

WEED SEEDS OF KANSAS:
DESCRIPTIONS OF 240 SPECIES
AND KEYS FOR IDENTIFICATION

by

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INTRODUCTION

This study describes and provides a means to identify the seeds of weeds occurring in Kansas. "Weed" is broadly defined here as a plant which is considered undesirable, which interferes with agriculture or other human enterprises, or which spreads rapidly or aggressively. Weeds of croplands, pastures, range, gardens, and lawns have been included. Aquatic plants, trees, and most shrubs have been excluded, though they might be weeds in some contexts. Criteria for inclusion of weed taxa in the study are discussed below.

Weeds have a great economic impact. They diminish crop yields, obstruct maintenance of pastures and rangeland difficult, and they sometimes poison livestock. Much effort is spent to rid lawns and gardens of undesirable plants. While modern herbicides have made control of many weeds easier, effective use of these chemicals requires rather precise knowledge of the weeds. Herbicides are usually quite selective in their effect and may depend on proper timing of application. They are also expensive and entail some hazards. As a practical matter, the question often arises whether an apparently weedy plant needs to be controlled, either by herbicides or other methods. If the

plant can be identified and consequently determined to be of no concern as a weed, expensive control measures can be avoided. If the plant is a threat as a weed, the proper control measures should be based on the correct identification of the plant. Weeds may require identification at any stage of their development. Often only a part of the plant is available, and identification must be based on that portion. Sometimes seeds are present with other parts of the plant, and at times they are the only part available. For example, weed seeds present as contaminants in commercial supplies of crop seeds are sometimes a serious problem. These seeds are seen in isolation from the parent plants, and must be identified without reference to other plant parts.

Seeds perpetuate flowering plants through time and disperse them through space. While many plants may also reproduce vegetatively, reproduction by means of seeds has three major advantages. Seeds are easily transported over large distances, they are well-suited for survival in a dormant state through unfavorable times, and seed production provides an opportunity for new combinations of genetic material.

An angiosperm seed is a mature ovule. The ovule arises with the ovary and is attached to the ovary wall by

the funiculus. The ovule consists of the nucellus (megasporangium) enclosed by one or two integuments. There is an opening in the integuments (the micropyle) through which pollen tube enters. Within the nucellus the embryo sac develops. The embryo sac includes the egg cell and the polar nuclei. When two sperm nuclei travel through the pollen tube and reach the embryo sac, double fertilization can occur. The ovule then begins to mature into a seed.

The structure of the seed reflects that of the ovule. There are three essential features of a seed: an embryo, a supply of stored nutrients, and a seed coat. The embryo, the product of the union of the egg cell and a sperm nucleus, is a multicellular but immature sporophyte. The supply of nutrients for the growth of the embryo is typically in the form of endosperm. Endosperm is the product of a sperm and one or more polar nuclei, the other half of the "double fertilization" which characterizes the angiosperms. In some cases the nutrients are stored instead as perisperm, a tissue derived from the nucellus. In many seeds, the nutrients are transferred from the endosperm or perisperm to the embryo during maturation. The mature seed then will contain a relatively large embryo and will lack separate storage tissues. The third

essential feature of the seed is the seed coat, which is derived from the integuments of the ovule. The funiculus usually abscises with maturation, leaving a scar, the hilum, on the seed surface. Sometimes a portion of the funiculus persists, becomes fused to the seed coat, and is present as a ridge (the raphe) on the mature seed (Esau, 1977).

Ovules arise within an ovary. There is much variation in the size and shape of the ovary, with one to many ovules arising in single or multiple locules. The mature ovary is termed a fruit. Fruits are of many types. They may be dry or fleshy, dehiscent or indehiscent. In some cases, the fruit wall fuses with the seed coat, in other cases the seeds are free within the fruit. Fruits may be inconspicuous (e.g. *Chenopodium*) or massive (e.g. *Cucurbita*). In some plants, other structures in addition to the ovary wall become fruit-like. In *Xanthium*, for example, each seed is enclosed in an achene (an indehiscent dry fruit), and two achenes are enclosed in a bur, a structure derived from the involucral bracts subtending the flowers. In some taxa, seeds separate from the fruit and disperse singly by a variety of methods. In many taxa, however, the fruits or fruit-like structures function as "diaspores" or units of dispersal (Fahn and Werker, 1972). Many fruits, as well as seeds,

appear to be equipped for effective dispersal.

While seed production is nearly universal in angiosperms, there is great variety in seed morphology and anatomy among various taxa. The distinguishing characteristics of various seeds may be subtle, and are necessarily small in size. However there is considerable variety of structure, and if care is taken, the details can be observed. This often permits definite identification of plants by their seeds alone. Somewhat less obvious than the diversity of seed morphology is the similarity of morphology within any given taxon. Compared to most other plant parts (leaves, roots, stems, and even perhaps flowers) seeds are very consistent within a species. While there is some latitude of variation within a species, characters such as shape, size, color, and surface texture of seeds are remarkably constant. Thus seeds can often be used to distinguish one species from other similar species. In plant identification there are many variable characters and few constant or unique ones to work with. Keys in manuals and floras rely on any available characters to distinguish species, yet identification may still be uncertain. Seeds are sometimes used in such keys; they might well be included much more often. While seeds are not always present with a plant specimen (and this is also

true of flowers), when they are available seeds may offer the most distinctive and easily measured characters for separating one group of plants from another (Kozlowski and Gunn, 1972).

LITERATURE REVIEW

Several authors have surveyed weed seeds for the purpose of identification. Korsmo (1935) described the seeds of 306 species of European weeds in detail and illustrated them with color plates. Martin and Barkley (1961) photographed seeds of 600 species of weeds of the United States, and included some information on distinguishing characteristics, particularly at the family level. Montgomery (1977) photographed seeds of about 1100 weedy species of eastern Canada and the northeastern United States; he provided brief descriptions of each species and a key. Delorit (1970) described the seeds of 192 weeds; he illustrated them with color photographs and provided keys. The species included in Delorit's work are mainly from the northeastern or north central regions of the United States. A publication of the Michigan Agricultural Experiment Station (Beal, 1910) described the seeds of 215 species of weeds and illustrated them with line drawings. Some authors have studied the seeds of one family. Notably, Murely (1951) described the seeds of the Cruciferae of northeastern North America in detail, and Delorit and Gunn (1986) described the seeds of representative species of

Leguminosae of the United States.

Some general works, such as regional floras and weed manuals, include brief descriptions of seeds. Rarely do they treat seeds in any consistent or extended manner. No survey of weed seeds of the Great Plains has been published, and the treatments of weed seeds mentioned above cover the region marginally or not at all. While the weedy flora of Kansas overlaps significantly with that of the more eastern areas, it also includes many plants which either do not occur in neighboring regions or which are not considered weeds there. Thus, earlier surveys of weed seeds omitted many of the species which are most troublesome as weeds in the Kansas. A brief publication by the Kansas Agricultural Experiment Station (Hitchcock and Clothier, 1897) is the only treatment of weed seeds of Kansas. It includes very brief descriptions and drawings of both fruits and seeds.

METHODS

This study surveys 240 species of weeds occurring in Kansas. (A complete list of species included is in Appendix C.) The species included in *The Common Weeds of Kansas* (Barkley, 1983) formed an initial list of species to be included. There are 201 species which have individual entries in that work, as well as some other related species which are briefly described or mentioned. From this list, most woody perennials were excluded. Some other species, mainly perennials which produce little seed or do not spread primarily by seed, were also excluded. Some species were added. The criteria for inclusion were occurrence in Kansas, weediness, and abundant seed production. Some of those included occur rather rarely in Kansas but are potentially serious weeds. Others are weedy more in the sense of being conspicuously abundant than of being economically significant.

For certainty in the task of identifying individual seeds, it is desirable to be able to refer to descriptions or specimens of many species rather than only those which are most common or most troublesome. When unknown seeds

are found mixed with crop seeds or in animal feed, for example, it is not apparent whether they are the seeds of troublesome weeds or of relatively harmless plants. Thus it is helpful to know not only those few seeds which are themselves toxic and those which produce aggressive weeds, but also those other seeds which are likely to be encountered. Inclusion of a large number of species in this study also makes comparisons between related or otherwise similar seeds possible, permitting identification to the species level with some confidence.

Seed samples were collected by the author from naturally occurring populations in Kansas. For each species at least 10 mature seeds and one voucher plant specimen were collected. Seeds for study were taken from the voucher plant or from other plants in the same population. Voucher plants and seed samples, with corresponding collection numbers, are deposited in the Herbarium of Kansas State University (hb KSC). For some species, several collections were made from different localities or in different seasons. In these cases, seeds from each collection were examined, but no systematic analysis of differences among the collections was attempted. Most collections are from Riley County or nearby counties. All were chosen as representative weedy

populations, growing in waste areas, roadsides, cropland, lawns, or pastures. Of the 240 taxa examined, 176 are represented by seed samples of the author's own collection. Seed samples of the remaining taxa were chosen largely from collections of H. A. Stephens, deposited in the Herbarium of the University of Kansas (hb KANU). These seed collections were also made in Kansas from natural populations and have corresponding voucher plant specimens. Taxa not selected from Stephens' collections were sampled from the permanent collection of hb KSC. Seeds were removed from herbarium sheets and labelled in accordance with the original data. In a few cases (4) neither living populations, older seed collections, nor herbarium specimens with good seeds could be found. These 4 species are represented in this study by seedsamples only; no voucher plant wre available. These seeds were obtained from other collectors, and their identity was determined by comparison with published descriptions of the seeds. The identification of all of the other species included in this study can be verified by examination of the corresponding voucher plants. (While all of the author's own seed collections include at least 10 seeds, some of the samples from other sources include as few as 5 seeds.)

Throughout this study, *The Flora of the Great*

Plains (Great Plains Flora Association, 1986) was used as the standard for taxonomy and nomenclature. For convenience, one or more common names is listed for each scientific name, except for those plants which have no common names in general use. The common names are drawn mostly from *The Flora of the Great Plains*; no attempt was made to include all names in common use.

Seeds were separated from the plant and examined to determine whether they were fully mature. Immature seeds and clearly diseased or defective seeds were excluded from further study. Many apparent seeds are more correctly described as fruits enclosing one or more seeds. Therefore, for each species, the seeds were examined to ascertain whether they were in fact seeds alone, or achenes, or some other kind of fruit. In the case of a dehiscent or fragile fruit, the seeds were removed from the fruit for further study. However many fruits are tough and indehiscent. They function as units of dispersal, containing the seeds until the time of germination, and the seeds are rarely seen alone. In such cases, the fruits were treated as seeds in this study, and the description and measurements were made of the fruit, as the effective unit of dispersal, rather than of the true seed. If both fruits and seeds of a given taxon are commonly seen, that

was noted in the description, and both were measured.

The external characteristics of the seeds were examined and described in terms of shape and structure, surface characters, and size. Since few authors have described seeds in detail, there is no generally accepted format for descriptions, Korsmo (1935) described a great variety of seeds and fruits. His work offers the clearest and most thorough descriptions of seeds of any published survey, and his format is adapted for use in this study.

The shape of each seed was described in three ways: 1) Outline, as seen when the seed is lying on a flat surface; 2) Cross section made near the midpoint of the length of the seed and at right angles to the lengthwise axis; and 3) Three-dimensional shape, which was termed "form". Seed shapes are seldom as neat or symmetrical as geometric figures. In particular, most edges, corners, and surfaces are rounded rather than flat or sharply angled. Descriptions of seeds as, for example, square or triangular nearly always need to be qualified as "somewhat square" or "more or less triangular". Descriptions so worded can be quite accurate while allowing for some variation, though they necessarily lack the precision of geometric definitions.

In this study, it was necessary to use many different

terms to describe the great variety of shapes observed. These terms are defined in the Glossary, Appendix A and illustrated in Appendix B. The external structure of the seed was examined and described using standard anatomical terms (e.g., hilum, raphe) where applicable. However, the seeds were not dissected, and most of the structural features of seeds are internal. In some instances, internal structure (e.g., shape of the embryo) was evident on the surface, and in such cases the external features were described with reference to the internal structure.

There is great variety in the surfaces of seeds. The surface of each seed was examined and described in terms of texture, sheen, pubescence (if any), and color. Surfaces were examined without magnification, and at 4x, 7x, 10x, and 30x magnifications. At varying magnifications, quite different features may be visible or conspicuous. Descriptions of surfaces were based on viewing at magnifications between 4x and 10x, unless otherwise noted. Except on the largest seeds, few surface details are visible without some magnification. Verbal descriptions of texture, sheen, and color tend to be vague and subjective. In order to be consistent and to facilitate comparisons, the number of terms used for these characters was kept to a minimum. While there is no one accepted set of botanical

terms for surface textures, Appendix B borrows from several authors (Radford et al. 1974, Esau 1977, Montgomery 1977, Sa'ad 1980) to illustrate the usages intended here.

Definitions of the terms are in the Glossary, Appendix A. Always, in dealing with seeds, precise description is made difficult by the naturally occurring variations which are to be expected in organic material.

Measurements were made of each seed in 3 dimensions. The seeds were positioned beneath a binocular dissecting microscope equipped with an ocular micrometer, and then viewed at 10x magnification. Measurements were made to the nearest 0.1 mm, except in for the largest seeds and fruits, which were measured to the nearest mm. The length was defined as the longest dimension of the seed; the width as a line through the widest part, perpendicular to the length; and the thickness as a line perpendicular to both the length and the width. Some seeds are symmetrical and thus measurements may be given as only a diameter for a spherical form or as length and thickness for a cylindrical or oblong form. In cases where the shape or variation of the seeds made more than one interpretation possible, the dimension measured as "length," "width," or "thickness" is described more fully. For most taxa, 10 or more seeds were measured along each dimension. (A few taxa were

represented by only 5--9 seeds.) The measurements were not averaged; instead a range of obtained measurements was recorded. The measurements excluded hairs, awns, and other minor projections from the surface.

An actual-size silhouette photograph was made showing one to several seeds for each species. These photographs are included with the descriptions to provide a visual method of identifying unknown seeds. They are particularly useful for showing the size of the seeds. A 35 mm single-lens reflex camera with a 100 mm lens was used for these photographs. The film was Kodak Technical Pan 2415.

A dichotomous key to all 240 species was constructed utilizing characters recorded in the descriptions of the seeds and seed-like fruits. Standard form for a botanical key was used. However, standard keys to plants may include characters from any part of the plant, sometimes at different stages of development, to assist in distinguishing plants. In this study, the key was based strictly on mature seeds (or other units of dispersal). As a result, the number of characters available for distinguishing the groups was limited, and sometimes the contrasts seemed slight. To compensate in part for this difficulty, multiple characters were included in each choice of the key whenever feasible.

