U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

# BORATE DEPOSITS

by

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Open-File Report

95-842



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# INTRODUCTION

The data on the borate deposits listed in this report were collected from 1988 to 1995 as part of a larger study. Data for the United States were largely obtained from published reports and Federal agency records. Much of the data for Turkey and Latin America came from dissertations, unpublished reports, and reports published in other languages. Data for China are largely based on information submitted to the U.S. Geological Survey's Minerals Resources Data System (MRDS) by R.P. Langford of BHP which were augmented by the author from limited published reports.

Table 1 lists known borate deposits sorted by country and then site name. Data listed for each deposit includes location, mineralogy, host rock and age, associated volcanic rocks and ages, and references that refer to that site. Additional information includes whether there are known associated springs, whether or not the deposit crops out at the surface, and if the deposit is known to have produced any borates. The reader should be aware that there may be significant uncertainty to the latitudes and longitudes depending on the availability and scale of maps for a given area. There are a handful of deposits where the author was unable to determine latitude and longitude with any certainty. Codes used in the deposit type and production fields are listed in tables 2 and 3, respectively.

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| ***Argentina*** | | | | | | | |
| Acazoque | S | | 24-17-30S | 066-20-30W | I010159 | P | borax, ulexite |
| Alejandra Occurrence | S | | 25-09-58S | 066-59-25W | AR15302 | O | |
| Alex Prospect | S | | 25-11-52S | 067-02-13W | AR15289 | O | |
| **Archibarca Ravine area** | D | Archibarca Ravine area | | | | | |
| Adriana | S | Archibarca Ravine area | 23-37- S | 067-05- W | I01044 | SP | ulexite |
| Lari | S | Archibarca Ravine area | 23-30- S | 067-00- W | I010152 | SP | ulexite, borax |
| Los Bayos | S | Archibarca Ravine area | 23-37- S | 067-05- W | I010149 | SP | ulexite |
| Tropa Pete | S | Archibarca Ravine area | 23-35- S | 067-05- W | I000728 | SP | ulexite, tincalconite? |
| Berta Prospect | S | | 25-15-16S | 067-04-03W | AR15290 | O | |
| Blanca Lila Mine | S | Salar de Blanca Lila | | | AR15107 | P | ulexite |
| Boratera de Antuco | S | | 24-10-19S | 066-40-16W | I000320 | SP | ulexite |
| Celti Occurrence | S | | 23-10-38S | 066-36-45W | AR08254 | P | ulexite |
| Coyaguaima | | | | | | | ulexite, minor borax |
| | | | 22-46-35S | 066-33-30W | I000321 | SP | |
| El Toro | S | | | | I010150 | SP | ulexite |
| La Mucar | S | | 23-22-38S | 067-04-59W | AR08158 | P | ulexite |
| Laguna Guachalayte | S | | 23-05-51S | 066-57-39W | AR08154 | P | ulexite |
| **Laguna Guayatayoc** | D | Laguna Guayatayoc | 23-15- S | 065-50- W | I000312 | P | ulexite |
| Baratoyoc Mine | S | Laguna Guayatayoc | 23-20-17S | 065-52-14W | AR08177 | P | ulexite |
| Grupo Cordoba | S | Laguna Guayatayoc | 23-25-52S | 065-51-56W | AR08260 | P | ulexite |
| **Laguna Vilama** | | | | | | | ulexite |
| | D | Laguna Vilama | 22-36- S | 066-55- W | I000313 | P | |
| Boratera Vilama I-II | | | | | | | ulexite |
| | S | Laguna Vilama | 22-34-05S | 066-54-15N | AR08056 | P | |
| Cerro Bayo | | | | | | | ulexite |
| | S | Laguna Vilama | 22-33-50S | 066-53-30W | I009005 | P | |
| Lagunita | S | | 23-00- S | 066-32- W | I010151 | P | inyoite, ulexite |
| Libertad | S | | 23-16-16S | 066-44-24W | AR08155 | SP | ulexite |
| Loma Blanca | | | | | | | borax, inyoite, ulexite, colemanite, |
| | S | | 23-03- S | 066-27- W | I000505 | BD | hydroboracite |
| Maria Teresa | S | | 25-15-16S | 067-00-02W | AR15291 | P | |
| Oire | S | | 24-48- S | 066-45- W | I010148 | SP | ulexite |
| Ojo de Agua | S | | 23-00- S | 066-42- W | I010147 | SP | ulexite |
| **Rio Alumbrio Spring Area** | | | | | | | ulexite |
| | D | Rio Alumbrio Spring area | 23-00-10S | 066-32-00W | I000314 | SP | |
| Arituzar Mine | S | Rio Alumbrio Spring area | 22-59-24S | 066-30-06W | AR08059 | SP | ulexite |
| Calichar | S | Rio Alumbrio Spring area | 23-00- S | 066-35- W | I010145 | SP | ulexite |
| Cañuelas | S | Rio Alumbrio Spring area | 22-59-10S | 066-30-20W | I010142 | SP | ulexite |
| Daniel Mine | S | Rio Alumbrio Spring area | 22-59-01S | 066-29-16W | AR08058 | SP | ulexite? |
| San Marcos | S | Rio Alumbrio Spring area | 23-00- S | 066-30- W | I010146 | SP | ulexite |
| Volcancito | S | Rio Alumbrio Spring area | 23-00- S | 066-33- W | I000319 | SP | ulexite |
| **Salar Centenario** | D | Salar Centenario | 24-52- S | 066-42- W | AR15098 | P/BR | ulexite, borax, brine |
| Anatuya Prospect | S | Salar Centenario | 24-50-56S | 066-47-37W | AR15101 | P | ulexite |
| Boroquimica Samicaf Mines | S | Salar Centenario | 24-49- S | 066-43- W | AR15100 | P | ulexite |
| La Argentina | S | Salar Centenario | 24-53- S | 066-45- W | I009020 | P | ulexite |

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| Maggie | S | Salar Centenario | 24-54- S | 067-44-30W | I009019 | P | ulexite |
| Mataro Prospect | S | Salar Centenario | 24-54-30S | 066-44-30W | AR15104 | P | ulexite |
| Maria Luisa I-II Occurrence | S | Salar Centenario | 25-07-22S | 066-50-40W | AR15295 | P | ulexite |
| Purmamarca Mine | S | Salar Centenario | 24-57-05S | 066-44-22W | AR15099 | P | ulexite |
| Salar de Antofalla | S | | 25-44- S | 067-55- W | I000506 | BD | ulexite |
| **Salar de Cauchari** | | | | | | | ulexite, borax, tincalconite, colemanite, |
| | D | Salar de Cauchari | 23-45- S | 066-45- W | I000311 | P/BD | howlite |
| Campamento Primero de Mayo | S | Salar de Cauchari | 24-01-35S | 066-47-55W | AR08267 | P | ulexite |
| Carlota-Corina | S | Salar de Cauchari | 24-03- S | 067-50- W | I010109 | P | ulexite? |
| Cinco Occurrence | S | Salar de Cauchari | 23-39-33S | 066-41-53W | AR08263 | P | ulexite |
| Defensa I-II-II Occurrences | S | Salar de Cauchari | 23-56-31S | 066-46-41W | AR08268 | P | ulexite, borax? |
| El Porvenir | S | Salar de Cauchari | 23-44-30S | 066-44-08W | AR08264 | P | ulexite |
| La Inundada | S | Salar de Cauchari | 23-54-02S | 066-45-45W | AR08266 | P | borax, ulexite |
| Mascota | S | Salar de Cauchari | 23-35-06S | 066-41-00W | AR08262 | P | ulexite |
| San Pedro | S | Salar de Cauchari | 23-58-47S | 066-47-12W | AR08269 | P | ulexite, borax |
| Siberia | S | Salar de Cauchari | 23-46-53S | 066-44-23W | AR08265 | P | ulexite |
| Salar de Incahuasi | S | | 24-15- S | 067-38- W | I000730 | P | borates? |
| **Salar de Jama** | | | | | | | ulexite, tincalconite? |
| | D | | 23-20- S | 067-00- W | I000318 | P | |
| Benito I-II | S | Salar de Jama | 23-22-53S | 066-59-53W | AR08159 | P | ulexite |
| Jama Mine | S | Salar de Jama | 23-15-14S | 067-00-00W | I009000 | P | ulexite |
| Maria Luisa | S | Salar de Jama | 23-24-07S | 066-57-19W | AR08160 | P | ulexite |
| San Francisco | S | Salar de Jama | 23-18-35S | 067-01-35W | AR08157 | P | ulexite |
| **Salar de Llullaillaco** | | | | | | | ulexite |
| | D | Salar de Llullaillaco | 24-51- S | 068-16-30W | I000732 | P | |
| Adela | S | Salar de Llullaillaco | 24-49-55S | 068-14-40W | AR15269 | P | ulexite |
| **Salar de Olaroz** | D | Salar de Olaroz | 23-30- S | 066-40- W | TC00580 | P | ulexite, borax? |
| El Condor | S | Salar de Olaroz | 23-24-36S | 066-39-07W | AR08257 | P | ulexite |
| Grupo San Nicolas | | | | | | | ulexite |
| | S | Salar de Olaroz | 23-26-13S | 066-39-29W | AR08258 | P | |
| Santa Ines | S | Salar de Olaroz | 23-27-54S | 066-39-29W | AR08259 | P | ulexite |
| Yacare | S | Salar de Olaroz | 23-28-45S | 066-43-15W | AR08162 | P | ulexite |
| **Salar de Pastos Grandes** | | | | | | | ulexite, inyoite, hydroboracite, |
| | D | Salar de Pastos Grandes | 24-40- S | 067-20- W | I000322 | BD/P/BR | meyerhofferite |
| Betina Mine | S | Salar de Pastos Grandes | 24-33-56S | 066-39-43W | AR15110 | P | ulexite |
| Boratera Blanca Lila | | Salar de Pastos Grandes | 24-30-24S | 066-43-00W | AR15107 | P | ulexite, inyoite |
| Coronel Gorrotti | S | Salar de Pastos Grandes | 24-33-21S | 066-42-09W | AR15111 | P | ulexite |
| **Salar de Pocitos o Quiron** | | | | | | | ulexite, inyoite? |
| | D | Salar de Pocitos o Quiron | 24-30- S | 066-59- W | I000727 | P | |
| Ducus IV | S | Salar de Pocitos o Quiron | 24-17-35S | 067-04-04W | AR15235 | P | ulexite |
| Dona Emma | S | Salar de Pocitos o Quiron | 24-20-02S | 067-02-54W | AR15237 | P | ulexite |
| **Salar de Pozuelos** | D | Salar de Pozuelos | 24-43- S | 066-49- W | I000326 | P | ulexite, borax? |
| Margarita | S | Salar de Pozuelos | 24-39-50S | 067-47-30W | | | |
| San Mateo Mine | S | Salar de Pozuelos | 24-39-40S | 066-46-20W | AR15108 | P | ulexite |
| Salar de Pucar | S | | 24-15- S | 067-55- W | I000731 | P | ulexite? |
| Salar de Rio Grande | D | | 25-05- S | 068-10- W | I000733 | P | ulexite |

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|---|---|---|---|---|---|---|---|
| **Salar de Santa Maria** | | | | | | | ulexite, colemanite, hydroboracite, |
| | D | Salar de Santa Maria | 24-04- S | 067-20- W | I010105 | P/BD | inyoite |
| Santa Maria Mine | S | Salar de Santa Maria | 24-05-22S | 067-21-33W | AR15106 | P/BD | borates |
| Salar de Turilari | | | | | | | borax, ulexite |
| | S | | 23-08-38S | 066-37-25W | I000324 | P | |
| **Salar del Hombre Muerto** | | | | | | | brine (Li), ulexite, borax, kernite, inyoite |
| | D | Salar del Hombre Muerto | 25-23- S | 067-06- W | I001023 | P/BR/BD | |
| 20 de Febrero | S | Salar del Hombre Muerto | 25-25-10S | 067-02-10W | I009006 | P | ulexite? |
| Calchaquina | S | Salar del Hombre Muerto | 25-25-29S | 066-28-12W | I009009 | P | ulexite? |
| Centenario | S | Salar del Hombre Muerto | 25-21-17S | 066-29-17W | I009007 | P | ulexite |
| Delia | S | Salar del Hombre Muerto | 25-23-52S | 066-28-25W | I009008 | P | ulexite? |
| Tincalayu | | | | | | | borax, (kernite, ulexite, kurnakovite, |
| | S | Salar del Hombre Muerto | 25-16- S | 067-03- W | I000327 | BD | oths) |
| **Salar del Rincon** | | | | | | | ulexite, borax, brine, tincalconite |
| | D | Salar del Rincon | 24-05- S | 067-10- W | I000323 | P | |
| Angela | S | Salar del Rincon | 24-07-18S | 067-00-23W | AR15225 | P | ulexite |
| Arunco | S | Salar del Rincon | 24-02-39S | 067-11-33W | AR15228 | P | ulexite |
| Carolina | S | Salar del Rincon | 24-04-05S | 066-59-49W | AR15224 | P | ulexite |
| Eduardo | S | Salar del Rincon | 24-01-12S | 067-00-29W | AR15245 | P | ulexite |
| Nelly | S | Salar del Rincon | 24-06-25S | 067-06-40W | AR15226 | P | ulexite |
| Salina Talisman | S | Salar del Rincon | 24-12-11S | 066-58-31W | AR15027 | P | ulexite? |
| San Eduaro | S | Salar del Rincon | 24-00-31S | 067-05-34W | AR15223 | P | ulexite |
| Salar Diablillos | | | | | | | ulexite, minor borax |
| | S | | 25-15- S | 066-40- W | I000325 | P | |
| **Salar Ratones** | D | Salar Ratones | 25-10- S | 066-45- W | I000734 | P | ulexite |
| Aeghyr Occurrence | S | Salar Ratones | 25-13-07S | 066-45-19W | AR15298 | P | ulexite |
| Esperanza Prospect | S | Salar Ratones | 25-14-36S | 066-43-01W | AR15299 | P | ulexite |
| **Salina de Lina Lari y de Pairiquis** | | | | | | | tincalconite, ulexite, borax |
| | S | Salina de Lina Lari | 23-00- S | 066-45- W | I000729 | P? | |
| Huincul Prospect | S | Salina de Lina Lari | 23-07-03S | 066-54-00W | AR08252 | O? | |
| **Salinas Grandes** | | | | | | | ulexite |
| | D | Salinas Grandes | 23-42- S | 065-55- W | I000735 | P | |
| Bahia Blanca | S | Salinas Grandes | 24-41-43S | 066-04-37W | AR15184 | P | ulexite |
| Boratera La Aguadita | S | Salinas Grandes | 23-44-40S | 065-57-30W | I000737 | P | ulexite |
| Boratera de Nino Muerto | S | Salinas Grandes | 23-45- S | 066-05- W | I000739 | P | ulexite |
| Boratera de Pozo Cavado | S | Salinas Grandes | 23-42-05N | 065-54-35W | I000738 | P | ulexite |
| Boratera de Tres Morros | S | Salinas Grandes | | | I000736 | P | ulexite |
| Cauchari Mine | S | Salinas Grandes | 24-03- S | 066-52- W | AR08064 | P | ulexite |
| Santa Marta I-II | S | Salinas Grandes | 23-44-21S | 65-49-55W | AR08273 | P | ulexite |
| Silvia | S | Salinas Grandes | 23-45-24S | 066-00-38W | AR15185 | P | ulexite |
| Valparaiso | S | Salinas Grandes | 23-45-24S | 066-08-22W | AR15186 | P | ulexite |
| Victoria | S | Salinas Grandes | 23-38-39S | 066-06-20W | AR15038 | P | ulexite |
| Salinas Grandes Prospect | S | | | | AR01032 | P | ulexite |
| San Antonio | S | | 23-28-16S | 066-55-56W | I000799 | ? | ulexite? |
| San Eduardo | S | | 23-08-34S | 066-55-04W | AR08153 | O | |
| San Luis | S | | 23-37-45S | 067-00-00W | AR08136 | | ulexite? |

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| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| **Serrania de Sijes** | | | | | | | |
| | D | Serrania de Sijes | 24-38-30S | 066-42-00W | I000950 | BD | hydroboracite, colemanite, ulexite, inyoite |
| Alejandro | | | | | | | ulexite, inyoite |
| | S | Serrania de Sijes | 24-47-00S | 066-40-30W | AR15102 | BD | |
| Andina | S | Serrania de Sijes | 24-30-30S | 066-42-50W | AR15113 | BD | ulexite, inyoite |
| Anita | | | | | | | hydroboracite, inyoite, ulexite, |
| | S | Serrania de Sijes | 24-48-32S | 066-44-48W | AR15103 | BD | colemanite |
| Elsa | S | Serrania de Sijes | 24-07-10S | 066-40-50W | I010153 | BD | ulexite, inyoite |
| Hierro Indio Prospect | | | | | | | ulexite, colemanite, hydroboracite, |
| | S | Serrania de Sijes | 24-36- S | 066-39-30W | TC00676 | BD? | inyoite |
| Juanita | S | Serrania de Sijes | 24-41-30S | 066-41-10W | I010135 | BD? | ulexite |
| La Esperanza | | | | | | | colemanite, hydroboracite, inyoite, |
| | S | Serrania de Sijes | 24-41-05S | 066-39-20W | AR15112 | BD | ulexite |
| La Paz | S | Serrania de Sijes | 24-35-10S | 066-39-00W | I010140 | BD | ulexite, inyoite |
| Monte Amarillo | | | | | | | hydroboracite, inyoite, ulexite |
| | S | Serrania de Sijes | 24-42-50S | 066-41-30W | I010134 | BD | |
| Monte Azul | S | Serrania de Sijes | 24-40-40S | 066-41-10W | I010132 | BD | hydroboracite, inyoite |
| Monte Blanco | S | Serrania de Sijes | 24-39-05S | 066-40-45W | AR15115 | BD | hydroboracite, inyoite |
| Monte Gris | S | Serrania de Sijes | 24-45-20S | 066-40-35W | I010138 | BD | ulexite, inyoite |
| Monte Marron | S | Serrania de Sijes | 24-45-30S | 066-41-30W | I010136 | BD | inyoite, colemanite, hydroboracite |
| Monte Verde | | | | | | | colemanite, inyoite, hydroboracite, |
| | S | Serrania de Sijes | 24-42-50S | 066-40-50W | I010133 | BD | ulexite |
| Santa Elena | S | Serrania de Sijes | 24-34-45S | 066-38-40W | I010139 | BD | hydroboracite, inyoite |
| Santa Elvira | S | Serrania de Sijes | 24-33-30S | 066-38-30W | I010141 | BD | ulexite |
| Santa Rosa | | | | | | | colemanite, hydroboracite, inyoite, |
| | S | Serrania de Sijes | 24-36-30S | 066-39-30W | I010137 | BD | ulexite, others |
| Socacastro | S | | 24-12- S | 066-50-30W | I010143 | SP | ulexite, pinnoite |
| Unnamed | S | | 22-34-05S | 066-51-54W | AR08055 | P | |
| ***Armenia*** | | | | | | | |
| Dzhulfa area | S | Transcaucasia | 39-40- N | 045-00- E | RL10034 | BD? | borax, tincalconite |
| ***Bolivia*** | | | | | | | |
| Cuevitas | | | | | I000482 | O | |
| Laguna Busch o Kalina | S | | 22-36-35S | 067-12-45W | BL00062 | L/BR | brine |
| Laguna Cachi | | | | | | | ulexite, brine |
| | S | | 21-43-45S | 067-56-30W | BL10026 | P/BR | |
| Laguna Capina Sur | S | | 21-55-30S | 067-34-20W | BL10030 | P/BR | ulexite, brine |
| Laguna Celeste | S | | 22-12-33S | 067-06-16W | BL00067 | L/BR | brine (B-Li) |
| Laguna Chiar Kkota | S | | 21-35- S | 068-04- W | BL10034 | L/BR | ulexite, brine |
| Laguna Chojllas | | | | | | | brine |
| | S | | 22-22-30S | 067-05-36W | BL00066 | L/BR | |
| Laguna Chulluncani | | | | | | | brine |
| | S | | 21-32-45S | 067-53-00W | BL10031 | BR | |
| Laguna Colorado | | | | | | | ulexite |
| | S | | 22-11-20S | 067-46-30W | BL10045 | P | |

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| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| Laguna Coruto | S | | 22-25-45S | 067-00-00W | BL00065 | L/BR | brine, ulexite |
| Laguna Hedionda Norte | S | | 21-34- S | 068-03- W | BL10033 | P | ulexite, brine |
| Laguna Loromayu | S | | 22-24-30S | 067-12-30W | BL00063 | L/BR | brine (B) |
| Laguna Mama Khumu | S | | 22-15-42S | 067-04-30W | BL10273 | P | ulexite |
| Laguna Ramaditas | S | | 21 38- S | 068-05- W | BL10038 | P/BR | brine |
| Laguna Sacabaya | S | | 18-38-40S | 068-57-45W | BL00060 | P/BR | ulexite, brine |
| Laguna Verde | S | | 22-47-40S | 067-48-20W | BL10049 | L/BR | brine |
| Lagunas Pastos Grandes | D | | 21-38-30S | 067-47-40W | BL10029 | P | ulexite, brine |
| **Salar de Challviri** | **D** | | 22-31-00S | 067-34-20W | BL10047 | P | ulexite, borax, colemanite(?) |
| Boratera de Challviri Norte | S | Salar de Challviri | 22-32-30S | 067-35-00W | BL10395 | P | ulexite |
| Boratera de Challviri Sur | S | Salar de Challviri | 22-34- S | 067-34- W | BL10396 | P | ulexite |
| Challviri Pampa East | S | Salar de Challviri | 22-29- S | 067-33- W | BL10394 | P | ulexite |
| Challviri Pampa North | S | Salar de Challviri | 22-28- S | 067-35- W | BL10393 | P | borax, ulexite, colemanite? |
| Herrera Pampa | S | Salar de Challviri | 22-34-30S | 067-32-30W | BL10397 | P | ulexite, colemanite? |
| **Salar de Chiguana** | **D** | | 21-08-00S | 068-02-45W | BL10044 | P | ulexite |
| La Carrillana | S | Salar de Chiguana | 21-08-43S | 068-04-55W | BL10361 | P | ulexite |
| Salar de Coipasa | D | | 19-22- S | 068-08- W | BL10040 | P | ulexite, Li-B brines |
| **Salar de Empexa** | **D** | | 20-19-46S | 068-28-33W | BL10041 | P | ulexite, brine |
| Istma | S | Salar de Empexa | 20-25-52S | 068-38-29W | BL10358 | P | |
| Laqueca | S | Salar de Empexa | 20-14-23S | 068-26-57W | BL10357 | P | |
| Salar de Luriques | S | | 22-23-55S | 067-10-10W | I000481 | P/BR | brine, ulexite |
| Salar de Ollague | S | | 21-10-30S | 068-14-00W | BL10067 | P | ulexite |
| **Salar de Uyuni** | **D** | | 20-00- S | 068-00- W | ISM0511 | P/BR | brine, ulexite |
| Llipi-Llipi | S | Salar de Uyuni | 20-46-13S | 067-24-18W | BL10023 | P | ulexite, brine |
| Rio Grande (Boratera Pampa) | S | Salar de Uyuni | 20-43-36S | 067-15-01W | BL10359 | P/BR | brine, ulexite |
| Salmuera del Rio Grande | S | Salar de Uyuni | 20-39- S | 067-19- W | BL10022 | BR | brine |
| Salmueras del Salar de Uyuni | S | Salar de Uyuni | 20-00- S | 068-00- W | BL10021 | BR | brine, ulexite |
| **Salar Laguani** | **D** | | 20-56-31S | 068-18-10W | BL10043 | P | ulexite |
| Pajoncha | S | Salar Laguani | 20-52-33S | 068-16-28W | BL10360 | P | ulexite |
| ***Chile*** | | | | | | | |

