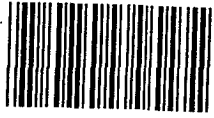


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Monitoring Lythrum Alatum for Effects o
OSMP Studies 4514

Study



Bunin, Jane

**Monitoring Lythrum alatum for
Effects of Biocontrol Beetles of
Lythrum salicaria**

Jane Bunin, PhD



**MONITORING LYTHRUM ALATUM FOR EFFECTS OF
BIOCONTROL BEETLES OF LYTHRUM SALICARIA**

Prepared for: City of Boulder Open Space and Mountain Parks
Boulder, Colorado

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Date: Year 2000 Field work
Year 2001 Report completion

MONITORING LYTHRUM ALATUM FOR EFFECTS OF BIOCONTROL BEETLES OF LYTHRUM SALICARIA

Prepared by Jane Bunin, PhD, Ecologist, Natural Science Associates, Inc.

Section 1: ABSTRACT

The goal of this work is to inventory and assess the status of Lythrum alatum, the native, winged purple loosestrife, on Open Space lands in the vicinity of Coot Lake. Since 1994, two species of biocontrol Galerucella beetles have been released in the wetlands west of Coot Lake in order to control the aggressive, exotic purple loosestrife, L. salicaria. The current project aimed to evaluate whether these beetles are affecting L. alatum under field conditions. Thus one of the goals of this work was to locate and inventory all populations of L. alatum near Coot Lake.

Two populations of L. alatum in the vicinity of Coot Lake were observed, documented and characterized. One of the localities, on Boulder Valley Ranch, near the Eagle Creek Trail, is remarkably large, dense and diverse. However, due to the long distance between the beetle release site and the two nearest populations, no conclusions can be drawn about possible effects of the beetles on L. alatum under field conditions. However, there is habitat suitable for L. alatum at Coot Lake and on the Johnson property to the west. One future consideration would be the transplanting of L. alatum to this area in order to evaluate possible effects of the Galerucella beetles on L. alatum.

A concern at both of these L. alatum localities is the invasion by Canada thistle and teasel. This should be monitored and addressed as needed.

Section 2: STATEMENT OF OBJECTIVES AND HYPOTHESIS

The overall objective of the work described here is to inventory and assess the status of populations of native, winged purple loosestrife, Lythrum alatum, on Open Space lands in the vicinity of Coot Lake. L. alatum is relatively uncommon in the Boulder Valley. Since 1994, two species of biocontrol beetles have been released in the human-created wetlands west of Coot Lake in order to control the aggressive, exotic purple loosestrife, Lythrum salicaria. The two beetle species are Galerucella pusilla and G. californiensis. The Galerucella spp. larvae and adults eat shoots, leaves and flowers of L. salicaria and can significantly weaken L. salicaria to the point of preventing seed production. These beetles are now well established at the Coot Lake location.

This work aimed to evaluate whether these two species of biocontrol beetles are affecting L. alatum in natural conditions. Thus one of the primary goals of this work was to locate and inventory all populations of L. alatum near Coot Lake. And since the two loosestrife species share similar geographic distributions throughout much of the United States east

of Colorado in lower elevations of wet or moist habitats, there was a potential for the findings of this study to be applicable in other localities in the U.S.

A goal of this work was, as appropriate, to make recommendations for further study or work. On City lands, the wet meadow habitats preferred by L. alatum are also managed for several rare or important natural resources. Thus another goal was to improve our understanding of L. alatum in order to improve wetland management planning strategies.

Section 3: DESCRIPTIONS OF METHODS

A review of existing information was the first task. This included information from the literature, herbarium specimens and people who work with Lythrum spp. It also included gathering information about the lands and wetlands in the vicinity of Coot Lake. Ms. Lynn Riedel, City Ecologist, and Ms. Debbie Eberts, Bureau of Reclamation Botanist, provided important information. On May 2, 2000, I visited Ms. Eberts' office to review her extensive literature collection. I also joined Ms. Eberts on May 26, 2000, for one of her spring monitoring visits to Coot Lake, during which we observed the signs of the overwintering beetle adults and larvae on L. salicaria, and discussed the life cycle of the beetles. Mssrs. Mike Lindstrom and Chris Brinkley also met us in the field. They carry out the City Mountain Parks Integrated Pest Management Program, and provided information about localities and control efforts for L. salicaria in the vicinity of Coot Lake. Mr. Dave Weber, Habitat Biologist with the Colorado Division of Wildlife, provided information on the L. salicaria control program that he coordinates on private lands in Colorado.

