

Habitat Impacts Table for Climate Scenarios

		Cold and Dry	Cold and Wet	Warm and Dry	Warm and Wet	Common Themes
Beach/Dune	Habitat Impacts	<ul style="list-style-type: none"> Reduced tourism in summer due to cold may have negative economic impacts on communities; drier, mid conditions early in spring may offer good conditions. Erosion of north facing beaches and growth of south facing beaches - much of the region's beaches are south facing, so may experience overall beach growth. Dune wetlands may suffer from reduced winter rain and reduced dune blowouts/wave overtopping due to decreased erosion in south facing systems. North facing dune systems may suffer increased erosion. Rough summer conditions may lead to increased rescues of ab divers, kayakers. 	<ul style="list-style-type: none"> Nearshore productivity will decrease, limiting success of some birds and nearshore species. Despite increases in offshore primary productivity, birds, seals, and other beach species will suffer from reduced habitat and haul-out areas due to increased erosion from storms. Southward facing beaches may be more affected due to wave direction. Increased erosion of adjacent cliff areas. Back-beach and inland flooding will increase, further disrupting habitats, vegetation, and adjacent coastal community infrastructure. Flood waters may introduce pollution, algal toxins Sunny beach days will not be as prevalent, but public-use space will decrease, possibly increasing stress on remaining recreation areas 	<ul style="list-style-type: none"> Decreased primary productivity is likely to lead to a decrease in reproduction success for birds. Harmful algal blooms may be more prevalent inshore Increased public use of beach 	<ul style="list-style-type: none"> facing beaches and dunes will be impacted more by storm swells and waves and will tend to have less sand than northern beaches. Coastal strand width will be reduced due to increased sea level from both southern winds and decreased upwelling (in addition to sea level rise from climate change), particularly during winter storms and spring tides. Wrack on beaches (from terrestrial sources, sea grasses, and drift algae) will increase during winter, decrease during summer. Due to high disturbance in winter, reduced wrack in summer, and reduced plankton productivity in spring/summer, beach productivity likely will be reduced which could impact shore bird populations. Beaches may be periodically closed during winter due to increased contaminants from rivers. 	<p><u>Tourism/Recreation:</u> Greatly impacted by weather conditions and available beach space. Likewise, the amount/type of recreation can impact beach/dune stability and quality.</p> <p><u>Erosion/Accretion based on storm direction:</u> Cold scenario brings storms from the north with erosion of north-facing beaches/dunes. Warm scenario brings the inverse. Most beach/dune systems in study area are south facing.</p> <p><u>Productivity:</u> Precipitation plays large role in distinction between type of lagoon system which impacts beach/dune species. In particular haul-out locations for pinnipeds and water quality for lagoon species.</p>
	Management Recommendations	<p>Work with local communities to promote tourism/recreation/public access in early spring, and increase education and access management efforts (e.g. ropes and stewards to protect plovers) in that season.</p> <p>May need to manage public access to direct people towards larger, south facing beaches and away from shrinking north facing beaches, although this impact may be reduced because the cold summers will reduce beach visitors.</p> <p>Monitor north-facing dune systems and consider enhancement of sediment supply (with dredged materials placed offshore?)</p> <p>Increased monitoring of dune wetlands and wetland-dependent species.</p> <p>Increase European beachgrass removal to promote dune mobility/blowouts and promote dynamic dune wetlands.</p> <p>Increased safety education and coordination with</p>	<p>Expand monitoring of populations and habitat for most at-risk species: plover, dune grass, etc.: expand protections for species at risk</p> <p>Establish more robust monitoring of beaches and erosion</p> <p>Continue water quality monitoring and link with public works, utilities, and Parks to manage access as appropriate</p> <p>Increase public education/ropes/signs to limit impacts on remaining habitats and public-use areas</p>	<p>Continued (or expanded) monitoring of bird populations and nesting sites</p> <p>Expanded protection measures for key species such as snowy plovers</p> <p>Water quality monitoring for HABS - work with SFPUC and other agencies to ensure proper monitoring and beach closures as needed.</p> <p>Work with shellfish growers to keep up monitoring of HAB toxins - increase public outreach for unsafe shellfish conditions, or promote if safe.</p> <p>Increase signage on beaches to promote responsible public use of resources.</p> <p>Less wind means less erosion to dunes, but more public may mean more trampling - increase signage to discourage walking and using dunes especially in sensitive areas.</p> <p>Work with air quality district to enforce spare the air days</p>	<p>Manage public access to direct public away from shrinking beaches, and to increase education and habitat protection at southern beaches where increased use and reduced beach area may exacerbate access impacts.</p> <p>Monitor dune systems and consider enhancing sediment supply for south facing systems.</p> <p>Monitor shorebird populations. Consider seasonal beach closures in some locations to reduce stress and flushing of shorebird populations if they are severely stressed by reduced productivity.</p> <p>Monitor water quality due to potential public health impacts from contaminant influx due to winter storms.</p>	<p>Extensive continued monitoring</p> <p>Consider prioritization of dune restoration with vegetation</p> <p>Consider cross-cutting recreation monitoring and guidance</p>
