UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MINERAL RESOURCE POTENTIAL OF THE WENAHA TUCANNON WILDERNESS, WASHINGTON AND OREGON

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STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Wenaha Tucannon Wilderness, Umatilla National Forest, Columbia, Garfield, and Asotin Counties, Washington and Wallowa County, Oregon. The Wenaha Tucannon Wilderness was established by Public Law 95-237 in 1978.

SUMMARY

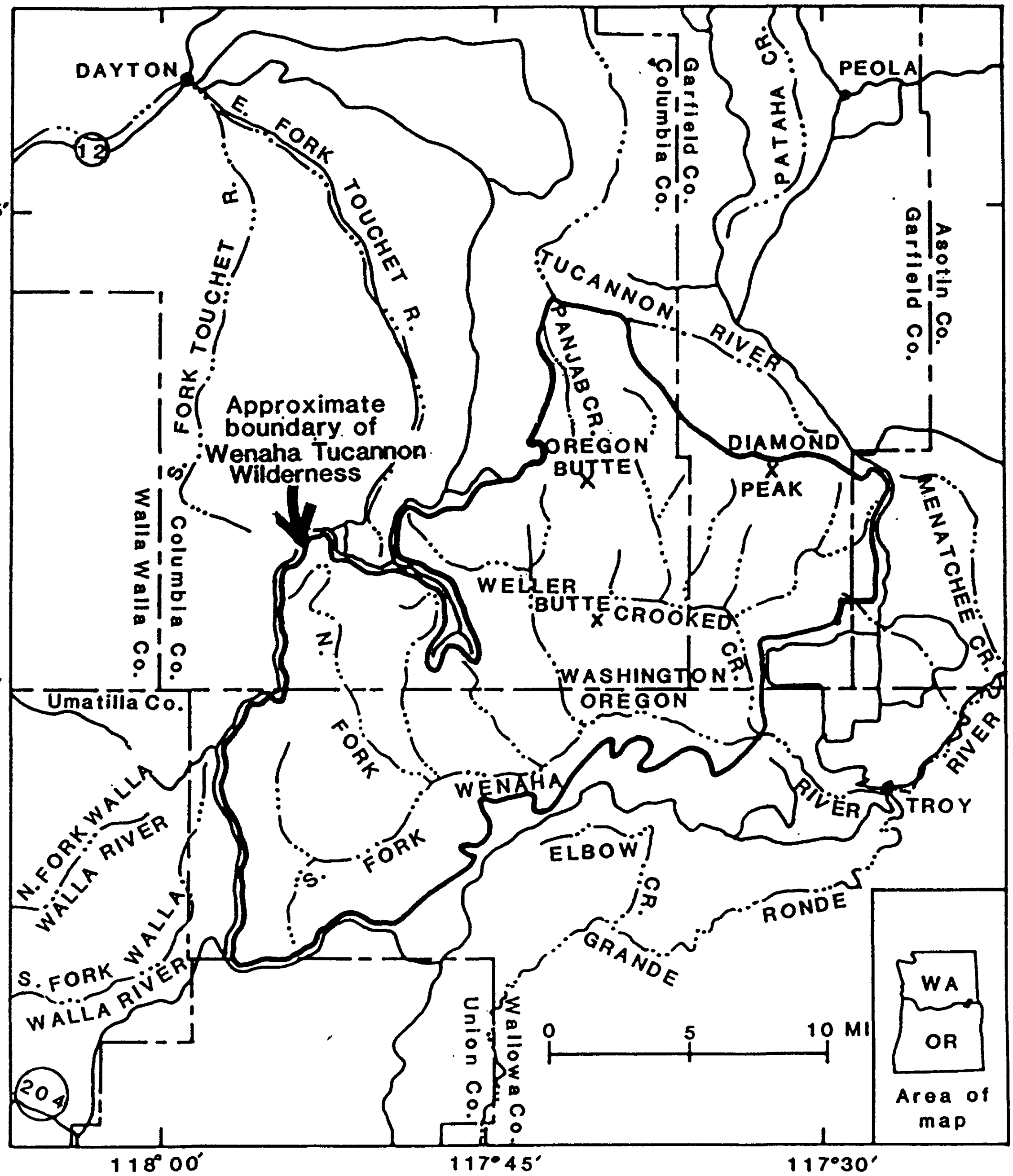
The results of geologic, geochemical, mining-activity, and production surveys in the Wenaha Tucannon Wilderness indicate a low potential for metallic, nonmetallic, or energy resources. No mining claims are known within the wilderness, and there is no recorded mineral production. Thin seams of low-grade coal may occur in the shallow subsurface in the southeast corner of the wilderness, but none is exposed. A low potential for gold, silver, and copper is suggested by several geochemical analyses of altered rocks in the northern tip of the wilderness. The wilderness has a low potential for oil, natural gas, and geothermal energy, similar to that of surrounding areas of the Columbia Plateau.

