PUBLISHED QUARTERLY BY UTAH GEOLOGICAL AND MINERAL SURVEY

SURVEY NOTES

formerly QUARTERLY REVIEW

Vol. 12 No. 2 Service to the State of Utah May 1978

SALT LAKE VALLEY TREMORS

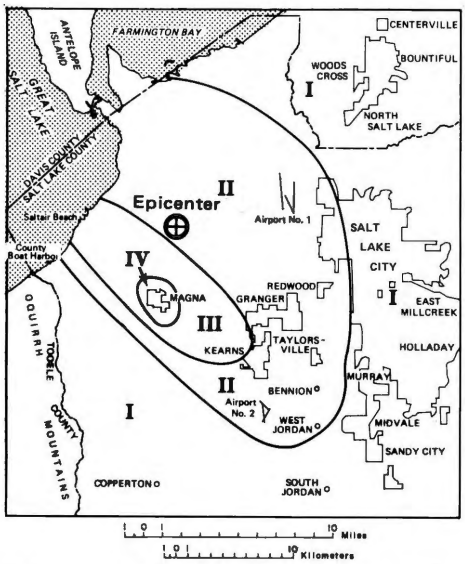
Four small earthquakes were widely felt in northern Salt Lake County and southern Davis County in late February and early March. Vital statistics reported by the University of Utah seismograph station are:

Date:	February 27, 1978
Local Time:	5:20 p.m.
Magnitude:	2.7
Epicenter:	40°44.99′ N., 112° 12.32′W.
Date:	March 8, 1978
Local Time:	11:30 p.m.
Magnitude:	3.3
Epicenter:	40°45.59′N., 112° 04.87′W.
Date:	March 8, 1978
Local Time:	11:46 p.m.
Magnitude:	2.5
Epicenter:	40°46.10′N., 112° 04.55′W.
Date:	March 13, 1978
Local Time:	6:35 a.m.
Magnitude:	2.8
Epicenter:	40°45.73′N., 112° 05.09′W.

The epicenter of the February 27 event was located in Great Salt Lake about 1 mile north of the Salt Lake County boat harbor. The other three were centered just south of U.S. Highway 40, about 1 mile east of Saltair. The epicentral area borders on the Survey's first Seismic Risk Zone Mapping project area and the earthquakes were therefore field investigated despite the low magnitudes.

All four earthquakes were felt most strongly in the vicinity of Magna, about 5 miles south of the reported epicenters.

The second and largest earthquake, that of March 8, 11:30 p.m., was the most widely felt. Confirmed reports range from Bountiful on the north to West Jordan on the south, eastward to 1300 East, and westward to Saltair Beach. The map below (figure 1) shows the extent of the felt area and the intensity with which the shock was felt in different parts of the valley. Estimates of intensity are based on the modified Mercalli scale which uses a 12-point scale to describe the severity of earthquake effects, from I (barely felt) to XII (complete destruction).



Epicenter and intensity distribution of earthquake of March 8, 1978, 11:30 pm. I, II, III, IV- intensity (modified Mercalli scale).

During the first and larger of the March 8 earthquakes some minor additional damage occurred to already damaged structures in the vicinity of Magna, such as widening of the cracks in the Magna fire station. No ground disturbance occurred at Saltair, closest to the reported epicenter; sleepers were not awakened, but individuals awake reported a low rumble and slight movement of a trailer house on blocks. A single, sharp shock was reported generally from west and south of the epicenter. Even as far south as West Jordan it was described as a hard shock accompanied by a "loud bang." However, reports from the east and northeast differ. At the International Airport two distinct shocks were felt about a second apart, followed by a short rolling motion. Farther east, near Redwood Road, the event was described as a gentle rolling sensation with no accompanying bump or noise.

IN SITU FIREFLOOD PRODUCES OIL, SURPRISES

The Department of Energy, Laramie Energy Research Center, shut down its *in situ* fireflood experiment at the Northwest Asphalt Ridge deposit, Uintah County on February 28. The successful experiment produced some 450 to 460 barrels of oil of two distinct types, the second and best type quite by surprise.

The experiment, the second by LERC on the site, was fired up in late 1977 to test the feasibility of producing oil and gas from oil sand (tar sand) *in situ* (without mining and surface processing) by burning the oil-impregnated sandstone underground. The fire was ignited in wells drilled into the deposit, and oil and gas was recovered from wells positioned in various patterns around the ignition centers. The underground fire was kept going by injection of air into the ignition wells. The experiment reservoir was in the Rimrock Sandstone Member of the Mesaverde Formation at an average depth of 350 feet. It is estimated that about 20 percent of the oil in place was produced from beneath 0.15 acre.

