

SUCCESSION IN URBAN AREAS

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Introduction

The stages in the development of a plant community are collectively referred to as succession. Introduced weeds are usually the first plants to repopulate newly cleared ground. Plant succession, given adequate time, leads to the development of climax plant communities similar to what existed on the site prior to man's arrival. (Obviously, if an area is denuded, it cannot revert to a prairie, a forest, or a sagebrush desert overnight. Assuming the soil is not removed, it takes 20 to 30 years for a grassland community to develop, and 100 years or more for a forest.) When an area is developed, however, artificial selection pressures initiate a unique 'urban succession.'

Urban primary succession

Established flora is the first casualty of new construction. An area does not remain bare for long, for it soon becomes repopulated through a process called primary succession. Primary succession can be observed almost anywhere - on an abandoned field, an eroded hillside, the denuded areas along a newly constructed road, or a burned-over forest.

Many of the characters which define 'weedy' plants - fast-growing, fast-spreading, prolific, tenacious, and adaptable - make these plants ideal for settling disturbed areas. Primary succession is often a succession of weeds.

Weed seeds have a variety of adaptations which facilitate dispersal. Hairs and parachutes (pappi), as well as small size, allow dispersal by wind. Seeds equipped with spines or hooks attach themselves to dogs and cats, who later lose them. Fruits and berries are actually disseminative mechanisms: birds and other animals scatter the seed of the fruits they eat.

Given all these means of transport, weed migration onto disturbed soil occurs rapidly, especially during the rainy season. Seeds, fruits, and spores travel via wind, birds, mammals, or water. Construction equipment can bring in seeds of many species, especially the following:

little mallow (cheeseweed)
velvetleaf
barnyardgrass

Malva parviflora L.
Abutilon theophrasti Medicus
Echinochloa crus-galli (L.) Beauv.

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Invasion of windborne seeds is the most important means for weed establishment on construction sites and in newly planted lawns and gardens. Most of California experiences periodic gusty winds, especially during spring and fall, and seeds travel from neighboring areas where weeds are established. Wind is responsible for the effective distribution of the weedy composites, which comprise a majority of California's (and the world's) weeds. Seeds of these weeds very often have pappi. The following composite weeds are prominent:

yellow starthistle	<u>Centaurea solstitialis</u> L.
hairy fleabane	<u>Conyza bonariensis</u> (L.) Cronq.
horseweed	<u>Conyza canadensis</u> (L.) Cronq.
prickly lettuce	<u>Lactuca serriola</u> L.
bristly oxtongue	<u>Picris echioides</u> L.
common groundsel	<u>Senecio vulgaris</u> L.
blessed milkthistle	<u>Silybum marianum</u> (L.) Gaertn.
spiny sowthistle	<u>Sonchus asper</u> (L.) Hill
annual sowthistle	<u>Sonchus oleraceus</u> L.
common dandelion	<u>Taraxacum officinale</u> Weber in Wiggers

In another means of windborne seed distribution, weeds of some plant families break off at the ground level after senescence and scatter their seed as tumbleweeds. Examples well known in urban environments include the following:

kochia	<u>Kochia scoparia</u> (L.) Schrad.
Russian thistle	<u>Salsola iberica</u> Sennen & Pau

Some especially obnoxious weeds are inadvertently carried to home sites with fill soil, which is often obtained from sandy riverbanks. Nutlets of yellow nutsedge (Cyperus esculentus L.) and seeds of bermudagrass [Cynodon dactylon (L.) Pers.] may go unnoticed in fill brought in during the winter when these species are dormant.

Many housing developments are on sites previously devoted to cultivated farmland and orchards. In such instances, the soil is often saturated with tens of millions of weed seeds per acre. In such areas, any number of weed species can become established after the land is cleared. Particularly common are redstem filaree [Erodium cicutarium (L.) L'Her. ex Ait.] of the geranium family, wild oats (Avena fatua L.), and yellow starthistle. If the construction site is in the foothills on land previously devoted to pastures, curlycup gumweed [Grindelia squarrosa (Pursh) Dunal] and poison-oak [Toxicodendron toxicarium (Salisb.) Gillis] may become a nuisance.