KEY

The key is in 6 parts: an introductory key, and 5 sections of the main key. The key is arbitrary and sequential. No attempt was made to keep plant families together. Since the purpose of the key is to distinguish seeds which may at first seem similar, any noticeable character may be used, whether it separates natural groups or not.

For success with the key, it is necessary to use the introductory key first. The introductory key indicates the correct section of the key for the specimen. The keys must be used sequentially, starting at the beginning of the introductory key, and proceeding step by step through the choices.

It is always preferable to have several seeds to examine. Some magnification is necessary in examining most seeds. Magnification levels of 5x and 10x are most helpful with this key. Few of the key characters require greater than 10x magnification. Measurement may be necessary. A millimeter ruler used with a 5x hand lens is usually satisfactory.

Introductory Key

1. Unit of dispersal a grass floret, i.e., a caryopsis with at least the lemma and palea attached, sometimes with glumes.....Section 1
1. Unit of dispersal a fruit or seed, but not a grass floret.
 2. An achene; distinctly triangular in cross section, with 3 similar sides alternating with 3 well-defined angles, wings, or lobes.....Section 2
 2. A fruit or seed; cross section various but not distinctly triangular.
 3. A fruit with persistent stiff spines, awns, or a long, tapered beak.....Section 3
 3. A fruit or seed; lacking spines or awns; apex rounded, truncate, or with a small projection, but lacking a sturdy, tapered beak.
 4. An achene; with a short apical collar, and often a pappus (ring of scales, bristles, or hairs) arising from the collar; form more or less elongate.....Section 4
 4. A seed, achene, or other fruit lacking an apical collar; form various.....Section 5

Section 1, Grass florets

1. Spikelet firmly attached to a long segment of the rachis, forming a cylindrical unit.....215.*Aegilops cylindrica*
1. Spikelet readily separated from the rachis, not appressed to it, or a single floret.
 2. A spikelet with one fertile floret; the fertile floret sessile, flanked by 2 pedicellate sterile spikelets, or only the 2 pedicels present.
 3. Both fertile and sterile spikelets long elliptical.
 4. All spikelets with stiff straight awns; dull; fertile floret $\pm 6-7$ mm long.....231.*Hordeum pusillum*
 4. Awns lacking, or if present fine, bent; fertile spikelet ± 4.7 mm long, shiny; sterile spikelets dull.....240.*Sorghum halepense*
 3. Fertile spikelets short elliptical, much broader than sterile spikelets; fertile spikelet shiny, red-brown to black.....*Sorghum bicolor*
 2. Floret single; or if a spikelet of several florets, sterile florets below the fertile floret, not flanking it as a pair.
 5. Fertile floret large, at least 6 mm long.
 6. Awns lacking; outline elliptical, but widest above the middle; width ± 2.0 mm or more....217.*Bromus inermis*
 6. Lemma awned; outline elliptical; width less than 2.0 mm.
 7. Cross section U-shaped; palea with conspicuously ciliate margins.....219.*Bromus secalinus*

7. Cross section C-shaped, lemma and palea glabrous or pubescent, but lacking strongly ciliate margins.....220.*Bromus tectorum*
5. Floret or spikelet smaller, 1--4 mm long.
 8. Floret about 5x as long as wide; lemma awned....230.*Festuca octoflora*
 8. Floret or spikelet generally elliptical, about 1.5--3x as long as wide.
 9. A spikelet; sterile lemma with a long awn; glumes and sterile lemma with spiny nerves.226.*Echinochloa crus-galli* (spikelet)
 9. A spikelet or floret; awns lacking; glumes, lemmas, and paleas lacking spiny nerves.
 10. Floret distinctly compressed; cross section a narrow triangle; lemma keeled, covering both broad faces of the caryopsis.....222.*Cynodon dactylon*
 10. Floret or spikelet rounded or slightly compressed, mostly plano-convex in cross section.
 11. Floret very small, 1.3 mm long; lemma and palea dark gray, shiny..232.*Panicum capillare*
 11. Floret or spikelet larger, at least 1.8 mm long.
 12. A spikelet, with 1 or 2 glumes and 1 sterile lemma, all membranous, subtending the fertile floret.
 13. Lemma and palea black; only one glume present.. .224.*Digitaria ischaemum*

13. Lemma and palea light colored; 2 glumes present, the lower one very short.
 14. Spikelet 2.7--3.0 mm long; the inrolled lemma covers the side margins of the palea.....225.*Digitaria sanguinalis*
 14. Floret 3.0--3.6 mm long; the inrolled lemma covers most of the palea, exposing only a narrow area.....223.*Digitaria ciliaris*
12. Unit of dispersal a floret; one lemma and one palea present but glumes lacking.
 15. Floret 1.8--2.1 mm long.
 16. Lemma with 7 light-colored nerves (some may be faint) which converge toward the apex; lemma smooth to striate.....233.*Panicum dichotomiflorum*
 16. Lemma lacking nerves, but with 3 faint lengthwise ridges; lemma papillate.....238.*Setaria viridis*
 15. Floret 2.5 mm or more long.
 17. Lemma and palea papillate.
 18. Floret thickest at or above the middle in edge view; lemma cross-corrugate with rough ridges.....237.*Setaria glauca*
 18. Floret thickest below the middle in edge view; lemma finely cross-corrugate.....236.*Setaria faberi*

17. Lemma and palea nearly smooth, shiny, not papillate.
19. Floret 3.5--4.2 mm long; apex acuminate.....226.*Echinochloa crus-galli*
19. Floret 2.8--3.2 mm long; apex acute.
20. Floret outline long ovate, width ± 1 mm.....235.*Panicum virgatum*
20. Outline short ovate or elliptical; width ± 2 mm.....234.*Panicum miliaceum*

Section 2: Achenes, cross section triangular

1. Faces concave; form with 3 prominent wings or 3 lobes; black, glossy.
 2. Wings narrow, cross section 3-pronged; achene ± 3.5 mm long.....42. *Polygonum scandens*
 2. Angles rounded, cross section 3-lobed; achene ± 2.0 mm long.....40. *Polygonum persicaria* (3-sided form)
1. Faces flat or nearly so; angles distinct.
 3. Achene 1.3--1.5 mm long; entire perianth tends to be adherent.....43. *Rumex acetosella*
 3. Achene 2.0 mm or more long; perianth loosely attached or only remnants present.
 4. Angles narrowly winged; surface brown.
 5. Achene 2.0--2.3 mm; dark orange-brown.....45. *Rumex crispus*
 5. Achene 2.6--2.9 mm; light to medium orange brown.
 6. Faces ovate (broader toward the base), nearly flat; achene 2.8--2.9 mm long....46. *Rumex patientia*
 6. Faces elliptical (broadest near the middle), often concave; achene 2.6--2.7mm long.....44. *Rumex altissimus*

4. Angles slightly rounded; greenish perianth remnants often present; achene surface black.
7. Surface mostly dull, but angles glossy; achene 3.5--4.0 mm long.....37. *Polygonum convolvulus*
7. Surface shiny; achene 2.0--2.9 mm long.
 8. Cross section an equilateral triangle faces elliptical.....41. *Polygonum ramosissimum*
8. Cross section a triangle with sides of different lengths; faces usually ovate (broader toward the base).
 9. Achene 2.0--2.4 mm long; an irregular 3-sided form; cross section a triangle with sides of 3 different lengths.....35. *Polygonum arenastrum*
 9. Achene 2.8--2.9 mm long; a compressed ovoid form; cross section a broad triangle.....36. *Polygonum bicorné*

Section 3: Fruits; spiny, awned, or beaked

1. Surface covered with many curved spines of similar size.
 2. Fruit small, 3--7 mm long.
 3. Fruit with a lengthwise groove; spines blunt....
.....124.*Daucus carota*
 3. Fruit obovate; spines fine, often hooked.....
.....170.*Ambrosia grayi*
 2. Fruit larger, 1--3 cm long; fruit an ovoid or ellipsoid bur; spines hooked at the tip.
 4. Bur ± 1.0 --1.2 cm long; ellipsoid.....
.....213.*Xanthium spinosum*
 4. Bur ± 2.2 --2.8 cm long; ovoid.....
.....214.*Xanthium strumarium*
1. Surface not generally spiny, but one to several persistent spines, beaks, or awns present.
 5. Fruit with a single sturdy beak extending from the apex; other teeth or tubercles may be present.
 6. Form long ellipsoid, ribbed, the ribs with teeth or barbs.
 7. Achene large, more than 1 cm long; terete..
.....210.*Tragopogon dubius*
 7. Achene small, 2.7--4.0 mm long; flattened.
 8. Ribs barbed; side margins of the achene winged; achene up to 3 mm long.
 9. Barbs present along entire length of the ribs; barbs extend into hairs near the apex
.....202.*Lactuca serriola*
 9. Barbs present only near the apex; hairs lacking....201.*Lactuca saligna*

- 8. Ribs with flaring teeth; side margins of the achene rounded; achene more than 3 mm long.
 - 10. Achene orange-brown.....208.*Taraxacum laevigatum*
 - 10. Achene dull olive.....*Taraxacum officinale*
- 6. Form obovate with a short, stout beak at the apex.
 - 11. Fruit ± 6 mm long.....172.*Ambrosia trifida*
 - 11. Fruit $\pm 3-4$ mm long.
 - 12. Fruit with a ring of 6--8 pointed tubercles projecting upward from the broadest part.....169.*Ambrosia artemisiifolia*
 - 12. Fruit lacking tubercles, or only 1--2 tubercles well developed.....171.*Ambrosia psilostachya*
- 5. Fruit with 2--4 spines or awns from the apex, but lacking a central beak.
 - 13. Fruit angular, with stout, flaring spines; tan.....118.*Tribulus terrestris*
 - 13. Fruit elongate, with retrorsely barbed awns; brown to black.
 - 14. Outline long, narrow; cross section rhombic; awns 2, 3, or 4.....177.*Bidens bipinnata*
 - 14. Outline obovate; cross section very narrow; awns 2.....178.*Bidens frondosa*

Key 4: Achenes with an apical collar

1. Apex constricted, rounded, with only a very small apical collar; pappus readily deciduous, usually missing.
 2. Achene red-brown; cross section very narrow; pappus (deciduous) of many fine hairs.....207.*Sonchus asper*
 2. Achene silvery or gray brown, often mottled; surface initially covered with soft white hairs but these often worn off; cross section various but not very narrow; pappus (deciduous) of 2 lacerate awns.
 3. Achene less than 3.5 mm long; outline a rounded oblong.....195.*Helianthus ciliaris*
 3. Achene 4.0--7.0 mm long; outline obovate or rounded triangular.
 4. Side margins of the achene winged; hairs (when present) ± 0.5 mm long, white; achene 4.0--5.0 mm long.....194.*Helianthus annuus*
 4. Side margins of the achene rounded; hairs (when present) ± 1.0 mm long, yellowish; achene 6.0--7.0 mm long.....196.*Helianthus petiolaris*
1. Apex truncate, not constricted and rounded, or only slightly so; pappus persistent and/or apical collar large in diameter.
 5. Surface dull, ribbed, striate, and/or hairy, or with a basal tuft of hairs.
 6. Outline generally oblong but with a large lateral notch near the base (the attachment area); a basal tuft of white hairs; pappus of sturdy bristles.....180.*Centaurea cyanus*
 6. Outline oblong, clavate, or triangular, lacking a basal notch and tuft of hairs; pappus various, but not of sturdy bristles, or absent.
 7. Achene more than 5.0 mm long; surface very dark mottled brown.....173.*Arctium minus*

7. Achene less than 4.0 mm long; yellow to brown.
 8. Achene with distinct ribs; ribs usually 5 or 10; pappus persistent.
 9. Ribs prominent, sharp-edged; resinous droplets present in the grooves.
 10. Pappus a crown of 5 lacerate teeth.....193. *Helenium autumnale*
 10. Pappus of 2 series of purple, barbed bristles, the inner ± 0.6 , the outer ± 1.0 mm long.
 11. Achene more than 3.0 mm long; ribs about 10.....212. *Vernonia fasciculata*
 11. Achene ± 2.4 --2.8 mm long; ribs about 5.....211. *Vernonia baldwinii*
 9. Ribs distinct but low or with rounded edges; grooves lacking resinous droplets.
 12. Achene less than 1.5 mm long; surface light yellow.....176. *Baccharis salicina*
 12. Achene more than 2.0 mm long; surface tan, brown, gray, or black.
 13. Ribs closely spaced, smooth; ribs pale, grooves brown.....206. *Solidago rigida*
 13. Ribs narrow, intervals broad; sparse white hairs present on the surface; achene gray to black.....200. *Kuhnia eupatorioides*
 8. Achene lacking distinct ribs, but may be striate or hairy, and may have a central ridge on each face; pappus persistent, deciduous, or lacking.
 14. Body of achene with straight white hairs.

