
Photo Credit: Kelly Hannah

Great Salt Lake Policy Assessment

Presented by the Great Salt Lake Strike Team, a collaboration of Utah's Research Universities and Utah state agencies

February 8, 2023

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Key Findings

How did we get here?

i. Despite some dry years, no long-term trend in precipitation.

ii. Human and natural consumptive water use are the main drivers of low lake levels. Other smaller contributing factors include natural precipitation variability and climate warming.

iii. Plan for similar or less water available in the GSL basin in coming decades.

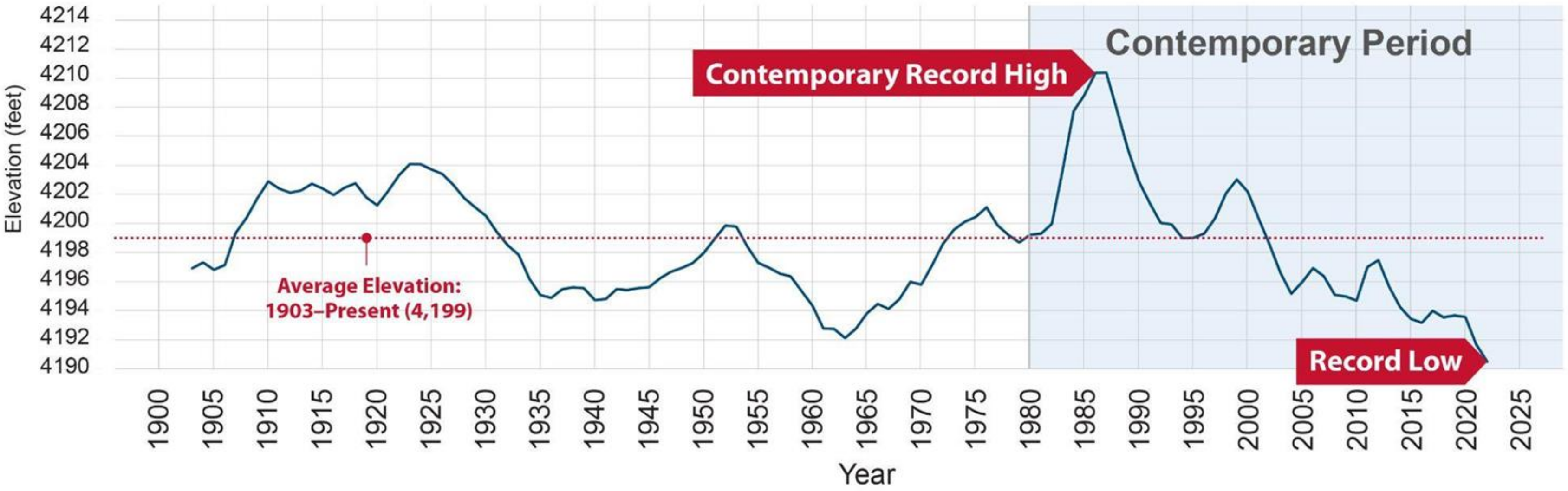
What can we do?

i. Scenarios to different lake elevation range goals.

ii. Policy assessments: Conservation, new water, engineering solutions.

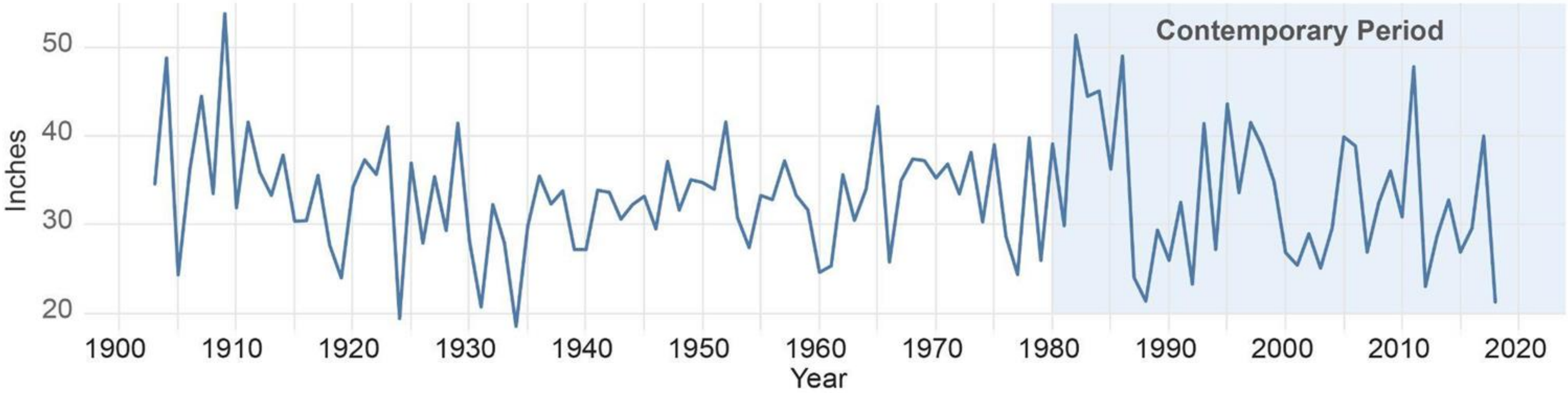
iii. Committing conserved water to the lake is key.

