Early life history responses of tidal wetland plants to sea-level rise and salinization in the Pacific Northwest

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Climate change is likely to alter the spatial distribution of abiotic gradients in estuaries, potentially increasing stress in tidal wetland plants. Using field and lab manipulations, we examined inter-specific variation in responses to elevated salinity and inundation in the Oregon wetland flora. The species we tested included plants occurring across a broad range of salinities and tidal elevations in the field. In 11 of 13 species, germination was strongly reduced at salinities of only 10-20. However, as adults many of these species were present in soils with dry season salinities up to 44, suggesting that low salinity periods may be important for seedling establishment. To assess growth responses to simulated sea-level rise, we transplanted seedlings of seven salt marsh species to a typical mid-marsh elevation (mean higher high water, MHHW) and to 25 and 50 cm below MHHW (the latter elevation being more typical of low marsh) in oligohaline, mesohaline and polyhaline marshes. After five weeks, increasing submergence and salinity both reduced productivity in all species, even in those frequently occurring in low to mid-elevation saline marshes. In several species, elevated salinity interactively exacerbated the effect of flooding on early plant growth. Additionally, greater flooding was usually associated with increasing shoot:root ratios, indicating a disproportionately negative effect on root biomass. Our data indicate that common tidal wetland species in the region vary in their sensitivity to inundation and salinity, but suggest that the early life history stages of a large percentage of the region's flora are negatively affected by increasing salinity and flooding. Given these responses, future sea-level rise may affect a broad suite of coastal wetland species in the Pacific Northwest, with likely consequences for ecosystem structure and function.