

Study



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2000

**Final Report
Inventory and Status Report for
Lythrum alatum (Native Loosestrife)
and Eustoma grandiflorum (Prairie
Gentian)
William Jennings 2000**

Clairne —

When this rpt. is
entered into the system
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Thank you,

Pauline

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FINAL REPORT
INVENTORY AND STATUS REPORT FOR
LYTHRUM ALATUM (NATIVE LOOSESTRIFE) AND EUSTOMA GRANDIFLORUM
(PRAIRIE GENTIAN)
PREPARED BY WILLIAM JENNINGS, INDEPENDENT CONSULTANT
CITY OF BOULDER OPEN SPACE RESEARCH PROGRAM, 2000

Section 1: Abstract

The results of the first year of a proposed three-year study of Lythrum alatum and Eustoma grandiflorum on City of Boulder Open Space land are presented.

Lythrum alatum had previously been poorly documented by voucher collections at the University of Colorado Herbarium (COLO). Some additional collections were seen at the City of Boulder Open Space Herbarium. Over the course of the summer, the species was personally seen at nine sites. At four sites where it had been documented in recent years, plants were sought, but not found, or the sites were not visited. In addition, one new site was reported by others, but not personally visited. It is concluded that in the proper habitat, Lythrum alatum is still relatively abundant in the Boulder Valley, and not disappearing as had been feared by the lack of herbarium collections. No future work directed specifically toward this species is suggested. However, any general studies or monitoring of wetland habitats on Open Space should include Lythrum alatum as an element in such studies, as the plant seems to be an indicator of high-quality, little disturbed, wetlands.

Eustoma grandiflorum was seen on only one Open Space parcel (the Fell Property). However, it also occurs in abundance on the Weiser property, upon which the city has a conservation easement. Further, it occurs within inches of the Open Space property boundary at the margins of Teller Lake #5, but no plants were found actually on Open Space land. No plants were seen on the Kolb property, where plants had been seen in abundance in the 1980's and no plants were found on the Ertl property, where plants had been seen in the 1970's, prior to gravel mining.

There appears to be one extended population encompassing primarily Weiser and Fell and bisected by the Union Pacific railroad tracks. Thousands of plants were seen in this population during 2000. Weiser was actively summer-grazed, but no grazing occurred on Fell, yet the plants appeared to be of comparable vitality on both tracts. It appears that the critical factor is soil moisture. Both Weiser and Fell were much more moist than Kolb, where plants had been seen in the past, but none

in recent years. As long as moisture is present near the surface, the plants appear to thrive. Further monitoring of the population and continued searches for other populations are recommended.

Section 2: Statement of Objective and Hypothesis

Lythrum alatum and Eustoma grandiflorum are rare or uncommon plant species that are known to occur on City of Boulder Open Space lands. While neither of these species is afforded federal protection under the Endangered Species Act, each is uncommon enough to be of some concern within the Colorado botanical community. Both species are present in greater numbers on the more eastern and moister parts of the Great Plains (eastern Kansas, eastern Nebraska, etc.), but are rare at the base of the Front Range, the western limit of their ranges.

Lythrum alatum is not currently on the Colorado Natural Heritage Program list of plant species of concern (CNHP list), but is quite uncommon in Colorado, being largely confined to the moist meadows at the base of the Front Range. Prior to the current study, about five populations are known from Open Space, based on collections at COLO, KHD, and Boulder Open Space Herbarium (no herbarium acronym has been designated; I will use BOSH).

Eustoma grandiflorum is an indicator of alkaline wetlands, and has been known for many years to occur on the Boulder Creek floodplain east of 75th Street. The species is on the CNHP list.

It was proposed that these species should be surveyed to determine the location of populations, the numbers of blooming plants, and the changes that occur in these populations over a three-year period. It was suggested that such a multi-year study of status and changes should provide information that could be beneficial to land managers. These species are indicators of good quality moist prairie habitat. Changes in soil moisture, irrigation practices, grazing, and competition will likely impact these species to a noticeable degree. If it appears that populations are being impacted by current land use practices, recommendations for change can be formulated. If it appears that populations are thriving or increasing, this would be an indication that land use practices are reasonable.

Section 3: Description of Methods

A review of the available literature and herbarium collections

was undertaken first.

At present, not a great deal of literature is available specifically directed towards these species, although they are treated in the works of W.A. Weber (Colorado Flora: Eastern Slope; Rocky Mountain Flora) and in Flora of the Great Plains.

