

**FIELD REPORT ON VANADIUM MINERAL INVESTIGATION OF THE ROAD RIVER FORMATION IN  
THE EAGLE, ALASKA AREA**

by

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**Field Report \*\*\*\*\* October 1992**

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## INTRODUCTION

A geochemical stream sediment survey of the Eagle and Charley River quadrangles by the National Uranium Resource Evaluation program (NURE) showed high vanadium values that consistently coincide with mapped units of the Road River formation. Base geologic maps by Foster (1976) for the Eagle quadrangle and Brabb and Churkin (1969) and Dover and Miyaoka (1988) for the Charley River quadrangle were used for reference. Brabb and Churkin (1969) describe the Road River formation as "dark-gray graptolitic shale with lesser amounts of grayish-black laminated chert and very minor dark-gray limestone, greenish-gray dolomite, grayish-black chert arenite and chert conglomerate."

The intent of this project was to determine whether a stratigraphic section of the Road River formation was enriched in vanadium. Outcrops of the Road River formation were few and mostly rubble crop where the formation was exposed. Dense vegetation covers most of the area where the Road River formation is mapped. Vegetation also prohibited access by helicopter.

## METHODS

The Bureau's survey was conducted with helicopter access to the Road River formation where the potential for outcrop availability was highest. In the Eagle and Charley River quadrangles the Road River formation consists of black carbonaceous shale interbedded with cherty black siltstone. The recessive weathering Road River formation forms few outcrops. Because vanadium-rich black shales are often enriched in uranium, outcrops were examined with a hand-held scintillometer.

Rock chip samples were collected from prospective outcrops and stream sediment samples were collected from some streams where NURE vanadium anomalies occurred. Stream sediment samples (table 1) and rock chip samples (tables 2 and 3) were analyzed by multi-element inductively coupled plasma (ICP) and atomic absorption spectrometric (AAS) methods.

## RESULTS

The most significant result of this survey is the discovery that the base of the Road River formation is a black shale that contains anomalous vanadium, uranium, and copper values (samples VD28221 to VD28225, tables 2 and 3; fig. 1). Vanadium, uranium and copper values are as much as >2000 ppm, 188 ppm, and 1439 ppm respectively in select basal layers.

The Road River formation disconformably overlies the Hillard Limestone which has also been found to be locally radioactive (VD28226, tables 2 and 3). Radioactivity in the Hillard Limestone appears near the top of the formation within the edge-wise conglomerate. Uranium enrichment may be the result of leaching from weathered Road River formation.

Stream sediment sampling was limited to a drainage north of Windfall Mountain and a northern tributary to Hard Luck Creek (fig. 2). Anomalous vanadium, copper, and zinc (sample VD28743, table 1) occurs near Windfall Mountain and no significant anomalies are indicated from the Hard Luck Creek area.

Table 1. -- Inductively coupled plasma analyses of stream sediment samples collected in the Eagle, Alaska area in 1992.

Sample Number	Ag ppm	Cu ppm	Pb ppm	Zn ppm	Mo ppm	Ni ppm	Co ppm	Cd ppm	Bi ppm	As ppm	Sb ppm	Fe pct	Mn ppm	Te ppm	Ba ppm	Cr ppm
VD28276	0.5	36	<2	184	<1	72	9	<2	12	26	<5	2.83	262	<25	904	144
VD28277	<0.5	40	9	174	<1	75	9	<2	15	22	7	3.12	310	<25	1143	136
VD28278	0.6	34	4	183	<1	71	8	<2	8	26	8	2.92	388	<25	900	85
VD28279	<0.5	60	<2	104	<1	39	10	<2	7	11	<5	3.2	1370	<25	677	55
VD28281	<0.5	30	<2	128	3	69	9	<2	<5	31	15	3.02	369	<25	789	122
VD28296	<0.5	29	<2	182	<1	88	17	<2	13	26	6	3.04	478	<25	1014	97
VD28303	0.6	34	5	308	<1	84	15	<2	12	29	<5	3.15	444	<25	956	108
VD28304	<0.5	34	<2	154	4	51	12	<2	<5	16	10	3.11	670	<25	1418	78
VD28743	<0.5	114	8	454	7	183	32	<2	11	30	9	4.74	525	<25	1947	119
VD28745	<0.5	21	11	94	<1	43	12	<2	<5	<5	11	3.31	689	<25	666	61
VD28746	<0.5	35	11	467	5	90	13	<2	12	13	<5	5.79	338	<25	1434	76
VD28747	<0.5	28	<2	178	4	81	6	<2	<5	23	<5	2.49	172	<25	1520	144
VD28748	<0.5	25	<2	159	3	82	8	<2	<5	17	<5	2.23	137	<25	1567	122