Average Annual Elevation of Great Salt Lake, 1903–2022



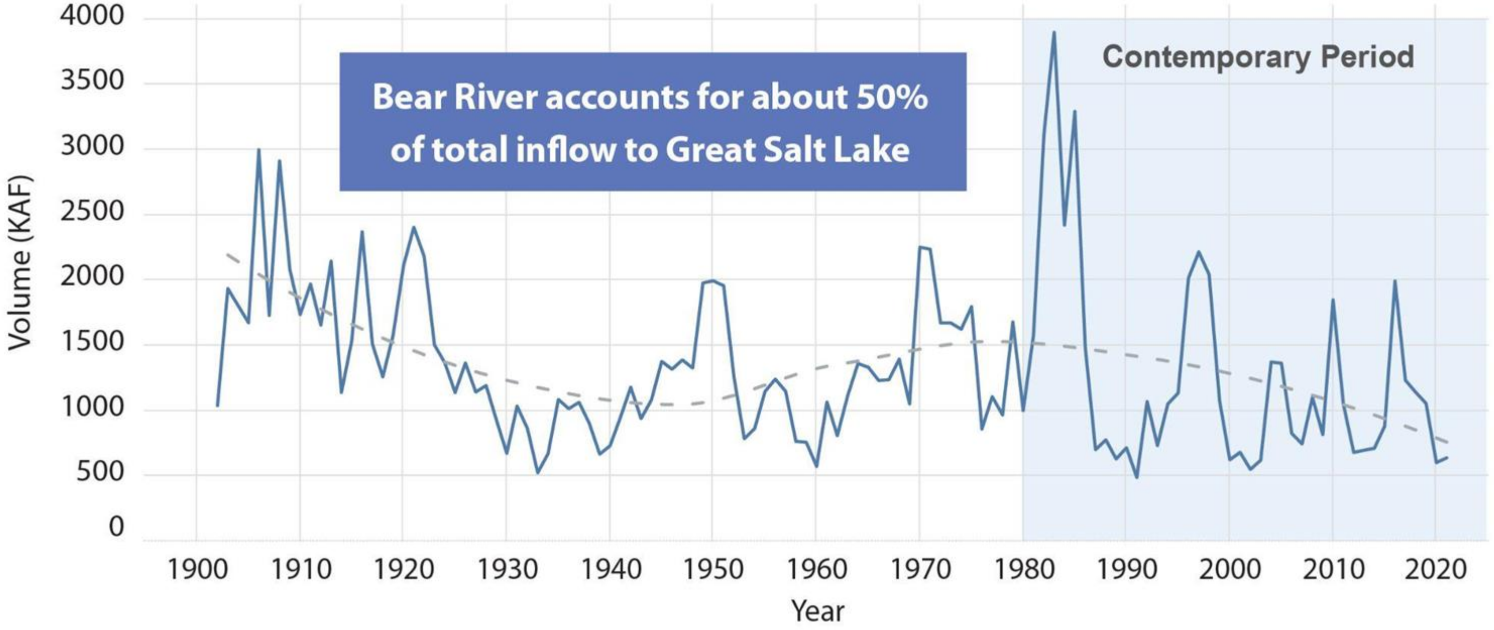
Source: US Geological Survey Historical Elevation at Saltair Boat Harbor

Mean Northern Utah Annual Precipitation, 1903–2018



Source: Brooks et al, 2021

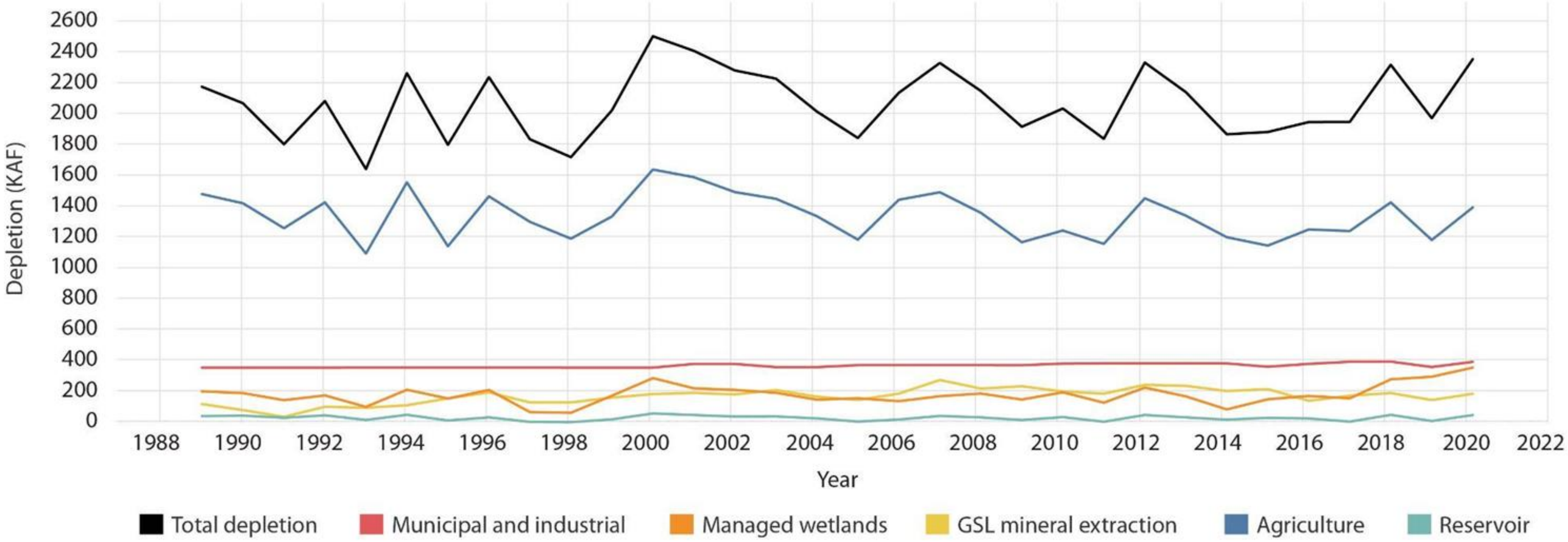
Bear River Annual Streamflow, 1903–2022



Note: Trend line generated using LOESS regression.