Prairie gentian (Eustoma grandiflorum) seems to have been the most intensively studied. William Jennings, author of this report, prepared a report on the herbarium record for Eustoma grandiflorum and his own searches for plants in 1989. A number of locations on the eastern Colorado plains were searched and plants were found at a few sites. (Jennings, William F., Final Report, Colorado Natural History Small Grants Program, December 20, 1989). Ed and Jean Dubois and Dorothy and Bob Udall "adopted" the species as part of the Colorado Natural Heritage Program's "adopt-a-rare-plant program." They visited several sites in 1990 and collected specimens at 6 sites. (Jennings, William F., Report of Activities - 1990, Adopt-a-Rare-Plant Program, November 20, 1990). Both the Dubois and the Udalls continued their searches and monitoring in 1991 and the Dubois continued in 1992. The Dubois directed Mr. Jennings to another site, which he collected in 1991. (Jennings, William F., Report of Activities - 1991, Adopt-a-Rare-Plant Program, December 31, 1991; Jennings, William F., Report of Activities - 1992, Adopt-a-Rare-Plant Program, December 31, 1992).

The above searches failed to uncover any populations in Boulder County beyond the one known on the Boulder Creek floodplain east of 75th Street. That population was documented as early as 1972 (Brown 459, COLO), when botanical work was done on the Ertl property, then slated for gravel mining. This author first saw and photographed plants on the Kolb property just east of 75th Street on August 15, 1986. City of Boulder volunteers (Elaine Smith, Elaine Hill, Janine Shawver, and others) monitored the Kolb site from 1988 through 1992. While numerous plants were seen in 1988 and 1989, only 2 were found in 1990, none in 1991, and 12 in 1992. Elaine Smith collected a specimen from this site on August 11, 1988 (Smith 403, COLO and BOSH).

Lythrum alatum, since it is not on the CNHP list, has not been the subject of much interest and no reports dealing with this species are known. In Colorado Flora: Eastern Slope, Weber & Wittmann comment that Lythrum alatum is "common in wet swales in the piedmont valleys near Boulder." However, this is not supported by the herbarium record at the University of Colorado. Specimens at the herbarium were seen from 10 locations in Boulder, Jefferson, and Denver counties. Other information at

the herbarium indicated this species had been collected in Weld and Yuma counties, but no specimens were seen. All but two specimens at COLO predate 1916, and this alone would seem to indicate it is disappearing as wetlands are drained or developed. The two recent collections are from the Boulder tallgrass prairie along South Boulder Creek (Santanachote 75) in 1988 and from Rocky Flats (Kunkel & Shultz 329) in 1973. Dr. Weber has apparently never collected the species.

The author of this proposal, in collaboration with ESCO Associates (Dr. David Buckner) surveyed the buffer zone at the Rocky Flats site for Spiranthes diluvialis in 1993, 1994, and 1995. Although not the focus of the study, Lythrum alatum was noted in several wetland locations, including the site collected in 1973 as documented at the herbarium.

At the Boulder Open Space Herbarium, there are five specimens of Lythrum alatum, all collected within the last 15 years. One is from Boulder Valley Ranch north of Boulder, but specific site data are not provided. Two are from the Burke property, south of Baseline Road and west of Cherryvale. One is from Van Vleet, south of South Boulder Road and north of US 36. One is from tallgrass prairie sites 1 and 2, west of Cherryvale and south of US 36. Interestingly, these collections contradict the results of study of specimens at COLO.

With the above in mind and considering habitat requirements, specific sites on Open Space were targeted for study during the summer blooming season. Since these are plants of wet meadows, the floodplains of Boulder Creek and South Boulder Creek were the primary focus. The herbarium record provided guidance as to when the surveys would be most fruitful, usually during the peak blooming season for the species. These species tend to have mid- to late-summer blooming seasons (July-August). Targeted areas were walked during the period July 11 to August 28, 2000. In addition, oral reports of Lythrum alatum came in from other researchers working on City of Boulder Open Space, and most of these sites were visited as well. Dr. Jane Bunin, Don d'Amico, and Lynn Riedel reported sites.

When known populations were visited or new populations were found, notes were taken regarding the condition of the population in general. Photographs and specimens were taken to document the observations. Counts of blooming plants were made for Eustoma grandiflorum, but the populations of Lythrum alatum were usually too large to count.

Section 4: Results

Lythrum alatum

Fourteen populations are now known for Open Space lands. Some populations documented by herbarium specimens were not rediscovered during this year's searches. The following populations were seen in 2000, or are documented by herbarium specimens collected within the last 15 years, or are reported by reliable observers, but not personally visited. Localities of recent herbarium specimens are presumed to document populations still in existence.

- 1) South Boulder Creek Trail, near old Open Space Operations Center (now razed) (T1S R70W sec 16 SW 1/4)

The wetland immediately adjacent to the trailhead and old Open Space Operations Center harbors a population of Lythrum alatum. Also present in this wetland are bog orchids (Platanthera sp.), Ute ladies'-tresses orchid (Spiranthes diluvialis), and Lobelia siphilitica. On July 11, 2000, the Lythrum alatum was observed in bloom along the southern margin of the wetland, generally in areas away from the wettest spots. On July 28, 2000, about 500 plants were counted at the margins of the wetland. Spiranthes diluvialis was in bloom as well. Thirteen plants were observed.

