

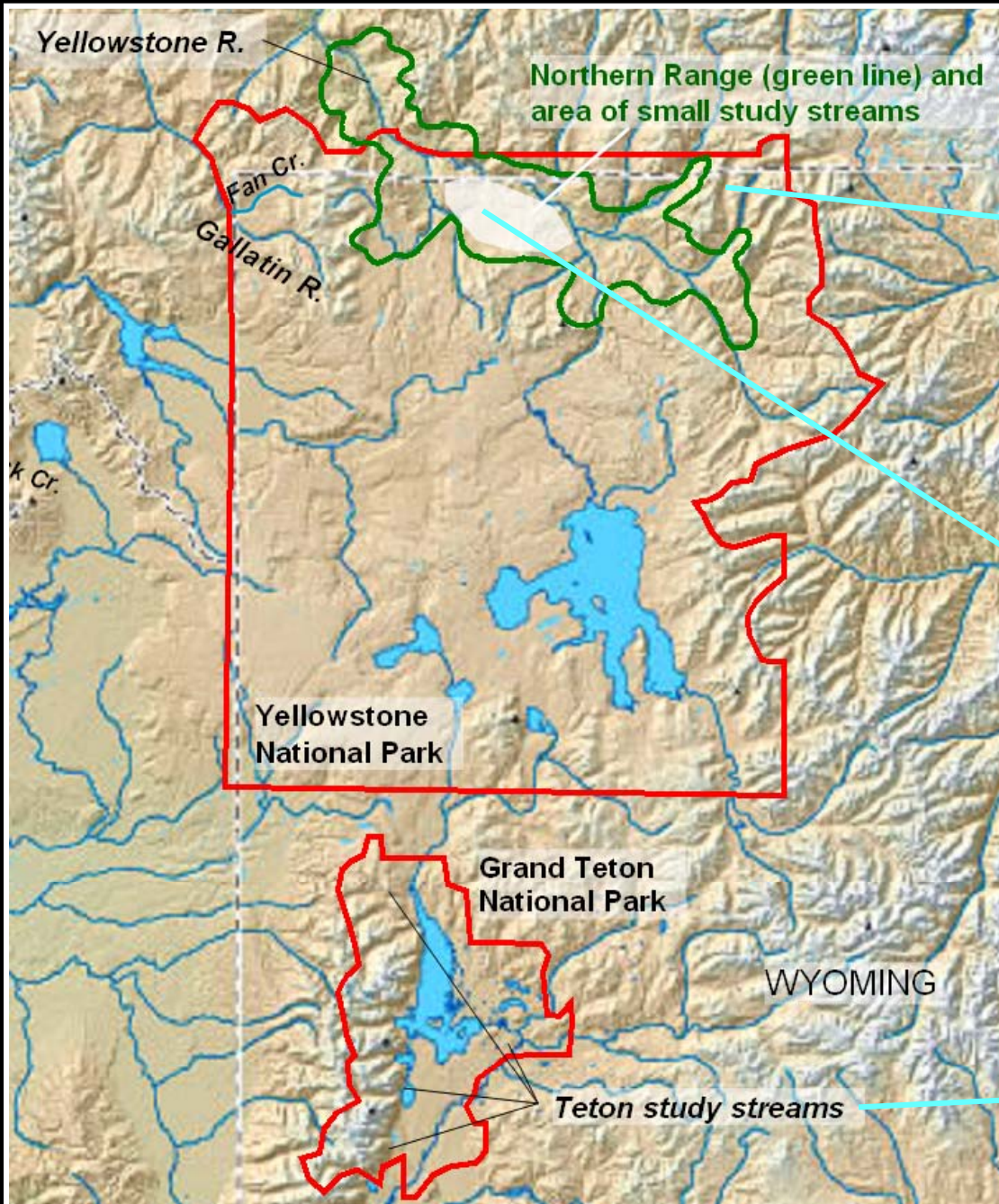
Holocene and modern climate and landscape response in the Greater Yellowstone Ecosystem

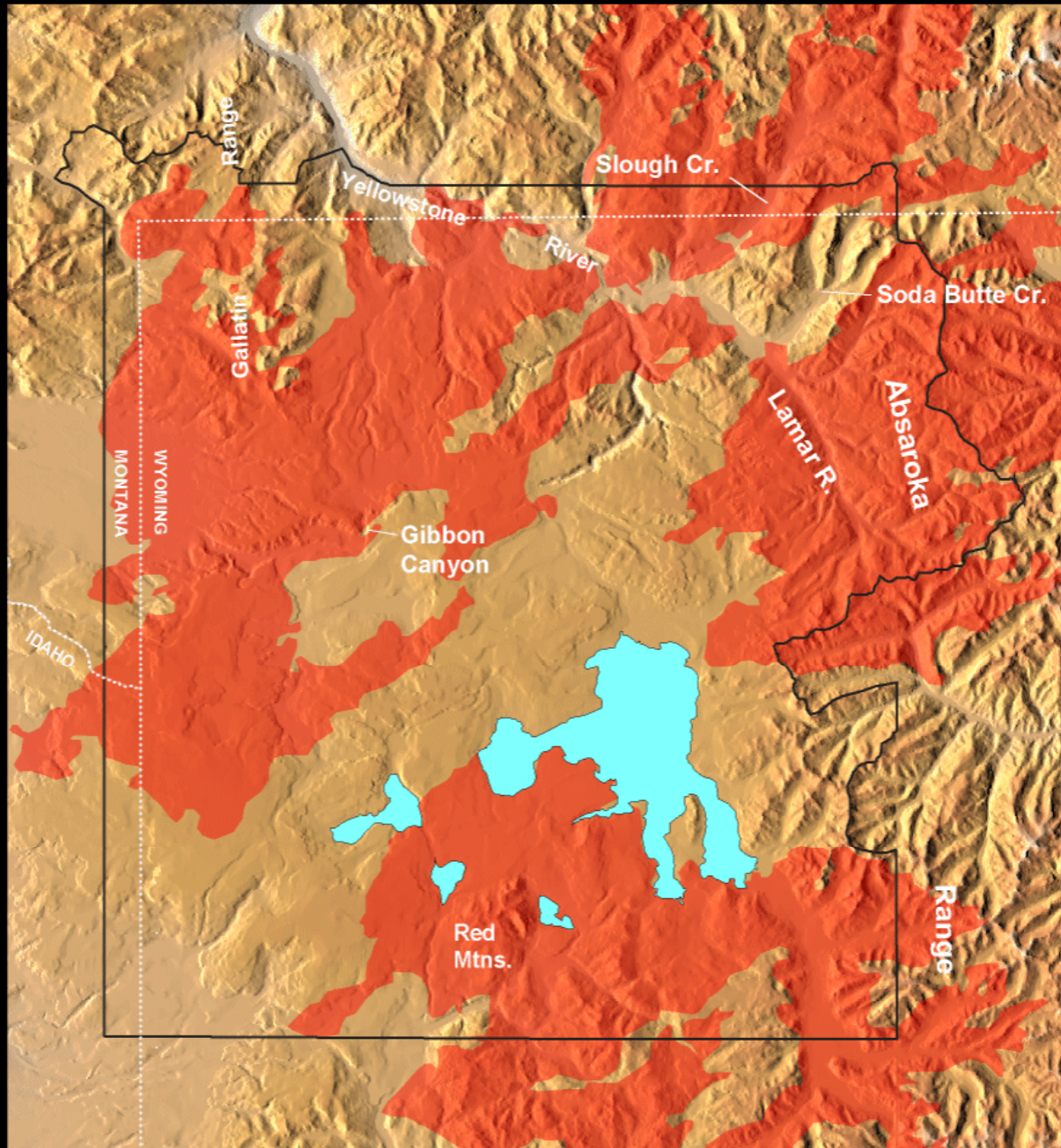


Grant Meyer

Lyman Persico





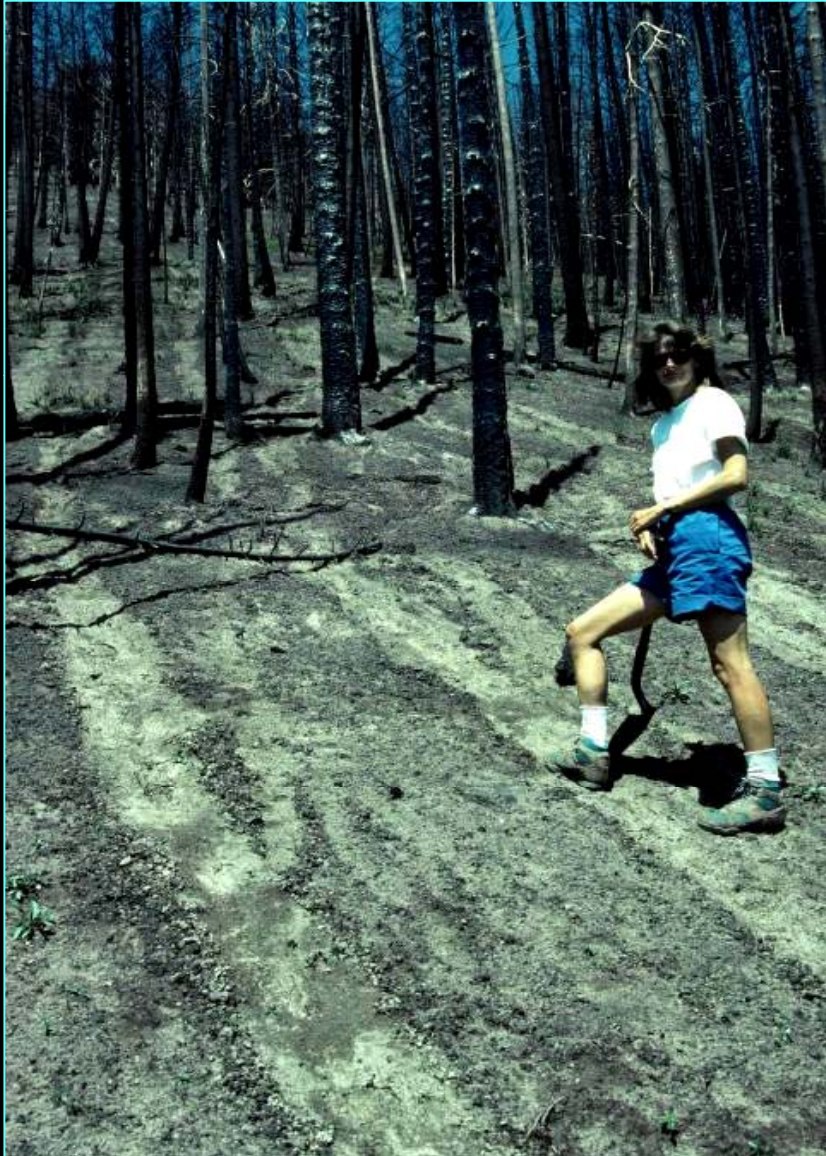


YELLOWSTONE NATIONAL PARK

1988 BURN AREAS
(in red)



Sediment bulking by hillslope rilling and channel incision in convective storms to produce fire-related, runoff-generated debris flows



