

Developing a Definition of Health for Great Salt Lake Wetlands



Society of Wetland Scientists

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Defining and Assessing GSL Wetland Health



➤ Project Objectives

- Develop a definition of health
- Assess current health
- Identify critical future stresses

➤ Intended Use

- Great Salt Lake Advisory Council
- “advise government officials on the sustainable use, protection, and development of Great Salt Lake.”

Conservation Action Planning Framework

- Developed by *The Nature Conservancy*
- Approach and tool for planning, implementing, and measuring success
- Facilitated workshops with scientists

Conservation Action Planning Steps

Step 1. Identify people Involved

Step 2. Define scope and focal targets

Step 3. Assess viability

Step 4. Identify Critical Threats

Step 5. Develop Conservation Objectives

Step 6. Establish measures

Step 7. Develop conservation strategies and work plans

Step 8. Implement

Step 9. Analyze, reflect, and adapt

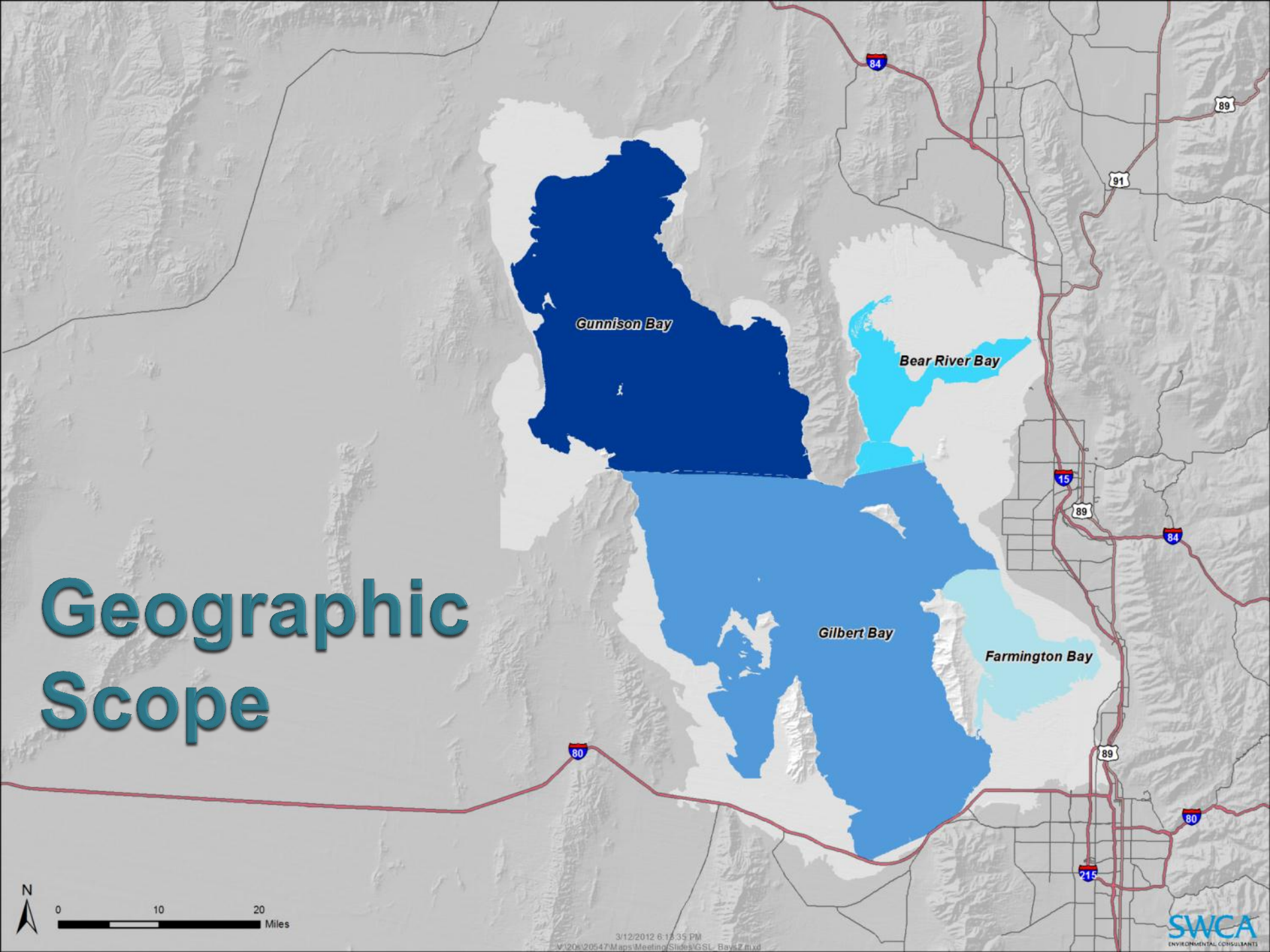
Step 10. Learn and share.

