Fission-track dates from the White River Formation, Shirley Basin, Uranium District, Wyoming

R.A. Zielinski and C.W. Naeser

Isochron/West, Bulletin of Isotopic Geochronology, v. 18, pp. 19-20

This page is intentionally left blank to maintain order of facing pages.

FISSION-TRACK DATES FROM THE WHITE RIVER FORMATION, SHIRLEY BASIN, URANIUM DISTRICT, WYOMING

by Robert A. Zielinski and Charles W. Naeser, *U.S. Geological Survey, Denver, CO 80225*

The White River Formation in the Shirley Basin District of Wyoming consists of as much as 850 ft (261.5 m) of interbedded fluvial and lacustrine rhyolitic tuff, tuffaceous siltstone, sandstone, claystone, and minor conglomerate and carbonate rocks. In most of the area the tuffaceous units directly overlie arkosic sandstone of the Wind River Formation (Eocene), which contains major uranium deposits (fig. 1). Downward percolation of uraniferous groundwater through tuffs and its lateral movement within the sandstone of the Wind River Formation are thought to be the path of uranium transport (Harshman, 1972). Nearby Precambrian granites exposed during Paleocene-Eocene time and the tuffs of the White River Formation (Oligocene) are both thought to be likely source rocks for the uranium. Clearly, if the uranium deposits were found to be older than the oldest tuffaceous units, White River tuff could not be a major uranium source. The data that follow indicate a maximum age of 32 ± 3 m.y. for the White River Formation in the Shirley Basin. Vertebrate fossil evidence from the White River Formation yields ages from early Oligocene (Chadronian provincial age) to middle Oligocene (Orellan provincial age) (Wood, 1948; Van Houton, 1954; Rich, 1962; Harshman, 1972). K-Ar age determinations on biotite separates from middle and lower members of the White River Formation near Alcova Reservoir, 8 mi west of the sampling area (fig. 1) and points farther west give ages in the range from 31.6 to 35.7 ± 2 m.y. (Love, 1970; Evernden and others, 1964).

Recent attempts using U-Pb isotope systematics to date massive pitchblende and calcite-cemented uranium ores from the Shirley Basin have generated estimated *minimum* ages from 24 ± 3 m.y. to 35 m.y. (K. R. Ludwig, written communication). In the absence of significantly older ages, White River tuff must be considered a probable source because of its favorable spatial and temporal relationship to the deposits.

