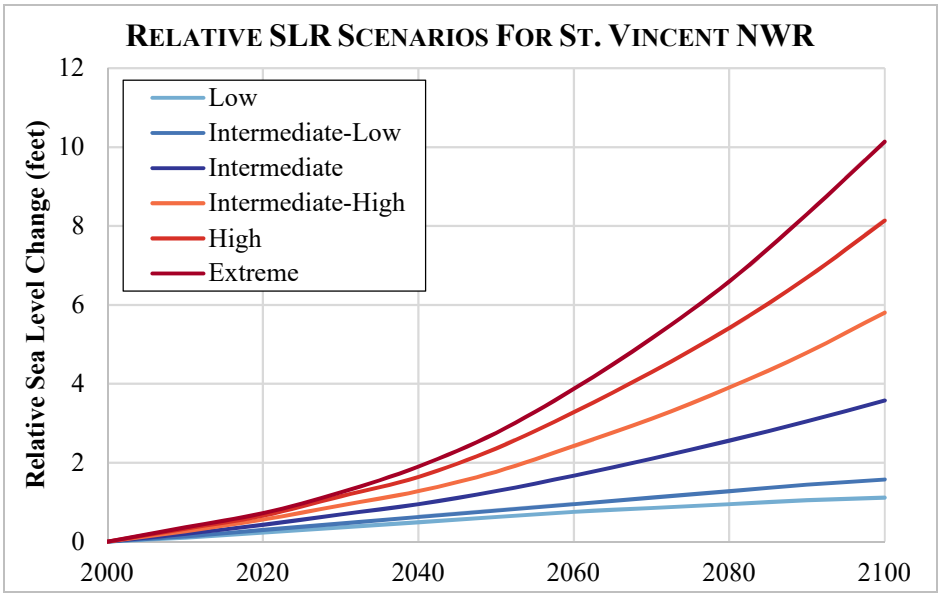
Sea Level Rise Scenarios for the St. Vincent National Wildlife Refuge (NWR)

How Will Sea Level Rise (SLR) Affect St. Vincent NWR?

Coastal flooding will become more frequent and occur in more places as sea levels rise. In addition to the potential effects on St. Vincent NWR's low-lying roads, buildings, and infrastructure, SLR is expected to lead to more nuisance flooding and increased saltwater intrusion, which may transform many of the NWR's coastal ecosystems. Under higher SLR scenarios, some ecosystems may be lost, while others may move upslope at the expense of less flood- or salt-tolerant ecosystems. As a result, SLR has the potential to greatly impact the St. Vincent NWR and its ability to fulfill its mission. This fact sheet presents information regarding relative SLR scenarios for St. Vincent NWR.

Where Can I Find SLR Scenarios For St. Vincent NWR?

A recent interagency report (Sweet et al. 2017) synthesizes the latest SLR research to provide updated global and regional SLR scenarios for the United States. While global SLR scenarios project average global sea level change, regional relative SLR scenarios incorporate additional processes that influence SLR locally (for example, vertical land movement, and ocean circulation). In parts of the Northern Gulf of Mexico, high rates of land sinking (that is, subsidence) can produce local relative SLR rates that are much larger than the global average and among the highest in the world.



Scenarios for 2060

SLR in St. Vincent NWR is projected to be about 22% greater than the global average. The bullets below summarize four scenarios for 2060.

- The **Low** scenario projects a SLR increase of 0.8 feet by 2060.
- The **Intermediate** scenario projects a SLR increase of 1.7 feet by 2060.
- The **High** scenario projects a SLR increase of 3.3 feet by 2060.
- The **Extreme** scenario projects a SLR increase of 3.9 feet by 2060.

Figure 1. Relative SLR scenarios for St. Vincent NWR associated with six different global SLR scenarios (Sweet et al. 2017, for site ID 1193). The **Low** and **Extreme** scenarios represent the minimum and maximum projected future rise in sea level through 2100. Probabilities associated with each of these six scenarios are discussed on the next page. Note that SLR is expected to continue increasing beyond 2100.

How Do I Incorporate These Scenarios Into My SLR Planning?

Incorporating SLR scenarios is easiest during the early stages of planning and design. For new projects, local relative scenarios can be selected from data that accompany the Sweet et al. 2017 report. However, for existing projects that use older scenarios, the older scenarios should be compared to those associated with the Sweet et al. 2017 report. If the differences are large, the project's scenarios may need to be updated. Ultimately, scenario selection for planning depends upon many factors including risk tolerance, funding availability, data availability, and planning time frame.

What Determines The Probability Of Each SLR Scenario?