Field surveys to inventory L. alatum were carried out between 8/8/00 and 8/15/00. This is typically flowering time and is also a time that damage from new Galerucella adults to L. salicaria is clear. All wetlands within about a one mile radius from the release site west of Coot Lake were studied. In addition, at Lynn Riedel's suggestion, a wetland about 2 miles WSW of Coot Lake was included in the work. This wetland is around a pond on Boulder Valley Ranch accessed from the Eagle Creek trailhead off North 51st St. Information was also shared with Bill Jennings. Notations were made on a City of Boulder Open Space Wetland Map from aerial composites. Data from the City Wetland Data Base were also utilized. Photographs were taken and herbarium specimens were collected. At the two sites where L. alatum was found, notes were made of associated species, vegetation type, estimated number of individuals, vigor of population, comments on phenology, and evidence of beetle damage.

Data were summarized and synthesized into a report. Maps, photographs and voucher specimens will be handled in ways as discussed with Open Space personnel.

Section 4: RESULTS

Section 4.1: BACKGROUND

In Colorado, L. alatum is quite uncommon, but is not currently on the Colorado Natural Heritage Program list of plant species of concern. It is found in moist meadows at the base of the Front Range. In the Boulder Valley, before the field work carried out in 2000 by Bill Jennings and by myself, L. alatum was poorly documented. Bill Jennings reports that prior to the field work of 2000, about five populations were known from Open Space. In his report to the City on L. alatum and Eustoma grandiflorum, Bill Jennings discusses what was known before 2000 about L. alatum in the Boulder Valley.

L. alatum is distinguished morphologically from L. salicaria by its pinkish flowers, its less dense and much smaller inflorescence, its more delicate and shorter stature (not over two feet), and by its alternate upper leaves. L. alatum typically occupies slightly drier habitats than L. salicaria. While L. salicaria tends to be found with Typha spp., L. alatum tends to occupy moist meadows just above or slightly drier than the Typha spp. areas.

Mr. Dave Weber, Habitat Biologist with the Colorado Division of Wildlife, coordinates the L. salicaria control program, which has been eradicating purple loosestrife on private lands since 1993. His office publishes a Purple Loosestrife newsletter, and was recently recognized by the Colorado Natural Heritage Program and The Nature Conservancy for their control program. The program uses manual removal and chemical treatments, and always aims to avoid further seed dispersal. He said that the biocontrol beetles are known to spread a little, up to about 200 yards. He suspects that there would be a limited potential for their use in Colorado due to limited areas with heavy infestations of L. salicaria, but he knew of other several Colorado localities with substantial beetle effects on the L. salicaria.

Mr. Mike Lindstrom and Mr. Chris Brinkley with the City Mountain Parks IPM program identified four other known localities for L. salicaria near Coot Lake in addition to the main area west of Coot Lake. All four have been treated with herbicides. Field visits in August revealed only dead L. salicaria at the four minor sites. At the main site west of Coot Lake, L. salicaria is still thriving, although most of it showed serious damage from the biocontrol beetles. The Junior Rangers were collecting the flowering portions of L. salicaria on 8/15/00 for subsequent burning as a means of control. However, this means of control must be carefully considered. A report in Ecological Restoration 18(3): 205-206 by Johanna Salatas indicates that removal of inflorescences is not recommended for control of purple loosestrife.

Both larvae and adults of the two Galerucella spp. damage the leaves, shoots and flowers of L. salicaria. In May, overwintering adults will create a shothole half-moon pattern, eating through the leaves, whereas larvae skeletonize and eat partly through the leaves. The adults lay eggs on the leaves and stem, and when hatched, the first instar of the larva eat the apical meristem tissue. After the first instar, the larvae feed on the underside of the leaves. By the end of June pupae have formed, and new adults emerge in early July. The new adults eat a lot during July and are done with their active feeding by the start of August. Thus in August L. salicaria may grow and recover from some effects of the Galerucella beetles.

Another biocontrol organism, Hylobius transversovittatus, a weevil, was not addressed in this work because it is a root feeder, is nocturnal, and considered not of consequence at Coot Lake by Ms Debra Eberts, Botanist with the U. S. Bureau of Reclamation, Lakewood, Colorado. Ms. Eberts has been in charge of the biocontrol organism releases for L. salicaria and provided information and field guidance for this work. Her work monitors beetle effects only within and not beyond the release site boundaries.