15. Achene dark brown, with 8--10 lengthwise rows of white hairs.....192.*Gutierrezia dracunculoides*
15. Achene light colored or grayish, hairs uniformly distributed over the body of the achene.
 16. Achene more than 2.0 mm long.
 17. Pappus (deciduous) of short, plumose bristles; achene body gray-brown....181.*Centaurea repens*
 17. Pappus persistent, very short, in 2 series, one of white teeth and one of yellow hairs; achene body light brown.....197.*Heterotheca latifolia* (disc floret)
 16. Achene less than 1.5 mm long; pappus a single series of minutely barbed hairs, or in 2 series, of short teeth and of hairs.
 18. Pappus in 2 series: an outer persistent ring of minute flaring membranous teeth and an inner series of deciduous bristles, ± 1.7 mm long; achene 0.8--0.9 mm long.....190.*Erigeron strigosus*
 18. Pappus a single series of minutely barbed bristles, 2.0--3.6 mm long; achene at least 1.0 mm long.
 19. Achene light brown; pappus ± 3.6 mm long.....175.*Aster ericoides*
 19. Achene pale yellow; pappus ± 2.0 mm long.
 20. Side margins of the achene narrowly winged; achene 1.2--1.3 mm long.....189.*Conyza ramosissima*
 20. Side margins of the achene thin but not winged; achene 1.0--1.2 mm long.....188.*Conyza canadensis*

14. Body of achene hairless.
 21. Achene less than 2.0 mm long; light colored, translucent; pappus absent.
 22. Pericarp membranous, whitish; seed dark...
.....168.*Achillea millefolium*
 22. Pericarp and seed yellow brown.....
.....174.*Artemisia ludoviciana*
 21. Achene 2.0--4.0 mm long; gray-brown, opaque.
 23. Achene less than 3.0 mm long; achene nearly straight; pappus persistent, of very short membranous teeth.....
.....182.*Cichorium intybus*
 23. Achene 2.9--4.0 mm long; achene usually curved to one side; pappus deciduous....
.....191.*Grindelia squarrosa*
5. Surface smooth and glossy; achene body ellipsoid or oblong in outline; pappus readily deciduous.
 24. Pappus (when present) of many simple bristles; achene body straw-colored with fine dark dotted stripes; achene 3.4--4.5 mm long.....
.....179.*Carduus nutans*
 24. Pappus (when present) of feathery bristles; body of achene yellow to orangish to brownish, with or without faint streaks, but lacking distinct dark stripes; achene 2.2--5.0 mm long or longer.
 25. Achene up to 4.0 mm long.
 26. Achene light brown with obscure lengthwise streaks; pappus (when present) more than 2.5 cm long.....
.....184.*Cirsium arvense*
 26. Achene orange-brown or gray-brown, unstreaked; pappus (when present) less than 2.0 cm long.....187.*Cirsium vulgare*

25. Achene more than 4.5 mm long.
27. Achene orange-brown with reddish streaks; width more than 2.7 mm, thickness more than 1.5 mm.....185.*Cirsium ochrocentrum*
27. Achene straw-colored, width less than 2.5 mm, thickness less than 1.5 mm.
28. Apical collar flaring, ± 0.7 mm long; beak (style base) extending 0.5 mm beyond the collar; achene body with pale streaks.....
.....186.*Cirsium undulatum*
28. Apical collar straight, ± 0.1 mm long; beak (style base) extending ± 0.3 mm beyond collar.....
.....183.*Cirsium altissimum*

Section 5: Other fruits and seeds,
all lacking an apical collar

1. Seed, distinctly sector-like in form (a sector of a rounded form, with 2 inner flat faces meeting in an angle and a convex outer face; or hemispherical).
2. Form not elongate, but like a sector or half of a nearly spherical form.
 3. Seed less than 2 mm long.
 4. Seed ± 0.7 mm long, sector-like but irregular.....28. *Cerastium vulgatum*
 4. Seed 1--2 mm long.
 5. Surface black or grayish; inner angle acute, with a notch.....50. *Malva neglecta*
 5. Surface yellow to orange-brown; inner angle obtuse, entire; form sometimes hemispheric.
 6. Surface smooth; seed ± 1.1 mm long.....144. *Cuscuta pentagona*
 6. Surface granular; seed ± 1.6 mm long.....143. *Cuscuta indecora*
 3. Seed more than 2 mm long.
 7. Convex face with a conspicuous deep notch...52. *Sida spinosa*
 7. Convex face entire; may be a smooth curve, wrinkled or bulging, but without a deep notch.
 8. Inner angle with a deep notch near the center; seed less than 3 mm long.....51. *Malvastrum hispidum*
 8. Inner angle with a shallow depression or flat area near the basal end; seed more than 4 mm long.

9. Convex face strongly curved outward at the middle but flat toward the ends; surface smooth with a slight sheen.....141.*Ipomoea lacunosa*
9. Convex face uniformly curved but may be lumpy or have a lengthwise furrow; surface roughened, granular, or tuberculate, and dull.
 10. Basal end of seed extended into 3 shallow lobes.....138.*Calystegia sepium*
 10. Basal end of seed entire, not lobed.
 11. Surface tuberculate; lacking hair-like processes; convex face uniformly curved...
.....139.*Convolvulus arvensis*
 11. Surface slightly rough or granular, but not tuberculate; covered with brownish hairs or transparent processes (visible at 10x); convex face often with a lengthwise furrow.
 12. Processes transparent, brownish or colorless, densely covering entire surface.....142.*Ipomoea purpurea*
 12. Hairs short, fuzzy, brownish, covering entire surface but more abundant near the angles.....
.....140.*Ipomoea hederacea*
2. Form elongate, at least 1.5x as long as wide (like a sector or half of an ellipsoid form).
 13. Seed more than 2x as long as wide; convex face with 3--5 lengthwise ridges, the ridges sometimes obscure.
 14. Seed ± 2 mm long.
 15. Convex surface nearly smooth, with 3 faint lengthwise ridges, also a few crosswise ridges near the apex.....
.....148.*Verbena hastata*

15. Convex surface reticulate, with distinct lengthwise ridges, and crosswise wrinkles near the base.....147.*Verbena bracteata*
14. Seed ± 3 mm long.
 16. Convex face with ± 5 lengthwise ridges; flat faces densely white-flecked.....149.*Verbena stricta*
 16. Convex face with ± 3 faint lengthwise ridge; flat faces slightly granular.....150.*Verbena urticifolia*
13. Seed 1.5--2x as long as wide; convex face lacking ridges.
 17. Color mottled.
 18. Mottled brown and white; seed less than 2 mm long.....152.*Lamium amplexicaule*
 18. Mottled tan and brown; seed more than 2 mm long.....153.*Salvia reflexa*
 17. Color uniform.
 19. Form like a quarter sector with an inner angle of about 90° ; surface brown151.*Glechoma hederacea*
 19. Form like half of an ellipsoid, with one flat face and one convex face; seed with a small tip at each end; surface pale tan...166.*Symphoricarpos orbiculatus*
1. Form various: may be globose, rounded, angular or compressed, but not sector-like.
 20. Seed, globose in overall form (not markedly compressed, angular, or elongate); may have small notches, furrows, flat areas, or projections.
 21. Surface conspicuously tuberculate or coarsely reticulate.

- 22. Surface tuberculate (tubercles visible at 7x); surface black or red-brown.....33.*Vaccaria pyramidalis*
- 22. Surface reticulate with conspicuous raised mesh; surface gray to black.
- 23. Seed diameter 1.8--2.2 mm.....3.*Argemone polyanthemus*
- 23. Seed diameter 2.3--2.6 mm.....4.*Argemone squarrosa*
- 21. Surface smooth or nearly so.
- 24. Seed diameter less than 2 mm; often slightly compressed in form; hilum visible as a small bit of whitish tissue.
- 25. Form slightly compressed, surface faintly reticulate at 10x.....59.*Brassica kaber*
- 25. Form slightly elongate but not compressed; surface distinctly reticulate at 10x.....58.*Brassica juncea*
- 24. Seed diameter 2--5 mm; hilum elliptical or indistinct.
- 26. Surface black or very dark.
- 27. Surface black; hilum very small, indistinct; surface finely reticulate at 7x.....145.*Ellisia nyctelea*
- 27. Surface brown-black (mottled with magnification); hilum 1.5--2.0 mm long, distinct; surface with a velvety sheen.....97.*Vicia villosa*
- 26. Surface brown, mottled.
- 28. Seed nearly perfectly spherical; diameter ± 3.2 mm.....117.*Tragia ramosa*

28. Seed slightly elongate; longest dimension ± 3.8 mm.....116.*Tragia betonicifolia*
20. Seed or fruit angular, elongate, or markedly compressed in overall form; not generally globose.
 29. Form generally angular, faces nearly flat and edges straight or nearly so.
 30. Outline rectangular; cross section square.
 31. Seed more than 6 mm long; hilum large, on one long angle.....92.*Strophostyles helvola*
 31. Achene, less than 4 mm long; achene with attachment point at one end and a small style base at the other end.....167.*Dipsacus fullonum*
 30. Outline and cross section various but not as above.
 32. Form chip-like; at least one large face slightly convex; hilum at the center of one face.....156.*Plantago rugelii*
 32. Form otherwise, not very thin; hilum indistinct.
 33. Surface areolate; angles not winged.....100.*Oenothera laciniata*
 33. Surface slightly roughened and wrinkled; angles narrowly winged...99.*Oenothera biennis*
 29. Form rounded, not generally angular; may be elongate, compressed or irregular.
 34. Large seeds or achenes (more than 5 mm long) with very compressed form; cross section very thin.

35. Outline pear shaped, but truncate at the small end; coma of white hairs (readily shed) from the truncate end; surface orange-brown.
36. Seed less than 6.5 mm long.
37. Coma (when present) ± 1.2 cm long; central area of each face dark colored.....129.*Cynanchum laeve*
37. Coma (when present) ± 2.5 cm long; central area of each face light colored.....128.*Asclepias verticillata*
36. Seed more than 6.5 mm long.
38. Coma (when present) ± 2.7 cm long; seed usually less than 7 mm long; surface only slightly wrinkled.....126.*Asclepias subverticillata*
38. Coma (when present) ± 3.0 -- 3.5 cm long; seed usually more than 7 mm long; surface with many fine but distinct wrinkles.....127.*Asclepias syriaca*
35. Outline more or less obovate, with the attachment point at the small end and a notch at the wide end; surface gray or purplish.
39. Surface streaked purple and green; apex with a rectangular notch.....204.*Silphium laciniatum*
39. Surface gray, with brown wing; notch not rectangular.
40. Apical notch a V-shape, flanked by 2 prominent teeth; surface may have short hairs.....203.*Silphium integrifolium*
40. Apical notch a U-shape, flanked by small acute teeth; surface with small resinous dots.....205.*Silphium perfoliatum*

34. Seed or fruit less than 5 mm long, or if longer then form not very compressed, cross section not very thin.

41. Surface with several distinct lengthwise or concentric ribs or ridges, these visible at low magnification.

42. Surface with concentric ribs; seed or fruit less than 2 mm long.

43. Seed ± 0.6 mm long; form coiled, with outline like a comma.....
.....27.*Mollugo verticillata*

43. Seed or fruit 1.0--1.9 mm long; not appearing coiled.

44. Form compressed ovoid, with a shallow groove on each face.....
.....74.*Thlaspi arvense*

44. Form elongate, with 1 lengthwise groove; cross section heart-shaped.
.....227.*Eleusine indica*

42. Surface with lengthwise ribs; form plano-convex; fruit more than 2 mm long.

45. Surface brown, ribs yellow-brown or orange-brown; intervals between ribs oily when crushed....122.*Cicuta maculata*

45. Surface gray-brown, ribs pale; oily areas lacking.....123.*Conium maculatum*

41. Surface smooth or roughened, but lacking distinct lengthwise or concentric ribs.

46. Seed or fruit large (7.0 mm or longer); flattened; outline ellipsoid, obovate or pear-shaped.

47. Surface conspicuously rough.

48. Surface very rough, black.....
.....163.*Proboscidea louisianica*

48. Surface corky, uneven, mottled light and dark brown.....
.....55.*Echinocystis lobata*

47. Surface smooth or nearly so.
 49. Cross section plano-convex; outline ellipsoid....214.*Xanthium strumarium* (achene)
 49. Cross section elliptical; outline obovate to pear-shaped.
 50. Surface dark brown; outline obovate with 2 distinct rounded teeth at the small end, on either side of the hilum.....56.*Sicyos angulata*
 50. Surface pale-colored; outline pear-shaped, lacking teeth; hilum along margin to one side of small end.....54.*Cucurbita foetidissima*
46. Seed or fruit smaller (less than 7.0 mm long).
 51. Entire surface distinctly tuberculate, papillate, or with other conspicuous projections (not ribs, wrinkles, or reticulate patterns).
 52. Seeds very small, 1.0 mm long or less.
 53. Surface gray-brown; form somewhat cylindrical or like a truncate cone; entire surface knobby.
 54. Seed 0.7--1.0 mm long; diameter 0.4--0.7 mm; the surface knobs are separated by deep grooves.....158.*Verbascum blattaria*
 54. Seed 0.7--0.9 mm long; diameter 0.4--0.5 mm; the surface knobs are separated by shallow grooves.....159.*Verbascum thapsus*
 53. Surface orange-brown, red-brown, or black; form various; surface papillate or tuberculate (visible at low magnification).

- 55. Surface light orange-brown.
 - 56. Tubercles star-shaped at high magnification....29.*Holosteum umbellatum*
 - 56. Tubercles rounded, not star-shaped.
 - 57. Outline nearly circular.....32.*Stellaria media*
 - 57. Outline rounded-triangular with a notch in one corner.....28.*Cerastium vulgatum*
- 55. Surface dark brown to black.
 - 58. Form coil-like, with a shallow depression on each face, hilum area covered by a light colored caruncle.....26.*Portulaca oleracea*
 - 58. Somewhat reniform, with 2 nearly flat faces; hilum in a small notch between the lobes...31.*Silene antirrhina*
- 52. Seeds or fruits larger, 1.8 mm long or longer.
 - 59. Form compressed, somewhat reniform; surface dark.
 - 60. The 2 lobes separated by a small well-defined notch; surface densely papillate.....30.*Saponaria officinalis*
 - 60. The 2 lobes separated by a large shallow notch; surface with scattered tubercles.
 - 61. Seed 2.9--3.4 mm long.....48.*Abutilon theophrasti*
 - 61. Length 2.0--2.2 mm.....49.*Hibiscus trionum*
 - 59. Cross section rounded, not compressed.
 - 62. Form obovate and elongate; surface very rough and hairy, gray-brown..8.*Mirabilis nyctaginea*
 - 62. Form ovoid, obovoid, or pear shaped, not elongate; surface lacking hairs.

- 63. Form pear-like, with the small end bent to one side; surface shiny with a dull, rhombic basal area.....146.*Lithospermum arvense*
- 63. Form ovoid, symmetrical; raphe visible as a lengthwise narrow line.
 - 64. Caruncle present near small end; surface tuberculate.
 - 65. Surface slightly glossy; cross section nearly round.
 - 66. Surface gray; tubercles in lengthwise rows.....102.*Acalypha ostryaefolia*
 - 66. Surface red-brown to gray; tubercles scattered...104.*Acalypha virginica*
 - 65. Surface dull, brown-black; cross section nearly rhombic..110.*Euphorbia dentata*
 - 64. Caruncle absent; surface very rough with sharp projections.....109.*Euphorbia cyathophora*
- 51. Surface smooth, finely textured, wrinkled or reticulate, but not distinctly tuberculate or papillate.
 - 67. Cross section round or angular, form not markedly compressed.
 - 68. Form clearly elongate, at least 2x as long as wide.
 - 69. Seed or fruit large (± 6 mm long).
 - 70. Form long obovoid, apex constricted; surface tan.....98.*Gaura parviflora*

70. Form narrow, with a flared, truncate apex;
surface dark brown....125.*Apocynum cannabinum*
69. Seed or fruit small (less than 4 mm long); oblong.
71. Cross section round or slightly compressed.
72. Surface smooth, lustrous.
73. Surface tan; hilum near one end....
.....53.*Viola rafinesquii*
73. Surface deep red; hilum near center
of one long edge.....80.*Coronilla varia*
72. Surface reticulate, brown.....
.....47.*Hypericum perforatum*
71. Cross section 3- or 4- sided.
74. Cross section 3-sided; outline
elliptic; surface translucent yellow....
.....221.*Chloris verticillata*
74. Cross section 4-sided; outline bullet
shaped; surface gray-brown.....
.....115.*Euphorbia prostrata*
68. Form round to ovoid, oblong, or somewhat conical, but
less than 2x as long as wide.
75. Form cylindrical, ends blunt; hilum conspicuous on
the long edge.....93.*Strophostyles leiosperma*
75. Form oblong, ovate, obovate, or conical.
76. Form ovate (broader near the base).
77. Seed large, ± 4 mm long; hilum with a
conspicuous collar at the base.....
.....5.*Cannabis sativa*
77. A caryopsis, ± 0.6 mm long.....
.....229.*Eragrostis cilianensis*
76. Form conical, oblong, or obovate.

