Climate Change Planning in Alaska's National Parks

CENTRAL ALASKA PARKS
Scenario Drivers and Climate Effects

alaskarenewableenergy.org

http://foreignpolicyblogs.com/wp-content/uploads/iceroad.jpg

www.nenananewslink.com

Climate Drivers

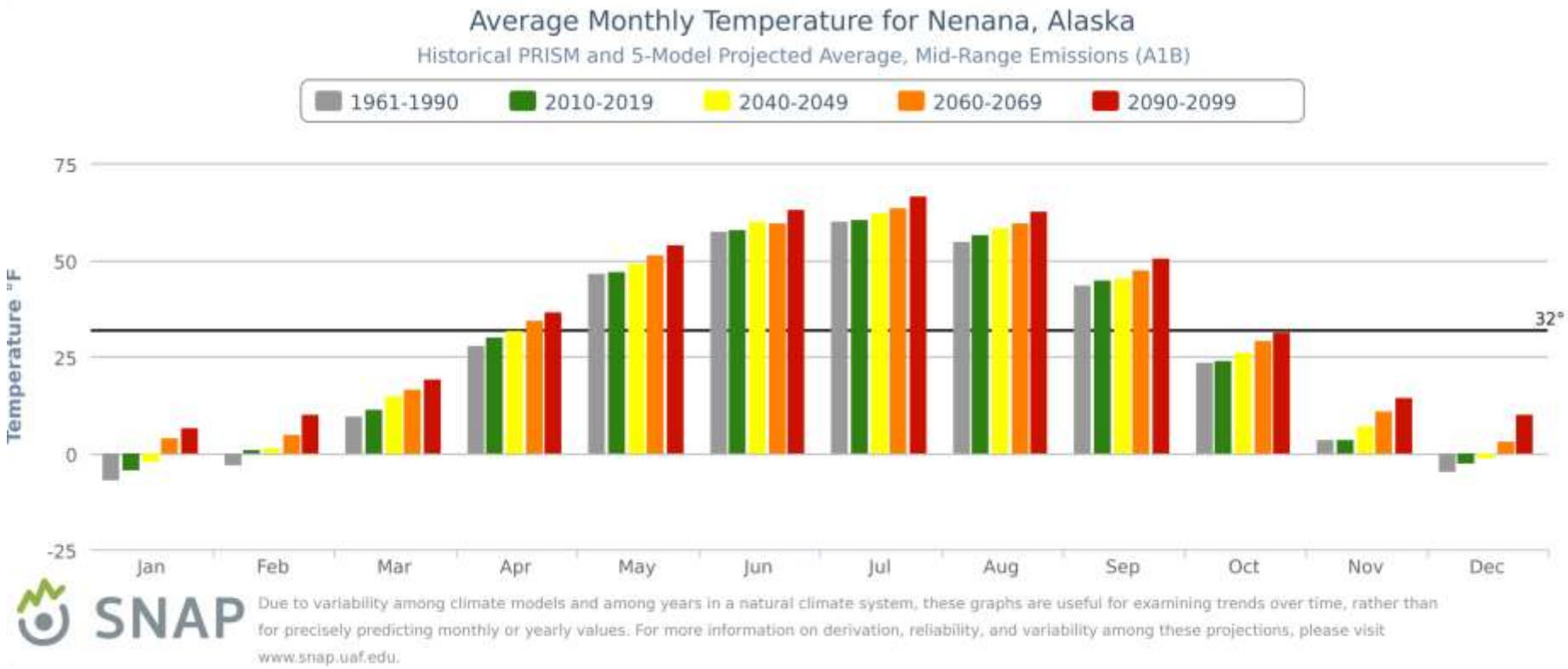
- Climate drivers are the **critical forces** in our scenarios planning process
- Critical forces generally have unusually **high impact** and unusually **high uncertainty**
- Climate drivers table specific for SE Alaska were compiled by John Walsh and Nancy Fresco of SNAP (see handouts).
- All scenarios are created by examining the intersection of two drivers, creating four sectors
- **Selection of drivers** is crucial to the planning process
- The importance of drivers is directly related to their potential **effects**