1989 fire-related debris flow deposits,
NE Yellowstone





1989 debris flow

1988 charred litter layer
(burned soil surface)

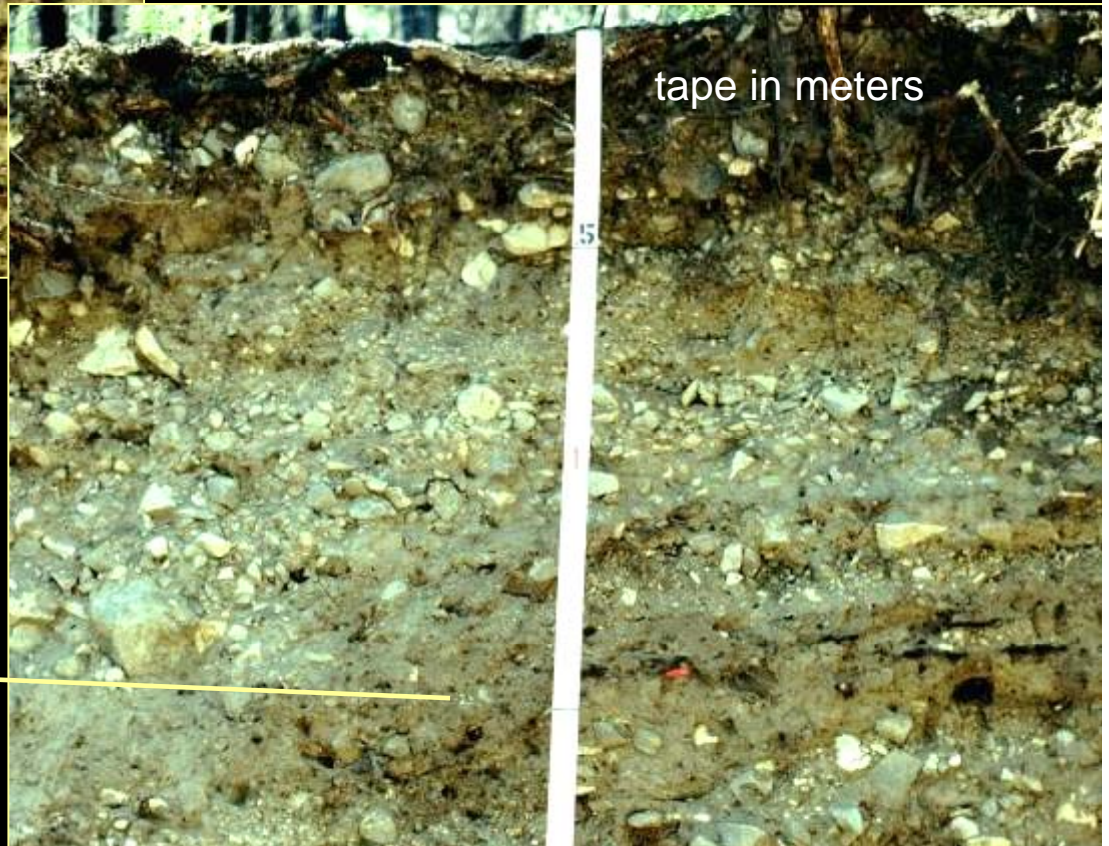
older fan sediments

**ALLUVIAL-FAN
STRATIGRAPHIC SECTIONS,
NE YELLOWSTONE**

probable fire-related debris flow



burned soil surface layer,
 1870 ± 70 ^{14}C yr BP



tape in meters

fire-related
debris flow,
gravel-poor
facies
 1190 ± 90
 ^{14}C yr BP



Fan aggradation from fire-related sedimentation
(2002 Missionary Ridge Fire near Durango, CO)

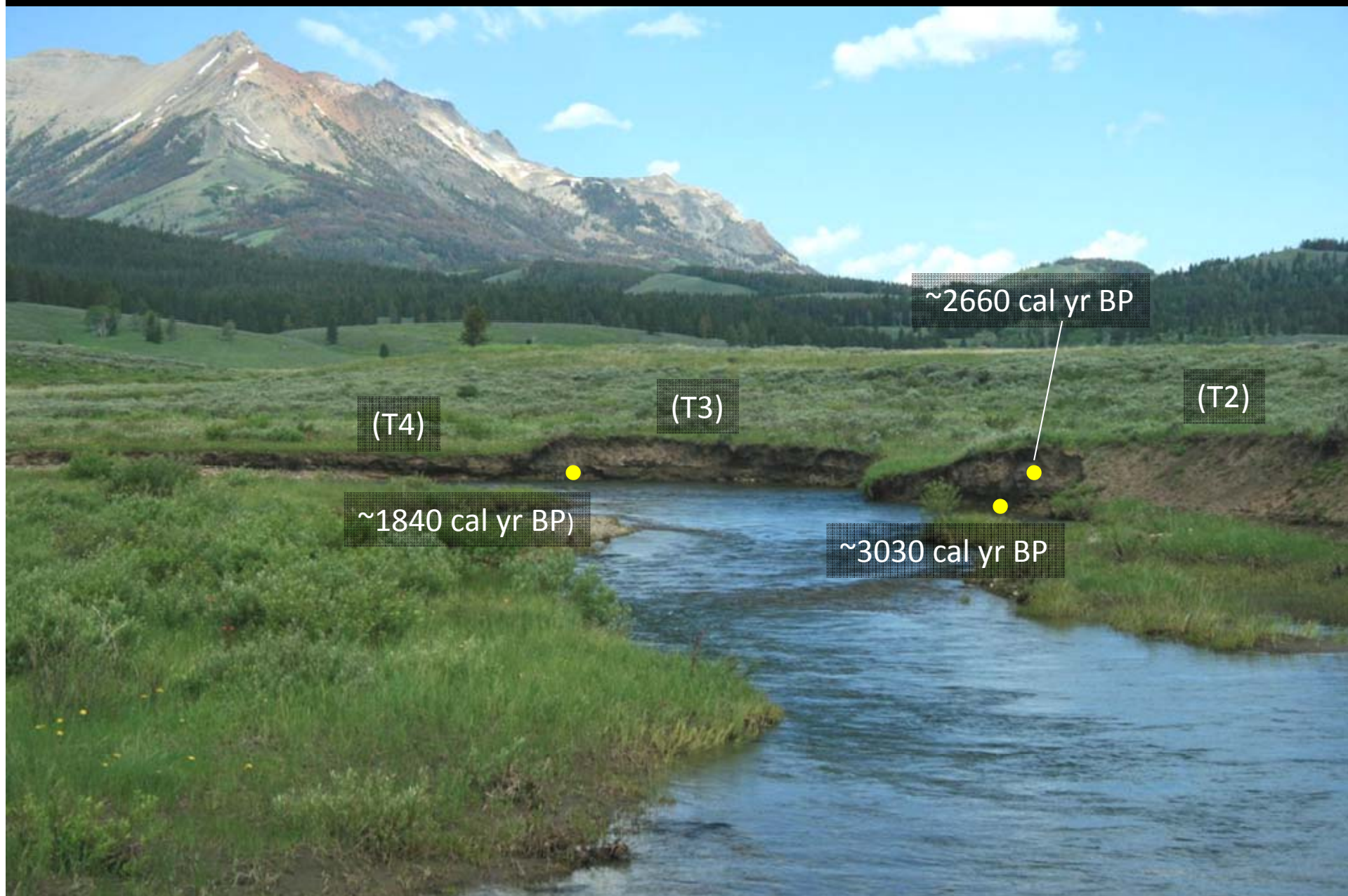


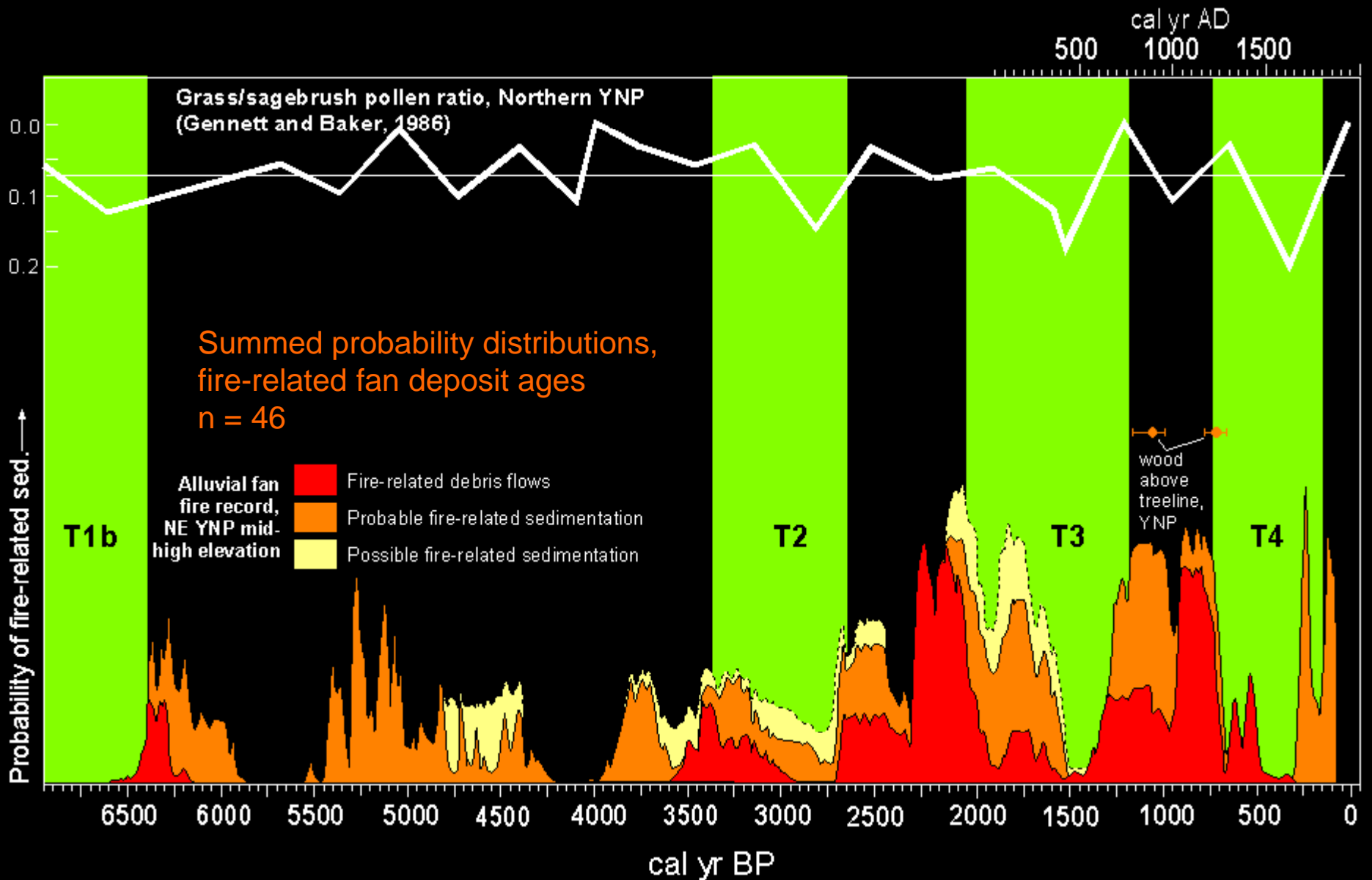
Holocene fluvial terraces in northern Yellowstone: Complex response or climate?