Section 4.2: FIELD WORK RESULTS

Two populations of L. alatum in the vicinity of Coot Lake were observed and characterized. 14 other wetlands identified on the City Wetland map were also inventoried. One L. alatum population, which is small, was known prior from the Axelson property and is one mile west of the Coot Lake beetle release site. The other population, on Boulder Valley Ranch, in Little Dry Creek, near the Eagle Creek trail, is two miles west of Coot Lake, and is a remarkably large and healthy population of L. alatum. Lynn Riedel suggested that the latter area be included in this work. Neither population shows significant signs of damage like that caused by Galerucella beetles. However, due to the long distance between the beetle release site and these two populations, no clear conclusion can be drawn about possible effects of the beetles on L. alatum in field conditions.

1. Axelson property, Wetland # 548, west of No. 55th St., T2N R70W, Sec 33.

Two small dense, healthy areas of L. alatum were located amidst an extensive wet meadow that lies below an irrigation ditch. In one clone covering about 6 feet by 6 feet there were hundreds (400??) of stems. In the other clone about 200 feet away, there were only a few stems, which were quite healthy. The associated plants were Baltic rush, Juncus arcticus; spike-rush, Eleocharis sp.; bulrush, Scirpus sp.; sedges, Carex sp.; and field mint, Mentha arvensis. Adjacent in slightly wetter sites cattail Typha latifolia was dominant. Nearby, Canada thistle, Cirsium arvense is invading and teasel, Dipsacus sylvestris appears to be actively encroaching on the L. alatum. The entire site appeared dry this year compared to typical conditions that support cattails and sedges. This locality is one mile west of the Coot Lake release site.

2. Boulder Valley Ranch, Eagle Creek Trail, Little Dry Creek drainage, west of No. 51st St, T1N R70W Sec 5.

An incredible dense, large, healthy population of L. alatum lies around a dammed pond along Little Dry Creek. The number of L. alatum is certainly in the millions and most of the plants are very vigorous and co-dominate the vegetation, especially on the south side of the pond. A limited number (fewer than 10 stems) of plants with a few signs that resemble adult Galerucella beetle damage were observed at the eastern edge of the population on the southern side of the pond.

Three herbarium sheets of specimens were collected of plants showing signs of various feeding. These included a few half-moon shaped holes in lower leaves, which are characteristic of the Galerucella beetles.

Bill Jennings suggests that this population is the likely location of the Boulder Open Space Herbarium specimen collected by Foster on 7/2/86. His description of the distribution of the population around the pond is clear, and agrees with my observations of the south and north sides. Starting on the south side of the pond and going clockwise, the population starts less than one-half the distance along the pond, goes considerably west, and continues around the north side of the drainage to just east of the north-south fence. The ground is mowed east of this fence up to the cattails, and there is no suitable habitat farther east on this north side of the pond.

Species commonly associated with L. alatum at this locality include cattails (in sites usually just wetter), Juncus sp.; Carex spp., goldenrod, Solidago sp.; Mentha arvensis; Verbena hastata; milkweed, Asclepias incarnata; three-square, Schoenoplectus pungens; and redtop, Agrostis gigantea. There are nearby areas of dense Canada thistle and teasel that appear to be invading the areas of L. alatum.

In Little Dry Creek downstream from the dam and east to North 51st St., Bill Jennings reports a few patches of L. alatum just below the dam and on the south side of the cattails for up to 200 feet downstream. He also notes a hillside seep facing south above the Little Dry Creek valley that has L. alatum.

The following localities were surveyed and there were no L. alatum. A few of these are beyond one mile from the Coot Lake release site. Only the first two localities (3 and 4) might provide suitable habitat for the native loosestrife species. In the following, I list the sites surveyed with no further data since they have been described in the City wetland database and the absence of L. alatum means that they will not be discussed further in this work.

3. Boulder Reservoir, just southwest of the Reservoir, Wetland # 61, east of North 51st St., T1N R70W Sec 4.

This is just downstream from locality 2 in Little Dry Creek.

