

# Climate Resilience and California's MPA Network

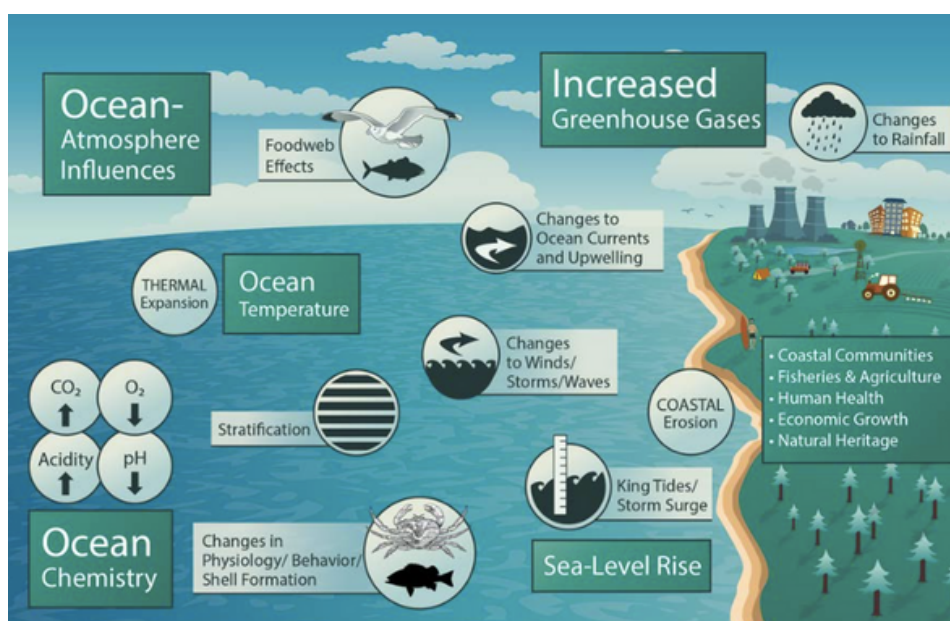
## How is Climate Change Impacting California?

Due to human-caused greenhouse gas emissions and associated climate change, the California Current is experiencing conditions such as ocean warming, marine heatwaves, alterations in ocean chemistry (ocean acidification and decreased levels of oxygen), sea-level rise, and extreme storms.

### Key Terms

#### Climate Resilience

The ability of a coupled socialecological-economic system and its components to absorb stressors and disturbance through resistance and/or recovery of core function, structure, and provision of services.



*Overview of climate change in California*

*Figure source: Della Gilleran from Sievanen, Phillips, et al. 2018,*



## What are MPAs?

Marine protected areas (MPAs) are intended to protect and restore marine life and habitats. MPAs protect against human disturbance and fishing pressures and restore and the health, productivity, and resilience of ocean ecosystems. These ocean sanctuaries provide refuge for fish and other marine life, as well as important habitat conservation. California has a total of 124 MPAs that cover over 852 square miles and protect 16% of state waters. Some scientific evidence suggests that MPAs can promote climate resilience in marine ecosystems.



## Climate Change, MPAs, and Equity

Climate change disproportionately impacts marginalized communities. These communities contribute less to the causes of climate change but face the harshest impacts. It is the responsibility of wealthy countries to take climate action, including protecting marine resources. Indigenous peoples globally have stewarded the coast and ocean since time immemorial. A long history of caring for the marine environment allows tribes to contribute not only important traditional ecological knowledge but, also contemporary Western science to the ongoing management of California's MPAs, ocean, and coast. This knowledge is vital for slowing and adapting to human-caused climate change.

# MPAs Support Resilience in 5 Primary Ways

Well-designed and well-managed MPAs provide **climate resilience** benefits to both the ocean and to the humans that rely on the ocean for physical, cultural, and spiritual sustenance purposes.

## 1

### Reduction of Environmental Stress

MPAs protect habitats, such as kelp forests, seagrasses, and salt marshes, that can buffer the coast from physical stressors like storms, allow for increased resistance to ocean acidification and hypoxia, and sequester significant amounts of CO<sub>2</sub> (about twice as much as forests).