The six updated scenarios, **Low** through **Extreme**, cover the range of scientifically plausible SLR scenarios (Sweet et al. 2017). Probabilities help convey the potential for exceeding each scenario. The probability associated with each SLR scenario is greatly influenced by greenhouse gases emitted to the atmosphere. Greenhouse gas emission scenarios, also known as Representative Concentration Pathways or RCPs, represent different potential futures based on alternative sets of policies and actions. Table 1 shows the probability of exceedance under RCP4.5, which is an emissions scenario that assumes modest decreases in greenhouse gas emissions, and RCP8.5, which assumes continued, "business as usual" increases in emissions. For St. Vincent NWR under RCP8.5, these values indicate that it is 100% likely that SLR will exceed 1.1 feet by 2100 (**Low** SLR Scenario), while there is a lower probability (0.3%) that SLR will exceed 8.1 feet by 2100 (**High** SLR Scenario). More details on the origin and use of these probabilities are in Sections 5 and 6 of Sweet et al. 2017 (see also Kopp et al. 2014).

Table 1. Probability of exceeding global SLR scenarios in 2100 based upon Kopp et al. 2014.

SLR Scenario	RCP4.5	RCP8.5
Low	98%	100%
Intermediate-low	73%	96%
Intermediate	3%	17%
Intermediate-high	0.5%	1.3%
High	0.1%	0.3%
Extreme	0.05%	0.1%

How Can Probabilities Be Used When Planning For SLR?

Probabilities help determine which scenario best supports a site's risk tolerance. For example, although the **Extreme** scenario has a low probability of occurring, this scenario may be appropriate for protecting long-term investments with low risk-tolerance (for instance, a military base, hospital, or water treatment facility). In contrast, higher risk may be tolerated for projects with lower costs, shorter lifespans, and fewer potential effects on human health and safety. More information on scenario selection and risk tolerance are available in Section 6 of Sweet et al. 2017.

Additional SLR Resources

- NOAA SLR Viewer: coast.noaa.gov/slr
- Climate Resilience Toolkit: toolkit.climate.gov/topics/coastal/sea-level-rise
- Climate.gov: climate.gov/news-features/understanding-climate/climate-change-global-sea-level
- USACE SLR Calculator: corpsmapu.usace.army.mil/rccinfo/slc/slcc_calc.html
- CO-OPS Inundation Dashboard: tidesandcurrents.noaa.gov/inundationdb

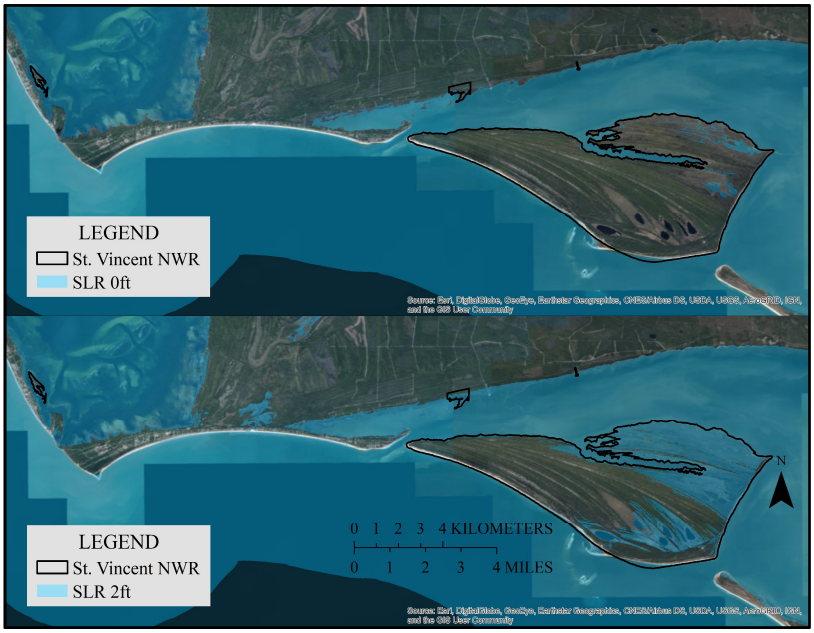


Figure 2. Inundation extent for 2016 mean higher high water level (top panel, SLR 0 feet) and a SLR increase of 2 feet (bottom panel), which is close to the **Intermediate** SLR scenario projection for 2060 (1.7 feet). Note that these maps only show areas that will be flooded and affected by oceanic salts; they do not show habitat losses, gains, or transformations. Moreover, the reach of high tides and diluted salts are expected to reach even further inland. For probabilities associated with the **Intermediate** scenario, see Table 1. For more detailed maps, see the NOAA SLR viewer.

References

Kopp et al. 2014. Probabilistic 21st and 22nd century sea-level projections at a global network of tide-gauge sites. Earth's Future 2: 383-406.

Sweet et al. 2017. Global and regional sea level rise scenarios for the United States. NOAA Technical Report NOS CO-OPS 083. NOAA, Silver Spring, Maryland, USA.

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