A revision of the herbaceous members of the genus Atriplex (Chenopodiaceae) for the state of Utah

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A REVISION OF THE HERBACEOUS MEMBERS OF
THE GENUS *ATRIPLEX* (CHENOPODIACEAE)
FOR THE STATE OF UTAH

A Thesis
Presented to the
Department of Botany and Range Science
Brigham Young University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by
Kaye Hugie Thorne
August 1977
This thesis, by Kaye Hugie Thorne is accepted in its present form by the Department of Botany and Range Science of Brigham Young University as satisfying the thesis requirement for the degree of Master of Science.

July 22, 1977
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INTRODUCTION

The Obione and Atriplex subgenera of the genus Atriplex include the annual species of Atriplex in Utah. These plants are salt tolerant and well adapted to the salt affected soils of Utah and other western states. Some of the herbaceous Atriplex taxa are native, others are adventive from Eurasia, and a few are escaped cultivars from Europe.

Since 1923 when Hall and Clement monographed Atriplex, no work has been done on the herbaceous materials in Utah. Much of it had been misidentified, and little was known of the patterns of distribution within the state. Many specimens in herbaria are too immature to identify with any degree of certainty.

Up to the time of Linnaeus (1753), the genus Atriplex included most of Chenopodiaceae and few Polygonaceae, but he followed the trend of European botanists of his time and drew the line more closely. Gaertner (1791) described a single species Obione muricata (now known as Atriplex sibirica). That taxon was adopted by Moquin-Tandon (1840) when he wrote his monograph of Chenopodiaceae. Watson (1874) reduced Obione to Atriplex in his revision of the North American Chenopodiaceae. He was the first to divide Atriplex into three sections: 1) radicle inferior or subascending, 2) radicle usually superior, annuals, and 3) radicle usually superior, perennials.
In their classic, Phylogenetic Methods in Taxonomy, Hall and Clement (1923) proposed two subgenera: 1) Euatriplex, radicle inferior, and 2) Obione, radicle superior. This system is still useful today.

In the present treatment of herbaceous Atriplex, sixteen taxa are reported for Utah: twelve species and six varieties. Four species are introduced from Europe: three of these are weedy adventives, and one is an escaped cultivar. All of them belong to the subgenus Atriplex. Eight species are known to be natives; all belong to the subgenus Obione.

The Atriplex subgenus contains the more primitive members of the Atriplex genus. These species are introduced from the Eurasian countries, the radicle is inferior, two types of seed are present and the plants are monoeious. The native species are of the subgenus Obione, the radicle is superior and the plants may be either monoeious or dioecious. (Hall and Clements, 1923.)

Two of the species pose taxonomic problems: Atriplex patula and A. argentea. Linnaeus named two species of Atriplex, A. patula and A. hastata. A. hastata has since been shown to be A. calotheca (Rafn.) Fries by Hansen and Pederson (1968). The name A. triangularis Willdenow (Sp. Pl. 4:963. 1805) had already been given to the plant which more nearly fit the European descriptions of A. hastata L. In 1867 Asa Gray named A. triangularis Willdenow as a variety of A. patula (Manual, ed 5:409). Hall and Clement (1923) list A. patula var. hastata Gray as a subspecies of A. patula which they named A. patula ssp. hastata.
Figure 1. Phylogenetic diagram showing tentative relationships between the Utah *Atriplex*.
Because of the recent work (Taschereau 1972) on the Linnaean specimen *A. hastata*, it appears that *A. hastata* L. should be rejected as a specific epithet for the species to which it is now applied. The oldest name available for *A. hastata* L. is *A. triangularis* Willdenow. Therefore the name of *A. patula* L. var. *triangularis* (Willd.) Thorne will be used. It is a nom. nov. for what had been known as *A. patula* L. var. *hastata* Gray.

*Atriplex argentea* var. *argentea* apparently cannot be separated vegetatively from *A. truncata*, and in fact fruiting bracts of the *A. truncata* type occasionally occur on specimens of *A. argentea* and vice-versa. Following Hall and Clement (1923) I have maintained *A. argentea* and *A. truncata* as distinct species although there is a close relationship between them which should be more thoroughly examined at some future time.

**Materials and methods**

Research materials have been obtained from the following sources: type specimens were borrowed from New York and Massachusetts; visits were made to herbaria in Utah, California, and Washington; and field studies were conducted during the 1974, 1975, and 1976 growing seasons.

Measurements on all parts of the plant were made. A stereoscopic microscope was used in examining small structures such as seeds, bracts, and reticulate venation in the leaves of plants having the $C_4$ photosynthetic pathway. The standard abbreviations are those of Holmgren and Keuken (1974).
DIAGNOSTIC CHARACTERISTICS

1. Kranztypus venation. This dark green reticulate branching pattern is revealed on the leaf surface when it is scraped with a razor blade and observed under a 12x microscope. It indicates the C₄ pathway of photosynthesis for the plant as compared to a non-reticulate surface in plants having the normal C₃ photosynthetic process (Smith and Robbins, 1974).

2. Seeds. All Utah species have a verticle seed between two bracts. The only species to have a horizontal seed is A. hortensis, considered to be the most primitive of the herbaceous Atriplex, because it retains a membraneous perianth around the horizontal seed. All the introduced species of Atriplex exhibit seminal dimorphism; a large brown seed with an inferior radical strongly produced, and a smaller black seed with a radical barely produced. All the native species have only one type of seed with a superior radical.

3. Fruiting bracts. This is a useful character when separating the Atriplex into species, but care must be taken to ensure that bracts are mature. United bracts are assumed to be more advanced than separate ones and leafy textured than spongy or hard bracts (Bessey, 1915).