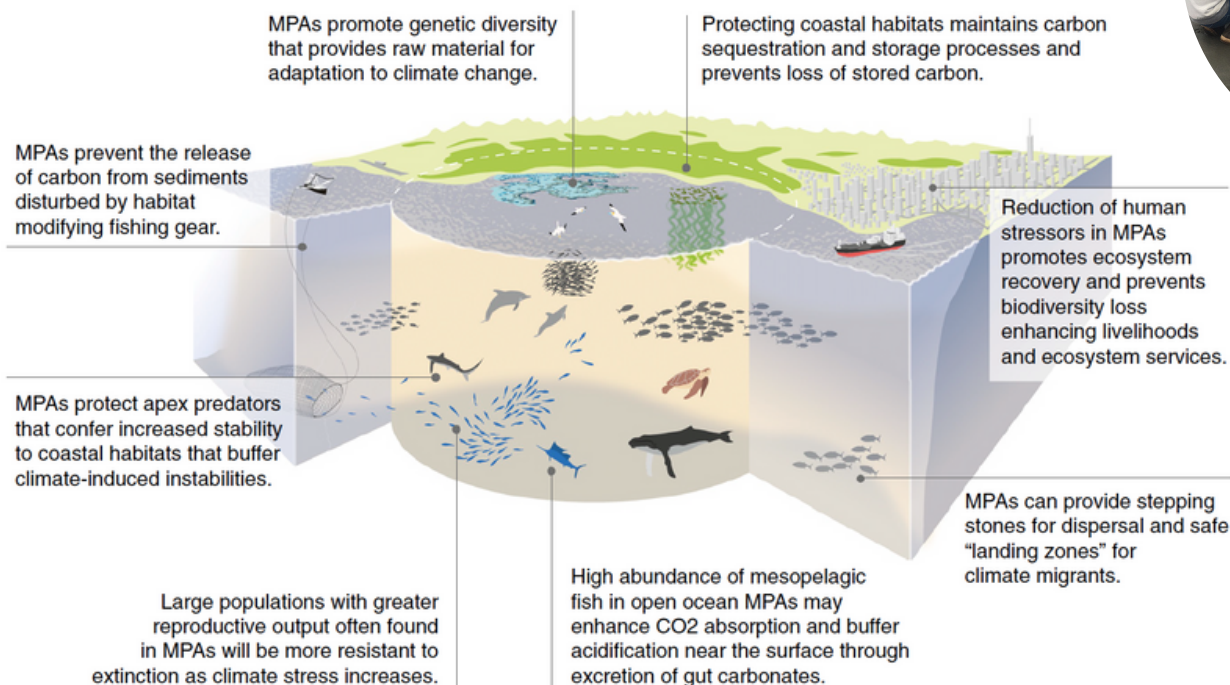
## 2

### Human Dimensions and Increased Coastal Community Resilience

MPAs protect habitats and species that: are of cultural and economic value; buffer coastal communities against severe weather; and store greenhouse gases. MPAs can also help attract ocean-based tourism for coastal communities.



**The Tolowa Dee-ni' Nation led a report which identified five keystone species (mussels, razor clams, seaweed, red tail surf perch, surf smelt, and night fish) that were considered to be a cultural indicator or cultural keystone for many North Coast Tribes in California (for food or for ceremony) that were likely to benefit from MPAs.**



Potential Mechanisms by which MPAs may promote resilience to climate change.  
Figure Source: Roberts et al. 2017

## 3

### Increased Organismal Resilience

The possible increased size and health of individual organisms within MPAs increases their resistance to climate stress.

## 4

### Increased Ecosystem Resilience

On a global scale, temperate MPAs increase the total species within marine ecosystems by 14%, which allows for increased resilience to climate disturbances.

## 5

### Increased Population Resilience

By protecting larger fish, which produce disproportionately more and higher quality offspring, as well as by supporting greater genetic diversity, populations have higher potential to replenish themselves after climate disturbances.