

**Geologic Map of the Tacoma Park, Montana 7.5' Quadrangle
West-central Montana**

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Introduction

The Tacoma Park 7.5' quadrangle, located in the southwest part of the Townsend 30' x 60' quadrangle in west-central Montana, lies on the south flank of the Devils Fence Anticline within the eastern part of the Montana fold and thrust belt. This very large, north-northeast-trending structure extends for some 25 miles northward from the Boulder River Valley to its surface terminous against the Elkhorn Mountains Volcanics. The volcanics also bound the structure on the east, while the Boulder River Valley forms the southern and southwestern flanks. Westward from the anticline, rocks of the Mississippian section extend into additional fold structures. Proterozoic metasedimentary rocks of the Belt Supergroup form the core of the anticline, with a well exposed Paleozoic and Mesozoic section forming the eroded flanks of the structure.

Devils Fence Anticline is a classic structure that has been a focus for numerous geologic investigations, from facies and basin analysis to petroleum exploration. Additionally, the area offers wide opportunity for other kinds of study, including volcanic terranes, Tertiary basin-fill deposits, and modern erosional and depositional processes. The present mapping program, conducted by geology faculty and students from the University of Wisconsin/Eau Claire under the U.S. Geological Survey's EDMAP program, is providing an integrated set of 1:24,000-scale geologic maps of the area (fig. 1).

