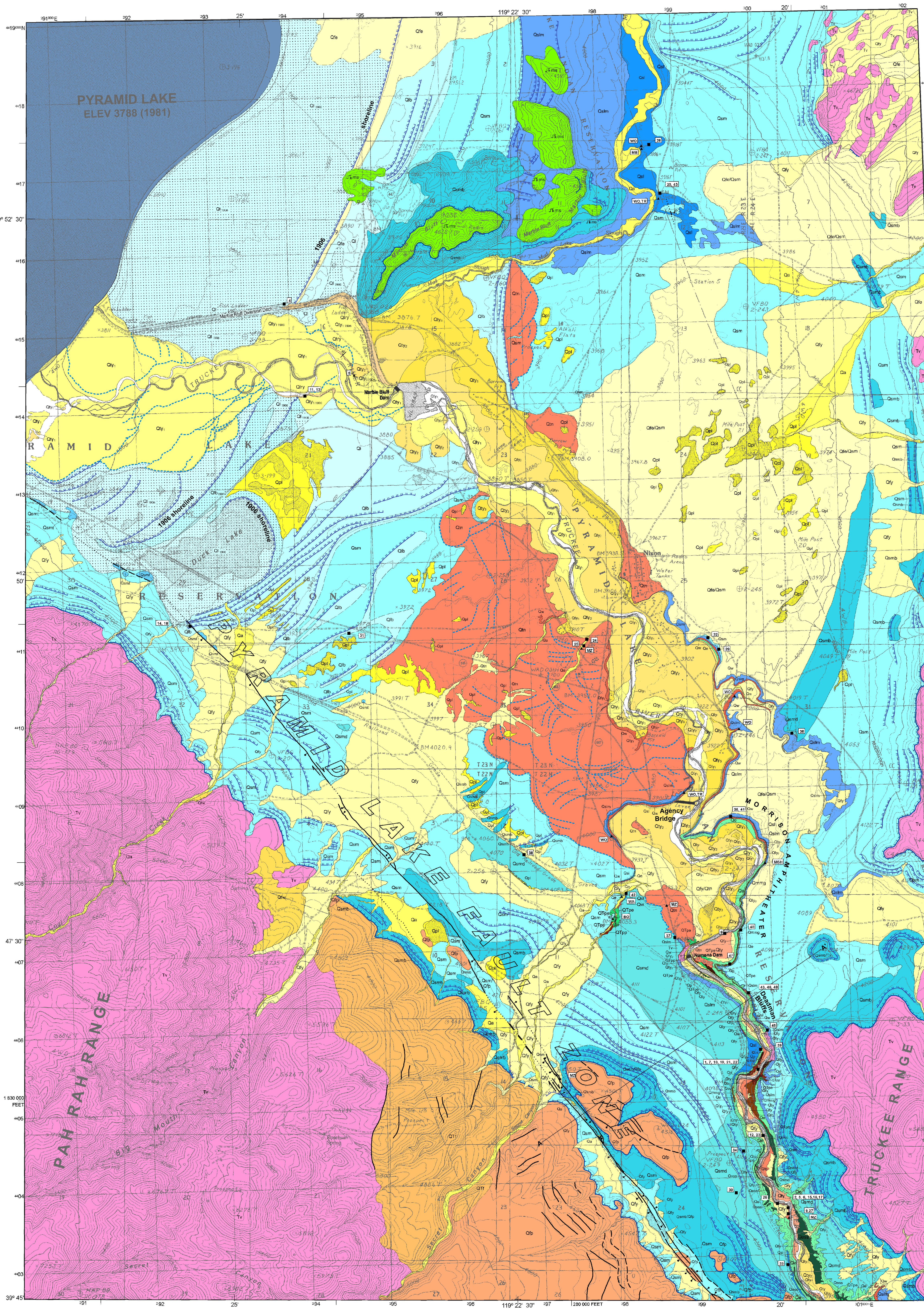
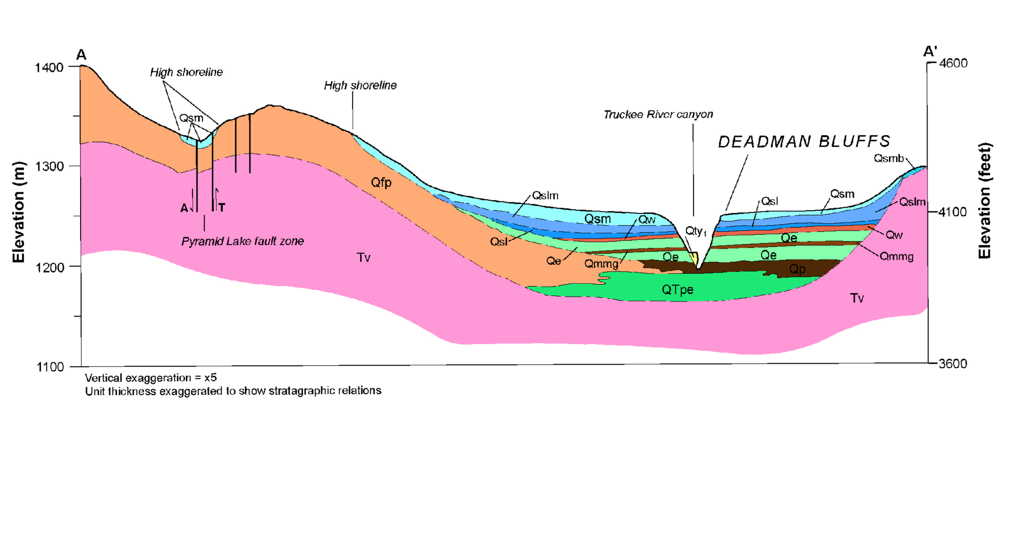
Prepared as part of the STATEMAP component of the National Cooperative Geologic Mapping Program in cooperation with the U.S. Geological Survey
Produced in collaboration with the Pyramid Lake Paiute Tribe