(continued on page 7)

DIGGIN'S

SALT LAKE'S "OFFSHORE" DRILLING TO START IN MAY

The first of six planned wells to be drilled in the Great Salt Lake is scheduled to start in late May. Amoco Production says that Parker Drilling Company, Tulsa, is to move its rotary rig No. 148 to Salt Lake to drill the projected 10,000 foot test well. The rig will be mounted on a 90-by-180 foot anchored barge in about 30 feet of water approximately seven miles offshore. Cost of the first well in the program is estimated at $5 million, but subsequent wells are not expected to be so costly. Amoco initiated the exploratory program in the early 1970's, filing on some 606,000 acres under the lake. Leases were issued in April 1974. An extensive geophysical program was conducted in 1973 and 1974, and permits for two wells in the southern part of the lake were granted in late 1974. However, economic conditions deferred drilling at that time.

(Survey Notes, February, 1978 listed Amoco Production's six wildcat location plans.) (Source: Petroleum Information Corporation, Daily Newsletter, February 28, 1978.)

DR. H. WILLIAM MENARD, JR. NEW HEAD OF U.S. GEOLOGICAL SURVEY

Dr. H. William Menard, nominated by President Carter to be Director of the U.S. Geological Survey, will assume leadership of the USGS at a time when that scientific agency is expanding its role in natural resources investigations and research.

Dr. Menard is an internationally recognized scientist with extensive experience in marine, atmospheric, and solid earth sciences. He has been highly recommended by the National Academy of Sciences, (NAS), which conducted a nationwide search for candidates eligible to head the U.S. Geological Survey.

Following favorable Senate action Dr. Menard would become the 10th director of the 99-year-old USGS, succeeding Dr. Vincent E. McKelvey, director since 1971. Headquartered in Reston, Virginia, the Survey is one of the Interior Department's largest agencies with more than 12,000 employees.

MUCHO LOCOWEED
. . . . endangered species?

Locoweed was reported to be holding up Chevron Oil Company's drilling program in the Uinta Basin. The plant was placed on the Endangered Species List by Congress in 1972, and by law, action by man may not further endanger the existance or growth of any plant on the list.

Larry England, Bookcliff Resource Area Botanist, and Dr. Stanley Welsh, expert on the flora of the Uintah Basin from Brigham Young University, have discovered the plant to be growing in great abundance in three areas of the Uinta Basin and have recommended that it be taken from the List of Endangered Species. As a matter of fact, Chevron Oil has been given clearance by the Bureau of Land Management to go ahead with their drilling, and the Bureau is taking steps to get the locoweed, (*Astragalus saurinus*, stricken from the list as a threatened as well as endangered species. (From the Vernal Express, April 6, 1978.)

UTAH NATURAL GAS
. . .most from oil fields

Final data on natural gas produced in Utah in 1976 show that gross production was 78.6 billion cubic feet of which 18.9 billion cubic feet (24.0%) was from gas fields or wells and 59.7 billion cubic feet (76.0%) was associated gas from oil wells or fields.

Of the gross production, 57.4 billion cubic feet (73.0%) was marketed, 20.2 billion cubic feet (25.7%) was used to maintain reservoir pressures in oil fields, and 1.0 billion cubic feet (1.3%) was flared or vented (direct losses in production or residue blown to the air).

Utah produced 0.38% of U.S. gross production of natural gas, 0.29% of U.S. marketed production, and stood 16th in rank of the 31 gas producing states.

USGS BUDGET REQUEST

The U.S. Geological Survey is requesting $583 million for the next fiscal year, 1979-80. $390,363,000 is requested for Surveys, Investigations and Research and $185,548,000 for exploration for oil on the National Petroleum Reserve in Alaska.

UTAH COPPER PRODUCTION SECOND IN NATION

Total mine production of copper for 1977, affected by strikes in the second half of the year and by production cutbacks, decreased 5 percent to 1,518,000 tons from the 1976 output, second in the nation, according to the U.S. Bureau of Mines. Arizona contributed 61 percent of the total 1977 mine production (932,005 tons); followed by Utah, 13 percent (193,700 tons); New Mexico, 11 percent (167,000); Montana, 6 percent (89,000); Nevada, 4 percent (66,850), and Michigan, 3 percent (43,300).