78. Form somewhat conical; a coiled embryo loosely covered by a membranous seed coat.
79. Seed diameter 1.7--1.8 mm.....18.*Salsola iberica*
79. Seed diameter 1.2--1.6 mm.....17.*Salsola collina*
78. Form oblong or obovate; seed with a firm seed coat or an achene with an adherent pericarp.
80. Outline rounded oblong; surface finely reticulate.
81. Seed ± 2.2 mm long; hilum distinct, ± 0.7 mm long, with projecting ends.....121.*Geranium carolinianum*
81. Seed ± 1.5 mm long; hilum obscure, in a shallow notch.....60.*Brassica nigra*
80. Outline obovate, or oblong with a blunt tip at one end; surface rough or smooth but not finely reticulate.
82. Outline obovate, with a tiny beak on the wide end; surface smooth, without lines.....169.*Ambrosia artemisiifolia* (achene)
82. Outline obovate or oblong; raphe evident as a narrow lengthwise line.
83. Cross section 4-sided; seed less than 1.5 mm long; surface wrinkled crosswise.
84. Surface red-brown with gray or white cast, seed less than 1.0 mm long.....112.*Euphorbia maculata*
84. Surface gray-brown; seed ± 1.4 mm long;.....114.*Euphorbia nutans*
83. Cross section nearly round; surface rough or smooth but lacking distinct crosswise wrinkles.

85. Seed more than 3 mm long; caruncle lacking;
surface rough with many small wrinkles.....
.....113.*Euphorbia marginata*
85. Seed 1.7--2.9 mm long; caruncle usually present.
86. Surface with many lengthwise wrinkled ridges;
mature seed surface with red undertones.....
.....101.*Acalypha monococca*
86. Surface finely roughened, lacking wrinkles
and ridges; color various but not reddish.
87. Seed less than 2.0 mm long; surface with
fine scalariform pattern; surface
mottled gray and black.....
.....103.*Acalypha rhomboidea*
87. Seed more than 2.0 mm long.
88. Surface with fine reticulate
pattern; surface gray-green,
flecked with brown.....
.....111.*Euphorbia esula*
88. Surface of immature seeds pale and
granular; mature seeds may be black
and finely roughened.....
.....108.*Euphorbia corollata*
67. Outline generally rounded (may be circular, ovate,
elliptical, rhombic, or kidney shaped), often with a
notch; form distinctly compressed; hilum or attachment
on the margin, often in a notch.
89. Outline symmetrical: ovoid, elliptical, or tear-
drop shaped, and with one acute end; the
attachment point or hilum at one end.
90. Surface smooth and shiny; outline tear-drop
shaped, an acute apical tip opposite the
blunt attachment point; achene 2.3--2.5 mm
long.....38.*Polygonum lapathifolium*

90. Surface dull; outline ovate or elliptical; seed or achene less than 1.5 mm long.
91. Outline ovate; surface finely roughened; an achene with a conspicuous attachment point at the broad end.....6.*Urtica dioica*
91. Outline nearly elliptical; surface with prominent crosswise ridges; seed with hilum obscure.
92. Entire surface dark orange-brown.....120.*Oxalis stricta*
92. Ridges dull white, intervals dark orange-brown.....119.*Oxalis dillenii*
89. Outline generally rounded, but not as above; asymmetrical, lacking an acute end, or the attachment point not at one end.
93. Outline round to ovate, with no more than a slight notch or extension; cross section biconvex.
94. Seed 3--5 mm long; one face with a narrow lengthwise line and a caruncle.
95. Outline nearly circular; caruncle fan-shaped, with its broad end toward the edge of the seed.....105.*Croton capitatus*
95. Outline ovate; caruncle heart shaped, with its tip toward the edge of the seed.
96. Seed 3.6--3.7 mm long; 2.6--2.8 mm wide; uniformly gray-brown.....106.*Croton monanthogynus*
96. Seed 4.0--4.7 mm long; 3.5--4.0 mm wide; brown, usually mottled....107.*Croton texensis*
94. Seeds less than 2.5 mm long.

97. Surface light orange-brown, color patchy; margin with a tiny hook.....2.*Ranunculus abortivus*
97. Surface black or very dark, color solid; margin often with a small notch.
98. Form symmetrically biconvex; marginal rim narrow, the border area slightly compressed.
99. Seed 1.5--1.7 mm long.....19.*Amaranthus graecizans*
99. Seed 0.9--1.3 mm long.
100. Outline nearly circular; seed ± 0.9 mm long.....23.*Amaranthus rudis*
100. Outline ovate; seed 0.9--1.3 mm long.
101. Surface dark red-brown, or black with red-brown undertones; border areas with a faint reticulate pattern, concentrically arranged, when seen at 25x.
102. Marginal notch distinct, V-shaped; seed 1.0--1.1 mm long, 0.6--0.7 mm thick.....20.*Amaranthus hybridus*
102. Marginal notch tiny, but rim of the hilum projecting as a tooth; seed 0.9--1.1 mm long, 0.5--0.6 mm thick.....24.*Amaranthus spinosus*
101. Surface of mature seeds uniformly black; border area may be dull or slightly roughened, but lacks a reticulate pattern when seen at 25x.
103. Center of each face shiny, border area dull when seen at 7x; seed 0.9--1.2 mm long, 0.4--0.6 mm thick.....21.*Amaranthus palmeri*

103. Entire surface shiny at 7x; seed 1.1--1.3 mm long, 0.6--0.7 mm thick.....
.....22.*Amaranthus retroflexus*
98. Form biconvex, but often asymmetrically so (one face more strongly convex than the other); marginal rim rounded, border area not compressed; there may be a groove from the margin to the center of each face; a membranous pericarp often persistent on the seed.
104. Seed more than 2.0 mm in diameter.....
.....12.*Chenopodium gigantospermum*
104. Seed 1.1--1.8 mm in diameter.
105. Pericarp adherent, usually present.
106. Neither face strongly convex; pericarp yellowish; seed diameter 1.1--1.3 mm.....10.*Chenopodium album*
106. One face slightly convex, the other strongly so or nearly conical; seed diameter 1.5--1.8 mm.....
.....14.*Cycloloma atriplicifolia*
105. Pericarp easily separated from seed.
107. Seed surface has fine radial wrinkles, pericarp is radially striate when seen at 10 x; seed diameter 1.1--1.3 mm.....
.....13.*Chenopodium pratericola*
107. Seed surface has a fine reticulate pattern, pericarp has a sharp reticulate pattern when seen at 10x; seed diameter 1.3--1.4 mm.....
.....11.*Chenopodium berlandieri*

93. Outline various, but neither round nor ovate, or if so, then not biconvex in cross section.
108. Outline circular, but with a small notch or extension; cross section oblong or elliptical.
109. Achene with a distinct basal attachment point on the margin opposite an apical tip.
110. Achene 2.8--3.1 mm long.....
 ...39. *Polygonum pennsylvanicum* or
 34. *Polygonum amphibium*
110. Achene less than 2.6 mm long.
111. Both faces concave, margins slightly thick; apex acute; achene 2.3--2.5 mm long.....
 38. *Polygonum lapathifolium*
111. One face flat or with a basal swelling; achene thicker near the base; apex acuminate; achene 2.0--2.2 mm long.....
 40. *Polygonum persicaria*
 (flat form)
109. Seed lacking an apical tip, but with a notch and/or rounded extension on the margin.
112. Seed small, up to 1.6 mm long; membranous pericarp often present.
113. Center of each face depressed; surface dull, orange-brown.....
 16. *Monolepis nuttalliana*
113. Each face with a small groove from the center to the marginal notch; surface shiny, black.....9. *Atriplex subspicata*
 (small form)

112. Seed larger, 2.6--3.0 mm long.
114. Surface smooth, glossy, purplish black....
.....7.*Phytolacca americana*
114. Surface finely textured, dull,
orange-brown or yellow-brown (may be
covered with a greenish membranous
pericarp).....9.*Atriplex subspicata*
(large form)
108. Outline various, but not circular; cross section
various.
115. Outline 3- or 4- sided, sides straight but
corners rounded.
116. Seed 1.5-1.7 mm long; outline triangular;
surface dark red...25.*Froelichia floridana*
116. Surface 3.3-4.0 mm long; outline
triangular or rhombic; surface brown or
black.
117. Surface brown, smooth; a narrow
V-shaped line present on each face..
.....75.*Desmanthus illinoensis*
117. Surface brown-black, pitted; several
rows of shallow round pits are
visible at 7x.....
.....76.*Cassia chamaecrista*
115. Outline ovate, obovate, reniform, elliptical or
otherwise generally rounded, not 3- or 4-sided.
118. Outline usually ovate to reniform; hilum
in a marginal notch.
119. Surface dark red-brown to black.
120. Surface dull.
121. Seed 2.4--2.7 mm long;
surface appearing
distinctly reticulate at
7x.....
...136.*Solanum rostratum*

121. Seed 3.4--3.8 mm long; surface appearing nearly smooth at 7x but finely reticulate at 10x.....130.*Datura stramonium*
120. Surface smooth and glossy.
122. Seed ± 4 mm long; outline ovate with the small end bent to one side.....77.*Hoffmanseggia glauca*
122. Seed ± 2 mm long; outline a broad ellipse.....84.*Lespedeza stipulacea*
119. Color various, but not dark-red brown or black.
123. Outline elliptic, with one end curved to form an S-shaped tip; seed 2.1--2.5 mm long.....78.*Amorpha canescens*
123. Outline various, but not elliptic, or if elliptic lacking an S-shaped tip.
124. Seed 2.7--3.7 mm long, 1.2 mm or more thick; one edge thicker than the other.
125. Seed 3.4--3.7 mm long; hilum on the thicker margin; surface smooth and glossy.....81.*Desmodium illinoense*
125. Seed 2.7--3.2 mm long; hilum on thinner margin surface dull or semi-glossy..82.*Glycyrrhiza lepidota*
124. Seed less than 2.7 mm long, and/or less than 1 mm thick.
126. Cross section narrowly elliptical, i.e., length of cross section more than twice its width.
127. Outline generally ovate, but with a blunt tip near the small end; seed 1.7--2.1 mm long.....135.*Solanum ptycanthum*
127. Outline ovate; seed 2.0--3.5 mm long.

- 128. Surface yellow-brown to brown.
 - 129. Seed 2.0--2.2 mm long.....137.*Solanum triflorum*
 - 129. Seed 2.6--3.5 mm long.....134.*Solanum eleagnifolium*
- 128. Surface yellow to orange-yellow or orange-brown.
 - 130. Surface dull, appearing granular at 10x.....132.*Physalis longifolia*
 - 130. Surface glossy, appearing areolate or pitted at 10x.
 - 131. Outline usually reniform, with a notch to one side of the center; hilum narrow, in the notch.....131.*Physalis heterophylla*
 - 131. Outline usually ovate, with a shallow notch near one end; hilum a deep pit in the notch..133.*Solanum carolinense*
- 126. Cross section ovate or elliptical, but not very narrow, i.e., length of cross section less than twice its width.
 - 132. Outline about 2x as long as wide; seed 1.8--2.0 mm long.....87.*Medicago minima*
 - 132. Outline less than 2x as long as wide.
 - 133. Outline nearly as wide as long; form only moderately compressed, with the thickness slightly less than length or width.
 - 134. Seed 1.3--1.6 mm long, 1.0--1.3 mm wide.....85.*Lotus corniculatus*

134. Seed 1.6--2.3 mm long, 1.5--2.2 mm wide.....
.....79.*Astragalus mollissimus*
133. Outline distinctly longer than wide; seed about half
as thick as long.
135. The lower rim of the marginal notch projects as
a distinct tooth; seed 1.2--1.6 mm long.....
.....86.*Medicago lupulina*
135. The rim of the marginal notch projects slightly
or not at all.
136. Notch very deep; surface brown, solid
colored.....91.*Oxytropis lambertii*
136. Notch shallow to distinct; surface color
various, often streaked or mottled.
137. Seed 0.8--1.2 mm long.
138. Seed 0.8--1.1 mm long,
0.8--1.0 mm wide; surface
dull.....96.*Trifolium repens*
138. Seed 1.0--1.2 mm long,
0.7--0.8 mm; surface with a
waxy sheen.....
.....94.*Trifolium campestre*
137. Seed 1.6--2.5 mm long.
139. Surface glossy, usually
red-tinged.....
.....83.*Lespedeza cuneata*
139. Surface dull; sometimes with
green, orange, or purple tinge
or mottling.

140. Notch large, making the outline of the seed somewhat mitten shaped; surface straw colored, with or without purple mottles, or solid purple.....95.*Trifolium pratense*
140. Notch small, the outline of seed somewhat kidney shaped, ovate, or elliptical; surface yellowish, lacking any purple color.
141. Seed 2.0--2.5 mm long; outline kidney shaped.....88.*Medicago sativa*
141. Seed 1.7--2.0 mm long; outline elliptical or ovate.
142. Seed 1.8--2.0 mm long,
1.3--1.5 mm wide.....89.*Melilotus alba*
142. Seed 1.7--1.9 mm long,
1.0--1.3 mm wide.....90.*Melilotus officinale*
118. Outline various: a rounded oblong or other rounded shape; hilum obscure, or if distinct, then not located in a marginal notch.
143. Cross section concave-convex.
144. Seed 0.7--0.8 mm long; surface reticulate; cross section C-shaped.....164.*Hedyotis crassifolia*
144. Seed 1.3--2.3 mm long; surface not reticulate; cross section dish-shaped.
145. Surface pale yellow; convex face with many crosswise wrinkles.....160.*Veronica agrestis*
145. Surface orange-brown; convex face smooth or with a single groove.
146. Convex face with a faint crosswise groove; an ovate white ring visible on the concave face.....155.*Plantago patagonica*

- 146. Convex face lacking a groove; concave face solid colored.
 - 147. Seed 1.6--1.8 mm long.....157.*Plantago virginica*
 - 147. Seed 2.0--2.3 mm long.....154.*Plantago lanceolata*
- 143. Cross section various, but not concave-convex.
 - 148. Surface covered with a membrane which is wrinkled into sharp irregular ridges; seed dark brown with a thin, translucent surface layer.....1.*Delphinium carolinianum*
 - 148. Surface smooth to finely roughened, but lacking a conspicuous wrinkled membrane.
 - 149. Outline pear shaped.
 - 150. Seed 1.1--1.2 mm long; center of each face depressed.....15.*Kochia scoparia*
 - 150. Seed 2.5--2.8 mm long; one or both faces convex.
 - 151. Surface black, tinged with purple; a central lengthwise ridge on each face.....199.*Iva xanthifolia*
 - 151. Surface gray-brown; 3 lengthwise ridges on each face (center ridge sometimes obscure).....198.*Iva annua*
 - 149. Outline rounded-oblong, ovate, or elliptical, but not pear shaped.
 - 152. Surface black; form irregular, bent.....165.*Hedyotis nigricans*
 - 152. Surface yellow to orange or brown.

