FIGURE 1. Geologic map of central Washington. New and published detrital zircon sample sites are shown in colored triangles with sample numbers.

Pliocene isolation of the Kittitas Valley from the Columbia Basin and implications for uplift of the Hog Ranch-Naneum Anticline
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ABSTRACT
The epeirogenic and widespread emplacement of the red Mio-Pliocene Columbia River Basalt Group filled palaeo-topography in the Columbia River basin, effecting much of the landscape and established a uniform baseline by ~15 Ma. Tectonic and fluvial processes have since reshaped the landscape dynamically. In central Washington, the Hog Ranch-Naneum Anticline (HRNA) is a broad, high amplitude structure that bisects the Columbia River basin. The Hog Ranch-Naneum anticline forms the divide between the Yakima and Kittitas Valleys. These results, along with depositional age estimates from sampled strata, indicate that the Kittitas Valley and its tributary streams are distally derived from the Idaho-Wyoming thrust belt and exposed in the modern upper Snake River watershed. Several Miocene-Pliocene Ringold strata collected east of the HRNA do not have many zircons >300 Ma and zircon ages match closely with locally exposed Esmerada strata (Chenard and Seward Formations).

RESULTS CONTINUED...
Cumulative Density Function plot (CDF) in Figure 5 delineate differences in samples over time and space. -Miocene-Pliocene Ringold strata collected east of the HRNA show zircon provenance from central landmarks and the upper Snake River watershed and are more zircons >300 Ma (Staisch et al., 2021). -Ringold formation detrital zircons do not seem to have a strong Yakima River source, noted by the absence of the sharp double age peaks (~180 and 300 Ma) that are seen in Tript (TOP14003), Chenard, and Sequoia samples. -Miocene-Eocene Kittitas Valley samples west of the HRNA show similar provenance. Of particular note are ages between 1900 and 1830 Ma and the Esmerada Chalks/Awsanica volcanic age peaks. The younger population of zircons (~30-50 Ma) collected west of the HRNA do not have many zircons >300 Ma, and zircon ages match closely with locally exposed Esmeranda strata (Chenard and Seward Formations).

FIGURES Cumulative density function plot (CDF) showing the vertical ends of the CDF indicate differences in samples over time and space.
- CDF shows older zircons are more prevalent in the lower Snake River watershed, as expected.
- CDF shows younger zircons are more prevalent in the upper Snake River watershed.

IMPLICATIONS FOR UPLIFT ALONG THE HRNA Our new detrital zircon analyses and results suggest that the sediment source into the Kittitas Valley changed significantly between red Mio-Pliocene and early Pliocene time. During the eruption of the CRBG (~10-10 Ma), sediment sourced from central sources and the northern Rockies was deposited in the Kittitas Valley (Figure 9A). These results suggest there was no topographic barrier between the central Columbia Basin and Kittitas Valley at this time.

Following CRBG eruption, between ~10 and 3.5 Ma, sediment sourced from central sources and the northern Rockies was deposited in the Kittitas Basin, but not from the Kittitas Valley. In the Kittitas Valley, ~3.5 Ma and younger sediments lack zircons of the younger detrital source (Figure 10C). It is unlikely that the east-west trending Kittitas Valley and north-south trending HRNA were significantly active at the same time. We therefore suggest that the majority of sedimentation along the HRNA was accommodated prior to 3 Ma.

REFERENCES