Copper produced at primary smelters decreased 6 percent for the year. Smelter output in 1977 was derived 94 percent from domestic primary, 3 percent from foreign primary, and 3 percent from secondary materials. Total refined production at primary plants for the year decreased 4 percent to 1,761,300 tons of copper. Stocks of refined copper at primary plants advanced 16 percent for the last month of the year to 233,500 tons, ending the year 44,000 tons above the 1976 year end stock level. (Source: U.S. Bureau of Mines, Mineral Industry Surveys, Copper Production in December, 1977.)

WILDCAT PLUGGED

One of the region's most closely watched wildcat tests for oil was plugged and abandoned in early February. Drilled by Dixel Resources, exploration subsidiary of a large Texas-based drilling tool and well servicing conglomerate, the No. 1 Gunnison-State well reached total depth, 15,833 feet, in the Nugget Sandstone (lower Jurassic). Originally planned as an 18,000-foot test of Mississippian formations, the drilling operation surmounted many mechanical difficulties including abandonment of a "fish" in the hole below 13,000 feet and drilling a side-tracked hole past it. There were no cores cut and no drill stem tests were run.

The site of the test was about 18 miles south of Nephi in the San Pitch Mountains on a large geophysically defined structure along the south part of the central Utah "hingeline". The 15 month-long operation is reported to have cost 3.5 million dollars making it one of the most expensive dry holes in Utah.

HALF OF OVERTHRUST BELT CLOSED TO OIL AND GAS EXPLORATION . . . . . .

How can we find needed energy if we can't even look?

The Overthrust Belt of western Wyoming, southeast Idaho and northern Utah is a major new oil and gas province, probably the most important discovered in the last 10 or 20 years in the "on shore" U.S. Unfortunately, much of it is closed to oil and gas exploration.

The Task Force on Mineral Lands Availability, created in the previous administration, recently submitted its final report on the availability of federally owned mineral lands to the Department of Interior. The task force reports, "The Overthrust Belt provides an example of the wide variety of restrictions placed on mineral development". That part of Overthrust Belt in which the Federal Government's policies severely restrict oil and gas development is significantly large.

Summary information on land administering agencies' land-use plans was not always available either to those interested in applying for oil and gas leases or to to Government decision-makers. Generally, restrictions on oil and gas leasing were for the purpose of protecting other resource values such as natural areas, proposed wilderness areas, wildlife refuges, other agency requests, etc. For the entire area, about 47 percent of the Federal lands are closed or restricted to varying degrees for oil and gas development, although not all of the restricted areas have high oil and gas potential.

That part of the Overthrust Belt within Utah is made up mostly of private and State surface ownership, with the Forest Service being the major Federal land-administering agency and with relatively little BLM land. Of the federally-owned lands within Utah's portion, about 25 percent are unavailable or restricted for oil and gas development. The 35 percent shown in this table includes the High Uintas Primitive area which is largely devoid of oil and gas potential. Other available lands include Federal lands with slight or no restrictions on leasing and Indian lands.

Federal lands in the Overthrust Belt of Idaho, Utah, and Wyoming where oil and gas leasing is prohibited or severely restricted.

OVERTHRUST BELT				
	IDAHO	UTAH	WYOMING	TOTAL
No oil or gas leasing or No surface occupancy	Forest Service Wilderness	High Uintas Primitive Area	Grand Teton National Park	
	Ft. Hall Indian Irrigation Project	Forest Service "No oil leasing"	Forest Service Wilderness Study Area	
	Bear Lake National Wildlife Refuge	BLM Classification Multiple Use Act Segregation	National Elk Refuge	
	Forest Service Roadless areas	BLM "No surface Occupancy"	Fossil beds National monument	
		Municipal Watershed	"Forest service objects to leasing"	
		Forest service Roadless areas	BLM "District Manager Objects to leasing"	
			Public Water Reserves	
			Forest Service Roadless Areas	
Acres	486,000	1,104,000	2.054,000	3,644,000
Leasing Severely Restricted	Power Site Reserves	BLM "Restricted Leasing Area"	BLM Wildlife & Watershed Areas	
	Stock Driveways	Bureau of Reclamation Withdrawals	Power Site Reserves	
		Power Site Reserves	Stock Driveways	
Acres	46,000	23,000	1,212,000	1,281,000
Total Closed or Restricted acres	532,000	1,127,000	3,266,000	4,925,000
Federal Oil and gas estate	1,994,000	3,208,000	5,368,000	10,570,000
Percent closed or restricted	27%	35%	61%	47%

Source: Final report of the task force on mineral lands availability.