INTRODUCTION

The Wenaha Tucannon Wilderness straddles the crest of the Blue Mountains in Columbia, Garfield, and Asotin Counties of southeast Washington and Wallowa County of northeast Oregon (Fig. 1). The wilderness occupies about 177,500 acres in the Umatilla National Forest. Most of the wilderness is drained by the Wenaha River and its principal tributary system, Crooked Creek. The northern prong is drained by the Tucannon River and a large tributary, Panjab Creek. Main road access is from Troy, Oregon, about 5 mi southeast of the wilderness; Pomeroy, Washington, about 25 mi north of the area; Dayton, Washington, about 15 mi northwest of the area; Walla Walla, Washington, about 25 mi west of the area; and Elgin, Oregon, about 22 mi south of the wilderness. An extensive trail system enables access to most parts of the wilderness. The area is rugged, with local relief as much as 3,300 ft. Highest elevations are about 6,387 ft on Oregon Butte and 6,379 ft at Diamond Peak. The lowest elevation, about 1,880 ft, is where the Wenaha River leaves the wilderness.

Figure 1. Map showing location of the Wenaha Tucannon Wilderness, Washington and Oregon.

Figure 1


DAYTON
E. FORK TOUCHET R.
S. FORK TOUCHET R.
Approximate boundary of Wenaha Tucannon Wilderness
TUCANNON RIVER
PANJAB CR.
OREGON BUTTE
DIAMOND PEAK
PEOLA
PATAHA CR.
Garfield Co.
Columbia Co.
Asotin Co.
Garfield Co.
Walla Walla Co.
Columbia Co.
MENATCHEE CR.
WELLER BUTTE
CROOKED CR.
WASHINGTON
OREGON
Umatilla Co.
N. FORK WENAHA
S. FORK
WENAHA RIVER
TROY
N. FORK WALLA WALLA RIVER
S. FORK WALLA WALLA RIVER
ELBOW CR.
GRANDE RONDE RIVER
Union Co.
Wallowa Co.
0 5 10 MI
WA
OR
Area of map
46°15′
46°00′
118°00′
117°45′
117°30′
12
204

GEOLOGY

The geology of the Wenaha Tucannon Wilderness (fig. 2) was mapped and described by Swanson and Wright (1983a). Flows belonging to, from oldest to youngest, the Grande Ronde, Wanapum, and Saddle Mountains Basalts of the Columbia River Basalt Group constitute the vast majority of rocks exposed within the wilderness, with an aggregate maximum thickness of more than 4,990 ft. They were erupted onto a surface of moderate relief developed on pre-Tertiary metasedimentary and metavolcanic rocks possibly correlative with the Seven Devils Group. These older rocks are exposed within the wilderness only along Panjab Creek.

