Cirsium palustre: An Evasive Invasive

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Voss 556
UMBS

Invasive plant species are those that are introduced to a region beyond their previous range. This introduction can take place by natural means or by human transport of the organism (Williamson 1996). Undesirable, introduced plant species that are difficult to control are anthropogenically classified as weeds. Weeds are able to proliferate inexhaustibly because they often possess the characteristics of r-selected or pioneer species. These characteristics include a high short-range dispersal ability, a high rate of reproduction, a high growth rate and a short generation time (Kareiva et al. 1993). Invaders also lack the natural enemies or herbivores of the host range's native species (Williamson 1996). This invasive pattern allows an invader to thrive reproductively in the host ecosystem while the native species suffer from herbivory. Invasions result in the overrunning of an ecosystem which can be disadvantageous to the native species that naturally occur there. Generally, ecosystems that are vulnerable to frequent breaks in plant cover and disturbances are the most susceptible to invasions (Mooney and Drake 1986). These ecosystems include roadsides and wetland regions.

In Michigan, the European swamp thistle, *Cirsium palustre* (L.) Scop., a member of the Asteraceae family, is an introduced species that was transported from western Europe in the early twentieth century, and has since established itself as an aggressive weed. It colonizes primarily alkaline wetland habitats, like cedar swamps which are exposed by frequent breaks in cover, and to regions of great disturbance, like roadsides. This introduction and subsequent invasion has established *Cirsium palustre* on both sides of the Atlantic Ocean in the northern latitudes, a circumpolar species, Figure 1. It was first recognized earlier this century in North America and collected in Newfoundland and New Hampshire. Locally, this invader has spread voraciously from Michigan's Upper Peninsula, where it was first collected in Marquette County in 1934, to the Lower

Peninsula where it was assimilated by 1959 (Voss 1996). It migrates vigorously along roadside ditches and by human transport, and continues to travel south (Voss 1996). A history of *Cirsium palustre's* invasive proliferation through the Upper Peninsula can be traced by the University of Michigan Biological Station's collection of herbarium specimens. This collection documents the invasion chronologically as follows:

on July 25, 1954 along Forest Highway 13, south of the Alger County line (E.G. Voss 2300);

on July 11, 1960 Pt. aux Barques on the Garden Peninsula in Schoolcraft Co. (E.U. Clover 465m);

on July 24, 1960 along Highway 28, east of Newberry (E.U. Clover 571m);

on July 24, 1961 along Highway 28, east of Newberry in Luce Co. (E.U. Clover 571m);

on June 25, 1962 in Wilderness State Park in Emmet Co. (L.L. Oakley);

on August 20, 1963 on the Huron Mountain Club, along the Salmon-Trout River in Marquette Co. (E.U. Clover);

on July 16, 1964 along the Rocky beach in the north side of Bois Blanc Island in Mackinac Co. (J.T. Brunson);

on July 8, 1972 south of Mackinac City at the west edge of sec. 29 and 32, Mackinaw TP in Cheboygan Co. (E.G. Voss 13875);

and, on July 28, 1973 Bois Blanc Island in Mackinac Co. (E.G. Voss 14352).

The European swamp thistle is overwhelming the range of the Michigan's native swamp thistle, *Cirsium muticum* Michaux. The invasive tends to colonize the cedar swamps that are characteristic of the range of the native swamp thistle. I have observed *Cirsium palustre* sharing with *Cirsium muticum* the habitat provided by Reese's Swamp in Cheboygan County (sec 3 T36N, R3W). In Reese's Swamp, I have observed both thistles sharing the cedar swamp habitat alongside Carex leptalea, Cystopteris bulbifera, Thuja occidentalis, Clintonia borealis, Trientalis borealis, Aralia nudacaulon, Listera cordata, Cypripedium reginae, Mitchella repens and Circaea alpina. I have also recognized *Cirsium*

palustre flourishing along the disturbed habitat provided by the following roadside ditches: along Highway 77 in Alger Co. (sec 31 and 25 T48N, R13W and R14W), along Highway 77 in Schoolcraft Co. (T49N, R13W), along Highway 117 in Luce Co. (between sections 32 and33 T45N, R10W) and along Highway 77, west of Sturgeon Bay in Emmet Co. (between sections 3 and 4 T37N, R6W). It prospers along roadside ditches concomitantly with other pioneer species like Asclepias syriaca, Daucus carota, Matricaria discoides, Campanula rotundifolia, Lathyrus palustris, Epilobea angustifolia, Hypericum perforatum, Rubus strigosis, Dulichium arundinaceum and Typha latifolia.

Cirsium palustre and *Cirsium muticum* are morphologically distinct when the species are flowering. Both grow up to a height of 2 meters and have purple inflorescences. The heads of these inflorescences are composed of disk flowers and are pollinated by bees, (photos 1 and 2). However, *Cirsium palustre* has several terminal, light purple, small heads in a crowded cyme-like form whereas *Cirsium muticum* has few terminal, large heads of a richer, deeper purple, (photos 3 and 4). The achenes of thistles are dispersed by the wind carrying the hairlike pappus that extends from the apex of the achenes. *Cirsium palustre* has dreadful, sharp-pointed prickles that line the stem and leaves, making this invasive thistle difficult to embrace as a welcomed introduced species, (photos 5 and 6). *Cirsium muticum* has prickles also, however its prickles are less formidable and they only line the leaves and not the stems of the native species.

