Why is Annual Bluegrass So Successful?

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When dealing with a species that is a weed one must keep in mind why an environment is favorable to the species as well as the biological adaptations of the species that allow it to invade. Often the cultural practices used to promote healthy turf also favor invasion of less desirable species, such as annual bluegrass. Some of the cultural practices that favor annual bluegrass invasion are high fertility, excessive irrigation, and close mowing.

What are the special adaptations that enable a plant to become an invading species? H. G. Baker, in his studies on the genetics of colonizing species, has outlined what he believes make an ideal weed, ideal meaning successful in terms of maintaining itself as a viable population. Baker lists fourteen attributes that a weed may possess in order to be a successful invader. A species does not need to have all of these characteristics to be an invading species; however, annual bluegrass has many of these characteristics.

Annual bluegrass progagation, according to T. K. Koshy, is mainly from seed, especially in the annual types. The perennial biotypes produce seed, but are also able to vegetatively reproduce indefinitely from the formation of new tillers and rhizomes. Koshy states that annual bluegrass' success as a weed is due in part to its high versatility in seed formation. **Poa annua** is self compatible, that is, it is able to self-pollinate. However, it also is able to undergo cross-pollination. The ability to undergo self-pollination is a very important characteristic for an invading species. If one seed falls in an open niche and conditions are favorable for germination and growth, the plant will be able to flower and produce seed even if there are no other plants of the same species present for pollination. The process of cross-pollination will lead to different biotypes in the population and is probably the reason that perennial types have developed.

Viable seed can be obtained from annual bluegrass on the same day anthesis (flowering) occurs. From a turfgrass management point of view this can present a problem. If the turf is cut daily, in order to remove seed heads as they are produced, there will still be viable seeds in the clippings or clinging to the machine to be deposited elsewhere and continue the spread.

Another advantage of annual bluegrass seed production is that seed can be produced under many different environmental conditions. J. B. Beard cites studies that show the optimum temperature for seedhead production is approximately 27°C. However, even under less than ideal temperatures (as low as 10°C) seed can be produced. The ideal photoperiod for seed production is a 12-hour day, but once started the plant can produce seed over a wide range of photoperiods all season long, according to Beard. A. J. Renny reports that annual bluegrass is able to produce seed the entire growing season if conditions are favorable, and feels this is the reason annual bluegrass can produce so much seed. Renny found that one plant may produce up to 360 seeds over a 4 month period. It has been shown that the soil surface lay may contain up to 30 million seeds per acre where an annual bluegrass population exists.

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The seeds of annual bluegrass do not exhibit much dormancy. The perennial biotype produces seeds that are ready to germinate immediately on exposure to favorable conditions, whereas, the annual biotype seeds need an afterripening period of approximately 3 months, accorrding to T. G. Tutin. The seeds of both types will remain viable in the soil for approximately 2 years, according to H. B. Sprange. Even though this is not a long period of dormancy, a large reservoir of seed can be built up in the soil.

Germination and seedling growth are very important for the success of any weedy species. Baker says that successful invaders will have no special requirements for germination. Annual bluegrass can germinate over a wide range of temperatures, (4°C to 21°C). Subsequent seedling growth, however, requires higher temperatures. Low germination temperature allows annual bluegrass to become the first grass in a turf mixture to initiate growth in the spring and to outcompete other species for space and nutrients, Beard reports.

There is a strong light requirement for the germination of annual bluegrass seeds, according to Beard. This can be a benefit for a species, such as annual bluegrass, that has a very small seed size. The light requirement will inhibit the seed from germinating in deep soil. If germination takes place too deep in the soil, food reserves will be used up before the plant can emerge. Also, seed would fail to germinate in highly shaded areas that are not conducive to growth. Annual bluegrass is a problem in areas that are continually mowed, have barespots, and where shading is at high light intensities, Sprague reports, it can effectively adapt to shaded conditions. Since neither Kentucky bluegrass or creeping bentgrass are well adapted to shade, annual bluegrass can often outcompete these desirable turf grasses in shaded environments.

The time from germination to flowering is an important factor in the weediness of a species. Also, if the time between flowering and seed set is short the plant will put a large share of its resources into reproductive production than into vegetative growth, and thus produce more seeds. A plant that has a short time to flowering and seed set is more able to produce its seed and escape potentially adverse environmental conditions. The annual biotype of annual bluegrass has a relatively short vegetative phase. Flowering will begin within approximately 50 days after emergency, while the perennial type takes longer, approximately 80 days, according to Beard. This relatively short time to flowering will allow the plants to have several flowering dates in a single season, and could help in the continual repopulation of the species.

According to Beard, the root system of annual bluegrass is commonly reported as being shallow. However, in most of these observations the plants were growing on compacted sites such as golf greens. Sprague and Burton have done studies that show the root system of annual bluegrass is comparable to Kentucky bluegrass or creeping bentgrass under non-compacted soil conditions. Annual bluegrass can adjust to compacted sites and lower oxygen concentrations better than Kentucky bluegrass or creeping bentgrass. Sprague reports the performance of these two desirable turfgrasses declines under compacted soil conditions the competitive abilities of annual bluegrass become apparent as it becomes the dominant species.