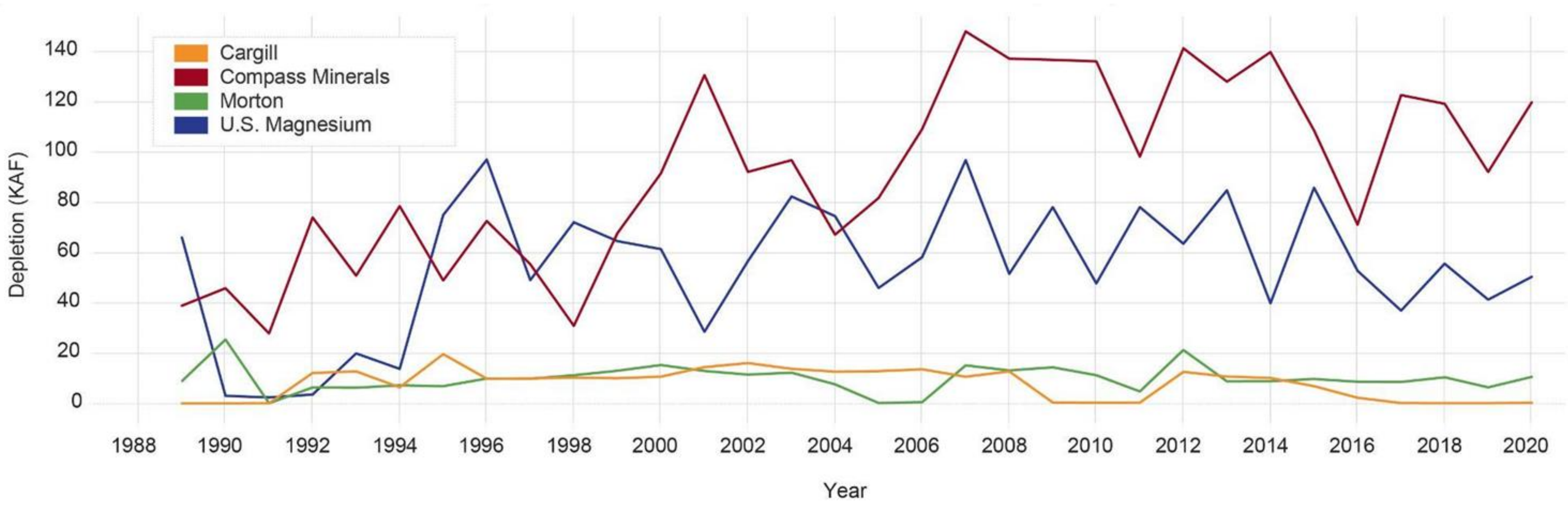
Source: Data from USGS gage 10126000 Bear river Near Corrinne with missing data (1957-1963) and values prior to 1949 derived from USGS gage 10118000 Bear River near Collinston (Analysis by David Tarboton)

Human Water Depletion by Type, 1989–2018



Source: Great Salt Lake Water Budget, Utah Division of Water Resources, 2023

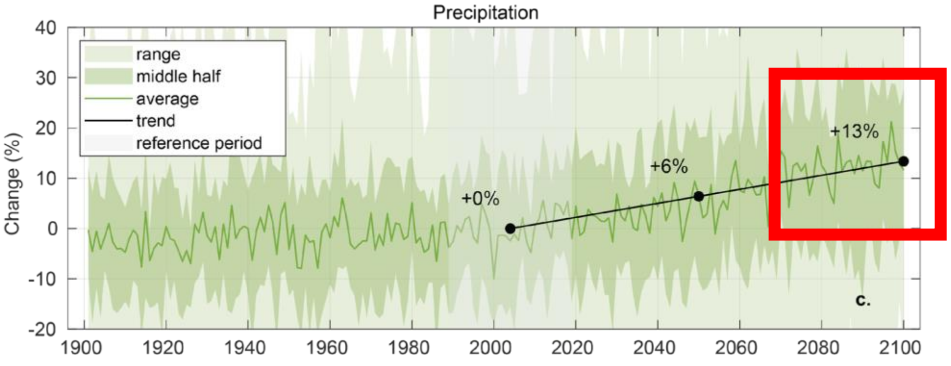
Mineral Extraction Depletions on Great Salt Lake, 1989–2018

