

NATIVE CACTI OF SASKATCHEWAN

VERNON L. HARMS, The W. P. Fraser Herbarium, University of Saskatchewan, Saskatoon, Saskatchewan. S7N 0W0

Introduction

This article attempts (1) to briefly introduce the cacti as a novel and interesting plant group, and (2) to present a taxonomic treatment of Saskatchewan's native cacti, with descriptions, habitat information, and distribution maps of verified records in the province.

The Cacti are unique plants that long have caught the popular fancy. The common name "cactus", is derived from the Greek word "kaktos" meaning "a prickly plant", making it an appropriate designation for plants of the family Cactaceae (= Opuntiaceae). Most North Americans think of cacti as warm-desert plants of the American Southwest and Mexico, where they are

indeed most common and diverse in numbers of species, and they often are surprised to find that there are native cactus species growing as far north as Saskatoon and North Battleford, Saskatchewan, and the Peace River country of Alberta and British Columbia.

Not all cacti are strictly desert plants, although most are indeed xerophytes (i.e. drought-resistant plants that are characteristic of relatively dry sites). In the Americas, members of the cactus family may be found in a variety of local habitats, and geographically ranging from Patagonia in southern South America, northward to our Canadian Prairies. Various species are even native



Prickly Pear Cactus.

Bob Godwin

to the tropical rain-forests, where they often are epiphytic (i.e. growing on other plants). Some well known examples of tropical cacti that are commonly grown as household ornamentals, are the Christmas and Easter Cacti (*Zygocactus* and *Schlumbergia* spp., and their hybrids). Authorities differ considerably as to the number of "good genera" into which to group the members of the cactus family (conservatively about 30-50, although some recognize up to 120), as well as the total number of included species best recognized (usually estimated as between 1500 and 2000).

An amazing variety of plant body-forms have evolved among cacti, — e.g., globular, cylindrical, columnar, flattened, jointed, branched or not, and single-stemmed or clustered from the base. Characteristically, in all succulent xerophytes, the main adaptation of the body-form to reduce water loss has been development of a decreased surface to volume ratio. Among cacti, this has involved the development of very fleshy stems and the reduction or complete loss of leaves. Only members of the more tropical, less xerophytic, and mostly shrubby, subfamily Pereskioideae, have "normal" leaves that persist. The species of subfamily Opuntioideae, including the prickly-pear cacti, have small awl-shaped juvenile leaves that soon fall off. Leaves are entirely lacking in the large subfamily Cereoideae, which includes the pincushion and barrel cacti.

With leaves absent, or reduced and short-lived, photosynthesis (food manufacturing) occurs instead in green cells of the stem outer layers. Much of the inner volume of succulent cactus stems is composed of storage cells containing mucilaginous materials with strong water-retaining capability. The tough waxy stem surfaces greatly retard water loss by evaporation. The remarkable efficiency of this latter feature is demonstrated by the great difficulty plant collectors have in properly

drying intact cactus specimens when using normal plant-pressing techniques. Instead, to obtain satisfactory dried specimens, cacti need special handling by first slicing the stems and fruits to expose the inner tissues, or killing them with alcohol or some other preservative before press-drying.

Spine-clusters called "areoles" are unique structures of cacti. Although other kinds of succulent plants often bear spines, these are not clustered in areoles. Cactus areoles are borne spirally arranged on the stems, positioned directly above the "leaves" or (in subfamily Cereoideae) the potential location of the leaves. The spine (etc.) structures in areoles thus represent parts developed from the stem axillary buds. In some cacti (including our native Purple Ball Cactus), the areoles are borne on small cone-shaped or globular protuberances. In some others, they may occur on spiralling or nearly vertical stem ridges. Often distinguishable within cactus areoles, are long central spines and somewhat shorter radial (or marginal) spines. Besides the obvious, long, firm spines, the areoles of many cacti (e.g. prickly pears and chollas) may also bear numerous, small, soft-flexible, barbed bristles called "glochids", that, although inconspicuous, are probably even more troublesome to humans contacting these cacti than the former. Frequently, wooly hairs also occur in the areoles.

