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A PRELIMINARY BIBLIOGRAPHY AND LAKE INDEX OF THE INLAND MINERAL WATERS OF THE WORLD

D. B. McCarraher
Hastings College, Hastings, Nebraska

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A PRELIMINARY BIBLIOGRAPHY AND LAKE INDEX OF THE INLAND MINERAL WATERS OF THE WORLD

Prepared by

D.B. McCarraher
Office of Limnology
Hastings College
Hastings, Nebraska, 68901 U.S.A.

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Preparation of this Document

This preliminary bibliography and lake index has been prepared by the author on the basis of information available in the Office of Limnology, Hastings College, Nebraska. Although all source material available there has been searched, it is recognized that many papers, especially those published in regional languages may have been left out. Readers are requested to point out such omissions and any inaccuracies that require correction.

This preliminary bibliography will be circulated among specialists in the subject for corrections to the citations and for suggested additions to the list. It is planned that the paper will then be revised to include abstracts of articles available to the compiler and issued as an FAO Fisheries Technical Paper.

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A PRELIMINARY BIBLIOGRAPHY AND LAKE INDEX OF THE INLAND MINERAL WATERS OF THE WORLD

The preparation of this bibliography and listing of inland mineral lakes is a first attempt to bring together knowledge of these lakes into a single document. The bibliography and lake index covers those bodies of water both temporal and permanent which historically and recently have not been adjoined by estuarine or marine waters. Their lake basins do not directly relate to marine environments, however, wind-blown salts may influence the chemical characteristics of lakes within close proximity to marine waters. The term "athalassic" (non marine) as proposed by Bayly (1967) appears to be an appropriate term for such inland mineral waters.

In the past it has been customary for many hydrobiologists to refer to all types of mineral lakes as saline without distinguishing the major ions present. In reviewing the published material the following ionic types are reported to be the most common (in order of abundance): $NaCl$, Na_2SO_4, $NaHCO_3$, $MgSO_4$, $CaSO_4$.

All possible intermediates of the above compounds do exist thus suggesting that the current terminology and usage of the term "saline waters" may not from the chemical viewpoint necessarily reflect the abundant proportion of anions, carbonates sulfates and chlorides.

The author has included in this bibliography and lake index only those papers concerning mineralized waters reported to contain salinities and/or conductivities above 3 000 ppm. Data recorded from lakes where the seasonal, annual or long-term periodic salinity varied from slightly below 3 000 ppm to greater concentrations were included. Many of the pre-1920 references have been omitted because more recent observations have updated the hydrobiological information for many of the lakes.

An internationally accepted classification of inland mineral waters formulated upon knowledge of chemical and biological indices needs to be considered. Several scientists have published accounts of classifications, based for the most part on chemical characteristics. Gorrell (1958) described freshwater (0-1 000 ppm); brackish (1 000-10 000 ppm); salty (10 000-100 000 ppm); brine (> 100 000 ppm) and used the sodium and chloride content of waters as the basis for his classification. Beadle (1959) discussed osmotic and ionic regulation of certain organisms in classifying inland saline waters. He proposed: (1) a lower range from fresh to about 15 000 ppm (1.5 percent) and colonized by species which are normal inhabitants of freshwaters; (2) a median range from 15 000 ppm (1.5 percent) to 50 000 ppm (5 percent) inhabited by species which show a preference for saline water; (3) greater than 50 000 ppm (5 percent) where several species of crustacea, i.e., phyllopoda, copepoda, cladocera, are dominant.

Bayly and Williams (1966), recognizing that the dividing line between "fresh" and "saline" non-marine waters is often arbitrary, adopted the convention that saline waters have a salinity greater than 3 000 ppm (0.3 percent). Rawson and Moore (1944) suggested an upper limit of 15 000 ppm (1.5 percent) salinity for the introduction of freshwater fish in the sodium-sulfate type lakes in Saskatchewan, Canada. Wilson and Kister (1956) described saline lakes in the U.S.A. on the basis of dissolved solids content (in ppm): slightly saline (1 000-3 000); moderately saline (3 000-10 000); very saline (10 000-35 000); brine (35 000).

The author with experience in hydrobiological studies of alkaline (bicarbonate-carbonate-hydroxide) lakes in Nebraska, U.S.A., recently classified alkaline habitats in relation to fish production along these lines: (1) slightly alkaline - <900 ppm alkalinity; (2) median alkaline 900-1 200 ppm alkalinity; (3) moderately alkaline - 1 200-1 900 ppm alkalinity; (4) strongly alkaline - > 1 800 ppm alkalinity. The basis for this provisional classification is contained in papers by the author (1970,1971).

