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Plant zonation patterns across New England salt marshes have been investigated for years, but how nutrient availability differs between zones has received little attention. We investigated how N availability, P availability, and plant N status varied across *Juncus gerardii*, *Spartina patens*, and mixed forb zones of a Northern New England high salt marsh. We also investigated relationships between several edaphic factors and community production and diversity across the high marsh. P availability, soil salinity, and soil moisture were higher in the mixed forb zone than in the two graminoid zones. NH_4^+ -N availability was highest in the *J. gerardii* zone, but NO_3^- -N availability and mid season net N mineralization rates did not vary among zones. Plant tissue N concentrations were highest in the mixed forb zone and lowest in the *S. patens* zone, reflecting plant physiologies more so than soil N availability. Community production was highest in the *J. gerardii* zone and was positively correlated with N availability and negatively correlated with soil moisture. Plant species diversity was highest in the mixed forb zone and was positively correlated with P availability and soil salinity. Thus, nutrient availability, plant N status, and plant species diversity varied across zones of this high marsh. Further investigation is needed to ascertain if soil nutrient availability influences or is a result of the production and diversity differences that exist between vegetation zones of New England high salt marshes.