TESTIMONY ON AREVA EIS

AUGUST 8, 2010

BOISE, IDAHO

BY E. MANLEY BRIGGS, MD

I am a physician and have been in practice in Boise since 1965. During that period I have been concerned about the potential harm to the people of Idaho due to the effects of radiation in the environment. There are three potential sources of this concern

1. Exposure from the Nevada Nuclear-Bomb tests. Four of the five counties in the U.S. with the highest exposure are in Idaho.

2. Exposure to radioactive material released into the air, water and soil by the Hanford Nuclear Facility near Richland, Washington.

3. Storage of nuclear waste at the INL site, situated over the Snake River Aquifer, which is a major source of water for much of Southern Idaho.

Because of the presence of these sources of radiation, I become concerned when other potential sources are introduced into our environment. Accordingly, I am concerned about the development of Areva's Eagle Rock Enrichment Facility, where depleted uranium hexafluoride will be stored over the aquifer. One of my concerns is that the INL is located in a seismically active area, and in addition of numerous other natural and man made accidents that could compromise the safety of the stored material, an earthquake could pose a serious hazard.

As you are probably aware, Idaho is very active seismically, and has the fifth highest earthquake activity in the nation. In addition, Idaho has experienced the two largest

earthquakes in the contiguous United States in the last fifty years—the 1959 Hebgen Lake Earthquake (M7.5) and the Borah Peak earthquake (M7.3) in 1983. Both of these quakes occurred in locations close to EREF. I have enclosed maps showing the close proximity of fault lines to the INL. The Areva EIS needs to address this danger.

One last observation that I would like to point out is the high incidence of thyroid cancer in Elmore County. Elmore is the first county below the Thousand Springs, which is where the Snake River Aquifer empties into the Snake River. This was noted in the 1999 NCI Report regarding the Nuclear-Bomb test fallout. This increased incidence occurred only in individuals born after 1958 and thus could not be attributed to the Bomb fallout. Could it be due to leaching of radioactivity into the aquifer from previously stored nuclear materials? This would certainly have bearing on Areva's proposal, and should be examined by the Areva EIS

I thank you for the opportunity to testify tonight.

E. Manley Briggs

E. Manley Briggs, MD

USGS science for a changing world

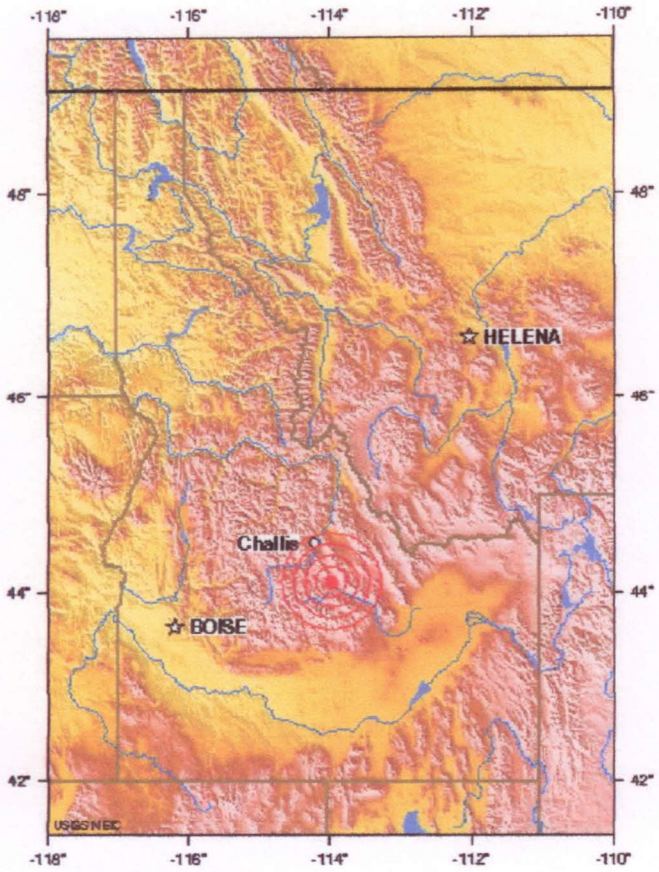
Earthquake Hazards Program

Last Earthquake in ...

Preliminary Earthquake Report

Magnitude 2 SOUTHERN IDAHO
2010 August 01 12:23:24 UTC

Magnitude	2
Date-Time	2010 08 01 12:23:24 UTC Time of Earthquake in other Time Zones
Location	44.11N 113.98W
Depth	13.1 kilometers
Region	SOUTHERN IDAHO
Distances	50 km (30 miles) SSE of **Challis, Idaho** 55 km (35 miles) NNE of **Ketchum, Idaho** 75 km (45 miles) NW of **Arco, Idaho** 185 km (115 miles) ENE of **BOISE, Idaho**
Location Quality	Error estimate: horizontal +/- 3.1 km; depth fixed by location program
Location Quality Parameters	Nst=14, Nph=14, Dmin=51 km, Rmss=0.27 sec, Gp=147.6 degrees
Source	
Event ID	mb10429699