Scope of the Term 'Health'

- *Ecological health of the lake is based on its current physical form and altered ecosystems*
- *Not defined as the "natural" pre-settlement condition*



Geographic Scope



Ecological Targets for GSL

Systemwide Lakes and Wetlands



Open Water of Bays



Unimpounded Marsh Complex



Impounded Wetland



Mudflats and Playas



Isolated Habitat for Breeding Birds



Alkali Knolls



Adjoining Grasslands and Agricultural Lands

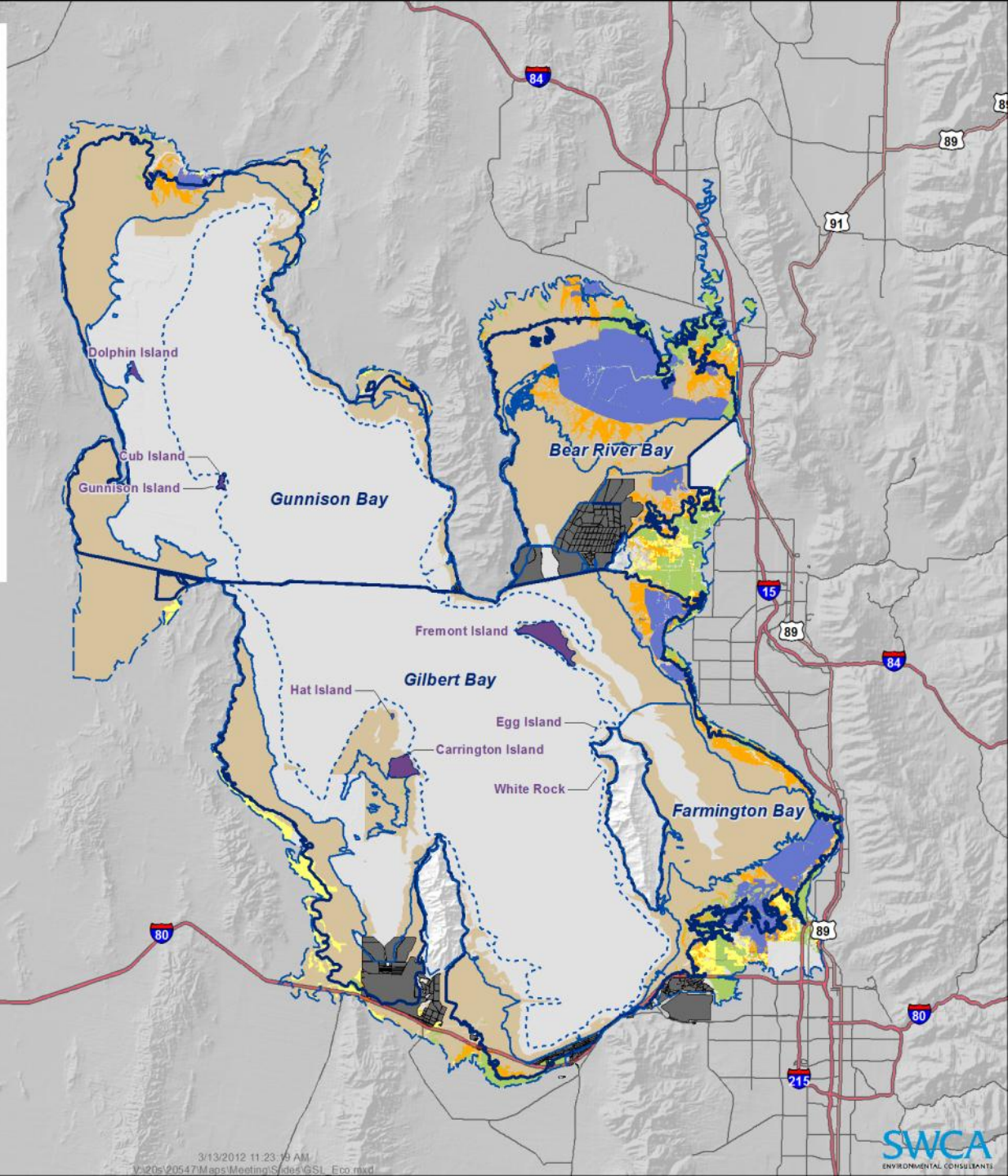


Current Ecological Targets

- Adjoining Grasslands and Agricultural Lands
- Alkali Knolls
- Impounded Wetland Complex
- Isolated Island Habitat for Breeding Birds
- Mudflats and Playas
- Unimpounded Marsh Complex