The most difficult distinction between these two species lies in the basal rosettes. Since these thistles are biennial, they have a vegetative stage in which only their basal rosettes persist (Fernald 1950). The form and size of the prickly rosettes are very similar, so distinguishing between the two species when they are not flowering is troublesome, (photos 7 through 10). In Reese's Swamp, I observed a characteristic of the basal rosettes that can be used to distinguish between these two thistles. I noticed that *Cirsium palustre* has basal rosette leaves that are intensely armed with long, pale prickles that line the leaf margins, whereas *Cirsium muticum* has basal rosette leaves that are comparatively sparsely

armed with short prickles that have purple bases extending about 1/4 the length of the prickle, (photos 11 through 14). This purple pigmentation is most easily seen on the prickles that extend from the tips of the lobes of the basal rosette leaves. Another character that separates these two species in their basal rosette form is the pigmentation at the base of the leaves. *Cirsium palustre* has basal rosette leaves with a pale base and *Cirsium muticum* has basal rosette leaves with a purple base, (photos 11 through 14). The length of the pigmented portion of the leaf depends on the length of the leaf of the basal rosette; it extends farther up the base of the leaf the longer the leaf is. In general, the pigmented portion of the leaf base is about 15% of the length of the leaf. This observation has proven valid for every *Cirsium muticum* basal rosette I have sampled in each of three sites: 20 samples from Reese's Swamp, 5 samples from the swamp along Crumley Creek in Ellis Township (NW 1/4 sec 4 T34N, R2W) and 9 samples from Duncan Bay in Cheboygan Co. (sec 27 T38N, R1W).

Distinguishing between these two species of thistle is important because *Cirsium palustre* is invasive and if management or biological control is considered, the invasive, not the native, must be identified for management. Since these thistle species are biennial, identifying them in their vegetative state is problematic. More samples of basal rosettes from other regions in the range of *Cirsium muticum* need to be observed to discern the consistency of the leaf and prickle pigmentation. If the pigmentation proves to be a reliable character to distinguish these two thistles, then management can be applied to the basal rosettes of *Cirsium palustre* without concern of harming *Cirsium muticum.*

A phytopathogenic bacteria has recently proven a useful biological control agent of weeds. The phytopathogenic bacteria, Psedomonas, is an effective producer of disease in members of the Asteraceae family (Johnson et al. 1996). However, in order for the applied bacteria to effectively penetrate the plants for infection, entry wounds or surfactant must be inflicted. Plants that are infected appropriately with the bacterium will subsequently suffer from lethal, systemic wilt (Johnson et al. 1996). Six months of innundative application,

or application at regular intervals, of the Xanthomonas campestris bacteria to annual bluegrass that had been mowed resulted in 70% control of the weed (Johnson et al. 1996). These trials are among the first using this bacterium for weed control.

This bacterium's implications for management appear promising for the control of other weedy species like *Cirsium palustre*. If the basal rosettes of the native and invasive thistle can be distinguished using the characters of prickle and leaf base pigmentation, then management using Pseudomonas bacteria feasibly could be applied to the basal rosettes of *Cirsium palustre*. This proposal should remain theoretical until the basal rosette pigmentation of *Cirsium muticum* proves a consistent character in other parts of its range, and until the bacteria, Pseudomonas, is fully tested as a reliable control agent for thistles.

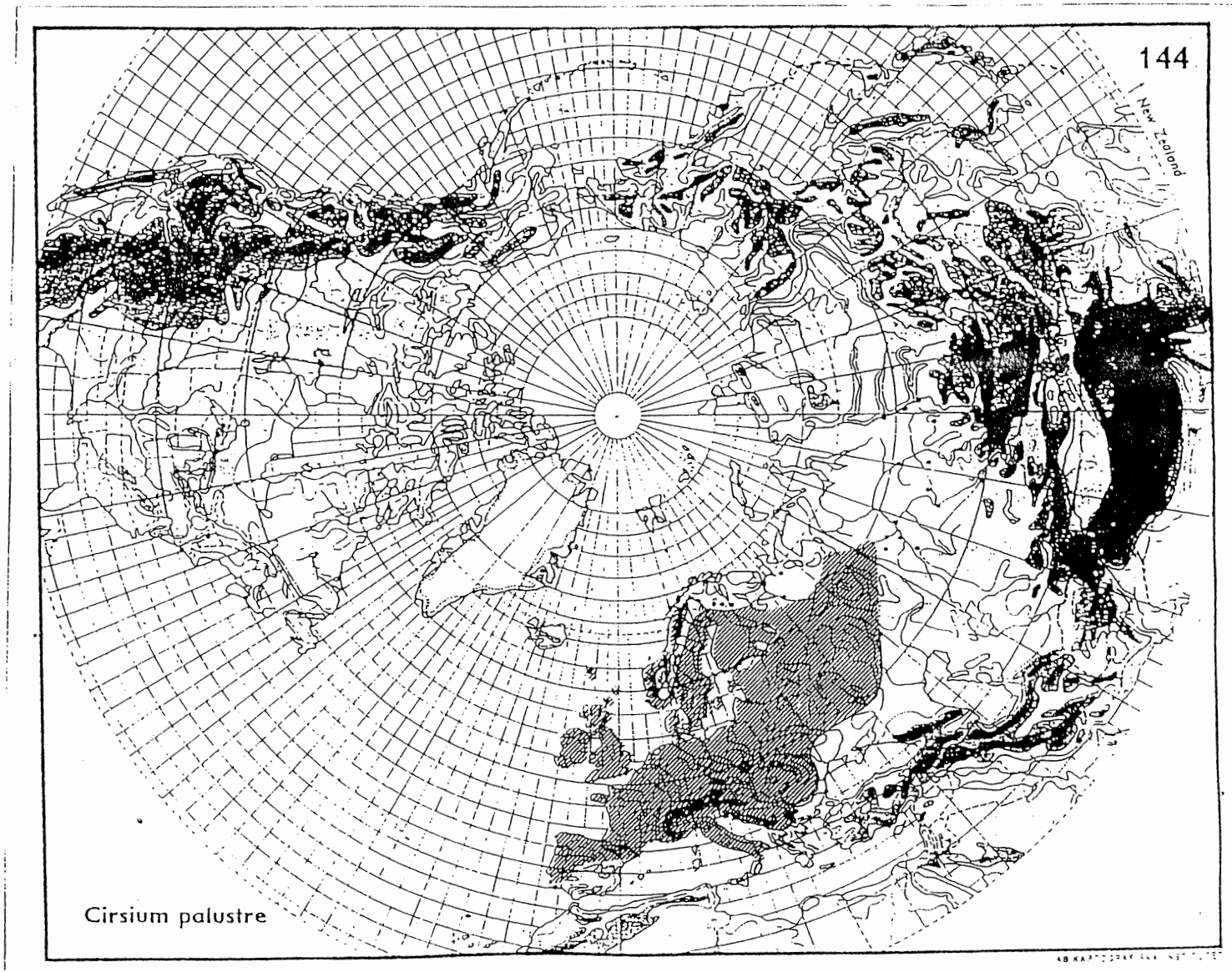

Figure 1: the distribution of Cirsium palustre as a circumpolar plant
(adopted from Eric Hulten's The Amphi-Atlantic Plants)

