

A stylized, colorful illustration of a landscape. The foreground features rolling green hills with a brown path. On the left, there is a green tree, a purple flower, and an orange butterfly. A red bird is flying in the sky. The background consists of layered blue and white waves, suggesting a sky or water. The overall style is flat and modern.

# *Biodiversity in Italy*

ERASMUS PRESENTATION

## Italy counts 22 national parks



that corresponds to the 5% of the national territory



-> 50 sites have been recognized as internationally relevant wetlands worth to be included in the Ramsar Convention on Wetlands' list





-> Areas included in Nature 2000 Network cover 20.5% of the national surface

Forests are very important for:

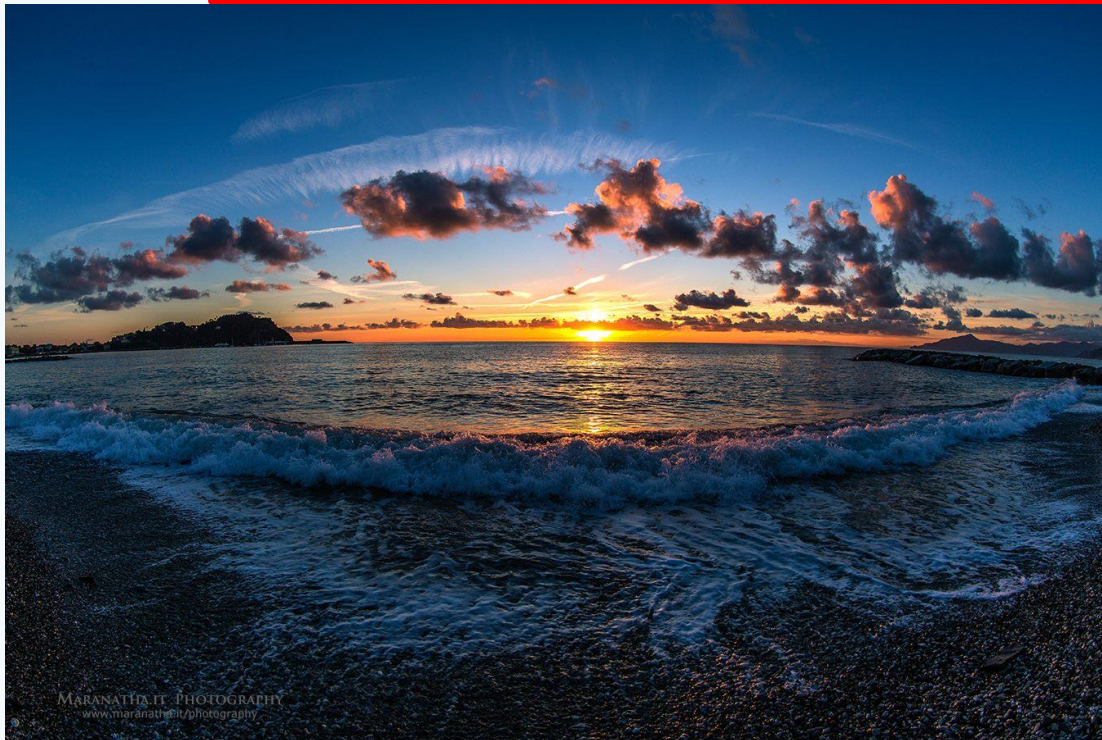
- landscape
- biodiversity
- balance of the environment
- economy

It occupies about 30% of national area

Around the Italian peninsula 23 protected marine areas and 2 marine parks safeguard <-



The combined action of anthropic effects and climate change negatively affects the entire ecosystem, causing the seashore regression and the decrease of marine life



## -> LIGURIAN SEA

→ about 30% of the original algae extension was lost in the thirty-year period between 1960 and 1990

→ the growth of Posidonia shows a positive trend related to the climatic parameters for the Ligurian area, representing one of the coldest part of the Mediterranean Sea