Central Alaska Network Park Units – Climate Drivers Table

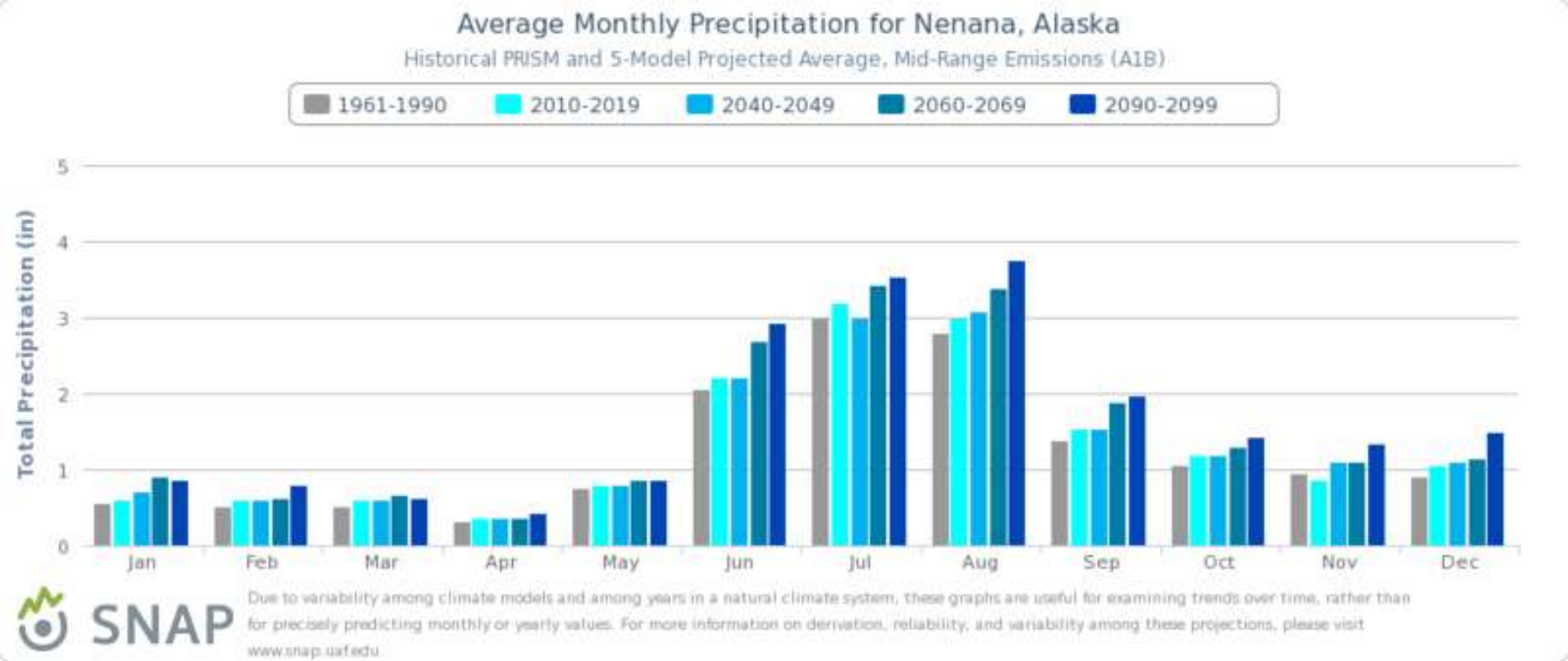
SNAP

Climate Variable	Projected Change by 2050	Projected Change by 2100	Patterns of Change	Confidence	Source
Temperature	+1.9°C ± 0.5°C	+3.7°C ± 0.8°C	More pronounced in N & in autumn-winter	>95% for increase	IPCC (2007); SNAP/UAF
Precipitation (rain and snow)	↑ 33-109 mm	↑ 64-220 mm	Increased % falls as rain in shoulder seasons	High uncertainty in timing of snow onset and melt	AMAP/SWIPA; SNAP/UAF
Freeze-up Date	4-11 days later	9-26 days later	Largest change near coasts	>90%	SNAP/UAF
Length of season with average temps > freezing	↑ 7-13 days	↑ 18-35 days	Largest change near coasts	>90%	IPCC (2007); SNAP/UAF
River and Stream Temps	↑ 1–3°C	↑ 2–4°C	Earlier breakup, higher summer temps	>90%	Kyle & Brabets (2001)
Water Availability	↓ 0–20%	↓ 10–40%	Longer summer, thicker active layer	>66% varies by region	SNAP/UAF; Wilderness Society
Relative Humidity	0% ±10% ↑ or ↓	0% ±15% ↑ or ↓	Absolute humidity increases	50% *as likely as not*	SNAP/UAF
Wind Speed	↑ 2–4%	↑ 4–8%	More pronounced in winter & spring	>90% for increase	Abatzoglou & Brown
PDO	Uncertain	Uncertain	Major effect on Alaska temps in cold season	High degree of natural variation	Hartmann & Wendler (2005)
Extreme Events: Temperature	3-6x more warm events; 3-5x fewer cold events	5-8x more warm events; 8-12x fewer cold events	↑ warm events, ↓ cold events	>95% likely	Abatzoglou & Brown; Timlin & Walsh (2007)
Extreme Events: Precipitation	Change of –20% to +50%	Change of –20% to +50%	↑ winter ↓ spring	*Uncertain*	Abatzoglou & Brown
Extreme Events: Storms	↑ frequency/intensity	↑ frequency/intensity	Increase	>66%	Loehman (2011)

Monthly temperature projections for Nenana
A1B (mid-range) scenario)