GEOLOGIC MAP OF THE NIXON AREA, WASHOE COUNTY, NEVADA

John W. Bell, P. Kyle House, and Richard W. Briggs
2005



Vertical exaggeration = x5
Unit thickness exaggerated to show stratigraphic relations

DEPOSITS OF THE TRUCKEE RIVER

The course of the Truckee River as shown on the map (uncolored) is based on digital orthophotoquad (DOQ) imagery taken in 1994; the topographic base map shows the course of the river in 1985. Changes in the course of the river due to the 1997 flood are not reflected in the mapping.

Qty **Young terrace deposits of the Truckee River** Late Holocene constructional and strath deposits; dominantly floodplain deposits: brown to gray mud, muddy sand, and silt containing organic-rich horizons (black mats), molluscs, gastropods, and vertebrate bones; intercalated layers of axial stream deposits: well-rounded, well-sorted, gray sandy, pebble to cobble gravel. From youngest to oldest in ascending order above the modern river:

Qty_1, **$Qty_{1\,1906}$** Historically active channel and floodplain deposits now standing up to 2 m above modern river level; contains meander scrolls and bar deposits related to modern river level prior to 1906, after which time the elevation of Pyramid Lake declined and the river incised resulting in the stranding of the older $Qty_{1\,1906}$ terraces. Locally inundated by the 1997 flood, and likely by similar floods in 1986 and 1963.

Qty_2 Recently abandoned channels and floodplain deposits standing up to 3 m above modern river level; fresh, remnant meander-scroll morphology visible on the terrace surface, often enhanced by riparian vegetation patterns. Radiocarbon dated at 470–690 yr BP[1] (samples 5, 6, 7).

Qty_3 Abandoned channel and floodplain deposits standing up to 5m above modern river level; subdued, remnant meander-scroll morphology. Radiocarbon dated at 1,300–2,120 yr BP in the Wadsworth Quadrangle to the south (Briggs and Wesnousky, 2004).

Qtry **Late Holocene deposits of the Truckee River** Fluvial deposits cropping out beneath Qty terraces and Ql lake deposits downstream from Marble Bluff Dam. Iron-stained red-brown to gray sandy, pebble to cobble gravel; locally crossbedded. Radiocarbon dated at 2,130±40 yr BP (sample 13). Elevation of deposit below 1906 shoreline indicates that the river was graded to a lower lake level in the late Holocene.

Qtn **Deposits of the Nixon terrace** Deposits of early to mid- Holocene age standing ~10-20 m above modern river level; associated with gradual regrading of the river with the recession of mid-Sehoo (Qsm) lake levels. Contains multiple, undifferentiated, inset terrace surfaces, the highest of which may correlate with the Wadsworth terrace (Qtw) to the south in the Wadsworth Quadrangle. Forms broad (2-km-wide), distinctive terrace surface between 1,198–1,219 m (3,930–4,000 feet) elevation at and west of the town of Nixon; characterized by multiple sets of nested meander belts cutting across and inset into Qfw and Qsm deposits. Dominantly gray sandy, small pebble to cobble, well-rounded gravel and medium well-sorted to muddy floodplain sand. Younger than 10.8 ka based on inset relation to dated Qsm deposits at 1,212 m (3,976 feet) elevation immediately to the west (Briggs and others, 2005). Contains the 6.85 ka Mazama ash at several locations. Typical soil: 8- to 10-cm-thick Av, 15- to 30-cm-thick platy Bw, and 50-cm-thick stage I Bk horizon.