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| Cebollar | S | | 22-29- S | 069-06- W | I010106 | P | colemanite? |
| Lagunas Bravas | D | | 26-19- S | 068-37- W | I010103 | P? | ulexite |
| Las Tizas | S | | 19-29- S | 069-44- W | I010121 | O | ulexite |
| Maria Elena | S | | 22-19- S | 069-40- W | W700670 | N | |
| **Pampa Tamarugal** | | | | | | | ulexite |
| | D | | 19-40- S | 069-40- W | I010120 | P? | |
| Chug-chug | S | Pampa Tamarugal | 22-06- S | 069-06- W | I010128 | SP? | ulexite |
| El Toco | | | | | | | ulexite, colemanite? |
| | S | Pampa Tamarugal | 22-08- S | 069-20- W | I010108 | P/BD? | |
| Pampa Joya | | | | | | | ulexite? |
| | S | Pampa Tamarugal | 21-52-40S | 069-31-40W | I000469 | P | |
| Quebrada de Barrera | S | Pampa Tamarugal | 22-00- S | 066-10- W | I010127 | | ulexite |
| Quillagua | D | | 21-47- S | 069-30- W | I000524 | P? | ulexite, borax? |
| Salar Cosapilla | S | | 17-50- S | 069-06- W | I000466 | | |
| Salar de Agua Amarga | S | | 25-35- S | 068-50- W | I010101 | P | ulexite |
| Salar de Aguas Calientes | | | | | | | ulexite |
| | S | | 25-00- S | 068-37- W | I000475 | P | |
| Salar de Aguas Calientes Norte (Zenobia) | | | | | | | ulexite, brine |
| | S | | 23-07- S | 067-25- W | I000472 | P | |
| Salar de Aguilar | S | | 25-50- S | 068-55- W | I000476 | P | ulexite |
| Salar de Ascotan | | | | | | | ulexite |
| | S | | 21-33- S | 068-18- W | I000471 | P | |
| **Salar de Atacama** | | | | | | | brine |
| | D | Salar de Atacama | 23-30- S | 068-15- W | I000198 | P/BR | |
| Tambillo | | | | | | | |
| | S | Salar de Atacama | 23-07- S | 068-06- W | I010119 | P | |
| Tilomonte | | | | | | | |
| | S | Salar de Atacama | 23-48- S | 068-07- W | I010117 | P | |
| Tilopozo | S | Salar de Atacama | 23-47- S | 068-15- W | I010118 | | |
| Salar de Carcote | S | | 21-23- S | 068-23- W | I000470 | P | ulexite |
| Salar de Cariquimas | D | | 19-28- S | 068-48- W | I000523 | P | ulexite |
| Salar de Gorbea | S | | 25-25- S | 068-40- W | I010111 | P | ulexite |
| Salar de Infieles | | | | | | | ulexite |
| | S | | 25-58- S | 069-03-30W | I000478 | P | |
| Salar de La Isla | S | | 25-45- S | 068-37- W | I010102 | P | ulexite |
| Salar de Las Parinas | D | | 25-51- S | 068-30-30W | I010112 | P | ulexite? |
| Salar de Maricunga | | | | | | | ulexite |
| | S | | 26-56- S | 069-05- W | I000480 | P | |
| Salar de Ollague | | | | | | | ulexite |
| | S | | 21-10-30S | 068-15-00W | I010100 | P | |
| Salar de Pajonales | | | | | | | ulexite |
| | S | | 25-10- S | 068-48- W | I000477 | P | |
| Salar de Pedernales | S | | 26-14- S | 069-07- W | I000479 | P | ulexite |
| **Salar de Pintados** | | | | | | | ulexite |
| | D | | 20-38- S | 069-38- W | I000297 | | |
| Diana | S | Salar de Pintados | 19-28- S | 069-45-30W | I010124 | ? | ulexite |

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| Salar de Punta Negra | | | | | | | ulexite |
| | S | | 24-37- S | 068-58- W | I000474 | P | |
| **Salar de Surire** | D | | 18-55- S | 069-05- W | I000296 | P | ulexite. brine |
| Borateras de Chilcaya | S | Salar de Surire | 18-49- S | 069-05- W | I000467 | P | ulexite |
| Salar del Huasco | | | | | | | ulexite |
| | S | | 20-18-45S | 068-50-30W | I010125 | P | |
| Salar Quisquiero | | | | | | | ulexite, brine |
| | S | | 23-15- S | 067-17- W | I000473 | P | |
| **TALTAL** | D | | | | | | |
| Alemania | S | Taltal | 25-27-21S | 069-49-56W | TC39985 | N | unspecified |
| Flor de Chile | S | Taltal | 25-12-36S | 069-45-48W | TC39983 | N | unspecified |
| Santa Lucia | S | Taltal | 25-27-34S | 070-00-00W | TC39986 | N | unspecified |
| **Tarapaca** | D | | | | | | |
| Humberstone | S | Tarapaca | 20-10-20S | 069-46-04W | TC39982 | N | unspecified |
| Negreiros | S | Tarapaca | 19-49-04S | 069-48-50W | TC39981 | N | unspecified |
| North Lagunas | S | Tarapaca | 20-55-27S | 069-38-35W | TC39980 | N | unspecified |
| Victoria | S | Tarapaca | 20-45-14S | 069-42-38W | TC39984 | N | unspecified |
| **Tocopilla** | D | | | | | | |
| Pedro de Valdivia | | | | | | | unspecified |
| | S | Tocopilla | 22-36- S | 069-41- W | W700671 | N | |
| Prosperidad | S | Tocopilla | 21-53-37S | 069-40-13W | TC39979 | N | unspecified |
| Santa Fe | S | Tocopilla | 21-52-11S | 069-36-56W | TC39978 | N | unspecified |
| Vega Carvajal | S | | 22-29- S | 069-06- W | I010107 | | colemanite? |
| | | | | | | | |
| ***China*** | | | | | | | |
| Bange Lake | S | | 31-50- N | 089-25- E | RL10016 | P | borax |
| Bangyu Salt Lake | S | | 33-30- N | 087-45- E | RL10014 | P/BR | borax? |
| Chalaka | S | | 32-00- N | 082-30- E | RL10012 | P | borax, tincalconite |
| Dujiali Lake | S | | 30-55- N | 088-45- E | RL10015 | P | borax, tincalconite |
| Geerkunsha | S | | 32-05- N | 080-15- E | RL10060 | P | borax, ulexite |
| Heping | S | | | | I007035 | SK | datolite |
| **Liaoning Province Mines** | | | | | | | |
| Gaotaigou | S | Liaoning | 41-08- N | 126-10- E | RL10001 | SK | szaibelyite, ludwigite?, suanite? |
| Houxianyu | S | Liaoning | 40-39- N | 122-31- E | RL10004 | SK | szaibelyite, ludwigite?, suanite? |
| Liaoning Province Borate Mine | S | Liaoning | | | I000526 | U | szaibelyite |
| Ougquangou | S | Liaoning | 40-28- N | 124-01- E | RL10003 | SK | szaibelyite, ludwigite?, suanite? |
| Wudaogou | S | Liaoning | 40-43- N | 124-44- E | I000072 | SK | szaibelyite, ludwigite |
| Zuanmiaogou | S | Liaoning | 40-45- N | 124-48- E | RL10002 | SK | szaibelyite, ludwigite?, suanite? |
| **Qiliping** | S | | 26-25- N | 112-25- E | RL10006 | SK? | |
| **Qinghai Plateau** | S | | | | I000525 | P | |
| **Qaidam Basin** | | | | | | | borax, tincalconite, pinnoite, kurnakovite |
| | D | | 37-30- N | 095-00- E | I000522 | P/BR | |
| Bielietan | S | Qaidam Basin | 38-10- N | 094-05- E | RL10009 | P | |
| Da Chaidan Lake | | | | | | | ulexite, kurnakovite, inderite, borax, |
| | S | Qaidam Basin | 37-50- N | 095-00- E | RL10010 | P | pinnoite |

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| Iksaydam Lake | S | Qaidam Basin | | | | BD/BR | ulexite? |
| Mahai | S | Qaidam Basin | 37-17N | 094-13E | I007057 | P? | ulexite, pinnoite |
| Qarhan Salt Pan | | | | | | | borates |
| | D | Qaidam Basin | 38-00- N | 095-00- E | I001030 | P/BR | |
| West Taijinaier Lake | S | Qaidam Basin | 38-30- N | 093 25- E | RL10008 | P | ulexite? |
| Xiao Chaidan Lake | S | Qaidam Basin | 37-30- N | 095 10- E | RL10011 | P | ulexite, pinnoite |
| Yiliping | S | Qaidam Basin | 38-45- N | 093 00- E | RL10007 | P | |
| Yeshan | S | | 33-00- N | 118-30- E | RL10005 | SK | |
| Yin Lake | S | | 28-15- N | 088-15- E | RL10017 | P | |
| Zhabuye Salt Lake | S | | 32-00- N | 084 00- E | RL10013 | P | borax |
| Zhacang | | | | | | | kurnakovite, inderite, inyoite, ulexite, |
| | S | | 32-25- N | 082-15- E | RL10059 | P | pinnoite |
| ***Ecuador*** | | | | | | | |
| Nono | S | | 00-05-00S | 078-34-55W | TC37734 | SP | unspecified |
| San Nicolas | S | | 02-38-51S | 078-58-18W | TC37094 | SP | unspecified |
| ***Germany*** | | | | | | | |
| Hamburg | S | Zechstein Basin | 53-30- N | 010-00- E | RL10042 | M | boracite |
| Stassfurt | S | Zechstein Basin | 51-51- N | 011-35- E | RL10041 | M | boracite, szaibelyite |
| ***Greece*** | | | | | | | |
| Karlovassi Basin - Samos Island | | Karlovassi Basin | 37-46- N | 026-13- E | RL10040 | BD? | colemanite, ulexite |
| ***India*** | | | | | | | |
| Puga Valley | | | | | | | borax |
| | D | Kashmir | 33-55- N | 078-25- E | RL10018 | P? | |
| ***Iran*** | | | | | | | |
| Ashin | D | Anarak | 33-20- N | 053-44- E | RL10021 | P | ulexite |
| Deh-e-Shotoran | D | Sirjan | 29-28- N | 055 44- E | RL10019 | P | ulexite |
| Tonkar | S | Sabzawar | 36-13- N | 057-38- E | RL10020 | P | ulexite? |
| ***Italy*** | | | | | | | |
| Tuscany | D | Maremma | 42-30- N | 011-30- E | RL10035 | | sassolite, boric acid |
| ***Kazakhstan*** | | | | | | | |
| Inder | | | | | | | hydroboracite, szaibelyite, inderite, |
| | S | | 48-33- N | 51-48- E | RL10022 | M | others |
| Lake Inder | | | | | | | borax, hydroboracite, szaibelyite, others, |
| | S | | 48-30- N | 51-55- E | RL10023 | BR | brine |
| ***Mexico*** | | | | | | | |
| Hamosilo | S | | 29-04- N | 110-58- W | RL10046 | BD | colemanite |
| La Salada | S | | 30-59-30N | 111-27-30W | MX00330 | BD | |

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| Mesa del Alamo | S | Magdalena | 30 35-35N | 110-54-40W | MX00340 | BD | howlite, minor colemanite |
| Tubutama | S | | 30-59-52N | 111-29-43W | MX00580 | BD/P | colemanite, howlite, ulexite, mcallisterite, others |
| ***North Korea*** | | | | | | | |
| Khol-don | | | 38 52- N | 126-27- E | I007058 | U | ludwigite |
| Raitakuri | | | 39-00- N | 125 45- E | I007059 | U | ludwigite |
| ***Peru*** | | | | | | | |
| **Chillicolpa** | D | | 17 13- S | 069-54 W | I000484 | SP/P | ulexite, borax |
| Cualqiuer Cosa Concesion | S | Chillicolpa | 17-12-50S | 069-54-20W | TAC0083 | | borax, ulexite |
| Alguna Cosa | S | Chillicolpa | 17-12-50S | 069 54-20W | TAC0084 | P? | ulexite, borax, brine |
| Laguna Blanca | S | | 17-38-30S | 069-33-30S | TAC0108 | P | B-Li brine |
| Laguna Salinas | S | | 16-22- S | 071-08-30S | I000483 | P | ulexite, inyoite; minor probertite, hydroboracite |
| ***Russia*** | | | | | | | |
| Crimea | S | Crimean Peninsula | 45-00- N | 034-00- E | RL10028 | BR | brine |
| Dalnegorsk (Bor) | S | | 44-30- N | 135-30- E | RL10025 | SK? | datolite |
| Kamchatka Peninsula | R | | 56-00- N | 161-00- E | RL10026 | SP | brine, other |
| Klyuchevskoye-Dimitryevskoye | S | | 55-00- N | 158-00- E | RL10029 | PG | tourmaline |
| Tazheran (Lake Baikal) | S | | 51-45- N | 104-00- E | RL10027 | SK | azoproit |
| ***Tajikistan*** | | | | | | | |
| Churkurkul | S | Pamir | 39-00- N | 073-30- E | RL10031 | SP | borax, tincalconite |
| Lyanger Lake | S | Pamir | 38-55- N | 070-50- E | RL10033 | SP | borax, tincalconite |
| Sask-kul Lake | S | Pamir | 37-40- N | 073-00- E | RL10032 | SP | borax, tincalconite |
| Shorkul Lake | S | Pamir | 38-23- N | 074-10- E | RL10030 | SP | borax, tincalconite |
| ***Turkey*** | | | | | | | |
| **Bigadic (Iskele Koyu)** | D | Bigadic | 39-28- N | 028-11- E | DE00149 | BD | priceite, colemanite, ulexite, hydroboracite, meyerhofferite, others |
| Acep | S | Bigadic | 39-27-55N | 028-12-00E | I000302 | BD | ulexite, colemanite, inyoite, meyerhofferite |
| Ankara Nos. 2 and 3 | S | Bigadic | 39-25-55N | 028-07-40E | I003031 | BD | colemanite, ulexite |
| Begendikler | S | Bigadic | 39-29-25N | 028-13-10E | I000303 | BD | colemanite |
| Boreke | S | Bigadic | 39-27-05N | 028-11-40E | I000308 | BD | colemanite, howlite |
| Domuz | S | Bigadic | 39-27-00N | 028-10-40E | I000307 | BD | colemanite, howlite |
| Gunevi | S | Bigadic | 39-28-35N | 028-13-35E | I000304 | BD | colemanite, ulexite; minor inyoite, meyerhofferite, hydroboracite |

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| Harmanicik | S | Bigadic | 39-45- N | 029-12- E | RL10044 | BD | colemanite |
| Kireclik | S | Bigadic | 39-27-20N | 028-14-30E | I000306 | BD | colemanite, meyerhofferite, priceite |
| Kurtpinari | S | Bigadic | 39-28-05N | 028-14-25E | I000305 | BD | colemanite, terschite |
| Salmanli | S | Bigadic | 39-26-25N | 028-08-05E | I003030 | BD | colemanite, ulexite |
| Tulu Degirmen | S | Bigadic | 39-27-15N | 028-05-55E | I003027 | BD | colemanite |
| **Emet** | | | | | | | colemanite, ulexite, hydroboracite, |
| | D | Emet | 39-16- N | 029-18- E | DE00150 | BD | meyerhofferite |
| Derekoy | S | Emet | 39-10-00N | 029-19-30E | I003029 | BD | colemanite |
| Espey | | | | | | | colemanite, ulexite, hydroboracite, |
| | S | Emet | 39-21-30N | 029-17-50E | I000528 | BD | meyerhofferite, others |
| Goktepe | | | | | | | colemanite, ulexite |
| | S | Emet | 39-15-30N | 029-16-05E | I003028 | BD | |
| Hamamkoy | S | Emet | 39-11-50N | 029-18-20E | I000530 | BD | colemanite |
| Hisarcik | | | | | | | colemanite, ulexite, hydroboracite, |
| | S | Emet | 39-14-00N | 029-16-00E | I000527 | BD | cahnite, teruggite |
| Killik | | | | | | | colemanite, ulexite, hydroboracite, |
| | S | Emet | 39-21-55N | 029-16-00E | I000529 | BD | meyerhofferite, others |
| Kestelek | | | | | | | colemanite, ulexite, probertite, |
| | S | | 39-40- N | 028-45- E | I003024 | BD | hydroboracite |
| Kirka | | | | | | | borax, tincalconite, colemanite, ulexite, |
| | | | 39-20- N | 030-30- E | W032839 | BD | others |
| Kucukler | S | | 39-31-35N | 028-20-35E | RL10047 | BD | colemanite |
| Selendi Basin | | | 38-42- N | 028-45- E | RL10045 | BD | colemanite |
| Sultancayir-Aziziye | S | | 39-52- N | 028-08- E | I000301 | BD | priceite, colemanite, ulexite, howlite |
| ***Turkmenistan*** | | | | | | | |
| Kara-Bagaz-Gol Gulf | D | | 41-00- N | 053-30- E | RL10024 | BR | brine |
| ***United States-Arizona*** | | | | | | | |
| Aguila | S | | 35-54- N | 113-08- W | RL10062 | P | brine |
| Gila Bend | S | | 32-57- N | 113-45- W | RL10063 | Float | colemanite |
| ***United States - California*** | | | | | | | |
| Ash Meadows Zeolite Deposit | S | | 35-57- N | 116-15- W | I002006 | P? | searlesite |
| **CALICO-DAGGET AREA** | | | | | | | colemanite, b-bearing shale, minor |
| | D | | 34-57- N | 116-48- W | RL10048 | BD | howlite, bakerite? |
| American Borax Mine | S | Calico-Daggett Borate Area | 34-56- N | 116-57- W | I003020 | BD | B-bearing shale |
| Centennial Mine | S | Calico-Daggett Borate Area | | | I003022 | BD | colemanite |
| Columbus Mine (Gem Borate) | S | Calico-Daggett Borate Area | 34-48- N | 116-53- W | I003018 | BD | B-bearing shale |
| Pacific Mine (Old Borate) | | | | | | | colemanite, howlite, bakerite?, B-bearing |
| | S | Calico-Daggett Borate Area | 34-57- N | 116-49- W | I003023 | BD | shale |
| Palm Borate Co. Mine | S | Calico-Daggett Borate Area | 34-55- N | 116-48- W | I003021 | BD | B-bearing shale |
| Union | S | Fort Cady | 34-57- N | 116-49- WE | I001170 | BD/P | |
| Western Minerals Mine | S | Calico-Daggett Borate Area | 34-57- N | 116-52- W | I003019 | BD | B-bearing shale |
| China Lake | S | | 35-43- N | 117-37- W | RL10053 | P | ulexite |

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| **CLEAR LAKE AREA** | | | | | | | |
| Borax Lake | S | | 38-59- N | 122-40- W | RI 10050 | BR/L | brine, borax |
| Lake Hachinhama | | | | | | | |
| Columbian | | | | | | mud | borax? |
| **DEATH VALLEY** | | | | | | | colemanite, ulexite, probertite |
| | D | | | | | BD/P | |
| Billie I and II | | | | | | | colemanite, probertite, ulexite |
| | S | Death Valley | 36-20-30N | 116-41-02W | I001026 | BD | |
| Boraxo (Thompson, Kern) | | | | | | | colemanite, ulexite, probertite |
| | S | Death Valley | 36-20-23N | 116-42-17W | I000399 | BD | |
| Corkscrew | S | Death Valley | 36-21-57N | 116-45-54W | I000394 | BD | colemanite, ulexite, probertite |
| DeBely | S | Death Valley | | | I000391 | BD | colemanite |
| Eagle Borax Works | S | Death Valley | 36-12-15N | 116-51-45W | I000659 | P | ulexite |
| East Coleman | S | Death Valley | 36-28-17N | 116-50-41W | I000397 | BD | colemanite |
| Gower Gulch | S | Death Valley | 36-24-58N | 116-50-08W | I000396 | BD | colemanite, ulexite |
| Grand View | S | Death Valley - Ryan area | 36-18-16N | 116-40-38W | I000385 | BD | colemanite |
| Harmony Borax Works | | | | | | | ulexite |
| | S | Death Valley | 36-31-35N | 116-53-35W | I000666 | P | |
| Inyo | S | Death Valley | 36-29-51N | 116-42-01W | I000393 | BD | colemanite, ulexite, probertite |
| Lila C | S | Death Valley - Amargosa area | 36-14-16N | 116-29-42W | I000383 | BD | colemanite |
| Lizzy V. Oakley | S | Death Valley - Ryan area | 36-17-53N | 116-40-26W | I000386 | BD | colemanite |
| Low | S | | | | I000657 | BD | colemanite |
| Lower Biddy McCarthy | S | Death Valley - Ryan area | 36-19-11N | 116-40-34W | I000388 | BD | colemanite |
| Maria | S | Death Valley - Amargosa area | 36-15-30N | 116-32-50W | I000381 | BD | colemanite |
| Monte Blanco | S | Death Valley | 36-23-14N | 116-46-40W | I000395 | BD | colemanite, ulexite, probertite |
| Paula | S | | 36-13-57N | 116-29-48W | I000658 | BD | colemanite? |
| Played Out | S | Death Valley - Ryan area | 36-20-10N | 116-39-15W | I000389 | BD | colemanite, ulexite |
| Terry | S | Death Valley - Amargosa area | 36-17-26N | 116-33-12W | I000382 | BD | colemanite, minor hydroboracite, ulexite |
| Upper Biddy McCarthy | S | Death Valley - Ryan area | 36-19-03N | 116-40-05W | I000387 | BD | colemanite, ulexite |
| White Monster - Sigma | S | Death Valley | 36-19-16N | 116-41-25W | I000398 | BD | colemanite, ulexite; probertite |
| Widow No. 3 | S | Death Valley - Ryan area | 36-17-45N | 116-39-46W | I000392 | BD | colemanite, ulexite, probertite |
| Widow No. 7 | S | Death Valley - Ryan area | 36-17-47N | 116-39-54W | I000390 | BD | colemanite, ulexite |
| Fort Cady Deposit | S | Fort Cady | 34-46- N | 116-25- W | I000064 | P/BD | colemanite |
| Gerstley I | S | | 36-01-05N | 116-13-55W | I000380 | BD | ulexite, colemanite, probertite? |
| Gerstley II | S | | 36-02-10N | 116-14-35W | I000379 | BD | colemanite, ulexite, probertite? |
| Hector | | | | | | | colemanite, howlite |
| | S | | 34-46- N | 116-27- W | I000011 | BD | |
| Koehn Lake | S | | 35-19- N | 117-53- W | RI 10054 | P | ulexite |
| **KRAMER AREA** | R | | | | | R | |
| Kramer | | | | | | | borax, kernite, tincalconite, ulexite, colemanite, other |
| | | | 35-02-28N | 117-41-14W | W031570 | BD | |
| Rho A - Upper and Lower | S | | 34-46-00N | 117-32-50W | I003005 | BD | colemanite |
| Rho B - Upper and Lower | S | | 34-29-56N | 117-32-21W | I003006 | BD | colemanite |
| Sunray (Rho) | S | | 34-47-50N | 117-34-15W | I003007 | BD | colemanite |