Projected monthly precipitation for Nenana

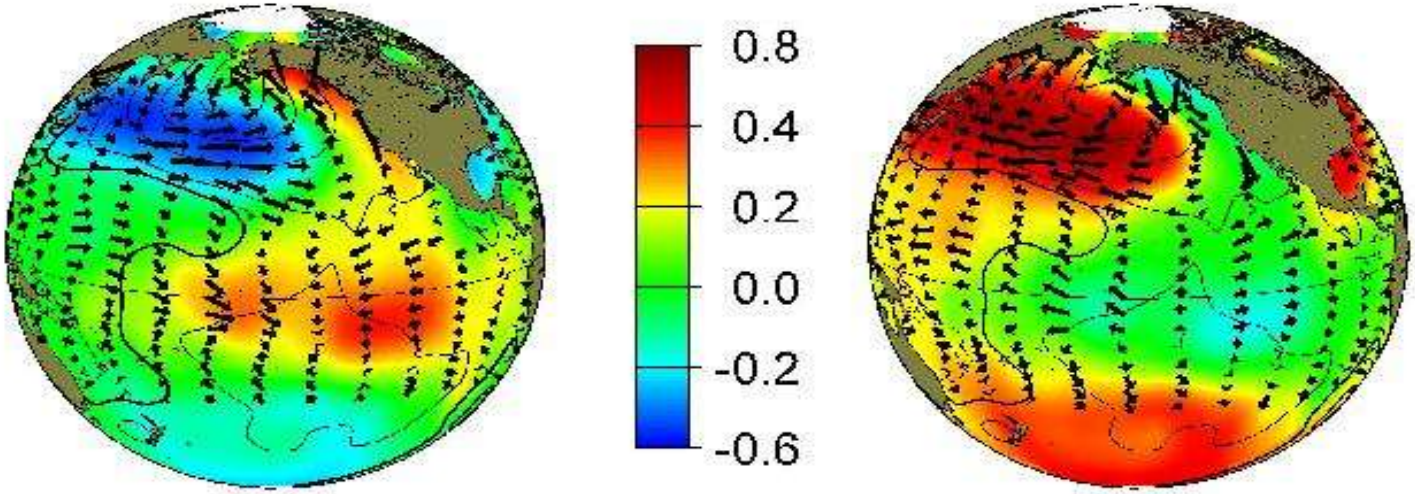


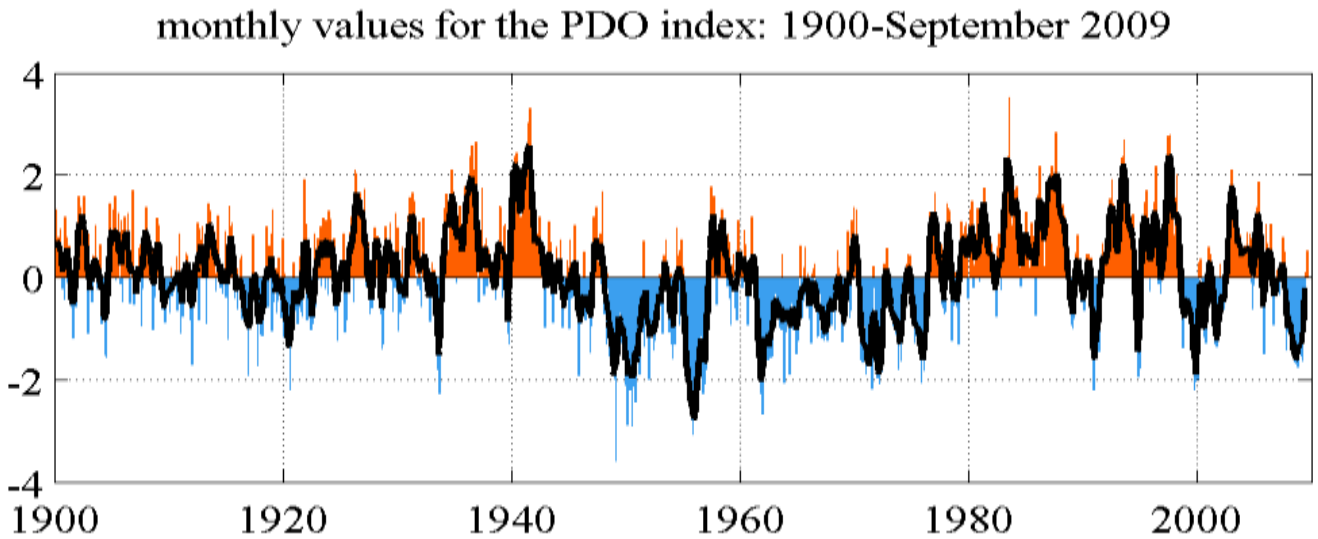
The Pacific Decadal Oscillation

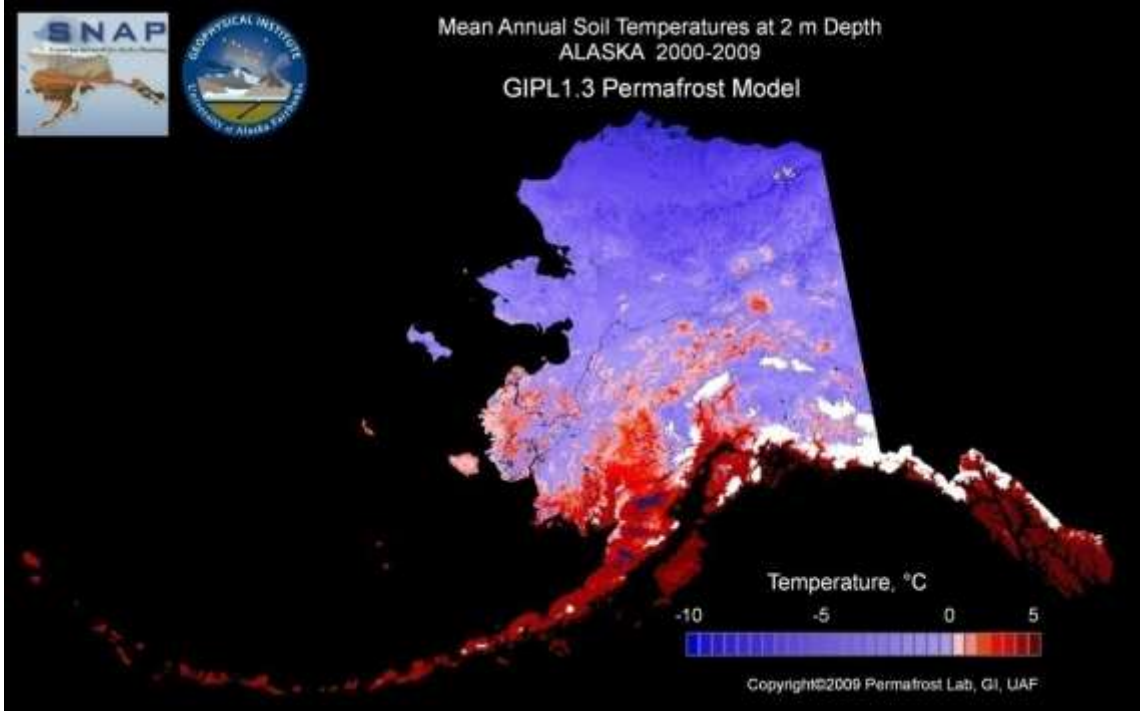
[from JISAO, Univ. Of Washington]

Alaska warm phase

Alaska cold phase

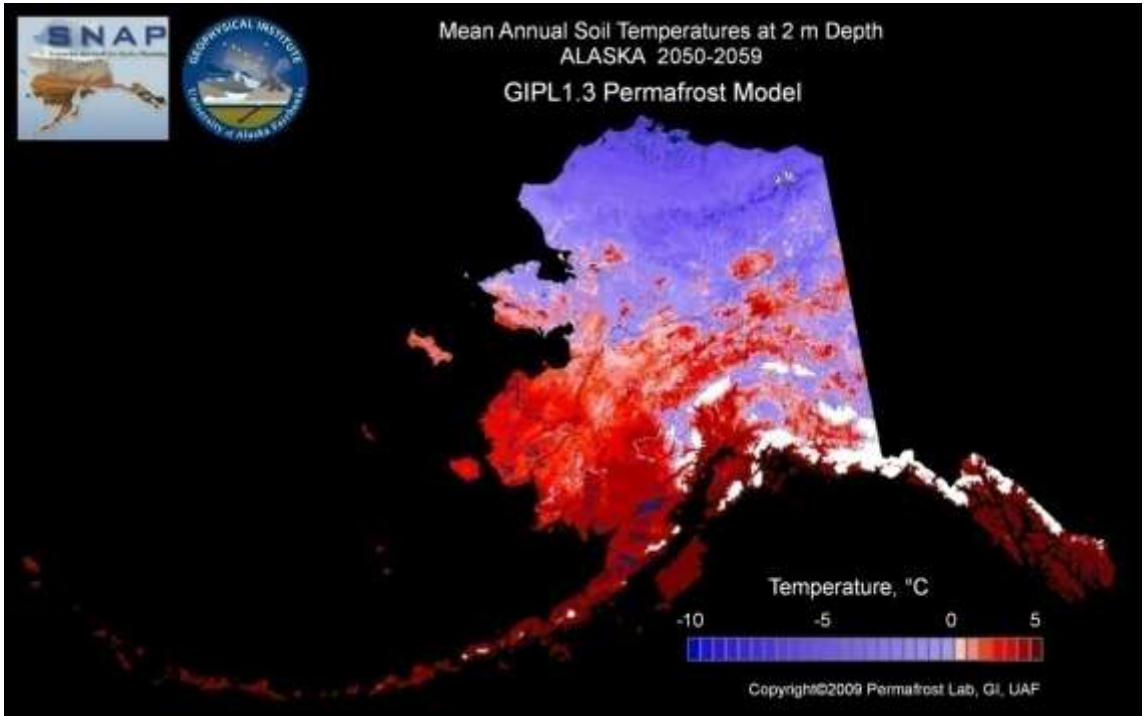






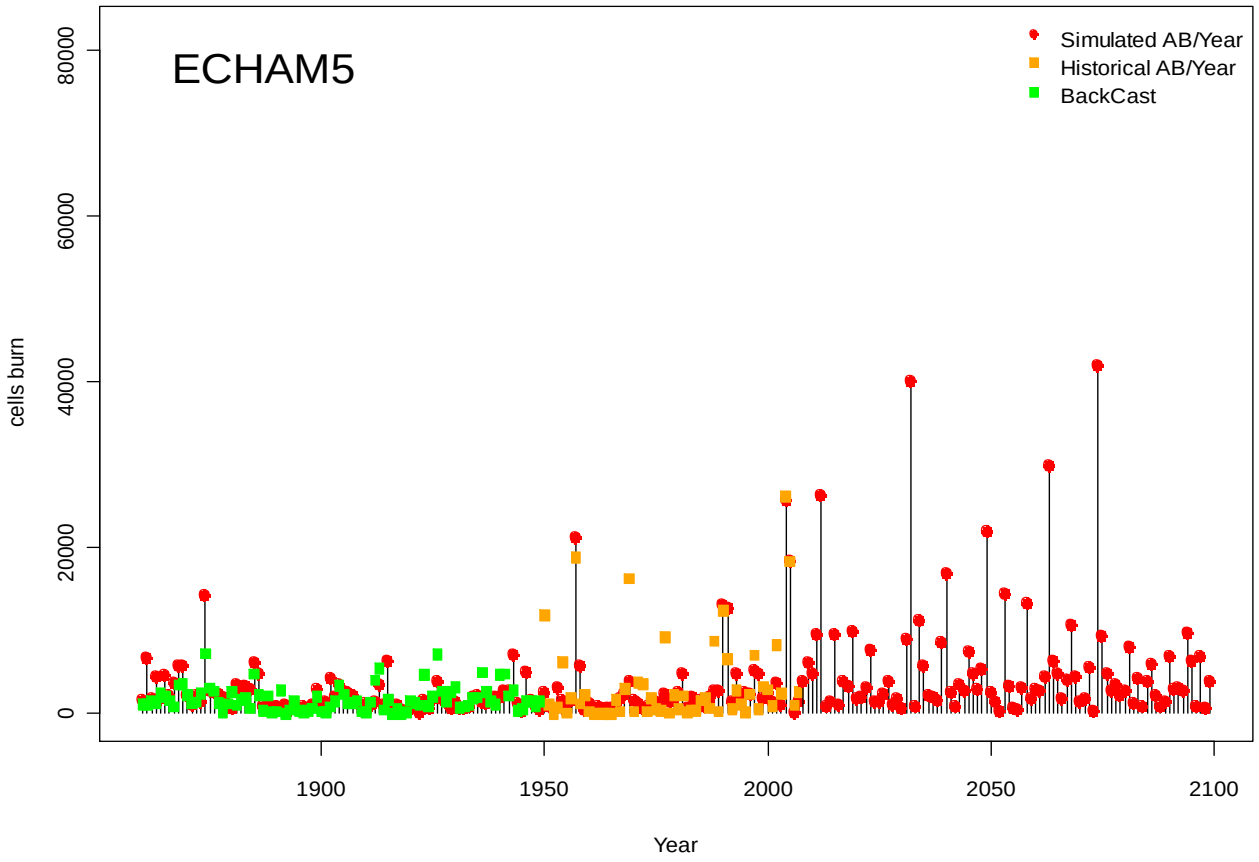
Mean annual soil temp. (2 m depth)