The flowers of cacti are solitary, usually large and conspicuous, and often strikingly beautiful. The flowering periods tend to be rather short. Cactus flowers are botanically anomalous in combining such purportedly primitive characteristics as numerous, spirally arranged, separate stamens and perianth parts (i.e. sepals and petals), together with such evolutionarily advanced features as inferior and multicarpellate ovaries with parietal placentation (i.e. attachment of ovules in several to many rows along the sides of

a single ovary chamber). Cactus flowers are radially symmetrical and bisexual (i.e. with stamens and pistils both present).

The perianth is not sharply differentiated into sepals and petals. Rather the outer perianth-parts, which are more greenish and sepal-like, intergrade with the inner perianth-parts, which are variously coloured and petal-like. The stamens are very numerous and spirally arranged, sometimes showing some basal fusion of the long filaments into groups. The pistils are composed of several to many fused carpels, with as many stigmas as carpels. The inferior ovary is 1-chambered with the numerous ovules borne in several to many vertical rows along the sides. The perianth-parts and stamens arise from above the (inferior) ovary (= epigynous) and, in subfamily Cereoideae, from the rim of a cylindrical floral tube (= hypanthium) that extends above the ovary. Such an extended floral tube is present in our Saskatchewan native Purple Ball Cactus (see figure 1), but is absent or very short in our Prickly Pear species (see figure 2). The cactus ovary matures into a berry-type fruit, ranging from quite fleshy to rather dry and leathery. Areoles often occur even on the outer surfaces of ovaries (later fruits) and sometimes on the floral tubes extending above the ovaries. (See figures 1 to 3 for illustrations of vegetative and flower parts of cacti).

Three native species of cacti occur in Saskatchewan: (1) the Purple Ball or Pincushion Cactus (*Mamillaria vivipara*), (2) the Plains or Many-spined Prickly-pear (*Opuntia polyacantha*), and (3) the Brittle Prickly-pear (*Opuntia fragilis*). These may be identified by means of the diagnostic characteristics given in the following key. (In using the key, choose between the first pair of alternative leads, "1a" vs. "1b"; then if your choice is "1b", choose between the subsequent pair of leads, "2a" vs. "2b").

Identification Key to the Native Species of Cacti in Saskatchewan

1a. Stem globular or pincushion-like, solitary or tufted only from base, unbranched above, not jointed into pad-like segments, covered with cone-shaped protuberances (tubercles), each tipped by an areole (spine-cluster); leaves entirely lacking; spines more than 12 per areole; areoles with dense woolly hairs, but lacking glochids (small, sharp, soft-flexible, barbed bristles); flowers borne between the tubercles; perianth-parts narrowly lance-shaped, less than 1 cm wide; the outer greenish perianth-parts ciliate-fringed; inner perianth-parts purplish-red; floral tube (hypanthium) distinct and elongated, extending somewhat above ovary; berry-fruit juicy-fleshy, non-spiny, wedged between the tubercles
1. *Mamillaria vivipara*.

1b. Stems often branched above base, conspicuously jointed into a series of more or less flattened pad-like segments separated by much-constricted joints; stem surfaces lacking cone-shaped tubercles; awl-shaped juvenile leaves present on very young stem pads but soon falling off; spines fewer than 12 per areole; areoles with tufts of glochids at base of longer spines; flowers borne from areoles on edges of young upper stem-segments (pads); perianth-parts, except outermost series, ovate to triangular or fan-shaped, over 1 cm wide; the outer green perianth-parts not ciliate-fringed; inner perianth-parts yellow, often tinged with green, tending more orange or pinkish-red with age and toward flower-centers; floral-tube above ovary absent or very short; berry-fruits relatively dry, with spiny areoles and often awl-shaped juvenile leaves on surfaces (see 2a vs. 2b).

2a. Pads (stem-segments) mostly less than 5 cm long, less than 2.5 cm broad, not strongly flattened, at least half as thick as broad; green to often somewhat reddish, the terminal ones quite readily

detaching; areoles crowded on pads, mostly less than 8 (–10) mm apart, with dense, distinctly white, wooly hairs; longer spines seldom more than 5 per areole, the largest spines mostly 2 cm long or shorter; the small young spines distinctly barbed (under 20x magnification); glochids relatively few; pad surfaces between areoles usually becoming strongly wrinkled on dried specimens; inner perianth-parts usually pale-yellow when fresh; stigmas 2 mm long or less 2. *Opuntia fragilis*.