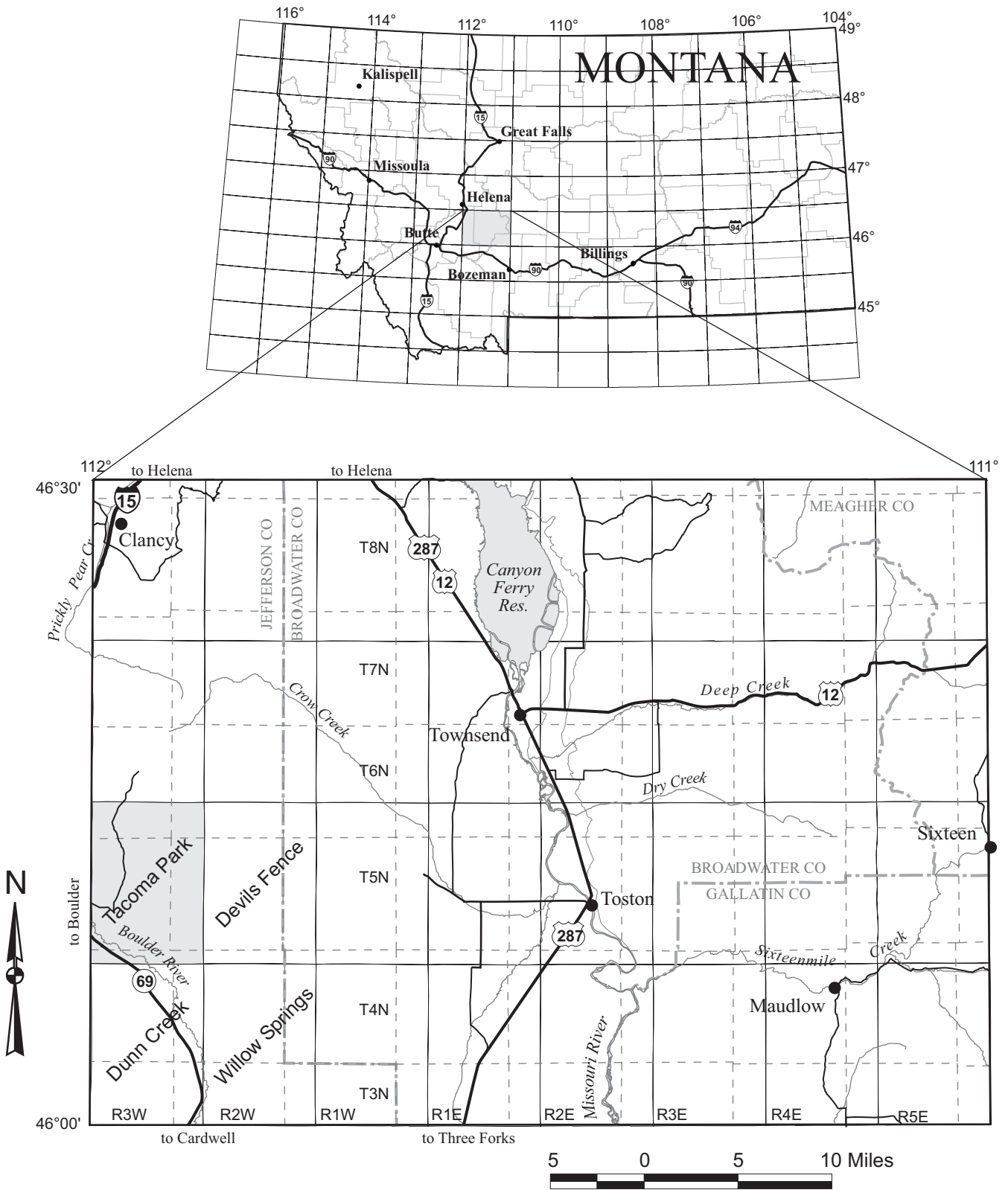


Figure 1. Location of Tacoma Park 7.5' quadrangle in southwest corner of the Townsend 30' x 60' quadrangle, west-central Montana. Additional named 7.5' quadrangles indicate where adjacent geologic mapping is complete or in progress.