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| Owens Lake | | | | | | | brine, borax |
| | S | | 36-25- N | 117-57- W | RL10052 | BR | |
| Saline Valley | R | | 36-43- N | 117-50- W | RL10051 | P | borax?, ulexite? |
| Searles Lake | | | | | | | brine, borax, kernite, colemanite? |
| | S | | 35-46- N | 117 24- W | ISM0513 | BR | |
| **VENTURA COUNTY AREA/FRAZIER MTN.** | | | | | | | colemanite, priceite |
| | D | | 34-47- N | 119-04- W | RL10057 | BD | |
| Alta Claim | S | Ventura County Borate Area | | | I006000 | BD | colemanite |
| Bitter Creek | S | Ventura County Borate Area | 34-46-05N | 119-06-30W | I003014 | BD | colemanite |
| Borate No. 3 | S | Ventura County Borate Area | | | I006005 | BD | colemanite |
| ***Bryan D Claim*** | ***S*** | *Ventura County Borate Area* | | | *I006009* | *BD* | *colemanite* |
| Columbus Mine | S | Ventura County Borate Area | 34-47-04N | 119-03-43W | I003008 | BD | colemanite, priceite |
| Denver Claim | S | Ventura County Borate Area | | | I006006 | BD | colemanite |
| Frazier Mine | S | Ventura County Borate Area | 34-46-33N | 119-04-57W | I003010 | BD | colemanite, priceite |
| Frisco | S | Ventura County Borate Area | | | I006002 | BD | colemanite |
| Ives Property | S | Ventura County Borate Area | 34-45-35N | 119-10-20W | TC36488 | BD | priceite |
| Ives Tunnel | S | Ventura County Borate Area | 34-45-50N | 119-07-18W | TC36490 | BD | colemanite? |
| Jessie | S | Ventura County Borate Area | | | I006008 | BD | colemanite |
| King and Queen | S | Ventura County Borate Area | | | I006007 | BD | colemanite? |
| Mane | S | Ventura County Borate Area | | | I006003 | BD | colemanite, priceite |
| Middle Fork Borate Prospects | S | Ventura County Borate Area | 34-46-11N | 119-07-29W | I003015 | BD | colemanite, priceite |
| North Fork Borate Deposits | S | Ventura County Borate Area | 34-45-30N | 119-09-00W | TC36489 | BD | priceite |
| Pinoche | S | Ventura County Borate Area | | | I006004 | BD | colemanite, priceite |
| Rusland | S | Ventura County Borate Area | | | I006010 | BD | colemanite, priceite |
| Russell Mine | S | Ventura County Borate Area | 34-46-55N | 119-04-13W | I003009 | BD | colemanite, priceite |
| Stubblefield and Halloway | | Ventura County Borate Area | 34-45-20N | 119-07-50W | I003016 | BD | colemanite, priceite |
| Thomas Boyle | | | | | | | |
| Tick Canyon (Lang, Sterling) | | | | | | | colemanite, howlite, probertite, ulexite, |
| | S | | 34-29-55N | 118-21-53W | I001190 | BD | veatchite |
| Tuscan Springs | S | | 40-14-27N | 122-06-38W | RL10064 | SP? | |
| ***United States - Nevada*** | | | | | | | |
| Anniversary Mine (Callville Wash) | S | Muddy Mtns. | 36-12-55N | 114-42-28W | M242220 | L/BD | colemanite, ulexite |
| Cave Spring | S | | 37-49-02N | 117-51-19W | M232045 | CC | searlesite |
| **Columbus Marsh** | | | | | | | ulexite |
| | D | | 38-02-46N | 117-59-21W | M242108 | P | |
| Borax Works | | | | | | | |
| Calmville Borax Works | S | Columbus Marsh | 38-01-15N | 117-56-35W | I009011 | P | ulexite |
| China Borax Works | S | Columbus Marsh | 38-02-20N | 117-59-50W | | | ulexite |
| Old Borax Works | S | Columbus Marsh | 38-04-20N | 117-58-05W | I009015 | P | ulexite |
| Dixie Marsh | S | | 39-49-11N | 117-58-11W | M233114 | P | ulexite |
| **Eagle Marsh** | **S** | | 39-43-46N | 119-02-31W | M234030 | P | borax, brine |

Table 1. Borate deposits.