Holocene terraces, Gardner River, NW Yellowstone

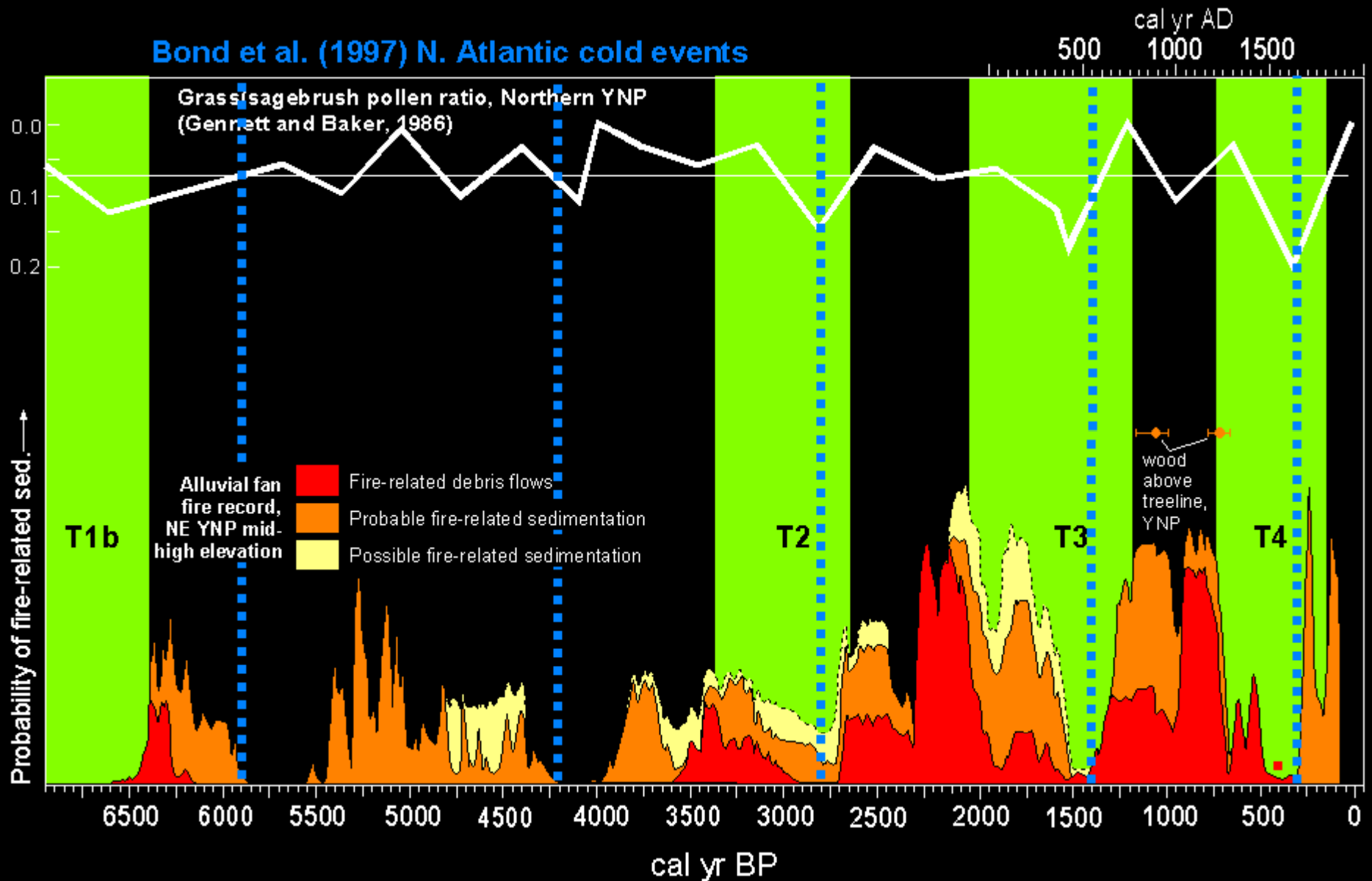
(ages are weighted mean of calibrated probability distribution)



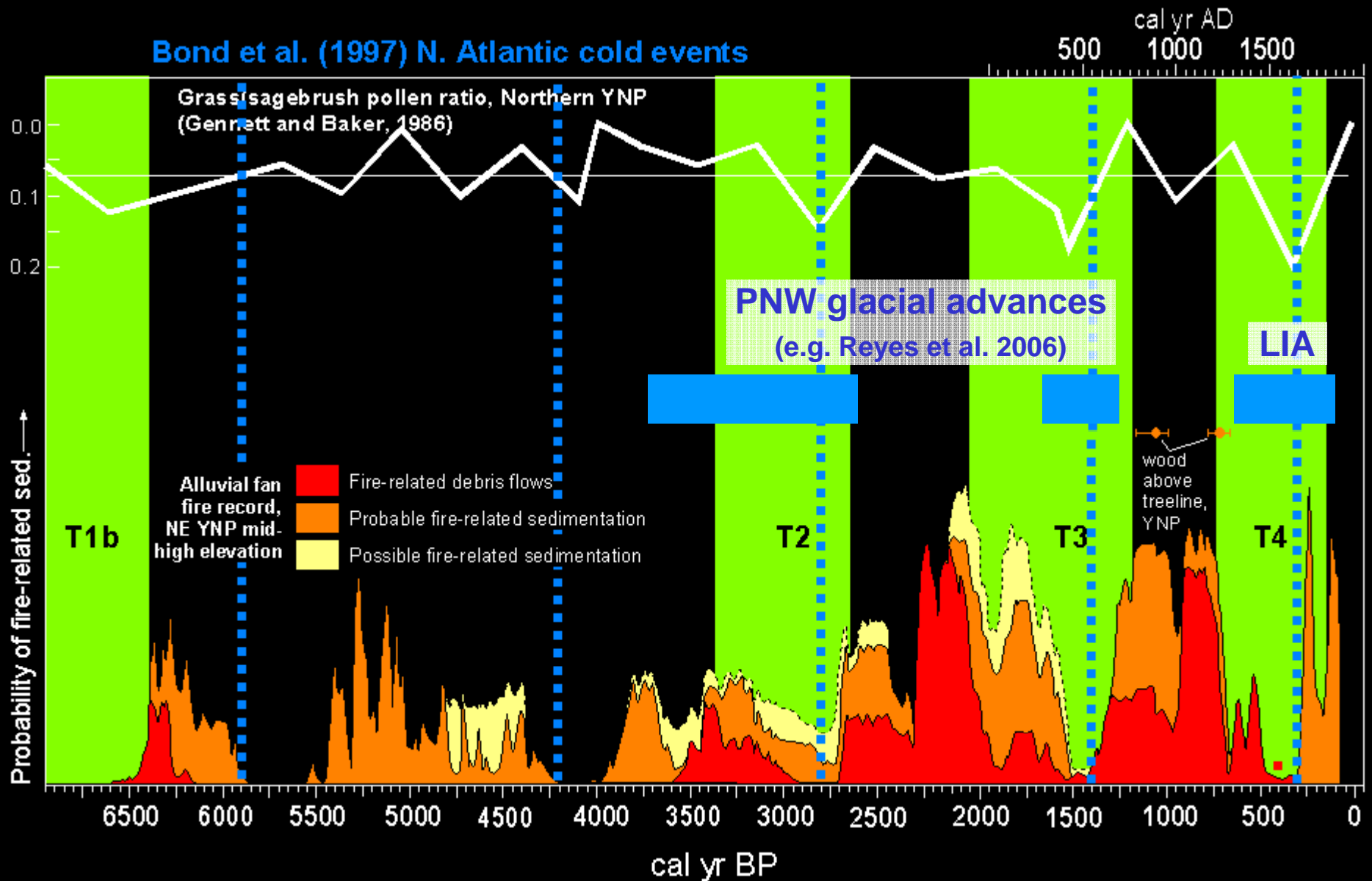


Fire-related fan sedimentation in relation to Soda Butte Creek
fluvial terrace deposit ages