4. Johnson Property, Wetland # 422, just west of Coot Lake, T2N R70W Sec 34.

5. IBM property, Wetland 31, T1N R70W Sec 2.

6. IBM property, Wetland 32, T1N R70W Sec 2.

7. IBM property, Wetland 33, T1N R70W Sec 2.

8. Median of Highway 119, Wetland 39, T1N R70W Sec 2.

9. Wetland 62, just west of Sixmile Reservoir, T1N R70W Sec 9.
10. Boulder Reservoir, Wetland 406, T1N R70W Sec 3.
11. Boulder Reservoir, Wetland 407, T1N R70W Sec 3.
12. Cowles property, Wetland 418, T2N R70W Sec 34.
13. Johnson property, Wetland 419, T2N R70W Sec 34.
14. Johnson property, Wetland 420, T2N R70W Sec 34.
15. Johnson property, Wetland 422, T2N R70W Sec 34.
16. Ellison property, Wetland 595, T2N R70W Sec 4.

Section 5: CONCLUSIONS AND RECOMMENDATIONS

The documentation of a very large, extensive and healthy population of L. alatum on Boulder Valley Ranch near Eagle Creek Trail is noteworthy. In conjunction with the findings of Bill Jennings, it appears that L. alatum exists at some number of City wetlands. It would be helpful for future studies to include GIS mapping support when feasible, to allow a higher level of accuracy.

However, it is of considerable concern that Canada thistle and teasel appear to be invading the two localities studied here. This situation should be monitored and strategies to maximize the health of the L. alatum should be developed as needed.

There were no populations of L. alatum found under one mile of the Galerucella biocontrol release site west of Coot Lake. The Axelson property is at one mile distance. Therefore this study cannot evaluate whether the beetles released to control L. salicaria may potentially have adverse effects on the native winged L. alatum under natural conditions

Monitoring of the health of the L. alatum populations on City lands is important because of the potential for the biocontrol bugs to migrate from purple loosestrife to the native loosestrife. Bill Jennings (2000) reported on the status of Lythrum alatum and found 14 localities that span from far south to far north on City lands. In recent times, L. salicaria have been found very abundantly at Coot Lake and also on IBM property, in Flatirons Industrial Park, in Viele Ditch on Mary Hogan Clyncke, near Neuhauser and at the St. Walburgia Abbey church property.

Both the habitat around Coot Lake and the Johnson property just west of Coot Lake (locality 4, Wetland 422) offer suitable habitat for L. alatum. The effects of the Galerucella beetles on L. alatum could be evaluated if the City is interested in trying

transplanting L. alatum to one of these sites. The implications of such an experiment for use of biocontrol organisms and for many areas east of Colorado could be considerable.

Section 6: BIBLIOGRAPHY

Anderson, Mark. 1995. "Interactions Between Lythrum salicaria and Native Organisms: A Critical Review". Environmental Management Vol 19, No. 2, pp 225-231.

Blossey, Bernd. 1992. "Impact of Galerucella pusilla and G. californiensis (Coleoptera: Chrysomelidae) on Field Populations of Purple Loosestrife (Lythrum salicaria).". Proc. of the 8th International Symp. On Biological Control of Weeds, 2-7 Feb. 1992, Lincoln University, New Zealand. Delfosse, E.S. and R. R. Scott (eds.) DSIR/CSIRO, Melbourne, pp 27-31.

Blossey, B and D. Shroeder. 1989. "Research Update. Biological Control of Purple Loosestrife" Study and Screening of potential biological control agents of purple loosestrife (Lythrum salicaria L.) C.A.B. International Institute of Biological Control (European Station). 2nd Annu. Report. 25 pp.

Blossey, B and D. Shroeder. 1995. "Host Specificity of Three Potential Biological Weed Control Agents Attacking Flowers and Seeds of Lythrum salicaria (Purple loosestrife)". Biological Control 4, 47-53.

Blossey, B, D. Shroeder, S. Hight, and R. Malecki. 1994. "Host Specificity and Environmental Impact of the Weevil (Hylobius transversovittatus), a Biological Control Agent of Purple Loosestrife (Lythrum salicaria). Weed Science (42): 128-133.

City of Boulder Open Space Wetland Evaluation Reports. 1987 through 1993. For wetland #s: 31, 32, 33, 38, 39, 61, 62, 406, 407, 418, 419, 421, 422, 548, 595.

Eberts, Debbie. Personal communications: 2/2/00, 5/2/00, 5/26/00. Botanist with the U.S. Bureau of Reclamation.

The Great Plains Flora Association. 1986. Flora of The Great Plains. Univ. Press of Kansas, Lawrence, Kansas.