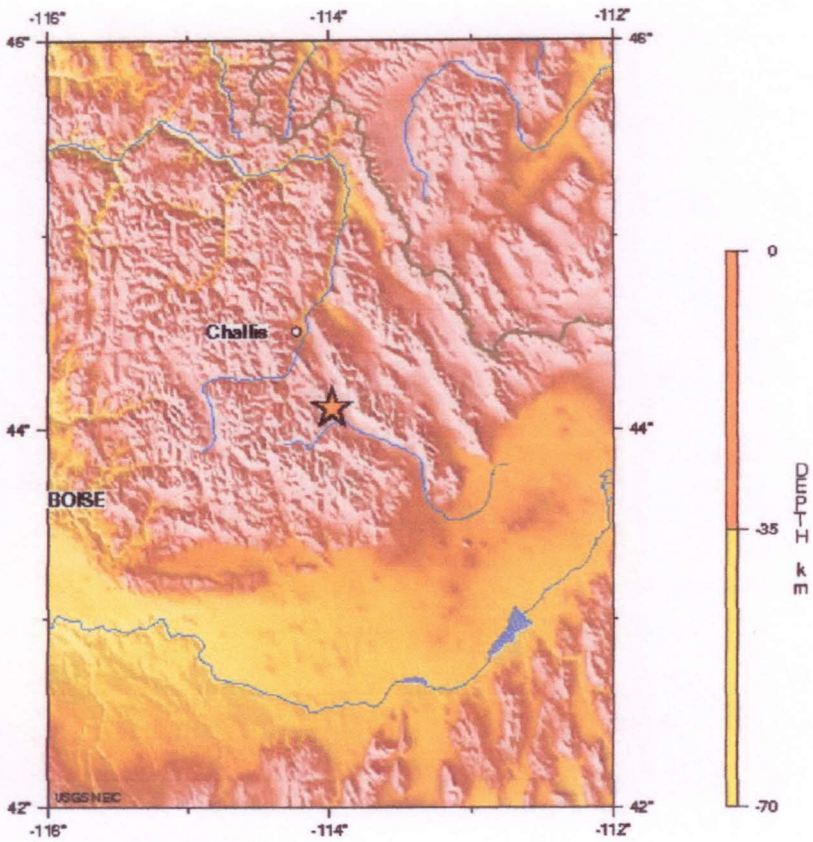
SOUTHERN IDAHO

2010 08 01 12:23:24 UTC 44.11N 113.98W Depth: 13.1 km, Magnitude: 2

Earthquake Location

Major Tectonic Boundaries: Subduction Zones -purple, Ridges -red and Transform Faults -green

USGS National Earthquake Information Center



SOUTHERN IDAHO

2010 08 01 12:23:24 UTC 44.11N 113.98W Depth: 13.1 km, Magnitude: 2

Earthquake Location

Major Tectonic Boundaries: Subduction Zones - purple, Ridges - red and Transform Faults - green

USGS National Earthquake Information Center

Where were you between 1944 & 1972?

If *you lived or attended school or college in the Inland Northwest you may have been exposed to radioactive material released into the air, water and soil by the Hanford Nuclear Facility near Richland, Washington. This does not r radiation harmed you. However, you may wish about possible exposures and radiation-related he*

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Exposure of the American People to Iodine-131 from Nevada Nuclear-Bomb Tests: Review of the National Cancer Institute Report and Public Health Implications (1999)
Commission on Life Sciences (CLS)

Among the birth cohort born 1948-1958, the incidence rate of invasive thyroid cancer, 1970-1996, was 4.45 cases per 100,000 person-years (see Table D.3). There were significantly more cases observed than expected in Health District 4 and Ada County. None of the four Idaho counties with highest estimated exposure to iodine-131 showed an elevation in thyroid cancer cases from 1970-1996 in the birth cohort born 1948-1958. Although the incidence rate of invasive thyroid cancer, 1970-1996, was highest for the birth cohort born 1948-1958, the number of cases observed was not statistically significantly different from that expected based upon rates for all birth cohorts.

Among the birth cohort born after 1958, the incidence rate of invasive thyroid cancer, 1970-1996, was 4.35 cases per 100,000 person-years (see Table D.4). There were significantly more cases observed than expected in Elmore County. None of the four counties with highest estimated exposure to iodine-131 showed an elevation in thyroid cancer cases from 1970-1996 in the birth cohort born after 1958.

Regarding the female-to-male ratios for invasive thyroid cancer cases, the differences in the overall female-to-male ratios by birth cohort (see Table D.5) appear to be due to the higher age-specific thyroid cancer incidence rates in younger females as compared with younger males. In all three birth cohorts, the cumulative age-specific ratios were similar for the age groups 25-29, 30-34, and 35-39 (the only age groups for which comparisons are available across all three birth cohorts, as CDRI has reliable statewide cancer incidence data since 1970).