Sample Number	V ppm	Sn ppm	W ppm	Li ppm	Ga ppm	La ppm	Ta ppm	Ti pct	Al pct	Mg pct	Ca pct	Na pct	K pct	Nb ppm	Sr ppm	Y ppm	Zr ppm
VD28276	167	<20	<20	42	19	10	<5	0.32	2.37	0.42	1.53	0.38	0.85	9	106	17	58
VD28277	169	22	<20	43	15	10	22	0.39	3.7	0.68	1.27	0.64	1.06	9	127	15	75
VD28278	158	<20	<20	44	11	9	<5	0.35	3.87	0.79	1.16	0.60	0.86	11	109	11	74
VD28279	134	<20	<20	31	14	18	<5	0.33	3.07	0.86	2.51	0.67	0.91	26	126	13	104
VD28281	177	<20	<20	36	15	14	<5	0.33	3.33	0.63	2.01	0.59	0.89	9	125	17	66
VD28296	149	<20	<20	37	17	12	<5	0.48	3.66	0.84	1.29	1.28	0.86	12	184	10	69
VD28303	151	<20	<20	32	14	11	<5	0.35	3.16	0.75	1.53	0.85	0.92	9	151	14	53
VD28304	242	<20	<20	23	17	8	<5	0.35	3.32	0.65	0.92	0.94	0.84	9	143	10	57
VD28743	304	<20	<20	25	12	14	<5	0.36	2.21	0.78	2.93	0.40	0.97	13	123	14	72
VD28745	94	<20	<20	27	<10	13	6	0.36	3.76	0.66	1.07	0.49	0.84	12	163	12	116
VD28746	154	25	<20	28	13	12	<5	0.37	3.70	0.67	1.42	0.42	1.08	14	121	15	123
VD28747	151	<20	<20	31	13	<5	<5	0.27	2.37	0.54	0.33	0.49	0.72	6	86	7	62
VD28748	145	<20	<20	31	<10	<5	<5	0.27	1.21	0.41	0.30	0.44	0.70	6	71	6	56

Table 2. -- Inductively coupled plasma analyses of rocks collected from the Eagle, Alaska area in 1992.

Sample Number	Ag ppm	Cu ppm	Pb ppm	Zn ppm	Mo ppm	Ni ppm	Co ppm	Cd ppm	Bi ppm	As ppm	Sb ppm	Fe pct	Mn ppm	Te ppm	Ba ppm	Cr ppm
VD28217	<0.5	24	<2	19	29	51	<1	<2	<5	17	17	0.72	25	<25	947	314
VD28218	<0.5	11	<2	32	<1	80	8	<2	<5	10	<5	>10.00	1457	<25	314	183
VD28219	<0.5	15	<2	88	<1	69	8	<2	<5	17	<5	>10.00	1003	<25	688	228
VD28223	6.1	1439	26	104	38	232	<1	4.8	10	60	14	1.32	16	<25	531	377
VD28224	<0.5	55	<2	62	<1	36	<1	<2	7	22	<5	0.45	31	<25	529	371
VD28225	1.9	498	<2	25	26	72	<1	<2	6	41	12	1.18	21	<25	438	255
VD28297	0.6	36	<2	155	8	79	2	<2	<5	32	24	3.43	66	<25	317	128
VD28299	<0.5	99	<2	533	<1	116	7	<2	10	18	<5	>10.00	2832	<25	114	27
VD28301	<0.5	60	<2	1039	37	111	4	27.9	18	32	6	1.68	390	<25	94	138