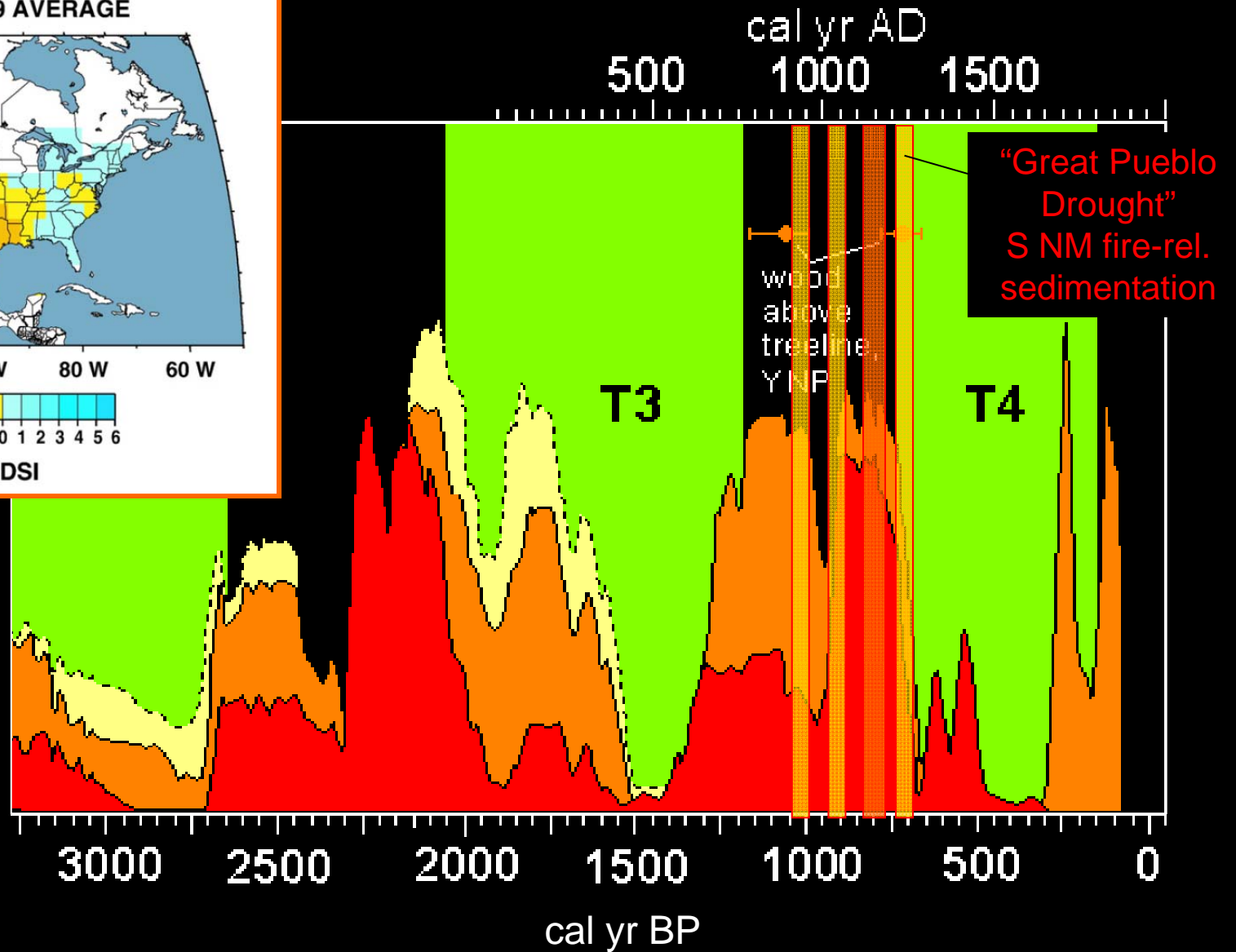
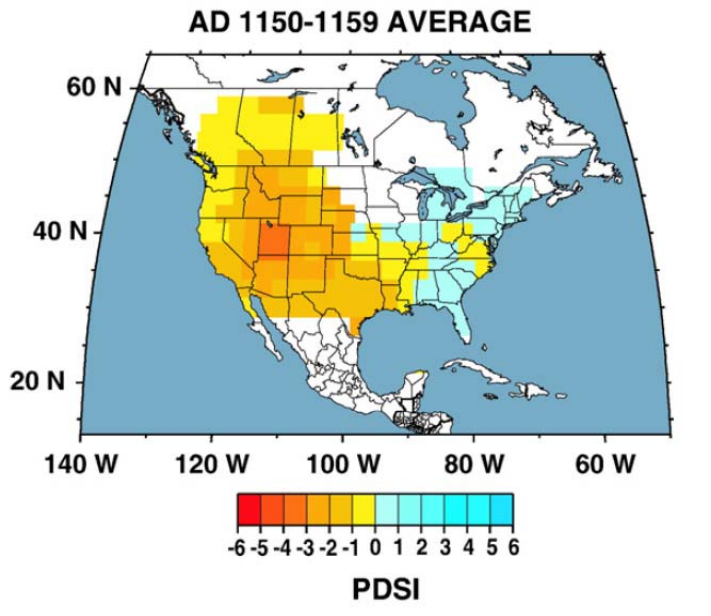
Bond et al. (1997) N. Atlantic cold events



Bond et al. (1997) N. Atlantic cold events



Medieval-period multidecadal droughts centered 936, 1034, 1150, 1253 AD
(Cook et al. 2004, 2007)