- 2) Boulder Tallgrass Prairie Site 3 (T1S R70W sec 21)

This site is just southwest of Sans Souci Trailer Court, on the west side of Broadway (Colorado 93) and south of South Boulder Creek. There is a specimen at COLO (Santanachote 75) collected at this site on August 31, 1988. In addition, a very old specimen (Ramaley 860, COLO) collected on August 19, 1901 and labeled: "moist place, meadow, Marshall" may have been collected here as well. In those days, it would have been a short walk from the Marshall railroad depot westerly across what is now Colorado 93 and around the hill to this site. Ramaley would not have had to cross the creek to access this site from the depot.

The site was not personally visited during the summer of 2000.

- 3) South Broadway (Colorado 93) at Marshall Road (T1S R70W sec 16 NW 1/4)

At the point where Marshall Road joins Broadway, Marshall Road runs east-west for about 100 feet, then turns south onto the original alignment. On the south side of this short east-west portion of the road, on the highway right-of-way, there is a

population of Lythrum alatum. About 30 to 40 stems were seen at this location on August 11, 2000, associated with Typha latifolia, Asclepias incarnata, Verbena hastata, Juncus sp., Salix exigua, and teasel (Dipsacus sylvestris). This is a location where the swamp milkweed has been observed many times in the past. However, the cattails and milkweed are stunted this year due to the dryness.

4) Rolling Rock Ranch (T1S R70W sec 16 center)

Lynn Riedel and Don d'Amico report Lythrum alatum from wet meadows on Rolling Rock Ranch during the summer of 2000. The site is reported to be due east from the trailhead, then due north. This area is a few hundred feet east of the above site, but was not personally visited.

5) Boulder Tallgrass Prairie Sites 1 and 2 (T1S R70W sec 15 NW 1/4)

There is a specimen of Lythrum alatum from this site (Lederer 238, BOSH), which is west of Cherryvale Road, south of US 36, and northwest of the Hogan and Buckner residences. In addition, Lynn Riedel reports seeing plants at this site during the summer of 2000. The site was not personally visited.

6) Van Vleet north of US 36 (T1S R70W sec 9 & 10)

There is a specimen from Van Vleet north of US 36 (Boulder Open Space Volunteers 677, BOSH), collected August 1, 1989, but no populations of Lythrum alatum were personally found on Van Vleet north of US 36 or on Van Vleet south of US 36, in the areas of greatest concentration of Spiranthes diluvialis, when searched August 3, 2000.

7) South Boulder Creek Trail from Bobolink Trailhead south (T1S R70W sec 3).

No populations of Lythrum alatum were found on the Burke I tract either west of South Boulder Creek, east of South Boulder Creek, or along the creek on August 3 or August 6, 2000, in spite of the fact that specimens are known from the area (Shawver 21, BOSH; Hill 98, BOSH). The area west of the creek was flooded by irrigation water or had been mowed for thistle. East of the creek there is plenty of habitat for the plant, but nothing was found.

8) Dry Creek Trail, between Baseline Road and Baseline Reservoir (T1S R70W sec 2 NW 1/4 NE 1/4)

A few plants (15 stems counted) were observed on the northwest side of Dry Creek, more or less opposite the trailhead parking area. This site is being encroached by Canada thistle (Cirsium arvense). All wetland areas on Open Space property between Baseline Reservoir and Baseline Road were checked. The site was visited August 4 and August 6, 2000.

9) Along South Boulder Creek, west of Stazio Ballfields (T1N R70W sec 27)

Two populations of Lythrum alatum were found in Open Space along South Boulder Creek west of the Stazio Ballfields and west of the Union Pacific tracks. There is an east-west concrete trail that goes under the UP tracks from the west side of Stazio Ballfields. A short distance west of the tracks, but east of the creek, there is a long, low, north-south ridge (berm) that may mark a sewer line. Walk south on the top of the berm. At 185 paces on the right and 230 paces on the left, plants of Lythrum alatum were found. At the first location, there is a seep facing west (toward the creek), where six clumps of Lythrum alatum occur with Verbena hastata, Epilobium ciliatum, Typha latifolia, Asclepias incarnata, Lobelia syphilitica, and species of Juncus, Scirpus, and Carex. At the second location, there is a seepy area facing east where one clump of Lythrum alatum occurs with Verbena hastata, Epilobium ciliatum, Typha latifolia, Asclepias incarnata, and Elaeagnus angustifolia.

Of further interest are a few plants of Lythrum salicaria (purple loosestrife) that occur directly under the high-voltage power lines 318 paces (4 plants) and 440 paces (4 plants) north of the same east-west concrete trail. Signs were posted regarding usage of herbicide on these plants. However, on August 9, 2000, they looked very healthy.

10) Biddle Property (T1N R70W sec 24)

This property is south of the Union Pacific tracks and west of 75th Street. The Sawhill Ponds area is just northwest of this tract. In the western portion of this tract, eight large clumps were found; in the central portion 42 clumps; and in the eastern portion eight clumps. The area was walked August 6, 2000.