Sample Number	V ppm	Sn ppm	W ppm	Li ppm	Ga ppm	La ppm	Ta ppm	Ti pct	Al pct	Mg pct	Ca pct	Na pct	K pct	Nb ppm	Sr ppm	Y ppm	Zr ppm
VD28217	697	<20	<20	11	<10	<5	<5	0.07	0.67	0.07	0.02	0.07	0.43	<5	38	5	19
VD28218	76	<20	<20	16	<10	<5	<5	0.10	0.68	1.65	1.04	0.17	0.56	<5	39	<5	9
VD28219	84	<20	<20	20	<10	<5	<5	0.13	1.64	1.14	0.54	0.13	0.50	<5	63	16	24
VD28223	>2000	<20	<20	17	16	53	18	0.01	2.68	0.25	10.00	0.16	1.18	<5	199	194	21
VD28224	161	<20	<20	4	<10	6	<5	0.01	0.58	0.04	3.80	0.03	0.19	<5	45	17	<5
VD28225	1135	<20	<20	19	<10	32	<5	0.01	2.18	0.18	10.00	0.05	0.74	<5	139	95	8
VD28297	287	<20	<20	40	19	<5	18	0.34	1.40	0.38	0.08	0.41	0.94	8	33	5	67
VD28299	210	30	<20	64	<10	<5	<5	0.11	2.17	4.71	0.66	0.47	0.71	<5	66	29	86
VD28301	936	<20	<20	10	<10	7	<5	0.1	1.64	3.2	6.66	0.30	0.66	<5	154	25	30

Sample Number	Sample Description
VD28217	Black shale with yellow oxide coating; McCann Hill formation
VD28218	Iron oxide concretion in sandstone; contains very fine-grained sulfides and chert pebble fragments; Nation River formation
VD28219	Iron oxide concretion in sandstone; near bottom of the Nation River formation
VD28223	Black carbonaceous and fissile shale; approximately 1700 cps; base of the Road River formation
VD28224	Brown chert with buff-colored oxide (?) specks; 1000 cps; Road River formation
VD28225	Black carbonaceous and fissile shale; approximately 550 cps; 3 to 5 ft above base of the Road River formation
VD28297	Fe-oxide stained layer in McCann Hill formation; intense blood red and yellow coatings with gypsum flakes lining fractures; host is black shale
VD28299	Finely laminated Fe-oxide concretions in siltstone; pyritic; McCann Hill formation
VD28301	Black carbonaceous siltstone; bed bounded by red and yellow oxide encrusted material; several beds 3 to 4 inches thick; Road River formation (?)

Table 3. --Atomic absorption analyses of rock samples collected from the Eagle, Alaska area in 1992