| DEPOSIT NAME | DISTRICT or SITE? | AREA/ DISTRICT | LATITUDE | LONGITUDE | MRDS NO. | DEPOSIT TYPE(S) | BORATE MINERALS |
|---|---|---|---|---|---|---|---|
| Hot Springs Marsh (Eagle Marsh) | | | | | | | brine |
| | S | | | | I003033 | BR | |
| **Fish Lake Marsh** | S | | 37-54-12N | 117-55-48W | M242053 | P | ulexite, minor borax |
| Pacific Borax Co. | | | 37-54-29N | 117-55-41W | M232047 | P | borax, ulexite |
| Gerlach Hot Springs | S | | 40-44-38N | 119-26-10W | RL10061 | SP | ulexite |
| North Sand Springs | S | | | | I000500 | P | ulexite, brine, borax |
| Ore Car Mine | S | | | | M242118 | ? | borates |
| Rhodes Marsh (Virginia Marsh) | | | | | | | ulexite, borax |
| | D | | 38-17-13N | 118-04-29W | M035428 | P | |
| Sample Site 1133 | S | Silver Peak | 37-53-56N | 117-55-13W | M241977 | P? | |
| Sand Springs Marsh (Salt Wells) | S | | 39-20- N | 118-30 W | I000500 | P | ulexite, borax?, brine |
| Silver Peak Marsh (Clayton Valley) | | | | | | | brine, ulexite |
| | S | | 37-45-10N | 117-38-20W | I001104 | P/BR | |
| Silver Peak Range | S | | 37-51-31N | 117-53-06W | M232044 | BD | ulexite |
| Soda Lake | S | | 39-31-31N | 118-52-25W | I000521 | BR | brine |
| Teels Marsh | | | | | | | borax, ulexite, tincalconite, brine |
| | S | | 38-12-27N | 118-21-12W | M035447 | P | |
| White Basin/Central Muddy Mtns | | | | | | | colemanite, ulexite? |
| | S | Muddy Mtns | 36-19-52N | 114-34-27W | M242219 | BD | |
| ***United States - New Mexico*** | | | | | | | |
| Lake Lucero | | | 32-40-31N | 106-25-00W | TC36029 | P | borax? |
| ***United States - Oklahoma*** | | | | | | | |
| West-Central Oklahoma | | | 34-00- N | 100-30- W | | M | |
| ***United States - Oregon*** | | | | | | | |
| Alvord Desert | | | 42-31-49N | 118-27-24W | OR05927 | | |
| Alvord Valley (Lake Alvord) | D | | 42-20- N | 118-35- W | I003002 | P/SP | borax |
| Lone Ranch (Chetco) | S | | 42-06- N | 124-21- W | M013596 | BD | priceite |
| Summer Lake (eastern playa) | S | | 42-50- N | 120-41- W | I005078 | P/BR | brine |
| ***Yugoslavia*** | | | | | | | |
| Jarandol | | | | | | | colemanite, howlite, searlesite, |
| | D | | 43-25- N | 020-40- E | RL10036 | BD | lunebergite |
| Kremna | S | | 43-50- N | 019-35- E | RL10037 | BD? | searlesite |
| Lopari-Sibosnica | S | | 44-38- N | 018-50- E | RL10038 | BD? | searlesite |
| Valjevo-Mionica | S | | 44-16- N | 020-00- E | RL10039 | BD | searlesite |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| ***Argentina*** | | | | | |
| Acazoque | sodium sulfate, travertine | QUAT? | QUAT? | | lacustrine clay |
| Alejandra Occurrence | | | | | |
| Alex Prospect | | | | | |
| **Archibarca Ravine area** | | | | | |
| Adriana | clay | QUAT | QUAT | | alluvium |
| Lari | travertine | QUAT | QUAT | | alluvium |
| Los Bayos | | QUAT | ORD | | sediments |
| Tropa Pete | travertine, onyx, trona | QUAT | QUAT | | alluvium |
| Berta Prospect | | | | | |
| Blanca Lila Mine | | LQUAT | LQUAT | | lacustrine evaporites, clay, sand |
| Boratera de Antuco | calcite, manganese, travertine, onyx | PLIO-HOLO? | PLIO-HOLO | | alluvium |
| Celti Occurrence | halite | | MIO-QUAT | | tuff, clay, sandy tuff |
| Coyaguaima | halite, calcite, travertine, tufa, aragonite | | | | argillite, shale, sandstone |
| | | LQUAT | CEN | | |
| El Toro | | QUAT | ORD | | |
| La Mucar | | QUAT? | QUAT | | clay, sand |
| Laguna Guachalayte | | | | | lacustrine sediments? |
| **Laguna Guayatayoc** | halite, clay | QUAT? | QUAT | | sand, clay |
| Baratoyoc Mine | halite | QUAT? | QUAT | | lacustrine sediments, evaporites |
| Grupo Cordoba | halite | QUAT? | QUAT | | lacustrine sediments, evaporites |
| **Laguna Vilama** | | | | | lacustrine sediments and evaporites |
| | | HOLO? | LPLEIS-HOLO | | |
| Boratera Vilama I-II | | | | | lacustrine sediments and evaporites |
| | | HOLO? | LPLEIS-HOLO | | |
| Cerro Bayo | | | | | lacustrine sediments and evaporites |
| | | HOLO? | LPLEIS-HOLO | | |
| Lagunita | clay | QUAT | QUAT | | clay, sand |
| Libertad | | | | | |
| Loma Blanca | realgar, travertinesulfur, orpiment, calcite, aragonite, montmorillonite | LMIO 6.99 MA | LMIO | Sijes Fm | tuffite, claystone, tuff |
| Maria Teresa | | | | | |
| Oire | travertine | QUAT | | | granitic-metamorphic rocks |
| Ojo de Agua | travertine | QUAT | ORD | | shale, mudstone |
| **Rio Alumbrio Spring Area** | travertine, tufa, onyx, calcite, Fe and Mn oxides, halite | PLIO-QUAT | ORD, CEN | Acoite Fm | conglomerate, tuff, sandstone, claystone, argillite, quartzite |
| Arituzar Mine | travertine, onyx, Fe and Mn oxides | PLIO | ORD | Acoite Fm | shale, siltstone, sandstone |
| Calichar | travertine, Fe oxides | QUAT | TERT | | sediments |
| Cañuelas | travertine, Fe oxides | QUAT | ORD | Acoite Fm | shale, argillite, sandstone, schist |
| Daniel Mine | Cu | QUAT | PLEIS-HOLO, | | alluvium; shale, siltstone |
| San Marcos | travertine, onyx | QUAT | ORD | Acoite Fm | shale, mudstone, sandstone |
| Volcancito | calcite, travertine, halite? | QUAT | TERT | | dacite tuff, flows, sediments |
| **Salar Centenario** | halite, brine, mirabilite, Li, K, Mg | QUAT | QUAT | | claystone, siltstone, sand |
| Anatuya Prospect | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Boroquimica Samicaf Mines | | QUAT | QUAT | | lacustrine sediments, evaporites |
| La Argentina | halite | QUAT | QUAT | | lacustrine sediments, evaporites |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| Maggie | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Mataro Prospect | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Maria Luisa I-II Occurrence | | QUAT? | QUAT | | lacustrine sediments, evaporites |
| Purmamarca Mine | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar de Antofalla | halite, gypsum, travertine | MIO-PLIO | MIO-PLIO | | lacustrine sediments, evaporites |
| **Salar de Cauchari** | gypsum, travertine, tufa, calcite, clay | | | | lacustrine silt, sand, clay, evaporites |
| | | LMIO-PLIO QUAT | CEN | | |
| Campamento Primero de Mayo | clay | QUAT | QUAT | | lacustrine sediments, evaporites |
| Carlota-Corina | | HOLO | CEN | | lacustrine sediments, evaporites |
| Cinco Occurrence | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Defensa I-II-II Occurrences | | QUAT | QUAT | | lacustrine sediments, evaporites |
| El Porvenir | travertine, sand, clay | QUAT? | QUAT | | lacustrine sand, silt, clay |
| La Inundada | | QUAT | QUAT | | lacustrine sand, clay |
| Mascota | travertine | QUAT? | QUAT | | lacustrine sand, mud |
| San Pedro | clay | QUAT? | QUAT | | lacustrine mud, clay |
| Siberia | travertine | QUAT? | QUAT | | lacustrine silt, clay |
| Salar de Incahuasi | halite | | | | |
| **Salar de Jama** | gypsum, halite, mirabilite, clay | | | | lacustrine clay, other sediments, |
| | | QUAT? | CEN | | evaporites |
| Benito I-II | halite, gypsum | QUAT? | QUAT | | lacustrine sediments, evaporites |
| Jama Mine | gypsum, halite | QUAT? | QUAT | | lacustrine sediments, evaporites |
| Maria Luisa | gypsum, halite | QUAT? | QUAT | | lacustrine sediments, evaporites |
| San Francisco | halite, gypsum | QUAT? | QUAT | | lacustrine sediments, evaporites |
| **Salar de Llullaillaco** | halite | | | | lacustrine sediments and evaporites |
| | | QUAT | QUAT | | |
| Adela | | QUAT | QUAT | | lacustrine sediments, evaporites |
| **Salar de Olaroz** | halite, gypsum, clay | QUAT? | QUAT | | laucstrine sediments |
| El Condor | halite, gypsum | QUAT? | QUAT | | lacustrine sediments, evaporites |
| Grupo San Nicolas | gypsum, halite | | | | lacustrine mud, calcareous sandstone, |
| | | QUAT? | QUAT | | salt, other |
| Santa Ines | gypsum, halite | QUAT? | QUAT | | limy sand |
| Yacare | | QUAT? | QUAT | | lacustrine sediments, evaporites |
| **Salar de Pastos Grandes** | halite, gypsum, travertine, brine, clay | | | | clastic sediments, gypsum, tuffaceous |
| | | PLEIS HOLO | LMIO-QUAT | | rks |
| Betina Mine | halite, clay | HOLO | HOLO | | lacustrine sediments, evaporites |
| Boratera Blanca Lila | travertine | PLEIS | PLEIS | | lacustrine mudstone, sandstone |
| Coronel Gorrotti | halite, clay | QUAT | QUAT | | lacustrine clay |
| **Salar de Pocitos o Quiron** | halite*, mirabilite, aragonite, gypsum, clay | | | | lacustrine sediments, evaporites |
| | | PLEIS HOLO | PLEIS HOLO | | |
| Ducus IV | | QUAT? | | | lacustrine sediments, evaporites |
| Dona Emma | | QUAT? | | | lacustrine sediments, evaporites |
| **Salar de Pozuelos** | halite, clay, organics | QUAT? | PLEIS-HOLO | | lacustrine silt, clay, sand |
| Margarita | | | | | |
| San Mateo Mine | halite, clay, organics | QUAT | QUAT | | lacustrine sediments, evaporites |
| **Salar de Pucar** | halite | | QUAT | | lacustrine sediments |
| Salar de Rio Grande | mirabilite*, halite, thenardite | QUAT | QUAT | | lacustrine sediments, evaporites |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| **Salar de Santa Maria** | trona, sulfate, halite | | CEN | | lacustrine sediments |
| Santa Maria Mine | trona, clay | LMIO | LMIO | Sijes Fm | lacustrine clay, tuff |
| Salar de Turilari | halite, calcite, Li, As, dolomite, bentonite | QUAT? | PLIO-QUAT | | green bentonitic mud, sand, clay, tuffaceous sediment |
| **Salar del Hombre Muerto** | gypsum, halite, travertine, sodium sulfate, realgar, orpiment | QUAT PLEIS LMI | QUAT PLEIS LMIO | | sst, clyst, tuff, evap, lst, congl |
| 20 de Febrero | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Calchaquina | | QUAT? | QUAT | | lacustrine sediments, evaporites |
| Centenario | | QUAT? | CEN | | lacustrine sediments, evaporites |
| Delia | | QUAT | CEN | | lacustrine sediments, evaporites |
| Tincalayu | halite, gypsum, realgar, orpiment, anhydrite | LMIO 5.9 MY | LMIO | Sijes Fm | sandstone, claystone, evaporites, tuff, conglomerate |
| **Salar del Rincon** | halite*, (Li, Mg, K) in brine, sodium sulfate | QUAT | QUAT | | lacustrine limestone, sand, silt, evaporites |
| Angela | | QUAT? | QUAT? | | lacustrine sediments, evaporites |
| Arunco | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Carolina | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Eduardo | | QUAT? | QUAT | | |
| Nelly | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salina Talisman | halite*, sodium sulfate | QUAT | QUAT | | lacustrine sediments, halite |
| San Eduaro | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar Diablillos | clay, travertine, minor gypsum, halite | QUAT | QUAT | | clay, sand, gypsum, salt, eolian sediments |
| **Salar Ratones** | halite, clay, Li, K, Mg | QUAT | QUAT | | silt, clay, halite |
| Aeghyr Occurrence | halite, clay | QUAT? | QUAT | | lacustrine silt, clay |
| Esperanza Prospect | halite, clay | QUAT | QUAT | | lacustrine silt, clay |
| **Salina de Lina Lari y de Pairiquis** | | QUAT? | QUAT? | | tuffaceous clay |
| Huincul Prospect | | | | | lacustrine sediments |
| **Salinas Grandes** | halite*, gypsum | QUAT? | QUAT | | lacustrine claystone, siltstone, limestone, sandstone, gypsum |
| Bahia Blanca | halite | QUAT? | QUAT | | lacustrine sediments, evaporites |
| Boratera La Aguadita | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Boratera de Nino Muerto | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Boratera de Pozo Cavado | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Boratera de Tres Morros | halite | QUAT | QUAT | | lacustrine clay |
| Cauchari Mine | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Santa Marta I-II | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Silvia | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Valparaiso | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Victoria | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salinas Grandes Prospect | halite | QUAT | QUAT | | lacustrine mud, salt |
| San Antonio | | | | | |
| San Eduardo | | | | | |
| San Luis | | | | | |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| **Serrania de Sijes** | carbonates, clay, gypsum, halite, anhydrite, travertine | LMIO-PLIO, PLEIS | LMIO PLIO | Sijes Fm/Blanca Lila Fm | clay, tuff, other lacustrine sediments, evaporites |
| Alejandro | | LMIO-PLIO | LMIO-PLIO | Sijes Fm | mudstone, tuff, other lacustrine sediments, evaporites |
| Andina | travertine, carbonate | PLEIS | PLEIS | Blanca Lila Fm | mudstone, sandstone |
| Anita | gypsum, travertine, Mn oxide | LMIO-PLIO | LMIO-PLIO | Sijes Fm | lacustrine mudstone, sandstone, tuff |
| Elsa | clay | PLEIS 1.5 MY | PLEIS | Blanca Lila Fm | lacustrine mud, clay, caliche, sand |
| Hierro Indio Prospect | clay, trona? | LMIO-PLIO | LMIO PLIO | Sijes Fm | clay, tuff |
| Juanita | gypsum | LMIO? | LMIO | Sijes Fm | sandstone, mudstone, claystone, |
| La Esperanza | gypsum, clay, realgar, Fe and Mn oxides | EPLIO | LMIO PLIO | Sijes Fm | mudstone, tuff |
| La Paz | gypsum | LMIO-PLIO | LMIO PLIO | Sijes Fm | claystone, tuff, gypsum |
| Monte Amarillo | gypsum, anhydrite, orpiment, realgar, rare halite | LMIO | LMIO | Sijes Fm | claystone, mudstone, sandstone, tuff, gypsum |
| Monte Azul | orpiment | LMIO-PLIO | LMIO-PLIO | Sijes Fm | mudstone, tuff |
| Monte Blanco | travertine, gypsum | LMIO-PLIO | LMIO-PLIO | Sijes Fm | claystone, tuff, sandstone |
| Monte Gris | | LMIO-PLIO | LMIO-PLIO | Sijes Fm | mudstone, tuff |
| Monte Marron | gypsum, anhydrite | LMIO-PLIO | LMIO PLIO | Sijes Fm | mudstone, gypsum, minor tuff |
| Monte Verde | clay, gypsum, anhydrite | LMIO | LMIO | Sijes Fm | claystone, siltstone, tuff, sandstone |
| Santa Elena | gypsum | LMIO-PLIO | LMIO-PLIO | Sijes Fm | mudstone, tuff, gypsum |
| Santa Elvira | halite, gypsum | LMIO-PLIO | LMIO-PLIO | Sijes Fm | mudstone, tuff |
| Santa Rosa | gypsum | LMIO-PLIO | LMIO-PLIO | Sijes Fm | sandstone, mudstone, claystone, tuff, gypsum |
| Socacastro | travertine, onyx | CEN | EMIO | Geste Fm | red sediments, gravel, sand |
| Unnamed | | | | | |
| ***Armenia*** | | | | | |
| Dzhulfa area | trona, halite, tennardite | QUAT? HOLO? | PLIO-QUAT | | travertine, shale, conglomerate |
| ***Bolivia*** | | | | | |
| Cuevitas | | | | | |
| Laguna Busch o Kalina | | HOLO | HOLO | | lacustrine sediments, ignimbrite |
| Laguna Cachi | trona*, halite, brine, thermonatrite, diatomite | HOLO | HOLO | | lacustrine sediments, evaporites |
| Laguna Capina Sur | lime, Li, K, halite, gypsum | HOLO | | | lacustrine sediments, evaporites |
| Laguna Celeste | Mg | HOLO | HOLO | | lacustrine sediments |
| Laguna Chiar Kkota | sulfur, halite, gypsum, sylvite, Li, calcite | | HOLO | | lacustrine sediments, evaporites |
| Laguna Chojllas | Li, Sr, K, Mg | HOLO | HOLO | | lacustrine sediments, evaporites |
| Laguna Chulluncani | sodium sulfate*, Li, K | HOLO | HOLO | | lacustrine sediments, evaporites |
| Laguna Colorado | trona*, mirabilite*, halite, diatomite, clay | HOLO | HOLO | | claystone, diatomite, other lacustrine sediments |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| Laguna Coruto | halite, gypsum, clay | QUAT | QUAT | | lacustrine sediments |
| Laguna Hedionda Norte | mirabilite*, native sulfur, halite | HOLO | HOLO | | lacustrine sediments, evaporites |
| Laguna Loromayu | Li, K, Mg, Na, Sr in brine | QUAT | QUAT | | lacustrine sediments, volcanics |
| Laguna Mama Khumu | halite, sulfur, arsenic minerals?, clay | HOLO | HOLO | | lacustrine sediments, evaporites |
| Laguna Ramaditas | gypsum, calcite | HOLO | HOLO | | mud, carbonate, gypsum |
| Laguna Sacabaya | halite | QUAT | QUAT | | lacustrine sediments and evaporites |
| Laguna Verde | calcite, clay, halite, organics | HOLO | HOLO | | lacustrine limestone, other sediments, ash |
| Lagunas Pastos Grandes | gypsum, clay, calcite, halite | HOLO | HOLO | | lacustrine limestone, evaporites |
| **Salar de Challviri** | gypsum, halite | HOLO | HOLO | | lacustrine sediments, evaporites |
| Boratera de Challviri Norte | gypsum | HOLO | HOLO | | lacustrine sediments, evaporites |
| Boratera de Challviri Sur | gypsum | HOLO | HOLO | | lacustrine sediments, evaporites |
| Challviri Pampa East | | HOLO | HOLO | | lacustrine sediments, evaporites |
| Challviri Pampa North | clay | HOLO | HOLO | | lacustrine clay |
| Herrera Pampa | | HOLO | HOLO | | lacustrine sediments |
| **Salar de Chiguana** | halite | HOLO | HOLO | | lacustrine sediments, evaporites |
| La Carrillana | halite | HOLO | HOLO | | lacustrine sediments, evaporites |
| Salar de Coipasa | halite*, gypsum, clay, diatomite, K | QUAT | QUAT | | lacustrine mud, limestone, gypsum, halite |
| **Salar de Empexa** | gypsum, clay, halite, calcite, Li | HOLO | HOLO | | lacustrine sediments, evaporites, clay |
| Istma | gypsum | HOLO | HOLO | | lacustrine sediments, evaporites |
| Laqueca | gypsum | HOLO | HOLO | | lacustrine sediments, evaporites |
| Salar de Luriques | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar de Ollague | halite | HOLO | HOLO | | lacustrine sediments, evaporites |
| **Salar de Uyuni** | halite*, sodium sulfate, sylvite, clay, Li* | QUAT | QUAT | | lacustrine sediments, evaporites |
| Llipi-Llipi | clay | HOLO | HOLO | | mud |
| Rio Grande (Boratera Pampa) | gypsum halite, clay, Fe oxides | HOLO | HOLO | | lacustrine-fluvial mud, clay |
| Salmuera del Rio Grande | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salmueras del Salar de Uyuni | halite, Li, sylvite, clay, gypsum | QUAT | QUAT | | lacustrine sediments, evaporites |
| **Salar Laguani** | halite | HOLO | HOLO | | lacustrine sediments, evaporites |
| Pajoncha | | HOLO | HOLO | | lacustrine sediments, evaporites |
| ***Chile*** | | | | | |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| Cebollar | gypsum | LPLIO-PLEIS? | LPLIO PLEIS | EL LOA FM | limestone |
| Lagunas Bravas | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Las Tizas | | | | | |
| Maria Elena | nitrates*, iodates*, chromates, halite | HOLO | HOLO | | alluvium, colluvium, caliche |
| **Pampa Tamarugal** | halite, potassium salts, carbonates | | | | sand, carbonate, caliche, halite, |
| | | PLIO HOLO | PLIO-HOLO | | conglomerate |
| Chug-chug | nitrates*, iodates*, chromates | | | | |
| El Toco | gypsum | | | | limestone, fanglomerate, ignimbrite, |
| | | LPLIO? | LPLIO-PLEIS | EL LOA FM | rhyolite, andesite |
| Pampa Joya | gypsum | | | | lacustrine and alluvial sediments and |
| | | HOLO | HOLO | | evaporites |
| Quebrada de Barrera | | | | | |
| Quillagua | | CEN | CEN | | lacustrine silt, clay |
| Salar Cosapilla | | | | | |
| Salar de Agua Amarga | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar de Aguas Calientes | gypsum, halite | | | | lacustrine sediments, evaporites |
| | | QUAT | QUAT | | |
| Salar de Aguas Calientes Norte (Zenobia) | gypsum, halite, clay | | | | clay, mud, sand, gypsum |
| | | QUAT-HOLO | QUAT-HOLO | | |
| Salar de Aguilar | halite | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar de Ascotan | diatomite, gypsum, halite, mirabilite | | | | lacustrine silt, clay, diatomite, evaporites |
| | | QUAT | CEN | | |
| **Salar de Atacama** | Li, K, halite, gypsum | | | | lacustrine clay, mud, silt, evaporites |
| | | CEN | TERT-QUAT | | |
| Tambillo | halite, gypsum | | | | lacustrine sediments?, evaporites |
| | | QUAT | QUAT | | |
| Tilomonte | | | | | lacustrine sediments?, evaporites |
| | | QUAT | QUAT | | |
| Tilopozo | halite, gypsum | QUAT | QUAT | | lacustrine sediments?, evaporites |
| Salar de Carcote | halite, gypsum | QUAT | QUAT | | lacustrine clay, silt, evaporites |
| Salar de Cariquimas | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar de Gorbea | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar de Infieles | halite | | | | lacustrine sediments, evaporites |
| | | QUAT | QUAT | | |
| Salar de La Isla | halite? | CEN | CEN | | lacustrine sediments, evaporites |
| Salar de Las Parinas | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar de Maricunga | halite, travertine, tufa | | | | lacustrine sediments, evaporites |
| | | QUAT? | MTERT-QUAT | | |
| Salar de Ollague | halite | | | | lacustrine sediments, evaporites |
| | | HOLO | HOLO | | |
| Salar de Pajonales | halite | | | | lacustrine sediments, evaporites |
| | | QUAT? | QUAT | | |
| Salar de Pedernales | halite, gypsum, clay, anhydrite | QUAT | LTERT-QUAT | | lacustrine sediments, evaporites |
| **Salar de Pintados** | thenardite, mirabilite, bloedite, halite, | | | | lacustrine silt, sand, evaporites |
| | gypsum | QUAT | QUAT | | |
| Diana | | | | | |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| Salar de Punta Negra | halite, gypsum | QUAT? | CEN | | lacustrine sediments, evaporites |
| **Salar de Surire** | mirabilite, halite, gypsum | QUAT | QUAT | | lacustrine sediments, evaporites |
| Borateras de Chilcaya | | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar del Huasco | gypsum, diatomite, halite, thenardite, clay | QUAT | QUAT | | lacustrine sediments, evaporites |
| Salar Quisquiero | halite, gypsum, clay | QUAT-HOLO | QUAT-HOLO | | silt, clay, mud, evaporites |
| **TALTAL** | | | | | |
| Alemania | nitrates*, iodates*, chromates, halite | HOLO? | HOLO? | | caliche |
| Flor de Chile | nitrates*, iodates*, chromates | HOLO? | HOLO? | | caliche |
| Santa Lucia | nitrates*, iodates*, chromates | HOLO? | HOLO? | | caliche |
| **Tarapaca** | | | | | |
| Humberstone | nitrates*, iodates*, chromates | HOLO? | HOLO? | | caliche |
| Negreiros | nitrates*, iodates*, chromates | HOLO? | HOLO? | | caliche |
| North Lagunas | nitrates*, iodates*, chromates | HOLO? | HOLO? | | caliche |
| Victoria | nitrates*, iodates*, chromates, halite | HOLO? | HOLO? | | caliche |
| **Tocopilla** | | | | | |
| Pedro de Valdivia | sodium nitrates*, iodates*, chromates, halite | HOLO | HOLO | | caliche, alluvium, colluvium |
| Prosperidad | | HOLO? | HOLO? | | caliche |
| Santa Fe | nitrates*, iodates*, chromates | HOLO? | HOLO? | | caliche |
| Vega Carvajal | gypsum | PLIO-PLEIS? | PLIO-PLEIS | El Loa Fm | limestone |
| ***China*** | | | | | |
| Bange Lake | | HOLO | HOLO | | lacustrine evaporites, mud |
| Bangyu Salt Lake | | HOLO | HOLO | | lacustrine evaporites, mud |
| Chalaka | | HOLO | HOLO | | lacustrine evaporites, mud |
| Dujiali Lake | clay | HOLO | HOLO | | lacustrine clay |
| Geerkunsha | halite, gypsum, anhydrite | QUAT | QUAT | | mud |
| Heping | | | LTRI | | granodiorite |
| **Liaoning Province Mines** | | | | | |
| Gaotaigou | magnesite, magnetite, rare earths | PROT? | PROT | | marble |
| Houxianyu | magnesite, magnetite, rare earths | PROT? | PROT | | marble |
| Liaoning Province Borate Mine | | | | | |
| Ougquangou | magnesite, magnetite, rare earths | PROT? | PROT | Liaojitite Suite | carbonates |
| Wudaogou | magnesite, magnetite, rare earths | PROT? | PROT | | dolomitic marble |
| Zuanmiaogou | magnesite, magnetite, rare earths | PROT | PROT | | |
| Qiliping | | PERM? | PROT | | carbonates |
| **Qinghai Plateau** | | | | | |
| **Qaidam Basin** | halite, potash*, gypsum, clay, sodium sulfate | PLIO-HOLO | PLIO-HOLO | | lacustrine sediments, evaporites |
| Bielietan | | HOLO | HOLO | | lacustrine evaporites, mud |
| Da Chaidan Lake | potash*, halite, gypsum, travertine | HOLO | HOLO-PLEIS | | lacustrine evaporites, mud |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| Iksaydam Lake | | | | | |
| Mahai | mirabilite? | QUAT | QUAT | | lacustrine sediments, evaporites |
| Qarhan Salt Pan | halite, sylvite (potash)*, carnallite, gypsum, mirabilite | QUAT | QUAT | | mud, halite, silt, sand |
| West Taijinaier Lake | halite? and other evaporites | HOLO | HOLO | | lacustrine evaporites, mud |
| Xiao Chaidan Lake | halite, mirabilite, Ca-Mg carbonates | HOLO | HOLO | | lacustrine mud, sand |
| Yiliping | potash?, sodium minerals? | HOLO | HOLO | | lacustrine evaporites, mud |
| Yeshan | | PROT? | PROT | | metasediments |
| Yin Lake | | HOLO | HOLO | | lacustrine evaporites, mud |
| Zhabuye Salt Lake | halite, gypsum? | HOLO | HOLO | | lacustrine evaporites, mud |
| Zhacang | gypsum, halite | HOLO | HOLO | | lacustrine evaporites, mud |
| ***Ecuador*** | | | | | |
| Nono | Li | | CRET | Macuchi Fm | volcanics |
| San Nicolas | Li, Mn | QUAT | PLEIS | Tarqui Fm | volcanics |
| ***Germany*** | | | | | |
| Hamburg | potash*, gypsum, halite, anhydrite | LPERM | LPERM | | gypsum, halite, anhydrite, clay |
| Stassfurt | potash* (carnalite, sylvite), gypsum, halite | LPERM | LPERM | | gypsum, halite, anhydrite, clay |
| ***Greece*** | | | | | |
| Karlovassi Basin - Samos Island | celestite, gypsum | | LMIO | | tuff, clay, marl |
| ***India*** | | | | | |
| Puga Valley | halite, sulfur, sodium sulfate, sodium carbonate, gypsum | HOLO-QUAT | HOLO/QUAT | | halite, mud, gypsum |
| ***Iran*** | | | | | |
| Ashin | halite, clay | HOLO-QUAT | HOLO-QUAT | | halite, mud |
| Deh-e-Shotoran | | HOLO-QUAT | HOLO-QUAT | | evaporites, mud |
| Tonkar | | HOLO-QUAT | HOLO-QUAT | | limestone, clay, evaporites |
| ***Italy*** | | | | | |
| Tuscany | carbon dioxide | HOLO-QUAT | CRET-PLIO | | sediments, volcanics |
| ***Kazakhstan*** | | | | | |
| Inder | gypsum, clay, carbonates, sylvite, anhydrite | PERM | PERM | | gypsum, clay |
| Lake Inder | sylvite, bromides | LQUAT | LQUAT | | evaporites, brine, mud |
| ***Mexico*** | | | | | |
| Hamosilo | | MIO? | MIO? | | lacustrine sediments? |
| La Salada | | MIO | LTERT | | conglomerate, sandstone, tuff |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| Mesa del Alamo | zeolites- clinoptilolite, phillipsite, calcite | MIO | TERT | | tuff, tuffaceous mudstone, sandstone, shale |
| Tubutama | zeolite, gypsum, clay | MIO | LMIO | | shale, sandstone, limestone, volcanics |
| ***North Korea*** | | | | | |
| Khol-don | | | | | |
| Raitakuri | | | | | |
| ***Peru*** | | | | | |
| **Chillicolpa** | halite, clay | QUAT | QUAT | | lacustrine sediments, evaporites |
| Cualqiuer Cosa Concesion | epsomite, halite | | | | |
| Alguna Cosa | clay | | QUAT | | volcaniclastic and lacustrine sediments |
| Laguna Blanca | clay, chlorides, sulfates | | LTERT-QUAT | | fluvioglacial sediments? |
| Laguna Salinas | halite, gypsum, thenardite, montmorillonite, illite | HOLO | HOLO | | sandy mud |
| ***Russia*** | | | | | |
| Crimea | | QUAT? | | | |
| Dalnegorsk (Bor) | | PALEOG? | PALEOG? | | volcanics |
| Kamchatka Peninsula | | | QUAT | | |
| Klyuchevskoye-Dimitryevskoye | | CRET? | CRET? | | pegmatite |
| Tazheran (Lake Baikal) | | PREC? | PREC | | skarn |
| ***Tajikistan*** | | | | | |
| Churkurkul | trona, halite, tennardite, hanksite, burkeite, thermonatrite, travertine | HOLO-QUAT | HOLO-QUAT | | clay, carbonate |
| Lyanger Lake | trona, halite, tennardite, hanksite, burkeite, thermonatrite | | HOLO-QUAT | | clay, salts, travertine |
| Sask-kul Lake | trona, halite, tennardite, hanksite, burkeite, thermonatrite | HOLO-QUAT | HOLO-QUAT | | clay, salts, travertine |
| Shorkul Lake | trona, halite, tennardite, hanksite, burkeite, thermonatrite | | HOLO-QUAT | | clay, salts, travertine |
| ***Turkey*** | | | | | |
| **Bigadic (Iskele Koyu)** | bentonite, gypsum, zeolites, chlorite, anhydrite, celestite | MIO | MIO 18-19 MY | | marl, limestone, gypsum, volcanics, tuff |
| Acep | bentonite | MIO | MIO | | marl, clay, tuff, limestone |
| Ankara Nos. 2 and 3 | clay | MIO | MIO | | lacustrine sediments |
| Begendikler | bentonite | MIO | MIO | | limestone, clay, tuff |
| Boreke | bentonite | MIO | MIO | | limestone, clay, tuff |
| Domuz | bentonite | MIO | MIO | | limestone, clay, tuff |
| Gunevi | bentonite | MIO | MIO | | limestone, clay, tuff |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| Harmanicik | | MIO | MIO | | marl, clay, limestone |
| Kireclik | bentonite | MIO | MIO | | limestone, clay, tuff |
| Kurtpinari | bentonite | MIO | MIO | | limestone, clay, tuff |
| Salmanli | | MIO | MIO | | lacustrine sediments |
| Tulu Degirmen | bentonite | MIO | MIO | | limestone, clay, tuff |
| **Emet** | orpiment, realgar, celestite, calcite, gypsum, native sulfur, clay | MIO | MIO 15-19 MA | | limestone, congl, clay, tuff, agglomerate, sandstone |
| Derekoy | calcite, montmorillonite, illite, chlorite | MIO | MIO | | clay, marl, tuff |
| Espey | bentonite, realgar, calcite, celestite, orpiment, native sulfur, illite, chlorite | MIO | E-MMIO | | gypsum, shale, limestone, marl, tuff |
| Goktepe | gypsum, calcite, montmorillonite, illite, chlorite | MIO | MIO | | clay, marl, tuff |
| Hamamkoy | calcite, montmorillonite, illite, chlorite | MIO | MIO | | clay, marl, tuff, limestone |
| Hisarcik | realgar, calcite, celestite, orpiment, gypsum, native sulfur, montmorillonite, illite, chlorite | MIO | MIO | | limestone, shale, marl, tuff, lignite |
| Killik | montmorillonite, realgar, native sulfur, calcite, illite, chlorite | MIO | MIO | | marl, tuff, clay |
| Kestelek | smectite, illite, calcite, quartz, zeolites, chlorite | EMIO | EMIO | | clay, tuff, limestone, marl |
| Kirka | clay, dolomite, calcite, montmorillonite, lignite | MIO 15-19 MA | MIO | | clay, tuff, marl, congl, limestone, basalt |
| Kucukler | | MIO? | MIO? | | lacustrine sediments |
| Selendi Basin | clay | MIO | MIO | | clay, marl, limestone, tuff |
| Sultancayir-Aziziye | gypsum, bentonite, zeolites, illite, chlorite | LTERT | LTERT | | limestone, tuff, gypsum, lignite |
| ***Turkmenistan*** | | | | | |
| Kara-Bagaz-Gol Gulf | Mg | QUAT | QUAT | | sediments |
| ***United States-Arizona*** | | | | | |
| Aguila | | QUAT | QUAT | | lacustrine sediments |
| Gila Bend | | LTERT? | | | |
| ***United States - California*** | | | | | |
| Ash Meadows Zeolite Deposit | zeolites*, clay, opal, calcite | PLEIS? | PLEIS | | tuff, mudstone |
| **CALICO-DAGGET AREA** | celestite, gypsum, calcite | MIO 13-17 MA | MIO | Barstow Fm | shale, limestone |
| American Borax Mine | | M-LMIO | M-LMIO | Barstow Fm | shale |
| Centennial Mine | calcite | M-LMIO | M-LMIO | Barstow Fm | shale, limestone |
| Columbus Mine (Gem Borate) | | M-LMIO | M-LMIO | Barstow Fm | shale |
| Pacific Mine (Old Borate) | calcite, celestite, gypsum | M-LMIO | M-LMIO | | lacustrine shale, limestone |
| Palm Borate Co. Mine | | M-LMIO | M-LMIO | Barstow Fm | lacustrine shale |
| Union | | TERT | MIO | | lacustrine sediments |
| Western Minerals Mine | | M-LMIO | M-LMIO | Barstow Fm | lacustrine shale |
| China Lake | halite, clay | QUAT | QUAT | | mud, evaporites |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| **CLEAR LAKE AREA** | | | | | |
| Borax Lake | trona, gaylussite | QUAT | QUAT | | mud, evaporites |
| Lake Hachinhama | | | | | |
| Columbian | | | | | |
| **DEATH VALLEY** | calcite, dolomite, gypsum, celestite | | | | limy mudstone, shale, tuffaceous |
| | | HOLO LMIO 6 MY | HOLO LMIO | Furnace Creek Fm | sediments |
| Billie I and II | calcite | | | | limy mudstone and shale |
| | | LMIO | LMIO | Furnace Creek Fm | |
| Boraxo (Thompson, Kern) | clay | | | | tuffaceous mudstone, shale, limestone, |
| | | LMIO | LMIO | Furnace Creek Fm | sandstone |
| Corkscrew | calcite | LMIO | LMIO | Furnace Creek Fm | limestone, shale, mudstone, sandstone |
| DeBely | calcite | LMIO | LMIO | Furnace Creek Fm | shaly limestone, shale |
| Eagle Borax Works | | QUAT | QUAT | | |
| East Coleman | calcite | LMIO | LMIO | Furnace Creek Fm | tuffaceous mudstone, sandstone |
| Gower Gulch | calcite, gypsum | LMIO | LMIO | Furnace Creek Fm | gypsum, conglomerate |
| Grand View | calcite | LMIO | LMIO | Furnace Creek Fm | shaly limestone, shale |
| Harmony Borax Works | | | | | playa sediments, evaporites |
| | | QUAT | QUAT | | |
| Inyo | calcite | LMIO | LMIO | Furnace Creek Fm | sandy conglomerate, mudstone |
| Lila C | calcite | LMIO | LMIO | Furnace Creek Fm | tuffaceous mudstone, sandstone |
| Lizzy V. Oakley | calcite | LMIO 6 MY | LMIO | Furnace Creek Fm | shale |
| Low | | LMIO | LMIO | Furnace Creek Fm | |
| Lower Biddy McCarthy | calcite | LMIO | LMIO | Furnace Creek Fm | limestone, shale, conglomerate |
| Maria | calcite | LMIO | LMIO | Furnace Creek Fm | tuffaceous mudstone and sandstone |
| Monte Blanco | calcite | LMIO | LMIO | Furnace Creek Fm | limestone, shale |
| Paula | | LMIO | LMIO | Furnace Creek Fm | lacustrine sediments |
| Played Out | calcite | LMIO | LMIO | Furnace Creek Fm | limy shale, shale, sandstone |
| Terry | calcite, zeolites, gypsum | LMIO | LMIO | Furnace Creek Fm | shale, tuff, gypsum, basalt, sandstone |