The future need to more completely utilize the protein resources of saline-alkaline "athalassic" waters is apparent. Many such waters do not naturally produce maximum fauna crops and are thus potentially receptive towards increased production. Throughout many of the developing countries the more complete utilization of thousands of permanent and temporal mineral waters for the production of food could be of considerable importance in the global fight against hunger and malnutrition. It is in light of this awareness that this publication was prepared.

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Lake Index of the Inland Mineral Waters of the World

Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
AFRICA			
Algeria			
Bahr Inférieur	11 940	$Na-SO_4$	*Gobius fasciatus*
Dayet Morselli	35 810	$Na-Cl$	*Artemia salina*
El Bachir	69 570	$Na-SO_4$	
Fontaine Chaude	1 100 — 3 000	$Na-Cl$	*Tellia apoda*
Merdjadja	41 460	$Na-Cl$	*G. fasciatus*
Quargla Chott	67 820	$Na-Cl$	*A. salina*
Salines Arzew	136 270	$Na-Cl$	
Sebkha Oran	19 666	$Na-Cl$	
Chad			
Mare de Latir	172 000	$Na-SO_4$	
Rombou	23 900	$Na-HCO_3$	
Congo, People's Rep. of			
Gypse de Kapiri	3 000	$Ca-SO_4$	
Saline de Kimengwa	2 700 — 3 200	$Na-Cl$	
Saline de Gombela	20 496	$Na-SO_4$	
Saline de Muyuya	5 092	$Na-SO_4$	
Ethiopia			
Abiata	166 000 — 210 000		
Pawlo	9 100 — 10 600		
Shala	200 000 — 212 000		
Kenya			
Baringo	1 000 — 4 000	$Na-HCO_3$	*Tilapia nilotica*
Crescent			
Elmentaita	11 660 — 14 500	$Na-HCO_3$	
Hannington	53 600	$Na-HCO_3$	
Magadi	20 000 — 30 000	$Na-CO_3$	*Tilapia grahami*
Manyara			
Naivasha Crater	5 300 — 8 700		*Diaptomus* sp.
Nakuru	19 800 — 22 600	$Na-HCO_3$	
Ngomeni Dam			
Rudolf	3 465 — 4 400	$Na-HCO_3$	*Lates nilotica*, *Tilapia* sp.

	Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
Rhodesia	Guvalalla (Pan)	2 800—— 3 300	$Na-HCO_3$	Clarias mossambica
	Salt (Pan)	1 700—— 3 800	$Na-HCO_3$	Phyllopoda sp.
	Sidina	1 000—— 3 100	$Na-HCO_3$	C. mossambica
Rwanda				
	Mohasi	3 100——	Na-Cl	
South Africa				
	Barbers (Pan)	1 800—— 4 000	Na-Cl	Barbus sp.
	Eliazar (Pan)		Na-Cl	Branchinella ornata,
	Leeuwkraal (Pan)		Na-Cl	Strepocephalus sp.
	Nhlange	3 000—— 4 900	Na-Cl	
	Nyamandhlovu	2 500—— 3 800	Na-Cl	C. mossambica
	Salt (Pan)	211 400——	Na-Cl	
	Sifungwe	4 200—— 13 800	Na-Cl	
Sudan				
	Bogar (Pan)			
	Bokalia (Pan)			
	Faya (Pan)			
	Guro (Pan)		Na-Cl	
	Jikjik (Pan)		Na-Cl	
	Kishikishi (Pan)		Na-Cl	
	Kufara (Pan)			
	Kuruadi (Pan)		Na-Cl	
	Kurudi (Pan)			
	Madadi (Pan)		Na-Cl	
	Sarra (Pan)			
	Umm el Adam (Pan)		Na-Cl	
	Unianga Kebir			
	Yarda (Pan)		Na-Cl	
Uganda				
	Kako			
	Katwee	310 000——	Na-Cl	
	Kikorongo			
	Kitagata			
	Mahiga			
	Murumuli			