153. Form chip-like, very thin; one face with a raised elliptical area or ridge.
 154. Surface smooth, shiny; cross section elliptical.162. *Veronica peregrina*
 154. Surface dull, finely wrinkled; cross section curved or bent.161. *Veronica arvensis*
153. Form flattened, but not very thin and chip-like; neither face with a ridge or raised area, but one or more lengthwise grooves present; the folded form of the embryo and the position of the radicle and cotyledons are discernible on the surface of the seed.
 155. Outline long-ovate and seed 2.3--2.5 mm long.68. *Lepidium campestre*
 155. Outline long-ovate but seed less than 2.0 mm long or outline otherwise: short-ovate, elliptical, or rounded oblong.
 156. Seed very small, 0.6--0.7 mm long, 0.6 mm wide.71. *Rorippa palustris*
 156. Seed at least 0.9 mm long.
 157. Each broad face with 1 deep groove.64. *Chorispora tenella*
 157. Each broad face with one or 2 shallow grooves.
 158. Outline shape only slightly elongate, up to 1.5x longer than wide.
 159. Each broad face with 2 grooves; seed 1.8--2.1 mm long.63. *Cardaria draba*
 159. Each broad face with 1 groove; seed 0.9--1.8 mm long.

- 160. Seed 0.9--1.0 mm long; surface distinctly reticulate at 4x..70.*Nasturtium officinale*
- 160. Seed 1.4--1.8 mm long; surface finely roughened but not reticulate at 4x.
 - 161. Outline ovate; margin with a narrow wing on the broad end and one long side.....69.*Lepidium densiflorum*
 - 161. Outline oblong; marginal wing lacking.....57.*Barbarea vulgaris*
- 158. Distinctly elongate, outline about 2x longer than wide.
 - 162. Radicle slightly longer than the cotyledons; cross section plano-convex; seed 1.3--1.7 mm long.....67.*Erysimum repandum*
 - 162. Radicle equal to or shorter than cotyledons; cross section usually ovate or rounded triangular.
 - 163. Fine ridges visible at 10x; seed 0.9--1.1 mm long, 0.5--0.6 mm wide.....65.*Descurainia pinnata*
 - 163. Surface finely tuberculate or roughened, but lacking ridges.
 - 164. Fine tubercles visible at 10x; form often somewhat angular.....61.*Camelina microcarpa*
 - 164. Surface roughened or striate but not tuberculate at 10x.
 - 165. Surface striate at 10x.....66.*Descurainia sophia*
 - 165. Surface finely roughened but not striate at 10x.

166. Seed 0.9--1.0 mm long; each broad face with 2 grooves.....62.*Capsella bursa-pastoris*
166. Length 1.1--1.6 mm; each broad face with 1 groove, or sometimes the radicle narrow and lying against one face.
167. Outline rounded oblong; one broad face often bulging outward in the center; seed 1.1--1.3 mm long; surface orange.....72.*Sisymbrium altissimum*
167. Outline variable; radicle narrow, often curved to one side; seed 1.1--1.6 mm long; surface orange-brown.....73.*Sisymbrium officinale*

DESCRIPTIONS

A description of each of the 240 species of seeds is presented below in a uniform style. The descriptions are arranged in systematic order, according to the sequence used in *The Flora of the Great Plains*. Each description includes the following information, in this order:

1. Species number (according to the systematic order).
2. Scientific name and authority.
3. Common name (unless none is known).
4. Family.
5. It is assumed that the "seed" is a true seed. If it is in fact a fruit, the kind of fruit is specified. If the seed is found either alone or enclosed in a fruit, or if the seeds are dimorphic, that is so stated.
6. Shape and structure. The first paragraph describes outline shape, cross section shape, and three-dimensional form. Any external structural features such as the hilum are described.
7. Surface characteristics. The second paragraph describes the surface texture, sheen, and color, and any other characteristics of the surface.
8. Size. The third paragraph gives the range of length, width, and thickness measurements obtained.

1.

Delphinium carolinianum Walter

Prairie larkspur

Ranunculaceae



Outline roughly semi-circular. Cross section rectangular. Form irregular, somewhat like a segment of a thick disc.

Surface, when seen without magnification, appears to be covered with a dull wrinkled membrane. At low magnification it is striate and has prominent, mostly crosswise wrinkles. At high magnification a fragile shiny layer of elongate tubular cells is visible on the surface. These cells are oriented lengthwise on the seed and appear to be sculpted into sharp crosswise ridges. Dark brown; the surface layer is translucent.

Length 1.9--2.5; width 1.0--1.5; thickness 0.8--1.1 mm.

2.

Ranunculus abortivus L.

Early wood buttercup

Ranunculaceae



Achene:

Outline rounded triangular or ovate with one nearly straight edge. Cross section biconvex. Form ovoid, compressed, with thin narrow margins. From the attachment point (at the small end of the achene) 2 thickened marginal ridges run most of the distance to the wide end, forming the straight edge. These ridges end in a minute hook-shaped style remnant which curves toward the wide end. The remainder of the margin is narrowly winged.

Surface smooth, glossy. Small shallow pits are visible with magnification. Light orange-brown, uneven in intensity.

Length 1.4--1.8 mm; width 1.2--1.4 mm; thickness 0.7 mm.

3.

Argemone polyanthemus (Fedde) G. Ownbey

Prickly poppy



Papaveraceae

Outline round, with 1 or 2 small pointed projections. Cross section round. Form nearly globose, but with a thin linear seam projecting above the surface for about 1/3 the circumference. One end of the seam forms a blunt tooth, and the other end is a small extended tip ± 0.2 mm long.

Surface covered with a honeycomb-like mesh of sharp-edged ridges with smooth pits between them. This pattern is visible without magnification and very distinct at 7x. The rows of pits appear to radiate from the small extended tip. The mesh looks like a membrane shrunk to the surface of the seed. Dull, but under magnification the pits are shiny. Dark gray to nearly black; the ridges and seam may be paler.

Diameter 1.8--2.2 mm.

4.

Argemone squarrosa Greene

Hedgehog prickly poppy

Papaveraceae



Outline round with a distinct small tip and 2 blunt projections. Cross section round. Form nearly globose, with a tooth-like projection, ± 0.3 -- 0.4 mm long. The hilum is next to the tooth. The hilum has an ovate rim which continues as a prominent ridge toward a point not quite opposite the tooth. Each end of this ridge forms a small blunt projection..

Surface covered with a conspicuous reticulate pattern of sharply defined ridges and smooth interspaces, visible without magnification. Gray brown; but when viewed at 15x magnification, the ridges are pale with fine dark central lines, while the interspaces are dark with a dense network of pale veins.

Diameter 2.3 -- 2.6 mm.

5.

Cannabis sativa L.

Marijuana, Hemp

Cannabaceae



Outline short ovate with a truncate, sometimes extended base. Cross section biconvex, but asymmetrical. Form ovoid, slightly compressed, with a blunt-tipped apex and a small base which extends downward. The dorsal and ventral faces meet in a narrow rim. The hilum, at the base, is large, round, and enclosed by a thickened collar.

Surface smooth, with a slight sheen. Under magnification it has a parchment-like luster. The color is patchy, ranging from dull green or greenish black to light brown or dark brown. With magnification fine dark streaks are visible in the paler areas, and there is a fine, light-colored network over the whole seed. This network appears to be in a translucent surface layer.

Length (3.1) 3.6--4.2 mm; width (2.4) 2.7--3.3 mm; thickness 2.2--2.6 mm.

6.

Urtica dioica L.

Stinging nettle

Urticaceae

..

Outline ovoid with a slightly extended base. Cross section narrowly biconvex. Form ovoid, compressed, with an acute tip at the small end and a narrow marginal wing all around. There is a small stalk-like extension from the center of the wide end of the seed; the hilum is at the end of this extension.

Surface finely textured, dull. Light dull orange; the wing is paler.

Length 1.0--1.1 mm; width 0.7--0.8 mm; thickness 0.3--0.4 mm.

7.

Phytolacca americana L.

Pokeweed

Phytolaccaceae



Outline nearly circular, with a small extension and a V-shaped notch. Cross section elliptical. Form discoid, with rounded margins. There may be a depression in the center of each face. There is one thin, somewhat angular extension of the margin; next to the extension is a broad notch, partly filled with corky tissue.

Surface very smooth, very glossy. Black, with purplish undertones.

Length 2.8--2.9 mm; width 2.5--2.8 mm; thickness 1.3--1.4 mm.

8.

Mirabilis nyctaginea (Michx.) MacM.

Wild four o'clock

Nyctaginaceae

90

Anthocarp (dry accessory fruit):

Outline obovate with a small truncate base and a short rectangular extension at the apex. Cross section approximately round; there are 5 angles, but they are obscured by the hairs. Form clavate, with a truncate base. There are 5 long faces which meet in 5 lengthwise angles. There is a small cylindrical extension at the apex. The attachment point, at the small end, has a circular rim and a small point at the center.

Surface very rough, dull, hairy. There are large irregular tubercles on the angles. The faces have small tuberculate wrinkles, with fine striations between the wrinkles. There are abundant white multicellular hairs. Gray-brown overall; the ridges and wrinkles are yellow-brown, and the interspaces are dark brown.

Length 3.5--3.7 mm; diameter 1.7--1.9 mm.

9.

Atriplex subspicata (Nutt.) Rydb.

Sparscale

Chenopodiaceae



The seeds of this species are dimorphic; the 2 forms may be found on the same plant.

Smaller form: Outline nearly round, with one rounded extension which forms a notch, and a tiny tip (style base) located about 1/3 the distance around the margin from the extension. Cross section elliptical. Form a thick disc with rounded margins. On each face there is a groove which runs from the notch toward the center. The membranous pericarp is often present.

Surface smooth, shiny, and black. The pericarp is greenish, with a slight sheen and lengthwise striations, but allows the dark color of the seed to show.

Diameter 1.4--1.6 mm; thickness 0.7--0.8 mm.

Larger form: Outline nearly round, with a distinct, tapered extension. Cross section a narrow wedge. Form discoid, apparently a coil with one free end; the margin of the disc is thicker toward the inner end of the coil. The membranous pericarp is often present.

Surface smooth, dull. With magnification it appears

finely textured. Orange-brown to dark yellow-brown. The pericarp is thin, greenish, and allows the color of the seed to show.

Length 2.6--3.0 mm; width 2.2--2.9 mm, thickness 0.9--1.2 mm.

10.

Chenopodium album L.

Lamb's quarters



Chenopodiaceae

Outline circular with a small extension. Cross section biconvex. Form biconvex. The hilum is in the notch formed by the extension. From the notch a groove runs toward the center of each face. The membranous pericarp is usually attached and may be strongly adherent. On the lower face a circular attachment scar is present in the center of the pericarp. On the upper face a small style remnant projects slightly from the center of the pericarp.

Surface (without the pericarp) nearly smooth and very shiny. Radial striations are visible at high magnification. Black. With the pericarp present, the surface is slightly roughened and radially striate. The pericarp is transparent, yellowish, and has a silky sheen.

Length 1.1--1.3 mm; width 1.0--1.1 mm; thickness 0.5--0.6 mm.

11.

Chenopodium berlandieri Moq.

Pitseed goosefoot



Chenopodiaceae

Outline nearly circular. Cross section a rounded shape with one slightly convex face; the other face is strongly convex or nearly pointed. Form a short broad cone; the pointed end is at the base in fruit, and the top surface is slightly convex. Some seeds are more nearly biconvex. On the margin there is a small extension, which forms a notch. On the upper face there is a slight groove from the notch to the center. On the lower face there is a wider groove. The seed is often covered by the thin, transparent, yellowish pericarp.

Surface (without the pericarp) smooth and shiny. There is a fine reticulate pattern which is visible at 10x. Black. When the pericarp is present the surface has a membranous sheen; a fine sharp reticulate pattern, arranged in radial lines, is visible with magnification. There is an opaque pale spot, the style base, in the center of the top face of the pericarp. On the lower face there is a dark spot in the center, at the attachment point. Yellowish gray, with the dark seed showing through the pericarp.

Diameter 1.3--1.4 mm; thickness 0.7--0.8 mm.

12.

Chenopodium gigantospermum Aellen

Maple-leaved goosefoot



Chenopodiaceae

Outline nearly circular, with a slight curved extension which forms a small notch. In cross section there are 2 unequally convex sides, with narrow wings. Form biconvex with a thin border area around the circumference on each face; this border area is ± 0.2 mm wide. On the edge, a notch is formed by a rounded extension. The hilum is located in the notch. On the more convex face (the lower side in fruit) there is a groove which runs from the notch to the center. All or part of the persistent pericarp may be present. On the lower face, the pericarp has a round attachment scar. In the center of its upper face there is a small style base.

Surface (without the pericarp) smooth and shiny. At high magnification, the upper face appears slightly roughened, and the lower face has fine radial striations. Black. The pericarp is thin, yellowish, and nearly transparent, with radial striations on the lower face; with the pericarp present the apparent color of the seed is dull brown.

Length 2.2--2.4 mm; width 2.1--2.3 mm; thickness

1.1--1.2 mm.

The perianth may be persistent on the fruit. There are 5 widely spaced sepals which are folded over the rim of the fruit but do not completely enclose it.

13.

Chenopodium pratericola Rydb.

Chenopodiaceae



Outline nearly circular with a small curved extension and a very small notch. In cross section there is one convex face and one face which is more strongly convex or nearly pointed. Form biconvex, but unequally so; the lower face may be nearly conic. Hilum very small, circular, in the notch. On each face there is a groove which extends inward from the notch. The pericarp is readily separated from the seed, but may be present. There may be a tiny style remnant present on the upper face of the pericarp. The seed is exposed through a break in the pericarp at the center of the lower face.

Surface (without the pericarp) smooth, shiny. At 10x fine radial wrinkles are visible, as well as faint parallel ridges on the small extension. Black. The pericarp is a thin translucent membrane, radially striate, with a slight sheen. With the pericarp present, the apparent color is dark yellowish gray.