Active beaver dam, upper Gallatin River: now uncommon in Yellowstone



Loss of beaver and stream system change in northern Yellowstone: Elk Creek

Active beaver pond, 1921

Abandoned dam and incised stream channel, 1957



Loss of beaver and stream system change in northern Yellowstone: Elk Creek 2010

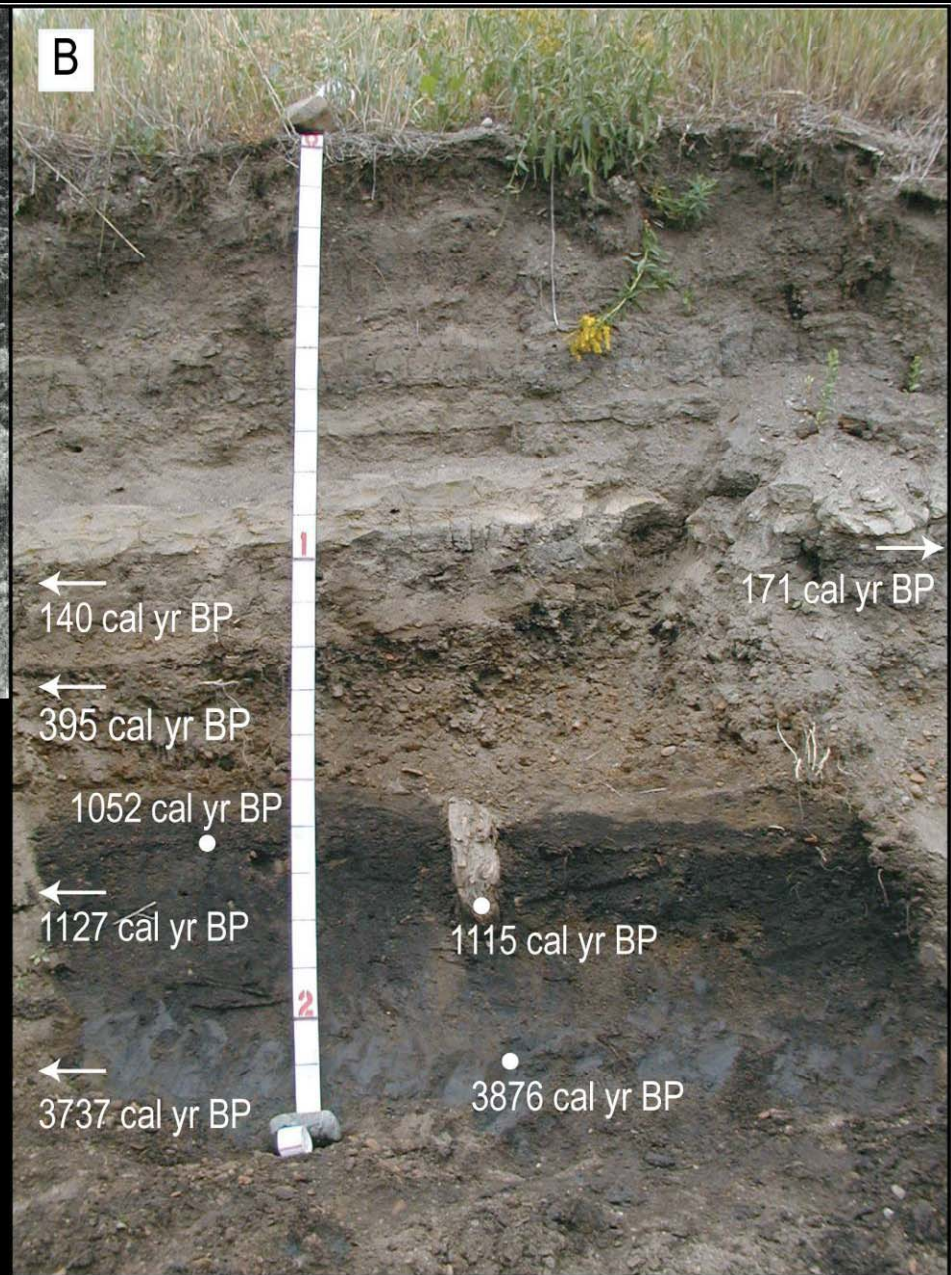


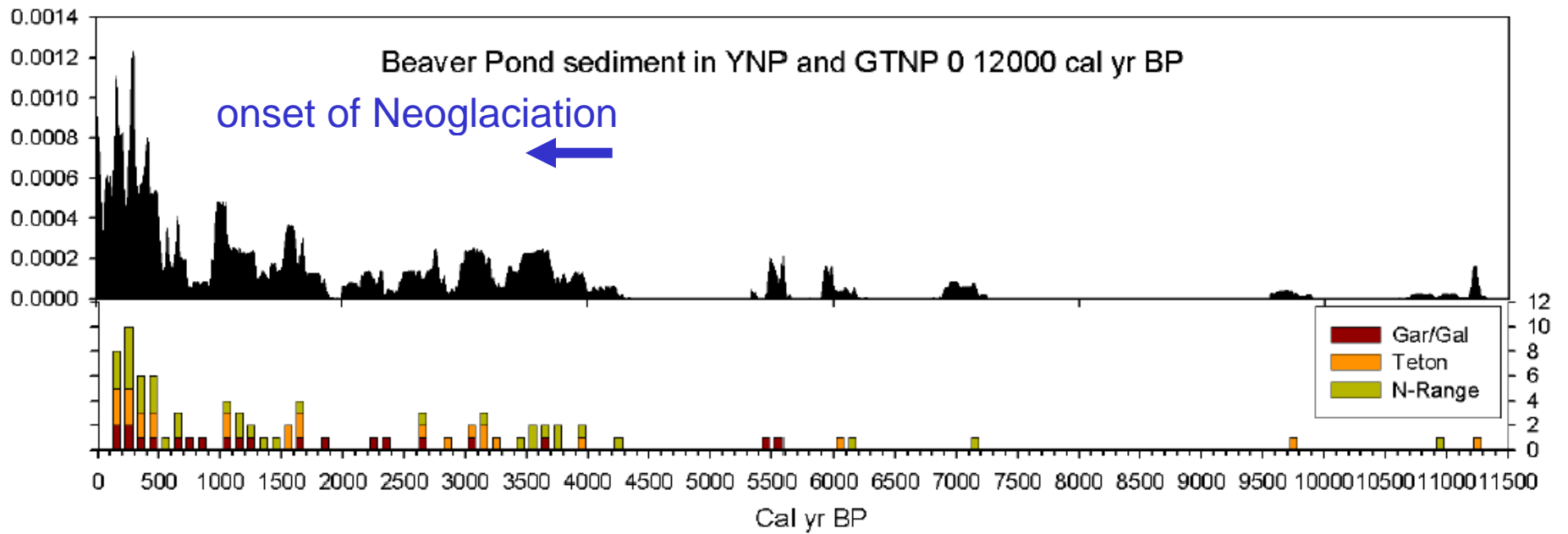
ap 25, 2009

44°55'41.06" N 110°26'34.58" W elev 6419 ft

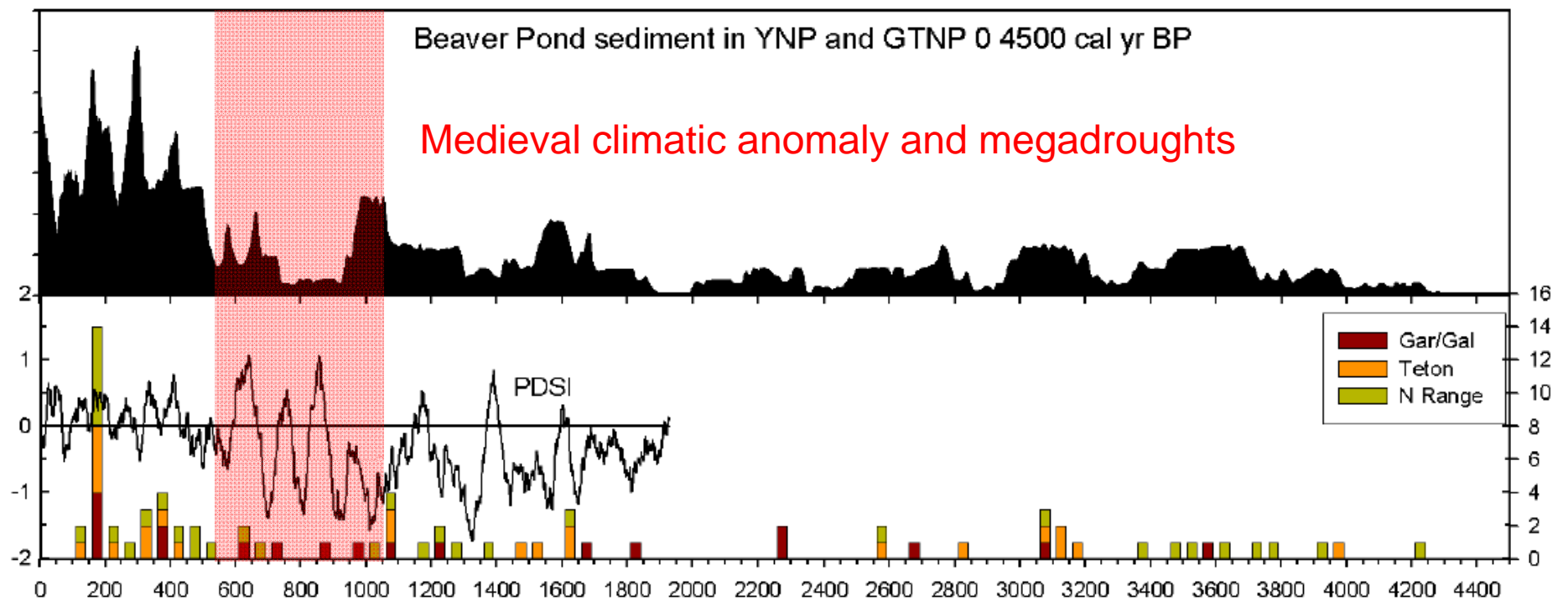
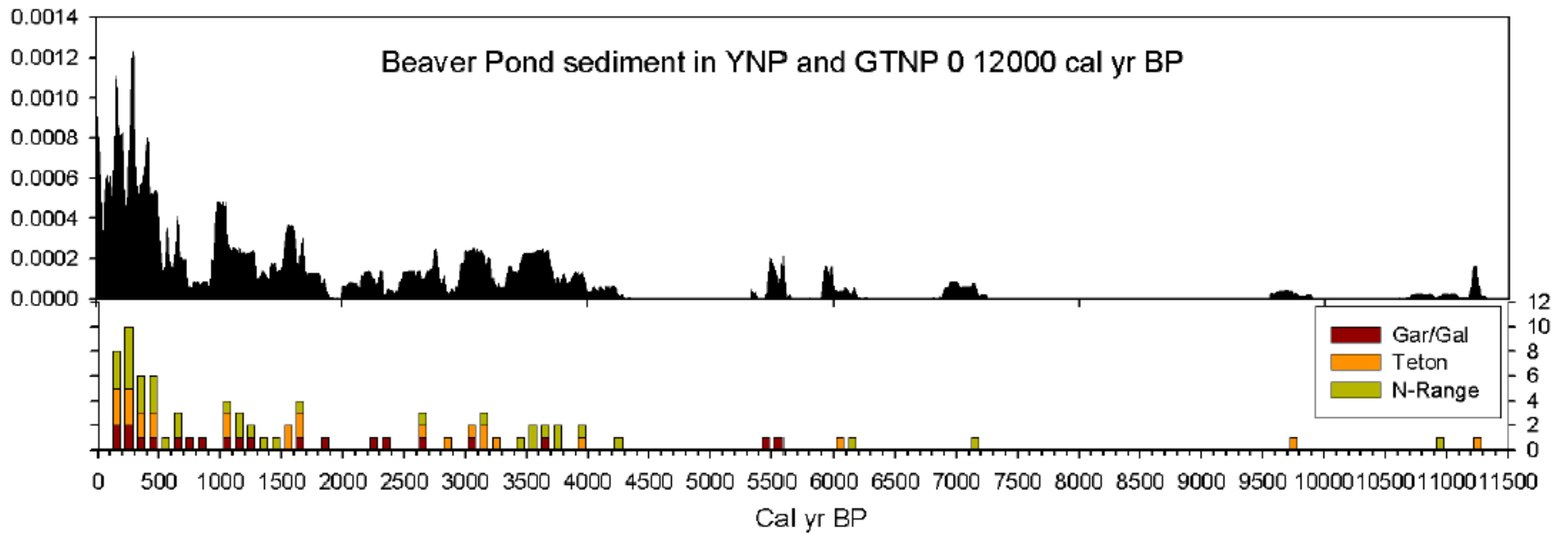
Eye alt 13166 ft

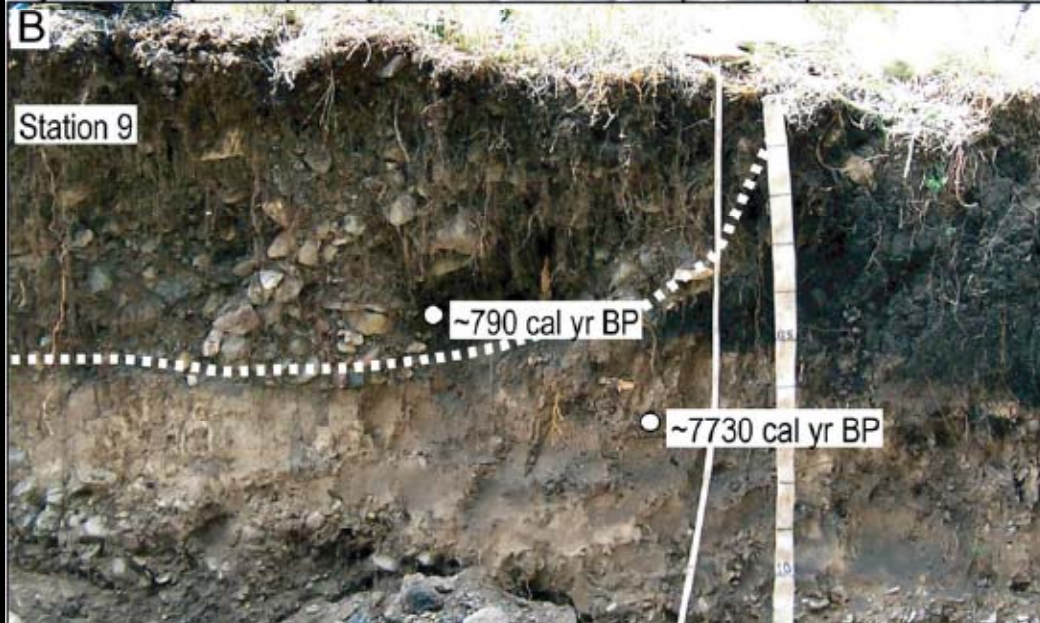
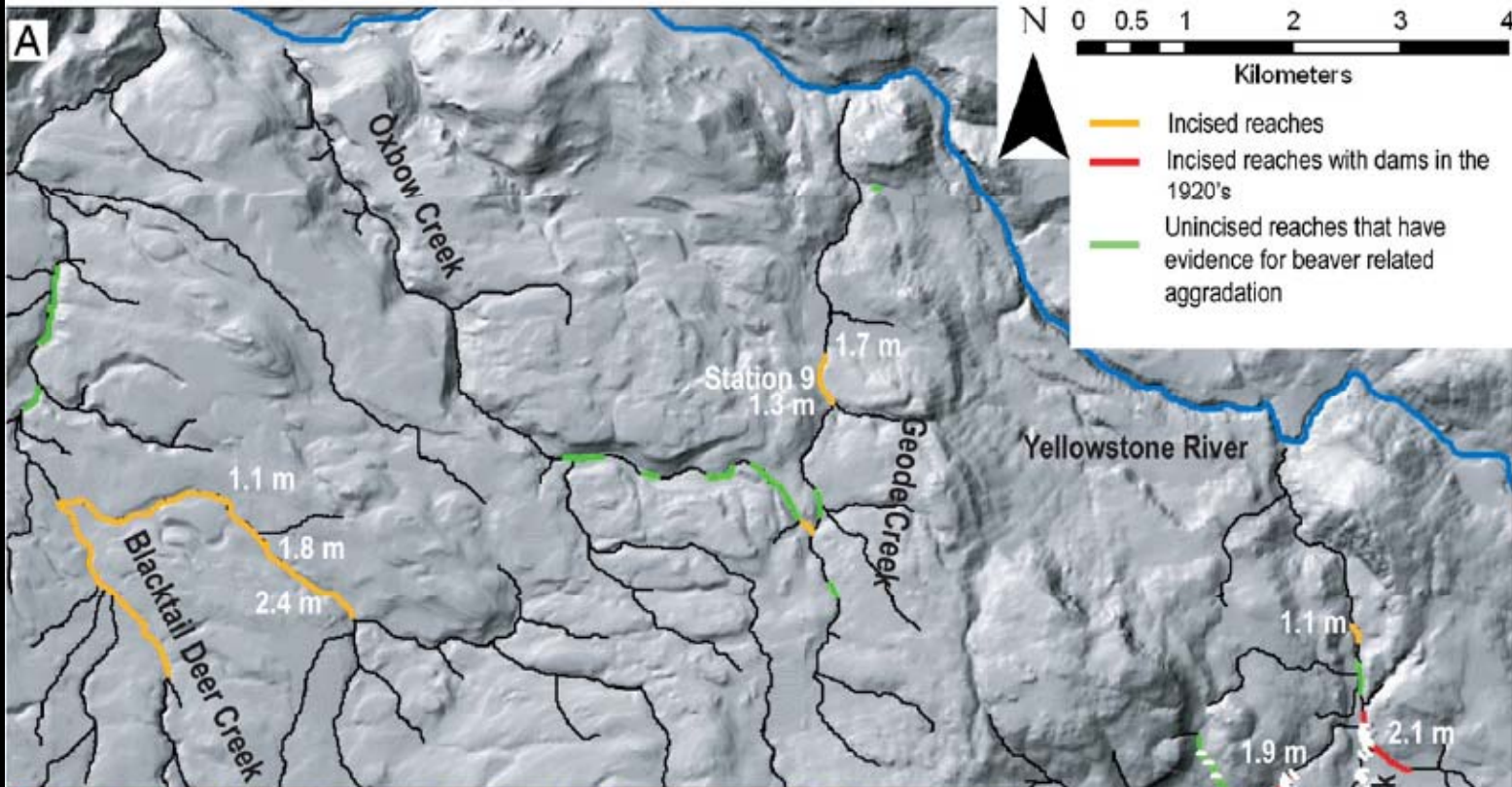
Beaver pond deposits and alluvial stratigraphy, N. Yellowstone