4. Bract tissue. A layer of spongy material may develop on the inside of the fruiting bract inner surface. It may be just around the edge or all over the wall and appears to be areenchyma cells. It occurs in some of the varieties of A. patula but not in others.
5. Leaves. This is a useful character when separating subgenera and indicating Kranztypus venation, but it is unwise to depend entirely on leaf shape or size to indicate species. Usually the lower leaves are opposite and the upper ones alternate. Those species with hastate or cordate leaves may be more primitive than those with lanceolate or linear leaves.

6. Flowers. The flowers are imperfect being either staminate or pistillate. The plants are monoeocious except A. powellii which is dioecious.

7. Inflorescence. Usually the flowers begin on the stem with male and female mixed in axillary clusters. Occasionally a plant will have only female in the lower axils, male and female mixed in the middle and upper axils, and sometimes male only in the upper axils or in terminal spikes. Usually the male flower has dropped off by the time the fruiting bracts are mature.

8. Pubescence. The Utah specimens are glabrate to densely scurfy with inflated trichomes. Most young plants of all the species are somewhat scurfy and some become glabrous with age.

9. Habit. The annuals are herbaceous with the exception of A. elegans which has been reported to live more than one season. However, other species are known to have a cambial layer and secondary xylem (A. powellii).

TAXONOMY


Plants annual or perennial, monoeocious or dioecious; stems simple to much branched, erect, ascending or prostrate; pubescence
of inflated or arachnoid hairs more or less present; lower leaves opposite, upper usually alternate, sessile or petioled, entire to coarsely dentate; flowers in axillary clusters, staminate and pistillate mixed or staminate only in the upper axils or terminal spike, staminate without bracts having a 3-5 cleft perianth, 3-5 stamens, the filaments united or not, the anthers two loculed, rudimentary ovary or not, pistillate flowers subtended by two bracts, united at the base, middle or summit, margins entire or variously dentate, sometimes thickened; perianth lacking or rarely a perianth of 3-5 cleft membraneous scales (Atriplex hortensis), no stamens or disk present, stigmas two, filiform; fruit an urticle enclosed or not within the bracts; seed verticle or rarely horizontal (Atriplex hortensis), pericarp free, seed coat membraneous or coriaceous; embryo surrounding the endosperm, radicle inferior, lateral or superior, wind or self-pollinated.

Key to the species.

1. Seeds dimorphic (2)
1. Seeds not dimorphic (5)
2. Fruiting bracts orbicular to suborbicular, face smooth, margin entire (3)
2. Fruiting bracts triangular, broadly triangular, triangular ovate or rhombic, margin denticulate or entire, face usually tubercled (4)
3. Black seed horizontal with membraneous perianth present; brown seed verticle between bracts. A. hortensis
3. Black seed verticle between two fruiting bracts, usually
smaller than the bracts containing the brown seed. *A. heterosperma*

4. Lower leaves ovate with dentate margins, sessile or short petiolate, Kranztypus venation present. *A. rosea*

4. Lower leaves lanceolate, rhombic, triangular or hastate with margins dentate or entire, petiolate, Kranztypus venation not present. *A. patula*

5. Plants monocious (6)

5. Plants dioecious, three veins prominent on abaxial side of leaf, fruiting bracts truncate, face tubercled. *A. powellii*

6. Fruiting bracts orbicular or suborbicular, margins denticulate or deeply lacerated, Washington County. *A. elegans*

6. Fruiting bracts various, but if orbicular then margins entire (7)

7. Lower leaves linear or lanceolate, sessile, not over 2 cm long (8)

7. Lower leaves rhomboid, deltoid or cordate, usually petiolate (9)

8. Fruiting bracts ovate or oblong, face tubercled. *A. tenuissima*

8. Fruiting bracts truncate, face smooth. *A. wolfii*

9. Fruiting bracts dimorphic; sessile to subsessile, truncate on the lower axils, long stalked with crested or horny appendages above sometimes reflexed; leaves cordate. *A. saccaria*

9. Fruiting bracts not dimorphic (10)

10. Fruiting bracts truncate, sessile, with three minute teeth at the apex. *A. truncata*
10. Fruiting bracts not truncate (11)

11. Fruiting bracts with a dentate foliaceous margin well below the apex, sometimes stalked with horny or crested appendages.

   A. argentea

11. Fruiting bracts winged with an entire foliaceous margin surrounding the seed. A. graciliflora
Atriplex argentea Nutt.

An erect freely branching globose plant, rarely strict; leaves grayish, scurfy when young, occasionally glabrate when mature, petioled or sessile, usually lance-ovate, lanceolate, deltoid or cordate, base cuneate to subhastate, apex usually obtuse or acute, 2-5 (6) cm long, 1-4 (5) cm wide; flowers monocious, pistillate and staminate with a 5-merous perianth; fruiting bracts sessile, subsessile, stalked or long stalked 4-15 (25) mm long, 4-10 (15) mm wide, margin foliaceous to well below the apex, usually dentate to laciniate, face smooth, tubercled, crested, or with horny appendages; seed 2 mm, brown; radicle superior. 2N=18.

Key to the subspecies and varieties of A. argentea
1. Fruiting bracts short-stalked to subsessile, face smooth, tubercled, or crested (2)
1. Fruiting bracts long stalked, face with horny appendages, frequently twisted. A. argentea var. caput-medusa
2. Upper leaves short-petioled or subsessile. A. argentea ssp. argentea
2. Upper leaves subsessile to sessile. A. argentea ssp. expansa

Atriplex argentea Nutt. Genera Pls. N. Amer. 1:198. 1818. Type locality: On sterile and saline places near the Missouri River.


