# Autecology of Skunkbush on the Northern Mixed Grass Prairie

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Report DREC 16-1107

The autecology of Skunkbush, *Rhus trilobata*, is one of the prairie plant species included in a long ecological study conducted at the NDSU Dickinson Research Extension Center during 67 growing seasons from 1946 to 2012 that quantitatively describes the changes in growth and development during the annual growing season life history and the changes in abundance through time as affected by management treatments for the intended purpose of the development and establishment of scientific standards for proper management of native rangelands of the Northern Plains. The introduction to this study can be found in report DREC 16-1093 (Manske 2016).

Skunkbush, *Rhus trilobata* Nutt., is a member of the cashew (sumac) family, Anacardiaceae, and is a native, perennial, deciduous, cool season shrub that is intolerant of flooding and high water tables. Skunkbush is a highly variable species with six recognized varieties and is primarily distributed throughout North America west of the Mississippi River. Aerial growth has numerous stems arising from stem bases; the stems have many irregular spreading branches forming a dense rounded crown 2-6.5 feet (0.6-2 m) tall and with a wider diameter. The three lobed leaves have a disagreeable odor when bruised. The root system has a taproot and has deep extensively branched fibrous roots. A shallow spreading woody rhizome system interconnects the numerous stem bases forming patches of clonal thickets 20-30 feet (6-9 m) across. Individual rhizomes can live for more than 30 years. Regeneration is by vegetative and sexual reproduction. Vegetative growth is sprouts from the rhizomes and root crowns. Sexual reproduction is mostly from polygamodioecious imperfect unisexual flowers with separate male and female organs located on different plants that emerge during May-June. Pollination is presumably by small mammals. The fruit is a one seeded drupe that matures by October and persists on the plant until eaten and dispersed by birds and small mammals. Individual plants have low seed production. Seeds have poor germination rates and seedling establishment is rare. Fire top kills aerial stems and activates vigorous sprout growth from the rhizomes, with some sprout development from adventitious buds on the root crowns. This summary information on growth development and regeneration of skunkbush was based on the works of Stevens 1963, Great Plains Flora Association 1986, Mozingo 1987, Nesom 2003c, Anderson 2004c, and Larson and Johnson 2007.

## Procedures

### The 1969-1971 Study

The range of flowering time of Skunkbush was determined by recording daily observations of plants at anthesis on several prairie habitat type collection locations distributed throughout 4,569 square miles of southwestern North Dakota. The daily observed flowering plant data collected during the growing seasons of 1969 to 1971 from April to August were reported as flower sample periods with 7 to 8 day duration in Zaczkowski 1972.

## Results

Skunkbush resumed growth during early May. The first flowers appeared about 10 days before the first leaves (table 1). The flower period occurred from early May to late June during the 1969-1971 study (table 2) (Zaczkowski 1972). Leaves appeared during mid May and remained the entire growing season. New twig leader growth began in late May developing to full length by mid July. A mean of 1.85 new leaders formed from each previous years twigs (Sanford 1970), reaching a mean length of 1.4 inches (3.6 cm) (Martin 1973). The average skunkbush plant produced a mean of 2,262 new twigs (Martin 1973). The new twig growth lost some of its length during late June to late July (Sanford 1970, Martin 1973). The retrogression of twig length was suspected to be caused by desiccation. Only around 5% to 15% of the flowers produced fruit. The developing fruits, a 1-seeded drupe, ripened during July turning a bright red. Old branches, 6 to 10 years old, produced the most prolific fruit (Sanford 1970). Most of the mature fruit persisted on the plant through winter unless eaten. Production of viable seed, however, was low and seedling mortality was high resulting in a scarcity of seedlings and only rarely were skunkbush plants developed from seed (Sanford 1970). The leaves turned a red or orange color during late September to early October terminating photosynthesis (Martin 1973) (table 1).

Most recruitment of new skunkbush plants was derived through vegetative reproduction. Skunkbush has an extensive spreading woody rhizome system that interconnects the stem bases of plants forming patches or thickets. Sanford (1970) documented one 30 year old rhizome to be an amazing 18 m (70.9 ft) long. However, most rhizomes do not grow to be over 6 m (20 ft) long. Sprouts develop from buds on the rhizomes and stem bases. Twig or branch removal by browsing, trampling, or burning increased the production of sprouts (Martin 1973). Some sprout mortality would be expected, however, skunkbush has a high capacity for successful vegetative reproduction (Sanford 1970).

**Discussion**

Plants that have successfully adapted to life in arid or semi-arid environments move towards a reliance on vegetative reproduction as the primary form of reproduction, which skunkbush has accomplished. Skunkbush readily produces vegetative sprouts from buds on the well developed woody rhizome system and stem bases (Sanford 1970, Martin 1973).

Skunkbush usually grows in harsh environments on steep upland slopes with poorly developed well-drained soils underlain by scoria or shale where the topsoil is extremely thin or absent (Sanford 1970). Skunkbush is tolerant of many soil textures but usually is associated with sandy clay loams that are mildly alkaline, high in potassium, and low in organic matter, phosphorus, and salts (Martin 1973).

Acknowledgment

I am grateful to Sheri Schneider for assistance in the production of this manuscript and for development of the tables.

Table 1. Phenological development of Rhus trilobata, Skunkbush.

| Phenological Stages | Time Period |
|---|---|
| First Flowers | early May |
| First Leaves | mid May |
| Flower Period | early May to late June |
| Full Leaf | late May |
| Green Leaf Period | mid May to late September |
| Twig Growth | late May to mid July |
| Twig Retrogression | late June to late July |
| Fruits Ripen | July |
| Leaves Turn Red | late September to early October |

Data from Sanford 1970, Zaczkowski 1972, Martin 1973.

Table 2. Flower period of Rhus trilobata, Skunkbush.

| | Apr | May | | Jun | | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|
| Flower Period 1969-1971 | | XX | XX | XX | XX | | | |

Flower Period Data from Zaczkowski 1972.

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