Plants also extend northward onto the southern portion of the Union Pacific right-of-way, but a previous search did not indicate any plants on the north side of the tracks. The plants are rhizomatous and plants in clumps are probably intimately interconnected underground. An exact count of plants is impractical. A clump may include only one or two plants or may include several, but without digging up the whole population it

is impossible to say for sure. The plants occur at the margins of the cattails. Associated species identified include two species of mints, Scirpus pungens, Carex nebrascensis, Asclepias incarnata, Helianthus nuttallii, and Helenium autumnale.

11) Manchester Property (T1N R70W sec 24)

This area is just east of the Biddle property, but across 75th Street, and really constitutes an eastward extension of that population, but the presence of 75th Street divides the areas. At 70 paces east of the north-south fence, and up against the UP east-west right-of-way fence, a few clumps of Lythrum alatum associated with cattails and Helenium autumnale were seen August 10, 2000.

12) Fell Property (T1N R70W sec 24)

This area is best known for the large population of Eustoma grandiflorum, but a few stems of Lythrum alatum were found on August 10, 2000, near the Fell Property west fence south of the cattail sloughs, associated with Lobelia syphilitica, Helenium autumnale, Epilobium ciliatum, Elaeagnus angustifolia, and species of Carex, Juncus, and Scirpus. First seen by Lynn Riedel and Kathy Damas in 2000.

13) Near Boulder Reservoir, mostly on Boulder Valley Ranch (T1N R70W sec 5)

Along Eagle Trail, west of Boulder Reservoir, there is a dammed pond on Little Dry Creek with a huge population of Lythrum alatum. This site was brought to my attention by Jane Bunin. There is a specimen at BOSH collected by Foster on July 2, 1986, that is likely from this site, but the label indicates only that it was collected on Boulder Valley Ranch. The pond margin was walked on August 13, 2000, in a clockwise direction from the southeastern corner of the dam, westerly, northerly, then easterly back to the dam. Lythrum alatum was present by the millions of plants, starting about halfway along the south side of the pond, west to near the center of section 5 on both branches of the creek. The population continues around the north side to just east of the north-south fence. East of that point, it is mowed for weeds right up to the edge of the cattails. There is no habitat on the rest of the north side of the pond, which is grassy right to the edge of the pond. In most areas, it is subdominant, and occupies a zone just outside of the cattails. This zone is being invaded by weeds especially teasel, Canada thistle (Cirsium arvense), sowthistle (Sonchus asper) and prickly-lettuce (Lactuca serriola). In some places, the Canada

thistle is nearly impossible to walk through.

Little Dry Creek downstream from the dam, as far east as North 51st Street, was also searched. A few patches of Lythrum alatum were found just below the dam and on the south side of the cattails for about 100 to 200 feet downstream, and then it disappears. There is a patch on the north side of the creek at the road, but no more were seen further west on the north side of the creek.

There is a hillside seep northwest of the sweeping curve in the road. The seep faces southerly above the valley of Little Dry Creek, and well south of Eagle Trail. At this location, there are plants of Lythrum alatum near cattails and swamp milkweed.

Near these three localities, associated species included cattails, several species of mints, swamp milkweed (Asclepias incarnata), and Verbena hastata.

14) Near Boulder Reservoir, Axelson Property (T2N R70W sec 33 SE 1/4)

This is an area discovered by Jane Bunin in her research on purple loosestrife. The site is north of the road (which runs due east-west here), opposite a big cottonwood tree on the south side of the road. Two patches of Lythrum alatum were seen August 10, 2000 at the margins of cattails. Teasel (Dipsacus sylvestris) is a problem here. Other areas on the south side of the road seem to have proper habitat, but much is mowed due to the teasel infestation. Nothing was seen on August 10, 2000.

Negative searches:

The following areas were searched without success. Included are areas documented by herbarium specimens, but where no plants were found in 2000. Also discussed here are the localities of some old herbarium specimens.

1) Flagstaff Mountain

There is a very old herbarium specimen collected in 1906 (Robbins 2570, COLO) with Flagstaff Mountain as the collection locality.

Considering the habitat requirements observed during 2000, it would seem that this location was probably along Gregory Canyon Creek, between the mouth of the canyon west of Chautauqua and the confluence with Boulder Creek. Possibly the creek was impounded

along here as a stock pond with a margin of cattails. This area is now developed and any habitat is likely destroyed or inaccessible. It is less likely that the plant was collected upstream from Flagstaff Mountain Road, as the proper habitat is not currently present.

- 2) South Boulder Creek Trail, southwest from old Open Space Operations Center (T1S R70W sec 16)

No additional plants were found in or near wetlands farther southwest along the South Boulder Creek Trail, which was walked on June 22, July 11, and July 28.