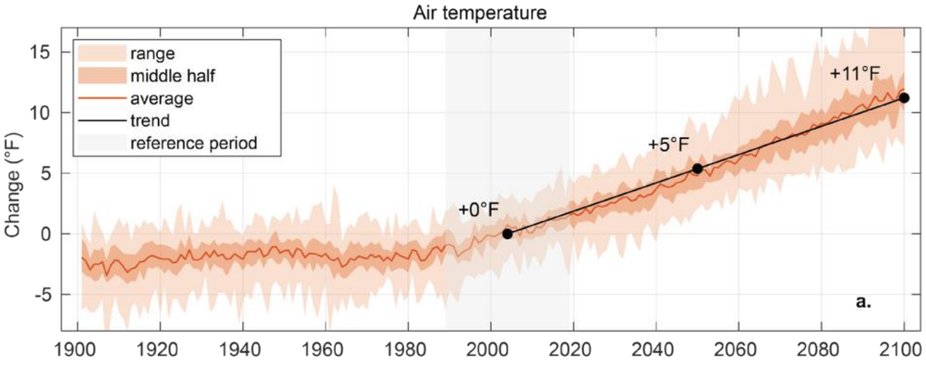


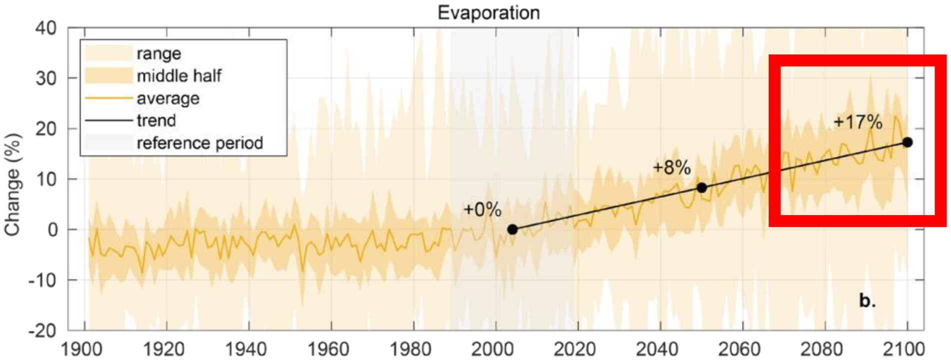
Source: Division of Water Resources. Great Salt Lake Water Budget. 2023.

Projected Trends in the Great Salt Lake Basin, 2022-2100

Changes Relative to 1989–2019







Projections indicate that slight increases in precipitation (on average) will be more than offset by increases in temperature and evaporation, **creating further challenges for the lake .**

Note: The analysis is based on a high greenhouse gas emission scenario referred to as Shared Socioeconomic Pathway (SSP) 585, 30 global climate models from the Coupled Model Intercomparison Project Phase 6 (CMIP6).
Source: Data from CMIP6; Analysis by Courtenay Strong, 2022.

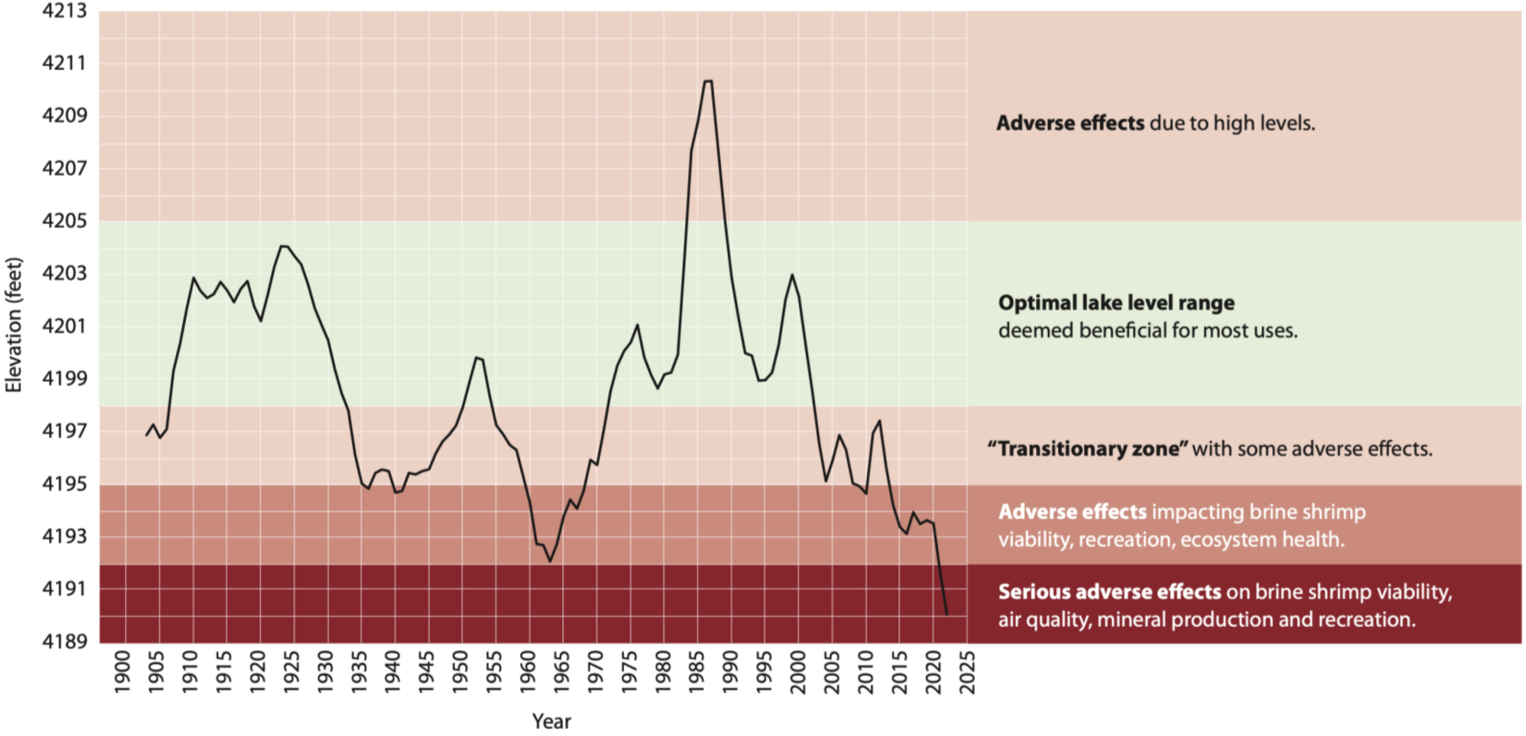
Target Lake Elevation Ranges

Range of Conservation Needed (KAF/year)