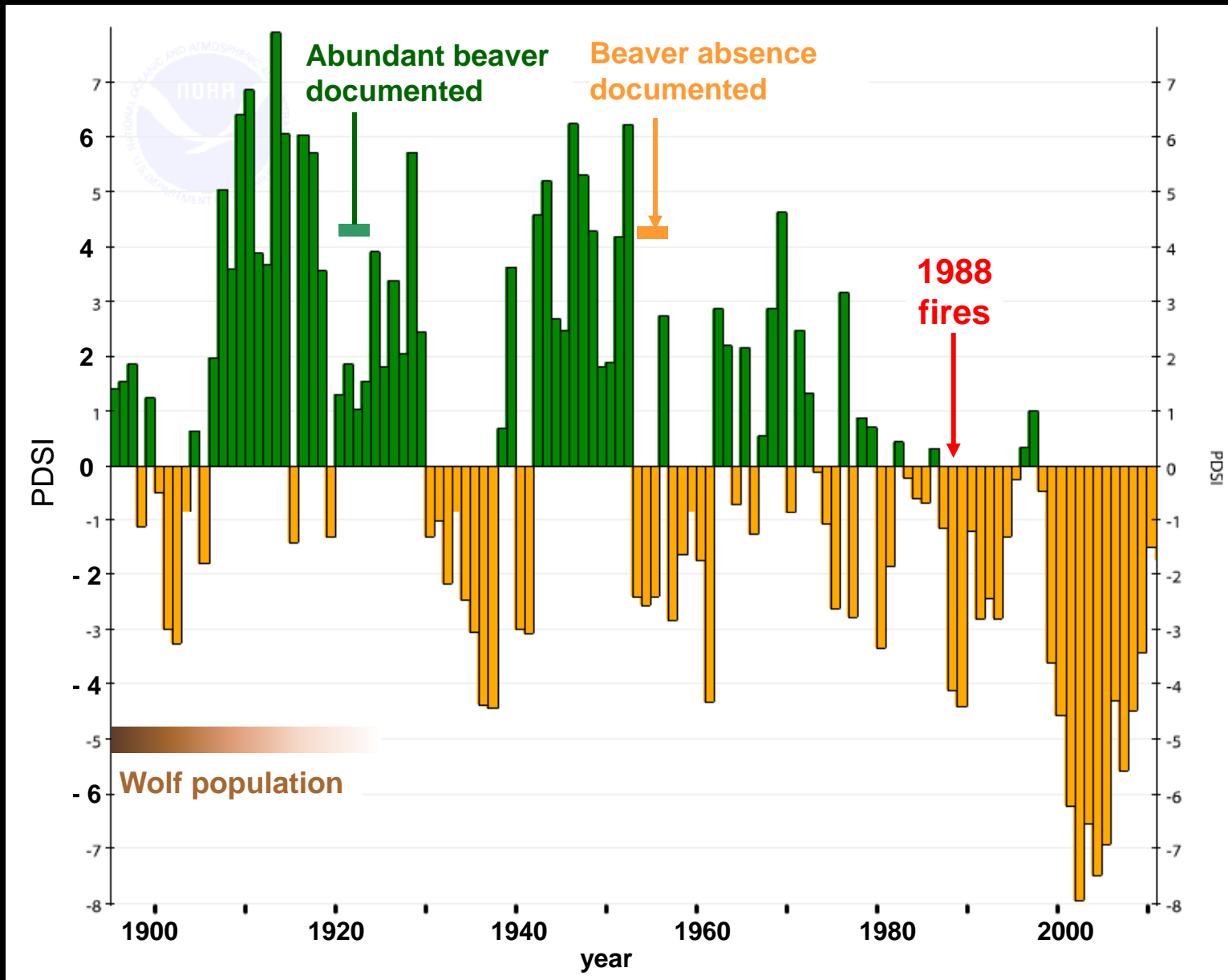
Full Holocene data, timing of beaver pond sedimentation

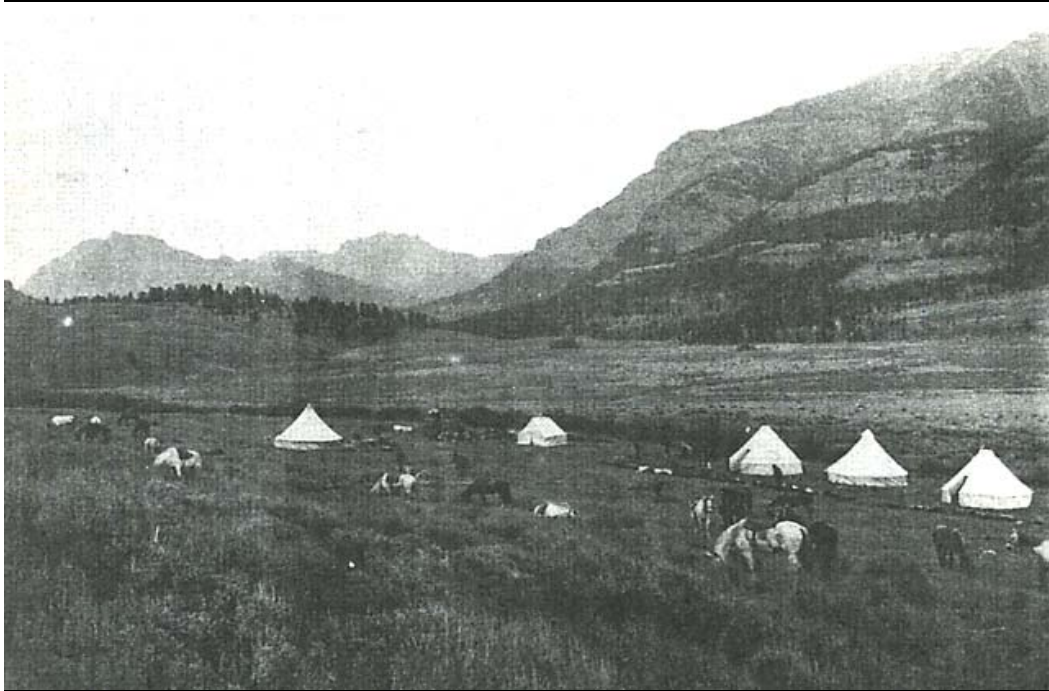




Incised stream reaches on Yellowstone's Northern Range

Modern severe drought: WY Division 1 annual mean Palmer Drought Severity Index 1895-2010