Certain weeds with hard, long-lived seeds may appear when soil relocation during construction brings long-buried weed seeds to the soil surface. The following are such weeds:

field bindweed	<u>Convolvulus arvensis</u> L.
common lambsquarters	<u>Chenopodium album</u> L.

jimsonweed	<u>Datura stramonium</u> L.
velvetleaf	<u>Abutilon theophrasti</u> Medicus
common mullein	<u>Verbascum thapsus</u> L.

Seeds of many species are known to survive 40 to 70 years in the soil; common lambsquarters seeds 1700 years old have germinated.

A few other weeds common in construction areas include

common purslane	<u>Portulaca oleracea</u> L.
redroot pigweed	<u>Amaranthus retroflexus</u> L.
common sunflower	<u>Helianthus annuus</u> L.

Urban secondary succession

Construction site weeds, our urban primary succession, will not necessarily remain later when lawns, garden, trees, and landscaping are established. But a regiment of weeds waits for the opportunity to get a toehold on landscaped property. In a temporal sense, this wave of weeds can be considered an urban secondary succession.

The guiding hand of this succession is not 'natural' selection, but it is selection nevertheless. Low or creeping species, especially those which produce stolons or rhizomes, can be difficult to find and eradicate; therefore such species become prevalent in the landscaped environment. Home owners and groundskeepers are all too familiar with the following pests:

creeping bentgrass	<u>Agrostis stolonifera</u> L.
English daisy	<u>Bellis perennis</u> L.
bermudagrass	<u>Cynodon dactylon</u> (L.) Pers.
smooth crabgrass	<u>Digitaria ischaemum</u> (Chbreb. ex Schweig.) Schreb. ex Muhl.
goosegrass	<u>Eleusine indica</u> (L.) Gaertn.
prostrate spurge	<u>Euphorbia humistrata</u> Engelm. ex Gray
prickly lettuce	<u>Lactuca serriola</u> L.
black medic	<u>Medicago lupulina</u> L.
creeping woodsorrel	<u>Oxalis corniculata</u> L.
dallisgrass	<u>Paspalum dilatatum</u> Poir.
broadleaf plantain	<u>Plantago major</u> L.
buckhorn plantain	<u>Plantago lanceolata</u> L.
annual bluegrass	<u>Poa annua</u> L.
prostrate knotweed	<u>Polygonum aviculare</u> L.
corn spurry	<u>Spergula arvensis</u> L.
common chickweed	<u>Stellaria media</u> (L.) Vill.
common dandelion	<u>Taraxacum officinale</u> Weber in Wiggers

Smooth crabgrass, a summer annual, dies in mid-fall, but annual bluegrass appears with the advent of cool weather to take its place. Bermudagrass stolons often invade from a neighbor's

lawn, but its seed also can be carried over by wind or other means. Two summer annual weeds - prostrate knotweed and goosegrass - thrive in trampled areas receiving heavy traffic. Once desirable grass disappears in such areas, these opportunistic weeds quickly fill in.

Two of the peskiest weeds are creeping woodsorrel and prostrate spurge. Both are prolific seed producers, well adapted to urban life. Spurge grows on top of turf, forming large mats; unhindered by shade, it spreads rapidly. Seed capsules of creeping woodsorrel and seed pods of prostrate spurge explode when ripe, flinging their seeds far from the mother plant. Since both species produce several generations of offspring during spring and summer, they can rapidly infest large areas.

Broadleaf and buckhorn plantain, dandelion, dallisgrass, creeping bentgrass, and English daisy are perennials. Careful digging or herbicide applications are required to control them.

Conclusion

Further plant successions are possible - in instances, for example, where herbicide-tolerant weeds migrate into an area, or weed control practices change to favor new species. In such cases, as in the primary and secondary urban successions, the stimulus for succession is provided by human activity rather than by nature; in addition, most of the competing species are present through human intervention in one form or another. However, the activities by which succession occurs (migration, establishment, competition, and so on) remain the same as in nature.

Weeds are opportunistic - i.e., extremely well adapted to fill any vegetation void created by human activity. They have accompanied us on all our travels, for we give them their chance at succession. However, the artificial cycle of urban plant successions becomes irrelevant when a cultivated or landscaped plot is abandoned and the area's natural vegetation returns to take hold.