Length 1.1--1.3 mm; width 1.0--1.2 mm; thickness 0.7--0.8 mm.

14.

Cycloloma atriplicifolium (Spreng.) Coult.

Tumble ringwing

Chenopodiaceae



Outline nearly circular; there may be a small notch. Cross section biconvex, but one face is much more strongly convex than the other. Form a disc with one distinctly convex face. A membranous adherent pericarp is usually present. There is a tiny style base in the center of the flat face. On the convex face a shallow groove runs from the marginal notch to the center.

Surface shiny. Black. The pericarp is dull, papery, and has fine radial striations. With the pericarp present, the apparent color is gray-black.

Diameter 1.5--1.8 mm, thickness 0.7--0.9 mm.

The seed is likely to be found still enclosed in the complete perianth, which is 2.2--2.5 mm in diameter. The lower side of the perianth is dark and cup-shaped with a ruffled marginal wing. The upper side has a dark brown center and a light brown ruffled wing. The 5 calyx parts are keeled and closely appressed to the upper face of the fruit, but do not completely enclose it; a 5-armed star shape appears in the center.

15.

Kochia scoparia (L.) Schrad.

Fire-weed, Kochia



Chenopodiaceae

Outline pear-shaped. Cross section a narrow triangle, with a notch in the short side. Form flattened ovoid, apparently folded. Two long tips meet to form the small end of the seed. There is a groove extending from the small end toward the center of each face. There is usually an ovate depressed area in the center of each face. One long edge of the seed is thicker than the other; the thicker edge has a groove along its outer face.

Surface very finely roughened, with a slight sheen. Dark red-brown to black; the thin edge of the seed is sometimes paler.

Length 1.1--2.1 mm; width 0.9--1.5 mm; thickness 0.5--0.8 mm.

16.

Monolepis nuttalliana (R. & S.) Greene

Poverty weed

Chenopodiaceae



Outline nearly circular. Cross section a narrow ellipse. Form a disc with a thin rim. The seed is vertical in the fruit, and there is a notch in the margin at the basal attachment point. The U-shaped embryo can be distinguished on both faces, and the center of each face is slightly depressed.

Part or all of the pericarp may be present.

Surface very finely textured, dull. Dark orange-brown. The pericarp is membranous, finely reticulate, and pale greenish in color. The rim of the pericarp is compressed. There may be a bifid style on the rim of the pericarp at the apex.

Diameter 1.1--1.3 mm; thickness 0.3--0.4 mm.

17.

Salsola collina Pall.

Tumbleweed



Chenopodiaceae

Outline roughly circular. Cross section round. Form somewhat conical, with the small end of the cone at the base in the fruit; the broad end of the cone is more or less concave. This cone is formed by the embryo, which consists of 2 spiral coils, one inside the other. A clinging membranous seed coat covers the coils. There is a style remnant at the center of the upper face.

Surface (of the seed coat) papery, striate, lusterless, and brown. The embryo is nearly smooth, semi-glossy, olive green, but darker toward the center of the coils.

Diameter (1.2) 1.4--1.6 mm; thickness 0.7-1.1 mm.
(Thickness measured from base to apex.)

18.

Salsola iberica Senn. & Pau.

Russian thistle, tumbleweed

Chenopodiaceae

Outline ovate, with a pointed small end. Cross section round. Form conical with an oblique, pointed base. The embryo itself is coiled, and there is only a very thin membranous seed coat covering the embryo.

Surface (of the seed coat) papery, dull. Brown. The embryo is smooth, shiny, dark green in the center, fading to brownish green toward the outer coil.

Length 1.7--1.8 mm; thickness 1.2--1.4 mm.

The seed is often found still enclosed in all or part of the adherent papery perianth. The perianth has a flaring conical form, with an oblique flat apex. There is a style remnant in the center of the apex. The flat area has an irregular horizontal wing with 5 rounded teeth.

Length 1.7--1.8 mm; thickness 1.2--1.4 mm.

19.

Amaranthus graecizans L.

Prostrate pigweed



Amaranthaceae

Outline ovate or sometimes nearly round. Cross section biconvex with sharply defined edges. Form ovoid, slightly compressed, with a distinct thin border on each face; the border is ± 0.2 mm wide and 0.1 mm thick. The small end of the seed is truncate or slightly notched, with the hilum in the notch.

Surface very smooth; glassy luster. At high magnification, a very fine reticulate pattern is visible in the border area, with a similar faint pattern in the center of each face. Black.

Length 1.5--1.7 mm, width 1.3--1.5 mm, thickness ± 0.7 --0.8 mm.

20.

Amaranthus hybridus L.

Slender pigweed

::.

Amaranthaceae

Outline ovate. Cross section biconvex. Form ovoid, compressed, with 2 faces which meet in a rounded narrow rim. On each face there is a border which is slightly more compressed than the rest of the seed. Near the small end of the seed there is a small, distinct, V-shaped notch which includes the hilum.

Surface smooth, shiny; the border areas are slightly duller. At 25x magnification, a faint reticulate pattern, in concentric lines, is visible on the borders. Black, with red-brown undertones; sometimes the border areas are reddish.

Length 1.0--1.1 mm; width 0.8--0.9 mm; thickness 0.6--0.7 mm.

21.

Amaranthus palmeri S. Wats.

Palmer's pigweed

Amaranthaceae



Outline ovate. Cross section biconvex. Form ovoid, compressed, with a small notch near the small end; the tiny hilum is in the notch. There is a slightly compressed border around each face.

Surface smooth, highly glossy; at magnifications of 7x or more, the border area appears duller than the center. At 10x magnification, the central area of each face appears very smooth and the border area slightly roughened. At 40x, the border appears to have a finely alveolate texture. Uniformly black.

Length 0.9--1.2 mm; width 0.8--0.9 mm; thickness 0.4--0.6 mm.

22.

Amaranthus retroflexus L.

Rough pigweed

Amaranthaceae



Outline ovate with a tiny tooth or notch on one side just below the small end. Cross section biconvex. Form ovoid, compressed, with a narrow rim. The outer margins of the two faces appear slightly compressed, forming a border area ± 0.1 mm wide. The hilum is small and round, located in the V-shaped notch; the lower edge of the notch sometimes projects as a small tooth.

Surface very smooth, very shiny with a glassy luster. Under high magnification the border area appears slightly roughened. Black.

Length 1.1--1.3 mm; width 0.9--1.1 mm; thickness 0.6--0.7 mm.

23.

Amaranthus rudis Sauer

Water-hemp



Amaranthaceae

Outline nearly circular. Cross section biconvex. Form a biconvex lens, with a slightly compressed border area on each face. The hilum is very small and is located in a marginal notch which is formed by 2 slightly extended tips; the rim of the hilum may appear as a tiny tooth.

Surface very smooth, luster glassy; the border areas slightly dull. At 25x magnification, the borders are marked with a regular, faint scalariform pattern. Black, with undertones of red in the border areas.

Length 0.9 mm; width 0.8--0.9 mm, thickness 0.5--0.6 mm.

24.

Amaranthus spinosus L.

Spiny pigweed



Amaranthaceae

Outline ovate. Cross section biconvex. Form ovoid, compressed, with 2 faces which meet in a rounded rim; on each face there is a slightly compressed border. There is a tiny notch in the rim near the small end of the seed. The hilum is in the notch, and its edge projects as a small tooth.

Surface smooth, shiny. At 25x magnification a fine reticulate pattern, in concentric lines, is visible on the border areas. Dark red-brown.

Length 0.9--1.1 mm; width 0.8--0.9 mm; thickness 0.5--0.6 mm.

25.

Froelichia floridana (Nutt.) Moq.

Field snake-cotton

Amaranthaceae



Outline rounded triangular. Cross section elliptical. Form a thick triangle, thinner toward one corner. The 2 faces of the triangle are slightly convex; they are joined by a broad band around the perimeter. The embryo is evidently folded, with 2 unequal tips which join to form the thinner corner of the seed.

Surface nearly smooth, with fine rounded wrinkles; shiny. Very dark red.

Length 1.5--1.7 mm; width 1.4--1.8 mm; thickness 1.0--1.4 mm.

26.

Portulaca oleracea L.

Purslane

Portulacaceae



Outline ovate to rounded triangular, with a small notch on one side just below the small end. Cross section long ovate. Form ovoid, compressed, a coil with the free end forming the small end of the ovoid form. Each face has a shallow groove, extending from the small end toward the center. The hilum area, located in the notch, is covered by a conspicuous piece of thin, light-colored tissue, placed crosswise to the edge of the seed.

Surface shiny, covered with small distinct tubercles. The tubercles are arranged in rows around the circumference of the seed. Dark red-brown to black.

Length 0.7--0.8 mm, width 0.5--0.7 mm; thickness 0.3--0.5 mm.

27.

Mollugo verticillata L.

Carpeweed

Molluginaceae

Outline like a comma, with a small projection from the notch of the comma. Cross section ovate. Form ovoid, compressed, apparently a coil; thicker toward the outer edge of the coil. There are 5--7 distinct, continuous narrow ridges around the circumference of the seed, from the narrow end to the notch, and several similar but fainter ridges concentric on each broad face. The hilum is a small conical tooth which projects ± 0.1 mm from the center of the notch.

Surface conspicuously ridged, shiny. Orange-brown; the ridges and the small tooth are darker. The ridges appear translucent when seen with magnification.

Length 0.5--0.6 mm; width 0.4--0.6 mm; thickness ± 0.4 mm.

28.

Cerastium vulgatum L.

Mouse-ear chickweed



Caryophyllaceae

Outline roughly triangular. Cross section ovate. Form sector-like, irregular, with some rounded and some angular edges. The round hilum, on one corner, is in a small notch formed by an incurved tip of tissue.

Surface papillate; many of the papillae are elongate and they appear to radiate from the hilum area. When seen without magnification the surface appears dull, but at low magnification the papillae are shiny, and at high magnification they are transparent. Light orange-brown.

Length 0.6--0.7 mm; width 0.6--0.7 mm; thickness 0.3--0.5 mm.

29.

Holosteum umbellatum L.

Jagged chickweed



Caryophyllaceae

Outline ovate. Cross section rounded triangular. Form ovoid, very compressed, bent; the dorsal face has a lengthwise groove and an extended, folded tip which continues as a ridge, 0.1--0.2 mm wide, for most of the length of the ventral face. The inconspicuous hilum is near the end of the ridge.

Surface dull, roughened with closely spaced protuberances which are more prominent on the dorsal face. These appear round when viewed at 10x magnification, but at 30x they appear as many-rayed stars; on the ridge they are elongate. Pale orange-brown.

Length 0.8 mm; width 0.6--0.7 mm; thickness 0.4--0.5 mm. The ridge is ± 0.2 mm thick.

30.

Saponaria officinalis L.

Soapwort

Caryophyllaceae

Outline ovate, with a distinct small notch at the center of one side. Cross section a narrow wedge. Reniform, compressed, thinner toward the notched edge, and often appearing somewhat wrinkled or irregular. The small indistinct hilum is in the notch.

Surface dull, papillate. The papillae are round to elongate and appear to radiate from the notch area. Under magnification they are shiny. Black.

Length 1.8--2.2 mm; width 1.4--1.8 mm; thickness 0.5--0.7 mm.

31.

Silene antirrhina L.

Sleepy catchfly

Caryophyllaceae

Outline kidney-shaped to semi-circular. Section rounded oblong. Reniform, with 2 nearly flat broad faces and only a slight notch. The hilum is an elliptical cavity lying crosswise in the notch.

Surface papillate; the papillae are small, sharply defined and closely spaced. The papillae are aligned in regular rows around the entire outer edge, from one side of the hilum to the other; on the broad faces of the seed the papillae are uniformly spaced. The surface appears dull, but at 10x magnification the tips of the papillae are shiny. Black.

Length 0.6--0.7 mm; width 0.5--0.6 mm; thickness 0.4--0.5 mm.

32.

Stellaria media (L.) Cyr.

Common chickweed



Caryophyllaceae

Outline nearly circular. Cross section wedge-shaped. Form discoid with 2 flat faces which join the margin at nearly right angles; the disc is thicker toward one side. The seed appears folded, with 2 small tips which meet at the margin on the thinner side. There is a groove between the tips which extends about 1/4 the distance to the center on each flat face.

Surface dull, tuberculate. The tubercles are arranged in rows around the marginal face and in concentric circles on each broad face. Straw colored to pale reddish brown. (The color darkens with maturity, but the seeds are often shed while still immature.)

Length 0.8--0.9 mm; width 0.8--0.9 mm; thickness 0.4 mm.

33.

Vaccaria pyramidata Medic.

Cow-cockle



Caryophyllaceae

Outline round to rounded triangular. Cross section approximately round. Form globose, but irregular, with one extended area. The hilum is on the extension, and the seed appears variously compressed or shrunken near the scar.

Surface dull, tuberculate. The tubercles are small and uniform, visible at 7x magnification. The tubercles are arranged in distinct rows on a broad band around the circumference, from one side of the hilum to the other; they are evenly spaced over the rest of the surface.

Black, with red-brown undertones.

Length 1.7--1.9 mm; width 1.5--1.7 mm; thickness 1.5--1.7 mm.

34.

Polygonum amphibium L.

var. *emersum* Michx.

Swamp smartweed

Polygonaceae



Achene:

Outline nearly round with a small apical extension. Cross section a rounded oblong. Form discoid, with rounded edges and a small tip. Both faces may be flat, but often one face is slightly concave or appears folded on its lengthwise center line. The small round attachment point is at the center of the base, opposite the tip. Perianth remnants and a style remnant are often present.

Surface smooth, very shiny. Under magnification it appears to have very fine, slight wrinkles. Black, often with red-brown undertones.

Length 2.8--3.1 mm; width 2.7--3.0 mm; thickness 0.9--1.1 mm.

35.

Polygonum arenastrum Jord. ex Bor.

Knotweed

Polygonaceae

Achene:

Outline ovate to tear-drop shaped. Cross section triangular, usually with sides of three different lengths; the sides may be straight, convex, or concave. Form 3-sided and 3-angled, with the angles curved gradually to an acute apex and abruptly to a rounded base. Calyx remnants are usually present at the base. At the apex there may be 1--3 small teeth, remnants of the style base.

Surface somewhat shiny, glossy on the angles. At 7x magnification it appears minutely granular; at high magnification it appears shiny but finely papillose in a lengthwise pattern. Dark red-brown.

Length 2.0--2.4 mm; width 1.3--1.6 mm; thickness 0.8--1.0 mm.

36.

Polygonum bicornne Raf.

Pink smartweed

Polygonaceae



Achene:

Outline ovate or broadly elliptic, with a blunt base and a small acute tip. Cross section a broad, rounded triangle. Form ovoid, compressed, with one flat side; the other side has a lengthwise or central convexity. The attachment point is at the center of the base, opposite the tip. It is round with a distinctly projecting rim. Style and perianth remnants may be present.