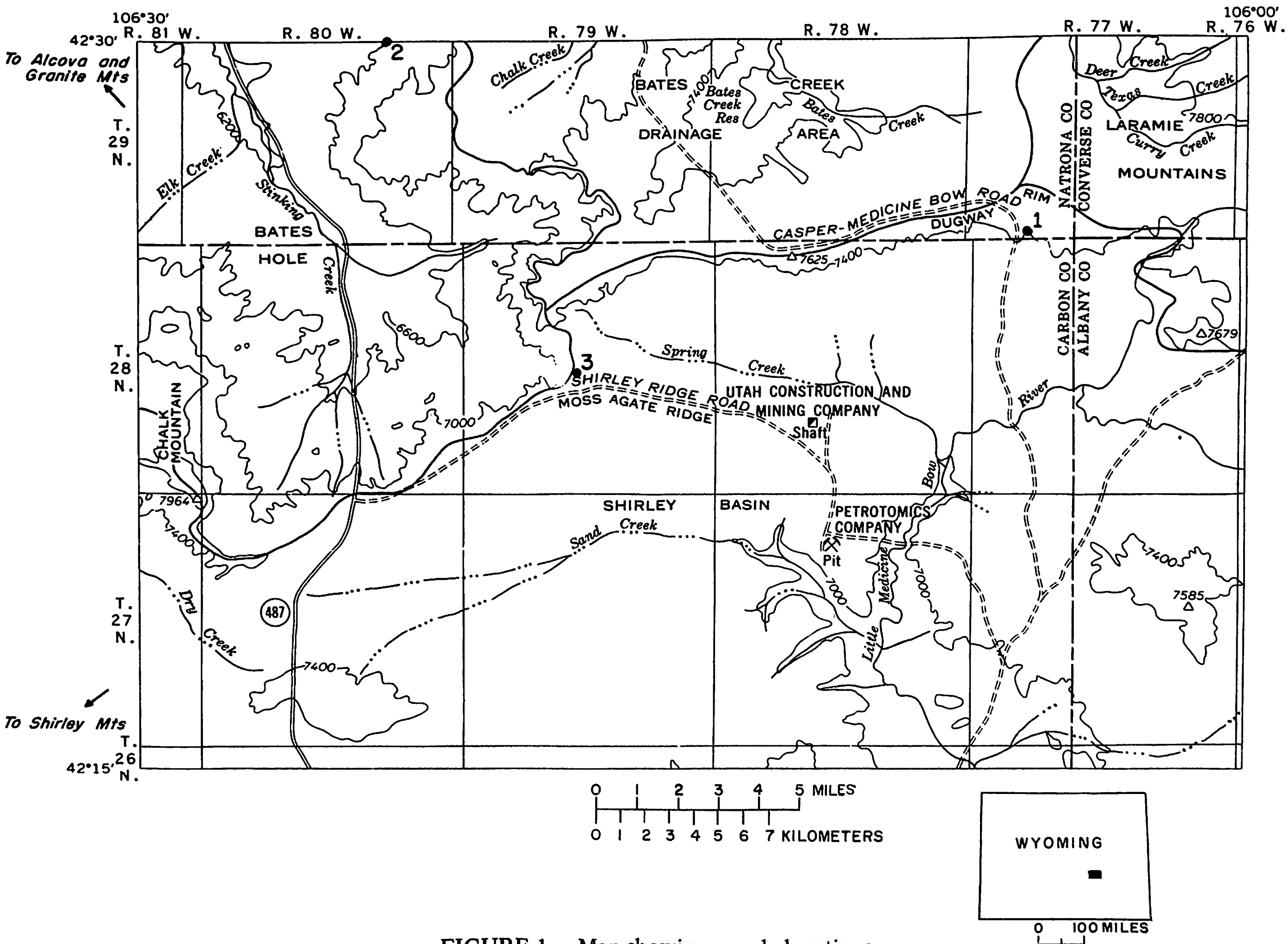

FIGURE 1 – Map showing sample locations.

SAMPLE DESCRIPTIONS

Dates were determined using zircon separates from outcrop samples according to the method of Naeser (1969). Reported analytical errors are ± 2σ and represent errors of counting statistics. The fission decay constant (λ_F) used for U^{238} is 6.85 x 10^{-17} yr^{-1} (Fleisher and Price, 1964). Samples were irradiated in the U.S. Geological Survey TRIGA reactor in Denver.

1. WTR-SB2 — Fission track

Rhyolite tuff (fig. 1), middle member, White River Formation (NW¼ sec. 32, T. 29 N., R. 77 W.; 42° 26.0'N., 106°6.0'W.; Natrona Co., WY). Gray glassy tuff with accessory plagioclase, biotite, and magnetite; minor calcite and clay alteration products. Analytical data: Six grains counted, P_s = 4.96 x 10^6 tracks/cm^2 (838 tracks counted), P_i = 10.15 x 10^6 tracks/cm^2 (858 tracks counted), ϕ = .98 x 10^{15} n/cm^2, U_{zircon}≈ 315 ppm. **29.3±2.8 m.y.**

2. 75-SB-8 — Fission track

Tuffaceous siltstone (fig. 1), lower member, White River Formation (SW¼ sec. 2, T. 29 N., R. 80 W.; 42° 30.2'N., 106°23.7'W.; Natrona Co., WY). Rhyolite glass with minor biotite and major calcite and clay alteration products. Analytical data: Six grains counted, P_s = 2.72 x 10^6 tracks/cm^2 (528 tracks counted), P_i = 4.04 x 10^6 tracks/cm^2 (393 tracks counted), ϕ = 7.80 x 10^{14} n/cm^2, U_{zircon}≈160 ppm. **32.1±3.0 m.y.**

3. 75-SB-9C — Fission track

Rhyolite tuff (fig. 1), lower member, White River Formation (NE¼ sec. 21, T. 28 N., R. 79 W.; 42°22.9'N., 106°18.3'W.; Carbon Co., WY). Gray glassy tuff with accessory plagioclase, biotite, and quartz, and minor clay. Analytical data: Six grains counted, P_s = 4.52 x 10^6 tracks/cm^2 (1,192 tracks counted), P_i = 9.36 x 10^6 tracks/cm^2 (1,235 tracks counted), ϕ = 1.10 x 10^{15} n/cm^2, U_{zircon} ≈260 ppm. **32.4±2.6 m.y.**

REFERENCES

Denson, N. M., and Harshman, E. N. (1969) U.S. Geol. Survey, Misc. Geol. Invest. Map I-570

Evernden, J. F., Savage, D. E., Curtis, G. H., and James, G. T. (1964) Potassium-argon dates and Cenozoic mammalian chronology of North America: Am. Jour. Sci., v. 262, no. 2, p. 145-148

Fleisher, R. L., and Price, P. B. (1964) Decay constant for spontaneous fission of U^{238}: Phys. Rev., v. 133, p. B63-B64

Harshman, E. N. (1972) Geology and uranium deposits, Shirley Basin area, Wyoming: U.S. Geol. Survey, Prof. Paper 745

Love, J. D. (1970) Cenozoic geology of the Granite Mountains area, central Wyoming: U.S. Geol. Survey, Prof. Paper 495-C

Naeser, C. W. (1969) Etching fission tracks in zircons: Science, v. 165, p. 388

Rich, E. I. (1962) Reconnaissance geology of Hiland-Clarkson Hill area, Natrona County, Wyoming: U.S. Geol. Survey, Bull. 1107-G, p. 447-540

Van Houton, F. B. (1954) Geology of the Long Creek-Beaver Divide area, Fremont County, Wyoming: U.S. Geol. Survey, Oil and Gas Map OM-140

Wood, H. E. (1948) Section of Beaver Divide: *in* McGrew, P. O., ed., Society of Vertebrate Paleontology Guidebook 3rd Ann. Field Cong., Southeastern Wyoming, p. 37-41

New Mexico Tech Print Plant

Type Faces:	Camera-ready copy composed on IBM Composer Text 10 pt. Press Roman leaded two points Subheads 11 pt. and 8 pt. Press Roman
Presswork:	Text and cover printed on Davidson 600
Paper:	Body on 60 lb. white offset Cover on 65 lb. Russett
Ink:	Vanson rubber base plus all-purpose black