- 3) South Boulder Creek Trail and adjacent lands from South Boulder Road south (Van Vleet) (T1S R70W sec 9 & 10)

There is a specimen from Van Vleet north of US 36 (Boulder Open Space Volunteers 677, BOSH), collected August 1, 1989, but no populations of Lythrum alatum were found on Van Vleet north of US 36 or on Van Vleet south of US 36, in the area of greatest concentration of Spiranthes diluvialis. A specimen collected in 1959 "near Boulder Turnpike, growing in open in tall grass in damp soil" (Brunquist s.n., KHD) may have been collected here. In the proper habitat, it appears that prairie cordgrass has increased substantially, possibly choking out the Lythrum alatum.

Farther south, the area from the margins of the old gravel pits (University of Colorado property) eastward to South Boulder Creek was searched without success. This area appears to be too dry and weedy for Lythrum alatum. The area was walked August 3, 2000. Southernmost point walked was the point where the trail turns abruptly west toward the Rolling Rock Ranch tract. The Fancher and Rolling Rock Ranch tracts were not personally visited, however Lynn Riedel and Don d'Amico report Lythrum alatum from wetlands on the Rolling Rock Ranch tract.

- 4) South Boulder Creek Trail from Bobolink Trailhead south (T1S R70W sec 3)

No populations of Lythrum alatum were found on the Burke I tract either west of South Boulder Creek or east of South Boulder Creek in spite of the fact that specimens are known from both areas (Shawver 21, BOSH; Hill 98, BOSH). No orchids (Spiranthes diluvialis) were personally seen in either area in 2000, even though orchids are also known from both areas and have been personally seen in prior years. Burke I west of the creek was largely flooded by irrigation water. Drier areas were mowed for

thistle. Burke I east of the creek shows good Lythrum habitat, but no plants were found. Some white-flowered plants of swamp milkweed (Asclepias incarnata) were seen on Burke I east of South Boulder Creek in habitat ideal for Lythrum alatum. The area seems to have a lot of dogbane (from casual inspection, probably Apocynum cannibinum, but Apocynum androsaemifolium or hybrids are likely present as well). The area was walked on August 3 and August 6, 2000.

5) Burke II north of Baseline Road (T1N R70W sec 34)

No populations of Lythrum alatum were found. The area is either mowed for hay or is overgrown with prairie cordgrass. Habitat is not good for Lythrum. The site was walked August 3, 2000.

6) East of Campus

There is an old specimen collected in 1906 (Robbins 2507, COLO) with this as the collection locality. This is too general to be located precisely, but may be in the area of the current CU research park, north of Colorado Avenue and west of Foothills Parkway. Man-made wetlands here may be mature enough to harbor populations of Lythrum alatum. Not personally visited during the summer of 2000.

7) North of Stazio Ballfields, near old brickyard and Public Service facilities, east of railroad tracks, west of 63rd St.
(T1N R70W sec 27)

There is an old specimen of Lythrum alatum (Ramaley 1291, COLO) collected in 1905 "in swamp, below brickyard near Boulder" that appears to refer to this site. Habitat is still present, but no plants were found. This area was walked on August 3, 2000.

8) South Boulder Creek at Valmont Road bridge (T1N R70W sec 22 & 27)

This area is a short distance west of the above site. Nothing was found in the wetlands along the creek either north or south of the bridge, along the paved trail, when the site was searched on August 9, 2000.

9) West of 75th Street, along the entrance road to Sawhill Ponds
(T1N R70W sec 24)

The entrance road is north of the Union Pacific Railroad tracks. no plants were seen on the north side of the tracks; however, a substantial population occurs on the south side of the tracks.

Habitat is appropriate and plants may be scattered here and there but were not visible from the road. Echinocystis lobata is present.

10) Kolb Property (T1N R70W sec 24)

This property is east of 75th Street and north of the Union Pacific tracks. No habitat was found that is proper for Lythrum alatum. The old creek bed that meanders across the property was dry and full of Persicaria sp. This site was checked June 22, July 11, and August 6, 2000.

11) White Rocks Preserve (Ertl property and adjacent Weiser Property), north of Boulder Creek (T1N R69W sec 17 & 18)

These areas were visited August 17 and August 21, 2000, with Lynn Riedel and David Anderson of CNHP to view the Apios americana. However, other plants were sought as well. No Lythrum alatum was seen in the moist areas at the base of the cliff, or growing in wet cracks, or along the creek.

12) Weiser Property, south of Boulder Creek (T1N R69W sec 18)

This area, rich in Eustoma grandiflorum, was walked on August 24, 2000, but no Lythrum alatum was found. Proper habitat is present.