ALLUVIAL-FAN, EOLIAN, AND PLAYA DEPOSITS

Qa Recent alluvial deposits in intermittent washes and ephemeral stream channels and along abandoned Truckee River course through Mud Lake Slough; variable sedimentology depending on provenance: silty, sandy, subangular to rounded pebble-cobble gravel where originating from alluvial fan sources; dominantly silt, sand to mud, and rounded beach gravel where originating from lake sediment sources.

Qpl Ephemeral playa deposits; silt and mud in small closed depressions on post-Qsm surfaces. Mid to late Holocene age.

Young alluvial-fan deposits of the Truckee River canyon

Qfy Mid– to late Holocene alluvial-fan deposits of post-Sehoo age (undifferentiated); unit radiocarbon dated at 2,090–6,180 yr BP (samples 12, 14, 18, 19, 21–23) and contains the 6.85 ka Mazama ash at the mouth of Secret Canyon (Briggs and Wesnousky, 2004). Consists of two types: 1) alluvial-fan deposits originating predominantly within the drainages eroded into the margins of the Truckee River canyon; silt and sand with local gravel derived primarily from reworking of lacustrine deposits; similar in age to Qty_2 and Qty_3 deposits; and 2) deposits originating in the upper drainages of the post-Sehoo alluvial piedmonts of the Pah Rah and Truckee Ranges; silty to sandy, subangular pebble to cobble gravel inset into older pre-Sehoo age alluvial fans and deposited as an alluvial veneer on middle Sehoo lacustrine deposits following recession of the lake; deposits containing the Mazama tephra are similar in age to Qtn.

Qfe **Fallon and Turupah Alloformations, undifferentiated** (Morrison, 1964; Morrison and others, 1965). Brown, medium, well-sorted eolian sand derived from underlying lake sand; sand sheets and dunes ranging in thickness from a thin (<1 m) veneer to >10 m; typically occurs as northeast-trending linear dunes capping the middle Sehoo-age lake deposits, best developed on broad post-Qsm surface east of Nixon; prominent linear dunes occur along and parallel to late Holocene shorelines.

Wyemaha Alloformation (Morrison, 1964; Morrison and others, 1965,; Morrison and Frye, 1965; and Morrison, 1991).

Qw Interlacustral, subaerial deposits separating the Eetza and Sehoo Alloformations in buried stratigraphic section; termed the medial gravel by Russell (1885). Mid to late Pleistocene age; ranges in age from <155-200 ka (based on the age of Wadsworth tephra in the upper Eetza Alloformation) to ~ 40,000–50,000 yrs BP (samples 47–48). Brown, reddish-brown to gray alluvial silty coarse pebble sand, eolian sand, and muddy to sandy, cobble to boulder fan gravel; upper part near contact with lower Sehoo deposits is locally brown to orange-brown sandy silt with abundant snails and may be in part lacustrine. Crops out discontinuously in the bluffs and tributary drainages flanking both sides of the Truckee River canyon; locally missing from exposed sections where eroded prior to deposition of the Sehoo Alloformation. Contains the Churchill Geosol which ranges in morphology from multiple, compound stacks of reddened, oxidized cambic B horizons to singular, 30- to 50-cm-thick, red-brown (7.5 YR), prismatic argillic B horizons and stage II Bk horizons. Where the Wyemaha Alloformation is <3 m thick, the deposit is typically oxidized and reddened throughout owing to the presence of cumulic weathering profiles. The lowest outcrop of the unit is found at an elevation of 1,195 m (3,920 feet) in a tributary drainage 1 km west of Nixon; Qw can be traced nearly continuously to the south into the Wadsworth Quadrangle where its relatively high topographic position in the bluffs on both sides of the present Truckee Canyon (lowest elevation ~1,240 m; 4,068 feet) indicates that no comparably deep river canyon was present during Wyemaha time.

Qfw Alluvial-fan deposits of the Wyemaha interlacustral interval; surface equivalent of the Wyemaha Alloformation found elsewhere in buried stratigraphic context; best exposed in the area of Big Mouth Canyon and Coal Creek. Soils developed on alluvial-fan surfaces typically contain 30- to 40-cm-thick, well-developed argillic (Bt) horizons, and surface contains locally well-developed rock varnish.

Paiute Alloformation (Morrison, 1964; Morrison and others, 1965; Morrison and Frye, 1965; and Morrison, 1991).

Qp Interlacustral subaerial deposits separating the Eetza Alloformation from older lacustrine sediments in buried stratigraphic section. Dominantly dark-brown to red-brown, sandy to clayey, cobble to boulder volcaniclastic gravel; 3–10 m thick in exposed sections. Middle Pleistocene in age based on correlation to similar deposits along the Humboldt River Valley which contain the ~400-ka Rockland and ~610 ka Dibekulewe tephra beds (Morrison, 1991). Best exposed near the stream gaging station 1.5 km south of Numana Dam. May contain multiple buried paleosols.

