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Population Viability Assessment for Sullivant's coneflower (Rudbeckia fulgida Aiton var. sullivantii (C. L. Boynt. & Beadle) Cronq.)

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POPULATION VIABILITY ASSESSMENT FOR SULLIVANT'S CONEFLOWER (RUDBECKIA FULGIDA AITON VAR. SULLIVANTII (C. L. BOYNT. & BEADLE) CRONQ.)

SCIENTIFIC NAME: Rudbeckia fulgida Aiton var. sullivantii (C. L. Boynt. & Beadle) Cronq.

COMMON NAME: Sullivant's coneflower, Sullivant's orange coneflower, showy black-eye Susan, orange coneflower.

FAMILY: Asteraceae

SYNONYMS: Rudbeckia sullivantii C. L. Boynt. & Beadle, Rudbeckia speciosa Wenderoth var. sullivantii (C. L. Boynt. & Beadle) B. L. Rob.

USFS REGION 9 STATUS: Sensitive Species

USFW STATUS: None

ILLINOIS STATUS: None

GLOBAL AND STATE RANK: G5N3T3T4Q

RANGE: This species can be found in Arkansas, Illinois, Indiana, Michigan, Missouri, Ohio, West Virginia, and Wisconsin (figure 1). In Illinois, this species has been reported in 10 counties: Coles, Kane, Kankakee, Lawrence, Menard, Pulaski, Richland, Vermilion, Wabash, and Will (figure 2).

PHYSIOGRAPHIC DISTRIBUTION: Rudbeckia fulgida var. sullivantii is found in the Southwestern Great Lakes Moraines Section and Upper Gulf Coastal Plain Section of the Eastern Broadleaf Forest Continental Province and in the Central Till Plains Section of the Prairie Parkland Temperate Province (Key et al., 1995). Based upon the Natural Divisions of Illinois (Schwegman et al., 1973), this species can be found in the Northeastern Morainal Division, Grand Prairie Division, Wabash Border Division, and Coastal Plain Division (Eric Ulaszek per. comm.).

HABITAT: This species can be found in calcareous wet habitats, sometimes in dry prairies, and rarely in calcareous sand prairies (Swink and Wilhelm, 1994). Also, it can be found in mesic to wet-mesic prairies (Eric Ulaszek per. comm.), mesic upland forests, and mesic floodplain forests usually in ledges and rocky open woods (www.fs.fed.us/ne/delaware/ilpin/R.htm). Plants associated with Rudbeckia fulgida var. sullivantii are: Andropogon gerardii, Aster lateriflorus, Cicuta maculata, Desmanthus illinoensis, Lysimachia quadriflora, Panicum virgatum, Ratibida pinnata, Rudbeckia subtomentosa, Solidago riddellii, Silphium terebinthinaceum, Solidago rigida, Valeriana

ciliata, Veronicastrum virginicum, Vermonia altissima, and Zizia aurea (Swink and Wilhelm, 1994).

SPECIES DESCRIPTION: Stoloniferous perennial species approximately 3-10 dm tall. Alternate leaves, lanceolate to ovate with sharply dentate margins and pinnate venation sometimes parallel. Several flower heads, commonly long-pedunculate with numerous orange yellowish ray flowers that usually become reflexed, and dark purple or brown disk flowers. Fruit an achene. This species can be confused with other varieties of Rudbeckia fulgida such as var. deamii and cultivar forms such as Oreile and Goldstrum (Bailey and Bailey, 1976).

LIFE HISTORY: Rudbeckia fulgida var. sullivantii blooms from August to September (Swink and Wilhelm, 1994). However, no additional information regarding the sexual reproduction such as the breeding system or pollinators associated with the species is available. Asexual reproduction occurs in Rudbeckia fulgida var. sullivantii via stolons forming discrete colonies (Eric Ulaszek per. comm.).

No information is available regarding seed germination or seed dispersal for Rudbeckia fulgida var. sullivantii. However, in the case of seed dispersal, the species produces achenes that, most likely, fall and stay under or near the maternal plant. Also, it is possible that because of its habitat, water can disperse the seeds a long distance.

In Illinois the species has been reported for 10 counties (Mohlenbrock and Ladd, 1978 and www.fs.fed.us/ne/delaware/ilpin/R.htm). However, no information regarding population size for these populations is available.

NATURAL AND HUMAN LAND USE THREATS: The main threat to Rudbeckia fulgida var. sullivantii is the loss of habitat as a consequence of development, agriculture, grazing, and changes in the hydrology of the area as a consequence of these activities. Although Rudbeckia fulgida var. sullivantii can also be found in forest and can persist in shaded conditions, encroachment of successional vegetation can affect the species (TNC-BioSources, 1999). In addition to these threats, the presence of cultivars may be a threat to local genotypes.