The oldest exposed flows of the Grande Ronde Basalt in the study area were probably erupted between 16.5 and 16 m.y. (million years) ago. After covering the existing topography, younger flows spread widely across the area. Some were erupted from feeder dikes within the area, but most entered the area from vents farther away. Rarely, thin deposits of hyaloclastite, basaltic tephra, and soil separate flows, a relation consistent with inferred rapid outpouring of the basalt. The rate of volcanism waned during late Wanapum and Saddle Mountains time, and dominantly fine-grained sediments were deposited between successive flows in the developing Grouse Flat syncline whose troughline follows the Wenaha River (fig. 2). Volcanism ended about 10.5 m.y. ago with eruption of the Elephant Mountain Member of the Saddle Mountains Basalt from a fissure system whose northern end is in the wilderness.

Structurally, the Wenaha Tucannon Wilderness is dominated by the Blue Mountains uplift, a major complex system of folds, monoclines, and faults extending from central Oregon to the tri-state area of Washington, Oregon, and Idaho. The crest of the uplift passes east-west through the northern part of the wilderness. The uplift, which consists of four anticlines and several associated monoclines and faults, may have begun to form in the wilderness area as early as the end of Grande Ronde time (about 15 m.y. ago) but was first prominent by the end of Elephant Mountain time. It continued to grow, together with the neighboring Grouse Flat syncline to the south, into post-Elephant Mountain time. A system of north-northeast-trending faults and a less prominent system of northwest-trending faults occur in the wilderness. Faults of both systems have scissors-type vertical displacement, a feature commonly associated with strike-slip faults. Regional considerations suggest that the north-northeast-trending faults may have left-lateral movement, and that the northwest-trending faults may have right-lateral movement.

GEOCHEMISTRY

Nineteen samples of silt-sized stream sediment collected along major drainages within the Wenaha Tucannon Wilderness were analyzed for 29 elements[1] by semiquantitative emission spectrography (Swanson and Wright, 1983b). Thirty-six lode samples were analyzed by quantitative

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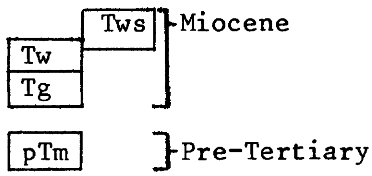
[1] The elements are: antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, gold, iron, lanthanum, lead, lithium, manganese, molybdenum, nickel, niobium, scandium, silver, strontium, thorium, tin, tungsten, vanadium, yttrium, zinc, and zirconium.

Figure 2. Geologic map of the Wenaha Tucannon Wilderness, Washington and Oregon, simplified from Swanson and Wright (1983a).

EXPLANATION

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

COLUMBIA RIVER BASALT GROUP (MIOCENE):

Tws SADDLE MOUNTAINS AND WANAPUM BASALTS, UNDIVIDED--Includes in southeastern part of wilderness tuffaceous sedimentary rocks interbedded with the Saddle Mountains Basalt, including the interbed of Grouse Creek of Ross (1978)

Tw WANAPUM BASALT--Includes Eckler Mountain and Frenchman Springs Members. Generally contains sparse to abundant plagioclase phenocrysts

Tg GRANDE RONDE BASALT (MIOCENE)--Basalt flows, dominantly non-porphyritic, and minor tephra

pTm METAMORPHIC ROCKS (PRE-TERTIARY)--Mostly greenstone, with minor metagraywacke, meta-argillite, and chert. Occurs only at extreme northern tip of wilderness