Outer Coast Estuaries	Habitat Impacts	<p>further offshore, food sources for migrating seabirds, seals, and salmon may be impacted.</p> <p>Colder summers slow recreational use in estuaries (SUP, kayaking, fishing) with negative economic impacts.</p> <p>With weaker winter runoff, hydrological circulation may slow, creeks mouths may dry and estuary inlets may close, impacting water quality, and promoting organic material build up and hypoxic events. This can impact invertebrate, vegetation, salmonids and marine wildlife.</p> <p>Increased OA might impact shellfish, and invertebrate species.</p> <p>Sediment may build up in certain areas that would otherwise be transported out to sea - this further impacts hydrological and sediment transport and</p>	<p>Stronger runoff with wetter winters expected, causing increased erosion and flooding from storm surge.</p> <p>Erosion of beaches and cliffs will transport more sediment into estuaries. These changes may greatly alter habitat types (i.e. diminished intertidal, wetland, and transitional zones etc).</p> <p>Public safety concerns may increase during storm events, in part due to flooding of infrastructure and roads.</p> <p>Storm events could impact nursery habitat - important to monitor shifts in habitat and ecosystem services provided by wetlands to reduce storm impacts.</p> <p>Floodplain function and connectivity between ground level and upland habitat will be important for withstanding storms.</p>	<p>Weaker runoff and upwelling, and warmer summers will lead to decreased productivity, impacting important nutrients and phytoplankton availability throughout the estuarine food chain.</p> <p>Warmer estuarine waters and less runoff promotes higher salinity, reduced water quality, impacts oxygen levels and impacts creek mouths.</p> <p>Warmer summers allow longer time periods for nonnative plants to encroach and push out native plants which changes ecosystem dynamics and impacts food sources for birds and animals.</p>	<p>Higher runoff and warmer sea surface temperatures will impact hydrological movement and sediment transport.</p> <p>Coastal erosion and flooding are likely to impact important wetland and riparian habitat.</p> <p>Available areas for estuaries to expand during flooding and also transition habitat for animals may be difficult.</p>	<p><u>Productivity:</u> Changes in weather cause site specific changes in estuarine salinity, oxygen levels, and water quality which all impact productivity and food sources.</p> <p><u>Habitat Shifts:</u> Weather scenarios cause increases or decreases in sediment deposition and transport (including runoff and erosion issues) which shifts habitats and impacts connectivity and transitional space and foraging/nursery availability.</p> <p><u>Social Impacts:</u> Increased flooding, erosion and storm surges poses public safety issues and can damage infrastructure or decrease economic value of property. Additional tourism and recreation are impacted during colder seasons and increased storm scenarios.</p>
Rocky Intertidal	Habitat Impacts	<p>OA will create winners and losers. Winners may be nearshore algae and plants but will negatively impact invertebrates as well as industry.</p> <p>May affect community assemblage composition</p> <p>Rough summer conditions may impact boating and recreation, for example may see an increase in emergency rescues of abalone divers.</p> <p>Recreation in shoulder seasons may increase impact to ecosystem.</p>	<p>Reduction in primary productivity with bottom up impact to whole ecosystem</p> <p>Storm damage may remove/damage key bioengineers such as kelps or surf grasses and key sessile and mobile species such as turf algae, mussels, and sea stars with both bottom up and top down impacts to whole ecosystem.</p> <p>Mixing and currents from storms may increase prevalence or spatial spread of invasive species</p> <p>Public hazards created due to erosion on adjacent cliff areas.</p>	<p>Thermal stress to create issues for both mobile and sessile species including larval and early stages of subtidal and pelagic fish that recruit to system.</p> <p>Algal blooms and increased disease transmission such as wasting disease to negatively impact communities.</p> <p>While a decrease in water movement may prevent reach of invasive species, increased SST may counter act this and allow for migration north of invasives or migration north of native ranges.</p> <p>Recruitment of intertidal species may be affected by changes in offshore water movement</p> <p>Predator size and abundance likely to decrease.</p>	<p>disturbance to system and may damage or remove key species or habitat-building species.</p> <p>Salinity levels may drop in winter months - may affect physiology of species especially in tidepools without as much flushing. Similar impact due to any terrestrial contaminants or increased nutrient pollution.</p> <p>Tidal ranges and timing of tides may change inundation levels and exposure times creating physiological stress or migration of species up or down system. This includes increased exposure time to increased air temperatures and SST.</p> <p>Changes in terrestrial conditions (fires, drought, erosion, flooding) may affect downstream to intertidal - nutrient and debris inputs.</p> <p>Calm, warm conditions may result in more human activity along the coastal zone and thus more</p>	