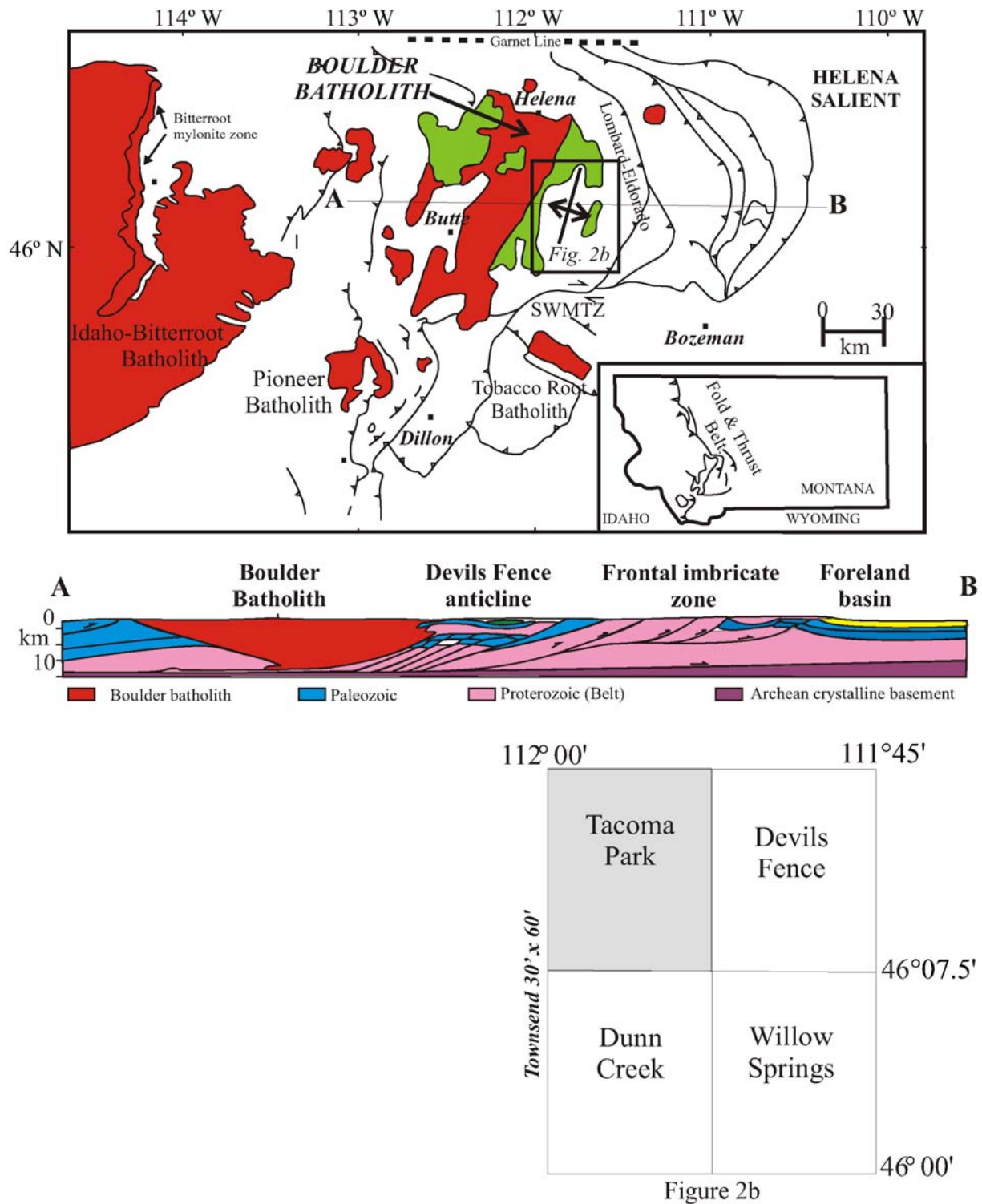
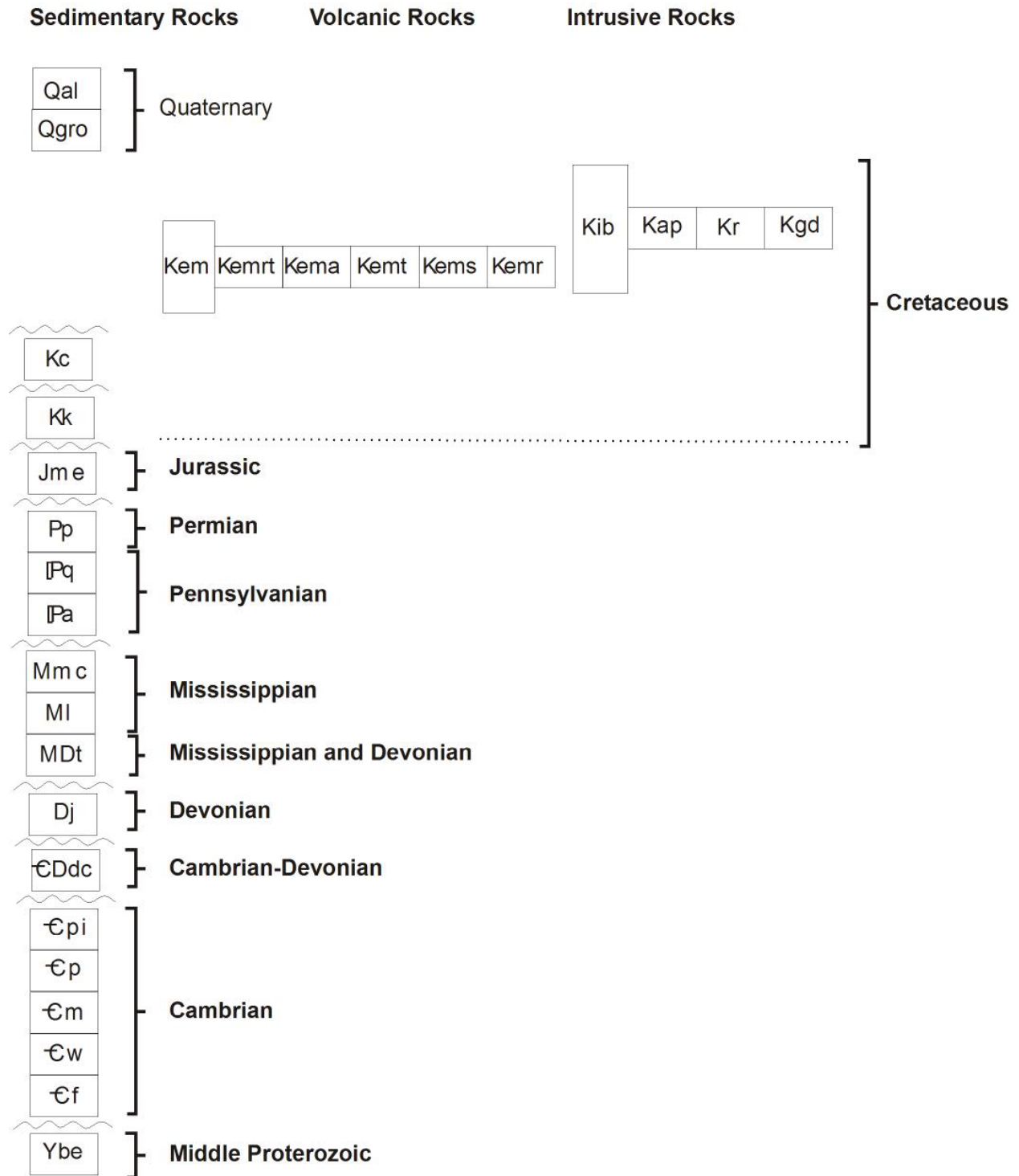