| Upper Biddy McCarthy | calcite | LMIO | LMIO | Furnace Creek Fm | limestone breccia, conglomerate, shale |
| White Monster - Sigma | calcite | LMIO | LMIO | Furnace Creek Fm | limy shale, mudstone |
| Widow No. 3 | calcite | LMIO | LMIO | Furnace Creek Fm | shaly limestone, shale |
| Widow No. 7 | calcite | LMIO | LMIO | Furnace Creek Fm | shaly limestone, shale |
| Fort Cady Deposit | anhydrite, gypsum, celestite, trona, halite | MIO | MIO | | lacustrine evaporites and sediments, tuff |
| Gerstley I | calcite | LMIO 6 MY | LMIO | | mudstone, conglomerate |
| Gerstley II | calcite | LMIO 6 MY | LMIO | | limestone breccia, conglomerate, shale |
| Hector | hectorite*, zeolites, anhydrite, clay, | | | | limestone, tuff, claystone |
| | gypsum, calcite, travertine | MIO 19-23 MY | | | |
| Koehn Lake | halite, gypsum | QUAT | QUAT | | lacustrine sediments, evaporites |
| **KRAMER AREA** | | | | | |
| Kramer | calcite, realgar, stibnite, clay, native arsenic and sulfur | | | | claystone, shale, sandstone, ash |
| | | MIO 18-20 MY | MMIO | Kramer beds/Ricardo Fm | |
| Rho A - Upper and Lower | realgar, orpiment, calcite | MIO? | MIO? | Tropico Grp | claystone, silty sandstone |
| Rho B - Upper and Lower | calcite, arsenic minerals? | MIO? | MIO? | Tropico Grp | claystone, silty sandstone |
| Sunray (Rho) | | MIO? | MIO? | Tropico Grp? | shale |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| Owens Lake | soda ash* | QUAT | QUAT | | lacustrine mud |
| Saline Valley | | QUAT | QUAT | | laucstrine mud, evaporites |
| Searles Lake | halite, Li, K, aragonite, dolomite, gaylussite, calcite | QUAT 0.03-0.( | LQUAT | | lacustrine clay, mud, salt |
| **VENTURA COUNTY AREA/FRAZIER MTN.** | gypsum | MIO 15 MY | MIO | | shale, limestone |
| Alta Claim | | | | | |
| Bitter Creek | gypsum | TERT? | TERT? | | lacustrine shale, limestone |
| Borate No. 3 | | | | | |
| ***Bryan D Claim*** | | | | | |
| Columbus Mine | gypsum | | | | lacustrine shale, limestone |
| Denver Claim | | | | | |
| Frazier Mine | gypsum, travertine? | MIO? 15 MY? | MIO? | | lacustrine shale, limestone |
| Frisco | | | | | |
| Ives Property | gypsum | | TERT MIO? | | lacustrine shale |
| Ives Tunnel | gypsum | | | | lacustrine shale |
| Jessie | | | | | |
| King and Queen | | | | | |
| Mane | | | | | |
| Middle Fork Borate Prospects | gypsum | TERT | TERT | | gypsum, shale, limestone |
| North Fork Borate Deposits | | TERT | TERT | | lacustrine shale |
| Pinoche | | | | | |
| Rusland | | | | | |
| Russell Mine | gypsum, selenite | TERT | TERT | | lacustrine shale, limestone |
| Stubblefield and Halloway | gypsum | | | | lacustrine shale, limestone |
| Thomas Boyle | | | | | |
| Tick Canyon (Lang, Sterling) | | MIO 20 MY | MIO | | lacustrine shale, limestone |
| Tuscan Springs | | | | | |
| ***United States - Nevada*** | | | | | |
| Anniversary Mine (Callville Wash) | clay, gypsum, dolomite, halite | MMIO 13-16 MY | MMIO | Horse Spring Fm | limestone, calcareous shale, tuff |
| Cave Spring | calcite | PLIO | PLIO | | calcitic to dolomitic claystone |
| **Columbus Marsh** | halite, clay | HOLO | HOLO | | mud, silt, sand |
| Borax Works | | | | | |
| Calmville Borax Works | halite | HOLO | HOLO | | mud, silt, sand |
| China Borax Works | halite | HOLO | HOLO | | mud, silt, sand |
| Old Borax Works | halite | HOLO | HOLO | | mud, silt, sand |
| Dixie Marsh | halite, brine, clay, gaylussite | QUAT | QUAT | | lacustrine sediments and evaporites |
| **Eagle Marsh** | halite, mirabilite, thenardite | QUAT | QUAT | | lacustrine and alluvial sediments |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED MINERALS (*=dominant mineralization) | MIN AGE | FM AGE | FORMATION | HOST ROCKS |
|---|---|---|---|---|---|
| Hot Springs Marsh (Eagle Marsh) | | CEN | CEN | | lacustrine sediments, evaporites |
| **Fish Lake Marsh** | sodium sulfate, halite | HOLO | HOLO | | clay, silt |
| Pacific Borax Co. | | QUAT | QUAT | | |
| Gerlach Hot Springs | | QUAT | QUAT | | |
| North Sand Springs | potash? | QUAT | QUAT | | lacustrine sediments |
| Ore Car Mine | | | PAL | | carbonates |
| Rhodes Marsh (Virginia Marsh) | halite, trona, gaylussite, thenardite, mirabilite, glauberite | QUAT | LQUAT | | lacustrine and alluvial sediments |
| Sample Site 1133 | | QUAT | QUAT | Emigrant Fm | lacustrine sediments |
| Sand Springs Marsh (Salt Wells) | potash? | QUAT | QUAT | | lacustrine sediments |
| Silver Peak Marsh (Clayton Valley) | lithium*, hectorite, gypsum, halite, clay, tufa | CEN | CEN | | lacustrine sediments and evaporites |
| Silver Peak Range | | EMIO | EMIO | Horse Spring Fm | calcareous chale, limestone, ash |
| Soda Lake | sodium carbonate | QUAT | QUAT | | lacustrine sediments |
| Teels Marsh | zeolite, trona, halite, gaylussite, magnesia | QUAT | LQUAT | | lacustrine and alluvial sediments |
| White Basin/Central Muddy Mtns | hectorite?, gypsum | MMIO 13-16 MY | MIO | Horse Spring Fm | limestone, calcareous shale, dolomite, tuffaceous rocks |
| ***United States - New Mexico*** | | | | | |
| Lake Lucero | halite, sodium sulfate | | | | |
| ***United States - Oklahoma*** | | | | | |
| West-Central Oklahoma | | | | | |
| ***United States - Oregon*** | | | | | |
| Alvord Desert | | | | | |
| Alvord Valley (Lake Alvord) | sodium carbonate | QUAT | QUAT | | lacustrine sediments |
| Lone Ranch (Chetco) | aragonite | | JUR | | serpentinite |
| Summer Lake (eastern playa) | soda ash*, sodium sulfate*, potash?, Mg | | QUAT? | | lacustrine sediments |
| ***Yugoslavia*** | | | | | |
| Jarandol | zeolites, magnesite, coal, calcite, gypsum | MIO | MIO | | claystone, chert, tuff |
| Kremna | magnesite, dolomite | MIO | MIO | | dolomite, magnesite |
| Lopari-Sibosnica | | MIO | MIO | | shale, marl |
| Valjevo-Mionica | dolomite, oil shale | MMIO | MMIO | | tuff, marl, clay, dolomite |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| ***Argentina*** | | | | | | | |
| Acazoque | dacite, andesite | MIO-PLIO | fossil | | N | | 6, 158 |
| Alejandra Occurrence | | | | | N | | 160 |
| Alex Prospect | | | | | N | | 160 |
| **Archibarca Ravine area** | | | | | | | |
| Adriana | | | Y | | N | | 6 |
| Lari | | | Y | | SPP | Completely mined out. | 6 |
| Los Bayos | basalt | QUAT | Y | | SPP | Deposit is mined out. | 6 |
| Tropa Pete | | | Y | Y | SPP | | 6, 38 |
| Berta Prospect | | | | | N | | 160 |
| Blanca Lila Mine | | | | | | | 15 |
| Boratera de Antuco | tuff, basalt, andesite | M-LPLIO | Y | | Y | Prod 1940-1949 | 6, 38, 40, 122, 129, 158 |
| Celti Occurrence | dacite | MIO | | | N | | 6, 160 |
| Coyaguaima | dacite tuff | | | | | contains about 10,000 t borate, 3 deposits | 1, 6, 18a, 38, 122, 129, 160, 173, |
| | | PLIO | Y | | S | | 196 |
| El Toro | | | Y | | N | | 6 |
| La Mucar | | | | | U | Small deposits in several depressions | 6, 160 |
| Laguna Guachalayte | | | | | N | | 160 |
| **Laguna Guayatayoc** | | | | Y | S | **below Rio Alumbro springs** | **6, 38, 129, 160, 173** |
| Baratoyoc Mine | | | | Y | S | | 160, 173 |
| Grupo Cordoba | granite | | | | U | | 160, 173 |
| **Laguna Vilama** | tuff, andesite, dacite | | | | | | |
| | | LPLIO-PLEIS | | Y | SPP | | **6, 129, 160, 196** |
| Boratera Vilama I-II | andesite, dacite | | | | | | |
| | | PLIO-PLEIS | | | N | | 6, 160 |
| Cerro Bayo | andesite, dacite | | | | | | |
| | | PLIO-PLEIS | | Y | SPP | | 6, 160 |
| Lagunita | dacite tuff, ignimbrite | PLEIS | | Y | N | | 6 |
| Libertad | | | | Y | SPP | Borate almost entirely mined out. | 6, 160 |
| Loma Blanca | tuff, dacite, rhyodacite | | | | | | |
| | | TERT MIO | fossil | | Y | | 6, 7, 160 |
| Maria Teresa | | | | | SPP | | 160 |
| Oire | | | | | N | | 6 |
| Ojo de Agua | | | Y | Y | SPP | | 6 |
| **Rio Alumbrio Spring Area** | basalt, andesite | | | | | ***11 spring aprons*** | |
| | | TERT | Y | Y | SPP | | **6, 122, 129, 160** |
| Arituzar Mine | volcanics | PLIO | Y | Y | SPP | Deposit is almost exhausted. | 6, 10, 122, 196 |
| Calichar | ignimbrite | | Y | Y | N | | 6 |
| Cañuelas | | | Y | Y | SPP | Deposit is exhausted. 3 springs. | 6 |
| Daniel Mine | dacite | PLIO | Y | Y | SPP | Deposit is exhausted. | 6, 196 |
| San Marcos | dacite tuff | PLEIS | Y | Y | I | | 6, 10 |
| Volcancito | dacite tuff | MIO | Y | Y | SPP | Prod ulexite in 1980's | 6, 122, 129, 158 |
| **Salar Centenario** | tuff, basalt, andesite | MIO-PLIO | | Y | S | | **6, 38, 129, 173, 195** |
| Anatuya Prospect | | | | | N | | 173, 195 |
| Boroquimica Samicaf Mines | | | | Y | Y | | 173, 195 |
| La Argentina | | | | Y | SPP | | 195 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| Maggie | | | | | SPP | | 195 |
| Mataro Prospect | | | | | N | | 173, 195 |
| Maria Luisa I-II Occurrence | | | | | N | | 160 |
| Purmamarca Mine | | | | | SPP | | 160, 173 |
| Salar de Antofalla | | | | | N | | 6, 8, 38 |
| **Salar de Cauchari** | | | | | | **Salar is 53 km x 80 km** | |
| | | | Y | | S | | **6, 8, 54, 122, 129, 160, 173** |
| Campamento Primero de Mayo | | | | | Y | | 160, 173 |
| Carlota-Corina | tuff, andesite, dacite | MIO-PLIO | | | SPP | | 158 |
| Cinco Occurrence | | | | | U | | 160 |
| Defensa I-II-II Occurrences | | | | | U | | 6, 160 |
| El Porvenir | | | | Y | SPP | | 6, 160, 173 |
| La Inundada | | | | Y | S | | 6, 160, 173 |
| Mascota | | | | Y | SPP | | 6, 160 |
| San Pedro | | | | | Y | | 6, 160 |
| Siberia | | | | | N | | 6, 160 |
| Salar de Incahuasi | | | | | N | | 38 |
| **Salar de Jama** | volcanics | | | | | | |
| | | TERT-QUAT | | | SPP | | **6, 38, 129, 160, 173** |
| Benito I-II | | | | | U | | 38, 160, 173 |
| Jama Mine | | | | | SPP | | 38, 160, 173 |
| Maria Luisa | | | | | U | | 38, 160, 173 |
| San Francisco | | | | | U | | 38, 160, 173 |
| **Salar de Llullaillaco** | | | | | | | |
| | | | | | S | | **38, 160** |
| Adela | | | | | N | | 160 |
| **Salar de Olaroz** | | | | Y | SPP | **add reserves in MRDS rec** | **6, 17, 38, 129, 160, 173** |
| El Condor | | | | Y | SPP | | 160, 173 |
| Grupo San Nicolas | | | | | | | |
| | | | | Y | SPP | | 6, 160, 173 |
| Santa Ines | | | | Y | SPP | | 160, 173 |
| Yacare | | | | | N | | 160 |
| **Salar de Pastos Grandes** | tuff, dacite, andesite | | | | | | **6, 8, 11, 38, 94, 129, 160, 173, 195** |
| | | LMIO-PLEIS | | Y | SPP | | |
| Betina Mine | | | | | S | | 173, 195 |
| Boratera Blanca Lila | dacite, andesite | EQUAT | Y | Y | Y | | 6, 15, 195 |
| Coronel Gorrotti | | | | | SPP | | 15, 195 |
| **Salar de Pocitos o Quiron** | andesite | | | | | | |
| | | QUAT | | Y | S | | **15, 38, 160, 173, 195** |
| Ducus IV | | | | | N | | 160 |
| Dona Emma | | | | | S | | 160, 173 |
| **Salar de Pozuelos** | | | | Y | ? | | **6, 38, 86, 129, 173, 195** |
| Margarita | | | | | | | |
| San Mateo Mine | | | | | Y | | 173, 195 |
| Salar de Pucar | | | | | N | | 38 |
| Salar de Rio Grande | | | | Y | SPP | | 38, 160, 173 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| **Salar de Santa Maria** | | | | | | | |
| | | | | | Y | | **17, 173, 195** |
| Santa Maria Mine | tuff | | | Y | S | | |
| Salar de Turilari | lithic tuff | | | | | | |
| | | PLIO | | Y | S | | 6, 81, 122, 129, 160, 173 |
| **Salar del Hombre Muerto** | tuff, basalt | | | | | | **6, 8, 10, 15, 17, 38, 39, 54, 88,** |
| | | TERT-PLEIS? | | | Y | | **124, 129, 169, 173** |
| 20 de Febrero | | | | | SPP | | 18 |
| Calchaquina | | | | | SPP | | 18 |
| Centenario | | | | | SPP | | 18 |
| Delia | | | | | SPP | | 18 |
| Tincalayu | tuff, basalt | | | | | In N-central part of salar, Sijes Fm overlies | |
| | | LMIO | | | M | thick halite sequence | 6, 8, 54, 81, 95, 97, 129, 169 |
| **Salar del Rincon** | | | | | | | |
| | | | | Y | SPP | | **6, 38, 87, 122, 129, 160, 173** |
| Angela | | | | | N | | 160 |
| Arunco | | | | | N | | 160 |
| Carolina | | | | Y | S | | 160 |
| Eduardo | | | | | N | | 160 |
| Nelly | | | | Y | I | | 160, 173 |
| Salina Talisman | | | | | N | | 173 |
| San Eduaro | | | | | N | | 160 |
| Salar Diablillos | volcanics | | | | | | |
| | | CEN | Y | Y | Y | | 6, 38, 41, 54, 129, 173 |
| **Salar Ratones** | | | fossil | | I | | **6, 38, 160, 173** |
| Aeghyr Occurrence | | | | | N | | 6, 160, 173 |
| Esperanza Prospect | | | | | N | | 6, 160, 173 |
| **Salina de Lina Lari y de Pairiquis** | ignimbrite, othr volcanics | | | | | | |
| | | CEN | | | SPP | | **6, 38** |
| Huincul Prospect | | | | | N | | 160 |
| **Salinas Grandes** | | | | | | | |
| | | | | Y | Y | | **6, 38, 160, 173** |
| Bahia Blanca | | | | | U | | 38, 160 |
| Boratera La Aguadita | | | | | SPP | | 38, 160 |
| Boratera de Nino Muerto | | | | Y | SPP | | 6, 38 |
| Boratera de Pozo Cavado | | | | Y | SPP | | 38, 160 |
| Boratera de Tres Morros | | | | | SPP | | 6, 38 |
| Cauchari Mine | | | | Y | SPP | | 158, 160 |
| Santa Marta I-II | | | | | U | | 38, 160 |
| Silvia | | | | | N | | 160 |
| Valparaiso | | | | | U | | 38, 160 |
| Victoria | | | | | U | | 38, 160 |
| Salinas Grandes Prospect | | | | | U | | |
| San Antonio | | | | | SPP | | 38, 160 |
| San Eduardo | | | | | N | | 160 |
| San Luis | | | | | N | | 160 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| **Serrania de Sijes** | tuff | | | | | | |
| | | | fossil | | Y | | **6, 95, 173, 195** |
| Alejandro | tuff | | | | | | |
| | | | | | N | | 6, 173, 195 |
| Andina | tuff, andesite, dacite | EPLEIS | fossil | Y | SPP | | 6, 195 |
| Anita | tuff | | | | | | |
| | | LMIO-PLIO | fossil | | N | | 6, 173, 195 |
| Elsa | | | | | N | | 6 |
| Hierro Indio Prospect | tuff | | | | | | |
| | | LMIO-PLIO | | | U | | 17, 173, 195 |
| Juanita | | | | Y | I | | 6 |
| La Esperanza | tuff | | | | | | |
| | | EPLIO | | Y | SPP | | 6, 173, 195 |
| La Paz | tuff | LMIO-PLIO | | Y | I | | 6 |
| Monte Amarillo | tuff | | | | | | |
| | | MIO | | Y | S | | 6 |
| Monte Azul | tuff | LMIO-PLIO | | Y | SPP | | 6, 173 |
| Monte Blanco | tuff | LMIO-PLIO | fossil | | N | | 6, 173, 195 |
| Monte Gris | tuff | LMIO-PLIO | | | N | | 6, 173, 195 |
| Monte Marron | tuff | LMIO-PLIO | | Y | N | | 6 |
| Monte Verde | tuff | | | | | | |
| | | LMIO | | Y | N | | 6 |
| Santa Elena | tuff | LMIO-PLIO | | | N | | 6 |
| Santa Elvira | tuff | LMIO PLIO | | | N | | 6 |
| Santa Rosa | tuff | | | | | | |
| | | LMIO-PLIO | | Y | S | | 6 |
| Socacastro | dacite tuff and flows | LMIO | | Y | N | | 6 |
| Unnamed | | | Y | Y | SPP | | 196 |
| ***Armenia*** | | | | | | | |
| Dzhulfa area | | | fossil | Y | Y | | 146, 207 |
| ***Bolivia*** | | | | | | | |
| Cuevitas | | | | | N | | 129 |
| Laguna Busch o Kalina | ignimbrite, dacite | MIO-HOLO | | | N | | 22, 165 |
| Laguna Cachi | volcanics | | | | | | |
| | | MIO-HOLO | | | U | | 2, 23, 139 |
| Laguna Capina Sur | andesite, pyroclastics | LMIO-QUAT | | Y | S | | 23, 137 |
| Laguna Celeste | volcanics | QUAT | | | N | | 143 |
| Laguna Chiar Kkota | volcanics | LMIO-QUAT | | | N | | 23, 135, 162, 165, 166 |
| Laguna Chojllas | dacitic to andesite | | | | | | |
| | volcanics | LMIO-HOLO | Y | | N | | 145, 165 |
| Laguna Chulluncani | dacitic to andesite | | | | | | |
| | volcanics, ignimbrite | LMIO-HOLO | | | N | | 23, 165 |
| Laguna Colorado | dacitic to andesite | | | | | | |
| | volcanics, ignimbrite | LMIO-HOLO | Y | Y | N | | 23, 35, 44, 140 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| Laguna Coruto | ignimbrite, dacite, andesite | QUAT | Y | | N | | 11, 144 |
| Laguna Hedionda Norte | dacitic to andesite tuff, ignimbrite | MIO-HOLO | | Y | N | | 23, 165, 166 |
| Laguna Loromayu | volcanics | QUAT | Y | | N | | 21 |
| Laguna Mama Khumu | ignimbrite, dacitic to andesite flows and tuffs | MIO-HOLO | | Y | S | | 142 |
| Laguna Ramaditas | ignimbrite, dacitic to andesite flows and tuffs | LMIO-HOLO | | | N | | 23, 166 |
| Laguna Sacabaya | ignimbrite, dacitic to andesite flows and tuffs | LMIO-HOLO | Y | Y | SPP | | 20 |
| Laguna Verde | ash, other volcanics | QUAT | | | N | | 23, 141 |
| Lagunas Pastos Grandes | ignimbrite, dacitic to andesite flows and tuffs | MIO-HOLO | Y | Y | S | | 23, 136, 166, 169 |
| **Salar de Challviri** | ignimbrite, dacitic to andesite flows and tuffs | LMIO-HOLO | Y | Y | SPP | | **23, 33, 138** |
| Boratera de Challviri Norte | | | | | N | | 23 |
| Boratera de Challviri Sur | | | | Y | SPP | | 23, 33 |
| Challviri Pampa East | | | | | N | | 23 |
| Challviri Pampa North | | | | | N | | 23 |
| Herrera Pampa | | | | | N | | 23 |
| **Salar de Chiguana** | ignimbrite, dacitic to andesite flows and tuffs | MIO-HOLO | | | S | | **23, 169** |
| La Carrillana | | | | | SPP | | 23 |
| Salar de Coipasa | dacitic to andesite volcanics | LMIO-HOLO | Y | Y | S | | 23, 60, 61, 134, 159, 163 |
| **Salar de Empexa** | volcanics | | Y | | SPP | | **23, 33, 60, 61, 166, 169** |
| Istma | | | | | N | | 23 |
| Laqueca | | | | | SPP | | 23 |
| Salar de Luriques | ignimbrite, dacitic to andesitic tuff | MIO-HOLO | | | S | | 129, 165 |
| Salar de Ollague | dacitic to andesite flows and tuffs | LMIO-HOLO | | | N | See Chile MRDS record I010100. | 11, 59 |
| **Salar de Uyuni** | tuff, basalt | LMIO-HOLO | | | S | | **2, 23, 33, 50, 61, 159, 164, 169** |
| Llipi-Llipi | tuff, basalt | | | | N | | 23, 33 |
| Rio Grande (Boratera Pampa) | tuff, basalt | LMIO-HOLO | | | SPP | | 23, 33, 76, 167, 190 |
| Salmuera del Rio Grande | | | | | N | | 23, 61 |
| Salmueras del Salar de Uyuni | volcanics | | | | N | | 23, 50, 60, 61, 159 |
| **Salar Laguani** | ignimbrite, dacitic to andesite flows and tuffs | MIO-HOLO | | | S | | **23, 33, 122, 169** |
| Pajoncha | volcanics | | | | N | | 23, 33 |
| ***Chile*** | | | | | | | |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| Cebollar | | | | Y | U | | 65 |
| Lagunas Bravas | volcanics | CEN | | Y | N | | 9, 189 |
| Las Tizas | | | | Y | SPP | | 206 |
| Maria Elena | | | | | N | | 65, 81 |
| **Pampa Tamarugal** | tuff, andesite, rhyolite | | | | | | |
| | | | | | SPP | | **179, 206** |
| Chug-chug | | | Y | Y | SPP | | 206 |
| El Toco | tuff, andesite, rhyolite | | | | | | |
| | | CRET | | Y | N | | 65, 206 |
| Pampa Joya | ignimbrite, rhyolite, | | | | | | |
| | andesite | CRET | | Y | SPP | | 65, 129, 206 |
| Quebrada de Barrera | | | | | SPP | | 206 |
| Quillagua | | | | | | | 109, 169, 180, 206 |
| Salar Cosapilla | | | | Y | N | | 129 |
| Salar de Agua Amarga | volcanics | CEN | | | N | | 11, 189 |
| Salar de Aguas Calientes | rhyolitic to basaltic tuffs | | | | | | |
| | and flows | MIO-HOLO | | Y | U | | 11, 29, 129, 189 |
| Salar de Aguas Calientes Norte (Zenobia) | ignimbrite, dacitic- | | | | | | |
| | andesitic tuff, basalt | LMIO-PLIO | | | U | | 71, 129, 189, 206 |
| Salar de Aguilar | volcanics | CEN | Y | | N | | 122, 129, 189 |
| Salar de Ascotan | andesitic flows and tuff | | | | | | 59, 96, 122, 129, 155, 169, 189, 206 |
| | | LMIO-PLIO | Y | Y | SPP | | |
| **Salar de Atacama** | dacite tuff, andesite | | | | | | **29, 43, 48, 60, 64, 99, 120, 154,** |
| | | PLIO-PLEIS | | Y | SPP | | **189, 204, 205** |
| Tambillo | dacitic-andesitic tuffs and | | | | | | |
| | flows | PLIO-PLEIS | | Y | SPP | | 154, 206 |
| Tilomonte | ignimbrite, dacite, | | | | | | |
| | andesite, basalt | PLIO-PLEIS | | Y | SPP | | 154, 206 |
| Tilopozo | dacite tuff | PLIO | Y | | SPP | | 154, 206 |
| Salar de Carcote | andesite flows and tuffs | LMIO-PLIO | | Y | N | | 122, 129, 155 |
| Salar de Cariquimas | | | | | S | | 109, 169, 206 |
| Salar de Gorbea | volcanics | CEN | | Y | SPP | | 189, 206 |
| Salar de Infieles | dacitic-andesitic tuffs and | | | | | | |
| | flows | MIO | | | N | | 11, 123, 129 |
| Salar de La Isla | volcanics | CEN | | | N | | 11, 189, 206 |
| Salar de Las Parinas | | | | | SPP | | 179, 198 |
| Salar de Maricunga | rhyolitic to andesitic | | | | | | |
| | flows and tuffs | LTERT | | Y | SPP | | 96, 117, 118, 129, 189, 206 |
| Salar de Ollague | ignimbrite, rhyolitic to | | | | | | |
| | andesitic flows and tuffs | LMIO-PLIO | | | N | | 11, 59, 155 |
| Salar de Pajonales | rhyolitic to basaltic | | | | | | |
| | volcanics | MIO-HOLO | | Y | N | | 29, 129, 189 |
| Salar de Pedernales | tuff, dacite, andesite | LTERT | | Y | SPP | | 13, 96, 117, 129, 189, 206 |
| **Salar de Pintados** | volcanics | | | | | | |
| | | MIO-PLIO | | Y | S | | **43, 49, 59, 96, 189** |
| Diana | | | | Y | SPP | | 206 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| Salar de Punta Negra | rhyolitic to basaltic volcanics | MIO-HOLO | | | N | | 29, 129, 189, 206 |
| **Salar de Surire** | volcanics | PLIO-PLEIS | | | S | | **49, 59, 95, 96, 109, 189** |
| Borateras de Chilcaya | volcanics | PLIO-PLEIS | | | | | 129, 206 |
| Salar del Huasco | rhyolitic to andesitic volcanics | MMIO-PLIO | | Y | SPP | | 203, 206 |
| Salar Quisquiero | ignimbrite, dacite tuff, basalt, andesite | LMIO-PLIO | | Y | U | | 11, 71, 129, 189, 206 |
| **TALTAL** | | | | | | | |
| Alemania | | | | Y | N | | 56, 58, 121 |
| Flor de Chile | | | | | N | | 56 |
| Santa Lucia | | | | Y | N | | 56 |
| **Tarapaca** | | | | | | | |
| Humberstone | | | | Y | N | | 56, 58 |
| Negreiros | | | | Y | N | | 56, 161 |
| North Lagunas | | | | Y | N | | 56 |
| Victoria | | | | Y | N | | 56, 58, 161 |
| **Tocopilla** | | | | | | | |
| Pedro de Valdivia | | | | | N | | 56, 65, 81 |
| Prosperidad | | | | Y | N | | 56 |
| Santa Fe | | | | Y | N | | 56 |
| Vega Carvajal | | | | | U | | 65, 206 |
| | | | | | | | |
| ***China*** | | | | | | | |
| Bange Lake | | | | | U | | 100 |
| Bangyu Salt Lake | | | | | N | | 100 |
| Chalaka | | | | | Y | | 26, 100 |
| Dujiali Lake | | | | | S | active mine | 100 |
| Geerkunsha | | | | | N | | 191 |
| Heping | | | | | U | | 77 |
| **Liaoning Province Mines** | | | | | | | |
| Gaotaigou | | | | | S | | 95 |
| Houxianyu | | | | | S | | 81, 95, 131 |
| Liaoning Province Borate Mine | | | | | | | 169 |
| Ougquangou | | | | | S | | 95 |
| Wudaogou | | | | | S | | 95, 100, 132, 169 |
| Zuanmiaogou | | | | | Y | | 95 |
| Qillping | | | | | Y | | 131 |
| **Qinghai Plateau** | | | | | Y | | **169** |
| **Qaidam Basin** | | | | | | | |
| | | | Y | | Y | | **81, 106, 107, 109, 152** |
| Bielietan | | | Y | | N | | 81, 100 |
| Da Chaidan Lake | | | Y | | Y | | 26, 81, 95, 108, 109, 131, 191 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| Iksaydam Lake | | | | | | | |
| Mahai | | | | | S | | 95 |
| Qarhan Salt Pan | | | | | | | |
| | | | | | U | | 81, 106, 169 |
| West Taijinaier Lake | | | | | N | | 191, 193 |
| Xiao Chaidan Lake | | | | Y | S | | 81, 95, 100 |
| Yiliping | | | | | N | | 191 |
| Yeshan | | | | | N | | 100 |
| Yin Lake | | | | Y | N | | 100 |
| Zhabuye Salt Lake | | | | | Y | | 100 |
| Zhacang | | | | | | | |
| | | | | | Y | | 191 |
| ***Ecuador*** | | | | | | | |
| Nono | | | | | N | | 55, 74, 147 |
| San Nicolas | | | | | N | | 55, 147 |
| ***Germany*** | | | | | | | |
| Hamburg | | | | | B | B recovered as byproduct of potash prod | 97, 98 |
| Stassfurt | | | | | B | B recovered as byproduct of potash prod | 97, 98 |
| ***Greece*** | | | | | | | |
| Karlovassi Basin - Samos Island | tuff | LMIO | | | N | only v. sm bodies recognized | 187 |
| ***India*** | | | | | | | |
| Puga Valley | tuff | | | | | | |
| | | | Y | Y | S | | 80, 91, 109 |
| ***Iran*** | | | | | | | |
| Ashin | | | | | SPP | | 109 |
| Deh e-Shotoran | | | | | I | | 108, 109, 110 |
| Tonkar | | | | Y | SPP | | 108, 109 |
| ***Italy*** | | | | | | | |
| Tuscany | volcanics | | | | SPP | | 97, 109 |
| ***Kazakhstan*** | | | | | | | |
| Inder | | | | | | | |
| | | | | | Y | | 81, 91, 95, 108, 109, 169 |
| Lake Inder | | | | | | | |
| | | | | | Y | | 26, 81, 97, 108, 169 |
| ***Mexico*** | | | | | | | |
| Hamosilo | | | | | N | | 3 |
| La Salada | tuff, basalt | LTERT | | | U | | 73, 150 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| Mesa del Alamo | tuff | TERT | | | N | | 73, 95, 101, 116, 150 169 |
| Tubutama | volcanics | MIO | | | N | 5Mt at lower grade | 19, 73 |
| ***North Korea*** | | | | | | | |
| Khol-don | | | | | S | Deposit described as "pipe". | 95 |
| Raitakuri | | | | | S | Deposit described as "pipe". | 95 |
| ***Peru*** | | | | | | | |
| **Chillicolpa** | basalt, andesite | | Y | | SPP | | 122, 129 |
| Cualqiuer Cosa Concesion | | | Y | | | | 37, 170 |
| Alguna Cosa | volcanics | TERT-QUAT? | Y | | SPP | | 37, 170 |
| Laguna Blanca | | | | | N | Part of this salar is in Chile. | 170 |
| Laguna Salinas | tuff, andesite, dacite | | Y | Y | S | | 95, 96, 97, 122, 129, 169 |
| ***Russia*** | | | | | | | |
| Crimea | | | | | Y | | 109 |
| Dalnegorsk (Bor) | | | | | Y | | 95, 169 |
| Kamchatka Peninsula | basalt | | | | N | | 146 |
| Klyuchevskoye-Dimitryevskoye | | | | | U | | 109, 169 |
| Tazheran (Lake Baikal) | | | | | N | | 109, 169 |
| ***Tajikistan*** | | | | | | | |
| Churkurkul | | | Y | | N | | 146 |
| Lyanger Lake | | | Y | | N | | 146 |
| Sask-kul Lake | | | Y | | U | | 146 |
| Shorkul Lake | | | Y | | N | | 146 |
| ***Turkey*** | | | | | | | |
| **Bigadic (Iskele Koyu)** | tuff, basalt, obsidian | MIO | | Y | L | 12 mines, several deposits | 4, 28, 32, 81, 82, 95, 96, 97, 111, 169 |
| Acep | tuff, obsidian | MIO | | Y | SPP | | 111 |
| Ankara Nos. 2 and 3 | | | | | SPP | | 111 |
| Begendikler | tuff, obsidian | MIO | | | SPP | | 111 |
| Boreke | tuff, obsidian | MIO | | | N | | 111 |
| Domuz | tuff, obsidian | MIO | | | N | | 111 |
| Gunevi | tuff | | | | Y | | 111 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| Harmanicik | tuff | | | N | N | discovered by drill intercept | 100 |
| Kireclik | tuff, obsidian | MIO | | Y | Y | | 111 |
| Kurtpinari | tuff, obsidian | MIO | | Y | Y | | 111 |
| Salmanli | | | | Y | PP | | 111 |
| Tulu Degirmen | tuff | | | Y | PP | | 111 |
| **Emet** | tuff, andesite | | | | | several deposits | 4, 26, 28, 32, 81, 82, 84, 95, 97, |
| | | MIO | | | L | | 111, 169 |
| Derekoy | tuff | MIO | | | Y | | 83, 84 |
| Espey | tuff | | | | | largest dep in district; underground | |
| | | MIO | | | Y | | 32, 83, 84, 109, 111, 169 |
| Goktepe | tuff | | | | | | |
| | | MIO | | | U | | 83, 84, 111 |
| Hamamkoy | tuff | MIO | | N | U | | 32, 83, 84, 111 |
| Hisarcik | tuff | | | | | important deposit; open pit | 32, 83, 84, 97, 109, 111, 169 |
| | | MIO | | | Y | | |
| Killik | tuff | | | | | | 32, 83, 84 |
| | | | | | Y | | |
| Kestelek | tuff | | | | | 3 beds | 4, 14, 28, 32, 95, 111, 169 |
| | | EMIO | | | Y | | |
| Kirka | tuff, basalt, andesite | | | | | | 4, 26, 52, 81, 82, 89, 90, 95, 97, |
| | | MIO | | | L | | 109, 169 |
| Kucukler | | | | | SPP | | 4, 81, 111 |
| Selendi Basin | tuff | | | Y | N | | 111 |
| Sultancayir-Aziziye | tuff | LTERT | | Y | Y | | 4, 32, 95, 109, 111 |
| ***Turkmenistan*** | | | | | | | |
| Kara-Bagaz-Gol Gulf | | | | | Y | | 108, 109 |
| ***United States-Arizona*** | | | | | | | |
| Aguila | | | | | N | | 78 |
| Gila Bend | | | | | N | | 78 |
| ***United States - California*** | | | | | | | |
| Ash Meadows Zeolite Deposit | tuff, basalt | TERT-PLEIS | Y | | O | | 130, 168, 175, 192 |
| **CALICO-DAGGET AREA** | volcanics, agglomerates | | | | | | **153, 182** |
| | | | Y | Y | PP | | |
| American Borax Mine | | | | | PP | | 153, 157, 202, 211 |
| Centennial Mine | volcanics | | | | PP | | 153 |
| Columbus Mine (Gem Borate) | | | | | PP | | 153, 157, 202, 210 |
| Pacific Mine (Old Borate) | volcanics | | | | | B sequence is 30 m thick. | 36, 109, 153, 157, 202, 210 |
| | | | | | PP | | |
| Palm Borate Co Mine | | | | | PP | | 153, 157, 202, 210 |
| Union | | | | | U | | 157 |
| Western Minerals Mine | | | | | PP | | 153, 157 |
| China Lake | | | Y | | Y | | 182 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| **CLEAR LAKE AREA** | | | | | | | |
| Borax Lake | volcanics | QUAT | | | PP | | 108, 182, 183, 185, 202, 210, 211 |
| Lake Hachinhama | | | | | | | |
| Columbian | | | | | | | |
| **DEATH VALLEY** | tuff, basalt, andesite | | | | | | |
| | | TERT | | | PP | | |
| Billie I and II | tuff, basalt | | | | | | 25, 46, 63, 81, 114, 128, 130, 169, |
| | | TERT | | | PP | | 182 |
| Boraxo (Thompson, Kern) | tuff, basalt | | | | | Cut on N by Pit fault; Diagram in Evans & oths | 63, 114, 119, 209 |
| | | | | Y | PP | | |
| Corkscrew | tuff, basalt | | | Y | U | | 63, 114 |
| DeBely | tuff, basalt | | | | PP | | 63, 114 |
| Eagle Borax Works | | | | | PP | | 112, 182 |
| East Coleman | tuff, basalt | LMIO | | | N | | 63, 114 |
| Gower Gulch | tuff, basalt | MIO | | | N | | 63, 114 |
| Grand View | tuff, basalt | LMIO? | | Y | Y | | 63, 114 |
| Harmony Borax Works | | | | | | Mineralization in part from leaching of Tertiary | 95, 112, 182, 183 |
| | | | | Y | Y | deposits. | |
| Inyo | tuff, basalt | MIO | | N | N | adjacent to Boraxo | 63, 114 |
| Lila C | tuff, basalt | MIO-PLIO | | Y | Y | | 25, 53, 112, 115, 182, 212, 213 |
| Lizzy V. Oakley | tuff, basalt | | | | Y | | 63, 114 |
| Low | | | | | Y | | 24 |
| Lower Biddy McCarthy | tuff, basalt | MIO | | | Y | | 63, 114 |
| Maria | tuff, basalt | TERT | | N | N | | 63, 115 |
| Monte Blanco | tuff, basalt | MIO | | Y | Y | | 63, 114 |
| Paula | | | | | Y | | 24 |
| Played Out | tuff, basalt | | | | Y | | 63, 114 |
| Terry | tuff, basalt | LMIO | | Y | Y | | 24, 63, 115 |
| Upper Biddy McCarthy | tuff, basalt | TERT | | | Y | | 63, 114 |
| White Monster - Sigma | tuff, basalt | MIO | | | Y | | 63, 114 |
| Widow No. 3 | tuff, basalt | | | | Y | | 63, 114 |
| Widow No. 7 | tuff, basalt | | | | Y | Deposit is wedge-shaped, opens down-dip | 63, 114 |
| Fort Cady Deposit | tuff | MIO | | N | X | | 92, 127, 130, 157, 169, 186 |
| Gerstley I | tuff, basalt | LMIO-EPLIO | | Y | Y | | 25, 63, 126, 182 |
| Gerstley II | volcanics | LMIO-EPLIO | | N | N | | 25, 63, 182 |
| Hector | tuff, basalt | | | | | | 113, 182, 193 |
| | | MIO-RECENT | Y | N | N | | |
| Koehn Lake | volcanics | | | | S | | 182, 194 |
| **KRAMER AREA** | | | | | | | |
| Kramer | tuff, basalt | | | | | elongate, irregular, double-convex shape | 27, 31, 70, 95, 96, 97, 126, 130, |
| | | | | | | ellipse | 169, 174, 176, 177, 178, 182, 186, |
| | | TERT | | N | L | | 202 |
| Rho A - Upper and Lower | | | | N | N | | 62, 75 |
| Rho B - Upper and Lower | | | | N | N | | 62 |
| Sunray (Rho) | | | | N | N | | 62 |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| Owens Lake | | | Y | | S | No evaporites in the upper 330 m of sediment. Dry due to diversion of inflow to | 42, 109, 182 |
| Saline Valley | alkaline volcanics, basalt | PLIO-QUAT | Y | | Y | 3 playas/salt lakes within the valley. | 69, 182 |
| Searles Lake | basalt | | | | Y | | 47, 95, 96, 97, 109, 169, 172, 181, 182 |
| **VENTURA COUNTY AREA/FRAZIER MTN.** | basalt | | | | | | 197 |
| | | MIO | fossil | Y | Y | | |
| Alta Claim | | | | | U | | 197 |
| Bitter Creek | basalt | | | | Y | | 67, 197 |
| Borate No. 3 | | | | | U | | 197 |
| ***Bryan D Claim*** | | | | | *U* | | ***197*** |
| Columbus Mine | basalt | | | | Y | | 67, 197, 202 |
| Denver Claim | | | | | U | | 197 |
| Frazier Mine | basalt | MIO | | | Y | | 67, 182, 197, 210 |
| Frisco | | | | | U | | 197 |
| Ives Property | basalt | | | | N | | 67, 197 |
| Ives Tunnel | basalt | | | | N | | 67 |
| Jessie | | | | | U | | 197 |
| King and Queen | | | | | U | | 197 |
| Mane | | | | | U | | 197 |
| Middle Fork Borate Prospects | basalt | | | | N | | 67, 197 |
| North Fork Borate Deposits | basalt | | | | Y | | 67, 197 |
| Pinoche | | | | | U | | 197 |
| Rusland | | | | | U | | 197 |
| Russell Mine | basalt | | | | Y | | 67, 197, 202 |
| Stubblefield and Halloway | basalt | | | | Y | | 67 |
| Thomas Boyle | | | | | | | 197 |
| Tick Canyon (Lang, Sterling) | tuff, basalt, andesite | | | | | | 132 |
| | | EMIO? | fossil | | Y | | |
| Tuscan Springs | | | | | N | | 109 |
| ***United States - Nevada*** | | | | | | | |
| Anniversary Mine (Callville Wash) | tuff | MMIO | | Y | Y | stromatolites | 32, 104, 125, 148, 149, 200 |
| Cave Spring | | | | | N | | 66, 148, 149, 184 |
| **Columbus Marsh** | | | | | | **Borates on E side of marsh; diagram in** | **4, 30, 68, 79, 85, 103, 148, 199,** |
| | | | | | Y | **Papke** | **200, 202** |
| Borax Works | | | | | | | 30, 148 |
| Calmville Borax Works | | | | | Y | | 30, 148 |
| China Borax Works | | | | | Y | | 30, 148 |
| Old Borax Works | | | | | Y | | 30, 148 |
| Dixie Marsh | | | | Y | S | | 103, 148, 198, 201 |
| **Eagle Marsh** | | | Y | | Y | | **148** |