2b. Mature pads mostly over 5 cm long and over 3 cm broad, strongly flattened, over (2–) 4 times as broad as thick, not readily separable, usually bright-green;

areoles more distant on pads, (8–) 10-13 mm* apart, with wooly hairs more sparse and whitish to mostly rusty-tinged; spines often more than 5 per areole and over 2 cm long; the short younger spines scarcely if at all barbed; barbed glochids much more abundant; pads less strongly wrinkling upon drying; inner perianth-parts usually bright-yellow when fresh; stigmas over 2 mm long 3. *Opuntia polyacantha*.

* ranges given in measurements denote normal variation in size; numbers in parenthesis represent extremes that have been found.

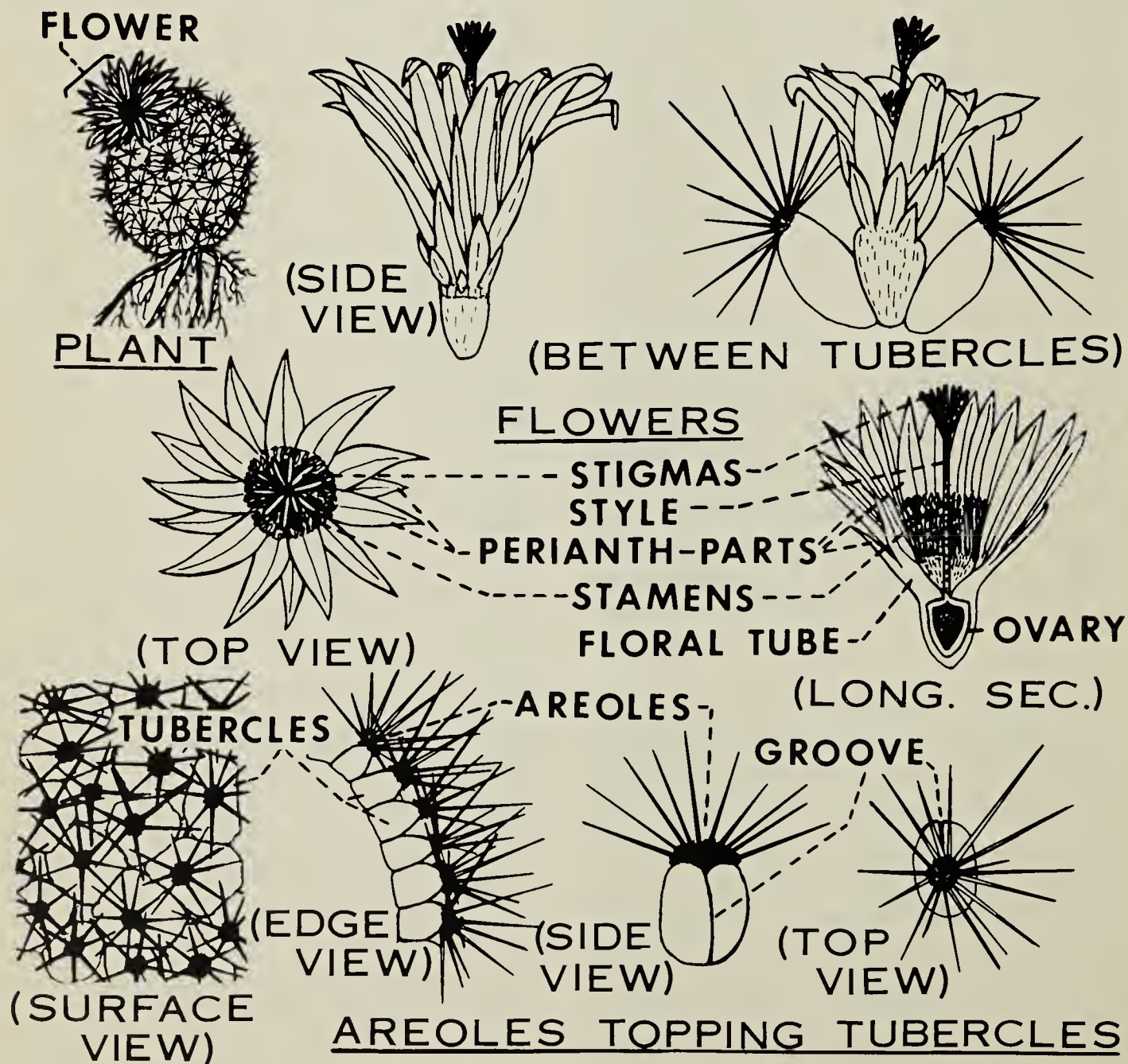


Figure 1. Purple Ball Cactus (*Mamillaria vivipara*).

Descriptions of Native Cactus Species

1. PURPLE BALL, PINCUSHION, or NIPPLE CACTUS. *Mamillaria vivipara* (Nutt.) Haw. [*Coryphantha vivipara* (Nutt.) Britt. & Brown; *Neomamillaria vivipara* (Nutt.) Britt. & Rose].

The plants occur solitarily or in clusters of 2-10. The stems are globular or pincushion-like (more or less vertically flattened), 3-5 (-8) cm high, about 5 (3-7) cm in diameter, covered with prominent cone-shaped protuberances (tubercles) about 4-10 (-15) mm long, each grooved on the upper surface and topped by an areole of spines. The areoles mostly have (1-) 3-6 central spines and 14-18 (-20) radial spines, all straight and rigid, reddish-brown to whitish, 1-2 cm long, the radial ones somewhat shorter than the long central spines. Dense, white, wooly hairs are usually present in the areoles, but glochids are lacking. Leaves are entirely absent, even on young cacti. The conspicuous flowers are 3-4 cm long, 1.5-3 (-5) cm wide, borne between tubercles (actually just above the groove of a tubercle) on upper part of stem. A distinct funnel-shaped floral-tube (= hypanthium) is present, extending somewhat above the inferior ovary. The perianth-parts are numerous, narrowly lance-shaped, 15-30 mm long, and 2-5 (-8) mm wide; the outer ones are green, sepal-like, and ciliate-fringed; the inner ones are