An erect globose plant, branching from the base, 1-8 dm tall, rarely strict; leaves usually triangular ovate, deltoid or
cordate, usually all petiolate, 2-5 cm long, 1-4 cm wide; fruiting bracts sessile to stalked, 4-7 (14) mm long, 4-9 (15) mm wide; margin foliaceous to well below the apex, usually dentate to lacinate, face usually tubercled or crested; seed brown, 2 mm; radicle superior. 2N=18. Collections: Carbon Co: 3 miles south on Utah Highway 10, K. H. Thorne 52, 9 Oct. 1975 (BRY). Garfield Co: 11 miles east of Hog Springs Highway 95, Howard Stutz 7247, 20 June 1973 (BRY). Salt Lake Co: Beck's Hot Springs, W. S. Flowers 640, 12 Sept. 1924 (UT). San Juan Co: Between Moab and Monticello, Rydberg and Garrett 9110, 22 July 1911 (US, isotype of A. rydbergii).

Habitat—Grows in moderate saline or alkali soils, sandy or rocky areas in a dry climate. A pioneer on disturbed sites or fallow fields. May-October.

Distribution—North America principally the western section, and northern Mexico.

Relationships between A. argentea, A. truncata and A. saccaria certainly exist. Young plants of A. truncata and A. argentea are indistinguishable. Mature plants differ only in their fruiting bracts; the summit of A. truncata is truncate with three dentate teeth in the foliaceous margin and the face usually smooth. In A. argentea the foliaceous margin with several dentate teeth is rounded well below the summit and the face is usually crested or tubercled. The two plants have a continuous range of variation, bracts resembling A. truncata have been found on A. argentea and vice-versa. Both plants are native to North America and are best defined east of the Rocky Mountains. Perhaps as the
plants moved west from the center of distribution, introgressive hybridization obscured the original populations (Lois Arnow, 1975).

ssp. expansa (S.Wats.) Hall and Clements

A. argentea Nutt. ssp. expansa (S. Wats.) Hall and Clements,
Carnegie Inst. Publ. 326:284. 1923. Type locality: Not definitely stated but the description comes from specimens collected in the valley of the Rio Grande, western Texas.

An erect globose plant, branching from the base, 1-8 dm tall, occasionally strict; leaves usually triangular ovate or cordate, petioled only on the lower leaves if at all, sessile on the upper part of the plant, 2-4 cm long, 4-7 cm wide; fruiting bracts sessile to stalked, 4-7 (14) mm long, 4-9 (15) mm wide, margin foliaceous to well below the apex, usually dentate to lacinate, face usually tubercled or crested; seed brown, 2 mm; radicle superior. 2N=18. Collections: Cache Co: Logan, Bassett Maguire 134, 4 Oct. 1931 (UT). San Juan Co: Desert flats, Monte-zuma Creek, J. Van Cott V-12, 12 Oct. 1940 (UT).

Habitat—Grows in moderately saline soils or alkali flats, a weed of fallow fields or waste places. Appears to be more abundant in the southern areas within the range of A. argentea. This subspecies is a host plant for Eutettix tenella the sugar beet leaf hopper. May-October.

Distribution—Includes the southern half of western North America and northern Mexico.
Atriplex argentea Nutt. var. caput-medusa (Eastw.) Fosberg

Atriplex argentea Nutt. var. caput-medusa (Eastw.) Fosberg Amer. Midl. Nat. 26:693. 1941. Type locality: San Juan Co., San Juan River near Recapture Creek. Alice Eastwood, 18 July 1895.


Plant is erect, globose, branching from the base, 1-8 dm tall, rarely strict; leaves usually triangular ovate, deltoid or cordate, usually all petiolate, 2-5 cm long, 1-4 cm wide; fruiting bracts long stalked with faces covered with flat horny appendages frequently twisted, 4-13 (15) mm long, 4-12 (15) mm wide; seed brown, 2 mm; radicle superior. Collections: San Juan Co: San Juan River near Recapture Creek, Eastwood 116, 18 July 1895 (CAS holotype, US isotype of A. caput-medusa Eastwood); Bluff, A. Eastwood and J. T. Howell, 15 Sept. 1938 (UC). Uintah Co: 13 miles west of Vernal U.S. Highway 40, Roxanna S. Ferris sn, 6 July 1947 (UTC).

Habitat—Grows in moderately saline or alkali areas. Not as abundant as the other subspecies of A. argentea. May-October.

Distribution—Western part of North America and northern Mexico.
Figure 2. *Atriplex argentea* Nutt. A. Habit of plants.

Distribution maps 1-3. 1. *Atriplex argentea* var. *argentea*.

Atriplex elegans (Moquin) Dietrich

Atriplex elegans (Moquin) Dietrich. Syn. Pl. 5:537. 1852. Type

locality: Sonora, Mexico.

An erect or decumbent plant with ascending branches, rounded and bushy, 1-6 dm tall, branches slender or stout, coarsely scurfy to glabrate; leaves sessile or short petioled, elliptic-spathulate, oblanceolate, oblong or obovate, base cuneate, apex obtuse or acute, 0.5-3 cm long, 0.2-0.8 cm wide, margin entire or somewhat dentate, scurfy on both side or only on the lower, mid-vein prominent; flowers monocious, all in axillary clusters, lower pistillate only, middle mixed, upper staminate only, staminate with a (3)5-merous perianth; fruiting bracts short stalked, strongly compressed, united except at the foliaceous margin, orbicular or suborbicular, 2-4 mm diameter, margins acutely dentate, terminal tooth sometimes prominent, faces smooth, scurfy to glabrate, mid-vein prominent; seed 1-1.4 mm, pale to dark brown, radicle superior. 2N=18. Collections: Washington Co: St. George, Hall H-29, 1934 (BRY). St. George, D. H. Galway sn, 26 Sept. 1935 (UT).

Habitat—Grows in moderately saline soils along roadsides, fallow fields and other disturbed sites. It is one of the few herbaceous Atriplex known to exist for more than one season. The Pima Indians are said to have used the greens of this plant as food. Flowering appears to be moisture related.

Distribution—Mexico, Texas, New Mexico, Arizona, southern California, Nevada, and Utah where it is known only from Washington County.
Figure 3. *Atriplex elegans* (Moquin) Dietrich. A. Habit of plant. B. Branch of *A. elegans*. C. Branch showing *A. elegans* var. *fasciculata* note the entire leaf and denticulate fruiting bract margin. This variety has not been collected in Utah, but it has in Arizona and Nevada close to the border.