Sample Number	Ag ppm	V ppm	Ufl ppm	Sample Description
VD28208	0.4	211	-	Black chert with weak yellow stain; 85 cps
VD28209	<0.1	19	-	Pyritic, vitreous black chert with minor red Fe-oxide staining; Road River formation
VD28210	0.9	427	40.0	Medium tan chert rubble collected in area of 700-800 cps; Hillard limestone
VD28211	0.8	293	-	Black to buff clast-rich chert; trace pyrite; 250 cps; Road River/Hillard formation (?)
VD28212	0.9	438	-	Black chert with slightly sooty carbonaceous appearance; Road River formation
VD28213	0.7	143	-	Very light, porous siltstone; leached (?) calcareous siltstone; Road River formation
VD28214	0.7	237	-	Black fissile shale with minor yellow staining; up to 170 cps; Road River formation
VD28215	1.2	826	-	Black petroliferous shale; weathers light buff - tan; 180 cps; Road River formation
VD28216	0.2	205	-	Black bituminous limestone member; approx. 6 in thick; McCann Hill formation
VD28220	<0.1	134	-	Petroliferous, oolitic siltstone member of McCann Hill formation
VD28221	0.3	137	42.0	Black chert with strong phosphorous staining; bioclastic; 430 cps; Road River fm.
VD28222	3.2	1056	112.0	Black carbonaceous shale; 3 in bed between chert layers; 450 cps; Road River fm.
VD28223	-	-	188.0	Black carbonaceous fissile shale; 1700 cps; Road River formation
VD28224	-	-	28.0	Brown chert with buff-colored oxide(?) specks; area of 1000 cps; Road River fm.
VD28225	-	-	50.0	Black carbonaceous fissile shale; 550 cps; 3 to 5 ft above base; Road River formation
VD28226	<0.1	67	37.0	Light tan-gray limestone; edge-wise conglomerate; 600 cps; near top of Hillard limestone and base of Road River formation
VD28227	0.2	638	-	Black silty shale; 200 cps; Road River or McCann Hill formations
VD28228	0.5	258	3.3	Soil sample; 250 cps; small boulders of shale and chert in the area
VD28280	0.2	377	-	Black shale with minor bluish phosphate staining; 130 cps; Road River or McCann Hill fm.
VD28298	0.2	305	2.5	Black clayey gouge in fractured shale and chert; 175 cps; McCann Hill formation
VD28300	5.8	828	-	Black carbonaceous shale with ostracods; 200 cps; Nation River formation
VD28302	0.8	1186	8.7	Black fissile shale; 490 cps; Nation River formation
VD28742	0.6	250	-	Black shale coated with yellow and green precipitate crust; Road River formation
VD28744	<0.1	69	-	White phosphatic carbonate nodule; 4 inches in diameter; Road River formation
VD28749	<0.1	26	37.0	Silicified, brecciated limestone boulder with 2% chert pebbles; 680 cps; 5 ft diameter; near thrust between Hillard Limestone (?) and the Lower Glenn Shale
VD28750	<0.1	30	3.0	Silicified, brecciated limestone boulder; 3 ft diameter; minor Fe-oxide staining; 420 cps; near thrust between Hillard Limestone (?) and the Lower Glenn Shale

EAGLE (D-1) QUADRANGLE  
ALASKA  
1:63360 SERIES (TOPOGRAPHIC)