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* all photos taken by Marisa Tohver at Reese's Swamp in Cheboygan Co., MI

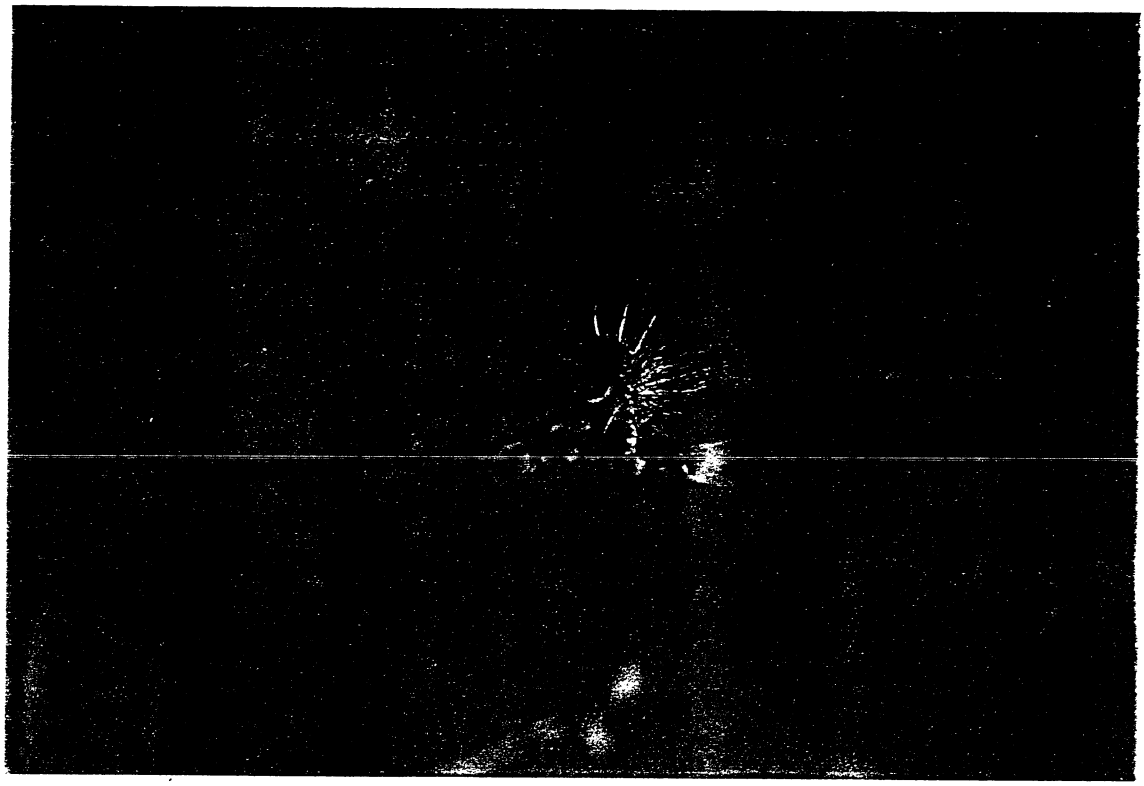


photo 1 (top) Cirsium palustre pollination by bee
photo 2 (bottom) Cirsium muticum pollination by bee