D. Fruiting bracts of *A. elegans* var. *fasciculata*.

E. Fruiting bracts of *A. elegans* var. *elegans*.

F. Seed
**Atriplex graciliflora** M. E. Jones


An erect, 1-3 dm plant, branching from the base, globose, branches ascending becoming brittle at maturity; leaves all petiolate, cordate-ovate, cordate, or deltoid-ovate (ours), base truncate or cordate, apex obtuse or acute, 1-2 cm long, 1-2 cm wide, margin entire, veins evident; flowers monocious, staminate in short, dense or loose panicles with a 5-merous perianth, pistillate all axillary; fruiting bracts sessile, subsessile, short or long stalked, compressed and united to the summit, orbicular, oblong or cordate due to the wings formed on an elliptic body, (6) 10-16 mm long and broad, margin foliaceous, entire or undulate, face smooth, midvein prominent; seed 3 mm, dull white, radicle superior.


Distribution—Previously known only from Utah, the plant was collected in Colorado in 1954.
Figure 4. *Atriplex graciliflora* M. E. Jones. A. Habit of plant. B. Branch showing fruiting bracts in the leaf axils. C. Fruiting bracts. D. Seed.

7. *Atriplex hortensis*.


**Atriplex heterosperma** Bge.

*Atriplex heterosperma* Bge. Reliq. Lehm. 1851. Type locality: Area between Buzuluk and Ural'sk, Russia.

Plant is erect or decumbent, 2-14 dm tall, branched or strict, usually rigid; mature stems glabrate with white or pale green verticle ribs; leaves usually opposite on lower axils and alternate above, rarely all opposite, petioled, occasionally sessile, triangular-ovate to hastate, base hastate, sometimes with a pair of small retorse subsidiary lobes, apex acute, occasionally fleshy, margin entire to coarsely dentate; flowers monocious, staminate and pistillate mixed in leaf axils or in simple or compound spikes above, staminate with a 5-merous perianth; fruiting bracts orbicular or sub-orbicular, rarely ovate, margins entire, face smooth, dimorphic, one larger with a light brown verticle seed, 2-3 mm, and one smaller with a shiny black verticle seed, 1 mm. 2N=36. Collections: Box Elder Co: Bear River Bird Refuge, Great Salt Lake, K. H. Thorne 121, 17 Oct. 1976 (BRY). Cache Co: 2 miles N. of Valley View Highway toward Benson, K. H. Thorne 117, 3 Oct. 1976 (BRY). Utah Co: Powell's Slough, Utah Lake, K. H. Thorne 113, 21 Sept. 1976 (BRY).

Habitat—Grows in brackish marshland, on disturbed soils or in fallow fields. It appears to occupy much the same ecological niche as does *A. patula* L. var. *triangularis* (Willd.) Thorne and the plants were found growing together. June-September.

Distribution—Central Asia, western Siberia, Utah, Colorado, California and Canada. Undoubtedly it is more widespread than the records indicate.
Figure 5. *Atriplex heterosperma* Bge. A. Habit of plant

B. Inflorescence  C. Small fruiting bracts with the black seed  D. Large fruiting bracts with the brown seed.
Atriplex hortensis L.

Atriplex hortensis L. Sp. Pl. 1053. 1753. Type locality: Siberia

An erect or subdecumbent plant 5-20 dm high, branching from
the base, upper branches ascending, usually glabrate especially
when mature; leaves petioled, ovate, triangular or lance-ovate, the
base cordate to subhastate, the upper leaves slightly rounded to
the petiole, apex obtuse, 4-12 (20) cm long, 3-5 (9) cm wide,
margin entire to sinuate, dentate, thin, usually bright green,
glaberous; flowers monocious, spicate along branches of elongated
terminal panicle, staminate and pistillate mixed or staminate may
be in terminal spikes, staminate calyx 3-5 lobed, pistillate
flowers of two kinds: vertical orbicular bracts or a horizontal
4-5 cleft perianth enclosing a pistil, both short pedicillate;
orbicular bracts compressed, united only at the base, greenish,
margins entire, 8-19 mm long, face smooth; seeds dimorphic, large
2-4 mm brown and smaller 1.5 mm black, shiny; radicle inferior.
2N=18. Collections: Duchesne Co: 2 W. 33 S. Salt Lake City,
E. F. Reimschussel sn, 18 Sept. 1964 (BRY). Utah Co: Mouth of

Habitat--Grows in brackish moist low-lying areas or along
ditch banks. It tends to disappear when these areas are cultivated.
May-September.

Distribution--Asia, Europe, north Africa, North America,
possibly South America and Australia.

A. hortensis probably originated in central Asia as a
garden form of A. nitens, and was selectively bred for its' present
glabrate appearance, but it is not positively known as a native
anywhere. It has become naturalized in Europe. Komarov (1936) states that he has not seen true *A. hortensis* either in Siberia or central Asia, but that a glabrate form of *A. nitens* Schkuhr is mistaken for it. This suggests that the phylogenetic type of *A. hortensis* is *A. nitens*, but the nomenclatural type remains *A. hortensis*. The plant has been used extensively as a garden herb or ornamental plant in the old world and was introduced in North America at several different places, usually as a garden herb.
Figure 6. *Atriplex hortensis* L. A. Habit of plant. B. Leaf.

C. Fruiting bracts showing the vertical bracts containing the brown seed and the horizontal black seed with a perianth. D. Inflorescence. E. Black seed with a perianth. F. Inflorescence showing the lanceolate leaf common on the upper part of the plant. G. Brown seed contained within the vertical fruiting bracts.
Atriplex patula L.