SUMMARY AND CONCLUSIONS

Thyroid cancer is relatively rare among all cancers, accounting for less than 2% of invasive cases in Idaho in 1996. The age-adjusted incidence rate of invasive thyroid cancer in Idaho, 1970-1996, was 4.22 cases per 100,000 person-years. In comparison, the Surveillance, Epidemiology, and End Results (SEER) rate for whites, 1973-1995, was 4.39 cases per 100,000 person-years. CDRI investigated thyroid cancer incidence in three birth cohorts to explore the relationship between age at the time of iodine-131 release from atmospheric nuclear bomb tests at the Nevada Test Site and thyroid cancer incidence. The number of invasive thyroid cancer cases in the state of Idaho, 1970-1996, was not statistically significantly higher than expected, based upon overall rates, for any of the three birth cohorts. Within each birth cohort, and for all cohorts combined, variation existed among health districts and counties in the incidence of thyroid cancer, with more marked variation observed among geographic areas with smaller populations.

There are several limitations of the data that may have influenced the results of the analyses. The accuracy of the estimated incidence rates assumes similar case

Exposure of the American People to Iodine-131 from Nevada Nuclear-Bomb Tests: Review of the National Cancer Institute Report and Public Health Implications (1999)
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TABLE D.4 Invasive Thyroid Cancer in Idaho, 1970-1996, Among Birth Cohort Born After 1958

		All Cases			Male Cases			Female Cases		
Residence	Incidence Rate	Observed	Expected	P-Value	Observed	Expected	P-Value	Observed	Expected	P-Value
STATE OF IDAHO	4.35	169	163.9	0.708	27	24.3	0.634	142	139.6	0.859
HEALTH DISTRICT 1	4.57	21	19.4	0.774	1	3.1	0.367	20	16.3	0.416
HEALTH DISTRICT 2	2.92	11	15.9	0.265	2	2.5	1.000	9	13.4	0.282
HEALTH DISTRICT 3	4.41	23	22.0	0.887	2	3.5	0.631	21	18.5	0.615
HEALTH DISTRICT 4	5.20	54	43.8	0.152	10	6.9	0.329	44	36.9	0.279
HEALTH DISTRICT 5	5.20	26	21.1	0.336	7	3.5	0.137	19	17.6	0.793
HEALTH DISTRICT 6	2.74	15	23.1	0.099	—	3.7	0.050	15	19.4	0.375
HEALTH DISTRICT 7	3.39	19	23.6	0.398	5	3.7	0.621	14	20.0	0.213
ADA	4.66	42	38.1	0.565	10	5.9	0.159	32	32.1	1.000
ADAMS	0.00	—	0.5	1.000	—	0.1	1.000	—	0.4	1.000
BANNOCK	3.49	10	12.1	0.678	—	1.8	0.321	10	10.2	1.000
BEAR LAKE	4.92	1	0.9	1.000	—	0.1	1.000	1	0.7	1.000
BENEWAH	3.60	1	1.2	1.000	—	0.2	1.000	1	1.0	1.000
BINGHAM	2.89	4	5.9	0.611	—	1.0	0.747	4	4.9	0.928
BLAINE	10.53	6	2.4	0.072	4	0.4	0.002	2	2.0	1.000
BOISE	0.00	—	0.5	1.000	—	0.1	1.000	—	0.4	1.000
BONNER	3.41	3	3.7	0.984	—	0.6	1.000	3	3.1	1.000
BONNEVILLE	4.23	12	12.0	1.000	3	2.0	0.648	9	10.0	0.922
BOUNDARY	0.00	—	1.2	0.621	—	0.2	1.000	—	1.0	0.759
BUTTE	0.00	—	0.4	1.000	—	0.1	1.000	—	0.3	1.000
CAMAS	0.00	—	0.1	1.000	—	0.0	1.000	—	0.1	1.000
CANYON	5.04	18	15.1	0.514	2	2.4	1.000	16	12.7	0.420
CARIBOU	0.00	—	1.1	0.693	—	0.2	1.000	—	0.9	0.828
CASSIA	2.86	2	3.0	0.867	—	0.5	1.000	2	2.5	1.000
CLARK	0.00	—	0.1	1.000	—	0.0	1.000	—	0.1	1.000
CLEARWATER	0.00	—	1.3	0.566	—	0.2	1.000	—	1.0	0.713
CUSTER	14.82	2	0.6	0.224	2	0.1	0.009	—	0.5	1.000

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Exposure of the American People to Iodine-131 from Nevada Nuclear-Bomb Tests: Review of the National Cancer Institute Report and Public Health Implications (1999)

Commission on Life Sciences (CLS)