Target Elevation (ft.)	Fill in 5 years	Fill in 10 years	Fill in 20 years	Maintain
4,189 ft.	-	-	-	0-268
4,192 ft.	116-700	0-524	0-442	0-404
4,195 ft.	629-1,213	270-854	127-711	95-679
4,198 ft.	1,332-1,916	760-1344	541-1,125	494-1,078

Note: This table assumes an initial lake elevation of 4,189 ft.
Source: Analysis by Great Salt Lake Strike Team, 2023

Average Annual Elevation of Great Salt Lake with Elevation Zones, 1903-2022



Adverse effects due to high levels.

Optimal lake level range deemed beneficial for most uses.

“Transitionary zone” with some adverse effects.

Adverse effects impacting brine shrimp viability, recreation, ecosystem health.

Serious adverse effects on brine shrimp viability, air quality, mineral production and recreation.

Sources: US Geological Survey Historical Elevation at Saltair Boat Harbor; Utah Division of Forestry, Fire and State Lands, GSL Lake Elevation Matrix, 2013

Policy Options

Conservation

Commit conserved water to Great Salt Lake

Optimize use of agricultural water

Optimize municipal and industrial water pricing

Limit municipal and industrial water use growth

Utilize water banking and leasing

Conduct active forest management in Great Salt Lake headwaters

Optimize Great Salt Lake mineral extraction

New Water

Import

Increase winter precipitation with cloud seeding

Engineering Solutions

Raise the and lower the causeway berm

Mitigate dust transmission hotspots

Policy Options

All policy options have benefits and tradeoffs.

There is no single silver bullet.

But, there are many pieces to the puzzle.

This will not be our only water problem.

Policy Options

Conservation

Commit conserved water to Great Salt Lake

Optimize use of agricultural water

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Import

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Engineering Solutions

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Mitigate dust transmission hotspots

Expert Assessment Scorecard Results

Commit Conserved Water to Great Salt Lake

Benefits

	Low				High
Water brought to the lake	①	②	❸	④	⑤
Air quality improvements	①	②	❸	④	⑤
Biological health	①	②	❸	④	⑤

Costs, Challenges, and Adaptations

	Low				High
Financial cost	①	②	❸	④	⑤
Agriculture changes	①	❷	③	④	⑤
Extractive industry changes	❶	②	③	④	⑤
Cultural shift	①	②	❸	④	⑤

Feasibility

	Low				High
Speed of implementation	①	②	③	④	❺
Legal/regulatory feasibility	①	②	③	❹	⑤

Expert Assessment Scorecard Results

Agriculture Water Optimization

Benefits

	Low				High
Water brought to the lake	①	②	❸	④	⑤
Air quality improvements	①	②	❸	④	⑤
Biological health	①	②	❸	④	⑤

Costs, Challenges, and Adaptations

	Low				High
Financial cost	①	②	❸	④	⑤
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Extractive industry changes	❶	②	③	④	⑤
Cultural shift	①	②	③	④	❺

Feasibility

	Low				High
Speed of implementation	①	②	③	❹	⑤
Legal/regulatory feasibility	①	②	③	❹	⑤

Expert Assessment Scorecard Results

Optimize Municipal and Industrial Water Pricing

Benefits

	Low				High
Water brought to the lake	❶	②	③	④	⑤
Air quality improvements	❶	②	③	④	⑤
Biological health	❶	②	③	④	⑤

Costs, Challenges, and Adaptations

	Low				High
Financial cost	❶	②	③	④	⑤
Agriculture changes	❶	②	③	④	⑤
Extractive industry changes	❶	②	③	④	⑤
Cultural shift	❶	②	③	④	⑤

Feasibility

	Low				High
Speed of implementation	①	②	❸	④	⑤
Legal/regulatory feasibility	①	②	❸	④	⑤

Expert Assessment Scorecard Results

Limiting Municipal and Industrial Water Use Growth

Benefits

	Low				High
Water brought to the lake	❶	②	③	④	⑤
Air quality improvements	❶	②	③	④	⑤
Biological health	❶	②	③	④	⑤

Costs, Challenges, and Adaptations

	Low				High
Financial cost	①	❷	❸	④	⑤
Agriculture changes	❶	②	③	④	⑤
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Cultural shift	①	②	③	❹	⑤

Feasibility

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Speed of implementation	①	②	③	❹	⑤
Legal/regulatory feasibility	①	②	③	④	❺

Expert Assessment Scorecard Results

Water Banking and Leasing

Benefits

	Low				High
Water brought to the lake	①	②	❸	④	⑤
Air quality improvements	①	②	❸	④	⑤
Biological health	①	②	❸	④	⑤

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Financial cost	①	❷	❸	④	⑤
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Feasibility