Lake	Salinity Range in ppm		Type	Fish Species/Invertebrates
ASIA AND THE FAR EAST				
Australia				
New South Wales				
Beads	2 444 ——	3 000	$Na-HCO_3$	
Jillamatong	21 244 ——		Na-Cl	
Queensland				
Buchanan	29 630 ——	87 624		
South Aust.				
Browne	3 855 ——		$Na-HCO_3$	
Edward	1 200 ——	3 000	$Na-SO_4$	
Eliza	276 729 ——		Na-Cl	
Emerald Springs	3 754 ——			
Eyre	115 000 ——		Na-Cl	
Hart	319 794 ——		Na-Cl	
Leake	5 139 ——		Na-Cl	
Leg of Mutton	3 000 ——	3 800	$Na-ClO_3$	
McDonnell	347 002 ——			
Pond near Eliza	61 900 ——		Na-Cl	
Tod Reservoir	1 367 ——	3 287	Na-Cl	
Weedina Springs	3 763 ——			
Tasmania				
Rushy	3 762 ——			
Templestowe	7 239 ——		$Mg-SO_4$	

Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
Australia			
Victoria			
Beeac	71 800 — 93 100	Na–Cl	Microcylops arnaudi, Calamoecia sp.
Bullenmerri	7 400 — 8 600	Na–Cl	Salmo trutta
Buloke	34 776 —		
Calverts Lagoon	3 362 — 8 100	Na–Cl	
Colac	3 674 —		
Coradgill	21 000 —	Na–Cl	Austrochiltonia sp.
Corangamite	22 000 — 63 000	Na–Cl	Austrochiltonia sp.
Crosby	332 870 —	Na–Cl	
Cundare	139 200 —	Na–Cl	
Gellies	15 630 — 55 980	Na–Cl	
Gnarpurt	17 900 —	Na–Cl	Austrochiltonia sp.
Gnotuk	12 220 — 55 980	Na–Cl	
Goldsmith	4 000 — 24 000	Na–Cl	
Kariah	22 300 —	Na–Cl	Austrochiltonia sp., Boeckella triarticulata
Keilambete	55 290 —	Na–Cl	
Modewarre	3 540 — 3 650	Na–Cl	
Murdeduke	5 580 — 9 750	Na–Cl	
Raak	320 510 —	Na–Cl	
Rosine	8 720 —	$Na–HCO_3$	
St. Clair (Pool)		Na–Cl	Boeckella triarticulata
Tim Dunn	37 410 —	$Na–SO_4$	
Weering	172 800 —	Na–Cl	
Western Aust.			
Clifton	7 953 — 24 000	Na–Cl	
Cowan	235 000 —		
Pond near Centre L.	108 900 — 290 800	Na–Cl	Parartemia zietziana
Wagin Dam	16 610 —		
White	141 900 —	Na–Cl	P. zietziana

Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
India			
Burdur			
Lonar	82 872	Na–Cl	
Periakulam Pool	3 000——— 4 200	Na–Cl	*Cyprinus* sp., *Chanos* sp.
Sakesar Kahar			
Sambhar	9 600———164 000	Na–Cl	*Artemia salina*
Vellore Moat	2 000——— 3 100	Na–Cl	*Cyprinus* sp., *Chanos* sp.
Virudunagar Pool	3 000———	Na–HCO_3	*Cyprinus* sp., *Chanos* sp., *Labeo* sp.

Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
EUROPE			
Hungary			
Feherto			
Medve	233 700——	Na-Cl	
Nagyszekto			
Palic	2 200—— 3 500	$Na-CO_3$	
Ruszanda	6 276——	$Na-SO_4$	
Italy			
Ganzirri (Sicily)	29 000——	Na-Cl	Engraulis russoi
Faro	34 000——	Na-Cl	E. russoi, Gobius sp.
Marinello	1 450—— 21 800		
Mergolo d. Tonnara	11 000—— 39 190		
Patria	10 000—— 14 000		Hydrobia, Palamontes sp., Odessia sp.
Sabaudia			
Verde	10 360—— 27 550		
Romania			
Lacu Sarat	58 038——	$Na-SO_4$	
Tekir-Chiol	70 877——	Na-Cl	
Turkey			
Aci			
Aksehir			
Bataklik			
Beysehir			
Burdur			
Cavuscu			
Eber			
Hoyran			
Iznik			
Kurusch	2 640——	$Na-HCO_3$	
Marmara			
Salda			
Sugla			
Tuz	250 000——		
Van	23 000——	Na-Cl	Alburnus tarihi

	Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
U.S.S.R.				
	Abalakh		$K-CO_3$	
	Ala-Kul	5 820——		Marinka, Cyprinus carpio, Perca sp.
	Balkhash	2 840—— 3 200	$Na-SO_4$	Acipenser sp., C. carpio, other species
	Baskuntschak	260 000——	Na-Cl	
	B. Bogatoe	352 000——	Na-Cl	
	Bolshoe	2 300—— 3 200	Na-Cl	Diaptomus salinus
	Burlinskoe		Na-Cl	Artemia salina
	Chana	2 800—— 3 500	Na-Cl	Fish species present, Rutilus sp.
	Chany			Fish species present
	Charkhal	5 900—— 6 600	Na-Cl	Rutilus sp., C. carpio, Stenodus sp., Esox sp.
	Dzhezkazgan	2 200—— 3 000	$Ca-SO_4$	C. carpio
	Ebeity	281 000——	Na-Cl	
	Elton	250 000——280 000	Mg-Cl	Dunaliella salina
	Gorkoe	60 000——	Na-Cl	Moina microcephala
	Issyk-Kul	5 820—— 6 300	$Na-SO_4$	Gobio sp., Phoxinus sp., Diptychus sp., Salmo sp., Leuciscus bergi, Leucis schmidti
	Kara-Kul	3 000—— 4 000	Na-Cl	Nemachilus sp.
	Kuchukskoe		Na-Cl	A. salina
	Petukhouskoe		Na-Cl	A. salina
	Sakskoe		Na-Cl	A. salina
	Sartlan	1 200—— 3 000	Na-Cl	Esox sp.
	Selenginskoe		$Na-SO_4$	
	Sulfatnoe	40 300——	Na-Cl	
	Tambukan	56 000——	Na-Cl	A. salina
	Tanatar			
	Turaly			

Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
LATIN AMERICA			
Brazil			
Escondida	5 350——	$Na-HCO_3$	
El Salvador			
Chanmico			
Coatepeque	1 100—— 3 000	Na-Cl	
Zapotitlan			
Guatemala			
Amatitlan		Na-Cl	*Callinectes* sp.
Atitlan		$Na-CO_3$	
Haiti			
Etang Bois Neuf	29 460—— 41 000	$Na-SO_4$	
Etang Saumâtre	7 432—— 10 300	Na-Cl	*Belonid* sp., *Gobius fasciatus*, *Dormitator* sp.
Honduras			
Yojoa			
Mexico			
Chichan-Kanab	4 446——	$Ca-SO_4$	
Coyuca	21 000—— 36 500	Na-Cl	
Tres Palos		Na-Cl	
Nicaragua			
Apeyo			
Nejapa	6 500—— 15 000	$Na-CO_3$	
Peru			
Encantada	3 900——	Na-Cl	
Huacachima		$Na-CO_3$	
Parinacochas	11 400—— 12 100	Na-Cl	

	Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
NEAR EAST				
A.R.E.				
	Mariut	15 300—— 56 000	Na-Cl	
	Natron	4 407—— 6 800	Na-CO_3	
	Qarun	19 600—— 29 430	Na-Cl	Tilipia zillii, Mugil cephalus, Solea vulgaris, Mugil saliens
Iran				
	Gaukhane	25 800——	Na-Cl	
	Maharlu	121 000——	Na-Cl	
	Niris	6 900——	Na-Cl	
	Schor-gol	31 300——	Na-Cl	Artemia salina
	Spring	4 000——	Na-Cl	
	Urmia	148 000——360 000	Na-Cl	A. salina
Iraq				
	Abbu-Dibis			
	Bahral Milh			
	Hawr al Habbanyah			
	Mileh Tharthar		Na-Cl	
Israel				
	Afikim Ponds	2 200—— 3 300	Na-Cl	Cyprinus carpio
	Dead Sea	32 000—— 34 000	Na-Cl	
	Dead Sea Pond A	4 500—— 8 600	Na-Cl	Tilapia nilotica, T. aurea and hybrids
	Dead Sea Pond B	3 800—— 11 800	Na-Cl	T. nilotica, Mugil cephalus
	Solar (Elat)	44 000—— 90 000	Na-Cl	A. salina, Robertsonia salsa
Libya				
	Tauorga			
Somali Republic				
	Abbe			
	Affambo			
	Gamarri			