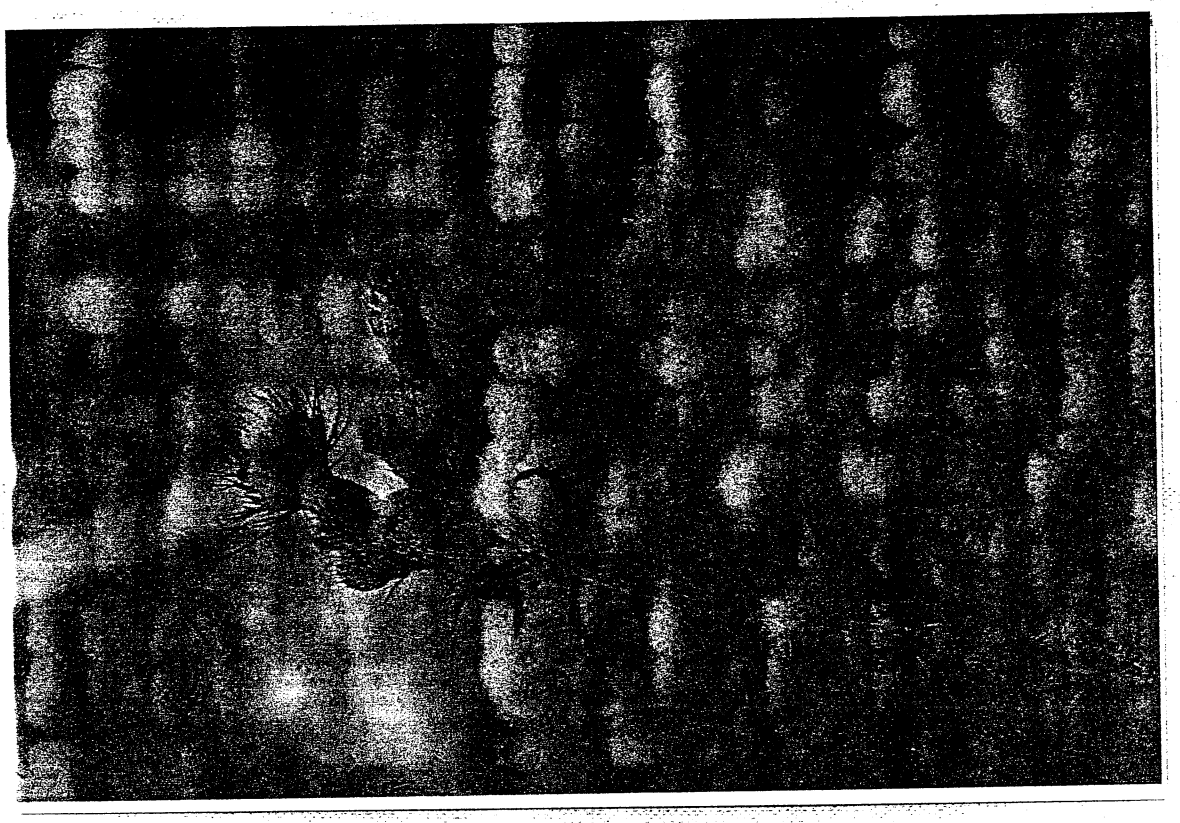


photo 3 (top) crowded, terminal heads of Cirsium palustre
photo 4 (bottom) uncrowded heads of Cirsium muticum

photos 5 + 6 prickles lining the stem of Cirsium palustre

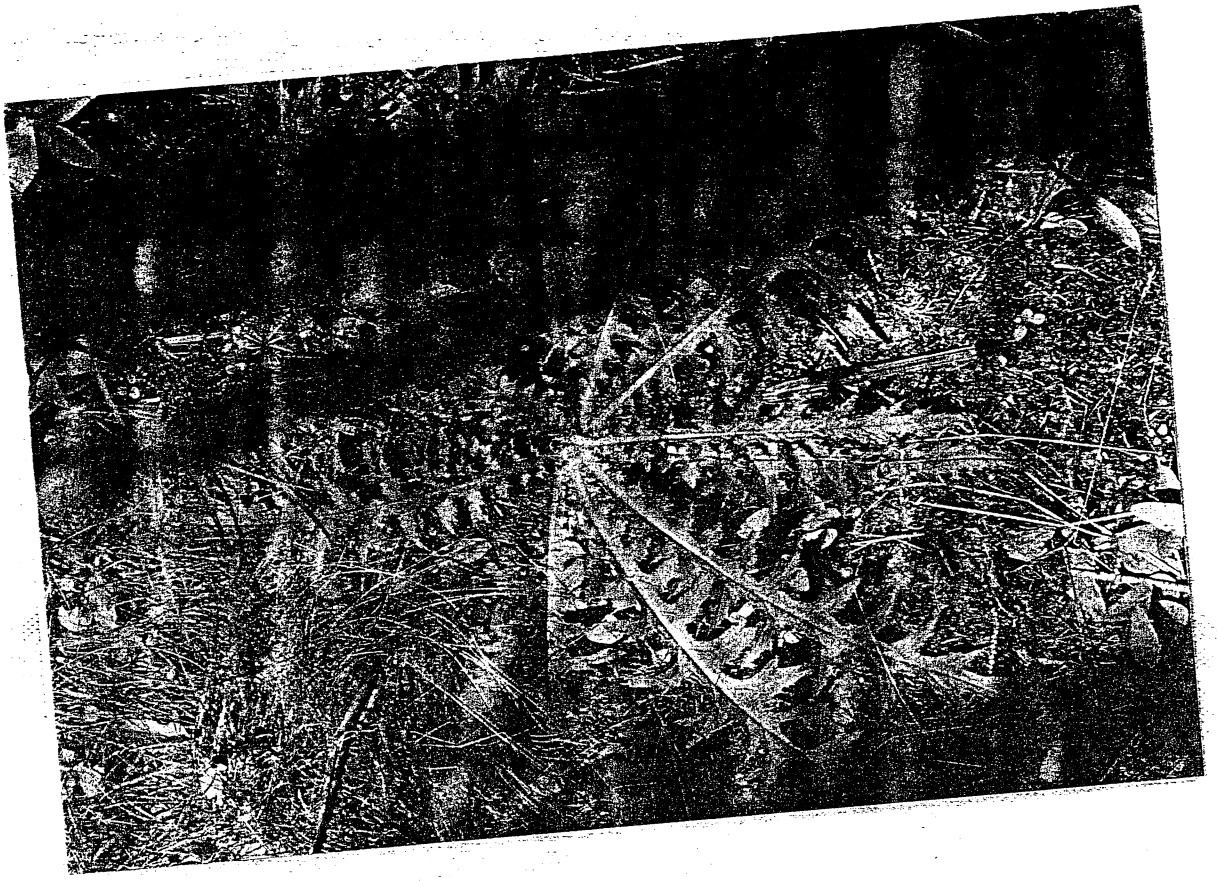
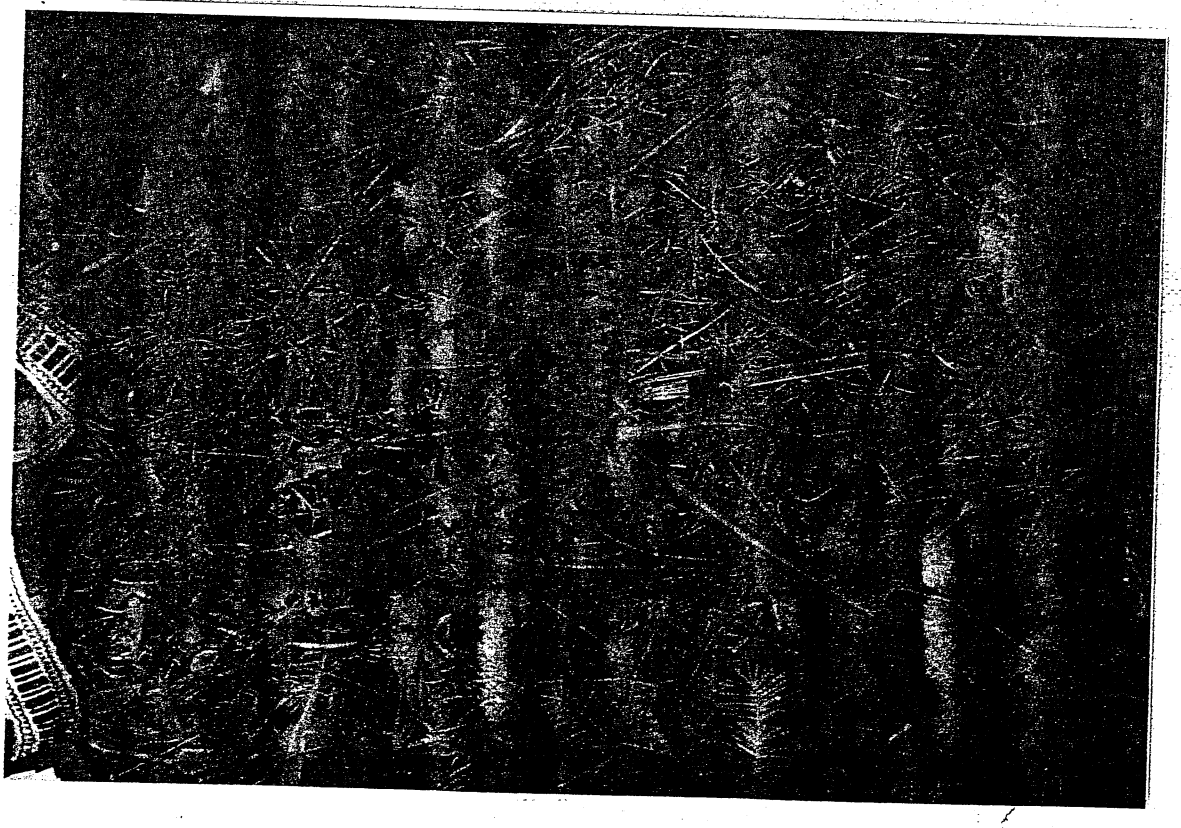