petal-like, bright purplish-red, varying to sometimes pale purplish-pink or salmon-pink. Stamens are numerous, the filaments pinkish-red or yellowish, and anthers yellow, forming the yellow flower-centers. Pistils are compound, of 6-15 fused carpels; stigmas 1.5-3 mm long, equal in number to carpels. The berry-fruit is quite juicy, globular to ovoid, 10-15 mm long, tightly wedged between stem tubercles, smooth, lacking spiny areoles, pale-green becoming brownish with age, sweet and edible. Seeds are 1.2-1.5 mm long, 1.5-

2 mm broad, with surfaces light-brown and reticulately pitted, and the hilum (seed-stalk scar) appearing lateral. (See figure 1).

These plants grow on dry, usually quite sandy, exposed hillsides and ridges in the grassland region of southern Saskatchewan, from the International Boundary, north to Saskatoon (see Map 1). The short-lived flowers appear in early summer (June), usually opening only in the mornings; the berry-fruits ripen by fall.

2. BRITTLE PRICKLY-PEAR. *Opuntia fragilis* (Nutt.) Haw.

The plants are low-growing, prostrate-spreading to more or less decumbent (i.e. terminal pads turned upward), often branching (two pads arising from the top of one below), sometimes forming dense mats to 5 dm wide and 0.5-2 dm high. The stems are conspicuously jointed, with the segments (pads) obovate to elliptical or ovate in outline, (1.5-) 2-3 (-5) cm long, 1-2.5 (-3.5) cm broad, somewhat flattened to nearly circular in cross-section, 1-2 cm thick, at least one half as thick as broad. The terminal pads are readily detached, facilitating dispersal by animals. Areoles are mostly distanced less than 8 (-10) mm apart on stem pads, each armed with (2-) 3-7, strongly divergent, yellowish to brownish, straight spines, 1-2 (-3) cm long; the smaller young spines are barbed. Areoles also commonly bear dense, coarse, white-wooly hairs, and only a few yellowish to whitish-grey glochids. Stems, upon drying, tend to strongly contract between areoles; thus dried herbarium specimens usually appear much wrinkled. The juvenile leaves are subulate (awl-shaped), 2.5-3.5 mm long, and soon fall off.