Lake	Salinity Range in ppm	Type	Fish Species /Invertebrates
NORTH AMERICA			
Canada			
Alberta			
Czar	2 300—— 5 100	$Na-SO_4$	Esox lucius, Culaea inconstans
Fleeinghorse	2 000—— 5 384	$Na-SO_4$	
Gillespie	1 100—— 3 000	$Na-SO_4$	Pimephales promelas
Keoma	5 000—— 7 500	$Na-SO_4$	Branchinecta sp.
Miquelon	1 500—— 7 300	$Na-SO_4$	C. inconstans, E. lucius
British Columbia			
Boitano	4 000—— 9 000	$Na-SO_4$	Fish species present
Bowers	10 900—— 22 175	$Mg-SO_4$	
Box 4	3 000—— 20 000	$Na-HCO_3$	
GR 2	19 000—— 60 000	$Na-CO_3$	
Ironmask	13 600—— 72 300	$Na-SO_4$	
LB 1	13 750—— 14 750	$Mg-SO_4$	
Long	4 750—— 29 000	$Na-SO_4$	
Lyons	8 000——285 000	$Ca-SO_4$	
Mahoney	10 000—— 88 000	$Ca-SO_4$	
One Mile	35 500—— 65 000	$Mg-SO_4$	
Phalerope	2 820—— 9 000	$Na-HCO_3$	Fish species present
Polygon	13 300—— 77 900	$Na-SO_4$	
Rush	3 000—— 4 750	$Na-SO_4$	P. promelas
Three Mile	9 280—— 28 000	$Mg-SO_4$	
White	3 200—— 9 000	$Na-HCO_3$	Hybopsis sp.
Manitoba			
Beauford	8 386——	$Na-SO_4$	
Crawford	10 311——	$Na-SO_4$	
Eighteen	3 981——	$Na-SO_4$	Fish species present
Horseshoe	5 982——	$Na-SO_4$	
Nora	3 530——	$Mg-SO_4$	Salmo gairdneri
Raven	9 346——	$Na-SO_4$	
Salt	6 200—— 8 160	$Na-SO_4$	Fish species present
Shoal	6 281——	$Na-SO_4$	

Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
Saskatchewan			
Antelope	13 170——	$Na-SO_4$	
Basin	11 190——	$Na-SO_4$	
Big Quill	16 550—— 30 000	$Na-SO_4$	
Bitter	14 050——	$Na-HCO_3$	
Charron	7 080——	$Na-SO_4$	
Fishing	3 227—— 4 200	$Mg-SO_4$	*Pimephales promelas*
Last Mountain	2 402—— 3 100	$Na-SO_4$	*S. vitreum*, *Catostomus* sp., *Lota lota*
Lenore	6 034——	$Mg-SO_4$	*E. lucius*, *Perca flavescens*
Little Manitou	80 114——118 700	$Na-SO_4$	*A. salina*
Little Quill	10 850—— 21 387	$Na-SO_4$	*G. aculeatus*
Manito	15 530—— 20 268	$Mg-SO_4$	
Redberry	11 572—— 14 946	$Mg-SO_4$	
Soda	9 318——	$Na-SO_4$	
Stoney	4 627—— 8 536	$Mg-SO_4$	*Gasterosteus aculeatus*
Wakaw	2 800—— 3 300	$Mg-SO_4$	Fish species present

Lake		Salinity Range in ppm	Type	Fish Species/Invertebrates
United States of America				
Arizona				
	Green Pond	61 300——112 000	$Na-HCO_3$	Artemia salina
	Painted Rock	4 800—— 15 000	Na-Cl	Tilapia mossambica, Gambusia affinis
	Papago	1 900—— 3 800	Na-Cl	Diaptomus dorsalis
	Red Pond	220 000——	Na-Cl	Artemia salina
California				
	Badwater	27 750—— 43 700	Na-Cl	Cyprinodon nevadensis
	Bristol (playa)	279 000——	Na-Cl	
	Cadiz (playa)	73 600——	Na-Cl	
	Dale (playa)	298 000——	Na-Cl	
	Danby (playa)	271 000——	Na-Cl	
	Elsinore	8 800—— 60 000	Na-Cl	
	Kane (playa)	210 000——	Na-Cl	
	Mono	50 000—— 60 000	Na-Cl	Artemia salina
	Owens	60 000—— 80 000	Na-Cl	Artemia salina
	Salton Sea	32 000—— 35 800	Na-Cl	Anisotremus davidsoni, Bairdiella sp., Cynoscion sp.
	Searles (playa)	344 000——	Na-Cl	
Colorado				
	Banner#12	3 140—— 4 928	$Na-SO_4$	Fundulus kansae, Archoplites interruptus, Lepomis gibbosus, Pimephales promelas
	Banner#13	3 521—— 6 924	$Na-SO_4$	F. kansae, A. interruptus, P. promelas
	Big Swede	5 486—— 8 400	$Na-SO_4$	
	Gaynor	4 524—— 7 200	$Na-SO_4$	
	Henry	900—— 3 000	$Na-SO_4$	L. gibbosus, Pomoxis sp., Ictalurus melas, Cyprinus carpio
	Meridith	4 264—— 11 415	$Na-SO_4$	I. melas, C. carpio, L. gibbosus
	Midge	11 094——	$Na-SO_4$	F. kansae
	Muddy	4 200—— 5 800	$Na-SO_4$	
	Nee Grande	10 100—— 14 300	$Na-SO_4$	F. kansae
	Newell	6 800—— 19 862	$Mg-SO_4$	F. kansae, L. gibbosus, A. interruptus, C. carpio
	Queens	2 355—— 3 143	Na-SO	L. gibbosus, I. melas, C. carpio, Stizostedion vitreum, Roccus chrysops

	Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
Kansas				
	Dry (playa)	6 000—— 12 500	$Na-SO_4$	Phyllopoda sp.
	Little Salt Marsh	4 800—— 8 800	$Na-SO_4$	Fundulus kansae
	Salt	11 000—— 14 500	Na-Cl	F. kansae
	Slate Valley	7 700—— 38 000	Na-Cl	
	Wilson Res.	1 600—— 3 000	Na-Cl	Stizostedium vitreum, Morone saxatilis
Montana				
	Alkali		$Na-SO_4$	
	Box Elder	980—— 2 000	$Na-HCO_3$	Salmo gairdneri
	Brush	6 000—— 7 500	$Na-SO_4$	Culaea inconstans
	Crane		$Na-SO_4$	
	Lost	153 787——	$Na-SO_4$	
	Medicine	2 300—— 3 000	$Na-HCO_3$	Pimephales promelas, Esox lucius, C. carpio, C. inconstans, Catostomus commersoni
	Plentywood	115 000——125 000	$Na-SO_4$	
	South Westby	91 000——	$Na-SO_4$	
	Westby	137 000——	$Na-SO_4$	
Nebraska				
	Alkali#1		$Na-HCO_3$	Branchinecta lindahli
	Alkali#2	52 300—— 66 500	$K-CO_3$	Artemia salina
	Antioch	15 300—— 26 780	$Na-CO_3$	Moina sp.
	Ashenburger	43 000—— 47 500	$Na-CO_3$	A. salina
	Bean	3 200—— 3 825	$Na-HCO_3$	
	By-Way	2 600—— 4 200	$Na-HCO_3$	P. promelas
	Cook	58 000—— 66 200	$Na-CO_3$	A. salina
	Cravath	3 300—— 6 200	$Na-HCO_3$	Diaptomus sp.
	Diamond	4 200—— 12 350	$Na-HCO_3$	Diaptomus sp.
	East Twin	2 600—— 4 650	$Na-HCO_3$	P. promelas
	East Valley	79 000—— 82 000	$Na-CO_3$	A. salina
	Goose	2 400—— 3 800	$Na-HCO_3$	Diaptomus sp.
	Grubny	30 000—— 35 500	$Na-CO_3$	A. salina
	Homestead	11 600—— 16 800	$Na-CO_3$	A. salina
	Jennings	3 400—— 4 500	$Na-HCO_3$	Diaptomus sp.
	Jesse	52 300—— 78 600	$Na-CO_3$	A. salina
	Kennedy	6 200—— 8 800	$Na-CO_3$	
	Lakeside	16 100—— 28 500	$Na-CO_3$	Diaptomus sp.
	Lilly	12 300—— 14 500	$Na-CO_3$	Branchinecta sp.

Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
Nebraska cont.			
Little Alkali	3 450——— 6 200	$Na-HCO_3$	*Diaptomus* sp.
Lost	5 490———	$Na-HCO_3$	
McKeel	1 100——— 4 500	$Na-HCO_3$	*Pimephales promelas*
Miles	7 400——— 9 600	$Na-CO_3$	
Patton	5 200——— 6 900	$Na-CO_3$	
Reno	32 100———	$Na-CO_3$	*Artemia salina*
Richardson	36 000——— 41 500	$Na-CO_3$	*A. salina*
Potash	15 200——— 26 000	$K-CO_3$	*Branchinecta* sp.
School	2 850——— 3 920	$Na-HCO_3$	*P. promelas*
Smithys	3 200——— 4 800	$Na-HCO_3$	*P. promelas*
Walters	3 500——— 8 600	$Na-HCO_3$	*Diaptomus* sp.
West Long#1	2 850——— 4 380	$Na-HCO_3$	*Branchinecta* sp.
Nevada			
Big Soda	24 700———113 700	$Na-Cl$	
Carson		$Na-Cl$	*Siphateles* sp.
Little Soda	5 310——— 8 697	$Na-SO_4$	*A. interruptus*, *Siphateles* sp.
Pyramid	4 700——— 5 800	$Na-Cl$	*A. interruptus*, *Salmo clarki*, *Catostomus tahoensis*, *S. bicolor*
Twin	2 500——— 3 100	$Na-SO_4$	*S. bicolor*, *S. clarki*, *Rhinichthys* sp.
Walker	6 850——— 10 300	$Na-Cl$	*S. clarki*, *S. bicolor*, *A. interruptus*, *C. tahoensis*
New York			
Fayetteville-Green	2 200——— 3 100	$Ca-SO_4$	
Onondaga	5 000——— 5 800	$Ca-Cl$	
Round	2 300——— 3 000	$Ca-SO_4$	

Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
New Mexico			
Bitter	7 000—— 27 300	Na-Cl	
Black	1 700—— 33 000		
Cottonwood	4 000—— 8 100	$Na-SO_4$	Salmo gairdneri, C. macularius, F. zebrinus
Devils Inkwell	4 100—— 4 830	$Na-SO_4$	F. zebrinus, S. gairdneri, C. carpio, Micropterus salmoides, L. cyanellus
Figure Eight	9 240—— 11 000	$Na-SO_4$	F. zebrinus, C. macularius
Lazy Lagoon	25 000——	$Na-SO_4$	Cyprinodon rubrofluviatilis macularius
Lea	7 220—— 10 600	$Na-SO_4$	Cyprinodon macularius
Lander Springbrook	2 782—— 3 300	$Mg-SO_4$	Gammarus sp.
Pasture	3 900—— 6 800	$Na-SO_4$	F. zebrinus, S. gairdneri, C. macularius
Willow	3 465—— 4 200	$Mg-SO_4$	F. zebrinus, C. macularius
North Dakota			
Blue		$Na-SO_4$	
Brekken		$Na-SC_4$	
Clearwater			
Cottonwood	8 532——	$Na-SO_4$	
Cranberry	23 100——	$Na-SO_4$	
Crooked	13 973—— 16 400	$Mg-SO_4$	
Douglas A	51 857——	$Na-SO_4$	
Devils	3 000—— 12 500	$Na-SO_4$	Esox lucius
Eastern Stump	60 000——108 000	$Na-SO_4$	
Free Peoples	8 600——	$Na-SO_4$	
George	15 200—— 15 800	$Na-SO_4$	
Horseshoe	5 630——	$Na-SO_4$	
Lower Lostwood	93 180——	$Na-SO_4$	
McKone	142 600——	$Na-SO_4$	
Miller	185 000——	$Na-SO_4$	Artemia salina
Moon	5 400—— 6 200	$Na-SO_4$	S. gairdneri, Gasterosteus aculeatus
Nettie			
Nyston			
Nelson			
Round	2 600—— 3 200	$Na-HCO_3$	A. interruptus, Gasterosteus aculeatus
Shell			
Seven Mile			
Sletton			
Spring	4 190——	$Na-SO_4$	

	Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
North Dakota cont.	Stink (Williams)	120 000——	$Na-SO_4$	Artemia salina
	Standley A	199 813——	$Na-SO_4$	
	Three Mile	19 565——	$Na-SO_4$	
	Thompson			
	Turtle			
	Westby A	191 000——	$Na-SO_4$	
	Westby B	157 000——	$Na-SO_4$	
	Westby C	128 000——	$Na-SO_4$	
	Western Stump	3 100—— 6 470	$Na-SO_4$	
	White	94 327——	$Na-SO_4$	
Oklahoma				
	Salt Plains Res.	2 600—— 4 100	Na-Cl	Cyprinus carpio, Fundulus kansae
Oregon				
	Abert	10 400—— 21 600	Na-Cl	
	Bluejoint	3 640——	$Na-CO_3$	
	Harney	22 000——	Na-Cl	
	Summer	18 000—— 36 000	Na-Cl	
South Dakota				
	Bitter	8 720—— 46 000	$Na-SO_4$	
	Byron	1 600—— 6 500	$Na-SO_4$	
	Cooley	40 890——343 900	$Na-SO_4$	
	Ft. Sissaton	2 000—— 3 200	$Mg-SO_4$	
	Horseshoe	4 300—— 32 000	$Mg-SO_4$	
	Hazelden	7 060—— 31 900	$Na-SO_4$	
	Long	9 000—— 18 600	$Mg-SO_4$	
	Medicine	35 000—— 83 700	$Mg-SO_4$	
	Mckillicans	5 176—— 8 846	$Mg-SO_4$	
	Minnewasta	1 800—— 3 200	$Na-SO_4$	Ictalurus melas
	Nicholson	80 292——206 108	$Na-SO_4$	
	Oakwood	2 500—— 3 100	$Mg-SO_4$	
	Piyas	2 570—— 4 380	$Mg-SO_4$	Pimephales promelas
	Red	2 200—— 7 100	$Na-SO_4$	P. promelas
	Round	8 800—— 20 435	$Mg-SO_4$	
	Stink	11 920—— 29 765	$Na-SO_4$	
	Waubay	4 690—— 11 200	$Mg-SO_4$	Gasterosteus aculeatus

	Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
Texas				
	Balmorhea	2 230——— 3 400	Na-Cl	Fish species present
	Bull	14 000——— 17 600	Na-Cl	
	Cedar	95 200———	Na-Cl	
	Coyote	23 000——— 28 000	Na-Cl	
	Danial Salt Res.	136 000———	$Na-SO_4$	
	Ft. Stockton	2 100——— 3 800	$Na-SO_4$	Fish species present
	Hamlin	3 100——— 4 600	Na-Cl	C. carpio, Fundulus sp., Carpiodes sp., I. melas
	Imperial Res.	14 000——— 20 000	Na-Cl	Paralichthys lethostigma, Sciaenops ocellata
	Kemp	2 830——— 3 400	Na-Cl	Fish species present
	Pauls			
	Red Bluff Res.	6 400——— 16 200	Na-Cl	Morone chrysops, S. ocellata, other species
	Rich	92 000———	$Na-SO_4$	
	Silver	19 200——— 22 500	$Na-SO_4$	
	Tahoka (playa)	120 000———	Na-Cl	Artemia salina
	Toyah	2 200——— 10 200	$Na-SO_4$	Fish species present
	White			
Utah				
	Great Salt	26 500——— 39 000	Na-Cl	A. salina
	Sevier	3 000——— 9 500	Na-Cl	
Washington				
	Blue	3 864——— 8 284	$Na-SO_4$	
	Clear			
	Hot	169 000———390 000	$Mg-SO_4$	
	Lenore	12 000——— 16 900	$Na-CO_3$	
	Lower Goose	41 480———	$Na-SO_4$	
	Medical			
	Moses	2 900——— 3 500	$Na-CO_3$	
	Newman			
	Omak	5 123——— 6 000	$Na-CO_3$	Salmo clarki, Hybopis sp., Catostomus rimiculus
	Soap	26 185——— 37 112	$Na-CO_3$	
	Wannacutt	7 864——— 12 415	$Mg-SO_4$	S. clarki

Lake	Salinity Range in ppm	Type	Fish Species/Invertebrates
Wyoming			
Alkali Res.	3 750——	$Ca-SO_4$	Fish species present
Aurora	2 600—— 3 400	$Na-SO_4$	Fish species present
Chases Res.	3 280——	$Na-SO_4$	Salmo gairdneri
Clark Res.	2 800—— 3 200	$Na-SO_4$	S. gairdneri
Cranes Res.	2 800—— 3 500	$Na-SO_4$	
Gillette Res.	6 100——	$Mg-SO_4$	
Jackson	57 700——	$Na-SO_4$	
Miller	21 000——	$Na-SO_4$	
Mud Springs Res.	2 820—— 3 800	$Mg-SO_4$	Fish species present
Oliver Res.	2 900—— 3 300	$Na-SO_4$	S. gairdneri
Peters Res.	6 300—— 7 500	$Mg-SO_4$	S. gairdneri
Pickett #2	6 000——	$Na-HCO_3$	
Soda #1	4 260—— 5 300	$Na-SO_4$	Fish species present
Y Res.	5 000—— 7 300	$Na-SO_4$	S. gairdneri