	Low				High
Speed of implementation	①	②	③	❹	⑤
Legal/regulatory feasibility	①	②	③	❹	⑤

Expert Assessment Scorecard Results

Active Forest Management in Great Salt Lake Headwaters

Benefits

	Low				High
Water brought to the lake	❶	②	③	④	⑤
Air quality improvements	❶	②	③	④	⑤
Biological health	①	②	③	❹	⑤

Costs, Challenges, and Adaptations

	Low				High
Financial cost	①	②	❸	④	⑤
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Feasibility

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Speed of implementation	①	❷	③	④	⑤
Legal/regulatory feasibility	①	②	❸	④	⑤

Expert Assessment Scorecard Results

Great Salt Lake Mineral Extraction Optimization

Benefits

	Low				High
Water brought to the lake	❶	②	③	④	⑤
Air quality improvements	❶	②	③	④	⑤
Biological health	❶	②	③	④	⑤

Costs, Challenges, and Adaptations

	Low				High
Financial cost	①	❷	③	④	⑤
Agriculture changes	❶	②	③	④	⑤
Extractive industry changes	①	②	③	④	❺
Cultural shift	❶	②	③	④	⑤

Feasibility

	Low				High
Speed of implementation	①	②	❸	④	⑤
Legal/regulatory feasibility	①	②	③	❹	⑤

Expert Assessment Scorecard Results

Import Water

Benefits

	Low				High
Water brought to the lake	①	②	③	④	❺
Air quality improvements	①	②	③	④	❺
Biological health	①	②	③	④	❺

Costs, Challenges, and Adaptations

	Low				High
Financial cost	①	②	③	④	❺
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Cultural shift	❶	②	③	④	⑤

Feasibility

	Low				High
Speed of implementation	❶	②	③	④	⑤
Legal/regulatory feasibility	❶	②	③	④	⑤

Expert Assessment Scorecard Results

Increase Winter Precipitation with Cloud Seeding

Benefits

	Low				High
Water brought to the lake	❶	②	③	④	⑤
Air quality improvements	❶	②	③	④	⑤
Biological health	❶	②	③	④	⑤

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Financial cost	❶	②	③	④	⑤
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Expert Assessment Scorecard Results

Raise and Lower the Causeway Berm

Benefits

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Air quality improvements	①	②	❸	④	⑤
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Feasibility

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Speed of implementation	①	②	③	④	❺
Legal/regulatory feasibility	①	②	③	④	❺

Expert Assessment Scorecard Results

Mitigate Dust Emission Hotspots

Benefits

	Low				High
Water brought to the lake	❶	②	③	④	⑤
Air quality improvements	①	②	③	④	❺
Biological health	①	②	❸	④	⑤

Costs, Challenges, and Adaptations

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Feasibility

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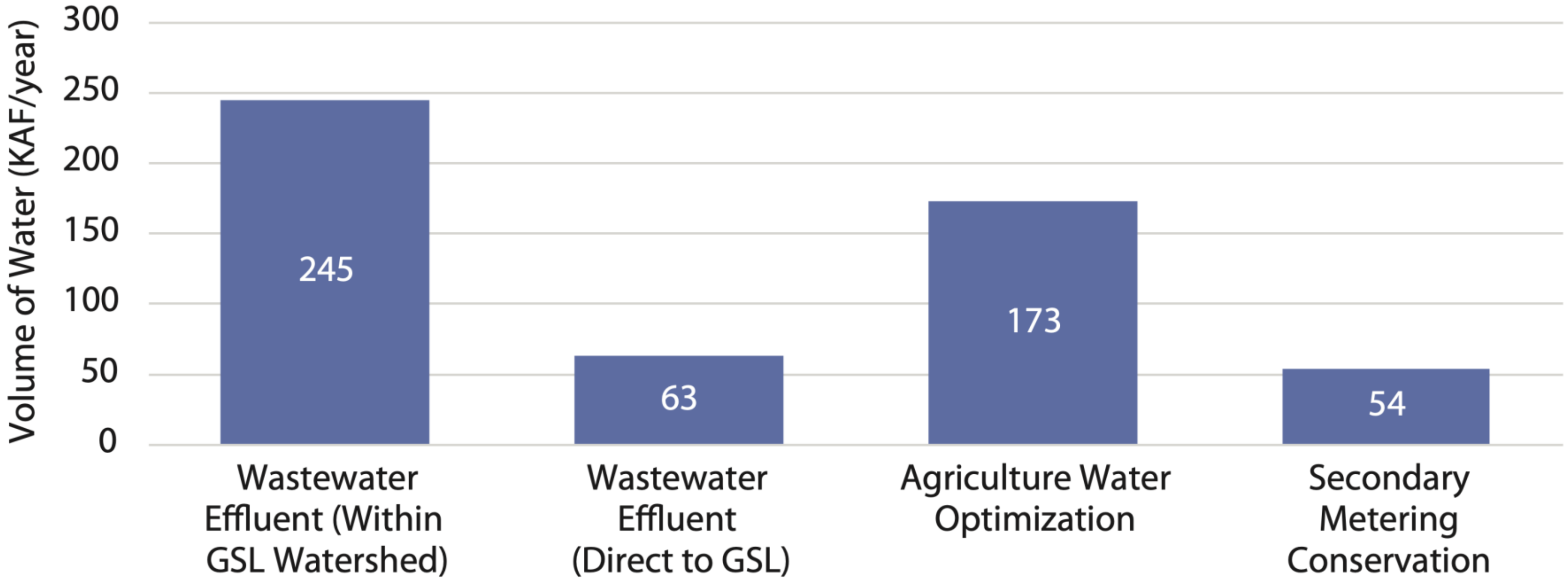
Speed of implementation	❶	②	③	④	⑤
Legal/regulatory feasibility	①	②	③	④	❺