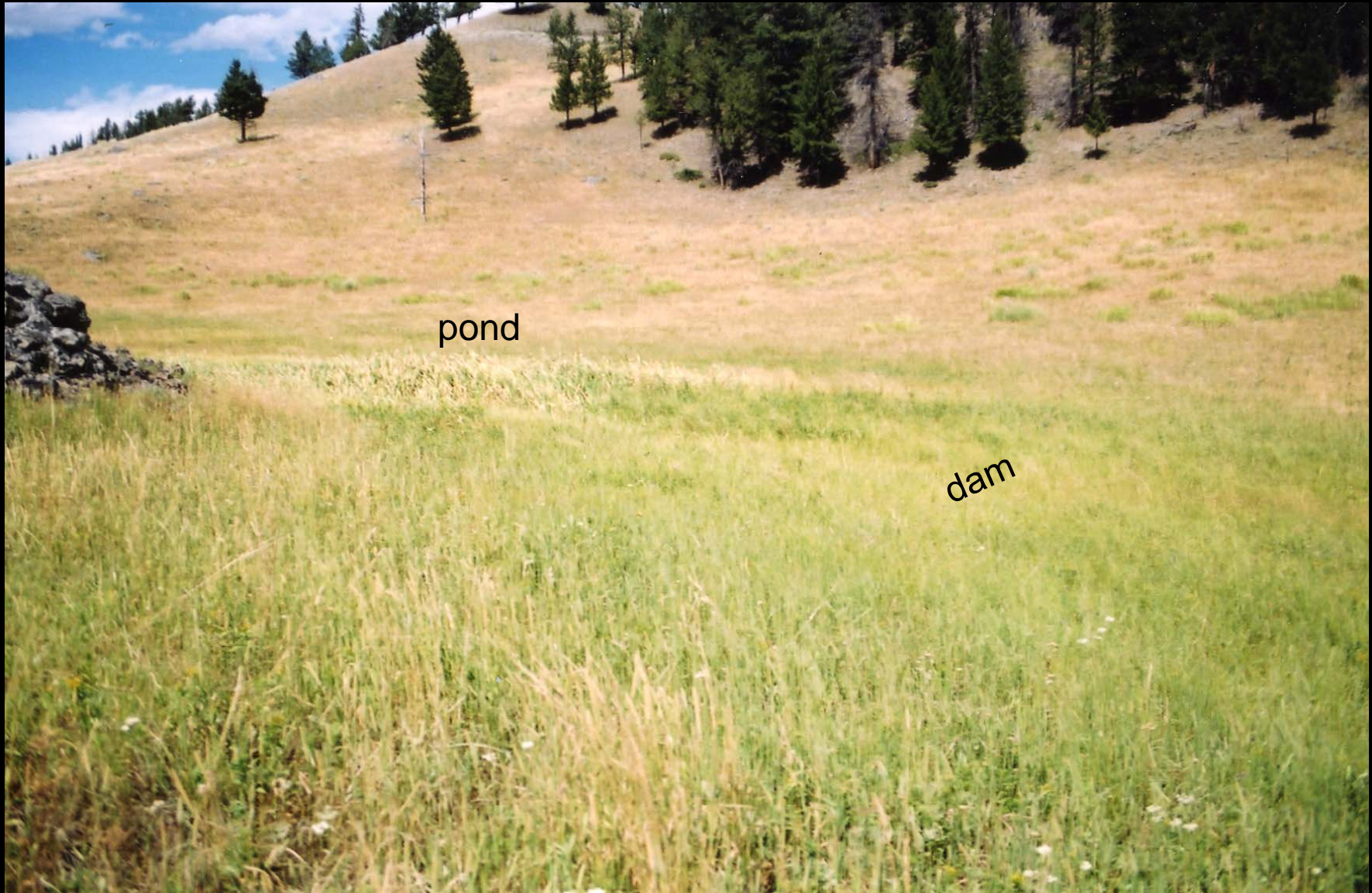
IMPACTS OF MODERN DROUGHT

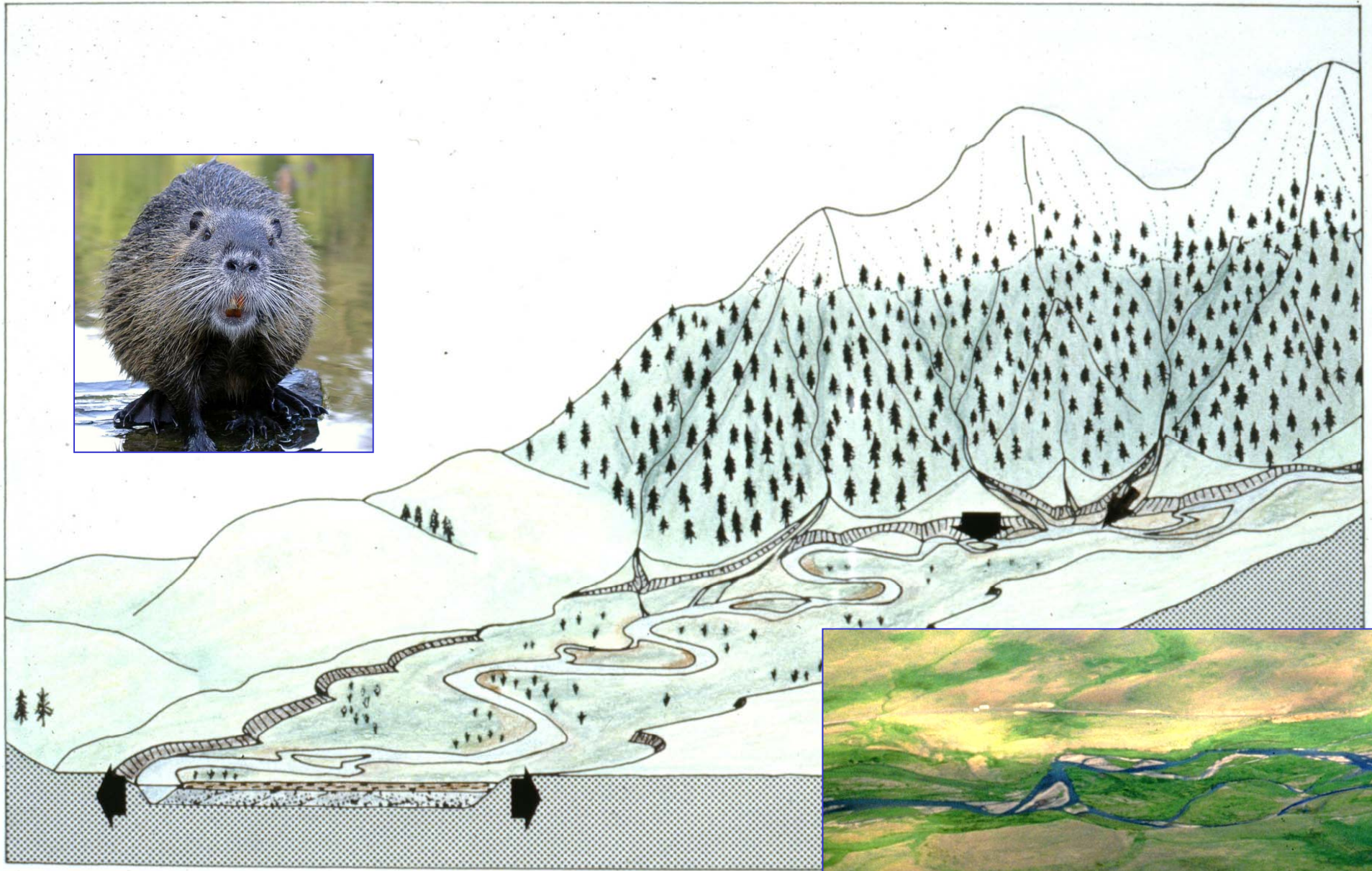
Spring-fed stream in lower Soda Butte Valley, 1896 or 1897
(from Chadde and Kay, 1991)



Same area, 2010

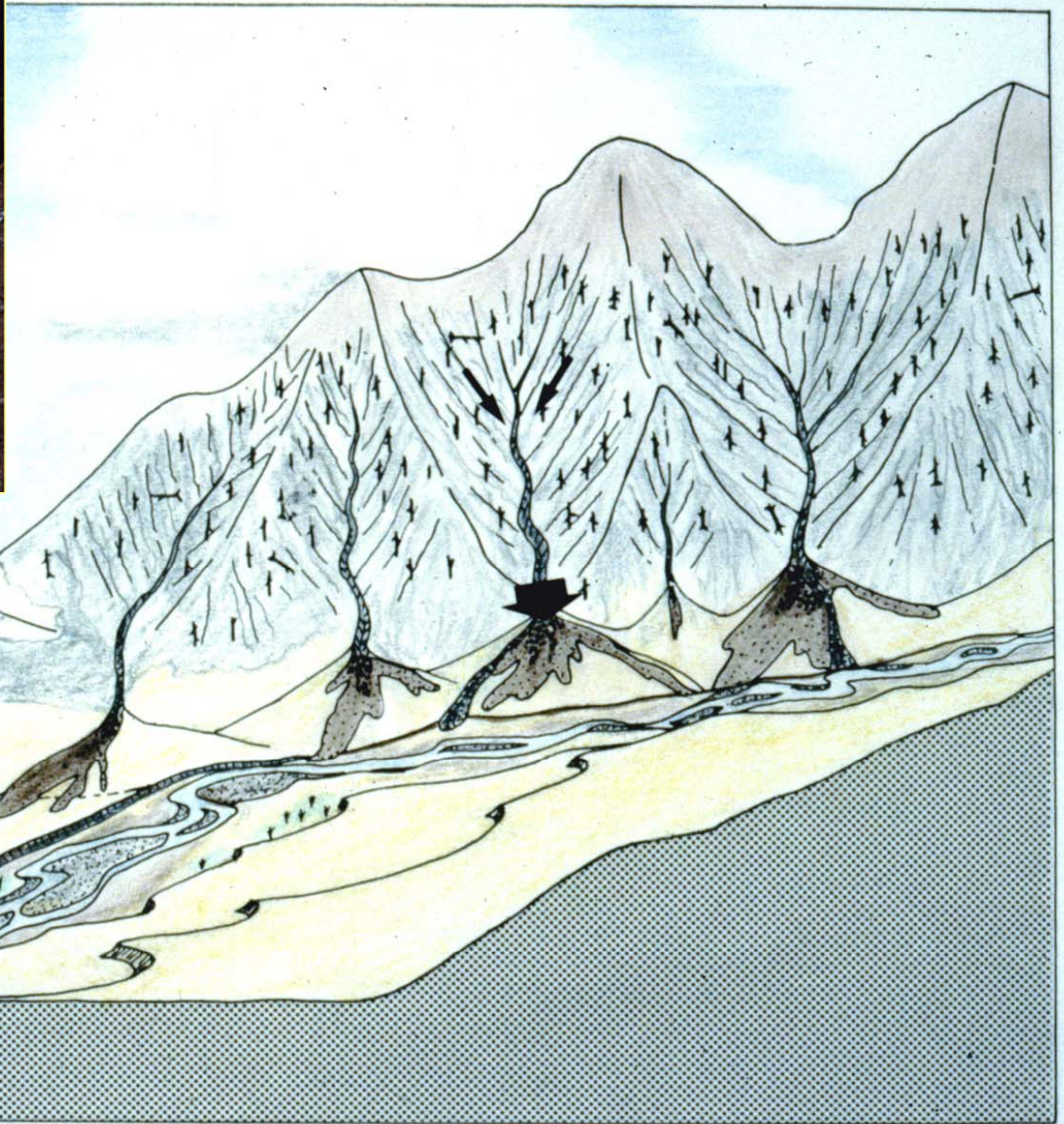
Crescent Hill, N. Yellowstone, 2004 – abandoned 1920's beaver dam on dry stream