Table 1. Borate deposits.

| DEPOSIT NAME | ASSOCIATED ROCKS | VOLC AGE | ASSOC. SPGS? | OUTCROP? | PROD? | COMMENTS | REFERENCE(S) |
|---|---|---|---|---|---|---|---|
| Hot Springs Marsh (Eagle Marsh) | | | | | U | | 148 |
| **Fish Lake Marsh** | | | | | S | **diagram in Papke** | |
| Pacific Borax Co. | | | | | | | 5, 103 |
| Gerlach Hot Springs | | | | | U | | 148 |
| North Sand Springs | | | | | Y | | |
| Ore Car Mine | | | | | N | | |
| Rhodes Marsh (Virginia Marsh) | | | Y | | Y | marsh is 3 sq mi; 40 acre borate area in n-central part | 16, 45, 148, 171, 200 |
| Sample Site 1133 | tuff | | | | N | | |
| Sand Springs Marsh (Salt Wells) | | | Y | | S | | 148, 182 |
| Silver Peak Marsh (Clayton Valley) | tuff | | | Y | U | Li, possible salt producer | 53, 93, 105, 148 |
| Silver Peak Range | | | | | S | | 5, 148, 149 |
| Soda Lake | | | | | S | | 148 |
| Teels Marsh | tuff | | | | Y | diagram in Papke; borates in NE part of playa; first discovery of natural borax in Nevada | 16, 45, 148, 149, 171, 200 |
| White Basin/Central Muddy Mtns | tuff | | | Y | S | Several small deposits here | 34, 104, 125, 149, 169, 182 |
| ***United States - New Mexico*** | | | | | | | |
| Lake Lucero | | | | | | | 12 |
| ***United States - Oklahoma*** | | | | | | | |
| West-Central Oklahoma | | | | | | | 182 |
| ***United States - Oregon*** | | | | | | | |
| Alvord Desert | | | | | | | |
| Alvord Valley (Lake Alvord) | basalt | LMIO | Y | | Y | | 26, 102, 182, 183, 202 |
| Lone Ranch (Chetco) | | | | | Y | | 156, 188 |
| Summer Lake (eastern playa) | basalt | LTERT PLIO? | Y | Y | N | | 151 |
| ***Yugoslavia*** | | | | | | | |
| Jarandol | tuff, andesite | MIO | Y | | N | | 95, 108, 133, 169 |
| Kremna | | | | | N | | 108 |
| Lopari-Sibosnica | tuff | | | | N | | 108 |
| Valjevo-Mionica | tuff | MMIO | | | U | | 133 |