		All Cases			Male Cases			Female Cases		
Residence	Incidence Rate	Observed	Expected	P-Value	Observed	Expected	P-Value	Observed	Expected	P-Value
ELMORE	10.58	11	4.4	0.011	—	0.8	0.918	11	3.6	0.003
FRANKLIN	0.00	—	1.3	0.538	—	0.2	1.000	—	1.1	0.671
FREMONT	5.22	2	1.6	0.961	—	0.3	1.000	2	1.3	0.767
GEM	5.11	2	1.7	0.984	—	0.3	1.000	2	1.4	0.796
GOODING	0.00	—	1.6	0.405	—	0.3	1.000	—	1.3	0.539
IDAHO	2.23	1	1.9	0.870	—	0.3	1.000	1	1.6	1.000
JEFFERSON	1.69	1	2.5	0.574	—	0.4	1.000	1	2.1	0.771
JEROME	1.83	1	2.3	0.659	—	0.4	1.000	1	1.9	0.858
KOOTENAI	5.26	14	11.2	0.480	1	1.8	0.950	13	9.5	0.321
LATAH	2.47	4	6.8	0.376	1	1.0	1.000	3	5.8	0.332
LEMHI	9.16	2	0.9	0.471	—	0.1	1.000	2	0.8	0.365
LEWIS	0.00	—	0.5	1.000	—	0.1	1.000	—	0.4	1.000
LINCOLN	18.17	2	0.5	0.159	—	0.1	1.000	2	0.4	0.115
MADISON	0.00	—	5.4	0.009	—	0.6	1.000	—	4.8	0.017
MINIDOKA	4.16	3	3.0	1.000	1	0.5	0.797	2	2.5	1.000
NEZ PERCE	4.69	6	5.4	0.906	1	0.8	1.000	5	4.6	0.957
ONEIDA	0.00	—	0.4	1.000	—	0.1	1.000	—	0.4	1.000
OWYHEE	0.00	—	1.3	0.572	—	0.2	1.000	—	1.0	0.723
PAYETTE	5.22	3	2.4	0.873	—	0.4	1.000	3	2.0	0.668
POWER	0.00	—	1.1	0.643	—	0.2	1.000	—	0.9	0.775
SHOSHONE	5.98	3	2.1	0.710	—	0.3	1.000	3	1.8	0.525
TETON	0.00	—	0.6	1.000	—	0.1	1.000	—	0.5	1.000
TWIN FALLS	6.16	12	8.2	0.258	2	1.3	0.771	10	6.9	0.318
VALLEY	4.82	1	0.9	1.000	—	0.1	1.000	1	0.7	1.000
WASHINGTON	0.00	—	1.1	0.645	—	0.2	1.000	—	1.0	0.772

NOTES: The incidence rate for the state of Idaho is the product of the age adjusted rate for all birth cohorts using the 1970 standard U.S. population (direct age adjustment) and the standardized incidence ratio for this birth cohort compared with all birth cohorts (indirect age adjustment). The incidence rates for the other geographic areas are the products of the standardized incidence ratios for this cohort and the state age-adjusted rate. Expected cases for geography other than state are based upon age- and sex-specific rates for the state of Idaho for this cohort. P-values compare observed and expected cases, are two-tailed, based upon the Poisson probability distribution.

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IDAHO GEOLOGICAL SURVEY

SINCE 1919, SERVING THE STATE THROUGH GEOLOGIC RESEARCH

Programs and Services

Geologic Hazards—Earthquakes

Geological and seismological studies show that earthquakes are likely to happen in any of several active zones in Idaho and adjacent states. Idaho is ranked fifth highest in the nation for earthquake hazard. Only California, Nevada, Utah, and Alaska have a greater overall hazard. Idaho has experienced the two largest earthquakes in the contiguous United States in the last thirty years—the 1959 Hebgen Lake earthquake (M7.5) and the 1983 Borah Peak earthquake (M7.3). Both tremors caused fatalities and millions of dollars in damage.

In all parts of Idaho, the historical record of seismicity reveals at least a moderate threat from earthquakes. The Idaho Geological Survey addresses earthquake concerns by studying faults and seismic activity, and by promoting earthquake education programs. The Survey works closely with other agencies in planning state and regional earthquake policy and response, and participates in regional organizations such as the Western States Seismic Policy Council (WSSPC).

Idaho Earthquake Information

Seismic recordings, Idaho earthquake history, and links to other earthquake information sites.

Recent Earthquake Activity around Idaho

Information on recent earthquakes in the vicinity of Idaho from the Idaho Bureau of Homeland Security.

Interactive Online Maps

Miocene and Younger Faults in Idaho

Miocene and Younger Faults in Idaho: Google Earth version.

Earthquakes in Idaho 1872-2000

Idaho Fault Map

This map shows the location and ages of Miocene and younger faults in Idaho and is useful for assessing fault activity and seismic source areas.

Historic Earthquakes

Location map and descriptions of historical earthquakes in Idaho and an isoseismal map for the 1983 Borah Peak earthquake. GeoNote 5 describes the Borah Peak earthquake

Earthquake Risk

A brief description of the earthquake risk in Idaho. Includes a risk map of Idaho, the U.S. Uniform Building Code map, and a seismicity map of the U.S.

Earthquake Education

What to do in an earthquake. How to lessen earthquake risk to you and your home. Measuring and comparing an earthquake's effects and damage with the scale of Modified Mercalli Intensities

Earthquake Images

Eight photos of the fault scarps and damage caused by the 7.3 magnitude Borah Peak earthquake in 1983 near Challis in east-central Idaho. Images are taken from the IGS publication, *The Borah Peak Earthquake: A 35-mm Slide Set for Earth Science Educators,* S-95-3

Earthquake Epicenters, 1872-1985

Records compiled on nearly 30,000 earthquakes in Idaho from 1872 through 1985. Available from IGS on a CD ROM.

Related Links

Western States Seismic Policy Council Web Site

Link to the Western States Seismic Policy Council for other earthquake information. Includes recent earthquakes in the western U.S., educational resources, and recent information on earthquake hazards and mitigation

Princeton Earth Physics Project

Calculating Earthquake Magnitudes

USGS Shake Map

Did you feel a recent earthquake? Report it here. Also view information about earthquakes in the region.