Plant is erect, decumbent, procumbent or prostrate, 2-10 (15) dm, branched or strict, slender or stout, usually somewhat rigid; stems smooth in young plants, older ones have vertical ribs, white or pale green; leaves usually alternate, rarely all opposite, petioled, occasionally sessile, subdeltoid, rhomboid, lanceolate, ovate, broad triangular, hastate or linear, 2-8 (13) cm but the size is highly variable, base is attenuate, cordate, hastate, or cuneate, apex acute or obtuse, margin entire to coarsely dentate, sometimes fleshy, young plants somewhat scurfy, becoming glabrate when mature; flower monoeious, staminate and pistillate usually mixed in the leaf axils on the lower part of the plant or in simple or compound spikes above, staminate with a 4-5-merous perianth; fruiting bracts sessile or subsessile, rarely stalked, united only at the base, not much compressed, broadly triangular, triangular-ovate or rhomboid, (2) 3-12 mm long, 3-9 mm wide, usually foliaceous, sometimes spongy or hardened, margin entire or denticulate, face smooth, muricate, or with clustered tubercles; vertical seeds of two kinds: large dark brown, 1-3 mm wide, and smaller black, 1-2 mm long; radicle inferior.

Key to the varieties of A. patula

1. Lower leaves hastate, triangular, rhomboid (2)
1. Lower leaves lanceolate, foliaceous, fruiting bracts rhomboid to ovate, foliaceous. 2N=36 A. patula var. patula
2. Leaves succulent, fruiting bracts wider than long, broadly triangular, spongy inner layer. 2N=54 A. patula var. carnosa
2. Leaves foliaceous, fruiting bracts triangular, rarely weakly spongy. 2N=18 A. patula var. triangularis

var. patula

Atriplex patula L. var. patula L. Sp. Pl. 1053. 1753. Type locality: Europe.

Plant is usually erect, 3-15 dm, branched or strict; leaves foliaceous, lanceolate, 2-10 (12) cm long, 2-5 cm wide, margin toothed or not, base long cuneate narrowing gradually into petiole; fruiting bracts usually sessile, rarely stalked, rhomboid to ovate, 2-6 (12) mm long, 2-5 mm wide, foliaceous, face tubercled or not, margin sometimes denticulate; seeds of two types, large brown 2-3 mm, round, radicle pointed, smaller black, 1-2 mm oval.

Collection: Salt Lake Co: S. of Salt Lake City in County Park at 1100 E. 4300 S., L. Arnow, 13 August 1974 (UT).

Habitat—Grows in soils of low saline or alkali content or in non-saline areas, plant of edges it establishes itself along the side of the road, buildings, cultivated fields, or waste places. Occurs frequently but rarely abundantly. June-September.

Distribution—North America, possibly South America, Europe, Asia, north Africa, and possibly Australia.

There are contradictory views on whether the A. patula group is a species with several varieties or several species. All European floras examined gave more than one species for the patula group. Tutin (1964) listed four: A. hastata, A. patula, A. litoralis and A. patens. Komarov (1963) lists twelve: A. litoralis, A. laevis, A. patens, A. crassifolia, A. patula, A.
oblongifolia, A. nudicaulia, A. gmelini, A. hastata, A. calotheca, A. heterosperma and A. dimorphostegia. With few exceptions the descriptions overlapped considerably. Clapham (1962) listed only three species: A. litoralis, A. patula and A. hastata. He mentions the difficulty of putting these plants into a specific level and says the only thing that separates them is the leaf shape and chromosome number. Hume's (1958) report of experimentally produced hybrids between A. patula and A. patula var. hastata said the $F_1$ generation was mostly sterile, triploid plants with irregular meiosis. Nothing like them were observed in the field.

According to Taschereau (1972) confusion within this group exists mainly because of the many polymorphic species which exhibit great phenotypic plasticity and the numerous autogamous biotypes this situation creates. Margarida Queiros (1975) suggests that the occurrence of mixoploidy, the result of endopolyploidy, is frequent in some populations.

The North American floras are divided in their treatment of this group; the older ones usually recognize both hastata and patula as species. This includes J. K. Small (1933) and P. A. Rydberg (1906). Later authors, C. L. Hitchcock, et. al. (1971) have followed Asa Gray (1867) in his opinion that A. patula var. hastata is the proper name for the hastate leaf plant while retaining the old A. patula L. for the lanceolate leaf one: As explained in the introduction, A. patula var. hastata is not acceptable under the 1972 rules of botanical nomenclature and the name A. patula L. var. triangularis (Willd.) Thorne is proposed.
Figure 7. *Atriplex patula* L. var. *patula*. A. Inflorescence. B. Fruiting bracts showing variety seen on various plants. C. Dimorphic seeds. D. Inflorescence showing leaf variety.
Examination of the herbarium specimens disclosed a continuum, i.e. the fruiting bracts on the hastate leaf plant were usually triangular, occasionally ovate or rhomboid. The fruiting bracts on the lanceolate leaf plant were usually rhomboid, occasionally ovate. The fruiting bracts of the succulent leaf plant were usually triangular-ovate, occasionally triangular, rarely broad ovate. The descriptions overlap if they truly cover the material that has been collected. Morphologically the plant is a species with several varieties, despite the different chromosome numbers.

var. *triangularis* (Willd.) Thorne nom. nov.

*Atriplex patula* L. var. *triangularis* (Willd.) Thorne nom. nov.

Type locality: Europe.

*Atriplex hastata* L. Sp. Pl. 1053. 1753.


*Atriplex patula* L. var. *hastata* A. Gray Man. 5:409. 1867.