Figure 2. Schematic map and cross section of pertinent geologic features in the northern Rocky Mountains (modified from Lageson and others, 2001). Note location of study area within Helena Salient of the Montana fold and thrust belt. Figure 2b shows Tacoma Park quadrangle in relation to other quadrangle maps in progress.

Correlation Chart of Map Units in Tacoma Park 7.5' Quadrangle



Description of Map Units

Cenozoic

- Qal Quaternary alluvium (Holocene):** Light-gray to light-brown, moderately to well sorted, crudely stratified boulder, cobble, pebble, sand, silt, and clay. Heterolithic clasts include Paleozoic carbonate and siliciclastic rocks, plutonic and volcanic rocks. Unit restricted to modern stream drainages. Thickness varies; generally less than 35 ft (~10 m).
- Ogro Quaternary gravels, older:** Unconsolidated, unsorted to poorly sorted, unstratified to crudely stratified, angular to subrounded boulders, cobbles, pebbles and sand. Unconformably overlies Paleozoic sedimentary rocks and Cretaceous volcanic rocks; mantles low relief erosional surface with a sediment blanket that slopes gently toward valley from flanking mountains. Forms sloping terraces between modern drainages. Thickness varies; as much as 70 ft (~20 m) locally.

Mesozoic

Cretaceous

Volcanic rocks

- Kem Elkhorn Mountains Volcanics:** Laterally variable succession of andesitic to rhyolitic flows, breccias, lapilli tuff, tuff, and intercalated sediments. Thickness less than 3,500 ft (~1,000m).
- Kema: andesite flows, breccia and hypabyssal dikes, and sills
Kemr: rhyolite flows, breccia and hypabyssal dikes, and sills
Kemrt: rhyolite welded to non-welded tuff, and lapilli tuff
Kems: volcaniclastic conglomerate, sandstone, and siltstone
Kemt: undivided volcanic tuff, lapilli tuff, and tuff breccia

Intrusive rocks

- Kib Intrusive rocks of the Boulder Batholith, undivided:** Medium- to coarse-grained, equigranular to potassium-feldspar-porphyritic biotite granite to granodiorite.
- Kgd Granodiorite:** Coarse-grained, biotitic (Sagebrush Creek stock).
- Kap Andesite porphyry:** Dark-green to dark-gray, aphanitic to plagioclase-phyric; commonly localized in thin-bedded, fine-grained Proterozoic and lower Paleozoic sedimentary units.
- Kr Rhyolite**

Sedimentary rocks

- Kk Kootenai Formation:** Light-gray to brown, medium-bedded, moderately sorted, chert-lithic arenite; commonly displays large low-angle cross stratification. Thickness 150-350 ft (~50-100 m).

