

Sea-level rise: conservation's next hurdle

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Melting sea ice and mountain glaciers, driven by climate change, are resulting in a rising sea-level. The evidence is clear (**Figure 1**): even if all of the goals set by the International Panel on Climate Change (IPCC) are met by every participating country, by 2100 global sea-levels are predicted to rise up to 1 m (3 ') or more.^{1, 2} Sea-level rise (SLR) affects humanity, of which ~10% of the world's population live below 10 m elevation, but also to the vast diversity of ecosystems on our planet.² It is important to the long term success of future conservation efforts that they reflect this environmental change.

It has been estimated that 60-70% of coastal wetlands and other low-lying ecosystems could be lost following 1 m of SLR. While this will affect many regions (**Table 1**) (including Florida's everglades), China, Vietnam, Libya, Egypt, Romania, and Ukraine will be hit the hardest.^{2, 3} Globally, however, islands face a greater threat of partial or complete submersion (**Figure 2**). Among them, the historic Galapagos Islands from which Charles Darwin drew inspiration while later working on his theory of evolution by natural selection. In essence, this theory posits that species with certain traits that make them "better" at surviving and reproducing in their specific environment (than others of the same species) are more likely to pass on their genes through reproduction; for example, the keen senses and "weaponry" of nearly all predatory animals that make them such proficient hunters. This leads to a gradual shift in the population over time towards those traits, splitting the population into two or more distinct, but related, species.

Endemic species are those which can only be found in one specific geographic place on the entire planet; local examples would include the Vancouver Island marmot (*Marmota vancouverensis*), which is listed as critically endangered,⁴ and the Arbutus tree (*Arbutus menziesii*), which can only be found in the Pacific Northwest in rocky, well-drained soils relatively near the ocean.⁵ And of all of the different ecosystems on the planet, islands are home to an average of ten times more endemic species than on the continents. If for no other reason than to protect endemic species, it is critical that current SLR predictions be taken into account when planning future conservation efforts. Using these predictions, funding could be focused on islands that are less at risk from SLR than those which risk of becoming mostly or completely submerged by 2100. With regards to continental conservation efforts, funding could be better allocated with regards to low-lying areas challenged by SLR and potential habitat expansion efforts.

Conservation of plant and animal species is vitally important. All of the species on this planet have evolved over the millennia to successfully inhabit their specific environments. When these environments change too quickly, their inhabitants do not have enough time to adapt (via evolution by natural selection), which generally takes many generations. Without societal intervention, these species are doomed to extinction. Well-planned conservation efforts are essential to ensuring the ability of future generations to see and learn about the vast and wonderful biodiversity that our planet has to offer.