13) Ertl Property (T1N R69W sec 17 & 18)

The Ertl property south of Boulder Creek, west of the East Boulder/White Rocks Trail, and as far west as the Weiser property fence, was walked on August 25, 2000. This is an area of old gravel pits. The many lakes and prairie dog towns are not habitat. Other areas were mowed, particularly north of the lakes near the south side of the creek. One good area was found in a seepy spot below the UP tracks and between some small lakes, where the water table was very near the surface. Lots of Lobelia syphilitica, Agalinus tenuifolia, and Helenium autumnale were found, but no Lythrum alatum. One tamarisk was seen.

14) Culver property (T1N R69W sec 17)

That portion of the Culver Property at the northern margins of the ponds just west of 95th Street was checked for Lythrum alatum on August 24, 2000, but none was found. Some Lobelia syphilitica was found along the northwestern pond margin. There are some tamarisks in here. The southern portion of the property was

walked on August 28, but nothing was found. Reclamation vegetation in the southern portion is not as mature as along the northern margin of the lakes. The area is very weedy.

15) Teller Lake #5 (T1N R69W sec 20)

The margin of the lake was walked on August 28, 2000, but no Lythrum alatum was found. This is known Eustoma area.

Eustoma grandiflorum

One extended population is known for Open Space lands, east of 75th street and west of 95th Street, on the Boulder Creek floodplain. A second population in this area, but not on the floodplain is at Teller Lake #5.

1) Fell Property (T1N R70W sec 24)

Lots of Eustoma grandiflorum were seen on the first visit to this site on August 4, 2000. Plants were seen in good bloom in several patches along with some singles. All plants had purple flowers. In addition, Spiranthes diluvialis was seen in bloom. On the second visit, August 10, 2000, plants were counted (2,376 plants). Only those in bloom or fruit were counted. Rosettes, sterile plants, or shoots hidden below the level of the grass were not counted or searched for. Nearly all plants were found north of a cattail-filled slough that meanders across the property from west to east. Plants were in large patches, as well as scattered as singles or a few plants. Seven large localized patches, with 165 to 320 plants counted, depending upon the patch, constituted the bulk of the population (1,620 plants). Plants seemed to be healthy, blooming and fruiting normally, in spite of the abnormal heat and dryness of the summer of 2000. The Fell property was not grazed during the summer of 2000.

Tom Grant, Denver Botanic Gardens research associate, collected some soil samples at Fell. The Colorado State University Soil, Water, and Plant Testing Lab provided analyses of the soil. Mr. Grant shared the data. The soil was characterized as a sandy clay loam, with sand-sized particles at 46 to 64 percent of the sample. Organic matter was from 2.4 to 7.9 percent. The soil pH was well above neutral at 8.1 to 8.5, and the lab indicated the lime (CaO) content was "high." These results were to be expected, considering the site is on a floodplain near an ancient stream channel and considering the generally high pH of soils and waters on the Colorado plains. Nitrogen (nitrate) was low (4.9

to 10.7 ppm) and phosphorus was low (1.0 to 1.3 ppm) but potassium was high (136 to 461 ppm). Iron content was high at 70 to 90 ppm, but the concentration of other metals was not particularly high.

2) Weiser Property (T1N R69W sec 18).

The City of Boulder does not own this tract, but does have a conservation easement. A very large population of Eustoma grandiflorum was seen on August 4, 2000. Ms. Weiser was very aware of the population, personally took us to the site, and provided a sketch map of where she had seen the plants in years past. Both purple and white-flowered plants were seen and photographed.

About 25 plants were seen just inside the Weiser property line fence from the Kolb property on August 6, 2000, in the extreme southwest corner of the Weiser property.

The Weiser population was counted on August 24, 2000. On that date, 1,988 plants (in bloom or fruit or generally obvious) were counted. As with Fell, plants in rosette stage or sterile plants were not counted. All plants were in the southern portion of the property, south of a slough that crosses from west to east, in a pasture (South Pasture) actively summer-grazed by cattle. As with Fell, the plants appeared to be healthy and reproducing normally. The plants were not being grazed by the cattle, in accord with gentian populations observed previously in Weld County, where plants were trampled, but not eaten by cattle. Plants were localized near low spots that were a little more moist than the rest of the field. The pasture was being irrigated, and in some areas it was flooded to a depth of an inch or two, but not in the gentian areas. The largest concentrations of plants were in the topographically lowest areas, near a stand of cattails, where the five largest patches were from 111 to 303 plants (total 1,031 plants). As with Fell, plants were in large patches, or scattered as singles and small patches. There were no noticeable patterns of growth or blooming to differentiate the Weiser plants from those on Fell. Habitat here was perfect for Lythrum alatum, however, none of the loosestrife was found. Some plants of Helenium autumnale and blue-eyed grass (Sisyrinchium sp.) were found. The species of blue-eyed grass that inhabits the Boulder valley floodplains is a summer blooming species and is not Sisyrinchium montanum. These plants also occur on Van Vleet, associated with Spiranthes diluvialis. It could be Sisyrinchium idahoense.