← **2000-2009**



← **2050-2059**

Simulated annual burn area in Alaska (ALFRESCO)



Alaska Division of Forestry
http://forestry.alaska.gov/wildland.htm

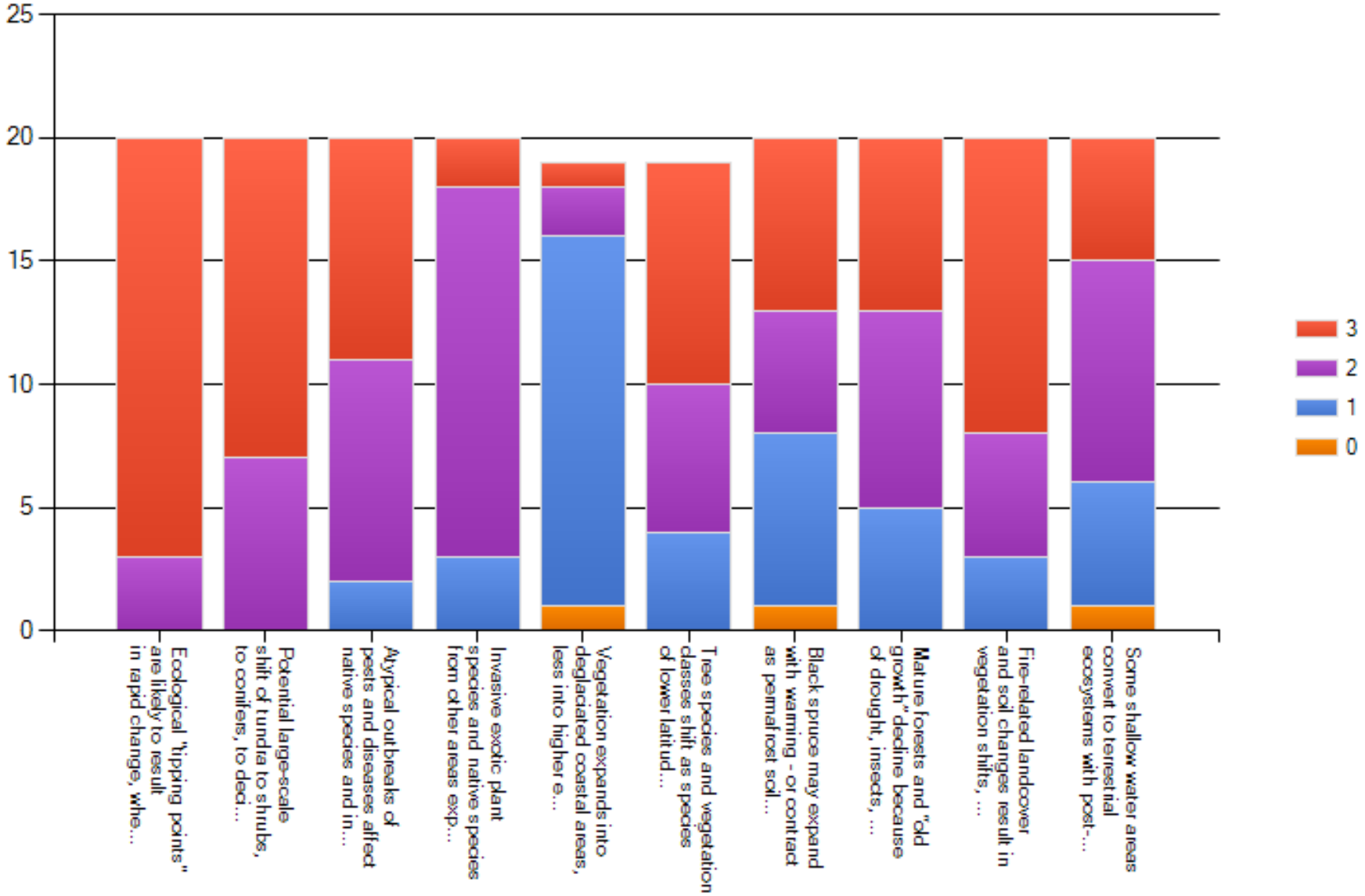
Climate Effects

Climate effects are the outcomes of the critical forces or drivers, as expressed by significant changes in particular parks.

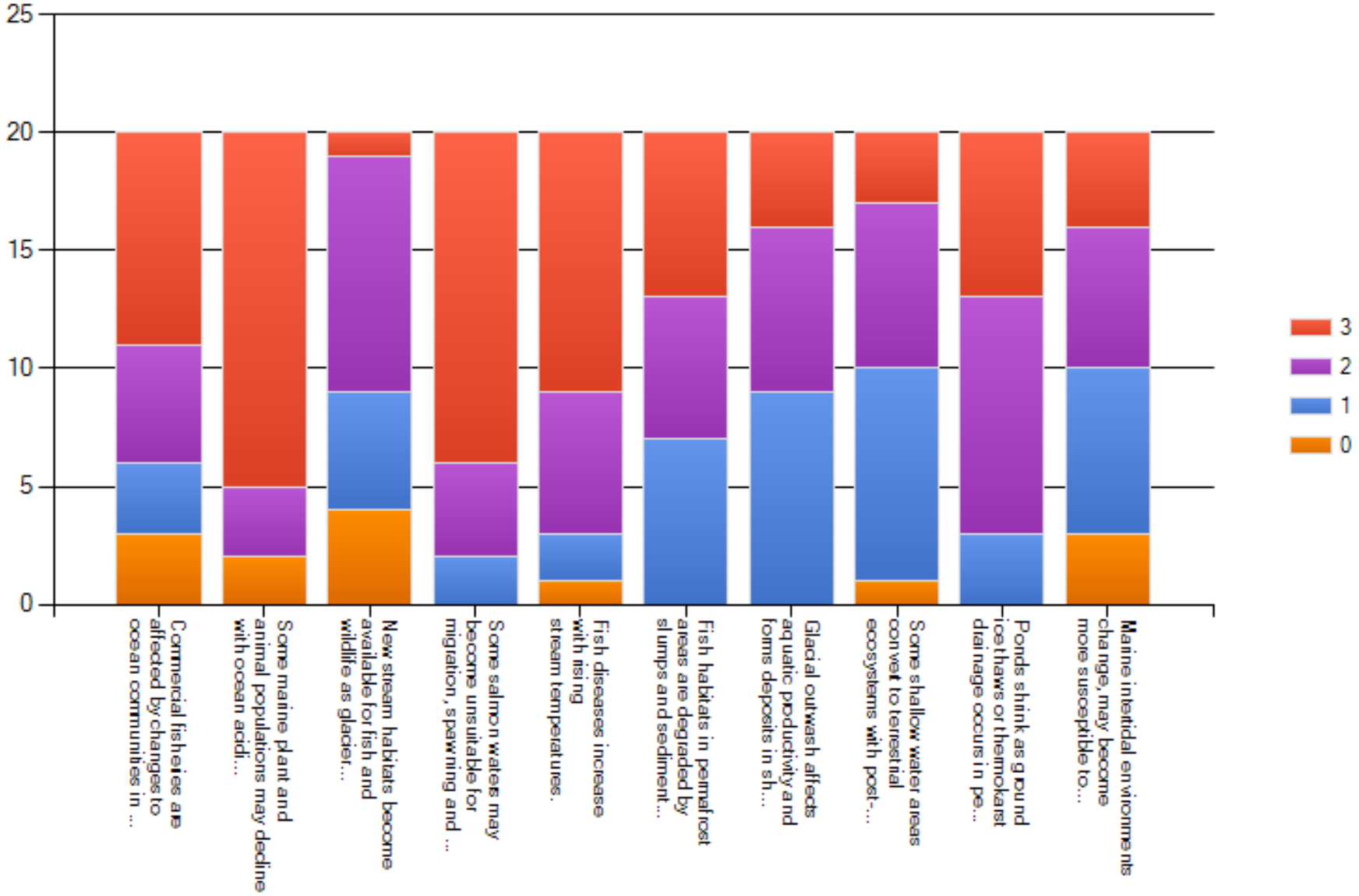
Points to consider include:

