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Controlling Californian thistles

Weed management is all about slowing or stopping an invasion. To continue the military analogy, the first step in winning the battle is “to know your enemy”. So let’s begin then with the life cycle of Californian thistle and see how it multiplies. Armed with this understanding we have the biological basis for managing an invasion of this weed.

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Seed cycle

Californian thistle has separate male (♂, pollen bearing) and female (♀, seed bearing) plants. This guarantees out-crossing and the genetic diversity that helps the thistle adapt to different habitats. Male and female plants can be easily distinguished during late summer by their different flower heads. They usually co-exist so that pollination (by insects) and seed production is common.

The small and highly viable seeds are formed with a white feathery pappus. Most detach from this “parachute” while still in the seed head and fall to the soil near the parent plant – and most of the parachutes fly away empty.

Almost all of the seeds are eaten by birds and other seed predators. The few remaining seeds germinate in the spring if the soil is cultivated, but not in a dense pasture.

The result is that **seedlings rarely contribute** to the multiplication of Californian thistle in an established pasture, although they may be involved in the initial establishment of the weed.

Vegetative cycle

Once a seedling has established, it soon begins to form “creeping” roots and shoot buds. These roots continue to grow and form shoot buds throughout the spring, summer and autumn. They may spread as far as two metres.

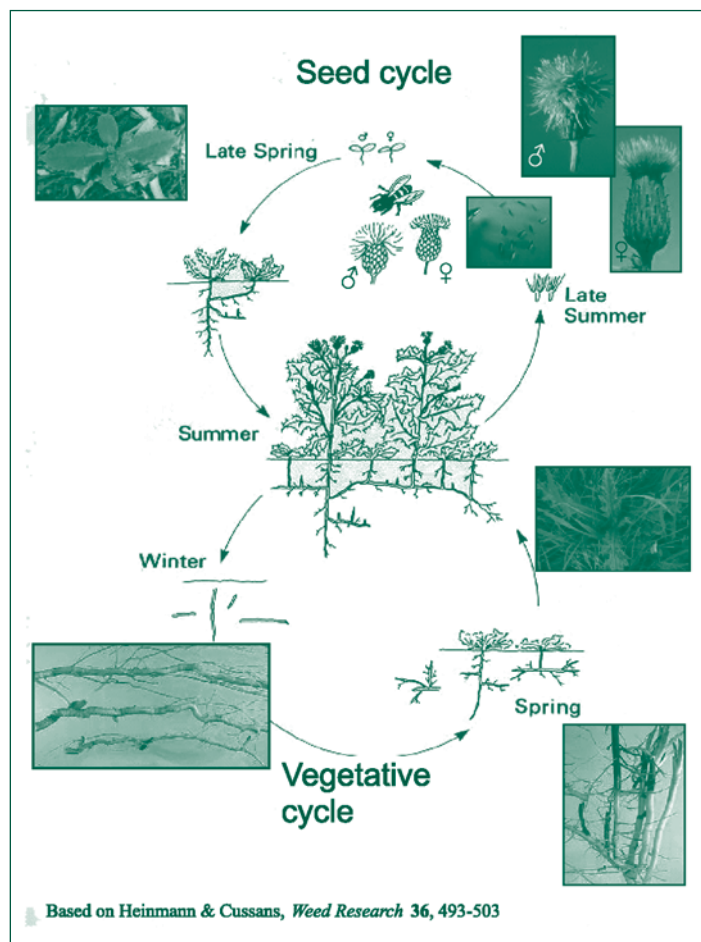
During the winter, when the foliage and flower stems have died, about one in five of the buds is released from dormancy to form subterranean shoots. These shoots grow up to the soil surface where they remain until the last spring frost after which they emerge to form the rosette, and later the flowering shoots characteristic of a Californian thistle patch.

Now in place of the original seedling is a patch of shoots spread over a circular area as wide as four metres. These new-season shoots produce new creeping roots while the last season’s roots die off.