Hight, Stephen and John Drea. 1991. "Prospects for a Classical Biological Control Project Against Purple Loosestrife (Lythrum salicaria L.) Natural Areas Journal 11(3):151-157.

Jennings, William. 2000. "Inventory and Status Report for Lythrum alatum and Eustoma grandiflorum. Prepared for City of Boulder Open Space.

Kok, L. T, T. J. McAvoy, et al. 1992. "Host Specificity Tests of Galerucella californiensis (L.) and G. pusilla (Duft.) (Coleoptera: Chrysomelidae), Potential

Biological Control Agents of Purple Loosestrife, Lythrum salicaria L. (Lythraceae).
Biological Control 2, 282-290.

Malecki, R., B. Blossey et al. 1993. "Biological Control of Purple Loosestrife".
BioScience 43(10): 680-686.

Malecki, R., B. Blossey, and S. Hight. 1993. Guidelines For Release of Hylobius transversovittatus, Galerucella californiensis, and Galerucella pusilla for the Control of Purple Loosestrife (Lythrum salicaria L.). Available from authors.

Malecki, R, S. Hight, L. Kok, D. Shroeder, J. Coulson. 1991. Information for the Preparation of an Environmental Assessment. "Host plant specificity testing of Hylobius transversovittatus (Goeze) (Curculionidae), Galerucella californiensis (L.) and G. pusilla (Duftschmidt) (Chrysomelidae) for use in the biological control of Lythrum salicaria (L.) (Purple Loosestrife) in North America.

The Nature Conservancy. 1987. Element Stewardship Abstract for Lythrum salicaria (purple loosestrife). Minneapolis, MN.

Salatas, Johanna. 2000. "Removal of Inflorescence Not Recommended for Controlling Purple Loosestrife (Washington)." Ecological Restoration (18)2: 205-206.

Section 8: PHOTOGRAPHS

The first 6 photographs were taken from the Boulder Valley Ranch property around the Eagle Trail Pond that lies along Little Dry Creek. This area is described in the text as locality #2, west of north 51st St. in T1N R70W S5. The photographs were all taken from the south side of the drainage. The numbers correspond to the negative numbers.

3. a close-up of winged purple loosestrife amidst dense wetland vegetation
7. understory in an area dominated by L. alatum.
9. L. alatum habitat that includes some cattails, looking west to east from the southwest of the pond.
11. typical L. alatum habitat that is more open.
13. looking over L.alatum habitat to the mesas around Boulder Valley Ranch.
14. looking upslope to the south from the south side of pond with L. alatum habitat in the foreground.

Three photographs show the area west of Coot Lake when the Junior Rangers were gathering the flowering stalks of L. salicaria for burning as a means of control.

19. L. salicaria eaten by Galerucella spp. beetles.
21. Junior Rangers harvesting purple loosestrife.
22. L. salicaria habitat west of Coot Lake in the vicinity of the biocontrol release sites.

NOTE:

**HERBARIUM SPECIMENS FROM THIS STUDY
MAYBE FOUND IN THE OSMP HERBARIUM AND
THE C.U. HERBARIUM**

**PHOTOS FROM THIS STUDY MAYBE FOUND
WITH THE OSMP LIBRARY COPY**

Lynn Riedel - lythrum alatum report

From: "Debra Eberts" <DEBERTS@do.usbr.gov>
To: <armstronga@ci.boulder.co.us>, <wichmanna@ci.boulder.co.us>
Date: 9/12/01 12:16 PM
Subject: lythrum alatum report

I just received a copy of Jane Bunin's report on *L. alatum*. I wanted to correct some statements that she made.

On the bottom of page 3 she refers to the adults "creat(ing) a shothole half-moon pattern".

On pages 4-5 she notes a population of *L. alatum* with what she suspects is *Galerucella* feeding damage. She then goes on to describe the damage:

"These included a few half-moon shaped holes in lower leaves, which are characteristic of the *Galerucella* beetles."

This is misleading. Feeding of that sort (half-moon-shaped areas of removed tissue) resembles more the feeding of the root-weevil adults (*Hylobius transversovittatus*), but is frequently caused in this area by a number of species of caterpillars.

Feeding of *Galerucella* adults is a characteristic "shot-hole" pattern, with larvae causing leaf skeletonization. Frass in the apical meristems towards the end of June is also another sign to look for when searching for *Galerucella* damage.