photo 7 (top) basal rosette of Cirsium palustre
photo 8 (bottom) basal rosette of Cirsium muticum



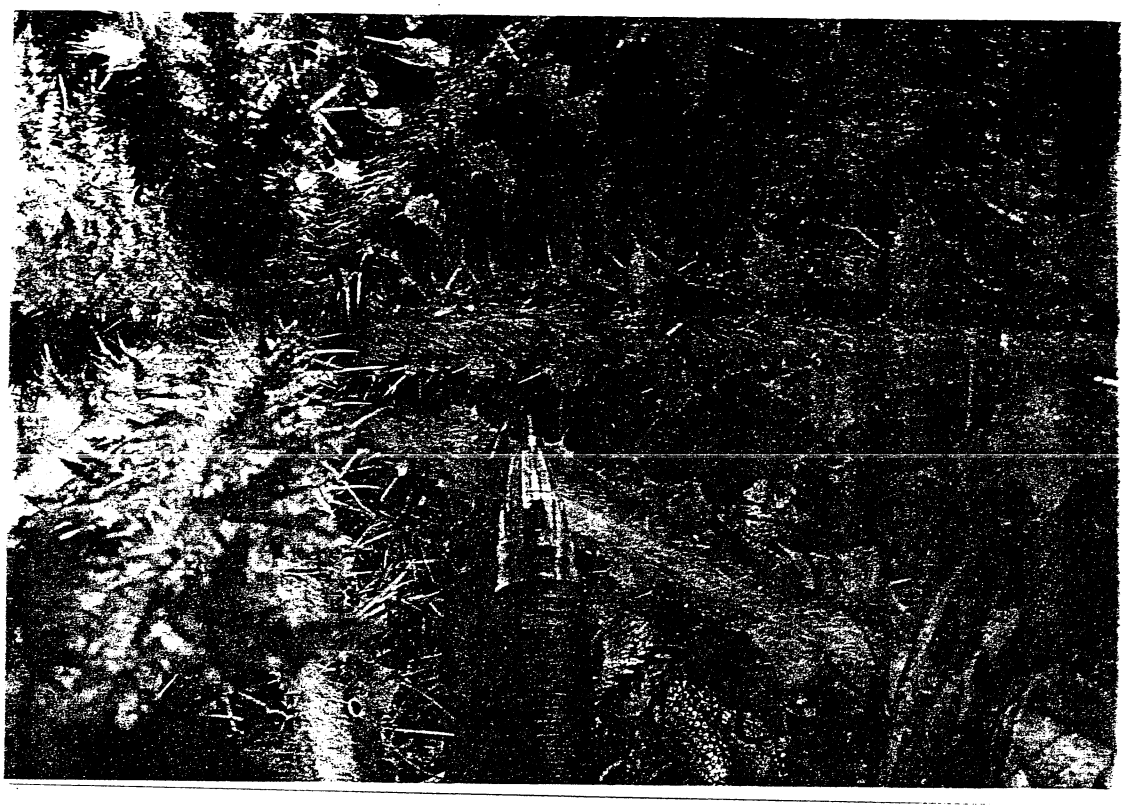
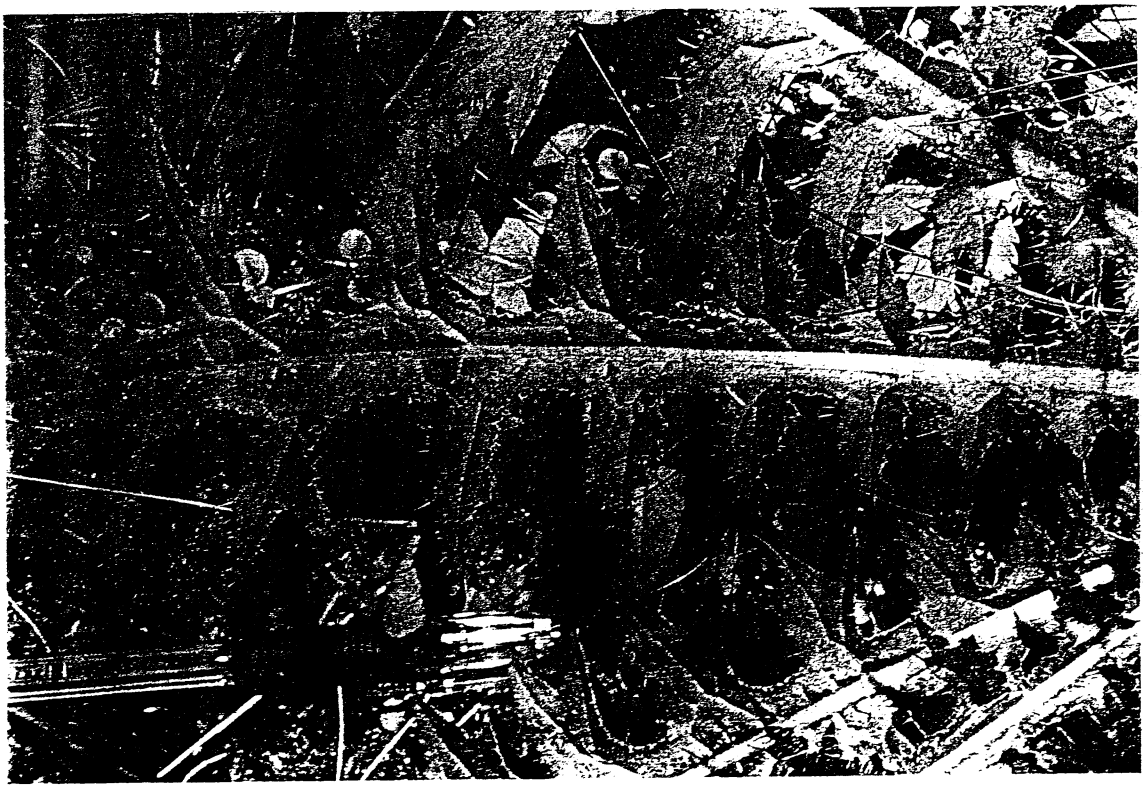


