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## **Why do weed biocontrol agents fail to establish or to control their hosts?**

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This information is intended to help land management personnel increase the probability of successfully establishing biological control agents of weeds. Identifying and avoiding common errors will help. The causes of failure can be grouped into three general categories: abiotic, biotic, and procedural. Procedural errors (the human factor) are frequently the source of failures in biological control. Most reported biocontrol failures are attributable either to climatic or biological factors, or analyzed based on their taxonomic group. Each case should be individually appraised based on the relationship between the natural enemy and its environment (non-living and living) and the procedures used. Factors in one category can be influenced by those in another, and therefore failures can be attributed to multiple causes. Successes and failures are often reported by large-scale political units, but rarely confirmed by the ecosystem approach. Successes happen in stages: biocontrol agent introduction, recovery, establishment, redistribution, and suppression of the target host. Any stage of the process can fail, especially as it relates to the number of sites targeted. During the past decade, more agencies and other interested parties have elected to incorporate biological control into their integrated weed management programs. Because the number of personnel lacking expertise and experience involved in biocontrol has grown, local failures have increased. Fortunately, when natural enemies become abundant in several areas, failures at local sites becomes less important because additional releases can be easily and economically made. But ease of obtaining additional release organisms should not serve as an excuse for carelessness. Adequate training and provision of information to secondary users (those who receive biocontrol agents after they have already been established locally) will help improve the establishment and success rates of biocontrol agents.

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