Comparison of Seed Production and Germination in Three Distinct Colonies of *Lesquerella ludoviciana*.

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ABSTRACT

Lesquerella ludoviciana (Nutt.) S. Wats. (silvery bladderpod) is an endangered, sand prairie plant in Illinois, where its only known habitat is the Henry Allen Gleason Nature Preserve. Three colonies are found within the preserve: North Bowl – upper, North Bowl – lower, and South Bowl. Objectives were to compare seed production and germination in these colonies. Stages of plant development (seedlings, vegetative, and reproductive), flower stalks, flowers, and fruits were counted in each colony on May 4, June 1, June 16, and July 16, 2000. Seed was collected from each colony on June 1 and 16, 2000. On June 1, seed was divided into early (lower portion of the flower stalk) and late (upper portion of the flower stalk) flowering groups. On June 16, only seed of the late flowering group remained on plants. Thus, three seed lots of differing maturity were tested. Seeds were germinated in petri dishes at 25ºC in continuous light, and counted every two to three days. Seed production was estimated using reproductive plant density, fruit numbers, and seeds per fruit. The three colonies varied greatly in seed production. The North Bowl – lower produced ten times more seed than the South Bowl, and sixty times more seed than the North Bowl – upper. Differences in seed production in each colony are due to many factors including: area (South Bowl – 270 m^2, North Bowl, upper – 1025 m^2, North Bowl, lower – 3248 m^2), density of reproductive plants (South Bowl – 1.4 plants/m^2, North Bowl, upper – 0.1 plants/m^2, North Bowl, lower – 1.1 plants/m^2), and presence of other plant species. Overall, germination percentages ranged from 20% to 66%. No colony differences in germination were observed. For each seed lot, a different colony exhibited better germination. Thus, no differences in germination were found due to colony but the seed production differed greatly between the colonies.

A *Lesquerella* plant in its native habitat

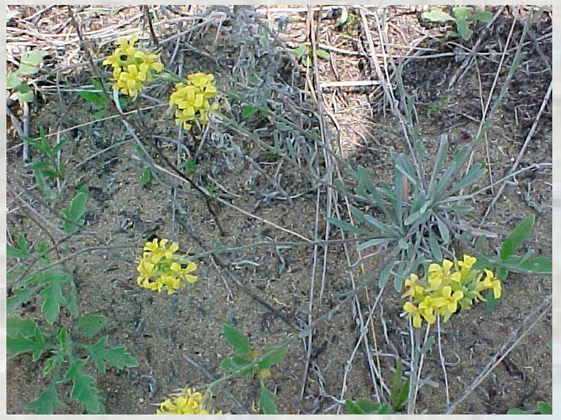
INTRODUCTION

Lesquerella ludoviciana (silvery bladderpod) is a native plant that is endangered in Illinois. Other than descriptive information, habitat location, and reports of its existence, little is known about *Lesquerella ludoviciana* at the eastern edge of its range (Herkert, 1991). At present, the only place that it naturally occurs Illinois is in a sand prairie on the Henry Allen Gleason Nature Preserve in Mason County.

Three colonies of *Lesquerella ludoviciana* exist in the Nature Preserve with visible differences between them (Ebinger, 1999, Unpublished). One area (North Bowl, lower colony) is sparsely populated by plants with silvery bladderpod being the predominant species. In 1999, its area was 2,050 m^2 containing approximately 10,300 silvery bladderpod plants. The second area (South Bowl) had a few other species, was smaller (272 m^2), and contained approximately 900 silvery bladderpod plants. The third area (North Bowl, upper colony) had many other plant species. It was 660 m^2 with approximately 220 silvery bladderpod plants (Coons, et al., 2000). The relative amount of open sand also varied with open sand decreasing as the number of plant species increased.

In 1999, seeds were collected from only the North Bowl, lower colony. Vigor of harvested seed varied for seed collected in 1999 when differences were found between the seed collection dates and position on the flower stalk (Coons, et al., 2000). A large difference was found in germination between seeds developed later or earlier on the flower stalk for the first collection date (June 8, 1999), with those from the earlier portion having a higher percentage. This difference was likely due to seed maturity. Percent germination for seeds collected from the later portion of the flower stalk on the second collection date (June 22, 1999) was similar to that of seeds from the earlier portion on the first collection date. Again this response probably relates to seed maturity.

More knowledge of the plant's reproductive strategy is needed to make sound management decisions to maintain the plant in Illinois. Due to the differences in plant populations between the three colonies, a study to compare the seed production and germination in these three colonies was undertaken.



A *Lesquerella* plant in flower.