Policy Highlights

Commit Conserved Water to Great Salt Lake

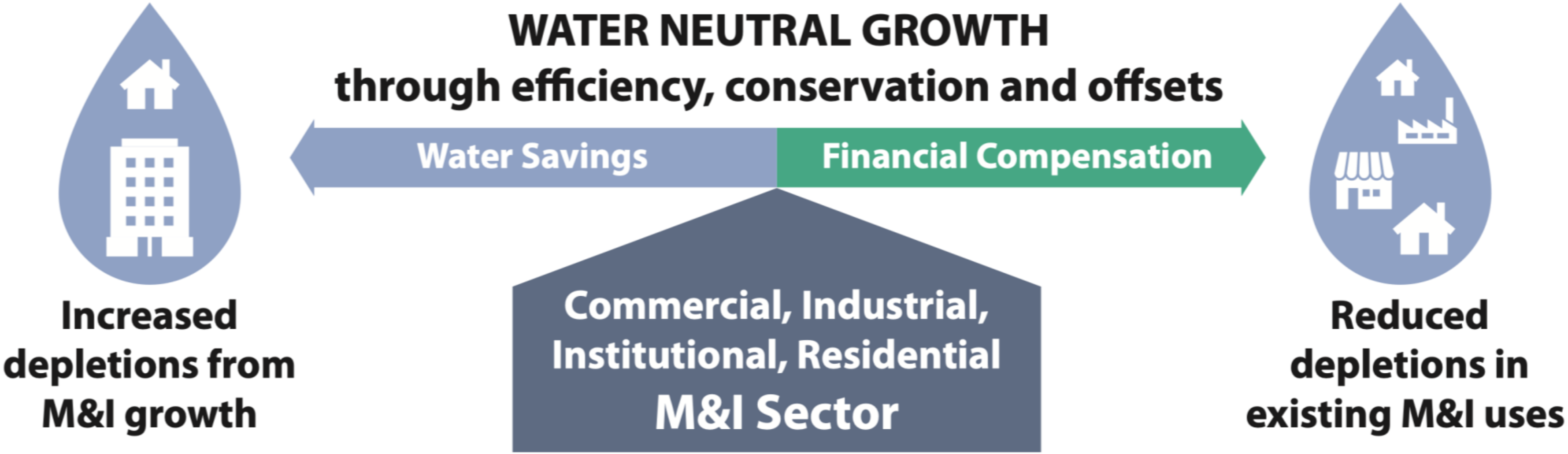
Commit Conserved Water to Great Salt Lake