VIABILITY: To maintain minimum viable populations of Rudbeckia fulgida var. sullivantii throughout its habitat range, protection, management, and restoration of habitat should be provided as much as possible. A minimum viable population is defined as a population size likely to give a population a 95% probability of surviving over a 100 year period (Menges, 1992). To insure viability:

1. It is vital that the size of the existing populations be maintained or increased to insure the persistence of this species in the region. Also, it is necessary that local seed sources are available for future reintroductions of the species to other areas. The only way to accomplish such a task is by protecting the already existing seed sources (i.e. populations) available in the region.

2. The creation and maintenance of a metapopulation for Rudbeckia fulgida var. sullivantii is crucial for the persistence of the species in the region. A metapopulation is

as an assemblage of populations existing in a balance between extinction and colonization, the boundaries of which can be a site or a geographical region (Husband and Barrett, 1996; Levins 1969, 1970). The populations that will form this metapopulation should be large because they may have a better opportunity of persistence than small populations (Hanski et al., 1996). Hanski et al. (1996) have suggested, based upon models, that a metapopulation should consist of a minimum of 15-20 well connected populations. However, Hanski et al. (1996) point out that if this cannot be achieved, the few remaining populations and habitats should be protected and other management techniques should be used to allow the persistence of these populations. Also, based upon models, populations should be >200 individuals to avoid demographical and environmental stochasticity (Menges, 1992). This number can be higher or lower depending upon the species.

The existing populations of Rudbeckia fulgida var. sullivantii in the region potentially can go extinct as a consequence of low recruitment, stochastic event, etc. By having a metapopulation this situation may be prevented. Also, by having a metapopulation, other interactions that will impact the overall viability of Rudbeckia fulgida var. sullivantii in the region, such as pollinator interactions, genetic structure, gene flow between and within populations, and seed dispersal, can be maintained.

3. Protection of existing and newly discovered populations in the region should be attempted. Protection of these populations also implies protection of their habitat.

MANAGEMENT: To maintain minimum viable populations of Rudbeckia fulgida var. sullivantii throughout its habitat range, specific management practices will be needed to insure the persistence of the species.

1. To maintain and increase the existing populations of Rudbeckia fulgida var. sullivantii, specific practices should be followed:

a. Management techniques such as minimum grazing or removal of vegetation (e.g. woody, noxious weeds, etc.) should be used to avoid encroachment in existing habitat. The use of an Integrated Pest Management Plan such as the one developed by Carroll and White (1997) can be used to control exotic species in these areas.

b. Activities that increase the likelihood of noxious weed introduction or cause trampling (e.g. humans or animals) of the plants should be avoided or minimized.

c. Development of trails in areas where Rudbeckia fulgida var. sullivantii is found should be avoided or minimized to prevent negative impacts to the populations.

2. To develop and maintain a metapopulation of Rudbeckia fulgida var. sullivantii, attempts should be made to restore or reintroduce this species in areas that were historically mesic or wet-mesic prairie. This includes the improvement of areas that have mesic or wet-mesic prairie and the reconstruction of areas that have lost the prairie plant matrix. Potential habitat can be sites that have soils found in wet-mesic prairies. The

following is a list of soils found in mesic or wet-mesic prairies (Laatsch and Loebach, 1997; Eric Ulaszek per. comm.): Brenton silt loam (soil depth 1.5-3.0 ft. over outwash), Drummer silty clay loam (soil depth 3.5-40 ft. over drift), Joliet silty clay loam (soil depth 10-25" over bedrock), LaHogue loam (soil depth 40-60" over sand), Millbrook silt loam (soil depth 25-42' over bedrock), Millsdale silty clay (soil depth 25-42" over bedrock), Morley silt loam (soil depth less than 2 ft. over till), and Proctor silt loam (soil depth 1.5-3.0 ft. over outwash). In addition to these habitats, populations may be reintroduced in mesic upland forest.

To maintain and increase these populations of Rudbeckia fulgida var. sullivantii, the following practices should be considered in addition to those measures outlined under 1 of this section:

a. Seeds should be collected from nearby populations (e.g. 50-100 miles from the site) to develop seedlings and rootstock. Particular attention must be paid to the origin of the seed source. Several cultivar forms of the species are available (Steven R. Hill per. comm.) and must be avoided to maintain the genetic integrity of the species.

b. Seed sowing and hand plantings will be used to develop populations in the proper areas.

c. For the successful establishment of Rudbeckia fulgida var. sullivantii in mesic upland forest, development of openings (i.e. expose areas) may be needed for germination and seedling establishment.

d. Monitoring and evaluation should be conducted for any restored or reintroduced populations. In the event that a restored or reintroduced population is unsuccessful, a site's potential for a second reintroduction or restoration attempt should be reevaluated. This may require additional research.