Qfp Alluvial-fan deposits of the Paiute interlacustral interval; surface equivalent of the Paiute Alloformation found elsewhere in buried stratigraphic context; represents major period of subaerial fan building between lake cycles. Principal fan remnants occur south of Secret Canyon where they are preserved as high, moderately dissected surfaces; prominent linear Qfp ridges at the mouth of Secret Canyon are in part buried by Qsmb beach gravel deposits. Deposits contain a thick (1–2 m), strongly developed argillic soil with a duripan, the Cocoon Geosol (Morrison, 1991).

QTpp **Pre-Paiute alluvial-fan deposits** Tilted subaerial deposits of pre-Paiute Alloformation age. Sedimentologically similar to Qp; dominantly dark brown to red-brown, sandy to clayey, cobble to boulder gravel. Exposed beneath unit Qp at stream gaging station and in association with tilted QTpe deposits along lower part of Secret Canyon Wash. May in part correlate with unit QTf.

QTf **Pleistocene and Pliocene alluvial–fan deposits** Dark-brown to red-brown clayey volcaniclastic gravel; similar to Qfp but occurs topographically higher and is more deeply dissected. May contain multiple paleosols; surface underlain by a strongly developed argillic soil 2 m or more in thickness with a duripan. Age uncertain, but unit is oldest alluvium overlying the Miocene volcanic rocks. May be in part correlative with the 635 to > 775-ka Lovelock Alloformation in the Humboldt River Valley (Morrison, 1991).

LACUSTRINE DEPOSITS
DEPOSITS OF PYRAMID LAKE

Historical lacustrine deposits associated with the 1906 lake level at ~1,180 m (3,871 feet) elevation. Pyramid Lake remained at this level, rising intermittently to 1,183 m (3,881 feet) in the period between 1845 and 1906 (Born, 1972).

Ql_{1906} Shallow water, near-shore lake deposits; Brown to gray thin-bedded silt, locally diatomaceous; erosionally inset into Ql. Lower part of deposit radiocarbon dated in the Marble Bluff diversion ditch at 430±40 yrs BP (sample 4).

Qlb_{1906} Beach ridge deposits associated with historical pre-1906 lake level. Brown coarse sand and gray pebble to small cobble gravel.

Lacustrine deposits associated with late Holocene rise of Pyramid Lake to ~1,199 m (3,934 feet). Deposits are inset against Holocene fluvial terrace deposits of the Truckee River (Qtn) along a prominent shoreline 5–10 m in height.

Ql Shallow water and near-shore lake deposits; brown muddy sand to gray bedded silt. Radiocarbon dated at 1930±40 yrs BP (sample 11) and overlies Qtry deposits dated at 2130±40 yrs BP (sample 13).

Qlb Beach ridge deposits associated with multiple shorelines between ~1187 and 1199 m. Gray sandy pebble gravel; up to 1–2 m thick. Lower beach ridges overlie Qfy alluvial fan deposits radiocarbon dated at 2.4–3.4 ka (samples 14, 18). Age of lake rise placed between 2.6–3.6 ka by Briggs and others (2005) from radiocarbon ages obtained beneath shorelines just south of Duck Lake; radiocarbon dates from this map study suggest that the lake rise was slightly younger (<2.1–2.4 ka; samples 13, 14).

Strike and dip of beds

28

^{14}C sample location (Table 1)

30

Tephra location

MZ

MZ Mazama
TR Trego Hot Springs
WO Wono
MB Marble Bluff
MSH Mount St. Helens Cy
WA Wadsworth
BO Bouse

Contact Dashed where approximately located. Underlying units, where known, indicated by additional label, e. g., Qfe/Qsm.

85

Fault Dashed where approximately located, dotted where concealed, ball on downthrown side, fault plane dip. Arrows show relative direction of movement.

High Sehoo shoreline, recessional Sehoo shoreline

River paleomeander trace

DEPOSITS OF LAKE LAHONTAN

Sehoo Alloformation (Morrison, 1964; Morrison and others, 1965; Morrison and Frye, 1965; and Morrison, 1991)[2]. Deposits associated with last major lacustral cycle of Lake Lahontan during late Wisconsinan time; called the upper lacustral clays by Russell (1885). Divided into lower, middle, and upper members. Numerous radiocarbon ages from throughout the Lake Lahontan basin in western Nevada are between 11 and 35 ka (Broecker and Orr, 1958; Broecker and Kaufman, 1965; Benson and Thompson, 1987; Benson and others, 1991); as much as 39.9 ka based on radiocarbon ages in the Truckee River canyon (this study).

Qslm Lower and middle members of the Sehoo Alloformation, undifferentiated.