The flowers are conspicuous, 2.5-5 cm long and broad. The perianth-parts (excluding outer bract-like series) are mostly triangular or ovate, 2-3.5 cm long, and 1.5-2.5 (-3.5) cm wide. The outer perianth-parts are sepal-like and

greenish, edged with yellow; the inner petal-like perianth-segments are pale-yellow, tending to pale-pinkish or orange with age especially toward the flower centers. Stamens are numerous, with the filaments yellowish to often reddish. Pistils are compound, with 10 carpels and 10 oblong stigmas, mostly 1.5-2 mm long. The fruit is a dry, ovoid, spiny berry, 1-2 cm long, about 1 cm in diameter, greenish when young, becoming tannish when mature. Seeds are numerous, 5-7 mm long, yellowish, and irregularly shaped. (See figure 2).

Brittle Prickly-pear grow on warm, dry, sandy, exposed hillsides, in the general grassland region of southern Saskatchewan, from the International Boundary, north to the Saskatoon and Battleford areas (see Map 2). They often are locally associated with, but almost always less frequent than, plants of the Plains Prickly-pear. The flowers bloom in June, but many plants do not seem to produce flowers, at least in a given year. The fruits mature over the summer to ripen in fall, although many appear not to develop after flowering.

3. PLAINS OR MANY-SPINED PRICKLY-PEAR. *Opuntia polyacantha* Haw. [*Opuntia missouriensis* DC.; *O. columbiana* Griffiths; *O. polyacantha* var. *borealis* Coult.; var. *microsperma* Engelm. & Bigel.; var. *platycarpa* (Engelm.) Coult.]

The plants are low-spreading, more or less prostrate to 2 dm high, of several to many jointed segments (pads), often forming large, prostrate mats or clumps. The larger stem-pads are broadly obovate or nearly circular in outline, 5-13 cm long, 4-10 cm broad, to about 1 cm thick, strongly flattened, at least 4 times broader than thick, not readily disjuncting, bright-green to bluish-green. The areoles are about 1 cm (8-13 mm) apart on mature stem-pads, with longer spines (3-) 5-10 per areole, straight, creamish-white or reddish-brown, 1-5 cm long and unflattened, about 0.5 mm in diameter at base; the smaller young spines are scarcely, if at all, barbed. Areoles also bear clusters of tawny, barbed, bristle-like glochids, and whitish to brownish-tawny woolly hairs.