3) Teller Lake #5 (T1N R69W sec 20)

With the assistance of David Anderson of CNHP, the margin of the lake was walked on August 28, 2000, but no Eustoma grandiflorum was found actually on Open Space property. However, plants were found only inches outside the fence (or where the fence had been). South of the lake, on private property just south of where the fence had been, 99 plants were counted. This site was not being grazed in the summer of 2000. Plants were scattered in small patches in slightly moist spots in the grass. On the east side of the lake, by looking over the (electric) fence, 25 were counted within 3 feet of the fence. More plants could be seen scattered in the pasture, but this was as far as counting could be extended accurately without getting jolted by the electric fence. Most plants were near a ditch or were in low, moist spots. This pasture was very heavily grazed by horses. In both localities, the plants appeared to be of comparable health. On another day, Clairelyn Dexter (Dexter Farms Market) said she was aware that the plants were in the area, indicating they were "all over the place," without being specific. The horse pasture mentioned above is more or less directly across Valmont Road from her market.

Negative areas:

- 1) South Boulder Creek, from confluence with Boulder Creek upstream to the old Open Space Operations Center site.

Nothing was found in the South Boulder Creek watershed. Areas were searched primarily for Lythrum alatum but any plants of Eustoma grandiflorum that might have been present would have been in the same general habitat. The following areas were checked, arranged from upstream to downstream. South Boulder Creek trail southwesterly from old Open Space Operations Center site, June 22, July 11, and July 28, 2000; near Broadway and Marshall Road, August 11, 2000; Van Vleet, north and south of US 36, August 3, 2000; Burke I, east and west of South Boulder Creek, August 3 and August 6, 2000; Burke II, north of Baseline Road, August 3, 2000; near Stazio Ballfields, August 3 and August 9, 2000; Dry Creek trailhead near Baseline Reservoir, August 4 and August 6, 2000.

- 2) Vicinity of Boulder Reservoir

The Little Dry Creek drainage was searched primarily for Lythrum alatum west and northwest of Boulder Reservoir. No trace of the prairie gentian was found on August 10 and August 13, 2000.

- 3) Entrance road to Sawhill Ponds (T1N R70W sec 24)

This area is on the floodplain of Boulder Creek, south of the

creek and west of 75th Street. Wetlands occur along the entrance road near the UP railroad tracks, but nothing was seen north of the tracks and south of the road on August 3, 2000.

4) Biddle Property (T1N R70W sec 24)

This area is west of 75th street and south of the Union Pacific tracks. A large population of Lythrum alatum was found, but no Eustoma. Habitat appears to be correct for the prairie gentian. The site was walked August 6, 2000.

5) Manchester Property (T1N R70W sec 24)

This is the area just west of the Fell property. While there were thousands of gentians on Fell, nothing was found to the west. Habitat appeared to be identical.

6) Kolb Property (T1N R70W sec 24)

The Kolb property east of 75th Street and north of the Union Pacific Railroad tracks was walked on June 22, July 11, and August 6, 2000. No sign of the prairie gentian was found. The area is very dry and very weedy. Weeds identified were: Cirsium arvense, Dipsacus sylvestris, Cirsium vulgare, Sonchus asper, and in dry areas, patches of a perennial species of Spergularia. Low spots, which connect together to form an ancient creek channel, were bone dry. In the past these had had at least a little standing water. There is one herbarium specimen from here (Smith 403, COLO, BOSH)

Plants were seen on the Weiser property on August 6, 2000, by looking across the fence from Kolb onto the extreme southwest corner of Weiser. No plants were seen in the southeastern corner of Kolb, only a few feet away. This same patch was visited from the Weiser side of the fence on August 24, but nothing was seen across the fence on Kolb.

7) White Rocks Preserve (Ertl property and adjacent Weiser Property), north of Boulder Creek (T1N R69W sec 17 & 18)

These areas were visited August 17 and August 21, 2000, with Lynn Riedel and David Anderson of CNHP to view the Apios americana.

However, other plants were sought as well. No Eustoma grandiflorum was seen in the moist areas at the base of the cliff, or growing in wet cracks, or along the creek.

8) Ertl Property (T1N R69W sec 17 & 18)

The Ertl property south of Boulder Creek, west of the East Boulder/White Rocks Trail, and as far west as the Weiser property fence, was walked on August 25, 2000. This is an area of old gravel pits, now reclaimed, but not yet close to natural except very locally. There is a specimen (Brown 459, COLO) from this area, apparently taken before gravel mining. The many lakes and prairie dog towns are not habitat. Other areas were mowed, particularly north of the lakes near the south side of the creek. One good spot was found in a seepy area below the UP tracks and between some small lakes, where the water table was very near the surface. Lots of Lobelia syphilitica, Agalinus tenuifolia, and Helenium autumnale were found, but no Eustoma grandiflorum. One tamarisk was seen.