- Time frame (20 years? 100 years?)
- Uncertainty (of both driver and effect)
- Severity of effect (and reversibility)
- Scope: what parks, who is impacted?
- Repercussions: what is the story?
- Feedback to policy

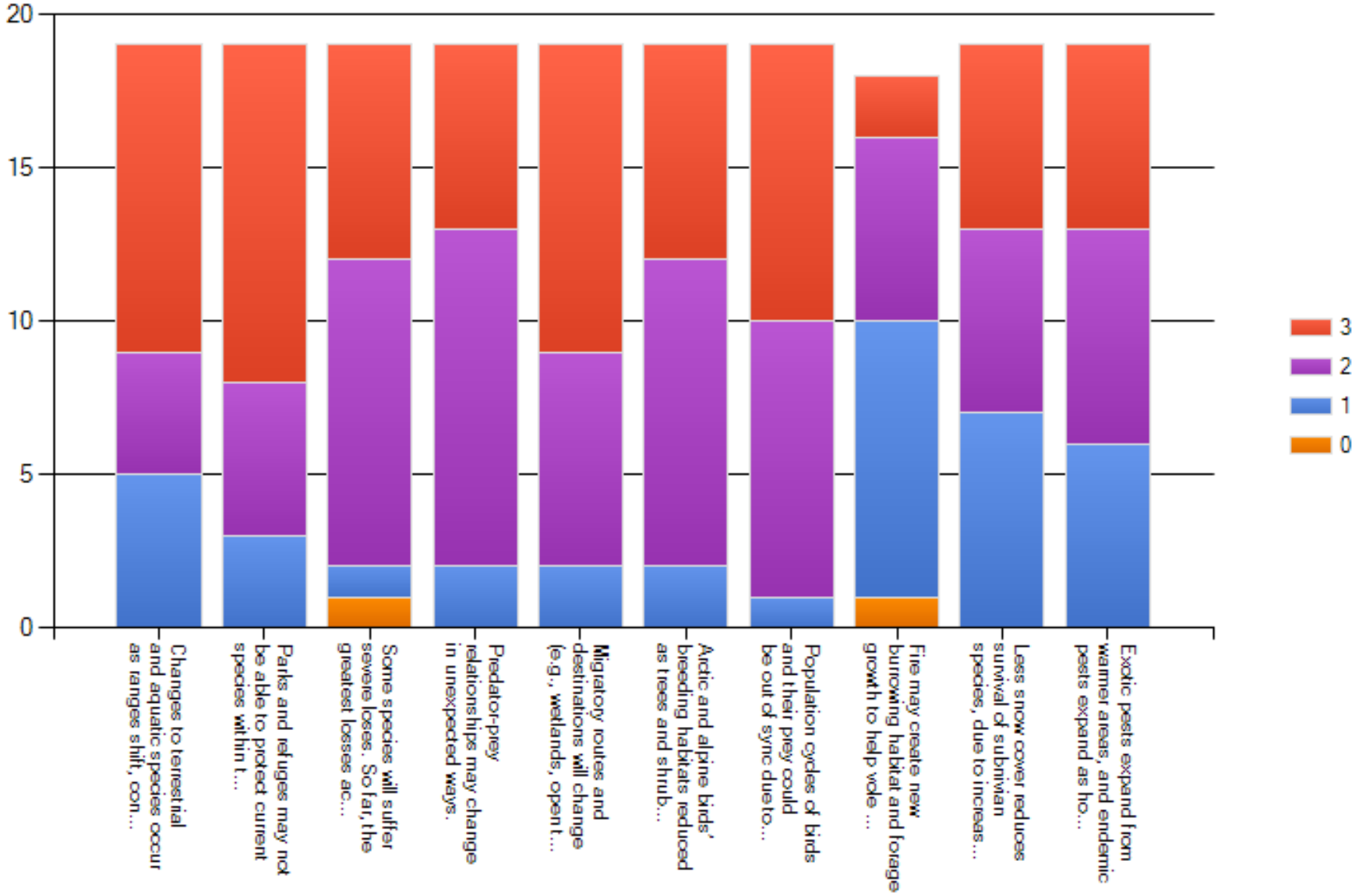
On a scale of zero to three, where 0=not important, 1=of minor importance, 2=fairly important and 3=very important, how would you rank the following possible climate change effects on VEGETATION?



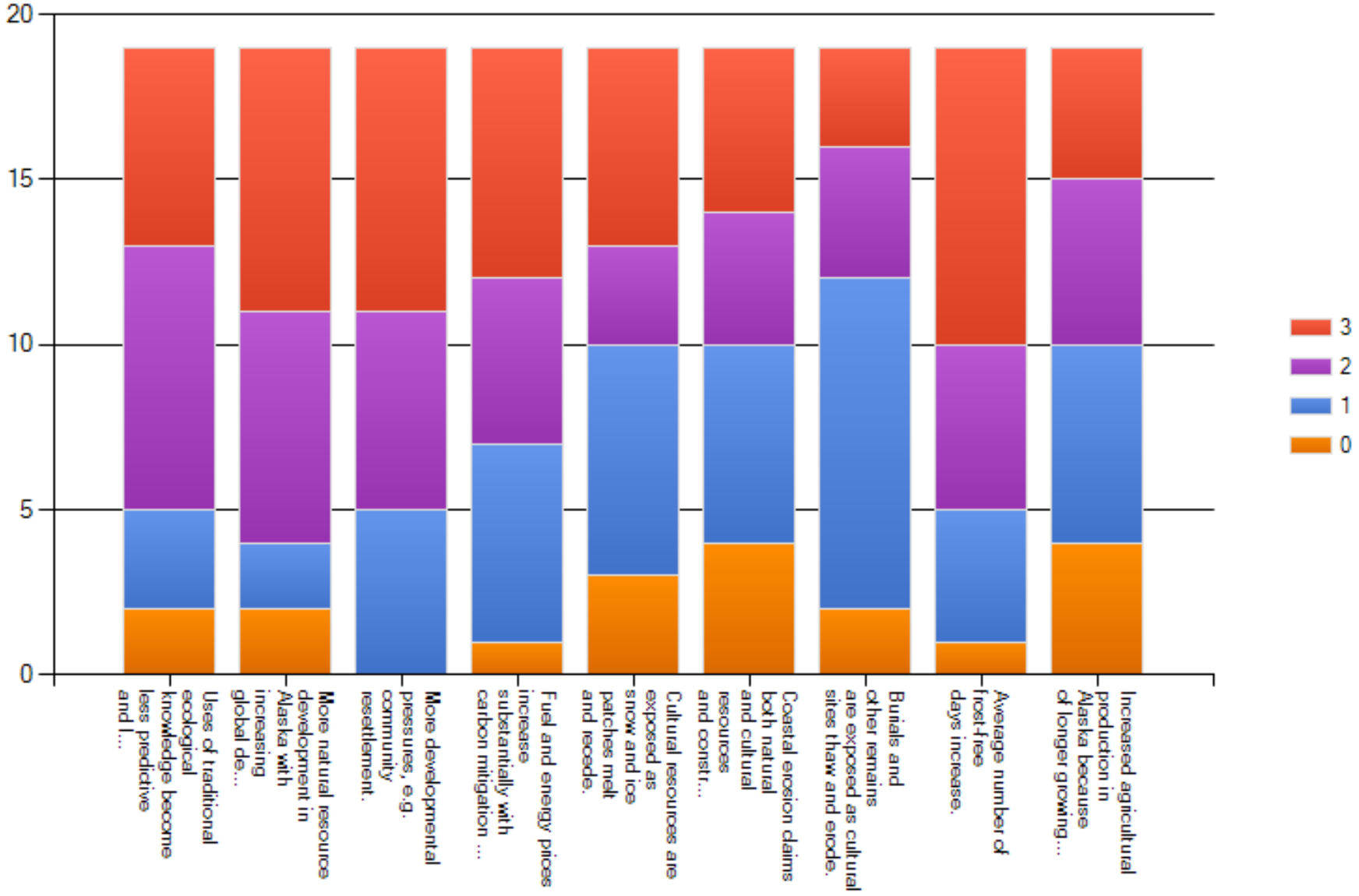
On a scale of zero to three, where 0=not important, 1=of minor importance, 2=fairly important and 3=very important, how would you rank the following possible climate change effects on AQUATIC ECOSYSTEMS?