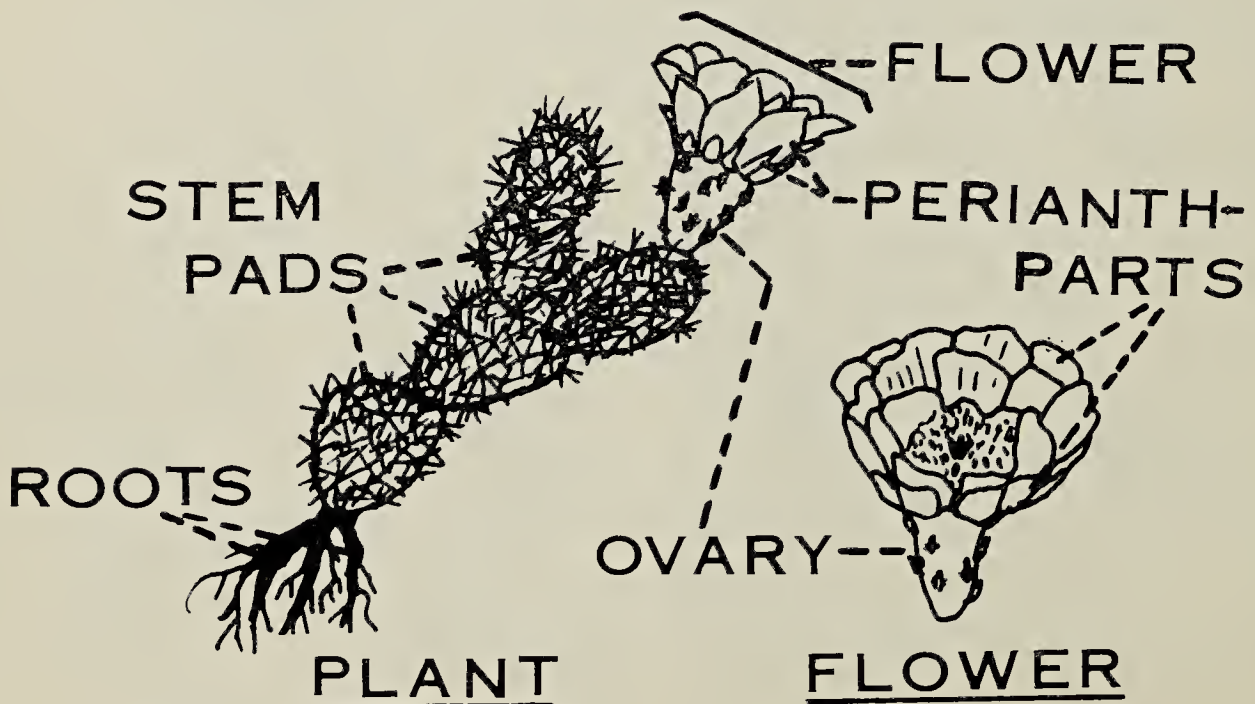


Figure 2. Brittle Prickly Pear (*Opuntia fragilis*).

The flowers are large and showy, 4-8 cm broad, and 2.5-6 cm long, waxy-appearing, borne from areoles along the margins of young upper pads. The perianth-parts are ovate to triangular, 2.5-5 cm long and 1.5-3 cm broad. The outer perianth-parts are greenish and sepal-like; the inner perianth-parts are petal-like and pale-yellow, tending toward pinkish or reddish-orange with age at bases and flower centers. Stamens are numerous, the filaments yellowish to often pinkish-red. The pistils are compound with 10-15 carpels; the stigmas are lanceolate to oblong, 2.5-4 mm long, as many as the carpels. The fruit is a dryish, quite leathery berry, globular to oblong or more or less obovoid, 2-3 cm long, tan to brown, with areolar glochids and spines. Seeds are numerous, 5-6 mm

long, irregularly shaped, yellowish to whitish. (See figure 3).

Plains Prickly-pear grow on warm, dry, usually quite sandy or gravelly, exposed and often denuded plains, hill-slopes and ridge-summits, in the grassland region of southern Saskatchewan, north to the Saskatoon and Battleford areas (see Map 3). The flowers appear in June, and fruits mature by fall. This is our most common cactus, locally frequent even as far north as Saskatoon. In some sand-hill areas, its frequency appears increased by overgrazing. Boivin's statement that this species is more southern in the Prairie Provinces than the Brittle Prickly-pear seems incorrect for Saskatchewan, since even at the northernmost known stations where they coexist, the Plains Prickly-pear is more abundant.¹