RESEARCH SECTION
Dr. J. Wallace Gwynn, Chief

Geothermal Project:

In spite of the wet, muddy winter at Crystal Hot Springs, adjacent to the Utah State Prison, six geothermal gradient holes have been completed for the Survey by Burt Drilling Co., Mapleton, Utah. Temperature measurements reveal that water as hot as 85°C (185°F) is present in the ground to depths of 76 meters (250 feet). This water would be suitable for heating green houses or other structures in the vicinity.

Four more geothermal gradient holes will be drilled in the vicinity of Midway, Utah in the immediate future. They will be used to help evaluate the geothermal potential in that area. Other areas slated for investigation during the summer include Newcastle, Becks and Wasatch Hot Springs, Wendover, Little Mountain (west of Ogden) and Udy Hot Springs.

Dr. Hank Goode, consultant with the Research section of the UGMS, has completed a synthesis of the available data on low to moderate temperature water throughout the state. His report and accompanying maps will be published by the Survey.

The Survey's low to moderate temperature geothermal resource program is being financed by the U.S. Department of Energy and is part of an overall assessment being conducted throughout the sixteen western United States.

INFORMATION SECTION
Carlton Stowe, Chief

The Utah Mineral Industry Activity Review for 1977 will be published in the August issue of "Survey Notes" to allow a more accurate presentation. The report will include preliminary statistical information of the U.S. Bureau of Mines and State of Utah, Division of Oil, Gas and Mining's final 1977 production figures.

The Utah Mineral Industry Operator Directory of 1977 is currently being checked with records of the Utah Tax Commission, Secretary of State's office and other official sources. The directory, a widely used publication, is planned for updating and publishing every two years. The next issue will be published in 1979.

A preliminary edition of The Collector's Guide to Mineral and Fossil Localities in Utah, June 1977, was printed primarily for two large "rockhound" shows held at that time in the state. Since then work has continued in updating and checking the localities where interesting rocks, minerals, and fossils can be collected. We plan to have the complete publication available late in 1978.

U.G.M.S. maps, publications and Utah Geological Association guidebooks were displayed at the March meeting of the Rocky Mountain Section of the American Association of Petroleum Geologists (AAPG) and the Society of Economic Paleontologists and Mineralogists (SEPM) in Salt Lake City. UGMS, in a joint sponsorship effort with the Division of Industrial Promotion, displayed Utah natural resources information along with publications and maps at the national convention of the AAPG-SEPM in Oklahoma City in April. Carlton Stowe managed booths at the meetings. Utah information was very popular at both conventions, with sales exceeding $4,000.

ENVIRONMENTAL SECTION
Fitzhugh Davis, Chief

The environmental section, in cooperation with the U.S. Geological Survey, is making progress on a series of environmental maps along the Wasatch Front. The high concentration of Utah's population and industry along the geologically active Wasatch Front makes this an area of prime concern for planning. The publication of a series of maps that depict the geological and hydrological features of importance will be beneficial to all users and occupants of land along the front.

Compilation is presently proceeding on a geologic map, a surface hydrology map, and a surficial geology map. Other maps being considered are a mineral resources map, a subsurface hydrology map, and some type of earthquake ground response map. All the maps will be at a scale of 1:100,000.

STAFF MEMBERS EARN DEGREES

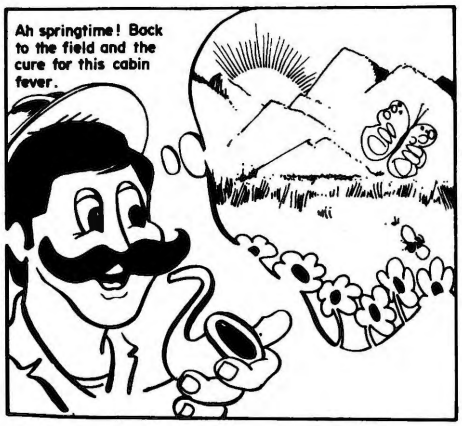
Jock Campbell successfully defended his doctoral dissertation, "Cenezoic Structure and Geomorphic Evolution of the Canyon Range, Southern Utah" on March 8, 1978, at the University of Utah.

Larry Trimble successfully defended his thesis, "Geology and Ore Deposits of the San Rafael River Mining Area" on November 23, 1977, at the University of Utah, and received his Master of Science degree in December 1977. Larry's thesis is included in UGMS Bulletin 113, coauthored with Hellmut Doelling, and soon to be published.

The highest elevation in the Oquirrh Mountains is Flat Top Mountain (10,620 feet) about 10 miles south of the Bingham mine in the southern part of the range.