Table 2. Deposit type codes.

| | |
|---|---|
| BD | bedded lacustrine/evaporite |
| BR | brine |
| L | lake (saline or alkaline) |
| M | marine |
| N | nitrate/iodate deposit |
| O | occurrence |
| P | playa |
| PG | pegmatite |
| SK | skarn and (or) metamorphic |
| SP | spring deposits |

Table 3. Production codes.

| | |
|---|---|
| Y | producer |
| S | small producer |
| M | medium producer |
| L | large producer |
| SPP | small past producer |
| PP | past producer |
| N | no production |
| U | uncertain if producer |

## REFERENCES


1. Ahlfeld, Federico, 1948, La boratera de Coyacuaima, Provincia de JuJuy: Asociacion Geologica Argentina Revista, t. 3, no. 4, p. 271-278.
2. Ahlfeld, F.E., and Schneider-Scherbina, Alejandro, 1964, Los yacimientos minerales y hidrocarburos de Bolivia: Bolivia Departamento Nacional de Geologia Boletín 5 (Especial), 388 p.
3. Alatorre, A., Harben, P., McVey, H., and Santini, K., 1993, Mexico--opportunities in industrial minerals: Presentation at 29th Forum on the Geology of Industrial Minerals, Long Beach, Calif., April 25-30, 1993.
4. Albayrak, F.A., and Protopapas, T.E., 1985, Borate deposits of Turkey, in Barker, J.M., and Lefond, S.J., eds., Borates: economic geology and production: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical and Petrole
5. Albers, J.P., and Stewart, J.H., 1972, Geology and mineral deposits of Esmeralda County, Nevada: Nevada Bureau of Mines and Geology Bulletin 78, p. 61.
6. Alonso, R.N., 1986, Occurrence, stratigraphic position, and genesis of the borate deposits of the Puna Region of Argentina: Salta, Universidad Nacional de Salta, Ph.D dissertation, unpublished, 196 p.
7. Alonso, R.N., Helvaci, C., Sureda, R.J., and Viramonte, J.G., 1988, A new Tertiary borax deposit in the Andes: Mineralium Deposita 23, p. 299-305.
8. Alonso, R.N., Jordan, T.E., Tabbutt, K.T., and Vandervoort, D.S., 1991, Giant evaporite belts of the Neogene central Andes: Geology, v. 19, p. 401-404.
9. Alonso, R.N., and Robertson, D.B., 1992, La genesis de kernita en los yacimientos de borax, *in* de Brodtkorb, M.K., and Schalamuk, I.B., eds., Io Reunion de Mineralogia y Metalogenia, La Plata, 28 a 29 de Octubre de 1991: Instituto de Recursos Minerales P
10. Alonso, R.N., and Viramonte, J.G., 1985, Geyseres boratiferos de La Puna, Argentina, in Actas--IV Congreso Geologico Chileno: Antofagasto, Chile, Universidad del Norte Chile, p. 3.23-3.44.
11. Alonso, R.N., and Viramonte, J.G., 1985, Provincia boratifera Centroandina, in Actas--IV Congreso Geologico Chileno: Antofagasto, Chile, Universidad del Norte Chile, p. 3.45-3.63.
12. Alto, B.R., Fulton, R.S., and Haigler, L.B., 1977, Salines, *in* Mineral and water resources of New Mexico: New Mexico Bureau of Mines and Mineral Resources Bulletin 87, p. 299-306.
13. Alvarez H., Eduardo, 1984, Exploracion del Salar de Pedernales (Atacama) mediante imagenes Landsat procesadas por computador: Revista Geologica Chile, no. 21, p. 77-97.
14. Anac, Selahattin, 1988, Etibank's place in the production of industrial minerals in Turkey: Industrial Minerals, no. 246, p. 25-29.

15. Angelelli, V., 1984, Yacimientos metaliferos de la Republica Argentina: Provincia de Buenos Aires Comision Invest. Cient., La Plata, v. 1, p. 303-325.
16. Archbold, N.L., 1966, Industrial mineral deposits of Mineral County, Nevada: Nevada Bureau of Mines and Geology Report 14, 32 p.
17. Argentina Direccion Nacional de Mineria y Geologia, 1991, Report on the Argentine mining sector, Argentine selected mining projects: Buenos Aires.
18. Argentina Instituto Nacional de Geologia y Mineria, 1966, Mapa minero de Provincias de Catamarca y Tucuman, escala 1:750,000.
18a. Aristarain, L.F., and Hurlbut, C.S., Jr., 1972, Boron minerals and deposits: The Mineralogical Record, v. 3, p. 213-220.
19. Arriaga Melendez, H., Pena Rocha, L., and Gomez Cabellero, A., 1986, Resultados de la evalucaion del deposito de boratos del area Tubutama, Sonora: Geomimet, no. 141, XIII Epoca, p. 41-60.
20. Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, and Blacutt, William, 1992, Laguna Sacabaya, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 196.
21. Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, and Orris, G.J., 1992, Laguna Loromayu, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 203.
22. Asher-Bolinder, Sigrid, and Soria Escalante, Eduardo, 1992, Laguna Busch o Kalina, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 204.
23. Ballivián, O., and Risacher, F., 1981, Los salares del Altiplano de Bolivia; métodos de estudio y estimación económica: Paris and La Paz, l'Office de la Recherche Scientifique et Technique Outre-Mer and Universidad Mayor de San Andres, 246 p.
24. Barker, C.E., 1980, The Terry borate deposit, Amargosa Valley, Inyo County, California: California Geology, v., 33, no. 8, p. 181-187.
25. Barker, C.E., and Barker, J.M., 1985, A re-evaluation of the origin and diagenesis of borate deposits, Death Valley, California, *in* Barker, J.M., and Lefond, S.J., eds., Borates: economic geology and production: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., p. 101-135.
26. Barker, J.M., and Lefond, S.J., 1985, Boron and borates: introduction and exploration techniques, *in* Barker, J.M., and Lefond, S.J., eds., Borates: economic geology and production: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical and Petroleum Engineers, Inc., p. 13-51.

27. Barnard, R.M., and Kistler, R.B., 1966, Stratigraphic and structural evolution of the Kramer sodium borate ore body, Boron, California, *in* Rau, J.L., ed., Second Symposium on Salt: Cleveland, Ohio, Northern Ohio Geological Society, v. 1, p. 133-150.
28. Bekisoglu, K.A., 1962, Boron deposits in Turkey: Turkish Economic Review, v. 3, no. 4, p. 12-34.
29. Boric P., Ricardo, Diaz F., Felipe, and Maksaev J., Victor, 1990, Geologica y yacimientos metaliferos de la Region de Antofagasta: Chile Servicio Nacional de Geologia y MineriaBoletin 40, 246 p., escala 1:500,000.
30. Bowser, C.J., 1964, Geochemistry and petrology of the sodium borates in the non-marine evaporite environment: Los Angeles, University of California, unpublished Ph.D dissertation, 199 p.
31. Bowser, C.J., and Dickson, F.W., 1966, Chemical zonation of the borates of Kramer, California, in Rau, J.L., ed., Second symposium on salt: Cleveland, Ohio, The Northern Ohio Geological Society, Inc., v. 1, p. 122-132.
32. Brown, W.W., and Jones, K.D., 1971, Borate deposits of Turkey, in Campbell, A.S., ed., Geology and history of Turkey: Tripoli, Petroleum Exploration Society of Libya, p. 483-492.
33. Cadima V., J., and Lafuente G., F., 1969, Prospección general de algunas borateras particulares Río Grande y Llipi-Llipi: Servicio Geológico de Bolivia Informe GB-M-647, 36 p.
34. Callaghan, Eugene, and Rubey, W.W., 1936, Borates, Nevada, Clark County, *in* Hewett, D.F., Callaghan, Eugene, Moore, B.N., Nolan, T.B., Rubey, W.W., and Schaller, W.T., Mineral resources of the region around Boulder Dam: U.S. Geological Survey Bulletin 871, p. 106-113.
35. Camacho M., Eduardo, 1971, Estudio geologico de Laguna Colorada, Lipez, Potosi: La Paz, Universidad Major de San Andres, Resis de Grado.
36. Campbell, M.R., 1902, Reconnaissance of the borax deposits of Death Valley and Mohave Desert: U.S. Geological Survey Bulletin 200, 23 p.
37. Castillo, Hernan, 1989, Informe tecnico concesiones Cualquier Cosa y Alguna Cosa: Banco Minero Informe Tecnico, COD B 3723.
38. Catalano, L.R., 1964, Boro-Berilio-Litio (Una nueva fuente natural de energia): Ministerio de Economia de la Nacion Estudios de Geología y Minería Económica Serie Argentina, no. 3, variously paged.
39. Catalano, L.R., 1964, Estudio Geológico-Económico del Salar de Hombre Muerto: Ministerio de Economia de la Nacion Estudios de Geología y Minería Económica Serie Argentina, no. 4, approx. 255 p.
40. Catalano, L.R., 1964, Puna de Atacama: Boratera de Antuco; Cuenca de Diablillos: Ministerio de Economia de la Nacion Estudios de Geología y Minería Económica Serie Argentina, no. 2, variously paged.
41. Catalano, L.R., 1964 (1927), Cuenca de Diablillos: Ministerio de Economia de la Nacion Estudios de Geología y Minería Económica Serie Argentina, no. 2, 70 p.

42. Chatard, T.M., 1890, Natural soda: Its occurrence and utilization, in Report of work done in the Division of Chemistry and Physics mainly during the fiscal year 1887-'88: U.S. Geological Survey Bulletin 60, p. 27-101.
43. Chong Diaz, G., 1984, Die salare i nordchile; geologie, strukur, und geochemie: Stuttgart, Geotekt. Forsh., no. 67, 146 p.
44. Cortez, L., 1968, Informe del muestro del yacimiento salino en Laguna Colorada concession Rose Maria: Servicio Geologico de Bolivia Informe GB-M-627, 4 p.
45. Couch, B.F., and Carpenter, J.A., 1943, Nevada's metal and mineral production (1859-1940 inclusive): University of Nevada Bulletin, v.37, no. 4, Geology and Mineralogy Series 38.
46. Countryman, R.L., 1977, The subsurface geology, structure, and mineralogy of the Billie borate deposit, Death Valley, California: Los Angeles, University of California, unpublished Master's thesis, 129 p.
47. Cowie, Charles, 1985, Searles Lake borax-- the first one hundred years, *in* Barker, J.M., and Lefond, S.J., eds., Borates: economic geology and production: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., p. 139-146.
48. Crozier, R.D., 1986, Lithium: resources and prospects: Mining Magazine, v. 154, no. 2, p. 148-152.
49. Crozier, R.D., 1988, Chile 1987- Industrial minerals review: Industrial Minerals, no. 251, p. 44-50.
50. Crozier, R.D., 1988, A strategy to enter a saturated market--Bolivian lithium: 8th Industrial Minerals Congress, Papers, p. 59-75.
51. Davis, J.R., Howard, K.A., Rettig, S.L., Smith, R.L., Ericksen, G.E., Risacher, Francois, Alarcon, Hugo, and Morales, Ricardo, 1982, Progress report on lithium-related geologic investigations in Bolivia: U.S. Geological Survey Open-File Report 82-782, 17 p.
52. Dickson, Ted, 1985, Etibank at Kirka--from ore to derivatives: Industrial Minerals, no. 210, p. 65-57.
53. Dole, R.B., 1913, Exploration of salines in Silver Peak Marsh, Nevada, in Contributions to economic geology--1911: U.S. Geological Survey Bulletin 530, p. 330-345.
54. Dublanc, E.A., Malca, D.A., and Perez Leale, Alfredo, 1993, Industrial minerals of Argentina-- looking for investment: Industrial Minerals, no. 312, p. 25-36.
55. Ecuador Ministerio de Recursos Naturales y Energeticos, 1982, Mapa geologico nacional de la Republica del Ecuador, scale 1:1,000,000.
56. Ericksen, G.E., 1981, Geology and origin of the Chilean nitrate deposits: U.S. Geological Survey Professional Paper 1188, 37 p.
57. Ericksen, G.E., Chong D., Guillermo, and Vila G., Tomás, 1976, Lithium resources of salars in the central Andes, in Vine, J.D., ed., Lithium resources and requirements by the Year 2000: U.S. Geological Survey Professional Paper 1005, p. 66-74.

58. Ericksen, G.E., and Mrose, M.E., 1970, Mineralogical studies of the nitrate deposits of Chile, II. Darapskite: $Na_3(NO_3)(SO_4)\cdot H_2O$: American Mineralogist, v. 55, p. 1550-1517.
59. Ericksen, G.E., and Salas O., Raul, 1989, Geology and resources of salars in the Central Andes, *in* Ericksen, G.E., Cañas P., M.T., and Reinemund, J.A., eds., Geology of the Andes and its relation to hydrocarbon and mineral resources: Houston, Texas, Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 11, p. 151-164.
60. Ericksen, G.E., Vine, J.D., and Ballon, R., 1977, Lithium-rich brines at Salar de Uyuni and nearby salars in southwestern Bolivia: U.S. Geological Survey Open-File Report 77-615, 47 p.
61. Ericksen, G.E., Vine, J.D., and Ballon, Raul, 1978, Chemical composition and distribution of lithium-rich brines in Salar de Uyuni and nearby salars in southwestern Bolivia, in Penner, S.S., ed., Lithium needs and resources: Oxford, Pergamon Press, p. 355-363.
62. Evans, J.R., and Anderson, T.P., 1976, Colemanite deposits near Kramer Junction, San Bernardino County, California: California Division of Mines and Geology Special Publication 50, 8 p.
63. Evans, J.R., Taylor, G.C., and Rapp, J.S., 1976, Mines and mineral deposits in Death Valley National Monument, California: California Division of Mines and Geology Special Report 125, 61 p.
64. Evans, R.K., 1986, Further developments of the Salar de Atacama, Chile: 7th Industrial Minerals International congress, Papers, v. 1, p. 87-91.
65. Ferraris B., Fernando, 1978, Hoja Tocopilla, Region de Antofagasta: Chile Instituto de Investigaciones Geologicas Mapas Geologicos Preliminares de Chile, no. 3, 32 p., escala 1:250,000.
66. Foshag, W.F., 1934, Searlesite from Esmeralda County, Nevada: American Mineralogist, v. 19, no. 6, p. 268-274.
67. Gale, H.S., 1914, Borate deposits in Ventura County, California, *in* Contributions to Economic Geology, 1912: U.S. Geological Survey Bulletin 540, p. 434-456.
68. Gale, H.S., 1914, Potash tests at Columbus Marsh, Nevada, *in* Contributions to Economic Geology, 1912: U.S. Geological Survey Bulletin 540, p. 422-427.
69. Gale, H.S., 1914, Salt, borax, and potash in Saline Valley, Inyo County, California, *in* Contributions to economic geology, 1912: U.S. Geological Survey Bulletin 540, p. 416-421.
70. Gale, H.S., 1946, Geology of the Kramer borate district, Kern County, California: California Journal of Mines and Geology, v. 42, no. 4, p. 325-378.
71. Gardeweg P., Moyra, and Ramirez R., C.F., 1985, Hoja Rio Zapaleri, II Región de Antofagasta: Chile Servicio Nacional de Geología y Minería Carta Geológica de Chile, no. 66, 89 p., escala 1:250,000.

72. González Barry, C.E., and Alonso, R.N., 1987, El deposito neterciario de boratos Esperanza, Salta: Acenolaza, F.G., ed., Actas del Decimo Congreso Geologico Argentino: San Miguel de Tucuman, Actas, v. II, p. 63-66.
73. Gonzalez S., J.R., 1985, Recursos minerales no metalicos y rocas industriales del Estado de Sonora: Gobeirno de Sonora Dirección de Minería, Geología y Energéticos, 44 p.
74. Gossens, P.J. Fozzard, P.M., and Mosquera, C.C., 1969, Mineral index map of Republic of Ecuador: Ministerio de Industrias y Comercio Nacional de Geologia y Minera, scale 1:1,000,000.
75. Griswold, W.T., 1959, Colemanite as an important source of borates: American Institute of Mining, Metallurgical, and Petroleum Engineers, Society of Mining Engineers Preprint 59H20, 20 p.
76. Grupo AQUATER-GEOBOL,1992, Resultado de la 1ra. Fase de Exploracion de Ulexita en el Delta de Rio Grande, Salar de Uyuni: La Paz, Bolivia, Simposio: Potential Minerao del Altiplano y la Cordillera Occidental, Resumenes, 9 al 11 de Marzo, 1992, p. 48-49.
77. Guanchun, Zheng, and Sufang, Jin, 1991, Geological characteristics and genesis of the Heping boron deposit in Changxing County, Zhejiang Province [abs.]: Mineral Deposits, v. 10, no. 2, p. 192.
78. Ham, W.E., Mankin, C.J., and Schleicher, J.A., 1961, Borate minerals in Permian gypsum of west-central Oklahoma: Oklahoma Geological Survey Bulletin 92, 77 p.
79. Hanks, H.G., 1883, Report on the borax deposits of California and Nevada: California State Mining Bureau, v. 3, pt. 2, 111 p.
80. Harben, P.W., 1993, Industrial Minerals Handybook?:
81. Harben, P.W., and Bates, R.L., 1990, Borates, in Industrial minerals--geology and world deposits: London, Industrial Minerals Division of Metal Bulletin Plc, p. 31-37.
82. Helvaci, Cahit, 1978, A review of the mineralogy of the Turkish borate deposits: Mercian Geologist, v. 6, no. 4, p. 257-270.
83. Helvaci, C., 1984, Occurrence of rare borate minerals: veatchite-A, tunellite, teruggite and cahnite in the Emet Borate Deposits, Turkey: Mineralium Deposita, v. 19, p. 217-226.
84. Helvaci, C. and Firman, R.J., 1976, Geological setting and mineralogy of Emet borate deposits, Turkey: Transactions of the Institution of Mining and Metallurgy, Section B, p. B142-B152.
85. Hicks, W.B., 1916, The composition of muds from Columbus Marsh, Nevada, in Shorter contributions to general geology, 1915: U.S. Geological Survey Professional Paper 95, p. 1-11.
86. Igarzabal, A.P., 1978, La Laguna de Pozuelos y su ambiente salino (Dep. de Tinconada; Prov. de Jujuy): Acta Geologica Lilloana, v. 15, no. 1, p. 79-103.

87. Igarzabal, A.P., 1993, Distribucion cuantitativa del trinomio boro, litio y potasio en la superficie del Salar El Rincon (Dpto. Los Andes, Prov. de Salta): Republica Argentina Revista del Instituto de Geología y Minería 9, p. 95-105.
88. Igarzabal, A.P., and Poppi, R.F., 1980, El Salar de Hombre Muerto: Acta Geologica Lilloana, v. 15, no. 2, p.103-117.
89. Inan, Kemal, 1973, The mineralogy and geochemistry of the Kirka borate deposit, Turkey: United Kingdom, University of Manchester, Ph.D dissertation, 137 p.
90. Inan, K., Dunham, A.C., and Esson, J., 1973, Mineralogy, chemistry and origin of Kirka borate deposit, Eskishehir Province, Turkey: Transactions of the Institution of Mining and Metallurgy, Section B, p. B114-B123.
91. Industrial Minerals, 1974, Borates: supplies still tight despite rising capacity: no. 79, p. 11-29.
92. Industrial Minerals, 1989, Corona controls Fort Cady borate, in World of Minerals: no. 260, p. 15, 17.
93. Industrial Minerals, 1993, Amax and Cyprus merger hits delay, in World of Minerals: no. 312, p. 21-22.
94. Jordan, T.E., and Alonso, R.N., 1987, Cenozoic stratigraphy and basin tectonics of the Andes Mountains, $20^{o}$-$28^{o}$ South Latitude: The American Association of Petroleum Geologists Bulletin, v. 71, no. 1, p. 49-64.
95. Kistler, R.B., and Helvaci, Cahit, 1994, Boron and borates, in Carr, D.D., ed., Industrial minerals and rocks, 6th edition: Littleton, Colorado, Society for Mining, Metallurgy, and Exploration, Inc., p. 171-186.
96. Kistler, R.B., and Smith, W.C., 1975, Boron and borates, in Lefond, S.J., ed., Industrial minerals and rocks (nonmetallics other than fuels): New York, American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., p. 473-496.
97. Kistler, R.B., and Smith, W.C., 1983, Boron and borates, in Lefond, S.J., ed., Industrial minerals and rocks (nonmetallics other than fuels): New York, American Institute of Mining, Metallurgical and Petroleum Engineers Inc., p. 533-560.
98. Kuhn, R., 1968, Geochemistry of German potash deposits: Geological Society of America Special Paper 88.
99. Laborde E., Martín, 1978, El Salar de Atacama: Minerales, v. 33, no. 142, p. 19-26.
100. Langford, R.H., 1993, BHP files.
101. Lefond, S.J., and Barker, J.M., 1979, A borate and zeolite occurrence near Magdalena, Sonora, Mexico, in Scientific Communications: Economic Geology, v. 74, p. 1883-1889.