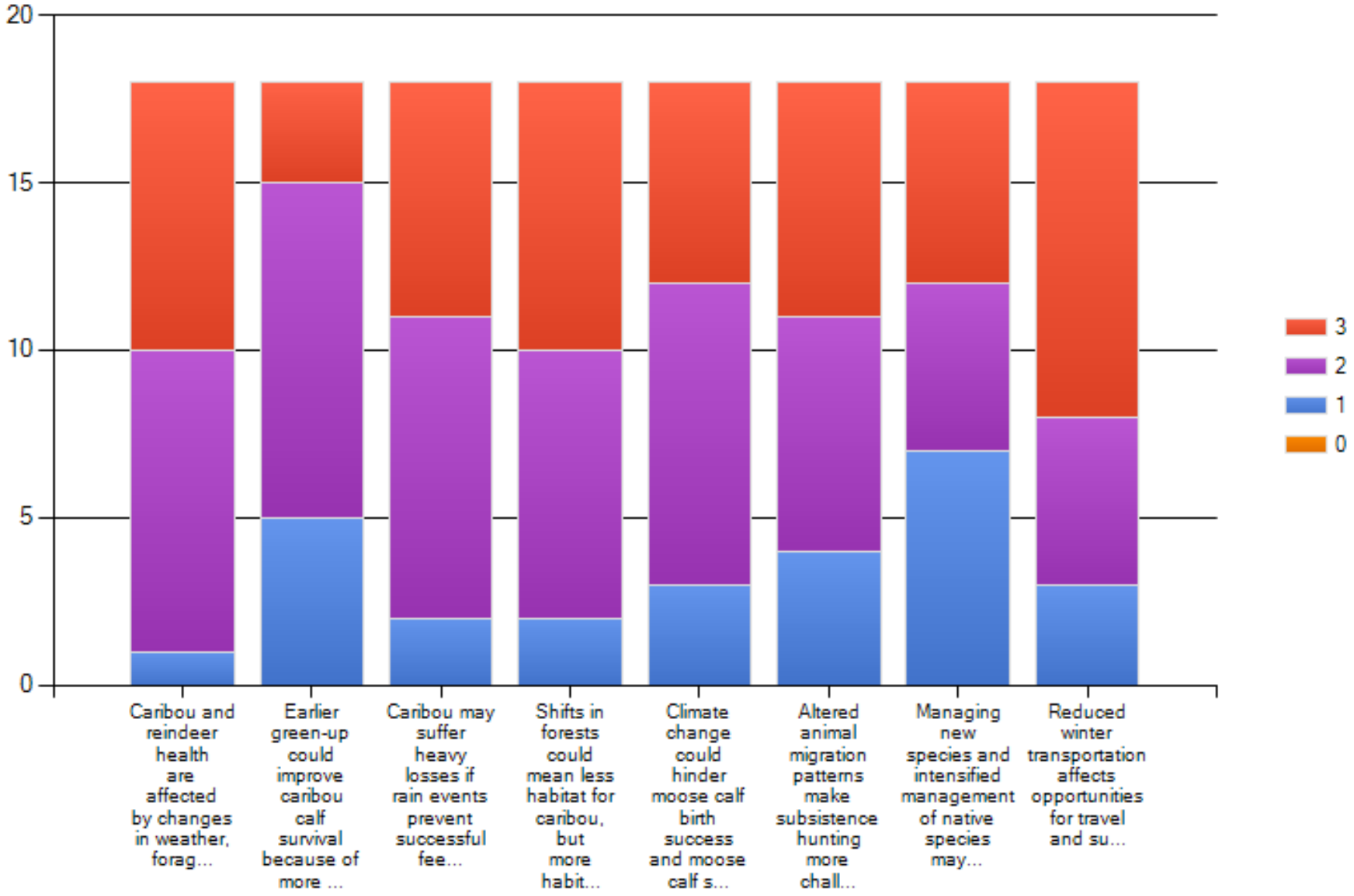
On a scale of zero to three, where 0=not important, 1=of minor importance, 2=fairly important and 3=very important, how would you rank the following possible climate change effects on WILDLIFE?



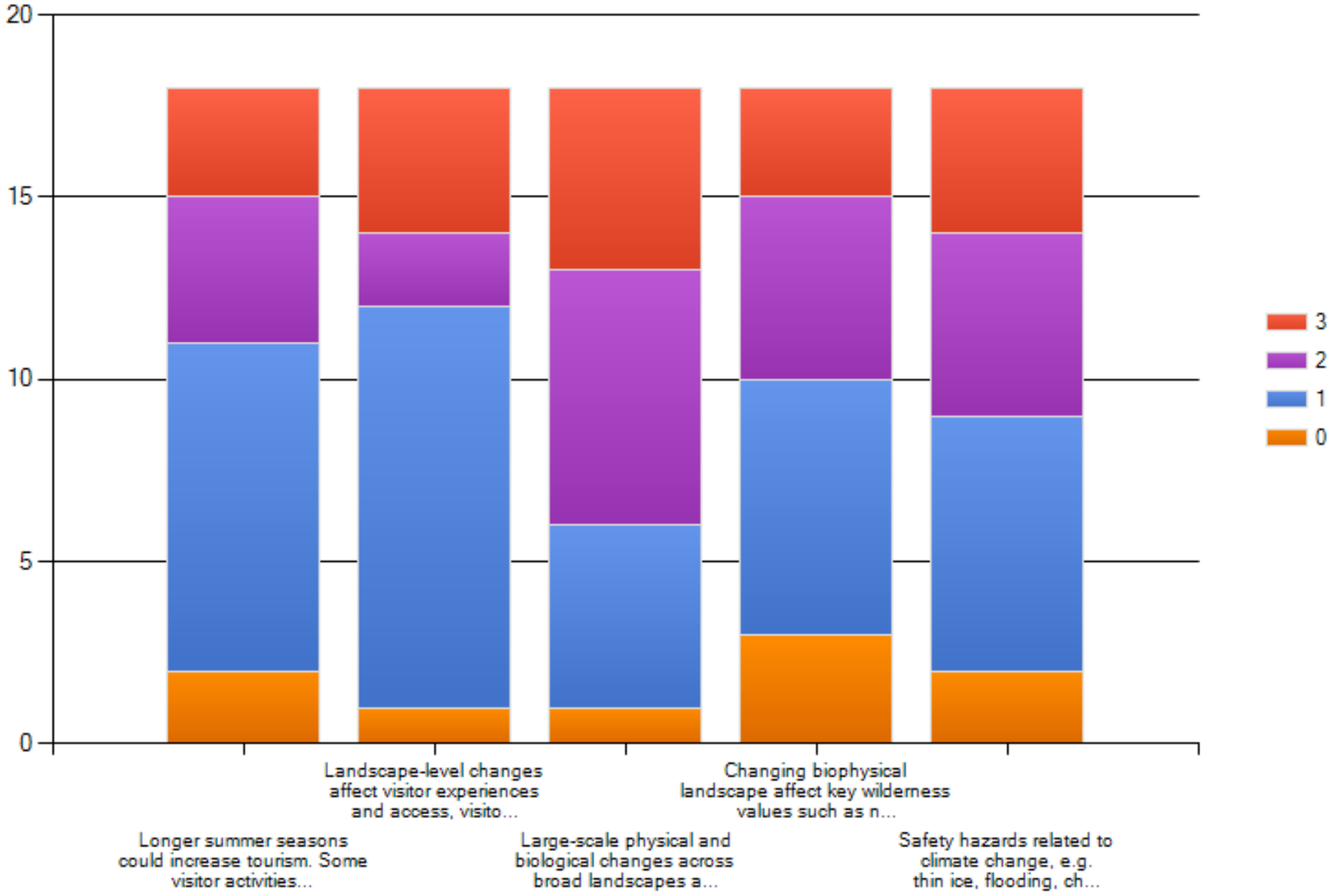
On a scale of zero to three, where 0=not important, 1=of minor importance, 2=fairly important and 3=very important, how would you rank the following possible climate change effects to DEVELOPMENT OPPORTUNITIES AND CULTURAL RESOURCES?



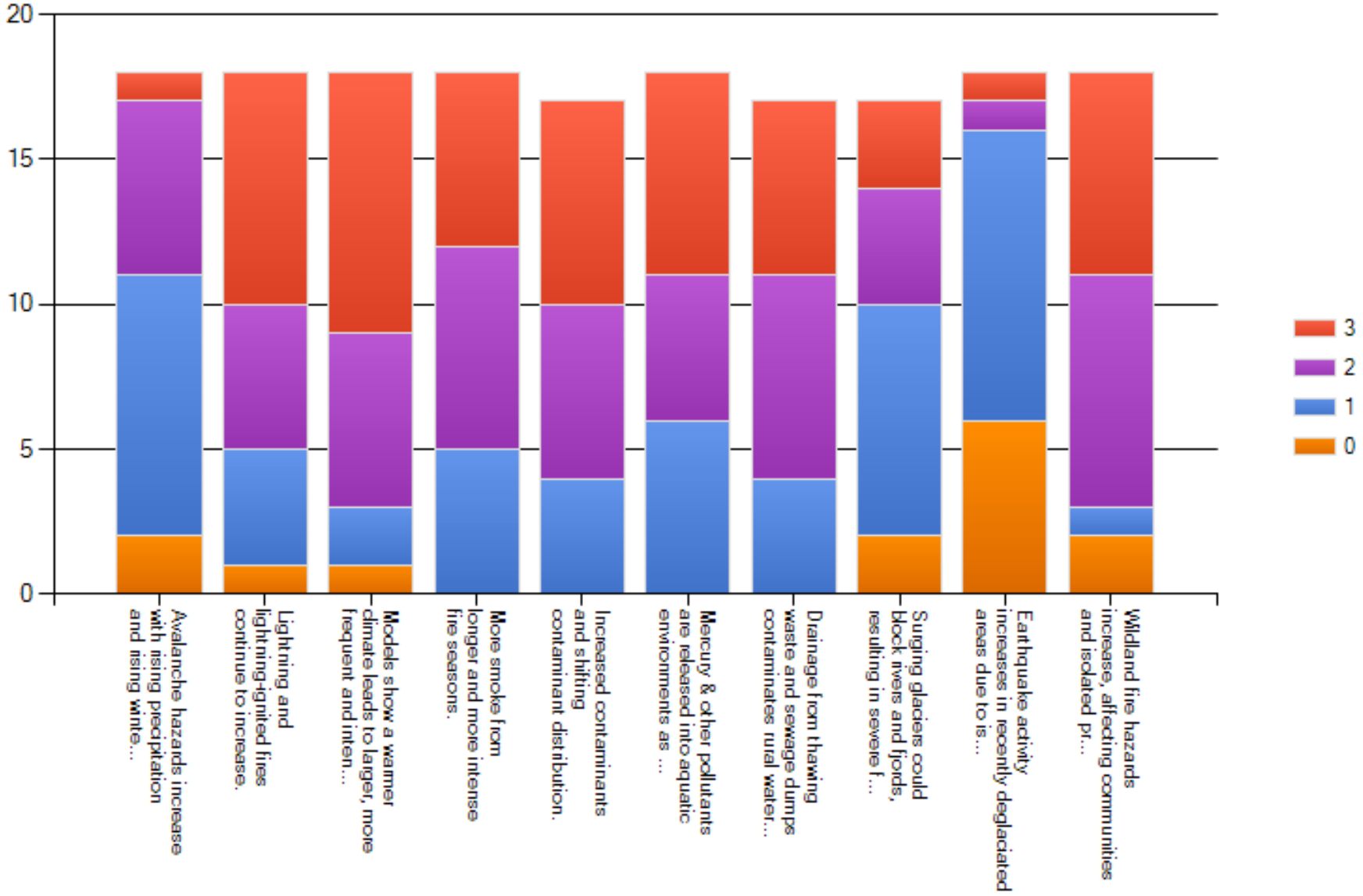
On a scale of zero to three, where 0=not important, 1=of minor importance, 2=fairly important and 3=very important, how would you rank the following possible climate change effects on SUBSISTENCE?