ROCKY RIDGES

by Greg McLaughlin



UTAH COAL PRODUCTION SHOWS STEADY INCREASE

Compiled by H. H. Doelling

Table 1. Coal production by county, 1870-1977, in thousands of tons

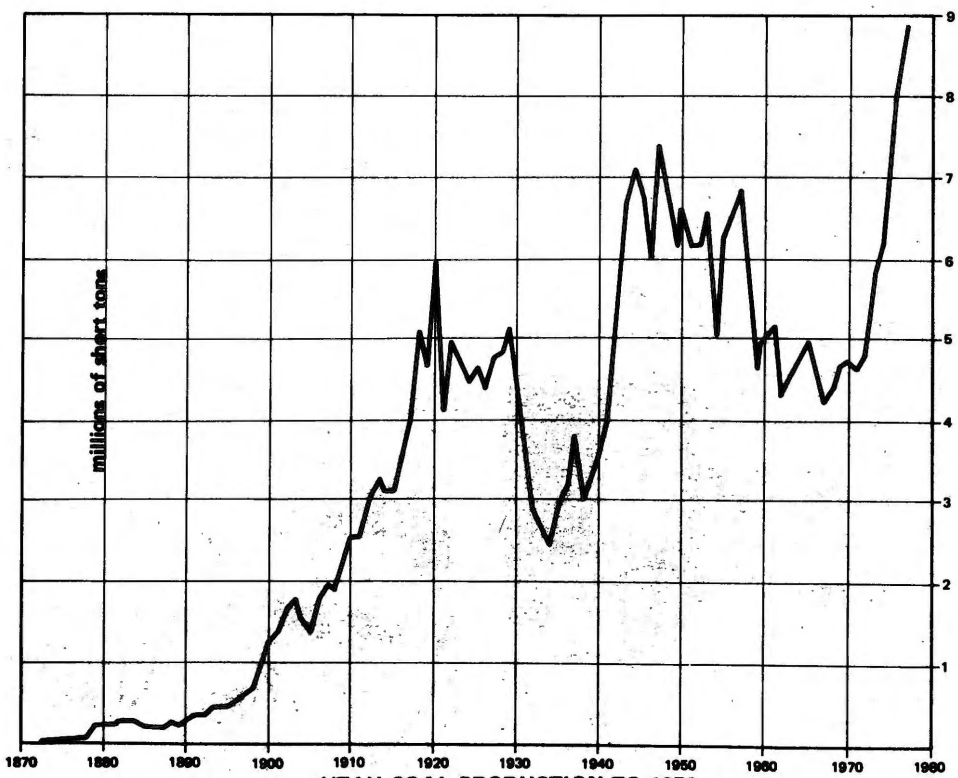
County	Through 1970	1971	1972	1973	1974	1975	1976	1977	Grand Total
Carbon County	248,000	3,347	2,956	2,866	2,754	2,984	3,868	4,390	271,165
Emery County	60,647	1,097	1,656	2,445	2,901	3,126	3,057	3,107	78,036
Grand County	2,650	---	---	---	---	---	---	4	2,654
Kane County	77	12	---	---	---	---	---	---	89
Sevier County	1,704	158	184	339	391	827	1,043	1,337	5,983
Summit County	4,244	12	6	---	---	---	---	---	4,262
Other counties	1,762	---	---	---	---	---	---	---	1,762
Totals	319,084	4,626	4,802	5,650	6,046	6,937	7,968	8,838	363,951

Table 2. Coal production by field, 1870-1977, in thousands of tons

Field	Through 1970	1971	1972	1973	1974	1975	1976	1977	Grand Total
Book Cliffs	208,800	2,738	2,507	2,467	2,187	2,241	2,534	2,722	226,196
Coalville	4,244	12	6	---	---	---	---	---	4,262
Emery	1,640	142	146	230	250	134	193	348	3,083
Kaiparowits Plateau	25	12	---	---	---	---	---	---	37
Sego	2,650	---	---	---	---	---	---	4	2,652
Wasatch Plateau	99,481	1,722	2,143	2,953	3,609	4,562	5,241	5,764	125,477
Other fields	2,244	---	---	---	---	---	---	---	2,244
Totals	319,084	4,626	4,802	5,650	6,046	6,937	7,968	8,838	363,951

THIRD HISTORICAL COAL PRODUCTION BOOM SINCE THE TURN OF THE CENTURY

Utah coal production has been steadily increasing each year since 1971. The graph shows the climb to the third historical "boom" period. In the first, the maximum annual production reached 6 million tons (1920), in the second it reached 7.4 million tons (1947). The latter figure was surpassed in 1976 and continues to climb. Coal production in 1980 is expected to reach 12 million tons and if anticipated projects come to fruition, production may reach 15 to 17 million tons by 1985. The phenomenal rise is due to the electrical power generation market. In 1970 only 18.4% of Utah coal was used to generate electricity. The best estimates indicate the figure to have risen to more than 60 percent of annual production in 1978. Tables 1 and 2 show Utah coal production since 1971 by county and coal field.