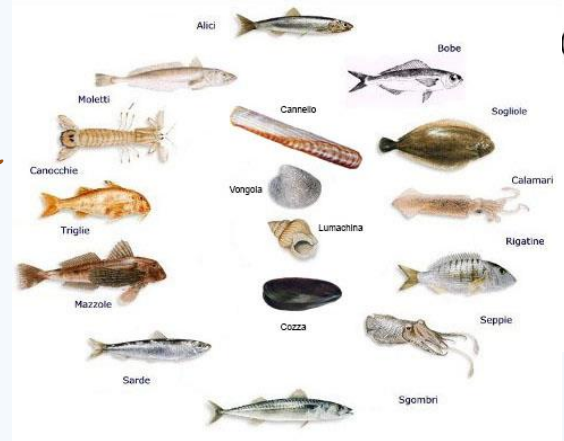
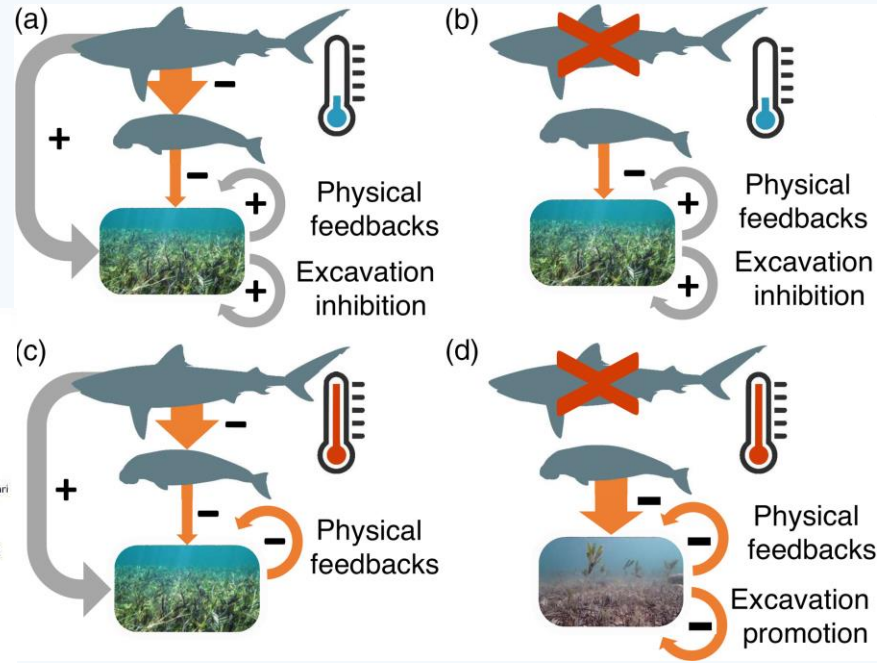
→ In the Eastern Ligurian Sea events of mass mortality regarding a large number of marine invertebrates have affected a broad geographic area causing on the whole losses higher than 50% in terms of density and biomass of several benthic species

# ADRIATIC SEA

Influenced by:

- Warming of air temperature
- Changes in precipitation patterns
- A varying Po river runoff during the last two decades

Due to changes in environmental conditions, a decrease in the abundance of anchovies was recorded



Are producing variation of marine properties:

changes have been reported in plankton organisms

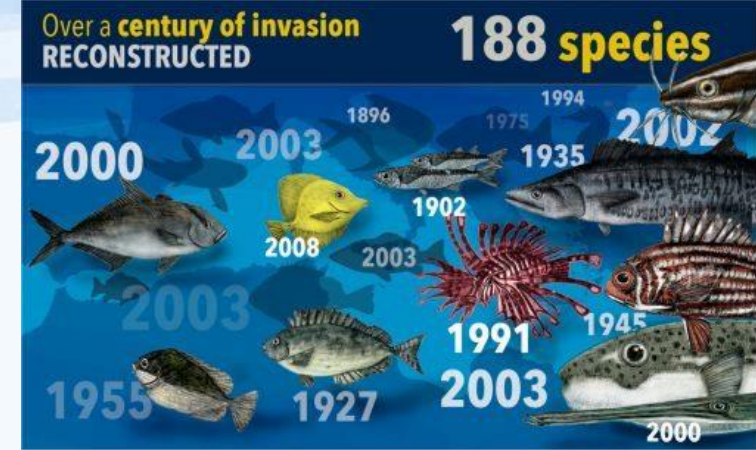


An impact on:

- Fish amount and on its community composition
- Modification of nursery areas
- Changes in juvenile survival
- Lack of synchronization between predators and preys

# MEDITERRANEAN SEA

The average surface temperature of the Mediterranean Sea will increase with a range between +1.73 and +2.97 °C in the period 2070-2099 compared to the period 1961-1990, and in the same period the salinity of the surface of the Mediterranean Sea will increase with a range between +0.48 and +0.89.