Surface smooth, very glossy. Dark red-brown to black; the hilum is white.

Length 2.8--2.9 mm, width 2.2--2.3 mm; thickness 0.9--1.1 mm.

37.

Polygonum convolvulus L.

Wild buckwheat

Polygonaceae



Achene:

Outline elliptic. Cross section triangular, with concave sides of 3 different lengths. Form ellipsoid, but 3-sided and 3-angled, broadest about the middle, with a blunt base and narrow apex. The attachment point is at the center of the base. Some perianth remnants and a style remnant may be present.

Surface smooth, dull; the angles are glossy. Under magnification the surface is finely reticulate or striate. Black; the hilum is pale.

Length 3.5--4.0 mm; width (of one face) 2.4--2.7 mm.

38.

Polygonum lapathifolium L.

Pale smartweed

Polygonaceae



Achene:

Outline ovate to tear-drop shaped, with a distinct acute tip. Cross section rounded oblong. Form ovoid, strongly compressed, with thick, rounded edges. The 2 faces are concave in the center, and sometimes appear bent or slightly creased lengthwise. The attachment point, at the center of the base, is small, circular, and slightly depressed. There is a very fine line around the circumference of the seed. Perianth remnants are often present, and there may be a style remnant.

Surface smooth, glossy. Under magnification it appears to have very fine slight wrinkles. Dark brown.

Length 2.3--2.5 mm; width 1.8--1.9 mm; thickness 0.7--0.8 mm.

39.

Polygonum pennsylvanicum L.

Pennsylvania smartweed



Polygonaceae

Achene:

Outline nearly circular with a small acuminate tip. Cross section a rounded oblong. Form discoid, with a narrow tip; one side is often somewhat concave or has a lengthwise crease. A style remnant may be present on the tip. The attachment point, located opposite the tip, is small, round, and has a raised rim. With high magnification a faint lengthwise line may be visible on the center of each face.

Surface smooth, highly glossy. Under magnification it appears very finely wrinkled. Black to dark brown, with a very pale attachment point.

Length 2.8--3.1 mm; width 2.7--3.0 mm; thickness 0.9--1.0 mm.

40.

Polygonum persicaria L.

Lady's thumb



Polygonaceae

The achenes of this species are dimorphic:

Flat form (more common): Outline short ovate with a small apical tip. Cross section a rounded oblong. Form ovoid, very compressed, thicker near the base. One side may have a distinct basal swelling.

Three-sided form (less common): Outline short ovate with a small apical tip. Cross section 3-lobed. Form ovoid, with 3 prominent ridges alternating with 3 concave folds.

In either form a small style remnant and perianth remnants may be present. The attachment point, located opposite the tip, is small and has a slightly raised rim.

Surface smooth, highly glossy. Black.

Flat form: Length 2.0--2.2 mm; width 1.8--1.9 mm; thickness ± 0.9 mm.

Three-sided form: Length 1.9--2.2 mm; thickness 1.4--1.8 mm; the ridges are ± 0.6 --0.7 mm thick.

41.

Polygonum ramosissimum Michx.

Bush knotweed

Polygonaceae



Achene:

Outline broadly elliptic. Cross section triangular. Form 3-angled, with 3 elliptic, somewhat concave faces. One end is blunt and other end is tapered to a fine tip. A style remnant and perianth remnants are usually present. The small round attachment point is at the blunt end.

Surface smooth, very shiny, especially on the angles. At high magnification the faces appear slightly roughened. Black to brown-black.

Length 2.3--2.9 mm; width (of one face) 1.7--2.1 mm.

42.

Polygonum scandens L.

Climbing false buckwheat

Polygonaceae



Achene:

Outline elliptical, with the widest part just below the middle. Cross section 3-pronged. Form ellipsoid, 3-winged. A style remnant and perianth remnants may be present. The attachment point is at the center of the base.

Surface smooth, highly glossy. Black, with a pale attachment point.

Length 3.3--3.6 mm; width (of one face) 1.8--2.2 mm.

43.

Rumex acetosella L.

Sheep sorrel

Polygonaceae

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Achene:

Outline ovate with an extended base. Cross section triangular. Form 3-angled, with 3 broadly elliptical faces. The angles are rounded but well-defined. The faces are flat or have a slight lengthwise crease. The apex is acute, and the extended base is blunt, with the attachment point at the center.

Surface covered by closely adherent perianth parts, making it dull and granular. There is a central lengthwise nerve on each of the 3 perianth parts. When the perianth is worn off the surface is smooth and glossy. Red-brown.

Length 1.3--1.5 mm; width (of one face) 0.9--1.0 mm.

44.

Rumex altissimus Wood.

Pale dock



Polygonaceae

Achene:

Outline broadly elliptic, tapering to an acute tip at the apex, and with a short, truncate tip at the base. Cross section triangular with well-defined angles and straight or concave sides. Form 3-angled shape, with 3 broadly elliptical faces. The faces are sometimes slightly concave, especially near the ends, or may have a faint lengthwise crease. The angles are narrowly winged. The attachment point is at the base.

Surface smooth, very shiny. Orange-brown.

Length 2.6--2.7 mm; width (of one face) 1.8--2.0 mm.

45.

Rumex crispus L.

Curly dock



Polygonaceae

Achene:

Outline ovate to broadly elliptical, with a narrow apex and short truncate base. Cross section triangular with well-defined angles. Form 3-angled, with 3 elliptical faces. The angles are narrowly winged. The hilum is at the base.

Surface smooth, very shiny. Dark orange brown.

Length 2.0--2.3 mm; width (of one face) 1.4--1.7 mm.

46.

Rumex patientia L.

Patience dock

Polygonaceae



Achene:

Outline ovate, with a narrow apex. Cross section triangular with very narrow angles. Form 3-angled, with 3 ovate faces. The angles are narrowly winged. At the basal juncture of the angles there is a very short stalk.

Surface smooth, highly glossy. Light orange-brown; the wings are tinged with green, and the stalk is white.

Length 2.8--2.9 mm; width (of one face) 1.8--2.2 mm.

47.

Hypericum perforatum L.

Common St. John's-wort

Clusiaceae

Outline rounded oblong with a small tip at each end.
Cross section round. Form cylindrical, with a small apical tip and a blunt basal tip which includes the hilum.

Surface pitted or roughened, but shiny when viewed at 10x magnification. At high magnification it appears strongly sculpted in an irregular reticulate pattern.
Light brown.

Length 1.0--1.2 mm; diameter 0.4--0.5 mm.

48.

Abutilon theophrasti Medic.

Velvet leaf

Malvaceae

Outline kidney-shaped or rounded triangular with a deep notch. Cross section elliptical, constricted in the center. Reniform or ovoid, compressed, the two broad faces concave; there is a distinct notch along one edge, dividing the seed into 2 unequal lobes. One lobe is thinner and usually more angular than the other. The hilum, in the notch, is covered by a remnant of the funiculus, a long thin piece of tissue which is adherent to the longer, thinner lobe of the seed, and is free and curved upward in the center of the notch.

Surface rough, very dull. When seen at 10x magnification it appears finely reticulate. There are scattered white strigose hairs, visible at 8x; these are more abundant in the notch region. Gray-brown; the funicular remnant is greenish.

Length 2.9--3.4 mm; width 2.6--2.9 mm; thickness 1.4--1.6 mm.

49.

Hibiscus trionum L.

Flower-of-an-hour



Malvaceae

Outline rounded triangular with a large shallow notch in one side. Cross section rounded oblong. Form ovoid, compressed, with a distinct notch in one edge which divides the seed into 2 unequal lobes. There is a depression in the center of each face. The ovate hilum is in the notch. The hilum is typically covered by a remnant of the tuniculus, a long thin tissue which is adherent the thinner end of the seed and is free and curved upward just above the center of the notch.

Surface rough, dull. At 10x it appears finely reticulate, and scattered, sharply defined tubercles are visible. At high magnification, these tubercles are transparent, yellow-brown, smooth, and shiny. Dark brown-black.

Length 2.0--2.2 mm; width 1.8--2.2 mm; thickness 1.3--1.5 mm. (Length measured along notched edge.)

50.

Malva neglecta Wallr.

Common mallow



Malvaceae

Outline kidney-shaped to nearly round, with a small well-defined notch in the margin. Cross section oblong. Form like a narrow sector of a thick disc, with a notch in the inner angle. The seed is thicker above the notch (the upper end in fruit). The hilum is in the notch, usually covered with whitish tissue.

Surface finely textured, dull. At high magnification a very fine overall pattern of wrinkles is visible. Black, with a grayish cast.

Length 1.6--1.8 mm; width 1.5--1.7 mm; thickness 0.9--1.2 mm.

51.

Malvastrum hispidum (Pursh) Hochr.

Malvaceae



Outline ovate with a deep curved notch on one side. Cross section wedge shaped. Form sector-like, narrow, with a deep notch located off center in the inner angle. The 2 broad faces are slightly sunken. Remnants of the funiculus are usually present as a bit of lacerate tissue at the edge of the notch near the smaller lobe of the seed, and a thin flap of tissue attached by one end to the inside of the notch.

Surface smooth, dull. At 10x magnification a network of very fine white nerves is visible. Dark red-brown to black; the notch is whitish.

Length 2.4--2.8 mm; width 2.1--2.5 mm; thickness 1.2--1.3 mm.

52.

Sida spinosa L.

Prickly sida



Malvaceae

Outline with one straight side, and one convex side which has a conspicuous deep notch near one end. Cross section wedge shaped, the angle less than 90° . Form sector-like, with a conspicuous notch near one end of the curved outer face. The hilum is in the notch.

Surface smooth, dull. At 10x magnification it is very finely granular and has a soft sheen. Dark red-brown.

Length 2.1--2.2 mm; width (of one flat face) 1.3--1.5 mm.

53.

Viola rafinesquii Greene

Johnny-jump-up



Violaceae

Outline a rounded oblong with one end obliquely truncate and slightly wider. Cross section nearly round. Form oblong, rounded, with one tapered end.

Surface very smooth, lustrous. At high magnification it appears finely striate. Tan to straw colored.

Length 1.1--1.3 mm; thickness 0.6--0.7 mm.

54.

Cucurbita foetidissima H.B.K.

Buffalo-gourd

Cucurbitaceae

Outline pear-shaped. Cross section a narrow ellipse. Form like a pear, very compressed, with rounded margins. Most seeds have a very narrow thin ridge around the rim. The hilum, ± 1.0 mm long, extends from the small end of the seed down one edge.

Surface nearly smooth, somewhat glossy. With magnification it appears finely roughened, but there is a smooth border, ± 0.2 mm wide, all around each face. Light tannish yellow, with paler margins.

Length 7.1--9.0 mm; width 4.2--5.4 mm; thickness 1.6--2.1 mm.

55.

Echinocystis lobata (Michx.) T. & G.

Wild cucumber

Cucurbitaceae



Outline ellipsoid with a broad notched extension at one small end. Cross section a rounded oblong. Form ellipsoid, compressed, with 2 nearly flat faces and rounded margins. One end has an acute tip, while the other end has a thin, slightly spreading extension, ± 3 mm wide, which is divided into 2 teeth by a shallow notch. The hilum is in the notch.

Surface dull, corky; it has many large irregular pits and wrinkles. Around the margins these may appear as notches. Light brown with a marbled pattern of dark brown. (The higher, flat areas are light while the pits and depressed areas are dark.)

Length 1.6--2.0 cm; width 8.2--10.1 mm; thickness 2.8--4.0 mm.

56.

Sicyos angulatus L.

Bur cucumber

Cucurbitaceae

Outline obovate with 2 distinct rounded teeth at the small end. Cross section elliptical. Form obovoid, compressed, with 2 ovoid teeth at the small end. The hilum is a straight narrow line along the margin of the small end; the teeth point outward from the ends of the hilum.

Surface smooth, very dull. It appears to have a glaucous coating. Dark brown; the teeth are paler.

Length 7.0--8.0 mm; width 5.2--6.0 mm; thickness 3.1--3.3 mm.

57.

Barbarea vulgaris R. Br.

Winter cress



Brassicaceae

Outline oblong with a notch in one short side. Cross section long ovate. Form oblong, compressed, with one long edge thinner and shorter than the other. The seed appears folded; on each face there is a groove which extends lengthwise from the notch. (The cotyledons are accumbent, with the radicle forming the thinner and narrower side of the seed.) The hilum is in the notch, and a small bit of lacerate tissue fills the notch.

Surface finely textured, with a slight sheen. At high magnification a fine honeycomb-like mesh is visible. Dull gray-brown; at high magnification there appears to be a glaucous yellowish or reddish coat over a dark red-brown surface.

Length 1.4--1.7 mm; width 1.1--1.3 mm; thickness 0.5--0.7 mm.

58.

Brassica juncea (L.) Czern.



Indian mustard

Brassicaceae

Outline round or rounded oblong. Cross section round. Form slightly elongate, smoothly rounded. The indistinct hilum is near one small end of the seed, and there is a slight bit of white tissue projecting from the hilum.

Surface smooth, dull. At 10x magnification a fine reticulate pattern is visible. Dark red-brown.

Length 1.4--1.9 mm; thickness 1.3--1.6 mm.

59.

Brassica kaber (DC.) Wheeler

Charlock

Brassicaceae



Outline round or broadly elliptical. Cross section round or ovate. Form globose or ellipsoid, slightly compressed. There is a short ridge of white tissue on one small end, at the hilum.

Surface smooth, dull. When seen at 10x magnification there is a low-relief mesh pattern over the entire surface. Dark orange-brown; the mesh is whitish.

Length 1.5--1.7 mm width 1.4--1.6 mm; thickness 1.1--1.4 mm.

60.

Brassica nigra (L.) Koch

Black mustard



Brassicaceae

Outline a broad ellipse. Cross section round. Form ellipsoid. At one small end there is a very shallow notch which includes the hilum and a small ridge of irregular tissue.

Surface smooth, dull. At 10x magnification it appears shiny, and a fine but distinct reticulate pattern is visible. Dark red-brown; there are small black patches near the notch.

Length 1.3--1.6 mm; diameter 1.0--1.2 mm.

61.

Camelina microcarpa Andr. ex DC.

Small-seeded false flax



Brassicaceae

Outline rounded oblong to ovate. Cross section rounded triangular with indentations in the center of one or two sides. Form oblong, compressed; apparently folded with one half broader, thicker, and slightly longer than the other half; the shorter half ends in a narrow tip. (The incumbent cotyledons form the larger side, and the radicle the shorter side.) The seed is often somewhat angular because of compression in the fruit. There is a small ridge of white tissue at the hilum, on the small end of the seed.