Plant is usually erect, 4-15 dm, branched or strict; leaves foliaceous, hastate or triangular, rarely somewhat succulent, 3-11 cm long, 2-8 cm wide, margin toothed or not, base truncate abruptly contracted to the petiole; fruiting bracts usually sessile, usually foliaceous, sometimes weakly spongy, triangular 3-5 (10) mm long, face usually tubercled, margin denticulate, seeds of two types, brown round 2-3 mm wide, radicle curved, black round 1-2 mm wide. Collections: Salt Lake Co: Salt Lake City 15 S. Jordon River Crossing of Rt. 111, L. Arnow 737, 22 Sept. 1967 (UT). Utah Co: Powell's Slough, Utah Lake, K. H. Thorne 111, 20 Sept.
Figure 8. *Atriplex patula* L. var. *triangularis* (Willd.) Thorne

A. Habit of plant. B. Inflorescence note the lanceolate leaves on the upper axils. C. Hastate leaf common on the lower part of the plant. D. Fruiting bracts. E. Dimorphic seeds. F. Fruiting bracts showing the slightly thicker variety. G. Leaf showing variety seen on a different plant.

Habitat—Grows in saline or non-saline areas. Appears to have a high tolerance for edaphic extremes in salt marshes, sea beaches, inland waste places and disturbed non-saline soils. It is the most abundant of the A. patula varieties in Utah. May-September.

Distribution—North America, Europe, Asia, and north Africa. Possibly Australia and South America.

The plant is diploid and has the usual Atriplex basic chromosome number of nine.

var. carnosa (Nels.) Thorne comb. nov.

Atriplex var. carnosa (Nels.) Thorne comb. nov. Type locality: Europe.


Plant is usually erect, 4-15 dm, branched or strict, usually rigid with branched ascending; leaves succulent, 5-12 cm long, 3-7 cm wide, margin toothed or not, base broadly cuneate to the petiole, sometimes lanceolate with two out pointing lobes; fruiting bracts usually sessile, broadly triangular or broadly ovate-triangular, spongy inner layer, margin denticulate or smooth, face usually tubercled, 3-7 (12) mm long, 4-7 mm wide, persistent;
seed of two types: brown elliptical or round 1.5-3 mm wide, radical apex incurved, black round 1-2 mm wide.

Habitat—Grows in low saline soil but apparently not in non-saline areas, a salt obligate, it does not tolerate extremes. Grows with A. patula var. triangularis and A. patula var. patula if conditions are right. June-October.

Distribution—North America, and possibly northern Mexico. The plant is a hexaploid member of the patula group. It occurs less frequently than A. patula var. hastata but more than A. patula var. patula does in Utah. P. M. Taschereau (1972) and I. J. Bassett and C. W. Crompton (1973) say it is a native species of Atriplex. In our material it appears to be a part of the continuum formed by the A. patula group, although future work on this complex plant may reveal its native status.
Figure 9. *Atriplex patula* L. var. *carnosa* (A. Nels) Thorne

A. Inflorescence. B. Leaves, lanceolate type.

C. Leaves, broad triangular. D. Fruiting bracts showing the broad triangular shape. E. Fruiting bracts showing a broad ovate triangular shape.

F. Dimorphic seeds. G. Fruiting bracts showing variety seen on different plants.

10. *Atriplex patula* var. *carnosa*.
Atriplex powellii S. Wats.


Type locality: Arizona, type specimen was cultivated from seed brought back from a western expedition by Captain John Wesley Powell.

An erect somewhat woody plant, slender or stout, pyramidal or columnar, branches ascending, usually scurfy or sometimes glabrate, pubescence of two types, inflated or arachnose; leaves petioled on the lower axils, sessile on the upper, broadly ovate or rhombic-ovate, base rounded or cuneate, apex acute, 1-4 (5) cm long, 0.8-3.0 cm wide, margin entire, firm, grayish scurf underneath, glabrate to slightly scurfy above, prominently three nerved; flowers imperfectly dioecious, most plants either pistillate or staminate, rarely a few pistillate on the lower axils of a staminate plant, all axillary glomerules with subtending leaves, staminate with a 4-5 cleft perianth; fruiting bracts sessile, thick, united to the summit, broadly spatulate, or broadly oblong, apex truncate or cuspidate, face with prominently thickened ascending processes, rarely smooth; seed 2 mm long, greenish yellow; radicle superior. 2N=18. Collections: Carbon Co: 5 miles E. of Price, B. F. Harrison 19265, 10 June 1941 (BRY). Emery Co: 5 miles N. of Cleveland on Utah Highway 10, K. H. Thorne 61, 9 Oct. 1975 (BRY). Grand Co: 8 miles S. of Crescent Junction of Utah Highway 6-50, Howard Stutz 7202, 26 July 1972 (BRY). Uintah Co: Vernal, Standly 7494, 21 August 1937 (BRY). Wayne Co: Capitol Reef National Park, H. K. Harrison 1132, 5 July 1973 (BRY).
Habitat—Grows on salty disturbed areas and roadsides where it sometimes forms pure stands or else becomes part of a community with other halophytes. Sometimes becomes abundant on soils with surface alkali. July–October.

Distribution—Western North America and northern Mexico desert areas.

This plant appears to have no close relatives and does not seem to be an intermediary between two herbaceous species. The leaf shape and venation are like A. argentea, but it is probably not a part of this group. It is the only dioecious annual in Utah, although it is sometimes imperfectly so.
Figure 10. *Atriplex powellii* S. Wats.  
A. Habit of plant.  
B. Branch of male plant.  
C. Branch of female plant.  
D. Male plant with unusually robust habit.  
E. Fruiting bracts showing truncate apex and tubercled face.  
F. Seed.
Atriplex rosea L.