CONTACT--APPROXIMATELY LOCATED

HIGH-ANGLE FAULT--Bar and ball on downthrown side

CRESTLINE OF ANTICLINE

TROUGHLINE OF SYNCLINE

MONOCLINE

Abrupt decrease of dip in direction of arrows

Abrupt increase of dip in direction of arrows

PROSPECT LOCALITY

BOUNDARY OF WILDERNESS

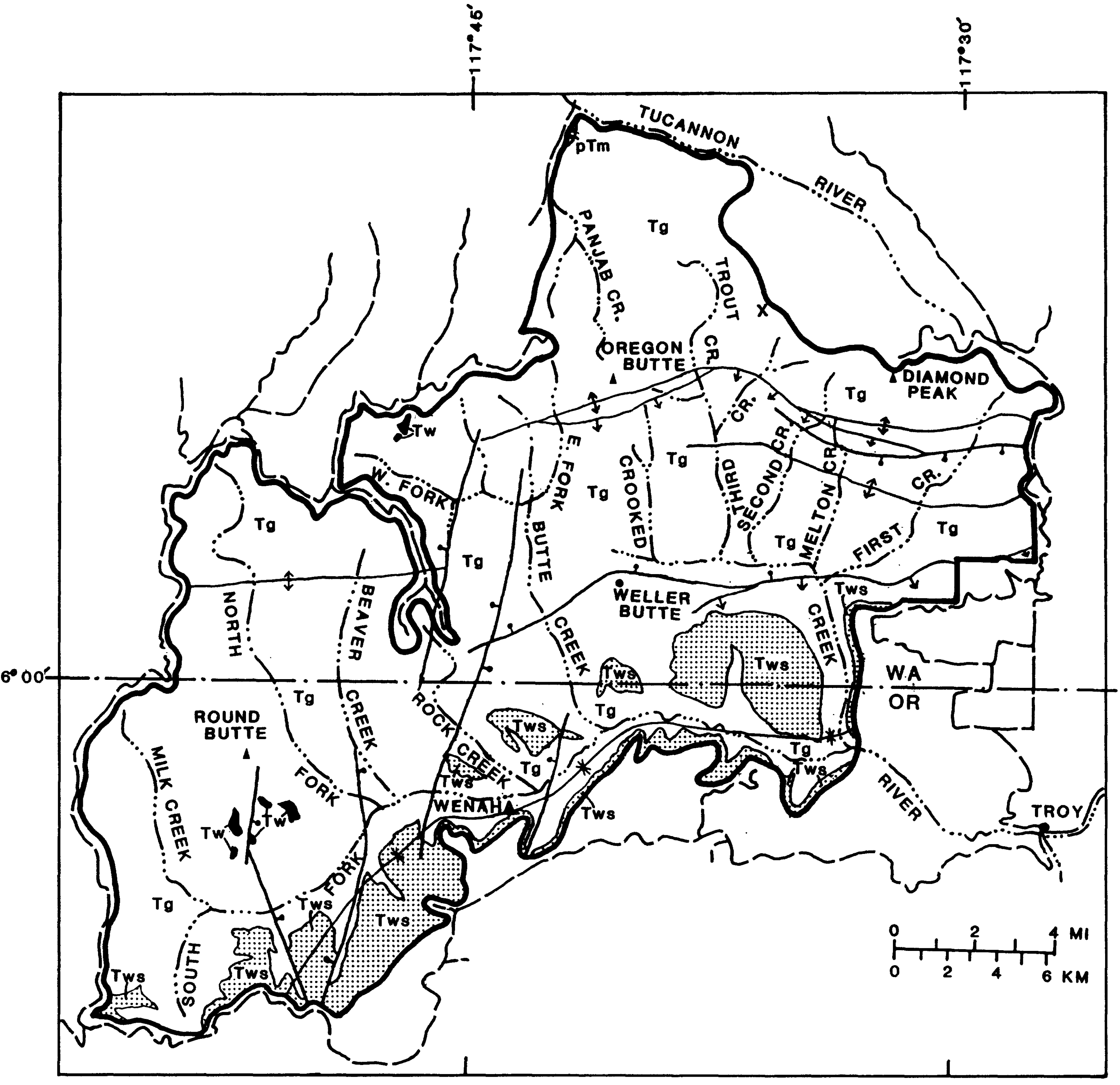

117°45′
117°30′
6° 00′
TUCANNON
RIVER
pTm
Tg
PANJAB CR.
TROUT
CR.
X
OREGON
BUTTE
DIAMOND
PEAK
Tw
W. FORK
E. FORK
BUTTE
CREEK
CROOKED
THIRD
CR.
SECOND CR.
MELTON CR.
FIRST
CR.
WELLER
BUTTE
Tws
CREEK
NORTH
BEAVER
CREEK
ROCK
CREEK
WA
OR
ROUND
BUTTE
MILK CREEK
FORK
WENAHA
RIVER
TROY
SOUTH
0 2 4 MI
0 2 4 6 KM