photo 9 (top) basal rosette of Cirsium palustre
photo 10 (bottom) basal rosette of Cirsium muticum



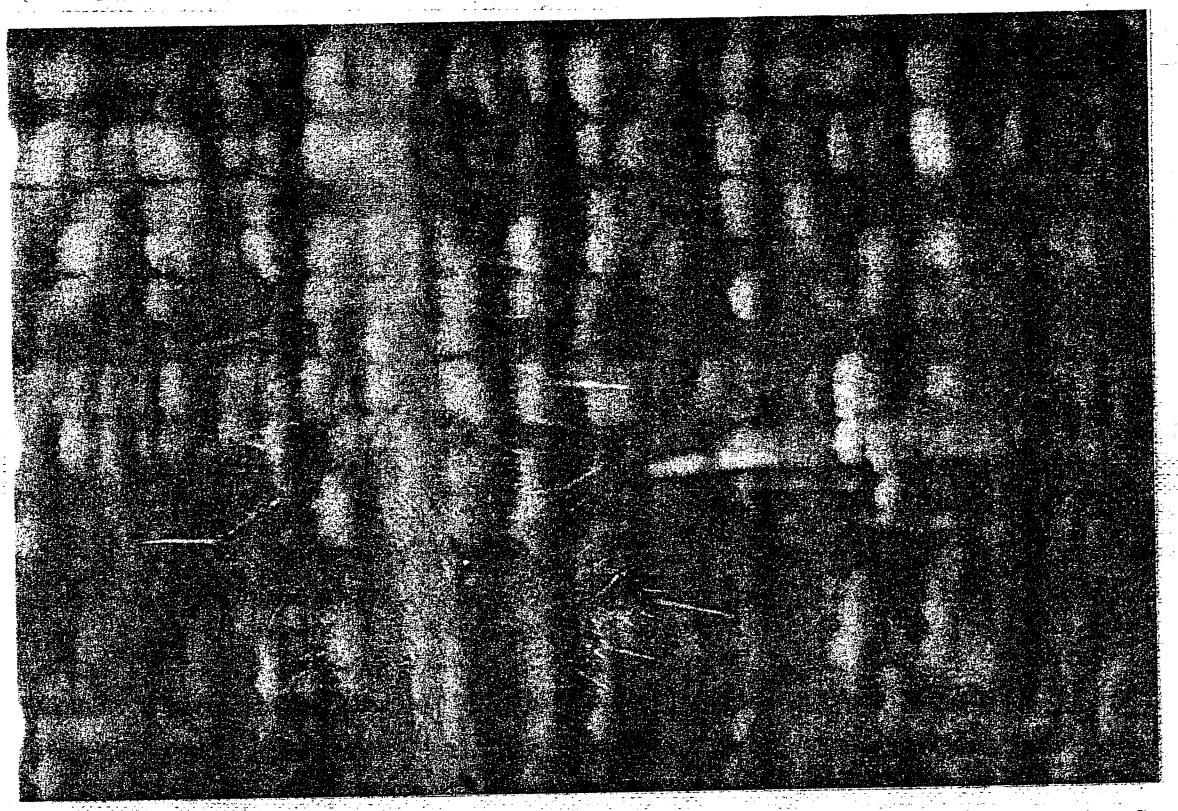
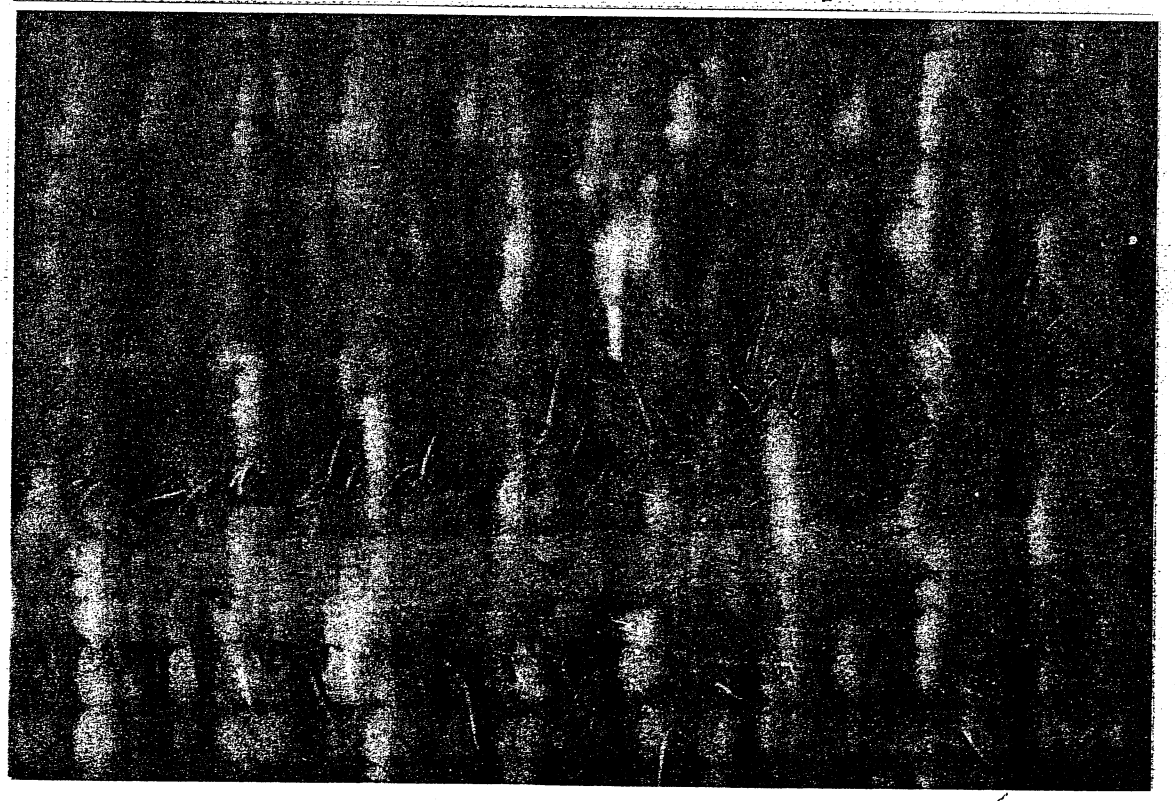