OBJECTIVES

The ultimate goal is to understand the germination strategy of *Lesquerella ludoviciana* to improve management decisions for its maintenance in Illinois.
The objectives were to compare the three different colonies of *Lesquerella ludoviciana* in the Henry Allen Gleason Nature Preserve for:
1) Seed production
2) Germination

PROCEDURE

Lesquerella ludoviciana is found in three colonies at the Henry Allen Gleason Nature Preserve in Illinois. In 2000, four trips were taken to the colonies. These trips occurred on May 4, June 1, June 16, and July 16, 2000. During all four trips, counts were taken of the number of seedlings (six leaves or less), vegetative, and reproductive plants present in each colony. The counts were taken using 0.25 m^2 quadrats, every meter for 45 m. The number of flower stalks, flowers, and fruits present on fifty plants from each colony also were noted. Seed was collected on June 1 and June 16, 2000. On June 1, seed was divided into early (lower portion of the flower stalk) and late (upper portion of the flower stalk) flowering groups. On June 16, only seed of the late flowering group remained on plants. This created three seed lots of different maturity. Seeds were stored at 4.5ºC and 40-50% relative humidity until germination was tested in October through November 2000.

Two sheets of filter paper (Whatman #1) were placed in a plastic petri dish (10 x 1.5 cm) with 5 ml deionized water. The dishes then were sealed with parafilm. Thirty seeds from each group (i.e. colony and seed maturity) were used. All seeds were dusted with Thiram (50% active ingredient, Tetramethylthiuram disulfide) for fungal control. Ten seeds from each group were placed in each dish, with three dishes (replications) per group. These dishes then were placed randomly in a plastic container (Rubbermaid, 41 x 28.5 x 17.5 cm) and placed in a controlled plant culture room at 25º C with 4.5 µ moles/m^2/sec of light. Germinated seeds were counted with a seed considered germinated if the radicle was evident.

Data were analyzed using analysis of variance. The CoStat program was used for statistics, and to determine means and standard deviations of each seed group.

Reproductive Capacity of Colonies

	Reproductive Plants	Flowerstalks (per Plant)	Fruits (per Plant)	Estimated Number of Seeds Produced[i]
North Bowl – Lower Colony	3,573	3.2	46.2	396,174
North Bowl – Upper Colony	103	2.1	24.4	6,032
South Bowl	378	4.0	42.2	38,284

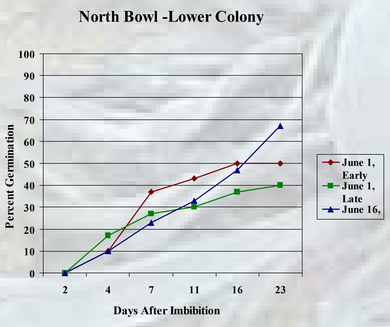
[i] Based upon 2.4 seeds per fruit as counted in 1999.

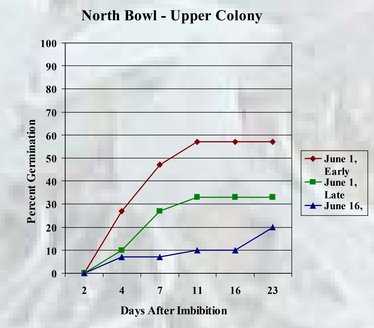
Due to differences in reproductive plants and fruits per plant, substantial differences in the number of seeds produced was seen between the colonies.

Germination of Seed Collected in 2000

	June 1, Early	June 1, Late	June 16
North Bowl – Lower Colony	50% ± 26%	40% ± 16%	67% ± 21%
North Bowl – Upper Colony	57% ± 15%	33% ± 32%	20% ± 10%
South Bowl	37% ± 12%	53% ± 25%	30% ± 20%

No significant difference was found in the germination percentage of the seed produced in different colonies after 23 days.





Overall germination was similar for all three locations with some variability among seed lots.

North Bowl Lower Colony

Density of Plants By Maturity

(per m^2)

	Seedlings[i]	Vegetative	Reproductive	Total
North Bowl – Lower Colony (3248 m^2)	[ii]3.1 ± 7.1 a	4.4 ± 8.0 a	1.1 ± 2.3 a	8.6 ± 12.8 a
North Bowl – Upper Colony (1025 m^2)	0.5 ± 2.5 b	1.2 ± 3.7 b	0.1 ± 0.6 b	1.8 ± 5.8 b
South Bowl (270 m^2)	1.2 ± 3.0 b	2.2 ± 3.6 ab	1.4 ± 2.6 a	4.8 ± 6.5 b

[i] Data collected on June 1, 2000
[ii] Means followed by different letters within a column are significantly different based upon Duncan's Multiple Range Test at P=0.05

Significant differences in density were seen between colonies regardless of maturity.

Total Number of Plants By Maturity

	Seedlings	Vegetative	Reproductive	Total
North Bowl – Lower Colony	10,069	14,291	3,573	27,933
North Bowl – Upper Colony	513	1,230	103	1,846
South Bowl	324	594	378	1,296

North Bowl - Lower Colony had more plants regardless of maturity.
Reproductive plants were notably fewest in the North Bowl - Upper Colony.

SUMMARY

- North Bowl - Lower Colony produced approximately ten times more seed than the South Bowl and approximately sixty times more seed than the North Bowl - Upper Colony.
- Differences in seed production in each colony are due to factors such as number of reproductive plants and number of fruits per plant.
- No colony differences in germination were observed.

North Bowl - Lower Colony, note quadrats by orange flag.

LITERATURE CITED

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