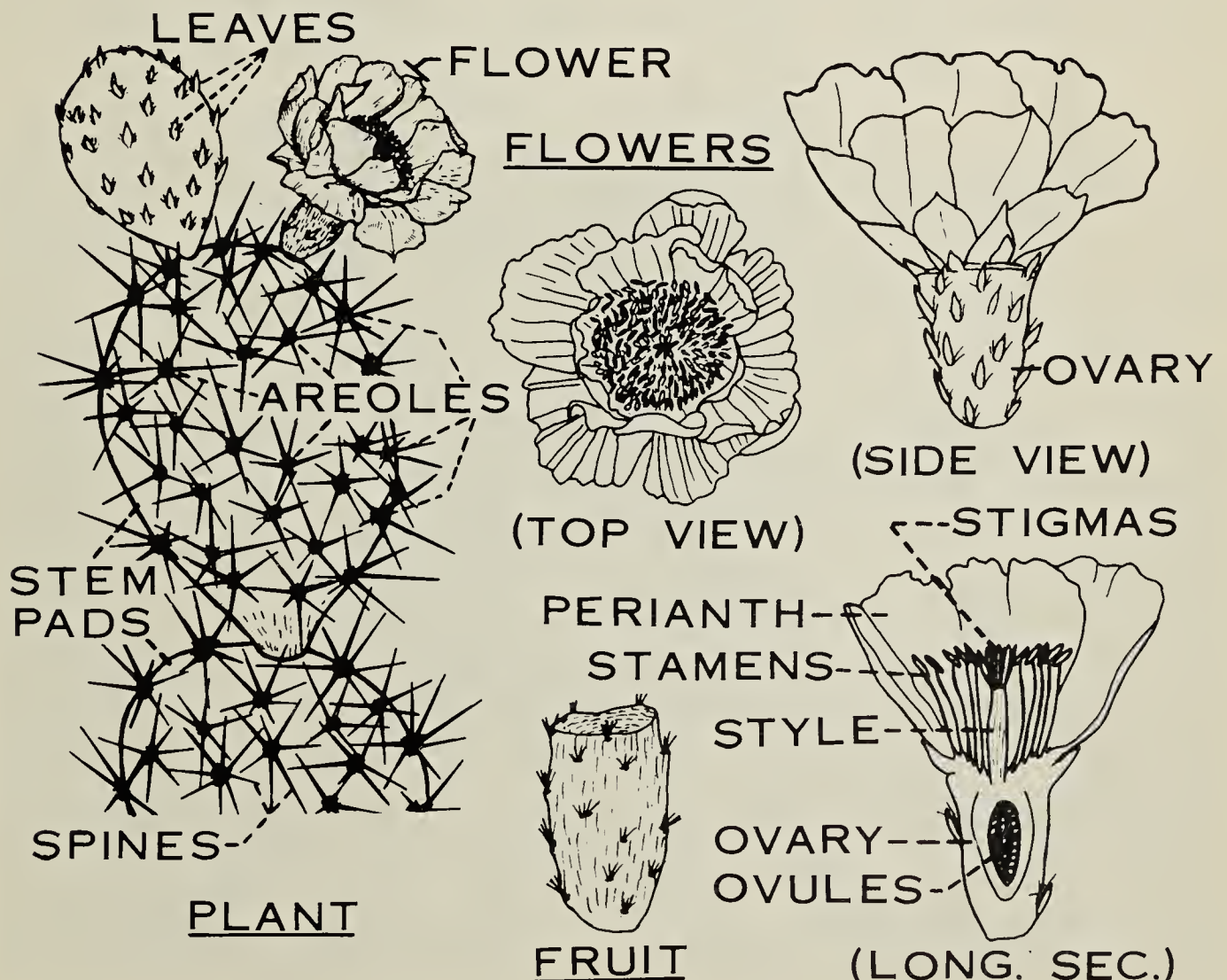


Figure 3. Plains Prickly Pear (*Opuntia polyacantha*).