Open Water Lake Levels (feet)

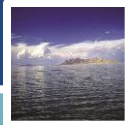
- 4,191
- 4,200
- 4,209
- 4,218
- Mineral Evaporation Ponds



Conservation Action Planning Concepts

Ecological Targets

- Heart of what we value for conservation or restoration.
- Examples include:
 - Systems
 - Communities
 - Significant species



Conservation Action Planning Concepts

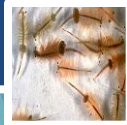
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Key Ecological Attributes (KEA)

- Parsimonious set of factors that account for the long-term viability of the target.
- Examples include:
 - Processes
 - Size
 - Condition
 - Landscape context



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Indicators

- Metric that allows assessment of each KEA (what you measure)



Conservation Action Planning Concepts

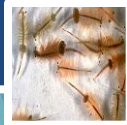
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Indicators

- Metric that allows assessment of each KEA (what you measure)



Indicator Ratings

- Definition of 'Good' v. 'Poor' conditions used to interpret indicator data
- In essence, this becomes the definition of health



Unimpounded Marsh Complex



Impounded Wetland



SIGNIFICANT SPECIES

- 
Brine shrimp
- 
Brine fly
- 
Stromatolictic structures
- 
Fish-eating (piscivorous) birds
- 
Shorebirds
- 
Waterfowl
- 
Colonial waterbirds
- 
Long-billed Curlew
- 
Eared Grebe

PRIMARY HABITAT USES

- 
Breeding habitat
- 
Foraging habitat
- 
Resting habitat
- 
Refuge habitat

Key Attribute	Indicator
Unimpounded Marsh Complex	
Maintain Natural Hydrologic Regime	<ol style="list-style-type: none"> 1. Period in which complex is moist to inundated in most years 2. Deviation from natural hydrograph for a given storm event TBD
Delivery of high quality water by tributaries into marshes and eventually the lake.	1. Stream visual assessment protocol scores of streams throughout watershed feeding wetlands
Diversity of habitat types	1. Presence of hemi-marsh, submerged aquatic vegetation, short emergent, tall emergent, wet meadows at average lake levels
Dominance of native and desirable nonnative plant species	1. Percentage cover of native and desirable nonnative plant species
Forage fish supportive of fish-eating birds	1. TBD
Healthy macroinvertebrate population supportive of waterfowl and other waterbirds	1. Total biomass g/m ²
Sufficient habitat to support significant shorebird populations	1. Acreage of habitat between elevations 4,200 and 4,218 (thousand acres)
Impounded Wetlands	
Dominance of native and desirable nonnative plant species	1. Percentage cover of native and desirable nonnative plant species
Food supply supportive of fish, waterfowl, and other waterbirds	<ol style="list-style-type: none"> 1. Macroinvertebrate (non-gastropods) biomass (g/m²) in upstream ponds in July/August 2. SAV tuber biomass (kg/m²) 3. SAV druplet biomass in September (kg/m²) 4. Fish Indicator TBD
Healthy Submerged Aquatic Vegetation (SAV) community	1. SAV branch density (thousand branches with leaves/m ²) in upstream ponds in July/August
Delivery of high quality water by tributaries into marshes and eventually the lake.	1. SVAP of streams throughout watershed feeding wetlands

Four-grade Scale for Indicators

Definition of healthy:

Very good: functioning at an ecologically desirable status and requires little if any human intervention.

Good: functioning within its range of acceptable variation; it may require some human intervention.

Fair: functioning outside of its range of acceptable variation and requires human intervention to restore a “Good” condition.

Poor: allowing the key attribute to persist in this condition would make restoration of the target practically impossible.