photo 11
photo 12 pale leaf base and prickles from basal rosette of Cirsium palustre



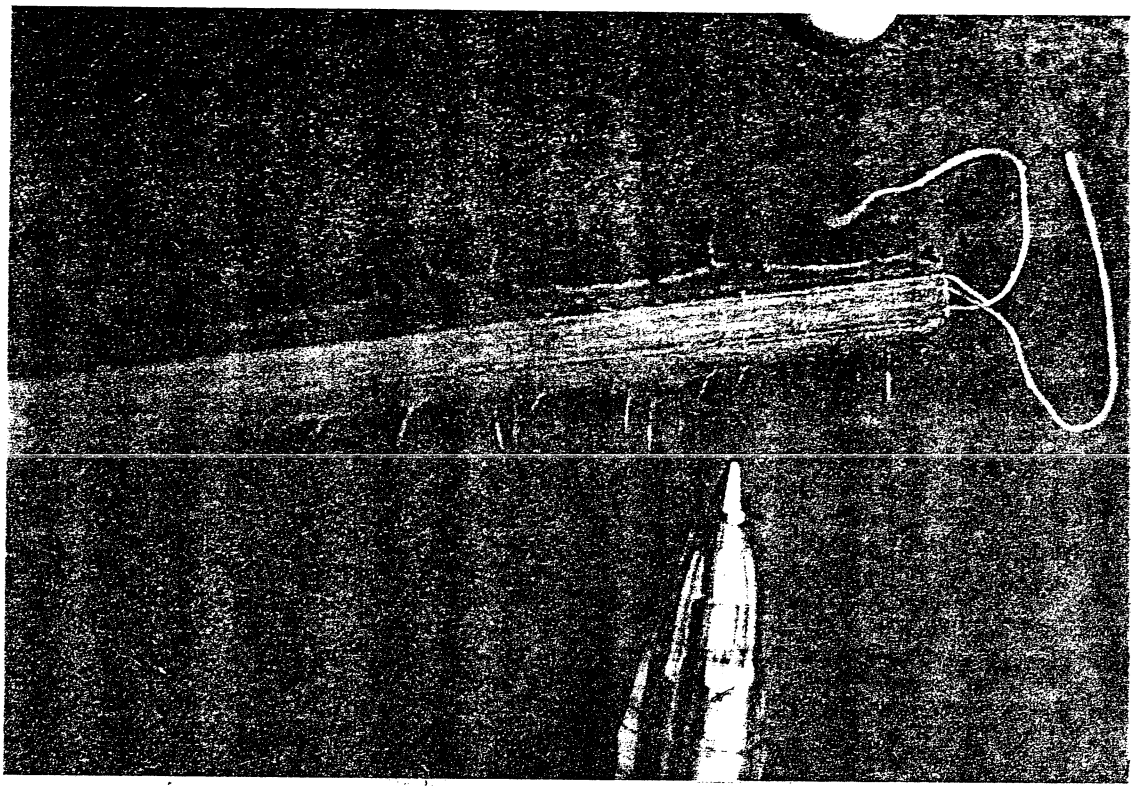
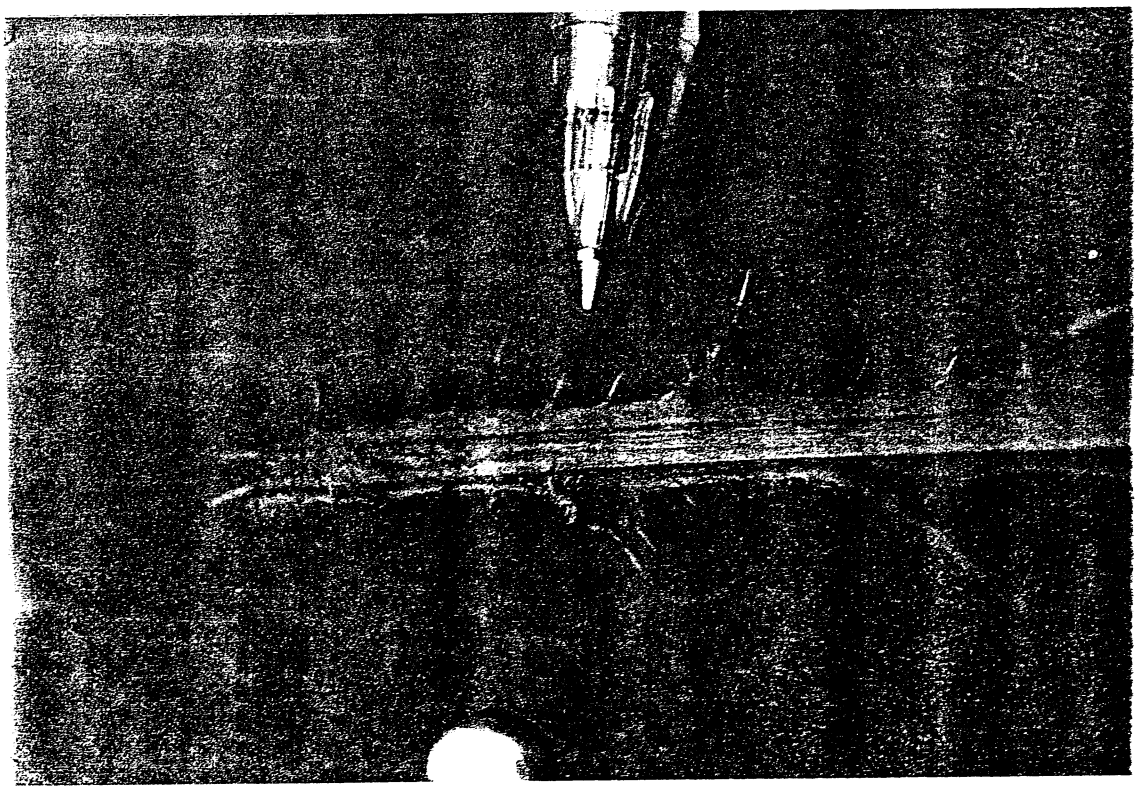