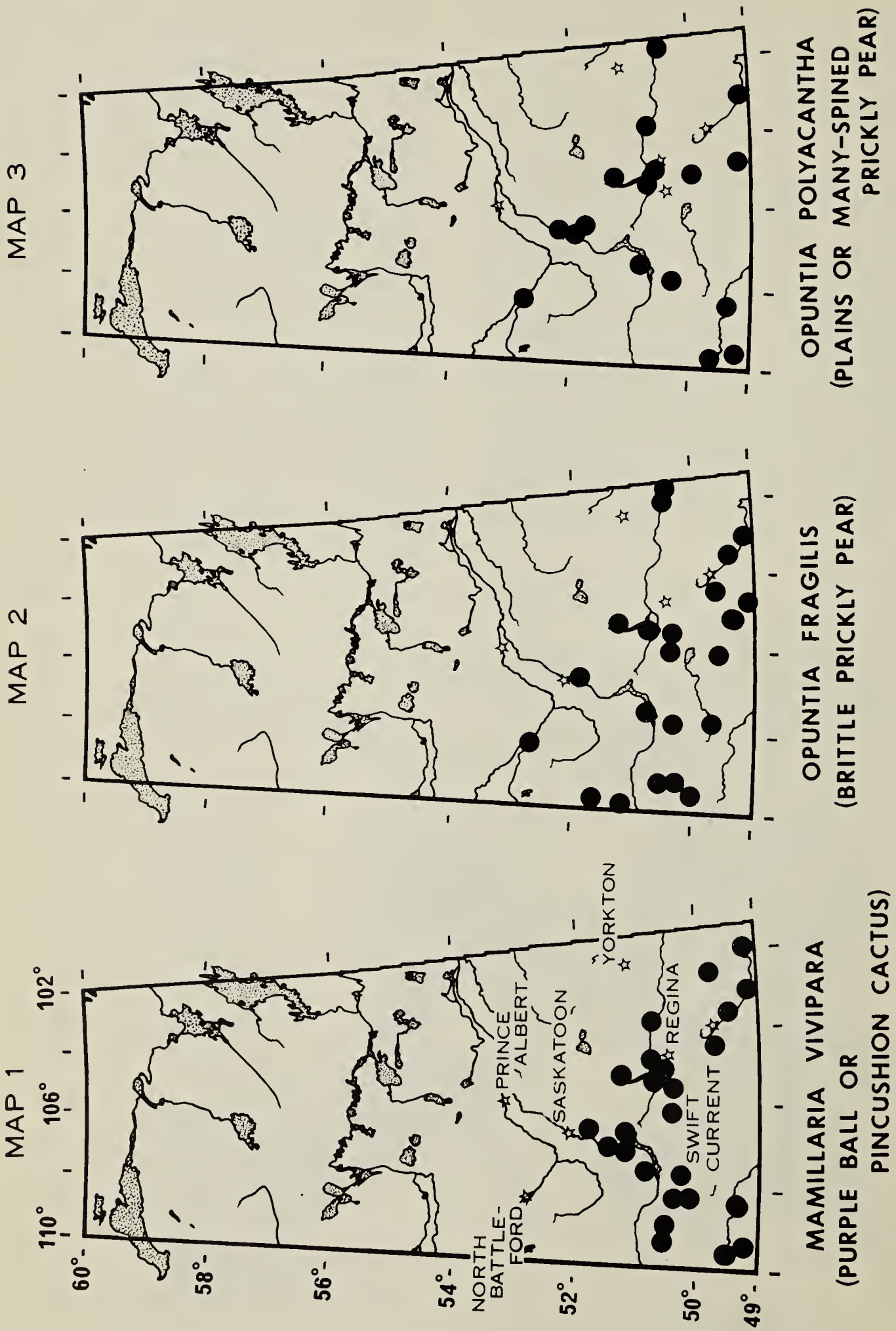


Figure 4. Range of Saskatchewan cacti.

Edibility of Native Cacti

Presettlement Indians, white pioneers, and even modern-day people have used the berry-fruits of cacti as a food source. The edible part is the fleshy pulp between the firm outer coat and seeds. The sweet juicy berries of our Purple Ball Cactus are edible. But the unusually dry, leathery fruits of the two prickly-pear species that are native to Saskatchewan make them less edible. The younger fleshy stem-pads of prickly-pear cacti have also been used for food after peeling off the outer coat along with the areolar spines (or else burning off the spines and glochids) and then roasting, boiling, or frying the internal parts. Prickly-pear cacti have also been used as an emergency food source for cattle, after burning off the surface spines and glochids.

Saskatchewan Distribution

Maps 1, 2 and 3 show the known documented records in Saskatchewan of the three native cactus species. The

dots on the provincial maps are based entirely on personally verified herbarium specimens filed in Saskatchewan and Ottawa herbaria. Thus, the full distributional picture for these cacti in the province is likely quite incomplete. Information about other locality records to help fill in the Saskatchewan distributions would be welcomed by the author. Better distributional information seems especially needed for eastern Saskatchewan. Brittle Prickly-pear might even be looked for in the southern fringes of the boreal forest in dry rocky clearings, as it has been reported from such habitats in eastern Manitoba.^{2 3}

¹ BOIVIN, B. 1967. Flora of the Prairie Provinces, Part I. Provancheria No. 2, Laval University, Quebec.

² SCOGGAN, H. J. 1957. Flora of Manitoba. National Museum of Canada Bulletin No. 140.

³ ———, 1979. Flora of Canada, Part IV. National Museum of Natural Sciences Publ. in Botany No. 7(4). National Museums of Canada, Ottawa.



Purple Ball Cactus.

Gary W. Seib