- Geologic Hazards
- Earthquakes

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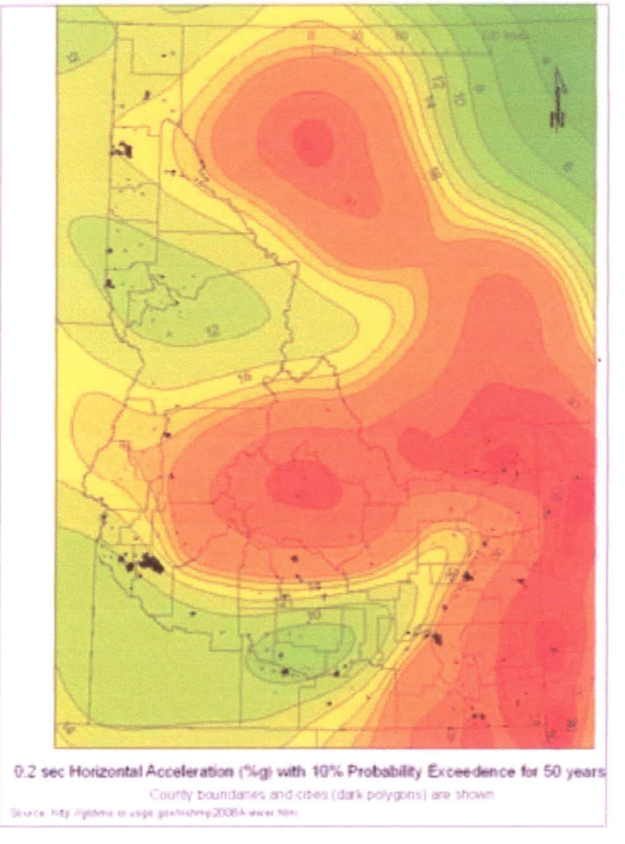
Earthquakes in Idaho

Earthquake Awareness Month Press Release

Governor C.L. "Butch" Otter Earthquake Awareness Month Proclamation



Idaho is among the most active of states in terms of the number of earthquakes experienced each year. Hundreds of small earthquakes have been recorded in the state by seismographs since systematic observations began in the mid-20th century. Two of the largest historic earthquakes in the continental US occurred in Idaho or within a few miles of the Idaho border in 1983 and 1959. These powerful magnitude 6.9 and 7.3 events caused fatalities as well as destroying buildings, roads, and other structures. The accounts of 19th century Euro-American settlers in Idaho also contain descriptions of damaging earthquakes. Geologists have extended the Idaho earthquake record thousands of years into

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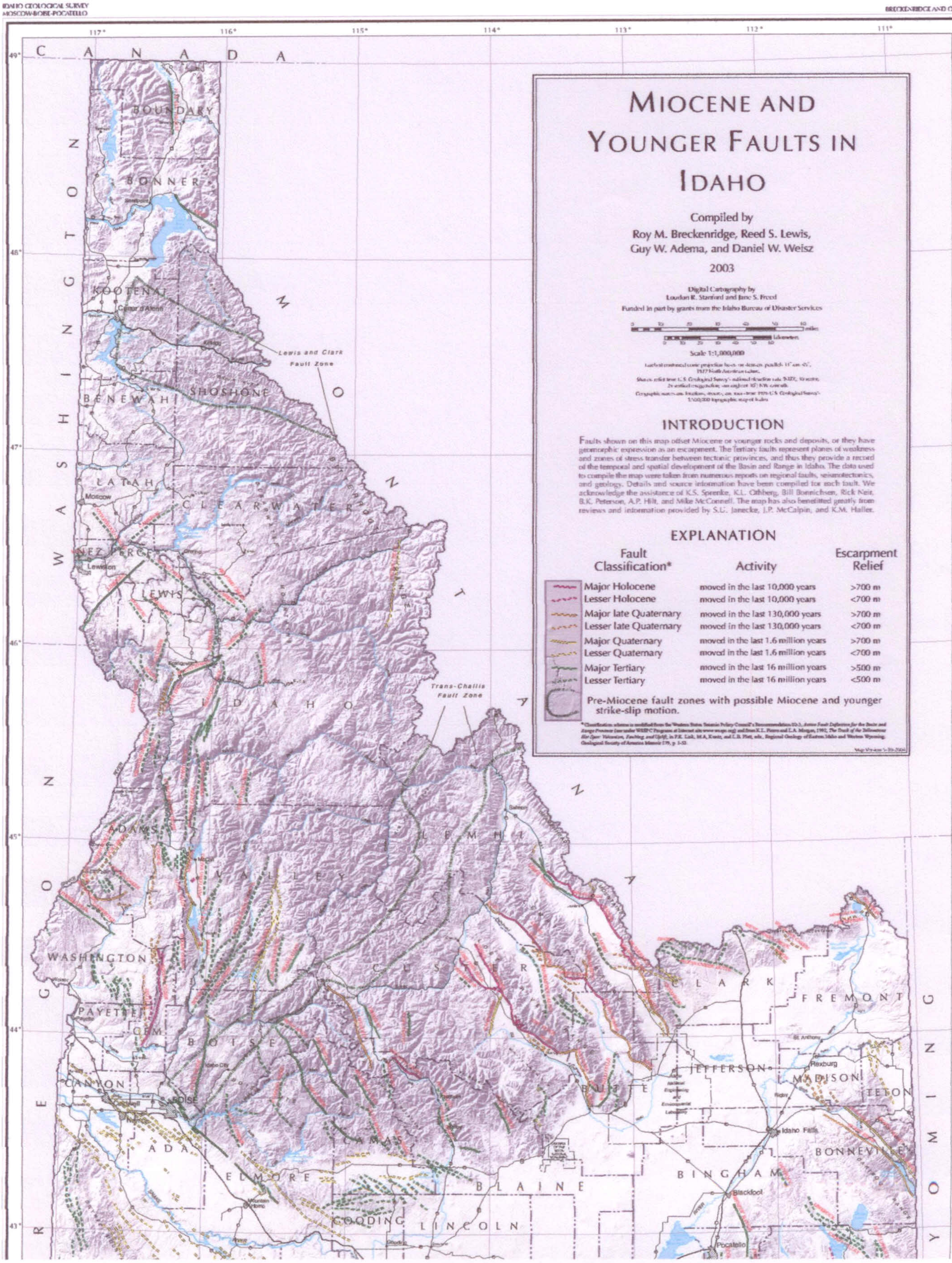