UTAH COAL PRODUCTION TO 1970

SPRING SEMINAR FOR SANITARIANS

Terrain Exploration and Soil Basics for Sanitarians was the subject of a seminar held in Salt Lake City on April 19, 20, 21.

Bruce N. Kaliser, chief engineering geologist, was coorganizer, with the Utah Division of Health, of the two and a half day seminar. Mr. Kaliser, who was also the chief speaker, has worked with the state's sanitarians for the past eleven years. As a result of his experience he has recognized the need for sanitarians to understand geologic criteria for fluid and solid waste disposal. This seminar was designed to demonstrate to members of the health profession the variety of geologic factors that relate to waste disposal and techniques for dealing with these factors.

The seminar included one half day of field observation. The participants were taken by bus to several localities throughout Davis County to observe testing in various geologic terrains. Exploration holes were kept open and percolation tests run to demonstrate procedures and to illustrate the importance of having some knowledge of subsurface conditions at prospective sites for waste disposal.

Topics discussed during the seminar included: Sources of geologic information; Soil and rock classification; Introduction to geomorphology; Terrain exploration techniques; Water movement through soil; Current status of the E.P.A. Land Treatment Guidelines; Soil as a wastewater treatment medium; Site evaluation for soil absorption of wastewater; Conventional soil absorption system design, and Construction and alternate wastewater disposal systems.

About 65 participants from throughout the state and beyond attended.

The Utah Geological and Mineral Survey and the Utah Division of Health were cosponsors of this Utah Environmental Health Association spring seminar. Working with Mr. Kaliser was Mr. Steven Thiriot, Association President, and the board of the Utah Environmental Health Association.

A barrel is a barrel is a barrel? A water barrel contains 31.5 gallons, a barrel of beer 31 gallons, and, despite the ubiquitons 55-gallon drum, the standard oil barrel contains 42 gallons.

TUSHAR MOUNTAINS MAY CONTAIN UNDISCOVERED MINERAL DEPOSITS

There is no gold rush yet, but new geologic studies of the Tushar Mountains of Utah, where metal mining has been going on for more than a century, indicate a significant potential for the discovery of additional ore deposits, according to three U.S. Geological Survey geologists, Charles G. Cunningham, Thomas A. Steven, and Charles W. Naeser.

New deposits of gold, silver, lead, zinc, uranium, molybdenum and possibly other economic minerals may be found in the Deer Trail Mountain-Alunite Ridge area in the Fish Lake National Forest in Piute County, Utah.

"Only peripheral types of deposits have been developed since ore was discovered in the 1870s," said Cunningham. "Undiscovered deposits at depth near the center of the mineralized area probably would be of the large, low-grade types where copper or molybdenum minerals are sparsely disseminated through large volumes of rocks."

The study of the Tushar Mountains is part of a larger USGS program to evaluate the mineral potential of an 8,120-square-mile (21,000-square-kilometer) area of Utah that includes all of Beaver County and parts of Piute, Iron, Garfield, Sevier, and Millard counties.

Copies of the report, "Preliminary Structural and Mineralogical Analysis of the Deer Trail Mountain-Alunite Ridge Mining Area, Utah." USGS Open-File Report 78-314, are available from the Open-File Services Section, Branch of Distribution, U.S. Geological Survey, P. O. Box 25425, Federal Center, Denver, Colorado 80225, Telephone 303-234-5888. Prices are $3.50 for each paper copy and $0.50 for each microfiche copy. Prepayment to the U.S. Geological Survey is required.

The highest point in the Wasatch Mountains is Mt. Timpanogos east of American Fork (11,750 feet). The highest elevation in the Wasatch east of the Salt Lake Valley is the eastern summit of the Twin Peaks (11,489 and 11,483 feet) south of Gad Valley in the Snowbird Ski Resort area (not to be confused with the Twin Peaks between Big and Little Cottonwood Canyons about 5 miles northwest).

CEDAR CITY GROUND SETTLING UNSETTLES DIKES

Three flood retention dikes constructed by the U.S. Department of Agriculture Soil Conservation Service to protect newer residential areas in southern Cedar City are showing effects of the ground subsidence that has been plaguing parts of Cedar City. Cracks in the dikes, which must be repaired by filling with mud, reappear; ground settling causes the earth of which the dikes are made to loosen and settle. As a result, the dikes may not be strong enough to hold back the flood waters they are designed to control.

In addition of the expense of maintaining dikes that were assumed by the city to be well engineered on sound sites, Cedar City may find itself liable for damages should the dikes fail. Since the dikes are also improperly used by off road recreational vehicles loosening of the earth of which the dikes are constructed could be hazardous to unwary motorists. Further liability might be created by the lack of protective devices along high cement walls which form part of the barriers in areas bordering urban communities.

Each year Cedar City incurs expenses and has demands placed on it as the result of lack of foresight by a federal agency which accepts none of the liability.

Arrow points to crack in dike caused by ground settling.

WASATCH FAULT MAPS AVAILABLE

Copies of 1:24,000 topographic quadrangle maps showing the Wasatch fault zone from Fayette north to the Idaho line are available at the UGMS sales office at $1.50 per sheet.

UGMS HOSTS HAZARDS MEET

Eighteen state and federal officials from Idaho, Montana, Utah, and Washington, D.C., gathered at the UGMS building on March 1st to discuss implementation of a national hazard warning program. Responsibility for carrying out the disaster warning procedures mandated by Public Law 93-288, known as the " Disaster Relief Act of 1974" has been assigned to the Director, U.S. Geological Survey.

Don Nichols, Hazards Information Coordinator, and Robert Matthews, Deputy Hazards Information Coordinator, both from USGS headquarters at Reston, Virginia, reviewed the procedures that had been proposed by the Director for recognition and warning of various kinds of geologic-related hazards and then described several examples that had been faced since the program started.

In one instance at Billings, Montana, a USGS geologist observed that a large slice had separated from The Rimrock at the Billings airport and was leaning outward at a precarious angle. Several houses below are immediately in the path of this rock which was judged to be on the verge of falling and so a warning notice was issued.

At Ventura, California, evidence of recent movement on a long recognized fault traversing the city was found by a geologist. Since the fault had been considered inactive a warning was issued that it should be considered active in future city planning.

At Las Vegas, Nevada, groundwater withdrawal has caused settling of the ground surface and development of numerous fissures. Recently, it was observed that some prominent fissures are following the lines of known faults, thus allowing predictions to be made of where future ground cracks may appear. The warning issued here should encourage placement of future buildings and utility lines away from zones of likely rupture.

After the review of these case histories the conferees, who were either geologists or emergency services people, were asked to discuss the program as it has evolved and to indicate what the best channels of communication from the U.S. Geological Survey to their states would be when a hazard warning was going to be issued. In Utah, Governor Matheson has designated Donald T. McMillan, Director of the Utah Geological and Mineral Survey, and Donald R. Spradling, Director of the Office of Emergency Services, as contacts for the national hazard warning network.

At the conclusion of the day-long meeting, it was agreed that many warnings would merely call attention to well-known hazards but that some would certainly identify new or previously unrecognized problems. As presently established, the national warning program does not actively seek out hazards but merely goes into action when USGS personnel encounter a geological situation that they consider a threat to life or property.

FIREFLOOD

(continued from page 1)

The experiment worked well. In the early phases, while the reservoir sandstone was kept relatively cool by the circulating air, the oil produced by flowing and pumping was heavy and viscous, about 14° API gravity, close to the unaltered oil contained in the reservoir. However, as the experiment continued, the wells became plugged with sand, heavy oil, and coke. Less air could circulate and reservoir temperatures rose to possibly 2000° F. Surprisingly, conditions underground began to simulate those in a refinery; the heavy oil was thermally "cracked," and the product which condensed out of the vapor stream was a much higher quality, less viscous oil, about 25° to 30° API. The high temperatures, however, destroyed thermocouples and caused casings to rupture and melt. It became very difficult and costly to cope with production problems. The decision to shut in the experiment was reached after a project review, involving everyone who worked on the experiment, concluded that continued operation faced insurmountable problems with little chance for obtaining additional valuable data.

The experiment area has been allowed to cool down, and a post-burn coring program has been successfully carried out to obtain data on the movement of the ignition front and its effect on the reservoir and wells.

Site of the fireflood in the Northwest Asphalt Ridge oil sand deposit is on land owned by Sohio Petroleum and contributed to the Department of Energy for the experiment. Location is 6 miles west of Vernal, a short distance north of State Highway 121.

ADMINISTRATION PROPOSAL ON MINING LAW OPPOSED

Three field hearings, held in Reno, Spokane, and Elko, by the House Mines and Mining Subcommittee on bills to change the federal mining laws turned up 150 witnesses. All but three witnesses opposed the Administration's proposal to establish a leasing system for hard-rock minerals.

Much of the testimony concentrated on bad experience with leasing systems governing coal, geothermal steam, phospate and potash. There was strong feeling that this should not be duplicated in the case of hard-rock mining.

Likewise, there was vigorous condemnation of any royalty provision. One witness cited the experience of British Columbia during the 2.5 year period when a royalty was in effect, when "not one new mine opened and several mines did close."

Straying somewhat afield from the subject, one witness voiced concern over the prohibition of mining in wilderness areas and declared "one can use wilderness lands only if you can walk six inches off the ground...." (from the American Mining Congress News Bulletin.)

POLLUTION CONTROL COST

The Arthur D. Little study, commissioned by the Environmental Protection Agency, shows the devastating impact of air and water pollution control costs on the copper industry and has stirred deep concern on Capitol Hill.

Rep. W. R. Poage (D - Tx) responded, this report "does in my opinion give a very fair and very disturbing picture of what is about to happen to the copper industry and its effect on our economy. I think that it is clear that those who have been concerned about the environment, our wilderness areas, etc., have become intoxicated with their own success. We all want to preserve the environment, but we can only do so at a cost. I think we must determine in each case whether the cost is too great." (from the American Mining Congress News Bulletin.)

REMEMBER THE DROUGHT?

"A good rain is the only quick solution to the problem of drought.. Unfortunately, a good rain washes away more than the drought, it washes away much of man's interest in providing for the next one, and it washes the supports from under those who know that another dry cycle is coming and who urge their fellows to make ready for it."(W.P. Webb, "More Water for Texas: the Problem and the Plan, " U. of Texas Press, Austin, 1954, quoted in J.R. Wallis, "Climate, Climatic Change and Water Supply," EOS: Transactions. American Geophysical Union, 58 (1977) p. 1012.)

In Memoriam

Marie P. Crane

Marie P. Crane (Mrs. Guy W.), 80, life-long resident of Utah, engineering draftswoman, retired chief of the drafting department of American Smelting Refining Company, died in Salt Lake City, February 8.

Born in Eureka, Utah, April 10, 1897, Marie grew up in intimate acquaintance with the Utah mining industry. She was a charter member of the Mineralogical Society of Utah and the Rock Artisans of Utah. Widely known and highly respected in the geological profession, her memory will be especially cherished by members of the UGMS staff, past and present, who knew her as a close friend.

Her splendid collection of Utah minerals displayed in the entry of the UGMS building is a fitting memorial to a woman of remarkable talent, wit and charm.

Henry E. Havenor

Henry E. Havenor, 91, geologist, editor, teacher, early curator of the University of Utah Geology Museum, stock broker, and mining and oil entrepreneur died April 15 in Salt Lake City. Mr. Havenor was a native of California and a graduate of the University of Utah.

SPRING LAKE LEVEL RISE NORMAL, IN SPITE OF WET WINTER, SPRING

The level of the Great Salt Lake continued its spring rise. Despite the wet winter and heavy mountain snow pack, the lake has not risen at an abnormal rate, indicating that much runoff is going into subsurface and surface reservoirs to replenish water supplies depleted in the brief but severe drought of 1976-1977.

The lake level on April 15 was 0.80 foot lower than on the same date a year ago and 2.3 feet below the Spring peak of 1976, which was the highest level in nearly half a century.

Gage heights recorded by the U.S. Geological Survey are:

Date	Boar Harbor (south arm)	Saline (north Arm)
February 1	4199.10	4198.05
February 15	4199.30	4198.25
March 1	4199.40	4198.30
March 15	4199.65	4198.50
April 1	4199.80	4198.50
April 15	4199.95	4198.60

GEOLOGISTS PROTEST

Geologists in Utah almost unanimously condemned the request of the Carter Administration for the resignation of Dr. Vincent McKelvey as Director of the United States Geological Survey. Dan Marriott, Representative from Utah, presented a petition signed by 212 Utah Geologists to Congress on Wednesday March 22, and had it entered in the Congressional Record.

Dr. McKelvey's public statements on the energy situation have been in contrast to the Carter Administration's energy "policy", making it appear that the request for his resignation is for political reasons. The petition demanded a "satisfactory explanation" from Secretary of the Interior Andrus.

UTAH GEOLOGICAL AND MINERAL SURVEY
SURVEY NOTES

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Department of Natural
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