Jurassic

Jme Morrison Formation and Ellis Group, undivided: Recessive succession of beds characterized by a lower portion of thin-bedded, calcite-cemented, lithic arenite, sandy siltstone, siltstone, and shale yielding orange, red, tan, and dark-gray, sandy siltstone regolith and an upper portion of thin- to medium-bedded, orange to red quartz arenite, thin-bedded siltstone, shale, and sandy micrite. Thickness 125-225 ft (~40-70 m).

Paleozoic

Permian

Pp Phosphoria Formation: Thin unit containing black to dark-gray bedded chert, cherty limestone, siltstone and gray to black, locally oolitic phosphatic shale. Locally contains a lenticular basal conglomerate. Thickness 0-20 ft (~0-5m).

Pennsylvanian

IPq Quadrant Formation: Cliff-forming unit of buff-yellow and pink, medium-thick bedded, silica-cemented, cross-stratified, quartz arenite. Locally contains chert nodules and thin calcareous silt laminations. Contains basal unit of dolomitic, cross-stratified quartz arenite to sandy dolomite. Thickness 150-350 ft (~50-100 m).

IPa Amsden Formation: Recessive unit of light-gray to tan, thinly laminated, thin-bedded quartz arenite, siltstone, shale, and silty micrite that produces distinctive reddish-brown regolith. Thickness 100-165 ft (~30-50m).

Mississippian

Madison Group

Mmc Mission Canyon Formation: Thick to massively bedded, medium- to dark-gray, fossiliferous (rugose corals, sponges, and bioclastic hash) wackestone, packstone and locally rudstone. Displays characteristic scalloped surface and locally abundant thin, dark-gray chert nodules. Coarsely crystalline in part. Massive character commonly makes determination of bedding orientation difficult. Thickness 575-825 ft (~175-250 m).

MI Lodgepole Formation: Characteristically very well bedded, thin- to medium-bedded micrite to packstone with tan silty interbeds. Displays abundant sedimentary structures including scour marks, graded bedding, parallel laminations, cross lamination, and ripple marks. Forms blocky outcrops. Becomes thicker-bedded and increasingly fossiliferous (crinoids, brachiopods, rugose corals, bioclastic hash) toward gradational contact with overlying strata. Thickness 500-650 ft (~150-200 m).

Mississippian and Devonian

MDt Three Forks Formation: Recessive unit of gray to green, thin-bedded, calcareous, micaceous shale, siltstone, silty micrite, and lesser fine-grained quartz arenite. Subdivided into three members consisting of a middle resistant, platy, thinly laminated siltstone, silty micrite, and fine-grained sandstone overlain and underlain by recessive siltstone and shale units. Characterized by reddish-orange to green, platy regolith. Thickness 165-250 ft (~50-75 m).

Devonian

Dj Jefferson Formation: Dark-gray to blue-gray, medium- to thick-bedded, locally massive, intercalated dolomite and subordinate limestone. Consists of a resistant basal medium-bedded, dark-gray, fossiliferous (crinoids, brachiopods, corals), sandy dolomitic wackestone with strong fetid odor overlain by a recessive black, calcareous shale. Upper section is a cliff-forming, slightly fetid, locally fossiliferous, sandy dolomitic wackestone with thin sandstone laminations. Unit is distinctly sucrosic and weathers to a light-gray scalloped surface. Thickness 500-650 ft (~150-200 m).

Cambrian

€dc Dry Creek Formation: Orange, red, brown, and yellow, thin-bedded, thinly laminated siltstone and shale with subordinate very fine grained quartz arenite. Contains abundant parallel laminae, cross-laminae, and climbing-ripple laminae. Weathers recessively and forms valleys and saddles characterized by reddish, platy regolith. Thickness 60-150 ft (20-50 m).

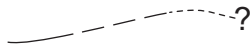
€pi Pilgrim Formation: Lower portion characterized by a gray to light gray, thin convolute-bedded, mottled micrite interbedded with orange weathering fine-grained quartz arenite. Grades into a dark gray, medium- to thin-bedded, bioturbated dolowackestone overlain by a resistant, fetid, heavily bioturbated dolomitic wackestone. Thickness approximately 500 ft (~150m).