One of the effects of water warming has been the spreading of “**invasive**” species never found before in the Mediterranean Sea, being confined to geographic areas considered as warmer.

Some tropical species have colonized the Mediterranean Sea coming from other seas through the Suez Canal, the Strait of Gibraltar and ships' ballast water.



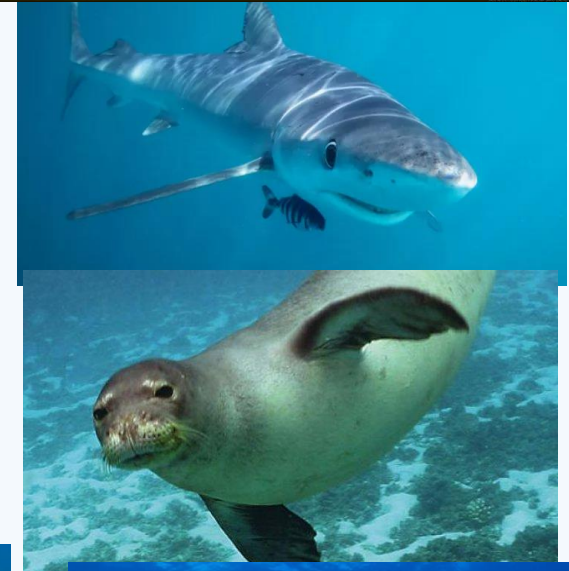
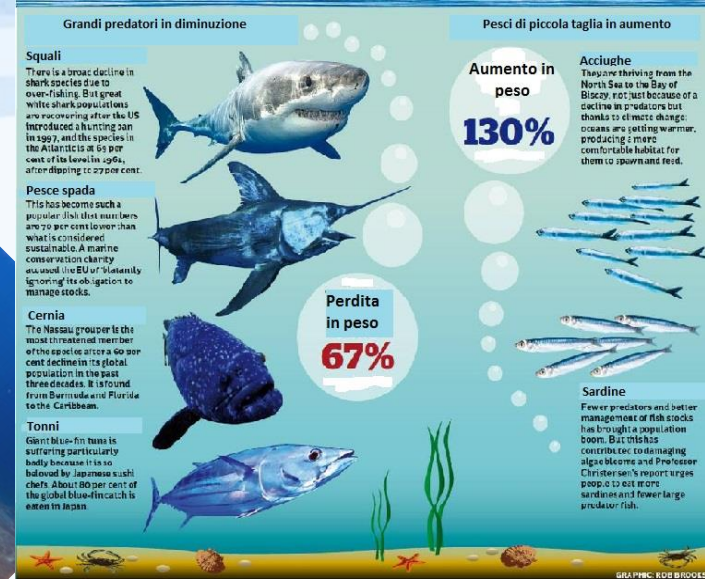
The projected rise in atmospheric CO<sub>2</sub> concentration, leading to increased dissolved CO<sub>2</sub> concentration in marine water and to a consequent **acidification**, will probably drastically **alter** marine ecosystems in the Mediterranean and cause a **decline** of the marine biodiversity.



# MEDITERRANEAN SEA

A **negative impact of acidification** on the functioning of coastal Mediterranean bivalves was shown for the Northern Adriatic. Examples of these impacts can be found at the level of a single organism, community and ecosystem, and include:

- Changes in **population size and distribution**, with replacement of local Mediterranean marine fauna and spreading of invasive species, such as some tropical species of algae
- Increasing **extinction rates of species**
- Phenology changes
- Mass mortality events of invertebrates
- **Mucilage outbreaks**, potentially associated with increased outbreaks of marine diseases
- Negative impacts on the prairies of *Posidonia Oceanica*, with consequent seashore regression and decrease of marine life, as in the case of the Ligurian Sea



# Vulnerabilities – Freshwater ecosystems

Freshwater ecosystems are expected to experience alterations:

Phenology changes,  
northward movements  
and development of  
invasive alien species

Salt-water intrusion  
into coastal fresh-water  
beds and loss of  
wetlands

Mediterranean ecohydrology is in danger  
because, due to the increase of  
temperatures, the water input is decreasing  
and there is an increasing of  
evapotranspiration



# Glacier – Fed rivers

The rapid shrinking of glaciers results in a reduction in glacial meltwater contribution to river flow in many glacierized catchments

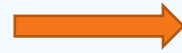


They potentially affect the biodiversity of specialized glacier-fed river communities