Figure 2

methods for gold, silver, lead, zinc, and copper, and by semiquantitative spectrography for 42 elements.[2] Heavy-mineral fractions of 25 placer concentrates were analyzed for their mineral content. Detailed results of the lode and placer concentrates are included in Munts (1982b). Except as noted below, analytical results show no unusual concentrations of any of the elements looked for.

MINING ACTIVITY

There is no mining activity in the Wenaha Tucannon wilderness. A mine near Troy, Oregon (fig. 1), produced a few tons of coal in 1900 for use in a local blacksmith shop. The Tucannon mining district extends into the northern part of the wilderness, but the principal part of the district is 4 mi north of the wilderness. The Asotin mining district is 6 mi northeast of the wilderness. Some of the mines occur in pre-Tertiary rocks. Several of the older mines and prospects in these districts are currently worked for precious metals, chiefly gold. No known claims and only one prospect (in an oxidized vesicular flow top near Bear Wallow Spring, west-northwest of Diamond Peak) occur within the wilderness.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

The Wenaha Tucannon Wilderness has a low potential for metallic, nonmetallic, and energy resources.

Trace amounts of gold were found in three lode samples and three placer samples (Munts, 1982a, b), most of which were collected from the northeastern part of the wilderness. An additional lode sample from propylitically altered basalt contains 0.162 oz gold per ton. Slightly elevated concentrations of silver and copper were also noted in some samples of altered basalt and greenstone that contain numerous quartz veins. Float of an altered intermediate to silicic plutonic rock along the Tucannon River, a short distance north of the wilderness boundary, suggests the presence of a similar intrusive body at depth within the pre-Tertiary rocks of the wilderness. Such intrusive bodies may be the source of high concentrations of gold, silver, and copper in some mining districts. Thus there exists a low potential for a gold, silver, or copper deposit in the pre-Tertiary rocks beneath the basalt in the Wenaha Tucannon Wilderness.

Two local occurrences of semiprecious gemstones were found in the Wenaha Tucannon Wilderness, one consisting of chalcedony, the other of sunstone plagioclase. Similar occurrences are numerous in exposures of the Columbia River Basalt Group on the Columbia Plateau.

No known geothermal springs or wells occur within the Wenaha Tucannon Wilderness, and the potential for geothermal resources is low.

Thin seams of low-grade coal occur locally in the interbeds of Squaw Canyon and Grouse Creek east of the wilderness, but none was found within

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[2] The elements are: aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, gallium, gold, hafnium, indium, iron, lanthanum, lead, lithium, magnesium, manganese, molybdenum, nickel, niobium, phosphorus, platinum, rhenium, scandium, silicon, silver, sodium, strontium, tantalum, tellurium, thorium, tin, titanium, vanadium, yttrium, zinc, and zirconium.

the wilderness itself. Carbonaceous shale occurs just southeast of the area; its BTU content is low. Buried coal seams may be interbedded with flows of the Saddle Mountains Basalt in the southeast part of the Wenaha Tucannon Wilderness, but it is unlikely that the seams would be thick enough, or the coal of sufficient grade, for more than local usage.

Oil and natural gas potential is low within the Wenaha Tucannon Wilderness, judging by the metamorphic nature of the observed pre-basalt rocks and the paucity of exposed sedimentary interbeds within the basalt. The presence of decayed vegetation in the interbeds of Squaw Canyon and Grouse Creek indicates low potential for low-pressure natural gas in the southeastern part of the wilderness.

The Wenaha Tucannon Wilderness contains abundant basalt, a common riprap material, but surrounding areas contain this too.

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