	Equivalent uranium (percent)	Uranium (percent)	Location Sec., Tp., R.
McCoy area, Eagle County, Colorado					
VC-1233	D76839	Green silty shale	0.005	0.003	1-2S-84W
Porphyry Mountain area, Eagle County, Colorado					
VC-1223	D84788	Tuff agglomerate	0.002	0.0010	2-3S-86W
Glenwood Springs area, Garfield County, Colorado					
VC-1004	85720	Red arkosic sandstone	0.002	--	1-6S-90W

Table 4.--Samples of water

Field number	Serial number	Description	Uranium (parts per million)	Location Sec., Tp., R.
Challis area, Custer County, Idaho				
VI-1107	D73710	Spring in Challis volcanics	Less than 0.002	28-10N-22E
Caribou Mountains and adjacent areas, Bonneville County, Idaho and Lincoln County, Wyoming				
VW-1100	D73703	Snake River water	Less than 0.002	4-37N-117W
VI-1103	D73706	Spring in Wayan fm. below silicic volcanic rocks	Less than 0.002	28-1N-41E
VI-1104	D73707	Spring in Wayan fm. below silicic volcanic rocks	0.005	31-2N-41E
VI-1105	D73708	Spring in Wayan fm. below silicic volcanic rocks	Less than 0.002	32-2N-41E
VI-1106	D73709	Hot spring on Fall Creek	Less than 0.002	8-1N-43E
Burnt Fork area, Sweetwater County, Wyoming				
VW-1234	D76840	Spring below Bishop conglomerate	0.0055	36-14N-110W
Bighole Gulch area, Moffat County, Colorado				
VC-1240	D76841	Spring in Wasatch formation	0.0065	29-12N-94W