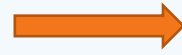
# Vulnerabilities - Mediterranean

- Paris agreement 2015



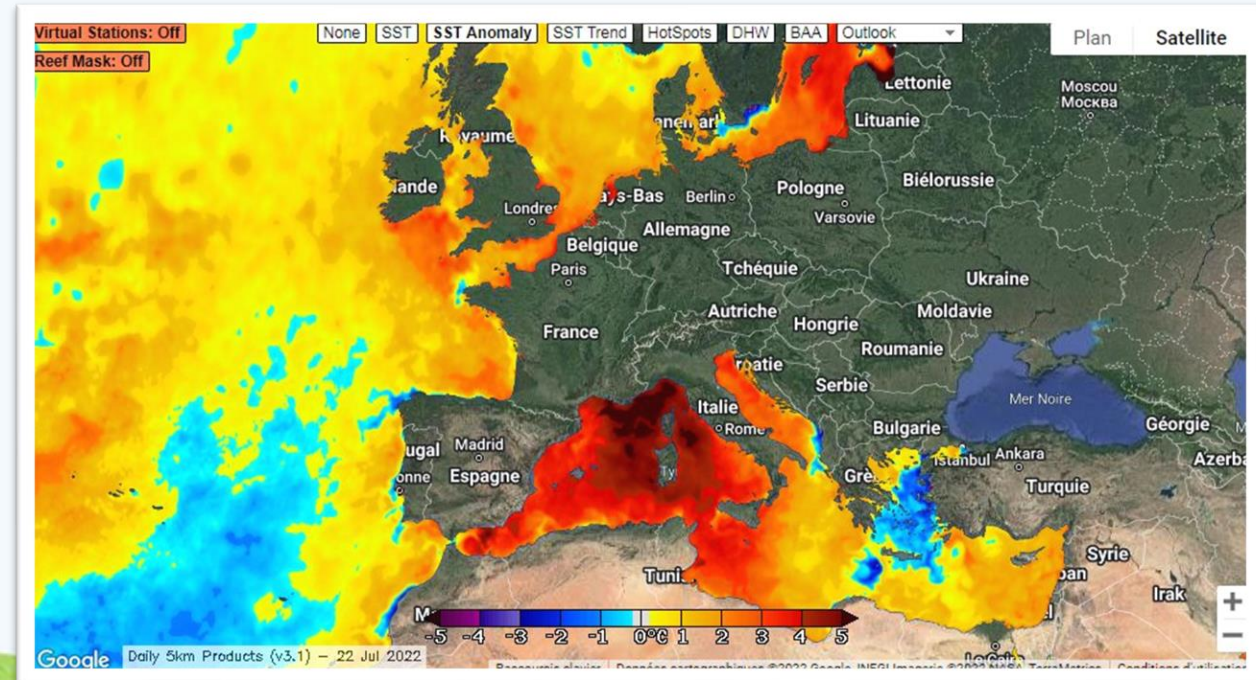
maintains the global average warming well below 2°C

- Ecosystem variability during the past 10,000 years was reconstructed from pollen analysis



It showed that regional temperatures in the Mediterranean basin are now ~1.3°C higher than during 1880-1920, compared to a worldwide increase of ~0.85°C

In addition to climate change, other human impacts affect ecosystems, such as land-use change, urbanization, and soil degradation. Many of these effects are likely to become even stronger in the future, because of the expanding human population and economic activity



# In Italy, what flora and fauna problems are we heading towards?



Projections on climate change suggest that the share of stable plant species in 2100, compared to 1990, has significantly decreased.

In Italy about 1/3 of the forests are threatened by the climate change and the risk of biodiversity loss is very high.

Ecosystems are moving north and up (above sea level): about 100 km north and 150 metres up for every 1°C increase in mean annual temperature

For the Mediterranean area  
the following impacts  
and related vulnerability issues, are expected:

- increased risk of extinction for several terrestrial species
- advancing trends in plant phenology, which will alter the growing season and affect ecosystems functioning and productivity
- Loss of Mediterranean wetland ecosystems, which are important not only for marine biodiversity, but also for bird migrations

ALPS

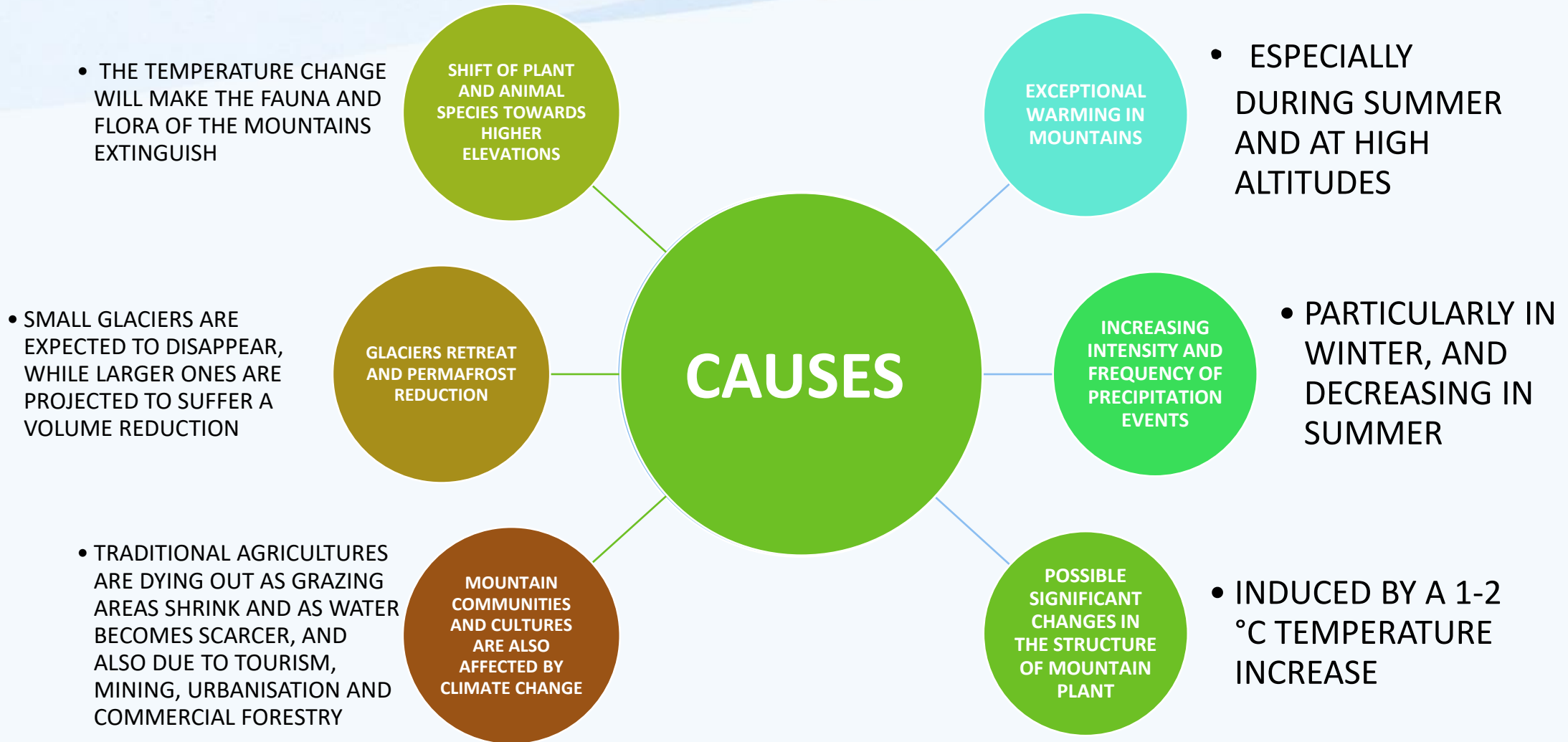


APENNINES



*The mountains are a fundamental and present ecosystem in Italy, we have Alps and Apennines.*

*Unfortunately, Mountain ecosystems are particularly vulnerable to the climate change*



# Extinction debt of high-mountain plants



In addition to these static, niche-based model predictions, a so-called hybrid model was used that couples niche-based projections of geographical habitat shifts with mechanistic simulations of local demography and seed dispersal.