Strata shown only on cross section A-A'

Kc	Colorado Group (part of Lower Cretaceous only)
Cp	Park Formation (Middle Cambrian)
Cm	Meagher Limestone (Middle Cambrian)
Cw	Wolsey Shale (Middle Cambrian)
Cf	Flathead Sandstone (Middle Cambrian)
Ybe	Belt Supergroup, undivided (Middle Proterozoic)

Symbols Used on Map and Cross Section Tacoma Park 7.5' Quadrangle

Map Symbols



Contact: solid where known; dashed where approximate; dotted where assumed; queried where uncertain.



Normal fault: solid where known; dashed where approximate; dotted where assumed; queried where uncertain; ball and bar on downthrown side.



Thrust fault: solid where known; dashed where approximate; dotted where assumed; queried where uncertain; teeth on up thrown side.



Strike-slip fault: solid where known; dashed where approximate; dotted where assumed; queried where uncertain.



Anticline: solid where known; dashed where approximate.



Syncline: solid where known; dashed where approximate.



Strike and dip of bedding



Breccia zone

Cross Section Symbols



Fault: showing relative vertical displacement



Strike-slip fault movement indicators showing movement into and out of fault plane of cross section (tail and tip of arrow, respectively)

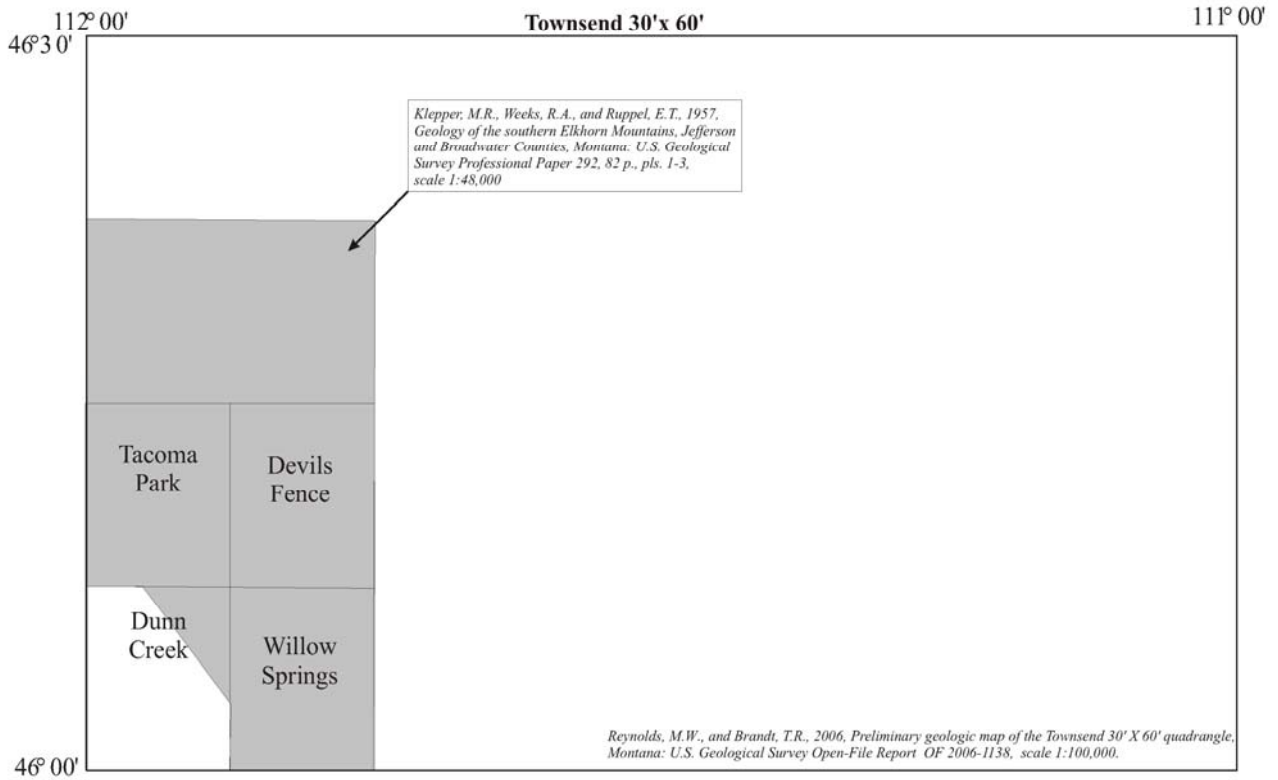
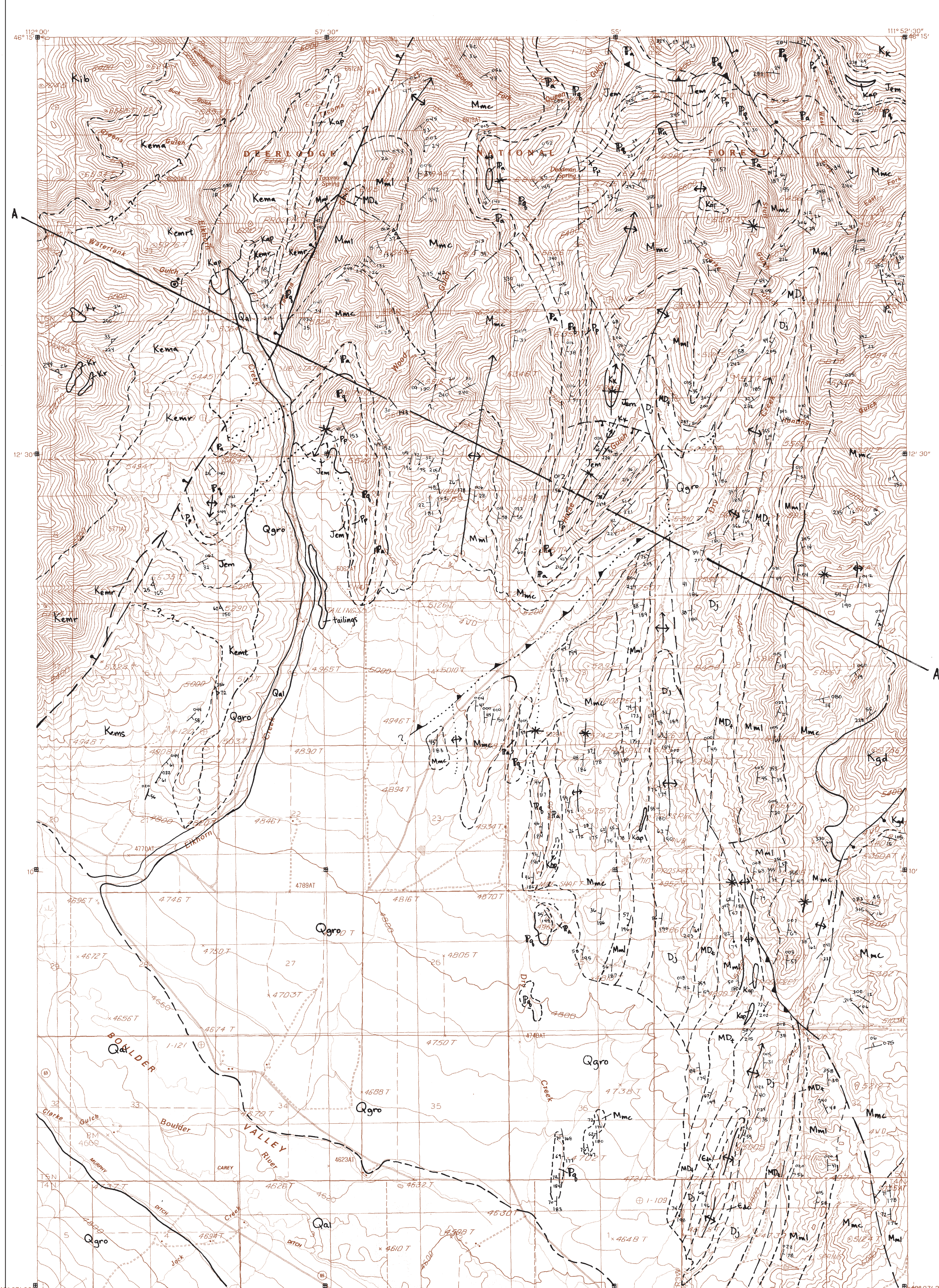


Figure 3. Geologic source maps used in this report. Shaded area is Klepper and others, 1957. Devils Fence, Dunn Creek, and Willow Springs 7.5' quadrangles maps are in progress.