650 000 FEET  
141°00'  
65°00'  
4 020 000  
FEET

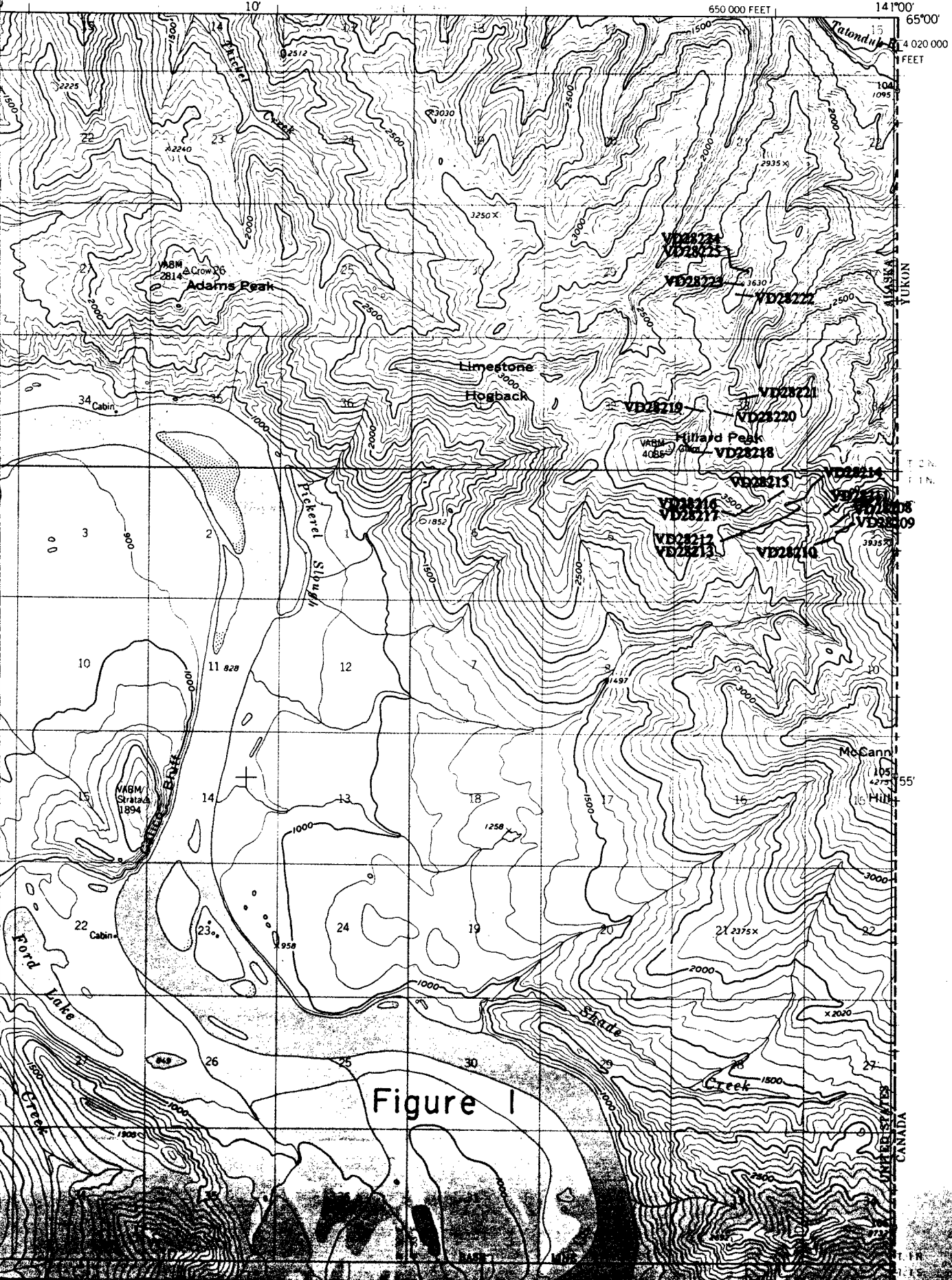
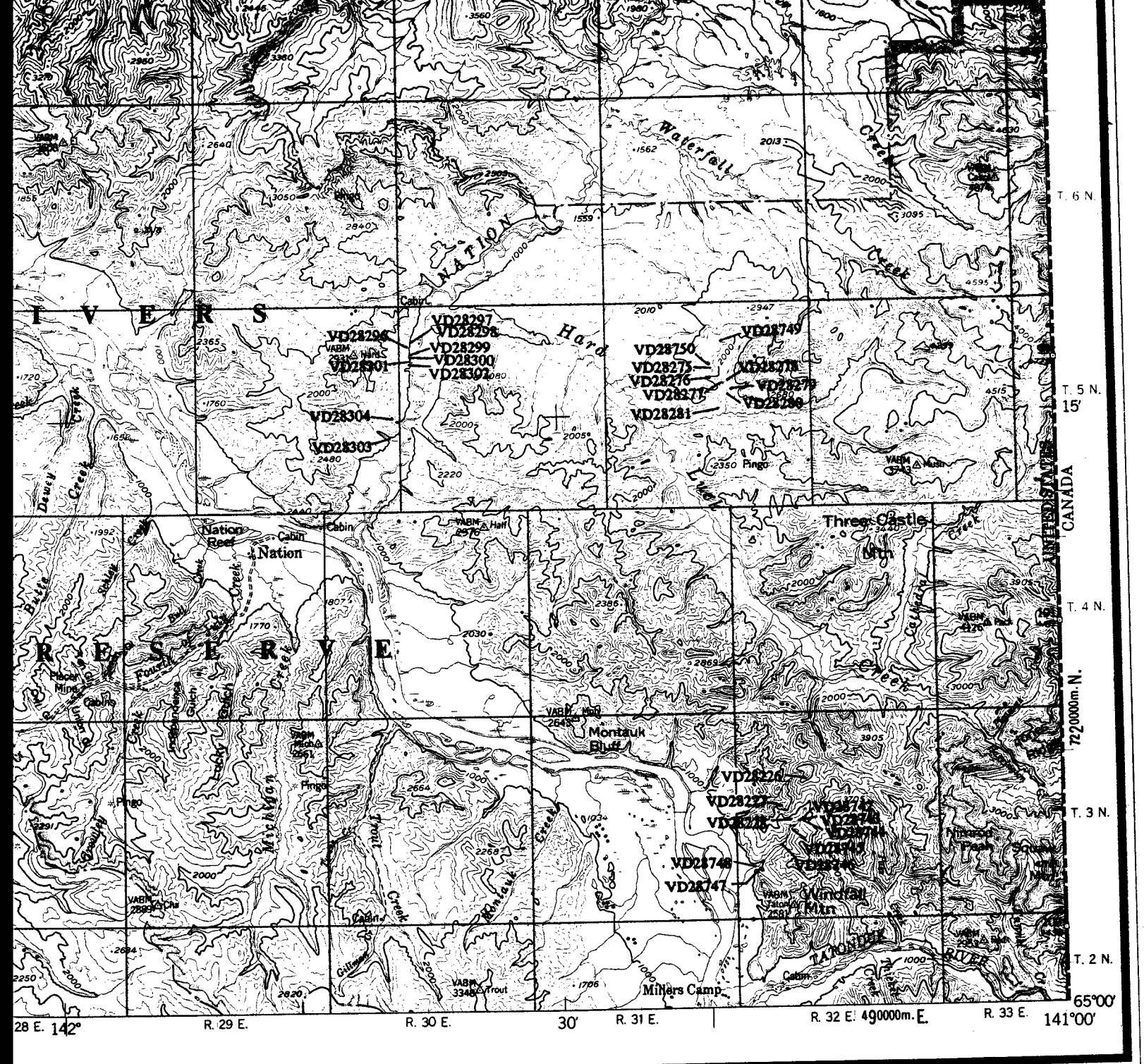
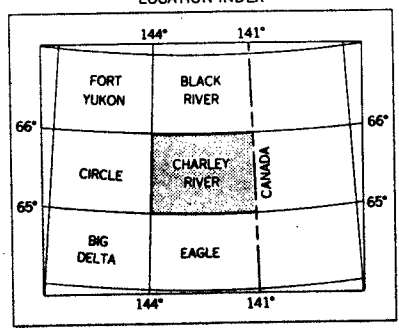


Figure 1



● INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1987

LOCATION INDEX



25 MILES

ROAD CLASSIFICATION

LIGHT-DUTY . . . . . UNIMPROVED DIRT . . . . .

CHARLEY RIVER, ALASKA  
65141-A1-TF-250

1956  
LIMITED REVISIONS 1982

Figure 2

## REFERENCES

- Brabb, E.E. and M. Churkin, Jr.. Geologic Map of the Charley River Quadrangle, East-central Alaska. USGS Miscellaneous Geologic Investigations Map I-573, 1969, 1 sheet.
- Dover, J.H. and R.T. Miyaoka. Reinterpreted Geologic Map and Fossil Data, Charley River Quadrangle, East-central Alaska. USGS Miscellaneous Field Studies Map MF-2004. 1:250,000 scale, 1988, 2 sheets.
- Foster, H.L. Geologic Map of the Eagle Quadrangle, Alaska. USGS Miscellaneous Investigations Series Map I-922. 1:250,000 scale, 1976, 1 sheet.