Abstract Horizontal and vertical zones of influence for root systems of four Mojave Desert shrubs were characterized using $^{32}$P as a nutrient tracer. *Larrea tridentata*’s horizontal zone of influence was sparse near the plant’s stem base, with a maximum probability of accessing $^{32}$P ($P_{\text{max}}$) of 41%. However, its horizontal zone of influence extended beyond 5m, and the distance from the stem base at which the probability of accessing $^{32}$P was half $P_{\text{max}}$ ($L_{50}$ ~3m) was significantly greater than the other three shrubs. *Ambrosia dumosa*’s zone of influence was dense near the plant’s stem base ($P_{\text{max}}$~78%), but was rare at distances 42m ($L_{50}$ ~1m). Zones of influence for *Lycium andersonii* and *Lycium pallidum* were intermediate between those of *L. tridentata* and *A. dumosa*. For vertical zones of influence, *L. tridentata* was more likely to obtain $^{32}$P from 5m soil depths than *A. dumosa*, but *L. pallidum* was not significantly different from either *A. dumosa* or *L. tridentata*. Horizontal zones of influence did not change with treatments that altered soil water and nitrogen availability, but vertical zones of influence increased with a flood irrigation treatment that increased water availability to 5m soil depth. These differences among species likely reflect compromises between their shoot growth strategies and their need to acquire spatially and temporally limited soil resources, especially through competitive interactions.