Indicator Ratings

Key Attribute	Indicator	Rating Category	Gilbert Bay	Gunnison Bay	Farmington Bay	Bear River Bay
Unimpounded Marsh Complex						
Dominance of native and desirable nonnative plant species	Percentage cover of native and desirable nonnative plant species	Poor	<50%	<50%	<50%	<50%
		Fair	50%–74%	50%–74%	50%–74%	50%–74%
		Good	75%–90%	75%–90%	75%–90%	75%–90%
		Very Good	>90%	>90%	>90%	>90%
Forage fish supportive of fish-eating birds	TBD	Poor	TBD	TBD	TBD	TBD
		Fair	TBD	TBD	TBD	TBD
		Good	TBD	TBD	TBD	TBD
		Very Good	TBD	TBD	TBD	TBD
Healthy macroinvertebrate population supportive of waterfowl and other waterbirds	Total biomass g/m ²	Poor	TBD	TBD	TBD	TBD
		Fair	TBD	TBD	TBD	TBD
		Good	1.5–2.5	1.5–2.5	1.5–2.5	1.5–2.5
		Very Good	TBD	TBD	TBD	TBD
Impounded Wetlands						
Dominance of native and desirable nonnative plant species	Percentage cover of native and desirable nonnative plant species	Poor	<50%	<50%	<50%	<50%
		Fair	50%–74%	50%–74%	50%–74%	50%–74%
		Good	75%–89%	75%–89%	75%–89%	75%–89%
		Very Good	90%–100%	90%–100%	90%–100%	90%–100%
Food supply supportive of fish, waterfowl, and other waterbirds	Macroinvertebrate (non-gastropods) biomass (g/m ²) in upstream ponds in July/August	Poor	<0.5	<0.5	<0.5	<0.5
		Fair	0.5–1.5	0.5–1.5	0.5–1.5	0.5–1.5
		Good	1.5–2.5	1.5–2.5	1.5–2.5	1.5–2.5
		Very Good	>2.5	>2.5	>2.5	>2.5
Delivery of high quality water by tributaries into marshes and eventually the lake.	SVAP of streams throughout watershed feeding wetlands	Poor	0–6	0–6	0–6	0–6
		Fair	6.1–7.4	6.1–7.4	6.1–7.4	6.1–7.4
		Good	7.5–8.9	7.5–8.9	7.5–8.9	7.5–8.9
		Very Good	9–10.4	9–10.4	9–10.4	9–10.4

Current Health of Great Salt Lake

Ecological Targets	Gilbert Bay	Gunnison Bay	Bear River Bay	Farmington Bay	OVERALL RANKING	Uncertainty
System-wide Lake and Wetland	Good				Good	Medium
Open Water	Good	Not ranked	Not ranked	Not ranked	Not ranked	Very High
Unimpounded marsh complex	Not ranked	Not ranked	Not ranked	Not ranked	Not ranked	High
Impounded wetlands	Not ranked	Not ranked	Good	Poor	Not ranked	Very High
Mudflats and playas	Good	Very Good	Good	Good	Good	Low
Isolated island habitat for breeding birds	Good	Good	NA	NA	Good	Low
Alkali knolls	Fair	Very Good	Poor	Poor	Fair	Low
Adjoining grasslands and agricultural lands	Good	Good	Good	Good	Good	Low
SUMMARY					Good	Medium

Top 3 Stresses

- Reduced lake levels
 - Increased predators on isolated islands
 - Altered salinity levels and impacts to brine shrimp health
- Increased *Phragmites* and undesirable plant cover
 - Especially around Farmington Bay
- Additional permanent loss of alkali knolls
 - Especially in Farmington and Bear River Bays

Severity of many stresses is unknown

Other highly ranked stresses

- Reduced period of moisture for the unimpounded marsh complex especially in Farmington and Bear River bays
- Reduced diversity and amount of habitat types in Farmington Bay unimpounded wetlands
- Loss of habitat to support significant bird populations around Farmington and Bear River bays
- Additional permanent loss of alkali knolls adjoining Gilbert and Bear River bays
- Reduced flood-irrigated area around Gilbert Bay, which is important habitat for White-faced Ibis
- Reduced water quality delivered to Farmington Bay impounded wetlands, unimpounded marsh complex, and open water
- Increased undesirable plant cover in Farmington Bay grasslands and pasture
- Reduced acreage of undisturbed Long-billed Curlew breeding habitat in grasslands and pasture adjoining Gilbert Bay

Future Stresses

Ecological Targets	Gilbert Bay	Gunnison Bay	Bear River Bay	Farmington Bay	SUMMARY	Uncertainty
System-wide lake and wetland	Medium				Medium	Medium
Open water of bays	High	Low	High	High	High	High
Unimpounded marsh complex	High	Low	Medium	High	Medium	High
Impounded wetlands	Very High	Low	Medium	Very High	High	Medium
Mudflats and playas	Medium	Low	High	Very High	High	Medium
Isolated island habitat for breeding birds	Very High	Very High	n/a	n/a	Very High	Low
Alkali knolls	High	Low	High	Very High	High	Low
Adjoining grasslands and agricultural lands	High	Low	Low	Medium	Medium	Low
SUMMARY					High	Medium

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