Qsm Middle member of the Sehoo Alloformation; called the dendritic allomember by Morrison (1964; 1991). Offshore deposits of brown to grey silt, sand, mud, and local clay are associated with the maximum lake levels occurring during the Sehoo lacustral period. Lake levels rose to the elevation of ~1,260 m (4,134 ft) during the 14-18 ka period, reached a maximum elevation of 1,332-1,337 m (4,370-4,386 ft) at 13 ka (Morrison, 1991; Adams and others, 1999), and receded to below 1,212 m (3,976 ft) elevation by 10.8 ka. Briggs and others (2005) interpreted this 1,212 m (3,976 ft) shoreline dated at 10,820 yr BP (sample 31) to mark a separate post-Sehoo transgression that rose to 1230 m (4,035 ft) during the Younger Dryas late glacial event. Lacustrine deposits within this altitude range have been mapped here as Qsm and Qsmb recessional deposits based on the absence of identifiable transgressional stratigraphic units. Based on a 9.6 ka radiocarbon age on post-Sehoo colluvium in the Truckee River canyon to the south in the Wadsworth quadrangle and a 9.7 ka date on deltaic deposits at Marble Bluff Dam (Born, 1972), the mid-Sehoo lake had receded below an elevation of 1,230 m (4,035 ft) by ~9 ka resulting in the complete downcutting of the present Truckee River canyon by this time. Locally subdivided into:

Qsmb Near- and onshore gravelly beach deposits of the middle member of the Sehoo Alloformation. Gray sandy, pebble to cobble gravel and coarse sand typically 1–3 m thick; generally well-sorted; subangular to well-rounded clasts reworked from underlying bedrock and alluvial fan deposits; occurs as linear shoreline berms and sheets; locally well-developed desert pavement and rock varnish.

Qsmd Tufa-bearing deposits of the middle member of the Sehoo Alloformation. Dendritic, lithoid, and thinolitic tufa occurring in dense colonies, typically forming erosionally-resistant layers. Dendritic variety is most common, with tufa heads as large as 1–2 m in diameter and tufa sheets as much as 3–5 m in thickness; believed to form in carbonate-rich water as lake levels remained stable. In this quadrangle the tufa-bearing member is primarily associated with the lake stand at 1,250–1,260 m (4,101–4,133 feet) elevation, forming prominent terraces bounding both sides of the Truckee River canyon from the gaging station south to the adjoining quadrangle. Radiocarbon dates on tufa, snail shells, and ostracodes ranging between 10 and 18 ka (Table 1) indicate that the lake was situated at the dendritic terrace level both ascending to and descending from the 13-ka highstand.

Qsmt Lithoid and dendritic tufa mounds composed of large (1 –3 m) spheres and barrels, and forming 3 - to 8-m-high knobs along the trace of the Pyramid Lake fault.

Qsl Lower member of the Sehoo Alloformation representing first major lake rise since the Eetza lacustral interval. Base of Qsl characterized by prominent tufa-cemented beach deposit forming a distinctive resistant ledge 1–10 m thick along much of the Truckee River canyon in the study area; best exposed from Agency Bridge south to the Deadman Bluffs. Consists of variably reworked subaerial and alluvial fan (Qw) deposits cemented by fine-grained tufa; gray sandy pebble to cobble gravel; locally massively crossbedded with prominent beach foreset bedding. Unconformably overlies Qw and older deposits; extends up the Truckee River canyon to a maximum elevation of 1,230–1,240 m (4,035–4,068 feet). Lower part of the deposit contains thick beds of snail- and clam-rich sand radiocarbon dated at 26.5–39.9 ka (samples 39–46). Conformably overlying the cemented beach deposits are offshore deposits of brown to gray silt, sand, and mud containing several tephra beds: Trego Hot Springs (23 ka), Wono (27 ka), Marble Bluff (33 ka), and the Mount Saint Helens Cy (47 ka) tephra (Davis, 1978; 1983; Benson and others,1997; Berger and Busacca, 1995). The Wono tephra is found throughout the study area, lying just above the tufa-cemented Qsl beach ledge at several sites near Agency Bridge. The Wono and Trego Hot Springs beds also crop out at several sites along Mud Lake Slough; near Marble Bluff the Wono bed directly overlies snail-rich shallow water deposits radiocarbon dated at 37.5 ka (sample 44); based on the well-constrained 27 ka age for the Wono bed (Benson and others, 1997), however, snails dated at this site may be re-worked from older deposits. Locally capped by 30- to 40-cm-thick Bw soil horizon formed during a post-early Sehoo lake recession.