Dr. Bernd Blossey of Cornell University has marked numbers of *Galerucella* and found that they can travel a distance of a mile. I have also observed, at a large site in WA, that they travel much greater distances than the 200 yards suggested by Dave Weber. They are strong fliers. 2002 levels of purple loosestrife at Coot Lake may be low enough to cause migration of beetles from the site in search of food.

Let me know if I can provide any further clarifications.

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Understory in an area dominated by *L. alatum*
BVR - Eagle Trail pond - Little Dry Creek

3A

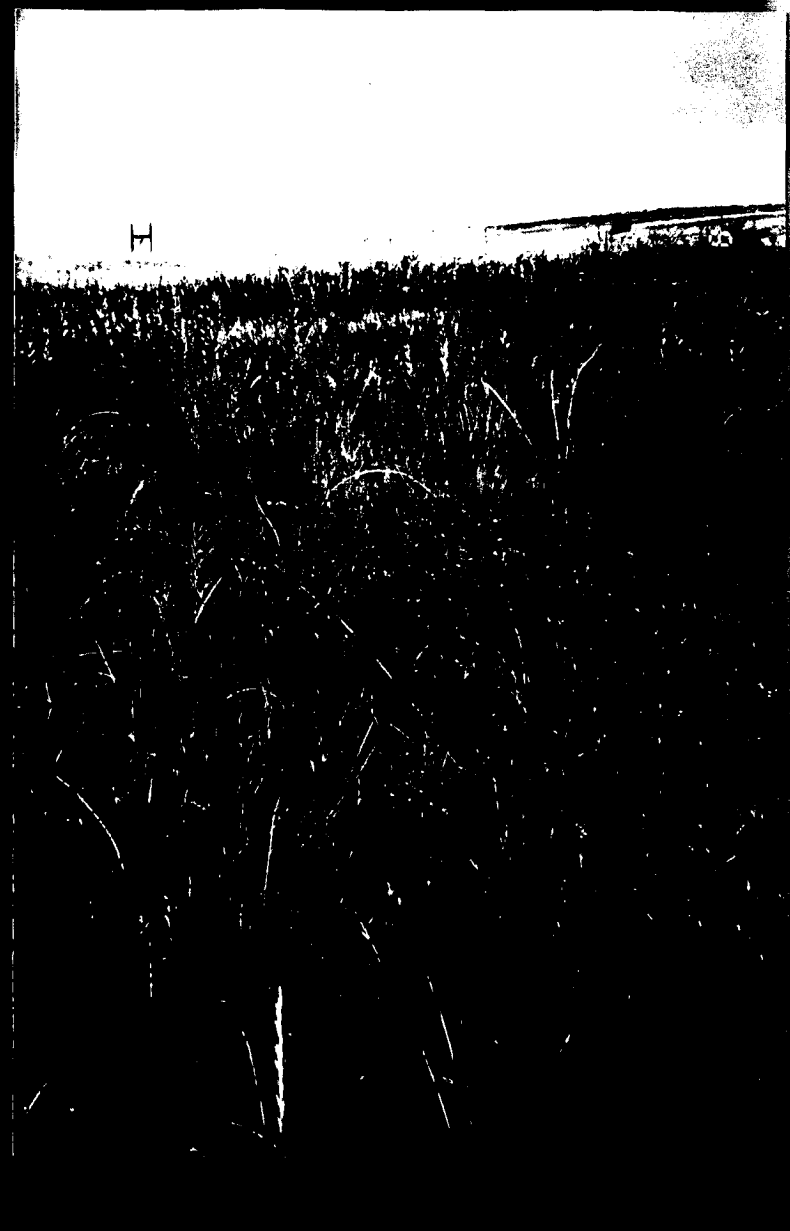
Close up of *L. alatum*
BVR - Eagle Trail pond - Little Dry Creek

9A *L. alatum* habitat BVR - Eagle Trail pond - Little Dry Creek

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14

L. alatum habitat BVR - Eagle Trail Pond -
Little Dry Creek

11A

L. alatum habitat (open example)
BVR - Eagle Trail Pond - Little Dry Creek

13A

L. alatum habitat BVR - Eagle Trail Pond -
Little Dry Creek

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BENTLEY

199

L. salicaria - showing herbivory by *Galerucella* spp.
 beetles
 west of: Coot Lake

21

L. salicaria - cutting stalks as a control treatment
 (Jim's Rangers)
 Coot Lake (west of lake)

23

L. salicaria habitat west of Coot Lake in the vicinity
 of the biological control release sites