MIOCENE AND YOUNGER FAULTS IN IDAHO

Compiled by
Roy M. Breckenridge, Reed S. Lewis,
Guy W. Adema, and Daniel W. Weisz

2003

Digital Cartography by
Loudon R. Stanford and Jane S. Freed

Funded in part by grants from the Idaho Bureau of Disaster Services

Scale 1:1,000,000

Lambert conformal conic projection based on standard parallels 33° and 45°, 1927 North American datum.

Shaded relief from U.S. Geological Survey's national elevation data (NED), 30 meter, 2x vertical exaggeration, sun angle at 30°; NW azimuth.

Geographic names and locations, roads, and towns from 1970 U.S. Geological Survey's 1:500,000 topographic map of Idaho.

INTRODUCTION

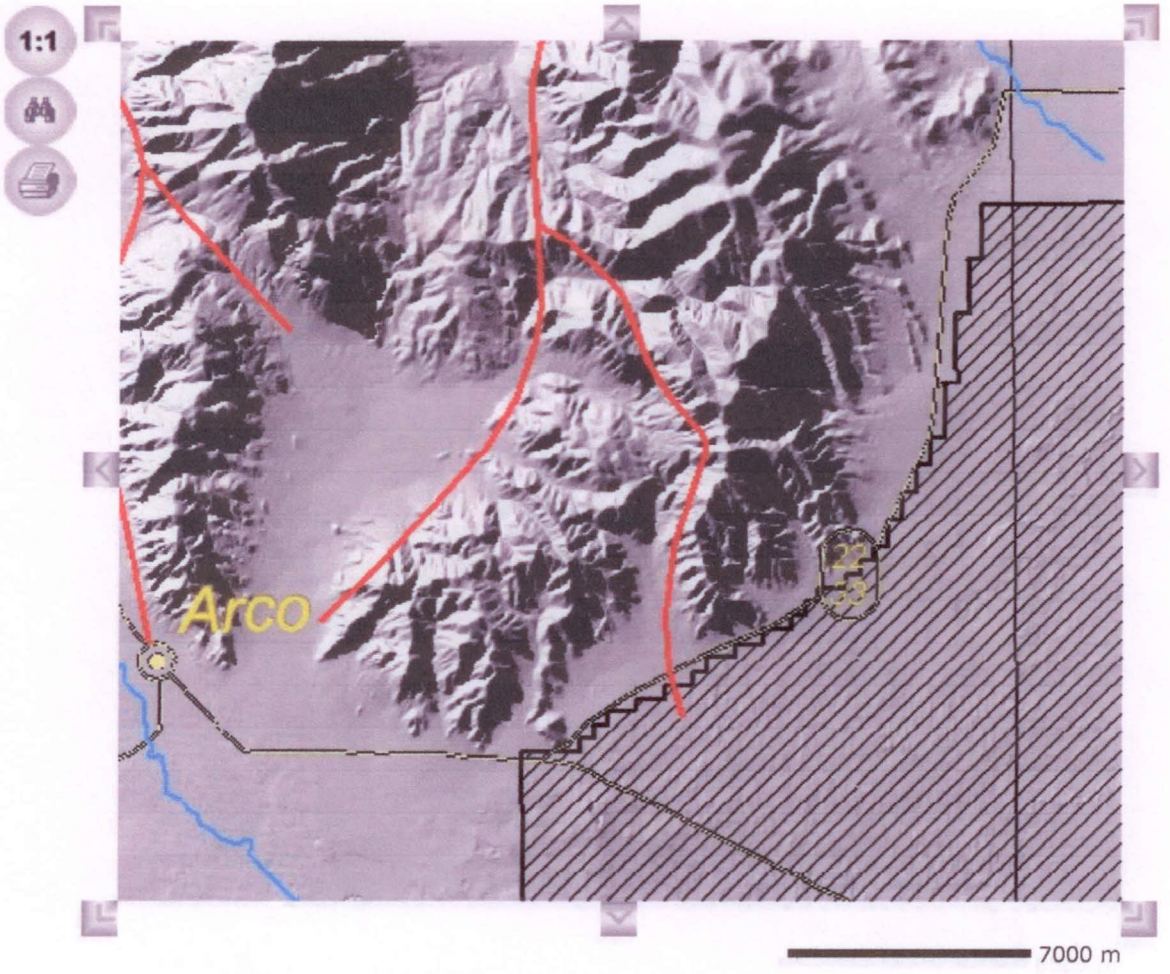
Faults shown on this map offset Miocene or younger rocks and deposits, or they have geomorphic expression as an escarpment. The Tertiary faults represent planes of weakness and zones of stress transfer between tectonic provinces, and thus they provide a record of the temporal and spatial development of the Basin and Range in Idaho. The data used to compile the map were taken from numerous reports on regional faults, seismotectonics, and geology. Details and source information have been compiled for each fault. We acknowledge the assistance of K.S. Sprenke, K.L. Othberg, Bill Bonnichsen, Rick Neir, B.K. Peterson, A.P. Hilt, and Mike McConnell. The map has also benefitted greatly from reviews and information provided by S.U. Janecke, J.P. McCalpin, and K.M. Haller.