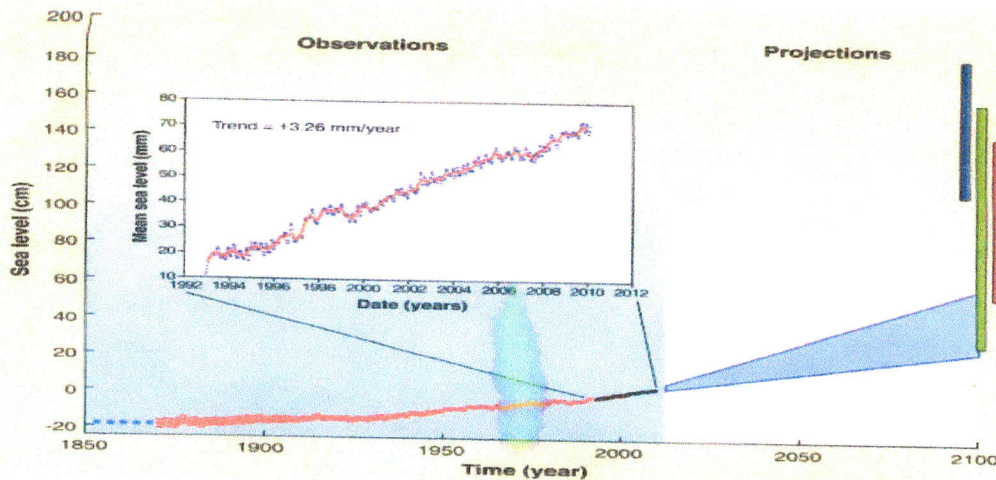


Figure 1: "Global mean sea level evolution over the 20th and 21st centuries. Red curve is based on tide gauge measurements. The black curve is altimetry record (zoomed over 1993-2009). Projections for the 21st century are also shown. The shaded blue zone represents IPCC AR4 projections. Bars are semi-empirical projections." [From: Nicholls and Cazenave, 2010]

Table 1: "Area of wetland lost as a % of total wetlands area- 1 m SLR" [From: Blankespoor, Dasgupta, and Laplante; 2014]

	Freshwater marsh	Swamp forest	GLWD Coastal wetlands	Brackish/saline wetlands
EAP	62.2	20.3	70.7	-
ECA	100	-	100	-
LAC	74.0	0.5	22.9	97.2
MENA	100	-	96.0	100
SA	0.2	-	48.7	11.3
SSA	72.5	26.7	54.0	99.9
Total	63.7	1.8	71.7	60.7

EAP East Asia and Pacific, ECA Europe and Central Asia, LAC Latin America and the Caribbean, MENA Middle East and North Africa, SA South Asia, SSA Sub Saharan Africa, GLWD Global Lakes and Wetlands Database

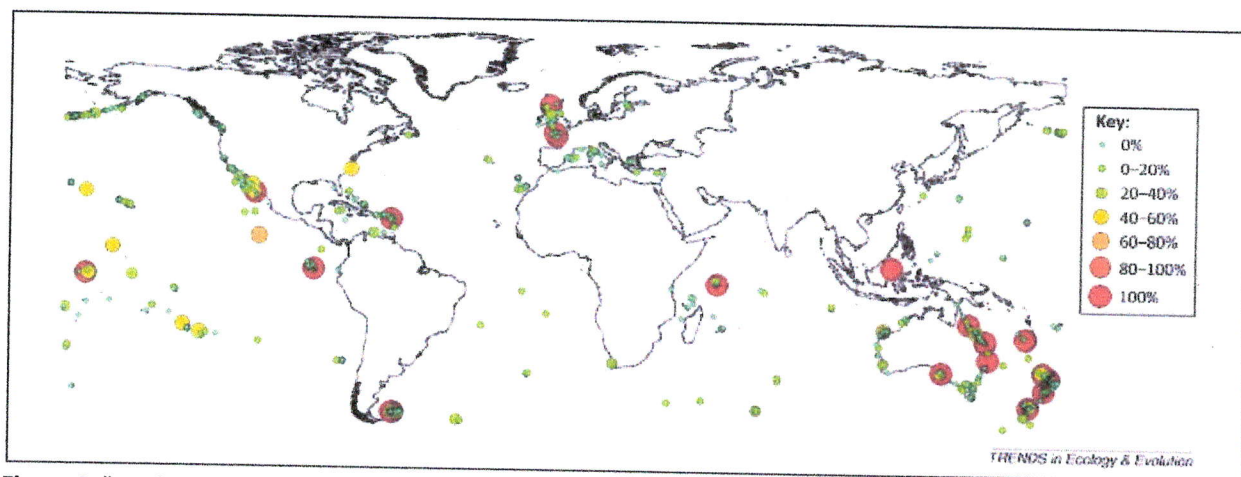


Figure 2: "Predicted area submersion on islands with an invasive vertebrate eradication program. The size and color of points represents the percentage of surface immersion. With a 1-m sea-level rise, 4% (26) of the 604 islands with an eradication program would be entirely under water and many more would lose a large part of their habitat." [Courchamp *et al.*; 2014]

References

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- ⁴: Marmot Recovery Foundation. Animal profile. From: <http://marmots.org/about-marmots/animal-profile/> [accessed July 15, 2016].
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