T3

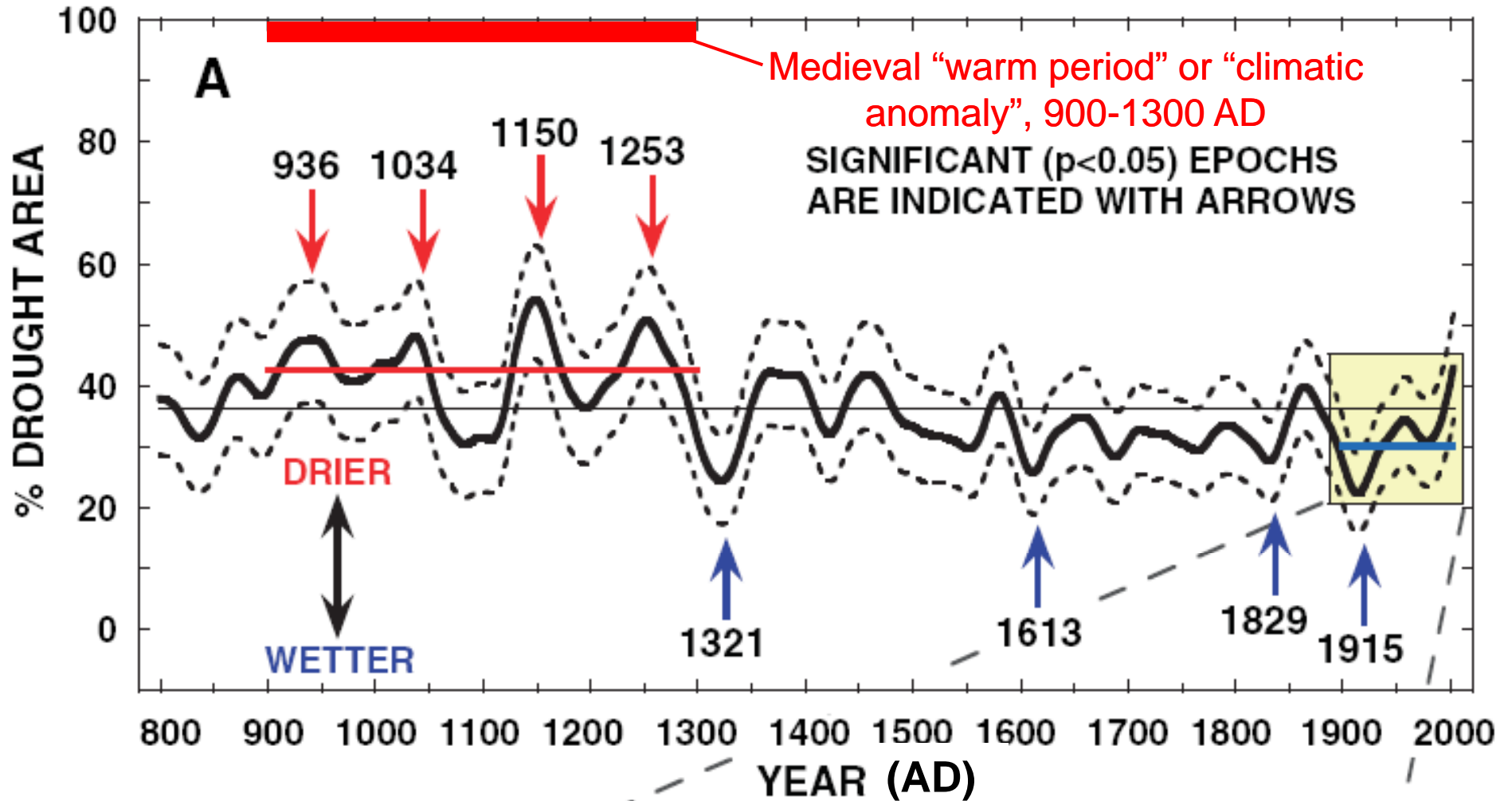
Cooler, wetter millennial-scale periods



Warmer, drier millennial-scale periods

Tree-ring reconstruction of drought area in the western USA

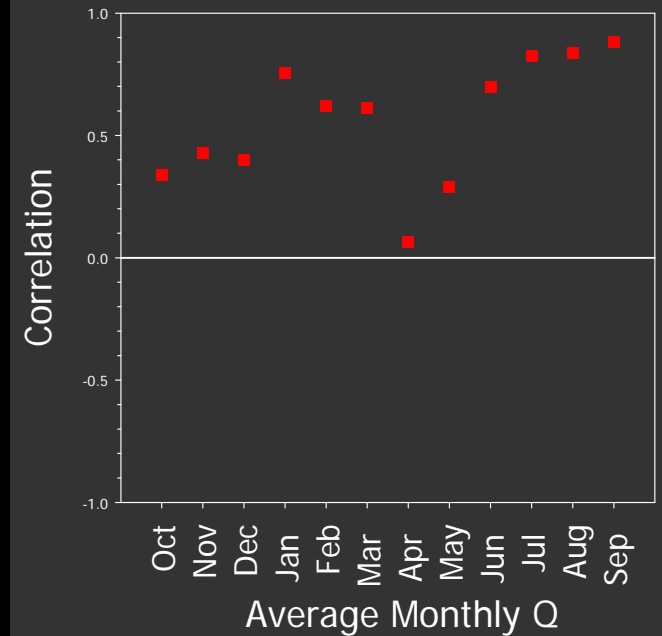
(Cook et al., 2004)



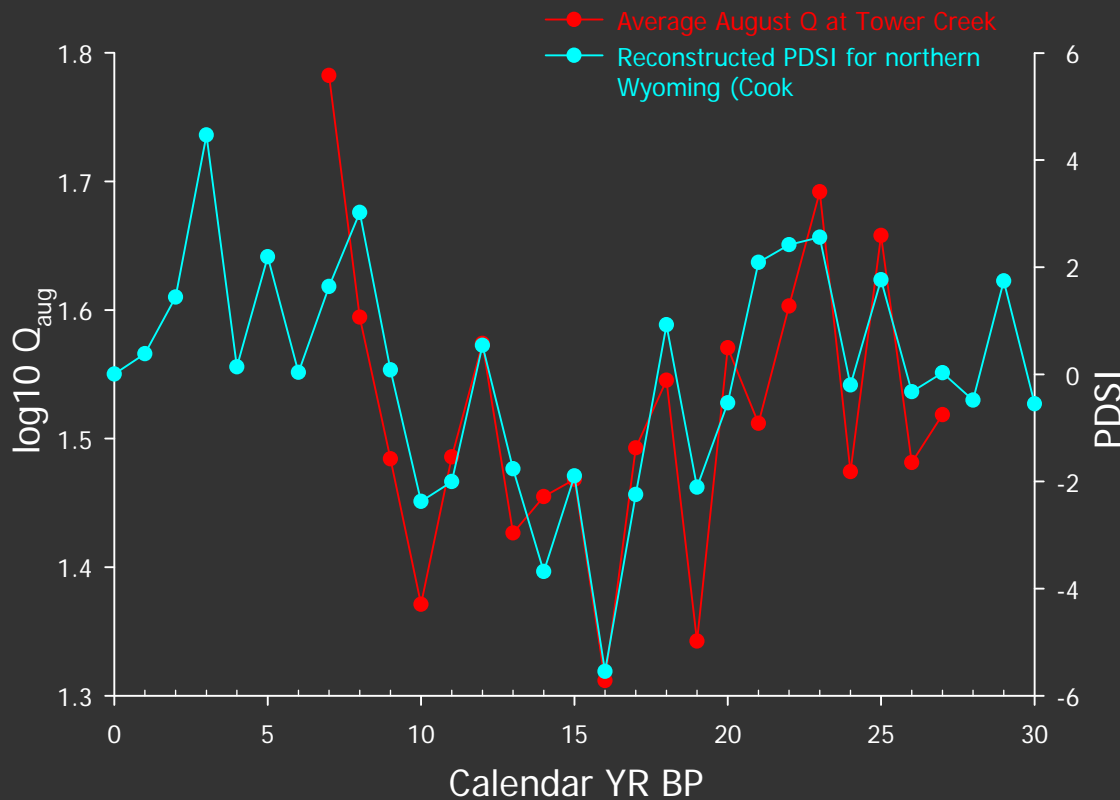
Variability in stream flows in the Northern Range

Tower Creek: Mapped beaver dams on side channels and spring Creeks in the 1920s.

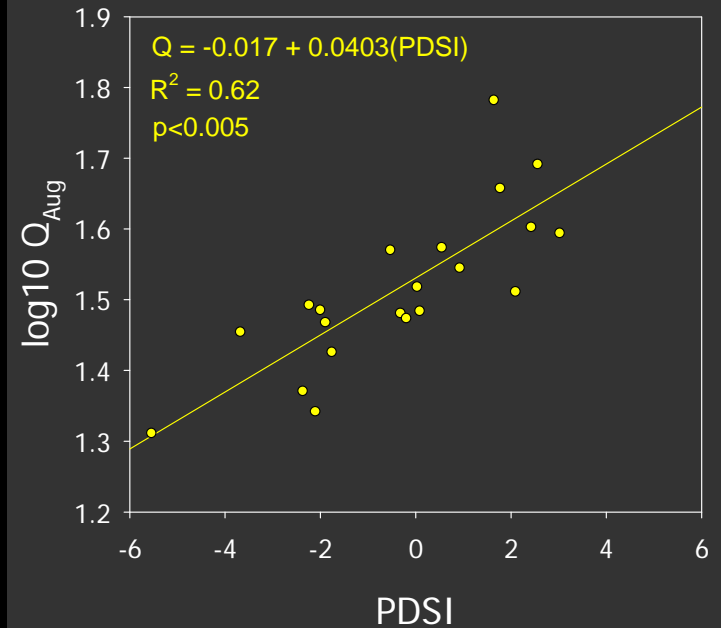
Bootstrap Correlation Values



Streamflows on Tower Creek and PDSI



Regression of Q_{aug} and PDSI



Reconstructed Stream flows on Tower Creek