Eetza Alloformation (Morrison, 1964; Morrison and others, 1965,; Morrison and Frye, 1965; and Morrison, 1991) Deposits associated with one or more penultimate lacustral cycles of Lake Lahontan during pre-Wisconsinan time (oxygen isotope stages 6, 8, and 10); called the lower lacustral clays by Russell (1885). Unit is composed of beds from multiple lake cycles with interfingering subaerial and deltaic deposits; it is the thickest exposed section of Lake Lahontan deposits in the quadrangle, comprising the major part of Truckee Canyon exposures. Middle Pleistocene; ranges in age from ~130 to 350 ka (Morrison, 1991). Upper part of the formation contains the Wadsworth tephra bed dated at 155-200 ka (Berger, 1991; Sarna-Wojcicki and others, 1991). Uranium-series ages from Eetza deposits elsewhere in the Lake Lahontan basin range between 110 and 288 ka (Morrison, 1991).

Qe Offshore, light- to dark-brown, red-brown, light- to medium-gray silt, light-gray to greenish-gray clay, and light-brown silty sand; generally well-stratified, ranging from thin (1–2 cm) to thick (1–3 m) bedded; clay beds exhibit flat, deep-water laminations; exposed sections are more than 50 m thick in this quadrangle. In the Wadsworth Quadrangle, unit contains interbeds of Gilbert-type deltaic deposits formed as the ancestral Truckee River flowed into shallow, fluctuating lake levels.

Qess Fluvial and subaerial deposits of the intralacustral S-Bar-S Allomember (Morrison and Frye, 1965). Prominent layers of gray, coarse fluvial sand and rounded pebble to cobble gravel grading into and interbedded with brown to red-brown alluvial fan deposits; ranges in thickness from 1–3 m and forms a resistant, darkly varnished terrace-like platform at an elevation of ~1,230 m (4,035 feet) along the canyon bluffs. Presence of well-rounded granodiorite clasts derived from the Sierra Nevada indicates that these are Truckee River gravels. Alluvial fan facies consist of muddy cobble to boulder gravel composed of locally derived volcanic lithologies.

Qmmg Madman gravel deposits (informal name); downstream facies of Qess that originates in the reach of the Deadman Bluffs and is best exposed in the Morrison Amphitheater. Distinctive dark to brown to gray, tabular, 3- to 5-m-thick bed of fluvial and subaerial cobble to boulder volcaniclastic gravel deposits; clasts are subangular to subrounded and subrounded boulders up to 1m in diameter. Exposures in northern outcrops contain foreset beds indicating shallow, subaqueous deposition (north of Deadman Bluffs).

QTpe Lacustrine deposits of pre-Eetza age, undifferentiated. May be in part correlative with the Rye Patch Alloformation (Morrison and Frye, 1965; Morrison, 1991) which contains the 640-ka Lava Creek B tephra bed . Tilted beds of offshore gray, red-brown to bluish-brown silt and clay; best exposed in the western river bluff and tributary drainages at and south of the pipeline road where they are overlain with an angular unconformity by Qe and Qess deposits. In the Wadsworth Quadrangle, the clay beds contain a 0.5- to 1-cm-thick Glass Mountain tephra bed estimated to be between 0.79 and 1.95 Ma (Andrei Sarna-Wojcicki, written commun., 2003). At the lower end of Secret Canyon Wash, near-vertical beds of red to white clay contain a 30-cm-thick tephra bed chemically correlative with a 5- to 6-Ma tephra found in the base of the Bouse Formation in southern California (M. Perkins, written commun., 2004).

BEDROCK DEPOSITS

Tv Tertiary volcanic rocks, undivided .

JŦms Mesozoic metamorphic rocks at Marble Bluff; recrystallized limestone and dolomite.

[1] Ages reported for radiocarbon samples, and ages of units reported as ka, are in radiocarbon yrs BP; calendar-corrected (calibrated) ages are listed in table 1.

[2] **A note regarding stratigraphic nomenclature:** Lake Lahontan and related subaerial deposits were considered lithostratigraphic units in the early studies of Roger Morrison and were designated as formations. With the revision of the North American Stratigraphic Code in 1983, new allostratigraphic and pedostratigraphic unit definitions were added which allowed the definition of time-transgressive, lithology-independent rock units and soils. Morrison (1991) redefined the Lake Lahontan sequence according to these new code definitions, a convention that we follow here.

PRINCIPAL QUATERNARY STRUCTURAL-STRATIGRAPHIC RELATIONS OF THE PYRAMID LAKE FAULT ZONE

The Pyramid Lake fault is part of the Walker Lane belt, a transcurrent right-lateral strike-slip system extending for more than 600 km across western Nevada (Stewart, 1988). In the Wadsworth Quadrangle to the south, structural deformation associated with the Pyramid Lake fault occurs in Lake Lahontan and younger deposits along a N20–30°W-striking series of faults lying along the west margin of the Truckee River canyon. In the Nixon study area, the fault zone strikes more westerly at N35–40°W along a principal, west-dipping trace that extends to the historical lake shorelines.