Erect plant, branching from the base, rounded or pyramidal form, sometimes simple stems with thin forms, nearly glabrate; leaves sessile or petiolate, usually oval, rarely obtuse at the apex, 2-6 cm long, 1-3 cm wide, margin acutely dentate or obtuse dentate, densely scurfy, becomes hard on drying, persistent on the stem; flowers monocious, staminate in the upper axils or in terminal spikes, perianth of 4-5 lobes, pistillate clusters in axils below the staminate; fruiting bracts, sessile, compressed, united to the middle, rhombic or ovate from a wide base, 4-6 (8) mm long and wide, firm, becoming hard in maturity, margins acutely dentate, face with sharp tubercles; seeds of two kinds: larger dull dark brown, 2-2.5 mm, and smaller black 1-2 mm; radicle inferior. 2N=18. Collections: Box Elder Co: Bear River marshes, G. Piranian, 14 Aug. 1936 (UT). Cache Co: 2 miles N. of Valley View Highway toward Benson, K. H. Thorne 118, 3 Oct. 1976 (BRY). Washington Co: Virgin River, R. W. Christian 1114, 10 Aug. 1963 (BRY).

Habitat—Grows in saline or alkali soil or in non-saline fallow fields and waste areas. Adapted for xerophytic habitats it tends to be variable according to edaphic conditions, (for instance an abundance of water causes the plant to become much larger than usual). A. rosea can become a tumbleweed and occasionally forms pure stands. July-October.
Distribution—Europe, western Asia, north Africa, North America (especially abundant in the western part), northern Mexico and possibly South America.

In Greece potash was made from the plant and western Europeans have a recipe for pickling the young shoots like capers. According to the doctrine of signatures, the plant was a cure for scrofula. However, it is known to be slightly poisonous. The pollen can cause hayfever in susceptible individuals. It is one of the major host plants for *Eutettix tennella*, the sugar beet leaf hopper.
Figure 11. *Atriplex rosea* L. A. Habit of plant. B. Branch showing fruiting bracts in the leaf axils.

C. Fruiting bracts. D. Leaves showing some of the variety seen on different plants. E. Seeds showing the two types.
Atriplex saccaria S. Wats.


Type locality: Southern Wyoming or northern Utah desert area.


An erect copiously branching plant with a globoid shape, stout, roughly scurfy, occasionally glabrate when mature; leaves petiolate, upper sometimes subsessile, broad cordate to cordate-ovate, base broadly truncate or cordate, apex acute, 1–4 cm long, 1–3 cm wide, margins entire, somewhat fleshy, usually scurfy, veins prominent; flowers monocious, staminate only in the upper axils or in lax open spikes, but these may break off in the mature plant, staminate with a 5-merous perianth, pistillate all axillary; fruiting bracts dimorphic, one subsessile or sessile, truncate, foliaceous margin at summit usually with three dentate teeth, face smooth, 3 mm long and broad, located on lower axils, one long stalked, occasionally reflexed, margin irregular and coarsely dentate, face thickly covered with crested appendages, usually on upper axils, 4–6 mm long, 3–6 mm wide; seed 2–3 mm, light brown or thickened dull white; radicle superior. Collections: Emery Co: Green River 4,500 ft., in clay, M. E. Jones 5481, 22 June 1894 (US, holotype of A. cornuta M. E. Jones); Morrison formation S. of Green River, S. L. Welsh 10820, 1 Sept. 1970 (BRY). San Juan Co: Navajo Mt. Trading Post, Atwood & Trotter 5353, 24 June 1973 (BRY). Uintah Co: Willow Creek, S. of Ouray, Howard Stutz 7686, 4 June

Habitat—Grows in saline, alkali or shaly soil. It often indicates the Tropic, Mancos, or other shale deposits. Somewhat restricted, the plant occurs on dry plains, hillsides and talus slopes. It has not been collected west of the Tavaputs Plateau. July–October.

Distribution—Southwestern Wyoming, northeastern Arizona, northwestern New Mexico and eastern Utah.

*A. saccaria* clearly shows its relationship to *A. truncata* by the fruiting bracts on the lower axils which are truncate and nearly identical to those of *A. truncata*. Fruiting bracts in the upper axils are long stalked with crested projections on the face similar to those of *A. argentea*. However, its adaption to different environmental conditions than either of the others tolerate, and its more restricted distribution indicate that *A. saccaria* should be regarded as a separate taxon. Future cytological work may show whether or not it is intermediary between these species.
Figure 12. *Atriplex saccharia* S. Wats.  
A. Habit of plant.  
B. Branch showing dimorphic fruiting structures.  
C. Leaf showing occasional hastate shape.  
E. Fruiting bracts with crested face.  
F. Fruiting bracts showing larger size, longer pedicle and horned face.  
G. Seed
Atriplex tenuissima A. Nels.


Erect annual plant 1-3 dm high, much branched, slender, ascending, branches becoming reddish, somewhat scurfy or glabrate; leaves sessile, linear, apex acute, 1-2 cm long, 1-3 cm wide, usually scurfy, flowers monoeocious, all axillary, staminate and pistillate mixed except staminate alone toward top of plant, staminate with a 5-merous perianth; fruiting bracts sessile, usually thick, united nearly to the summit, oblong or ovate 2-3 mm long, 1-2.5 mm wide, face usually with a few tubercles around middle, rarely smooth; seed 1-2 mm, brownish; radicle superior. Collections: Carbon Co: 6 miles N. of Wellington, Highway 53, Welsh & Christensen 6605, 11 Aug. 1967 (BRY); 3 miles S. of Price on Utah Highway 10, K. H. Thorne 51, 9 Oct. 1975 (BRY). Sevier Co: Gunnison 5,300 ft., M. E. Jones 6525, 15 Sept. 1900 (GH, isotype of A. tenuissima A. Nels).

Habitat—Grows in soils of moderate to high salt or alkali content. Forms loose communities with other halophytes. June-October.


