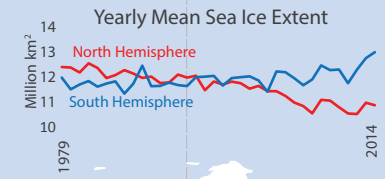
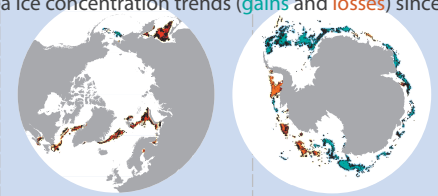


CHANGING GLACIERS AND SEA ICE

Glaciers and sea ice exist in fluctuation and motion close to the melting point and therefore are sensitive to changes in climate. **Glacier** net mass balance is a factor of melting and frontal ablation (loss) and snow accumulation (gain), which are influenced primarily by temperature and precipitation. Glaciers impact local ecosystems, most prominently by providing crucial dry season meltwater to streams in arid mountainous regions, also regulating stream temperature and flow. **Sea ice** is primarily influenced by temperature and wind. Sea ice impacts polar temperatures because of its albedo effect, and it further regulates global atmospheric and ocean circulation. Polar wildlife is dependent on sea ice presence for habitat, as well as its ability to provide seasonal fresh water for phytoplankton blooms.



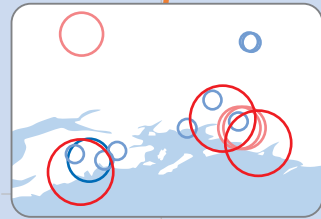
Sea ice concentration trends (gains and losses) since 1979.



North
-43,476 km²
avg sea ice
change
per year

South
+28,881 km²
avg sea ice
change
per year

The Northern hemisphere is losing ice more rapidly than the Southern hemisphere is gaining ice



Varying local trends may be due to differences in topography.

Glacier Natl Park
125 glaciers (83%)
since 1850

60% of Peru's population
rely on glacial meltwater during
dry periods.

70% of
world's tropical
glaciers lost
in Peru over
30 years

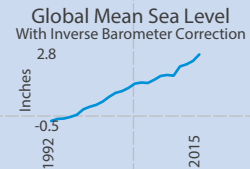
With global trends of increasing temperatures, decreasing glaciers and sea ice, and increasing sea levels, will ecosystems and populations adapt to the rates of change?

World Glacier Monitoring Service Data
Change in km² per year since 1959

- -3.5 to -1.5 (greatest loss)
- -1.5 to -0.22
- -0.22 to 0.22 (minimal change)
- +0.222 to +1.5
- All WGMS glaciers

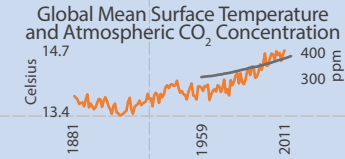
-0.15 km²
avg glacier
change
per year

+3.06 in
since
1992
Melting glaciers
and sea ice
cause sea levels
to increase



The increasing global temperature
may be primarily due to rising levels
of CO₂, the primary greenhouse gas.

+1.2° F
since
1959



Main projection: Miller Cylindrical. Central meridian: 0°.
Polar projections:
North Pole Orthographic. Longitude of Center: 0°. Latitude of Center: 90°.
South Pole Orthographic. Longitude of Center: 0°. Latitude of Center: -90°.
Map author: Kristi Nixon. Geog 370. 12/2015.

Data sources: Basemap: Natural Earth.
Glacier data: World Glacier Monitoring Service. Glacier images: United Nations Environment Programme (UNEP): http://wgms.ch/products_fog_maps/
Information: UNEP "Global Glacier Changes: Fact and Figures"; National Snow and Ice Data Center (NSIDC) "About the Cryosphere" website;
USGS "Retreat of Glaciers in Glacier National Park" website. <http://guardianlv.com/2014/02/peru-glaciers-receding-amounting-evidence-of-climate-change/>;
<http://www.peruthisweek.com/news-cctv-peru-glaciers-are-disappearing-threatening-crops-and-water-supply-107153>
Global surface temperature data: UNEP Environmental Data Explorer.
Mauna Loa CO₂ data: NOAA/Earth System Research Laboratory: www.esrl.noaa.gov/gmd/ccgg/trends/#mlo_data
Sea ice data and images: NSIDC archive: http://nsidc.org/data/seaice_index/archives.html
Sea level data: University of Colorado Sea Level Research Group: <http://sealevel.colorado.edu/>