9) Culver property (T1N R69W sec 17)

That portion of the Culver Property at the northern margins of the ponds just west of 95th Street was checked for Eustoma grandiflorum on August 24, 2000, but none was found. Some Lobelia syphilitica was found along the northwestern pond margin. There are some tamarisks in here. The southern portion of the property was walked on August 28, 2000, but nothing was found. Reclamation vegetation in the southern portion is not as mature as along the northern margin of the lakes. The area is very weedy and is not habitat for prairie gentian.

Section 5: Conclusions

As a result of the study, there are at least 14 known locations for Lythrum alatum on City of Boulder Open Space. It is concluded that in the proper habitat, Lythrum alatum is still relatively abundant in the Boulder Valley, and not disappearing as had been feared by the lack of herbarium collections. No future work directed specifically toward this species is suggested. However, any general studies or monitoring of wetland habitats on Open Space should include Lythrum alatum as an element in such studies, as the plant seems to be an indicator of high-quality, little disturbed, wetlands.

Eustoma grandiflorum was seen on only one Open Space parcel (the Fell Property). However, it also occurs in abundance on the Weiser property, upon which the city has a conservation easement.

Further, 124 plants were seen very near, and sometimes within inches of the Open Space property boundary, at the margins of Teller Lake #5, but no plants were found actually on Open Space land.

No plants were seen on the Kolb property, where plants had been seen in abundance in the 1980's and no plants were found on the Ertl property, where plants had been seen in the 1970's, prior to gravel mining.

There appears to be one extended population on the Boulder Creek floodplain, encompassing primarily Weiser and Fell and bisected by the Union Pacific railroad tracks. Thousands of plants were seen in this population during 2000 (1,988 on Weiser and 2,376 on Fell in flowering or fruiting condition). If rosettes and sterile plants were counted, the total would probably double.

Weiser was actively grazed during summer 2000, but no summer grazing occurred on Fell. Similarly, no summer grazing occurred at the south side of Teller Lake #5, but summer grazing did occur east of the lake. The plants appeared to be of comparable vitality whether they occurred in grazed or ungrazed areas. Over the long term, trampling is likely to be a factor. The summer of 2000 was extremely hot and dry. It appears that the critical factor is soil moisture. Both Weiser and Fell were much more moist than Kolb, where plants had been seen in the past, but none in recent years. As long as moisture is present near the surface, the plants appear to thrive. Good weed control and general land management practices are important for Eustoma grandiflorum to return to Kolb or thrive on Fell. Further monitoring of the population and continued searches for other populations are recommended.

During the course of the study, the following specimens were taken, to be placed in an appropriate herbarium. The specimens have been given to Open Space.

Spergularia sp., Kolb property, June 22, 2000, Jennings 1226

Spergularia sp., Kolb property, July 11, 2000, Jennings 1228

Lythrum alatum, wetland near old Open Space Operations Center, July 11, 2000, Jennings 1229

Lythrum alatum, Biddle Property, west of 75th St., south of UP tracks, August 6, 2000, Jennings 1235

Lythrum alatum, along South Boulder Creek, west of Stazio Ballfields, August 9, 2000, Jennings 1236

Lythrum alatum, near Boulder Reservoir, T2N R70W sec 33 SE 1/4, August 10, 2000, Jennings 1238

Lythrum alatum, Manchester Property, east of 75th St., south of UP tracks, T1N R70W sec 24 NE 1/4, August 10, 2000, Jennings 1239

Helenium autumnale, Manchester Property, east of 75th St., south of UP tracks, T1N R70W sec 24 NE 1/4, August 10, 2000, Jennings 1240

Lythrum alatum, South Broadway (Colorado 93) at Marshall Road,

August 11, 2000, Jennings 1241

Tamarix sp., Culver Property, south of Leggitt Ditch, west of ponds, August 24, 2000, Jennings 1244

During the course of the study, photographs were taken of the specified plants at the localities indicated. Photographs have been given to Open Space.

Lythrum alatum, wetland near old Open Space Operations Center, July 28, 2000

Alisma triviale, wetlands along South Boulder Creek trail, southwest of old Open Space Operations Center, July 28, 2000

Asclepias incarnata (white flowers), Burke I, west of Cherryvale Road and east of South Boulder Creek, August 3, 2000

Eustoma grandiflorum (both purple and white color forms), Weiser Property, August 4, 2000

Lysimachia vulgaris, along South Boulder Creek, west of Stazio Ballfields, August 9, 2000

Lythrum alatum, Manchester Property, 70 paces east of 75th St., south of UP tracks, August 10, 2000

Apios americana, base of cliff at White Rocks, White Rocks Preserve (Ertl Property), August 18, 2000

Aristida basiramea, in cracks in "turtlebacks," White Rocks,
north of Boulder Creek, Weiser Property, August 21, 2000

Asplenium adiantum-nigrum, cracks of overhanging cliff, White
Rcks, Weiser Property, August 21, 2000

Lobelia syphilitica, cracks of overhanging cliff, White Rocks,
Weiser Property, August 21, 2000