102. Libbey, F.W., 1985, Boron in Alvord Valley, Harney County, Oregon, *in* Barker, J.M., and Lefond, S.J., eds., Borates: economic geology and production: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., p. 167-177.
103. Lincoln, F.C., 1923, Mining districts and mineral resources of Nevada: Reno, Nevada, Nevada Newsletter Publishing Co.
104. Longwell, C.R., and others, 1965, Geology and mineral deposits of Clark County, Nevada: Nevada Bureau of Mines and Geology Bulletin 62, p. 203.
105. Lowe, N.T., Raney, R.G., and Norberg, J.R., 1985, Principal deposits of strategic and critical minerals in Nevada: U.S. Bureau of Mines Information Circular 9035, 202 p.
106. Lowenstein, T.K., Spencer, R.J., and Pengxi, Ahang, 1989, Origin of ancient potash evaporitets: clues from nonmarine Qaidam Basin of western China: Science, v. 248, p. 1090-1092.
107. Lowenstein, T.K., Spencer, R.J., Yang, Wenbo, Casas, Enrique, Zhang, Pengxi, Zhang, Baozhen, Fan, Haibo, and Krouse, H.R., 1994, Major-element and stable-isotope geochemistry of fluid inclusions in halite, Qaidam Basin, western China: Implications for late Pleistocene/ Holocene brine evolution and paleoclimates, *in* Rosen, M.R., ed., Paleoclimate and basin evolution of playa systems: Geological Society of America Special Paper 289, p. 19-32.
108. Lyday, P.A., 1992, Boron: U.S. Bureau of MInes Annual Report, p. 1-11.
109. Lyday, P.A., 1992, History of boron production and processing: Industrial Minerals, no. 303, p. 19-37.
110. Lyday, P.A., 1993, Boron, in Mineral commodity summaries 1993: U.S. Bureau of Mines.
111. Maden Tetkik ve Arama Enstitüsü Yayinlarindan, 1965, Borate Deposits of Turkey: Mineral Research and Exploration Institute of Turkey Publication 125, 11 p.
112. Majmundar, H.H., 1988 (1985), Borate mining history in Death Valley, Inyo and San Bernardino Counties, in Gregory, J.L., and Baldwin, E.J., eds., Geology of the Death Valley region: Santa Ana, California, South Coast Geological Society, p. 365-371.
113. Mardsen, B.M., 1970, Core logs of three test holes in Cenozoic lake deposits near Hector, California: U.S. Geological Survey Bulletin 1296, 43 p.
114. McAllister, J.F., 1970, Geology of the Furnace Creek borate area, Death Valley, Inyo County, California: California Division of Mines and Geology Map Sheet 14, 9 p., scale 1:24,000.
115. McAllister, J.F., 1973, Geologic map and sections of the Amargosa Valley borate area -- southeast continuation of the Furnace Creek area -- Inyo County, California: U.S. Geological Survey Miscellaneous Geologic Investigations map I-782, scale 1:24,000.

116. McAnulty, W.N., and Hoffer, J.M., 1972, A new howlite occurrence in Sonora, Mexico: Boletin de Sociadad Geológica Mexicana, v. 33, p. 21-24.
117. Mercado W., Margaret, 1978, Avance geológico de las Hojas Chañaral y Potrerillos, Región de Atacama: Chile Instituto de Investigaciones Geológicas Mapas Geológicos Preliminares de Chile, no. 2, 24 p., escala 1:250,000.
118. Mercado W., Margaret, 1982, Hoja Laguna del Negro Francisco, Región de Atacama: Chile Servicio Nacional de Geología y Minería Carta Geológica de Chile, no. 56, 73 p., escala 1:100,000.
119. Minette, J.W., and Wilbur, D.P., 1973, Hydroboracite from the Thompson Mine, Death Valley: The Mineralogical Record, v. 4, p. 21-23.
120. Moraga, A., Chong, G., Forth, M.A., and Henriquez, H., 1974, Estudio geologico del Salar de Atacama, Antofagasta: Chile Inst. Invest. Geol. Boletin 29, 59 p.
121. Mrose, M.E., Fahey, J.J., and Ericksen, G.E., 1970, Mineralogical studies of the nitrate deposits of Chile, III. Humberstonite, $K_3Na_7Mg_2(SO_4)_6(NO_3)_2 \cdot 6H_2O$, a new saline mineral: American Mineralogist, v. 55, p. 1518-1533.
122. Muessig, S., 1966, Recent South American borate deposits, in Rau, J.L., ed., Second Symposium on Salt: Cleveland, Ohio, Northern Ohio Geological Society, Inc., v. 1, p. 151-159.
123. Naranjo, J.A., Puig, Alvaro, 1984, Hojas Taltal y Chañaral, Regiónes de Antofagasta y Atacama: Chile Servicio Nacional de Geología y Minería Carta Geológica de Chile, nos. 62-63, 140 p., escala 1:250,000.
124. Nicolli, H.B., Suriano, J.M., Mendez, Vicente, and Gomez Peral, M.A., 1983, Salmueras ricas en metales alcalinos del Salar del Hombre Muerto, Provincia de Catamarca, Republica Argentina: Buenas Aires, Argentina, Actas del Congreso Latinoamericano de Geologica 5, 17-22 Octubre, 1982, p. 187-204.
125. Noble, L.F., 1922, Colemanite in Clark County, Nevada: U.S. Geological Survey Bulletin 735-B, 21 p.
126. Noble, L.F., 1926, Note on a colemanite deposit near Shoshone, California, with a sketch of the geology of a part of Amargosa Valley, in Contributions to Economic Geology: U.S. Geological Survey Bulletin 785, p. 63-73.
127. Norman, J.C., 1991, Boron: a review of 1990 activities: Mining Engineering, v. 43, no. 7, p. 740-741.
128. Norman, J.C., and Johnson, F.C., 1980, The Billie borate ore body, Death Valley, California, in Fife, D.L., and Brown, A.R., eds., Geology and mineral wealth of the California Desert: Santa Ana, California, South Coast Geological Society, p. 268-277.

129. Norman, J.C., and Santini, K.N., 1985, An overview of occurrences and origin of South American borate deposits with a description of the deposit at Laguna Salinas, Peru, *in* Barker, J.M., and Lefond, S.J., eds., Borates: economic geology and production: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical and Petroleum Engineers, Inc., p. 53-69.
130. O'Driscoll, Mike, 1990, Minerals in the US south-west--breaking rocks in the hot sun: Industrial Minerals, no. 272, p. 52-87.
131. O'Driscoll, Mike, 1994, China's minerals industry gathering for the great leap forward: Industrial Minerals, no. 321, p. 19-45.
132. Oakeshott, G.B., 1958, Geology and mineral deposits of the San Fernando quadrangle, Los Angeles County, California: California Division of Mines and Geology Bulletin 172, 147 p.
133. Obradovic, Jelena, Stamatakis, M.G., Anicic, Stojan, and Economou, G.S., 1992, Borate and borosilicate deposits in the Miocene Jarandol Basin, Serbia, Yugoslavia: Economic Geology, v. 87, p. 2169-2174.
134. Orris, G.J., Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, and Enriquez Romero, René, 1992, Salar de Coipasa, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 196-197.
135. Orris, G.J., Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, and Enriquez Romero, René, 1992, Laguna Chiar Kkota, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 199.
136. Orris, G.J., Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, and Enriquez Romero, René, 1992, Lagunas Pastos Grandes, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 199.
137. Orris, G.J., Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, and Enriquez Romero, René, 1992, Laguna Capina, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 200-201.
138. Orris, G.J., Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, and Enriquez Romero, René, 1992, Salar de Challviri, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 204.
139. Orris, G.J., Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, Enriquez Romero, René, and Bailey, E.A., 1992, Laguna Cachi, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 199-200.

140. Orris, G.J., Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, Enriquez Romero, René, and Bailey, E.A., 1992, Laguna Colorada, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 201-202.
141. Orris, G.J., Asher-Bolinder, Sigrid, Soria Escalante, Eduardo, Enriquez Romero, René, and Bailey, E.A., 1992, Laguna Verde, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 205-206.
142. Orris, G.J., Enriquez Romero, René, and Bailey, E.A., 1992, Laguna Mama Khumu, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 202.
143. Orris, G.J., Enriquez Romero, René, and Soria Escalante, Eduardo, 1992, Laguna Celeste, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 201.
144. Orris, G.J., Enriquez Romero, René, and Soria Escalante, Eduardo, 1992, Laguna Coruto, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 203-204.
145. Orris, G.J., Soria Escalante, Eduardo, and Enriquez Romero, René, 1992, Laguna Chojllas, *in* U.S. Geological Survey and Servicio Geológico de Bolivia, Geology and mineral resources of the Altiplano and cordillera Occidental, Bolivia: U.S. Geological Survey Bulletin 1975, p. 202-203.
146. Ozol, A.A., 1976, Basic features of boron geochemistry and formation conditions for its deposits of volcanic-sedimentary type [translated]: Litologiya i Poleznye Iskopaemye, 3, p. 60-74.
147. Paladines, P.A., San Martin, D.H., and Suarez, L.H., 1980, Mapa metalogenico de la Republica del Ecuador: Ministerio de Recursos Naturales y Energeticos, scale 1:1,000,000.
148. Papke, K.G., 1976, Evaporites and brines in Nevada playas: Nevada Bureau of Mines and Geology Bulletin 87, 35 p.
149. Papke, K.G., 1985, Borates in Nevada, in Barker, J.M., and Lefond, S.J., eds., Borates: economic geology and production: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., p. 89-99.
150. Pérez Segura, Efrén, 1985, Carta metalogenetica de Sonora 1:250,000, una interpretacion de la metalogenia de Sonora: Gobierno del Estado de Sonora Dirreccion de Minería, Geología y Energéticos Publicación 7, 64 p., scale 1:500,000.

151. Peters, T.J., Kostick, D.S., and Diggles, M.F., 1995, Brine mineral occurrence in the Diablo Mountain study area, Oregon, and its possible significance to Pacific Rim trade, *in* Tabilio, M., and Dupras, D.L., eds., 1995, 29th Forum on the Geology of Industrial Minerals: California Division of Mines and Geology Special Publication 110, p. 223-240.
152. Phillips, F.M., Zreda, M.G., Ku, Teh-lung, Luo, Shangde, Huang, Qi, Elmore, David, Kubik, P.W., and Sharma, Pankaj, 1993, 230 Th/234 U and 36 Cl dating of evaporite deposits from the western Qaidam Basin, China: Implications for glacial-period dust export from Central Asia: Geological Society of America Bulletin, v. 105, p. 1606-1616.
153. Piper, J.R., 1985, Borate deposits of the Calico-Daggett area, California, *in* Barker, J.M., and Lefond, S.J., eds., Borates: economic geology and production: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., p. 147-155.
154. Ramírez R., C.F., and Gardeweg P., Moyra, 1982, Hoja Toconao, Region de Antofagasta: Chile Servicio Nacional de Geologia y Mineria Carta Geologica de Chile, no. 54, 121 p., escala 1:250,000.
155. Ramírez R., C.F., and Huete L., Carlos, 1981, Hoja Ollagüe, Región de Antofagasta: Chile Insituto de Investigaciones Geológias Carta Geológica de Chile, no. 40, 47 p., escala 1:250,000.
156. Ramp, L., and others, 1977, Geology and mineral resources and rock material of Curry County, Oregon: Oregon Department of Geology and Mineral Industries Bulletin 93, p. 54.
157. Rapp, J.S., and Vredenburgh, L.M., 1992, Industrial mineral resource potential of Tertiary playa deposits of the Fort Irwin area, San Bernardino County, California: Society for Mining, Metallurgy, and Exploration Preprint 92-44, 9 p.
158. Reinaldo Vilela, Cesar, 1969, Descripcion geologia de la Hoja 6c, San Antonio de los Cobres, Provincias de Salta y Jujuy: Argentina Direccion Nacional de Geologia y Mineria Carta Geologica-Economica de La Republica Argentina Bulletin 110, 60 p., escala 1:200,000.
159. Rettig, S.L., Jones, B.F., and Risacher, F., 1980, Geochemical evolution of brines in the Salar de Uyuni, Bolivia: Chemical Geology, v. 30, p. 57-79.
160. Ricci, S.M., 1973, Mapa minero de las Provincias de Jujuy y Salta: Ministerio de Economica de Reoublica Argentina, escala 1:750,000.
161. Rich, J.L., 1942, Physiographic setting of nitrate deposits of Tarapaca, Chile: its bearing on the problem of origin and concentration: Economic Geology, v. 37, no. 3, p. 188-214.
162. Risacher, François, 1976, Reconocimiento de algunos salares del Altiplano Boliviano: La Paz, Bolivia, Universidad Mayor de San Andrés and l'Office de la Recherche Scientifique et Technique Outre-Mer, unpublished report, 10 p.

163. Risacher, F., 1984, Origine des concentrations extrêmes en bore et en lithium dans les saumures de l'Altiplano bolivien: Académie des Sciences de France Comptes-Rendus des Séances, série 2, v. 299, no. 11, p. 701-706.
164. Risacher, François, 1988, Ultimos datos sobre el Salar de Uyuni- recursos económicos y origen de las concentraciones en Li, K, Mg, B, in Actas del Segundo Simposio de la Investigacion Francesa en Bolivia: La Paz, Bolivia, L'Office de la Recherche Scientifique et Technique Outre-Mer, p.19-26.
165. Risacher, François, and Fritz, Bertrand, 1991, Geochemistry of Bolivian salars, Lípez, southern Altiplano--Origin of solutes and brine evolution: Geochimica et Cosmochimica Acta, v. 55, p. 687-705.
166. Risacher, F., and Miranda, J., 1976, Indicios de interés económico en los salares del Sud Lípez: La Paz, Bolivia, Universidad Mayor de San Andrés and l'Office de la Recherche Scientifique et Technique Outre-Mer, unpublished report, 8 p.
167. Risacher, F., Miranda, J., and Carlo, L., 1977, Litio y potasio en las borateras de Río Grande: La Paz, Bolivia, Universidad Mayor de San Andrés and l'Office de la Recherche Scientifique et Technique Outre-Mer, unpublished report, 3 p.
168. Rosen, Nathalie, 1993, American Resource's growth strategy: Mining Magazine, March, p. 104-110.
169. Roskill Information Services, 1993, The economics of boron 1993, 7th ed.: London, Roskill Information Services Ltd., 156 p.
170. Rospigliosi, Constantino, and Quispe A., Luis, 1981, Prospeccion geologica por litio en los salares de sur de Peru: INGEMMET, unpublished report.
171. Ross, D.L., 1961, Geology and mineral deposits of Mineral County, Nevada: Nevada Bureau of Mines and Geology Bulletin 58.
172. Ryken, L.E., 1976, Lithium production from Searles Valley, in Vine, J.E., ed., Lithium resources and requirements by the year 2000: U.S. Geological Survey Professional Paper 1005, p. 33-34.
173. Schalamuk, Isadoro, Fernandez, Raul, and Etcheverry, Ricardo, 1983, Los yacimientos minerales y no metaliferos y rocas de aplicacion de la Region NOA: Ministerio de Economia de Republica Argentina Anales, v. XX, 208 p.
174. Schaller, W.T., 1930, Borate minerals from the Kramer district, Mohave Desert, California, in Shorter contributions to general geology, 1929: U.S. Geological Survey Professional Paper 158, p. 137-170.
175. Sheppard, R.A., and Gude, A.J., 3d, 1968, Distribution and genesis of authigenic silicate minerals in tuffs of Pleistocene Lake Tecopa, Inyo County, California: U.S. Geological Survey Professional Paper 597, 38 p.
176. Siefke, J.W., 1980, Geology of the Kramer borate deposit, Boron, California, in Fife, D.L., and Brown, A.R., eds., Geology and mineral wealth of the California Desert: Santa Ana, California, South Coast Geological Society, p. 260-267.

177. Siefke, J.W., 1985, Geology of the Kramer Borate Deposit, Boron, California, in Barker, J.M., and Lefond, S.J., eds., Borates: economic geology and production: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., p. 157-165.
178. Siefke, J.W., 1991, The Boron Open Pit Mine at the Kramer borate deposit: Society of Economic Geologist Guidebook, p. 4-15.
179. Silva, L.I., 1977, Hojas Pisagua y Zapiga, Provincia de Iquique, Tarapacá (I Región) Chile: Chile Instituto de Investigaciones Geológicas Carta Geológica de Chile, no. 24, 10 p., escala 1:100,000.
180. Skarmeta M., Jorge, and Marinovic S., Nicolás, 1981, Hoja Quillagua, Región de Antofagasta: Chile Instituto de Investigaciones Geológicas Carta Geológica de Chile, no. 51, 63 p., escala 1:250,000.
181. Smith, G.I., 1976, Origin of lithium and other components in the Searles Lake evaporites, California, *in* Lithium resources and requirements by the year 2000: U.S. Geological Survey Professional Paper 1005, p. 92-103
182. Smith, G.I., 1985, Borate deposits in the United States: dissimilar in form, similar in geologic setting, *in* Barker, J.M., and Lefond, S.J., 1985, Borates: economic geology and production; proceedings of a Symposium held on October 24, 1984, at the Fall Meeting of SME-AIME in Denver, Colorado: New York, Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., p. 38-51.
183. Smith, W.C., 1962, Borates in the United States: U.S. Geological Survey Mineral Investigations Resource Map MR-14, scale 1:3,168,000.
184. Smith, W.C., 1964, Borates, in Mineral and water resources of Nevada, Report of the U.S. Geological Survey, Senate Document no. 87: Washington, D.C., U.S. Government Printing Office, p. 180-194.
185. Smith, W.C., 1966, Borax and other boron compounds: California Division of Mines and Geology Bulletin 191, pt. 1, p. 104-111.
186. Sprague, R.W., 1990, Boron, *in* Industrial minerals: Metals and Minerals Annual Review-1990, p. 114-115.
187. Stamatakis, M.G., and Economou, G.S., 1991, A colemanite and ulexite occurrence in a Late Miocene saline-alkaline lake of West Samos Island, Greece: Economic Geology, v. 86, p. 166-172.
188. Staples, L.W., 1948, The occurrence of priceite in Oregon: Northwest Science, v. 22, no. 1, p. 69-77.
189. Stoertz, G.E., and Ericksen, G.E., 1974, Geology of salars in northern Chile: U.S. Geological Survey Professional Paper 811, 65 p.
190. Suarez, Milton, Clari, Renzo, Franceschini, Giovanni, Princivalli, M.M., and Arias, Freddy, 1993, Resultados de la primera fase de exploracion de ulexita en el delta de Rio Grande, Salar de Uyuni, Bolivia: Boletin del Servicio Geologico de Bolivia, , no. 1, ano 1993, p. 109-116.
191. Sun, D., and Li, B., 1993, Origin of borates in saline lakes of China, in Kakihana, H., and others, eds., 7th Symposium on Salt: Amsterdam, Elsevier, v. 1, p. 177-194.

192. Surdam, R.C., 1986, (1977), Zeolites in closed hydrologic systems, *in* Mumpton, F.A., ed., Mineralogy and geology of natural zeolites: Mineralogical Society of America Reviews in Mineralogy, v. 4, p. 65-91.
193. Sweet, W.E., Jr., 1980, The geology and genesis of hectorite, Hector, California, in Fife, D.L., and Brown, A.R., eds., Geology and mineral wealth of the California desert: Santa Ana, California, South Coast Geological Society, p. 279-283.
194. Troxel, B.W., and Morton, P.K., 1962, Mines and mineral resources of Kern County, California: California Division of Mines and Geology County Report 1.
195. Turner, J.C.M., 1964, Descripcion geologica del la Hoja 7c - Nevado de Cachi (Provincia de Salta): Republica Argentina Direccion Nacional de Geología y Minería Boletin 99, 78 p., escala 1:200,000.
196. Turner, J.C.M., 1982, Descripcion geologica de la Hoja 4AB, Mina Pirquitas: Argentina Servicio Geologico Nacional Boletin 187.
197. U.S. Bureau of Land Management Mineral Record Cards, 1993.
198. U.S. Bureau of Mines Minerals Inventory Location System, 1993.
199. Van Denburgh, A.S., and Glancy, P.A., 1970, Water resources appraisal of the Columbus Salt marsh - Soda Spring Valley area, Mineral and Esmeralda Counties, Nevada: Nevada Department of conservation and Natural Resources Water Resources Reconnaissance Series Report 52, 66 p.
200. Vanderberg, W.O., 1937, U.S. Bureau of Mines Information Circular 6964.
201. Vanderberg, W.O., 1940, Reconnaissance of mining districts in Churchill Co., Nevada: U.S. Bureau of Mines Information Circular 7093.
202. Ver Planck, W.E., 1956, History of borax production in the United States: California Journal of Mines and Geology, v. 52, no. 3, p. 273-291.
203. Vergara L., Hernán, and Thomas N., Arturo, 1984, Hoja Collacagua, Región de Tarapaca: Chile Servicio Nacional de Geología y Minería Carta Geológica de Chile, no. 59, 79 p. escala 1:250,000.
204. Vila, T., 1974 (1975), Geologia y geoquimica de los depositos salinos Andinos, Provincia de Antofagasta: Thesis Universidad de Chile, Rev. Geol. de Chile, no. 2, p. 41-55.
205. Vila, T., 1986, Geologia de los depositos salinos del Norte de Chile, in Fuitos, J., and others, eds., Geologia y Recursos minerlaes de Chile, v. 2: Santiago.
206. Vila, Tomas, 1953, Recursos minerales no-metallicaos de Chile: Santiago, Chile, Editorial Universitaria, S.A., 449 p.
207. Vinogradov, A.P., 1967, Atlas of the lithological-Paleogeographical maps of the USSR, v. 14, Paleogene, Neogene, and Quaternary: USSR Academy of Sciences.
208. Watanabe, Takeo, 1967 (1976), Geochemical cycle and concentration of boron in the earth's crush, in Walker, C.T., ed., 1976?, Geochemistry of boron: Stroudsburg, Penn., Halsted Press, Benchmark Papers in Geology 23, p. 388-399.

209. Wilson, J.L., 1976, Geology and engineering aspects of Boraxo pit, Death Valley, California: Los Angeles, University of Southern California, unpublished Master's thesis, 95 p.
210. Yale, C.G., 1904, Borax, in Mineral resources of the United States - 1903: Washington, D.C., U.S. Geological Survey, p. 1017-1028.
211. Yale, C.G., 1905, Borax, in Mineral resources of the United States - 1904: Washington, D.C., U.S. Geological Survey, p. 1017-1028.
212. Yale, C.G., 1907, Borax, in Mineral resources of the United States - 1906: Washington, D.C., U.S. Geological Survey, p. 1059-1062.
213. Yale, C.G., and Gale, H.S., 1912, Borax, in Mineral resources of the United States - 1911: Washington, D.C., U.S. Geological Survey, p. 857-866.