3. In the case that additional populations of Rudbeckia fulgida var. sullivantii are found in the region, they should be marked and protected from any potential damage and the above practices for maintenance and enhancement of these populations should be followed. Their habitat should also be protected.

MONITORING: In natural populations, regular counts of individuals or ramets should be done to determine population status. Transects and quadrats should be used to determine the size of a population in a large area. Hand counts can be done if a population is small (less than 100 individuals). In restorations, sampling should be done as above to detect increases or decreases in the population. If no significant changes are detected, reevaluation of seeding techniques and management practices should be done to enhance the population.

RESEARCH NEEDS: Immediate research needs that will help in the establishment and management of Rudbeckia fulgida var. sullivantii are:

1 Collect information on several aspects of the natural history (e.g. specific habitat requirements) of the species. This will allow a better understanding of how and where the species can be reintroduced.

2. Conduct studies to determine the correct taxonomy of the species. For example, questions regarding if Rudbeckia fulgida var. sullivantii is a species or not are pending.

3. Determine if populations are really Rudbeckia fulgida var. sullivantii or introduced cultivars. The reintroduction of cultivar genes may be detrimental for the genetic integrity of the species.

4. Determine several aspects of the reproductive biology (e.g. breeding system, pollinators, etc.) of the species. For example, this information may help us understand if reproductive factors associated with the species (e.g. presence/absence of pollinators) may be the limiting factor in the persistence of populations in an area or in the reintroduction of the species to an area.

5. Collect demographic and population size information. This information is needed to determine the population structure and population changes (i.e. increases or decreases) of the species. With this information, specific recommendations can be made if the population is declining or only seedlings are found.

6. Develop a Population Viability Analysis (PVA). A PVA identifies the threats faced by a species and can evaluate the likelihood that the species will persist for a given time into the future. To develop a PVA field, studies, data analysis, modeling, assessment of extinction risks, sensitivity analysis, and monitoring, among other things, are needed.

7. Determine the impact of different management (e.g. grazing) and recreational activities. It is important to determine the best management practice(s) to improve the habitat for the species. Also, it is important to determine which recreational activities are compatible with the species. This will prevent any risks to the species and its habitat.

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b) Web pages cited

www.fs.fed.us/ne/delaware/ilpin/R.htm

www.itis.usda.gov/plantproj/plants/cgi_bin/fr_enter.cgi?earl=fr_qurymenu

c) Personal communication

Steven R. Hill. Illinois Natural History Survey-Center for Biodiversity. 607 East Peabody Drive. Champaign, Illinois 61820. Phone number: 217-244-8452.

Eric Ulaszek. U.S. Forest Service. Midewin National Tallgrass Prairie. 30071 South State Route 53. Wilmington, Illinois 60481. Phone number: 815-432-6370.

Figure 1) Distribution of Rudbeckia fulgida var. sullivantii in the United States of America (www.itis.usda.gov/plantproj/plants/cgi_bin/fr_enter.cgi?earl=fr_qurymenu).

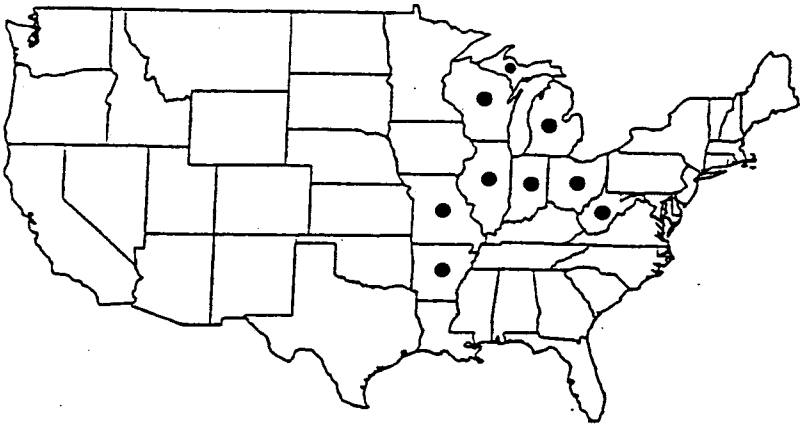

Figure 2) Distribution of Rudbeckia fulgida var. sullivantii in Illinois (Mohlenbrock and Ladd, 1978 and www.fs.fed.us/ne/delaware/ilpin/R.htm).