Figure 15: Selected Water Sources Available for Committing to GSL



Limiting Municipal and Industrial Water Growth

Limiting Municipal and Industrial Water Growth



WATER NEUTRAL GROWTH

through efficiency, conservation and offsets

Water Savings

Financial Compensation

Increased depletions from M&I growth

Commercial, Industrial, Institutional, Residential

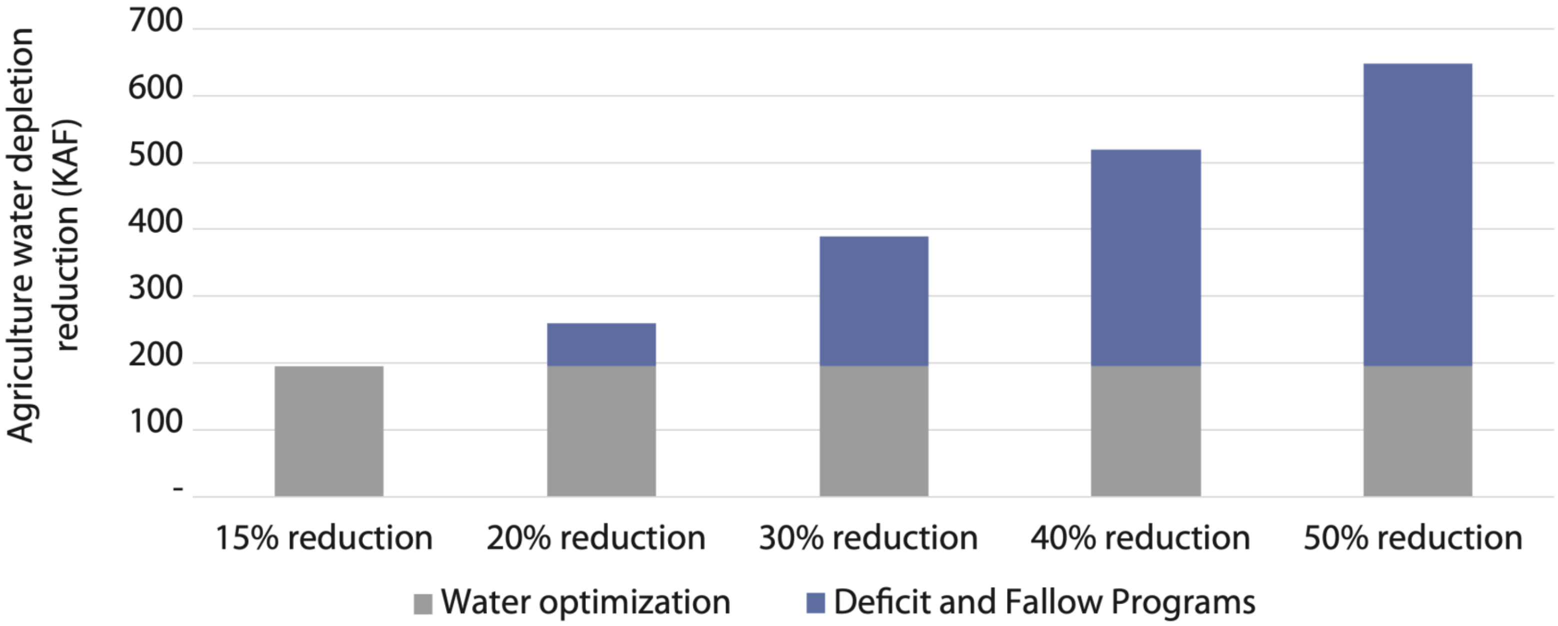
M&I Sector

Reduced depletions in existing M&I uses

Agriculture
Water Optimization

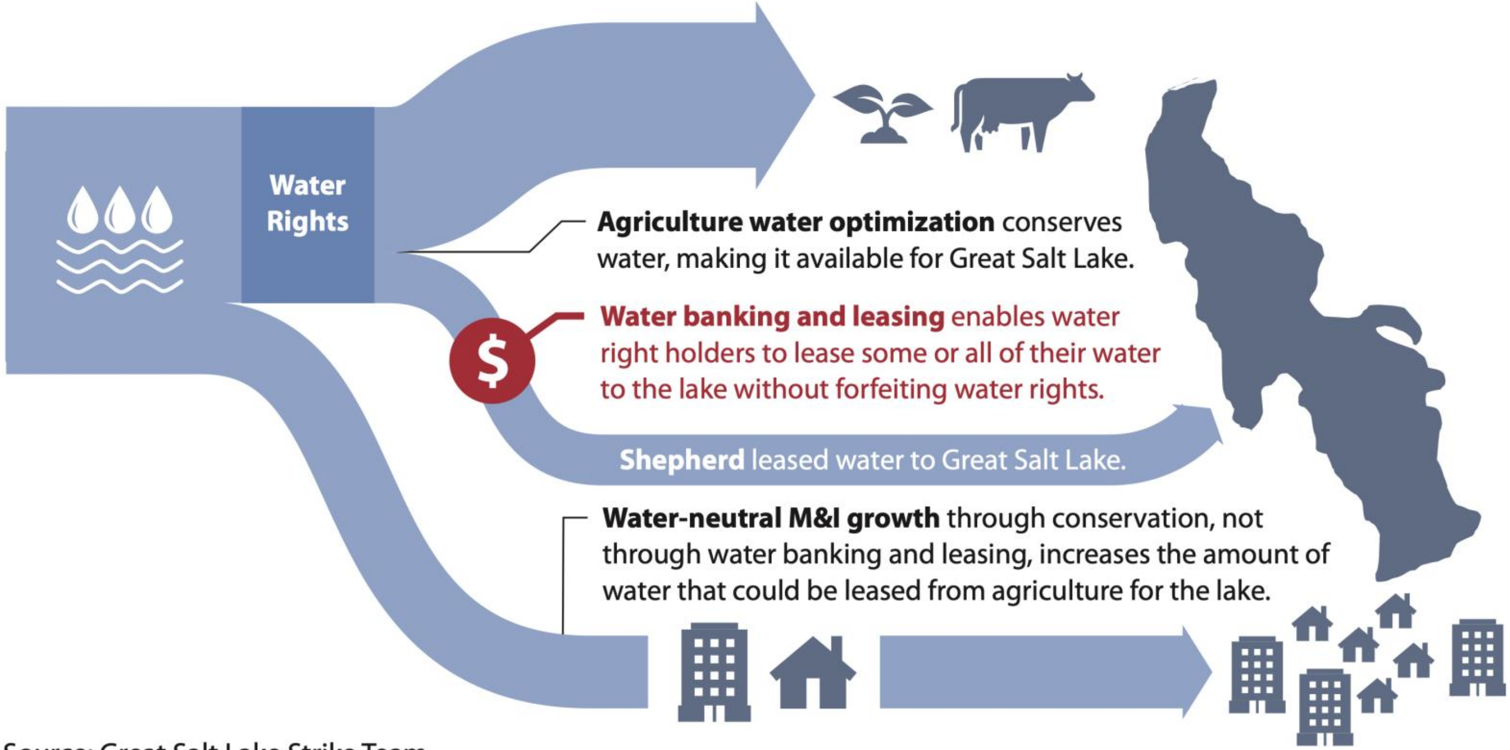
Agriculture Water Optimization

Figure 16: Estimated Reductions in Agriculture Depletions through Optimization and Deficit/Fallow Programs



Water Banking and Leasing

Water Banking and Leasing



Agriculture water optimization conserves water, making it available for Great Salt Lake.

Water banking and leasing enables water right holders to lease some or all of their water to the lake without forfeiting water rights.

Shepherd leased water to Great Salt Lake.

Water-neutral M&I growth through conservation, not through water banking and leasing, increases the amount of water that could be leased from agriculture for the lake.

Source: Great Salt Lake Strike Team

Thank you!

Photo Credit: Kelly Hannah

Presented by the Great Salt Lake Strike Team, a collaboration of Utah's Research Universities and Utah state agencies