In contrast to the normal-slip character of the Wadsworth section of the fault zone, the Pyramid Lake fault in the Nixon area locally displays slip geometry suggestive of strike-slip motion. Back-facing scarps and a linear strike-slip-like depression along the fault zone occur in Qfp and younger deposits south of Secret Canyon, and trenching data at the mouth of Secret Canyon suggest that fault displacement is oblique-slip with ~ 3 m of vertical offset and an undetermined amount of lateral offset of the Mazama tephra bed (Anderson and Hawkins, 1984; Briggs and Wesnousky, 2004). Near Big Mouth Canyon, Briggs and Wesnousky (2004) described 12–15 m of right-lateral offset along the fault trace in post-Qsm ephemeral streams. However, our studies could not confirm this stream offset, and our mapping shows that Qsm shorelines exhibit no visible evidence of measurable lateral displacement. High Qsm shorelines cut by the fault at the mouth of Secret Canyon and at Coal Creek do not show lateral offset; similarly the Qlb shorelines cut by the fault trace near Duck Lake show ~1 m of vertical displacement but no visible lateral displacement on 1:6,000-scale low-sun-angle aerial photography.

Most slip indicators found along the Pyramid Lake fault in the Nixon study area and in the Wadsworth Quadrangle suggest that the fault is dominantly a normal, dip-slip structure. Some evidence, however, is suggestive of strike-slip motion, particularly along the Nixon section of the fault zone, indicating that fault motion is dominantly normal with some lesser amount of lateral offset.

Regional structural relations may also be more complex than suggested by the mapped trace of the fault. Portions of the fault zone may be concealed beneath the late Holocene lacustrine and fluvial deposits. At the Marble Bluff Dam abutment, Prokopovich (1983) and U.S. Bureau of Reclamation (unpublished data, 1974) reported that a N35–50°W-striking, 40-70°W-dipping fault was mapped in lake sediments. In addition, correlation of the Qsl-Wono tephra bed section from Agency Bridge to Marble Bluff suggests that regional tilting may account for some deformation in the region. Although the Marble Bluff site is 30 m lower than the Agency Bridge site, generally similar shallow-water characteristics of the deposits containing the Wono tephra bed occur at both sites suggesting that regional tilting to the north has occurred.

ACKNOWLEDGMENTS

Tephra analyses were done by Michael E. Perkins and Franklin F. (Nick) Foit.

Scale 1:24,000

0 0.5 1 Kilometer

0 0.5 1 Mile

0 1,000 2,000 3,000 4,000 5,000 Feet

CONTOUR INTERVAL 40 FEET
Supplementary Contour Interval 20 feet

Base map: U.S. Geological Survey Pah Rah Mountain, Nixon, Nixon NW, and Russell Peak, NV 7.5' Quadrangles, 1989
Projection: Lambert Conformal Conic Projection, central meridian -114.6875°, standard parallels at 20° and 60°