This annual vegetative cycle is how an undisturbed Californian thistle patch increases in size and numbers of shoots per unit area (shoot density) in a pasture.

Spread of Californian thistle is promoted by root fragmentation (e.g. through natural decay of the roots or when the paddock is cultivated). Root fragmentation releases additional buds from dormancy.

Table A: Creeping roots key problem



How can Californian thistle be controlled?

Armed with this knowledge it becomes clear that to control an established Californian thistle population in a pasture we need to concentrate on reducing the numbers of over-wintering shoot buds in the soil. But how? And by how much?

Research has shown:

- The amount of above-ground thistle vegetation accumulated during a growing season (Sept-April in Canterbury) determines the amount of root that will over-winter
- Over-wintered bud numbers are directly related to root mass (two to three buds per gram of root)
- One in five buds form shoots and one in three shoots survive to flowering
- Roots survive for 12 months and are replaced annually

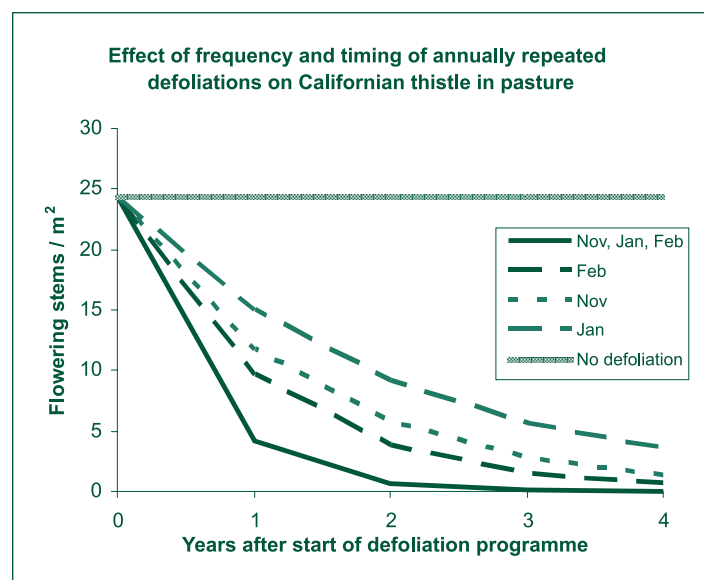
Along with the above research, field trials in North and South Island pastures have demonstrated how Californian thistle can be best controlled.

- An infestation can be reduced substantially in pasture by a two-year defoliation programme. This means three defoliations (removing all shoots to ground level) per growing season. Thistles were virtually eradicated by four years. This is shown by the solid line in Graph A.
- A single defoliation per year gives a slower decline, and is most effective if conducted later in the growing season when foliage levels and root growth are both high (see the February defoliation in Graph A).
- For greatest success from mowing or grazing, Californian thistle should be defoliated as close to the ground as possible.
- Defoliation may be achieved by mowing, hard grazing or with an herbicide.
- Herbicides with label claims for Californian thistle are: 2,4-D [Baton, Pasture-Kleen, Thistle Killen LV], clopyralid [Versatill, Void, Tango, Multiple], dicamba [Banvel, Kamba 500] or MCPA [Agrotone 720, Pasture Guard MCPA, Jolyn Clean Sweep, Dow Agrosiences MCPA]. All of these herbicides will damage the clovers in the pasture.
- Regardless of the defoliation method, it is crucial remove as much of the above ground vegetation as possible for as long as possible, thereby minimising root formation.
- Insect and microbial biocontrol agents are potential future defoliators for the management of Californian thistle, particularly on hilly terrain.

How can Californian thistle be prevented from establishing?

Since new infestations of Californian thistle almost always arise from seeds germinating in cultivated soil, make sure you can identify the seedlings in a new pasture. Use one of the herbicides above to kill them while you can still see the smooth-edged seed leaves and before more than four to six "true" spiny-edged leaves are present. Creeping roots (and buds) begin forming early in seedling development and the herbicides become less effective the more these roots develop.

Graph A



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