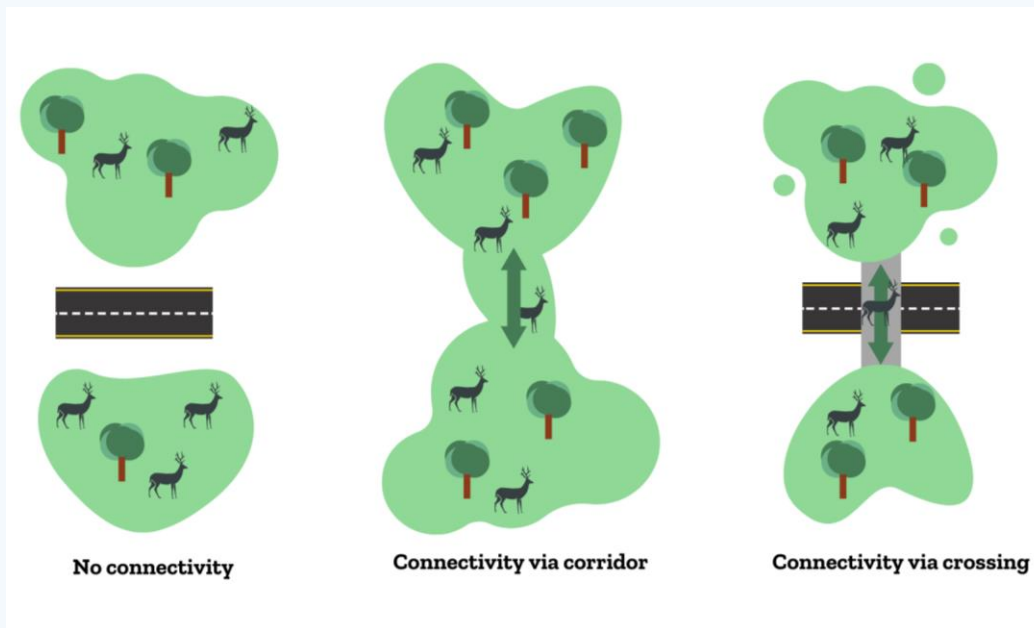
Averaged across 150 species in the Alps, the hybrid model simulations indicate that by the end of the twenty-first century these high mountain plants will have lost 44-50% of their present alpine habitat ranges under high and low values of demographic and dispersal parameters

Luckily, there is a benefit from the climate change: an opposite trend caused by the lengthening of the growing period is recorded in central-norther Italy where a forest expansion is observed

# ADAPTION STRATEGIES to promote...

the development of efficient ecological corridors

the integration of climate  
change considerations into all  
land-use planning



the surveillance of the most  
competitive species

protection projects for  
endangered species



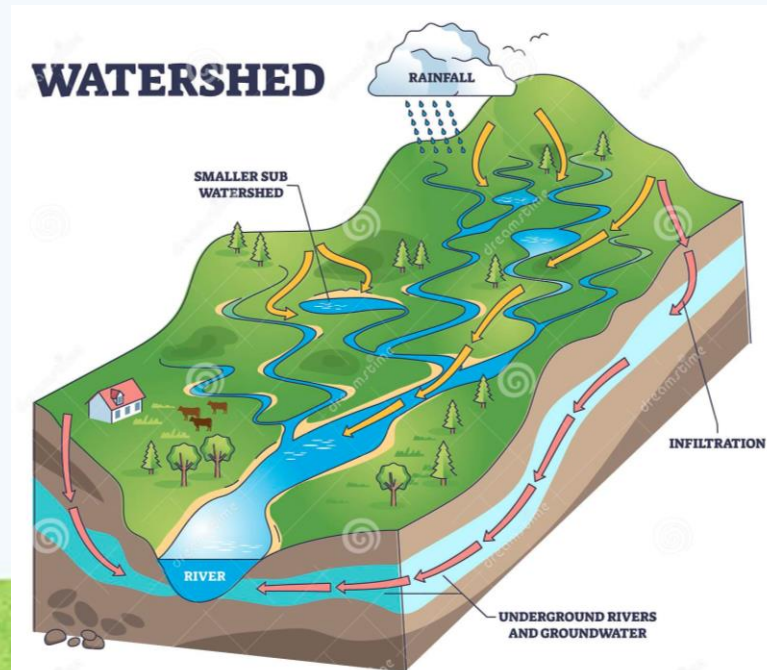
# MARINE ECOSYSTEM

- Sustainable fishing
- Rivers' recovery plan
- Ecosystem safeguard
- Water resources management



# WATERSHED SYSTEM

Because of the differences of watershed types, strategies need to incorporate local needs and issues strategies should focus on increasing their resilience to climatic change basing on a long-term strategy



# COSTAL MARINE ECOSYSTEM

Adopt measures to limit overfishing, pollution and loss of habitat