The habit of Atriplex tenuissima closely resembles that of A. wolfii and in fact overlaps it in size, and leaf shape. It differs in the type and shape of fruiting bracts; those of A. tenuissima are ovate or oblong with tubercles on the face, rarely smooth, thick, united nearly to summit and those of A. wolfii are
cuneate, rarely tubercled, with a tiny tridentate apex, united to the summit. *A. tenuissima* may be related to *A. pusilla*, a maritime species with ovate fruiting bracts, but probably not to *A. wolfii*. All of the Utah herbarium specimens examined had the name *A. wolfii* on them but were in fact *A. tenuissima*, having the distinctive ovate or oblong fruiting bracts.
Figure 13. *Atriplex tenuissima* A. Nels.  
A. Habit of plant.  
B. Fruiting bracts showing variety.  
C. Seed
Atriplex truncata (Torr.) A. Gray


An erect, occasionally subdecumbent plant, usually branched, slender, somewhat scurfy to glabrate; leaves mostly sessile, deltoid or triangular ovate, rounded ovate, rarely oval, base broad truncate or subhastate, apex acute or obtuse, 1-3 (5) cm long, 1-3 (4) cm wide, margin entire or rarely dentate, scurfy especially beneath, becoming glabrate with age; flowers monocious, axillary, staminate and pistillate mixed, occasionally staminate only in upper axils, staminate with a (4) 5-merous perianth; fruiting bracts sessile or subsessile, broadly cuneate, summit truncate, 2-3 mm long, 2-3 mm wide, margin foliaceous with three (rarely more) teeth across the summit, face smooth, rarely tubercled, veins prominent; seed 1-2 mm long and wide, light to dark brown; radicle superior. 2N=18. Collections: Carbon Co: Price River, near Price, S. L. Flowers 829A, 12 Sept. 1927 (UT). Utah Co: E. shore of Utah Lake, B. F. Harrison 9888, 10 Sept. 1940 (BRY). Washington Co: St. George, Hall 6276, 3 Sept. 1934 (BRY). Wayne Co: Fish Lake, 9,000 ft. in grassy meadows, M. E. Jones 5745, 6 Aug. 1894 (US, holotype of A. subdecumbens Jones).

Habitat—Grows in areas of low alkalinity and tends to become dwarfed in soils of high salt content. May-August.
Distribution—Western United States to Wyoming, B. C. Canada, and southward to California and New Mexico. Possibly also in northern Mexico.

Two minor varieties occur in Utah, A. truncata var. subdecumbens, type locality, Fish Lake, and A. truncata var. stricta, type locality, along the Green River. Both appear to be ecological forms.
Figure 14. *Atriplex truncata* (Torr.) Gray.  
A. Habit of plant.  
B. Branch showing leaves and clusters of bruiting bracts in axils.  
C. Fruiting bracts.  
D. Seed
**Atriplex wolfii** S. Wats.


An erect plant 1-2 dm tall, branching from the base, ascending to spreading, slender, scurfy or glabrate, stems tend to become reddish in age; leaves sessile, linear, apex obtuse, 0.5-1.5 cm long, 0.1-0.2 cm wide, conduplicate; flowers monoeious, all axillary, staminate and pistillate mixed in the lower axils, but staminate alone toward the top of the plant, staminate with a 5-merous perianth; fruiting bract sessile or subsessile, cuneate, compressed, united to summit, 1.5 mm long, 2 mm wide, face smooth, rarely with a few minute tubercles; seed 1.5 mm, pale brown; radicle superior. Collections: Colorado, Saguache Co: Saguache, Territory, Lt. Wheeler's Expedition, Professors John Wolf and J. T. Rothrock 277, 1873 (US isotype of *A. wolfii*). Utah, Puite or Garfield Co: Circle Valley, altitude 7,000 ft., M. E. Jones sn., 4 Sept. 1894 (UC).

Habitat—Grows in saline or alkali soil under xerophytic conditions, usually with other halophytes. May-September.

Distribution—Wyoming, Colorado and Utah.

Related to *A. truncata* and *A. argentea*, the plant has only one known locality in Utah. The plants examined in the Utah herbaria were labeled *A. wolfii* but were in fact *A. tenuissima*. It is not as widespread as previously supposed. I saw one true specimen of *A. wolfii* from Utah in the University of California at Berkeley herbarium.
Figure 15. *A. wolfii* S. Wats. A. Habit of plant.

B. Fruiting bracts.
BIBLIOGRAPHY


Gray Herbarium Index. 1968. Harvard University, G. K. Hall and Co.,


Moquin-Tandon. 1840. Chenopodearum monographica enumeratio.


Queiros, M. 1975. Contribuição Para O Conhecimento Citotaxonomico
das Spermatophy X Chenopodiaceae. Boletim da Sociedade
Broteriana, Coimbra. 49:143-161.

Rydberg, P. A. 1922. Flora of the Rocky Mountains and adjacent


3:1579-1587.

Stafleu, F. A. 1972. International code of botanical nomen-


Stutz, H. C., J. M. Melby, and G. K. Livingston. 1975. Evolution-

Taschereau, P. M. 1972. Taxonomy and distribution of Atriplex

Taxon Index to Vol. 1-20, Part I Scientific Names. 1972. Roulean,
Ulrecht, Netherlands. 388 pp.

Herb. 25:1-665.

Tutin, T. G., V. H. Heywood, N. A. Burges, D. H. Valentine, S. M.
Walters, and D. A. Webb. 1964. Flora Europa I, Lycopodiaceae

Am. Acad. Arts. 9:82-126.


A REVISION OF THE HERBACEOUS MEMBERS OF

THE GENUS ATRIPLEX (CHENOPODIACEAE)

FOR THE STATE OF UTAH

Kaye Hugie Thorne
Department of Botany and Range Science
M. S. Degree, August 1977

ABSTRACT

The herbaceous Atriplex species which occur in Utah are revised. This study is based on herbarium specimens and field observations throughout the state. My treatment largely follows that of Hall and Clements (1923). A brief discussion of the history, diagnostic characteristics and phylogeny is given. A descriptive key that includes all taxa has been prepared: type locality, synonyms, general habitat and distribution is reported for each entity. Illustrations and maps are included. One variety is described as new.

COMMITTEE APPROVAL: