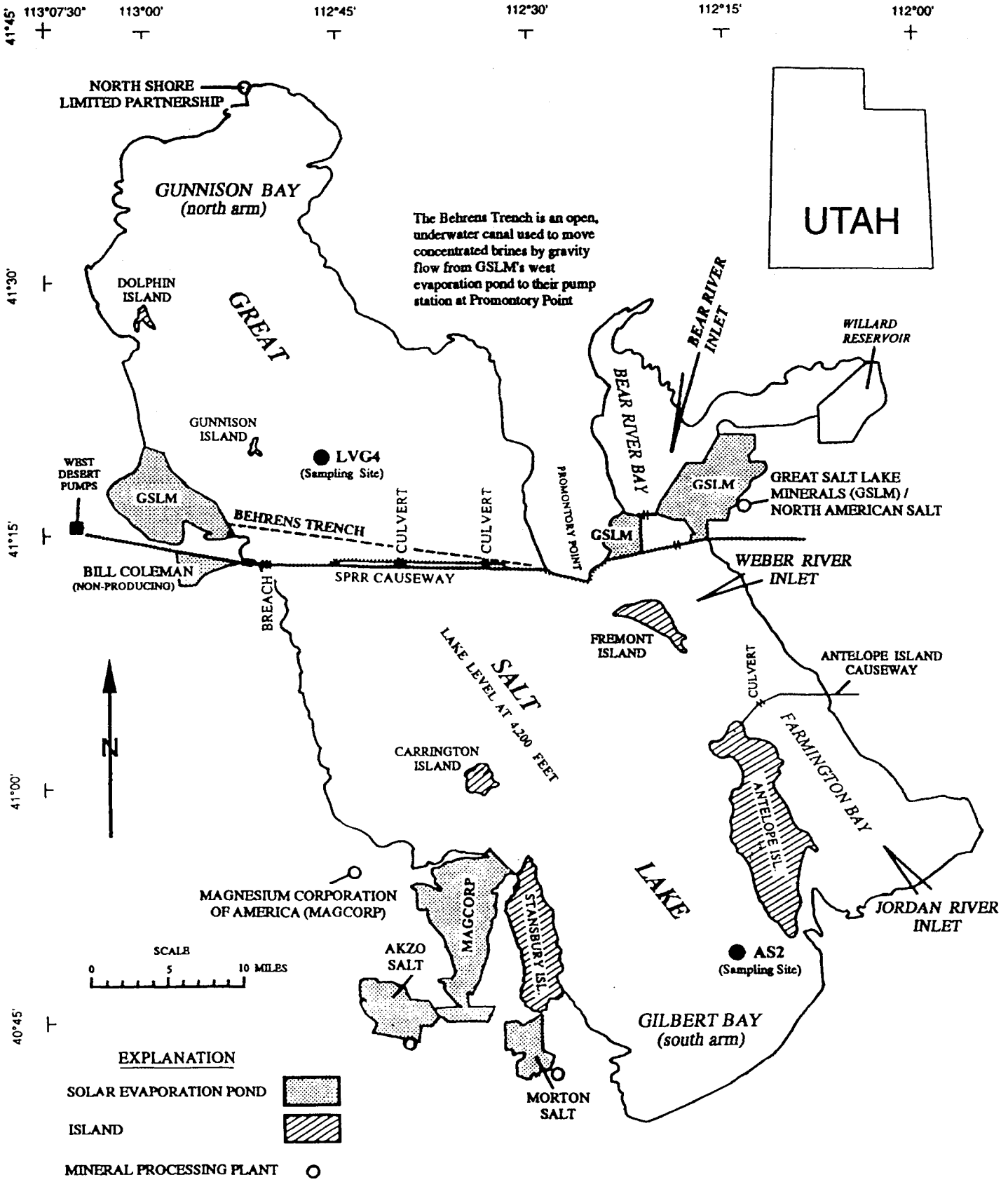


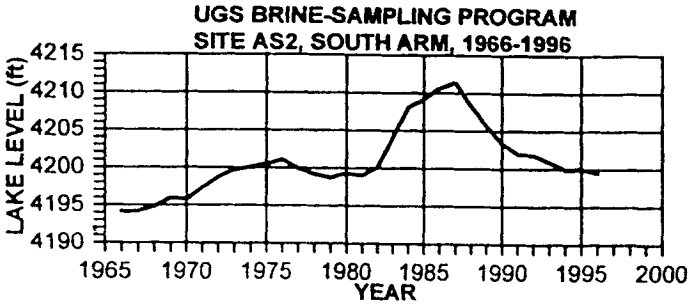
Public Information Series 51
Utah Geological Survey
a division of
Utah Department of Natural Resources

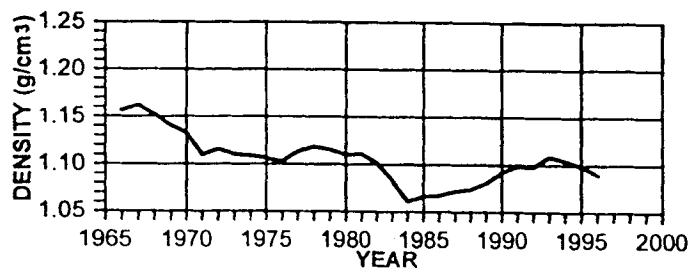
BRINE PROPERTIES, MINERAL EXTRACTION INDUSTRIES, AND SALT LOAD OF GREAT SALT LAKE, UTAH

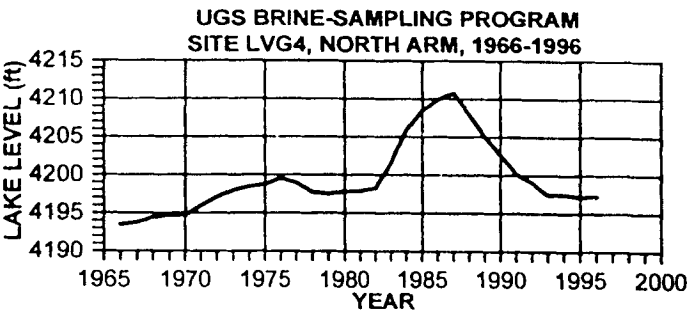
J. Wallace Gwynn - 1997

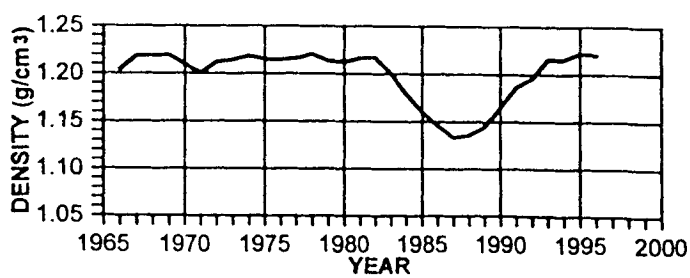
WATER DENSITY VERSUS LAKE ELEVATION

The graphs show average yearly lake elevation (feet above mean sea level) and water density (g/cm^3), a measure of salinity or salt content, for the south (site AS2) and north (site LVG4) arms of the lake from 1984 through 1996 (see map). The density of the south arm, which is fed by fresh-water tributaries, varies inversely with lake elevation. The north arm, which is fed by salty south-arm water, is more saline and less influenced by lake level. Farmington and Bear River Bays are much less saline than either the north or south arms of the lake.









WATER CHEMISTRY

Water chemistry, or the relative abundance of dissolved ions (dry-weight basis), remains relatively constant throughout both arms of the lake.

Table 1 shows the composition of dissolved salts in Great Salt Lake compared with the ocean (average composition), the Dead Sea, and Sevier Lake (Millard County, Utah).

Table 1. Comparison of different water chemistries

ION	GREAT SALT LAKE	OCEAN	DEAD SEA	SEVIER LAKE UTAH
Sodium	32.1	30.8	12.3	35.5
Potassium	2.3	1.1	2.3	1.4
Magnesium	3.7	3.7	12.8	1.6
Calcium	0.3	1.2	5.2	0.2
Chloride	54.0	55.5	67.1	49.1
Sulfate	7.6	7.7	0.1	12.1

MINERAL-EXTRACTION INDUSTRIES

Six mineral-extraction industries currently operate on Great Salt Lake (table 2). Cumulatively, these industries produced nearly 2.8 million tons of products during 1995, valued at about $300 million.

Table 2. Active mineral extraction industries

INDUSTRY	PRODUCT(S)
Magnesium Corporation of America (MAGCORP)	Primary magnesium metal, alloys, and chlorine gas
AKZO Salt Company	Sodium chloride products
Morton Salt Company	Sodium chloride products
Great Salt Lake Minerals Corporation (GSLM)	Potassium sulfate (fertilizer), magnesium chloride products
North American Salt Company	Sodium chloride products
North Shore Ltd. Partnership/ Mineral Resources International	Concentrated brines/ processed into dietary supplements

SALT LOAD AND POTENTIAL RESOURCES

Great Salt Lake contains about 4.5 billion tons of salt. Major changes in lake conditions, such as the 1980s flooding, breaching the Southern Pacific Railroad (SPRR) causeway in 1984, and West Desert pumping in 1987, have altered the balance of salt between the two arms. Raising the SPRR causeway during the 1980s reduced the permeability of the causeway and the bi-directional transfer of brines between the southern and northern arms. Because of this, there has been a constant loss of salt from the south arm of the lake to the north arm since 1994. The reduction in salinity is of great concern to the south-arm mineral-extraction industries and to the lake's multi-million dollar brine shrimp industry.

A buried, wedge-shaped body of natural sodium sulfate (mirabilite) extends westward from Promontory Point, beneath the SPRR causeway. Sodium sulfate is found cementing the near-shore sediments at shallow depths at numerous locations around the perimeter of the lake.