EXPLANATION

Fault Classification*	Activity	Escarpment Relief
Major Holocene	moved in the last 10,000 years	>700 m
Lesser Holocene	moved in the last 10,000 years	<700 m
Major late Quaternary	moved in the last 130,000 years	>700 m
Lesser late Quaternary	moved in the last 130,000 years	<700 m
Major Quaternary	moved in the last 1.6 million years	>700 m
Lesser Quaternary	moved in the last 1.6 million years	<700 m
Major Tertiary	moved in the last 16 million years	>500 m
Lesser Tertiary	moved in the last 16 million years	<500 m

Pre-Miocene fault zones with possible Miocene and younger strike-slip motion.

*Classification scheme is modified from the Western States Seismic Policy Council's Recommendation 02-3, *Active Fault Definition for the Basin and Range Province* (see under WSSPC Programs at Internet site www.wsspc.org) and from K.L. Pierce and L.A. Morgan, 1992, *The Track of the Yellowstone Hot Spot: Volcanism, Faulting, and Uplift*, in P.K. Link, M.A. Kuntz, and L.B. Platt, eds., Regional Geology of Eastern Idaho and Western Wyoming: Geological Society of America Memoir 179, p. 1-53.



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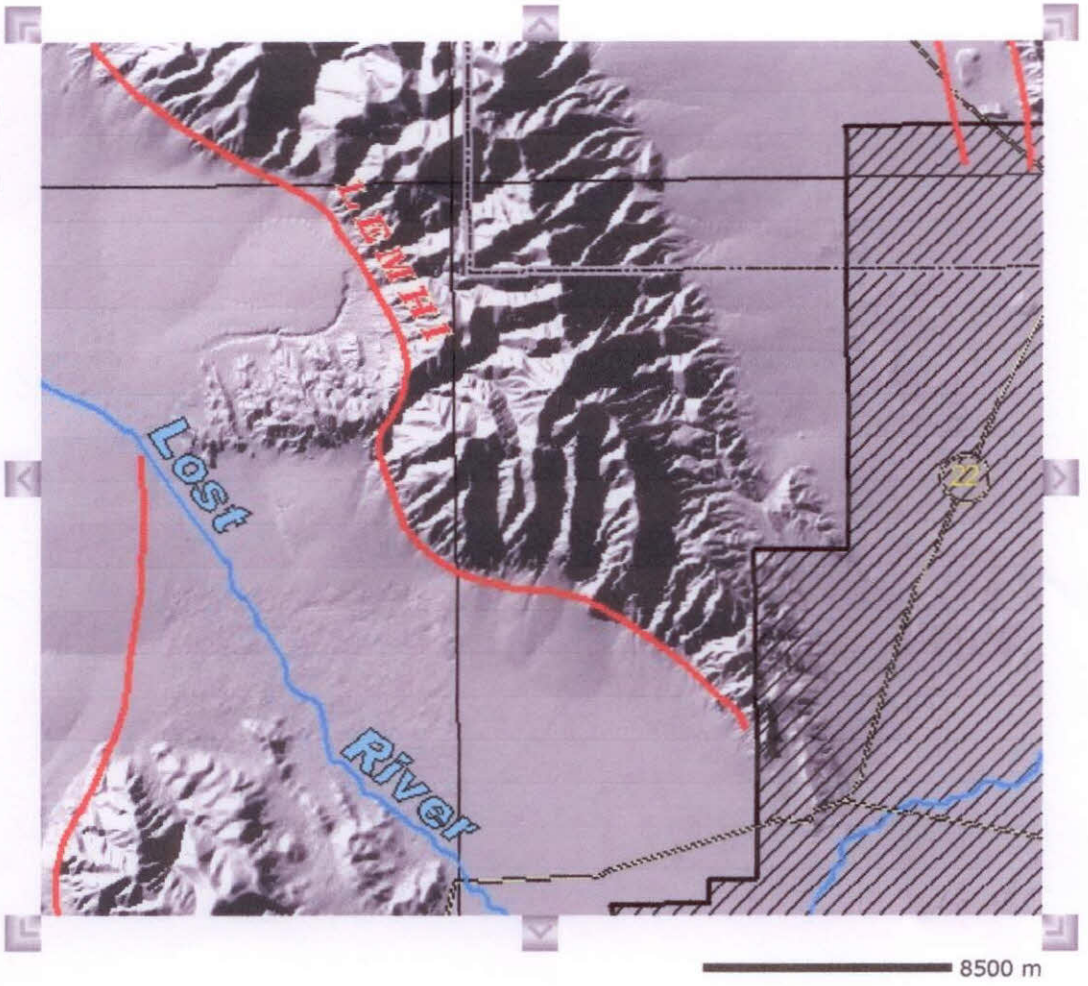