Photo 13
Photo 14 pigmented leaf and prickle bases of basal rosette of Cirsium muticum



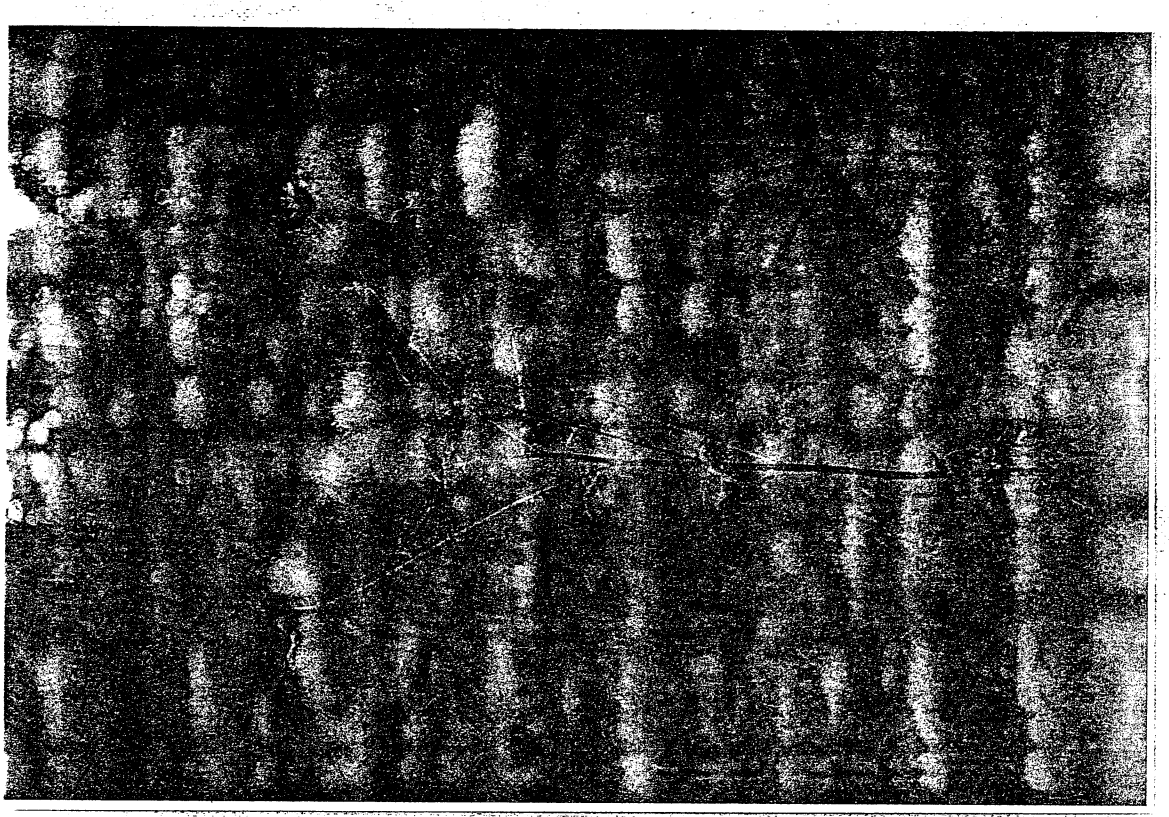


photo 15 (top) the benign beauty of Cirsium muticum
photo 16 (bottom) basal rosettes of the evasive invasive, Cirsium palustre