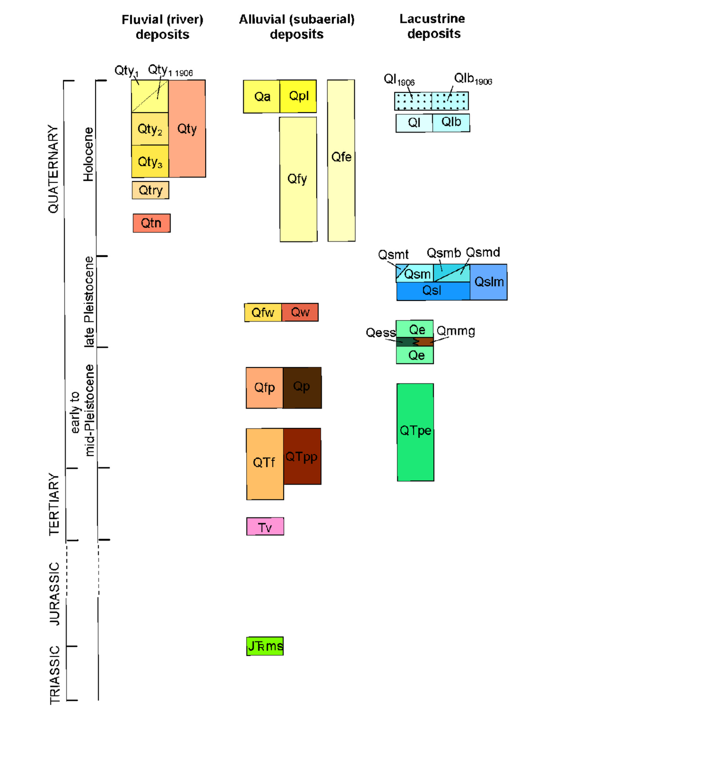


Table 1. Radiocarbon dates from this study

Sample no.	Lab no.	Material dated	^{14}C age (yr BP)	Calibrated age (1-σ; cal BP)	Unit
1	Beta-112099	charcoal	110 ± 50	--	Qty_1
2	Beta-165459	charcoal	120 ± 50	0-260	Qty_1
3	Beta-165454	charcoal	170 ± 40	0-270	Qty_1
4	Beta-202821	wood	430±40	333-505	Ql_{1906}
5	GX-31721	charcoal	470±90	434-628	Qty_2
6	Beta-165458	charcoal	500 ± 40	510-543	Qty_2
7	Beta-112098	charcoal	690 ± 50	563-674	Qty_2
8	GX-30151	organic sed	820 ± 60	674-787	Qty
9	Beta-165462	shell	930 ± 60	790-917	Qty
10	Beta-165456	charcoal	950 ± 40	793-926	Qty
11	Beta-192175	organic sed	1930 ± 40	1,840-1,900	Qtry
12	Beta-165457	charcoal	2090 ± 40	2,001-2,114	Qfy
13	Beta-192176	charcoal	2130 ± 40	2,050-2,150	Qtry
14	GX-18934	org sed	2395 ± 100	2,338-2,708	Qfy
15	Beta-162140	charcoal	2820 ± 40	2,861-2,959	Qty
16	Beta-165455	charcoal	3100 ± 50	3,260-3,370	Qty
17	Beta-162141	clam shell	3340 ± 40	3,481-3,633	Qty
18	GX-18933	organic sed	3435 ± 205	3,930-3,453	Qfy
19	Beta-107319	charcoal	4440 ± 60	4,879-5,275	Qfy
20	GX-31283-AMS	fish bone (leached)	4910 ± 200	5,466-5,905	Qsl
21	Beta-165934	charcoal	5460 ± 60	6,194-6,307	Qfy
22	Beta-108392	charcoal	5760 ± 60	6,490-6,639	Qfy
23	Beta-108393	charcoal	6180 ± 80	6,950-7,208	Qfy
24	Beta-192174	charcoal	7020 ± 40	7,800-7,870	Qtp
25	Beta-192173	organic sed	7380 ± 40	8,160-8,200	Qtp
26	Beta-165453	charcoal	7800 ± 60	8,456-8,633	Qtp
27	Beta-165461	bone	7940 ± 40	8,651-8,978	Qtp
28	GX-31284-AMS	clam shell	8230 ± 50	9,127-9,281	Qsm (?)
29	GX-31281	clam shell	8830 ± 200	9,680-10,165	Qsm (?)
30	GX-30464	tufa	10270 ± 120	11,697-12,555	Qsmd
31	CAMS-90412	clam shell	10820 ± 35	12,640-13,100	Qsm
32	Beta-202817	snail shells	12530 ± 50	14,577-14,914	Qsm
33	GX-30153	snail shells	13730 ± 170	16,175-16,783	Qsm
34	GX-30465	snail shells	13820 ± 160	16,286-16,879	Qsmd
35	GX-30265	tufa	14420 ± 120	16,992-17,551	Qsmd
36	GX-28205	tufa	16600 ± 580	19,048-20,515	Qsmd
37	GX-31280-AMS	ostracodes	17480 ± 240	20,370-21,218	Qsmd
38	GX-31285-AMS	snail shells	18040 ± 120	21,080-21,797	Qsmd
39	GX-30154	snail / clam	26470 ± 670	NA	Qsl
40	GX-29814	snail shells	27910 ± 830	NA	Qsl
41	GX-30266	tufa	28990 ± 550	NA	Qsl
42	Beta-183019	snail shells below Wadsworth tephra (contaminated?)	36970 ± 780	NA	Qsl
43	Beta-179738	snail shells	36950 ± 380	NA	Qsl
44	GX-31282-AMS	snail shells below Wono tephra	37490 ± 850	NA	Qsl
45	GX-30150-AMS	snail shells	37550 ± 770	NA	Qsl/Qw
46	Beta-179739	snail shells	39980 ± 490	NA	Qsl/Qw
47	Beta-182045	snail shells	43320 ± 1520	NA	Qw
48	Beta-182044	snail shells	> 49880	NA	Qw

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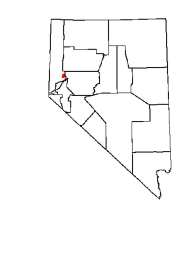

Adjoining 7.5' quadrangle names to this map (shaded)

1	2
3	4
5	6

1 Nixon NW
2 Russell Peak
3 Pah Rah Mountain
4 Nixon
5 Olinghouse
6 Wadsworth

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