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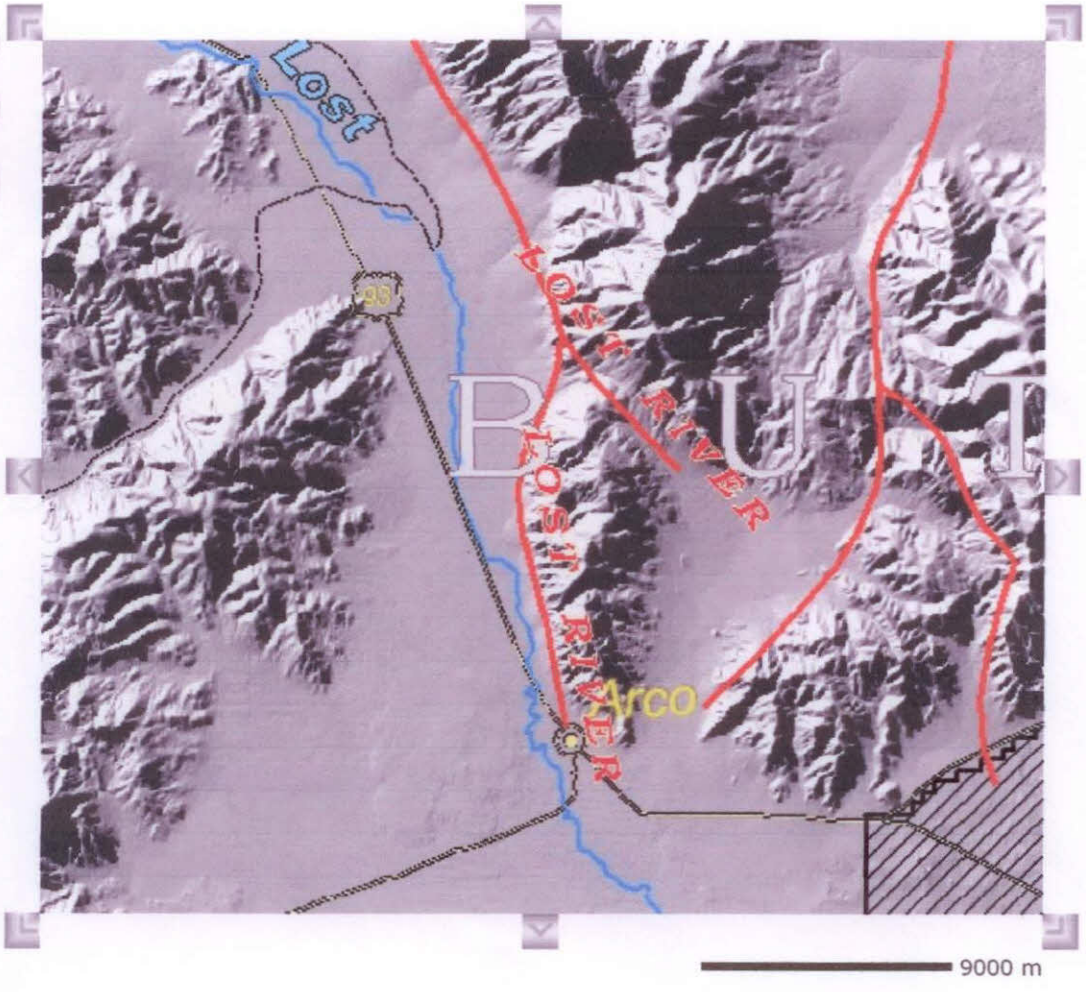
IDAHO GEOLOGICAL SURVEY
Home

Miocene and Younger Faults in Idaho, (Beta version: 1.2004.08)



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Working with the maps

- Hovering your mouse over the map will show you different fault names and fault zones.
- To zoom in for a closer view of a specific fault, click the fault image on the map or choose an entry from the dropdown list below.
- When the zoomed image is in view, clicking on a fault will bring up a table with detailed information about that fault.

- LOST RIVER

Explanation

Fault Classification	Activi
Major Holocene	movec in the last 10,00(years