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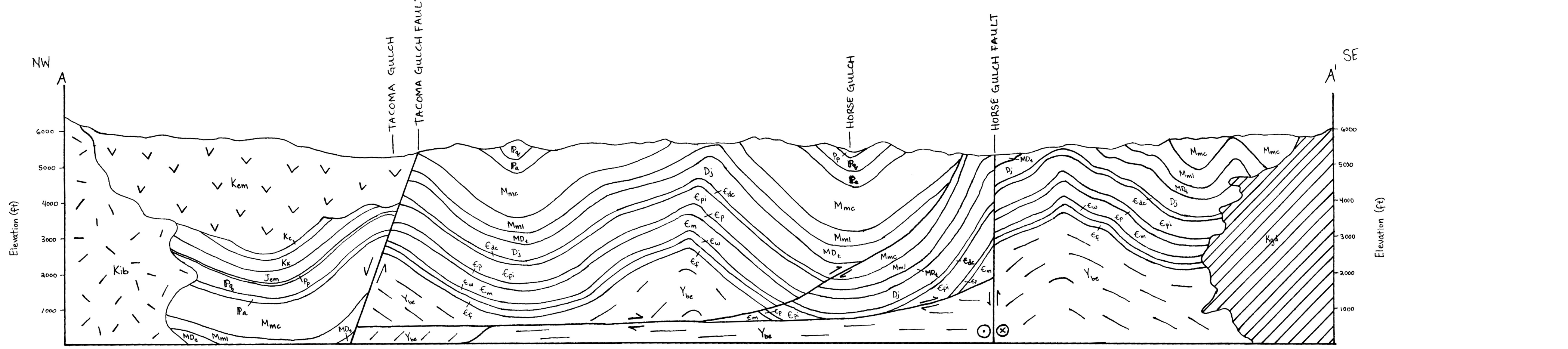
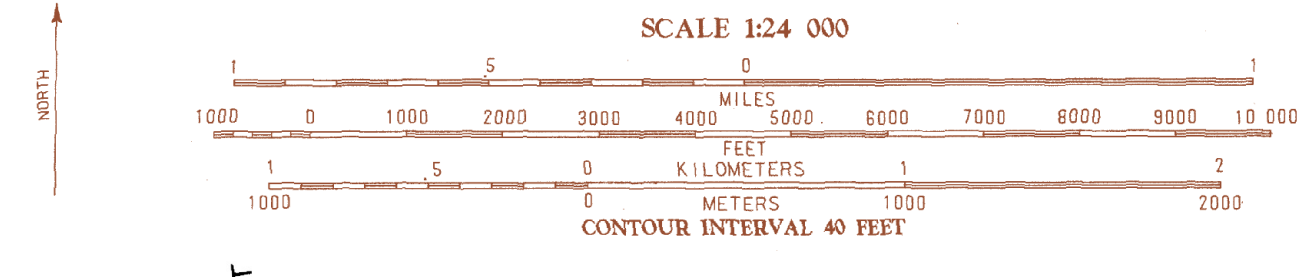
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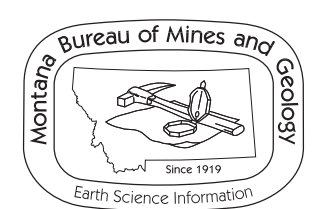
For a more detailed description of the map units and symbols, please refer to the text accompanying this map.

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DATUM: MEAN SEA LEVEL
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NO VERTICAL EXAGGERATION

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