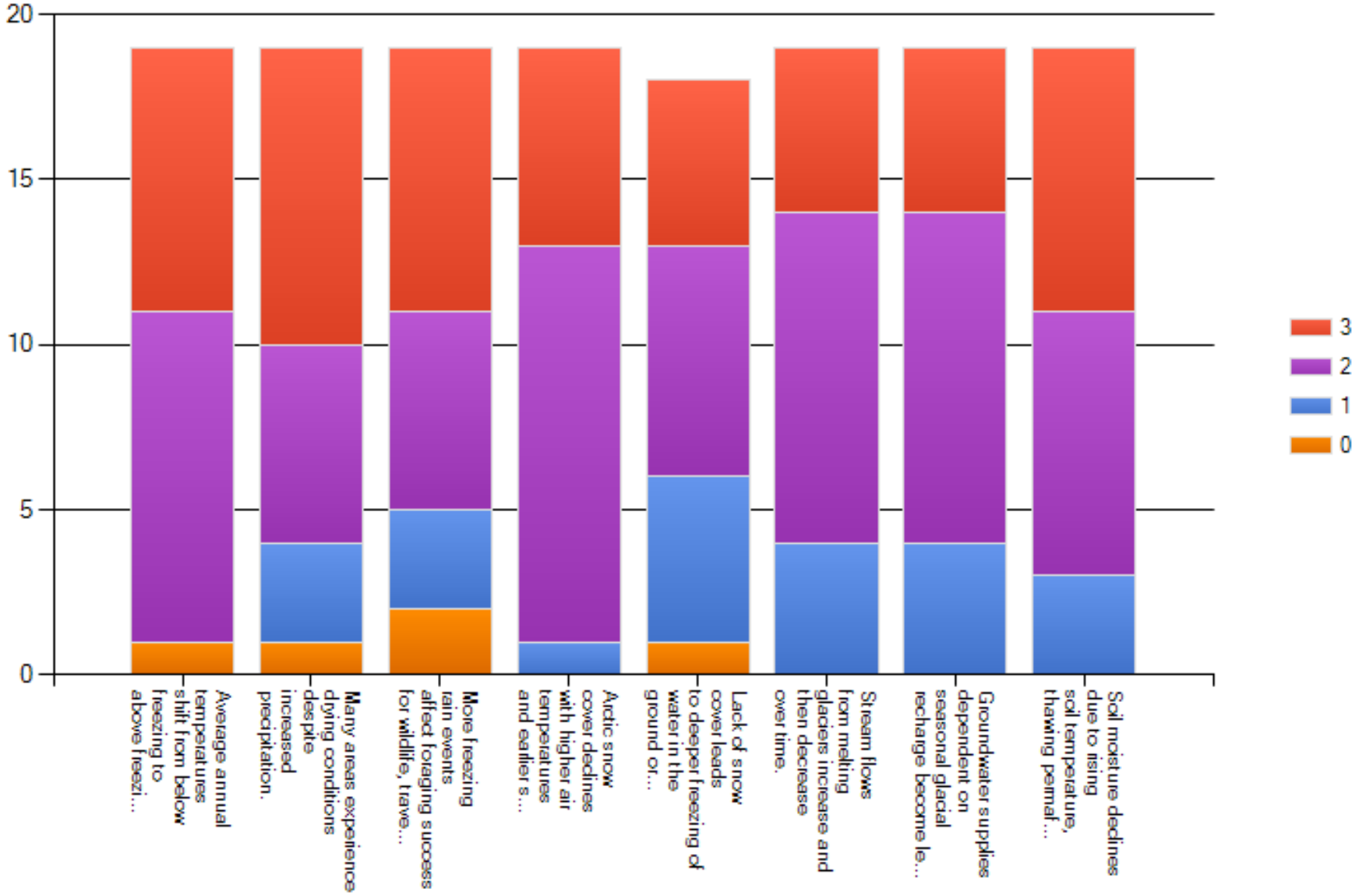
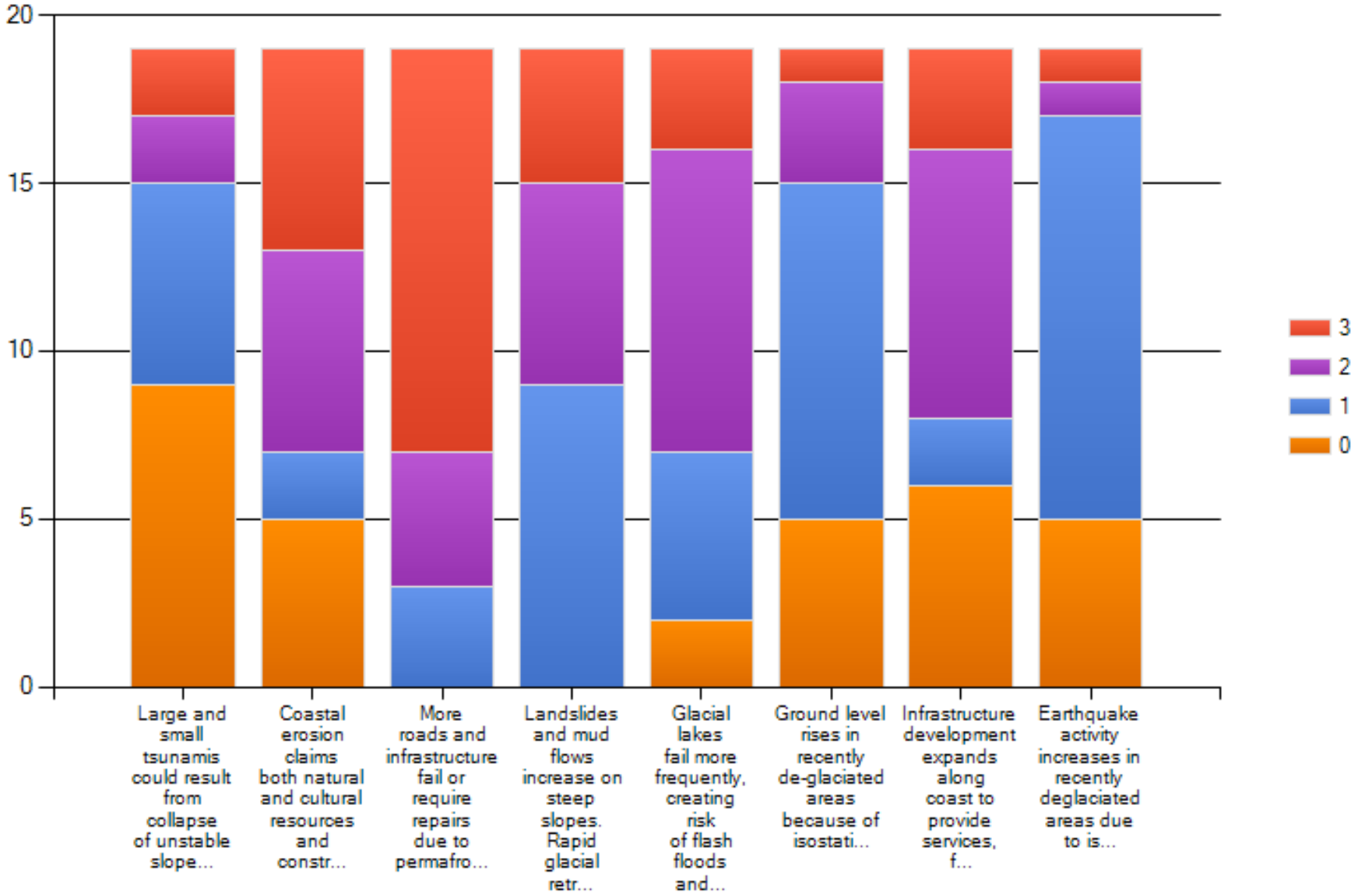
On a scale of zero to three, where 0=not important, 1=of minor importance, 2=fairly important and 3=very important, how would you rank the following possible climate change effects on RECREATION?



On a scale of zero to three, where 0=not important, 1=of minor importance, 2=fairly important and 3=very important, how would you rank the following possible climate change effects on HUMAN HEALTH AND SAFETY?



On a scale of zero to three, where 0=not important, 1=of minor importance, 2=fairly important and 3=very important, how would you rank the following possible climate change effects on WATER AVAILABILITY?



On a scale of zero to three, where 0=not important, 1=of minor importance, 2=fairly important and 3=very important, how would you rank the following possible climate change effects on INFRASTRUCTURE?