Surface smooth, dull. At 10x magnification fine, evenly spaced tubercles can be seen, and the surface appears slightly glossy. Orange-brown; the small end may be darker.

Length 1.1--1.4 mm; width 0.5--0.9 mm; thickness 0.7--0.9 mm.

62.

Capsella bursa-pastoris (L.) Medic.

Shepherd's purse

Brassicaceae



Outline rounded oblong. Cross section ovate with wavy sides. Form oblong, compressed. The seed is apparently folded; each broad face has 2 lengthwise curved grooves. (The cotyledons are incumbent; the deeper groove is between the radicle and the cotyledons, while the shallower groove separates the 2 cotyledons.) The basal end of the seed is thin and truncate, with a small thin piece of projecting tissue.

Surface smooth, dull. At 10x magnification it appears very finely textured and has a slight sheen. At high magnification it appears finely reticulate. Dull orange; the basal end is darker.

Length 0.9--1.0 mm; width 0.5 mm; thickness 0.3--0.4 mm.

63.

Cardaria draba (L.) Desv.

Hoary cress, White-top

Brassicaceae

Outline ovate. Cross section ovate. Form ovoid, slightly compressed; one long edge is thinner and longer than the other. The seed is apparently folded; on each face there is a distinct groove and a faint groove which extend from the small end about 1/3 the length. (The cotyledons are incumbent, with the radicle forming the narrower edge of the seed. The deeper groove separates the radicle from the cotyledons, and the fainter groove separates the 2 cotyledons.) The hilum is in a notch at the small end of the seed.

Surface finely roughened, dull. At high magnification a fine honeycomb-like mesh is visible, and the raised areas appear shiny. Orange-brown; the small end of the seed and the deeper groove are darker.

Length 1.8--2.1 mm; width 1.2--1.4 mm; thickness 0.8--0.9 mm.

64.

Chorispora tenella (Pall.) DC.

Blue mustard



Brassicaceae

Outline a rounded short oblong. Cross section a narrow rounded oblong with indentations which divide it into 2 unequal segments. Form chip-like, bent, with one round thick end and one straight thin end. There is a deep groove on each face, extending from the straight end most of the length. (The cotyledons are accumbent; the groove separates the radicle from the cotyledons.) The radicle side makes up about $1/3$ the width of the seed; it is thicker and slightly longer than the cotyledons, and it has a tapered tip. The cotyledon side is very thin toward the straight (basal) end of the seed. At the base there is a small piece of white tissue.

The surface is dull and finely roughened. Dull yellow-orange.

Length 1.2--1.3 mm; width 0.8--0.9 mm.

65.

Descurainia pinnata (Walt.) Britt.

subsp. *brachycarpa* (Richard) Detling

Tansy mustard

Brassicaceae

Outline a rounded oblong. Cross section ovate or rounded triangular. Form oblong, compressed; apparently folded, with a lengthwise groove on each face. (The groove separates the radicle from the cotyledons.) The radicle side is thinner and tapers to an incurved tip at the small (basal) end of the seed. The cotyledon side is thicker, and truncate at the basal end. The hilum is in the notch formed by the 2 parts; the notch is filled with a bit of translucent tissue.

Surface smooth, dull. At 10x magnification fine fingerprint-like ridges are visible. At high magnification these ridges are seen to be formed by many lengthwise rows of very small crosswise elliptical depressions, and the surface seems shiny. Light orange brown, darker near the base.

Length 0.9--1.1 mm width 0.5--0.6 mm; thickness 0.4--0.5 mm.

66.

Descurainia sophia (L.) Webb.

Flixweed



Brassicaceae

Outline a rounded oblong. Cross section ovate to rounded triangular. Form oblong, rounded, with one convex and one nearly flat face. The seed is apparently folded, with 2 faint lengthwise grooves on each face. (The cotyledons are incumbent; one groove separates the radicle from the cotyledons, while the other groove is between the cotyledons.) The radicle side tapers to a narrow tip. The attachment point is in the shallow notch between the radicle and cotyledons; the notch is filled by a thin piece of white tissue. Some seeds have a thin transparent marginal wing on the rounded end, opposite the notch.

Surface smooth, dull. At 10x magnification lengthwise striations are visible. At 25x these are seen to be formed of rows of minute depressions, and the surface appears slightly shiny. Dull orange.

Length 0.9--1.3 mm; width 0.4--0.6 mm; thickness 0.3--0.5 mm.

67.

Erysimum repandum L.

Bushy wallflower, Treacle mustard

Brassicaceae



Outline a rounded oblong. Cross section plano-convex. Form ellipsoid, with one flat face. The seed is apparently folded, with a lengthwise groove extending from the base most of the length of each face. (The groove marks the separation between the radicle and the cotyledons.) The radicle makes up about 1/3 the width of the seed, and is slightly longer than the cotyledons. There is a membranous marginal wing, ± 0.1 --0.2 mm wide, at the rounded end of the seed, and a similar wing on the lower end of the cotyledon portion. The hilum is in the shallow notch between the radicle and cotyledons; the notch is filled with a thin piece of irregular tissue.

Surface finely roughened, with a slight sheen. Yellow-orange; the ends of the seed are darker, and the marginal wing is transparent.

Length 1.3--1.7 mm; width 0.6--0.7 mm; thickness 0.3--0.4 mm.

68.

Lepidium campestre (L.) R. Br.

Field peppergrass

Brassicaceae

Outline long ovate. Cross section rounded, with one straight side and one strongly convex side. Form obovoid, with one flat face. (The cotyledons are incumbent; one side of the cotyledons forms the flat face of the seed, and the narrow radicle forms the convex face.) The radicle is outlined by distinct grooves which extend from the small end of the seed most of the length. At the small end there is an extension of translucent tissue, ± 0.2 mm long.

Surface very finely wrinkled, dull. Dark red-brown.

Length 2.3--2.5 mm; width 1.0--1.2 mm; thickness 1.2--1.3 mm.

69.

Lepidium densiflorum Schrad.

Peppergrass

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Brassicaceae

Outline ovate, with one long straight side. Cross section narrowly triangular. Form obovoid, compressed; apparently folded, with a groove from the small end to the center of each broad face. (The cotyledons are accumbent.) The long straight edge of the seed (the cotyledon side) is thicker and has a narrow flat marginal face. Along the radicle side and around the wide end of the seed there is a conspicuous but very thin wing. ± 0.1 -- 0.2 mm wide. There is a small bit of tissue in the hilum area, at the small end.

Surface finely roughened, slightly glossy. At high magnification it appears finely tuberculate. Orange; the wing is darker, but has a transparent edge.

Length 1.4 -- 1.8 mm; width 0.9 -- 1.2 mm; thickness 0.4 -- 0.5 mm.

70.

Nasturtium officinale R. Br.

Watercress



Brassicaceae

Outline elliptical or obovate. Cross section ovate. Form ellipsoid, compressed; apparently folded, with a faint groove on each face. (The cotyledons are accumbent.) The wider, thinner side of the seed is formed by the cotyledons; the radicle is thicker but narrow and tapered to a small tip. There is a shallow notch at the base; the notch is filled with a bit of thin tissue.

Surface distinctly reticulate; shiny. Orange-brown.

Length 0.9--1.0 mm; width 0.7--0.8 mm; thickness 0.3--0.4 mm.

71.

Rorippa palustris (L.) Bess.

Bog yellow cress

Brassicaceae

Outline variable; generally ovate with a notch in the wide end. Cross section ovate. Form usually ovoid, compressed but of irregular thickness. The seed is apparently folded; there is a broad lengthwise groove on each face. (The cotyledons are accumbent.) The radicle is tapered to a small tip, and the radicle side is thinner and narrower than the cotyledon side. The notch at the wide (basal) end of the seed is filled with thin whitish tissue.

Surface appears glittery when seen at 10x magnification. At high magnification it appears distinctly colliculate and shiny. Yellow-brown; the notch area is darker.

Length 0.6--0.7 mm; width 0.6 mm; thickness 0.3 mm.

72.

Sisymbrium altissimum L.

Humbling mustard



Brassicaceae

Outline a rounded oblong. Cross section ovate with a notch in each long edge. Form oblong, compressed; evidently folded, with a distinct groove on each broad face. (The cotyledons are incumbent.) The radicle makes up about 1/3 the width of the seed. The broad faces of the seed may be similarly rounded; or one of them may be flat, and the other conspicuously humped in the center. At the base there is a small notch which is filled with a thin bit of tissue.

Surface smooth, dull. At high magnification it appears very finely tuberculate, semi-glossy. Dull orange.

Length 1.1--1.3 mm; width 0.6-0.8 mm; thickness 0.4--0.6 mm.

73.

Sisymbrium officinale (L.) Scop.

Hedge mustard

Brassicaceae



Outline variable; elliptic to rounded oblong, or with one straight edge and one convex edge. Cross section variable; often a rounded V-shape. Form oblong; evidently folded, with 2 lengthwise grooves. (The cotyledons are incumbent.) The radicle is narrow, tapered to a small tip, and often curved to one side; its position relative to the cotyledons varies. There is a notch between the radicle and cotyledons at the base of the seed; the notch is filled with white tissue.

Surface dull, finely roughened. At high magnification it appears irregularly tuberculate and semi-glossy. Orange-brown.

Length 1.1--1.6 mm; width 0.5--0.7 mm; thickness 0.3--0.5 mm.

74.

Thlaspi arvense L.

Pennycress



Brassicaceae

Outline roughly ovate; one long edge has a more pronounced curve than the other. Cross section long ovate. Form ovoid, compressed; apparently folded, with a groove extending from the small end to about the center of each face. (The cotyledons are accumbent.) The radicle side forms the straight edge and is thinner than the cotyledon side. A bit of white tissue extends ± 0.1 mm from the small (basal) end of the seed.

Surface covered by ridges arranged in concentric loops. These are barely visible without magnification. There are ± 6 loops on each broad face. The ridges are somewhat wavy in form and uneven in height. With magnification the surface appears glittery or shiny. Red-brown; the ridges and basal area are slightly darker.

Length 1.7--1.9 mm; width 1.1--1.2 mm; thickness 0.6--0.7 mm.

75.

Desmanthus illinoensis (Michx.) MacM.

Illinois bundleflower

Mimosaceae



Outline variable; may be rounded triangular, rhombic, or elliptical. Cross section rounded oblong. Form more or less ovoid, flattened, of irregular thickness, with 2--4 rounded corners. One corner is extended to form a distinct tip. The whole seed may be somewhat bent. The hilum is located along one edge, just below the tip. The hilum is an elliptical raised area, ± 2.0 mm long and 1.0 mm wide. On each face of the seed there is a narrow but distinct V-shaped line which opens toward the tip. The line is just visible without magnification and is conspicuous with low magnification.

Surface smooth, somewhat glossy. Orange brown; the V-shaped line is darker, and the hilum is blackish.

Length 3.3--3.8 mm; width 2.3--2.6 mm; thickness 1.0--1.1 mm.

76.

Cassia chamaecrista L.

Showy partridge pea

Caesalpinaceae



Outline rhombic, with 2 nearly straight sides opposite 2 curved sides, and with a tip projecting from one corner. Cross section elliptical. Form rhomboid, flattened, with rounded edges and one extended corner. On each broad face there is a slight rounded ridge which extends from the tip toward the center. The hilum is located on the curved edge below the tip. The hilum is dark, round, and small. Just above the hilum is a very small, downwardly curved hook of tissue.

Surface smooth, with a waxy sheen. Faint striations are visible without magnification. When viewed at 7x, irregularly spaced lengthwise rows of very shallow pits can be seen. Each of these circular pits has a central dot depression. Black-brown; the margins are yellowish, reddish, or gray.

Length 3.4-4.0 mm; width 2.3--2.9 mm; thickness 1.2--1.3 mm. (Length measured from the tip along the adjacent straight side.)

77.

Hoffmanseggia glauca (Urt.) Eifert

Indian rush-pea

Caesalpiniaceae

Outline ovate, with the small end bent slightly to one side. Cross section oblong. Form ovoid, flattened, with rounded margins. The small ovate hilum is on the margin, just below the bent small end.

Surface smooth, glossy. When seen at high magnification it appears finely textured. Black.

Length 3.7--4.2 mm; width 2.6--2.8 mm; thickness 0.8--1.0 mm.

78.

Amorpha canescens Pursh

Lead plant



Fabaceae

Outline elliptic, with one end curved to form an S-shaped tip. Cross section ovate. Form elongate, rounded, compressed, with one end curved and tapered to a narrow tip. Just below the tip is a notch which includes the ovate hilum. There is a dark ring around the hilum, and a dark line extends along the margin from the hilum to the other end of the seed.

Surface very smooth, shiny. Light red-brown.

Length 2.1--2.5 mm; width 1.1--1.2 mm; thickness 0.8-1.0 mm.

79.

Astragalus mollissimus Torr.

Woolly locoweed

Fabaceae

Outline variable; may be reniform, rounded triangular with a notch in one side, or oblong. Cross section ovate. Generally reniform, with one lobe thicker than the other, but sometimes wider (from the hilum to the opposite side) than long. The 2 broad faces may be rounded or flat. The hilum, in the notch, is a small round depression.

Surface smooth, dull. Under magnification there is a soft sheen. Olive, orange-brown, or purplish brown; the hilum area is paler, and at high magnification a uniform pattern of fine dark dots is visible.

Length 1.6--2.3 mm; width (perpendicular to the hilum) 1.5--2.2 mm; thickness 0.9--1.4 mm.

80.

Coronilla varia L.

Crown vetch

Fabaceae



Outline rounded oblong with a shallow notch in the center of one long side. Cross section elliptical. Form cylindrical, slightly compressed, with rounded ends and a shallow rounded notch near the center of one long edge. The very small round hilum is located in the notch.

Surface smooth, glossy. Deep purplish red.

Length 3.1--3.7 mm; width 1.0--1.3 mm; thickness 0.9--1.1 mm.

81.

Desmodium illinoense A. Gray

Illinois tickclover

Fabaceae

Outline ovate, with a shallow notch in the center of one long side. Cross section ovate or elliptical. Form ovoid, compressed; both faces are slightly depressed in the center. One long edge is slightly thicker than the other. The thicker edge has a small notch which includes the hilum. The hilum is ± 0.5 mm in diameter and has a distinct collar.

Surface smooth, glossy. Dull yellowish or greenish brown; the collar is darker.

Length 3.4--3.7 mm; width 2.5--2.6 mm; thickness 1.2--1.4 mm.

82.

Glycyrrhiza lepidota Pursh

Wild licorice

Fabaceae



Outline variable; a somewhat ovate shape. Cross section ovate. Form ovoid, compressed, thinner toward one long edge. Near the wide end, along the thinner edge, there is a distinct shallow notch which includes the hilum. The hilum is round, ± 0.3 mm in diameter. The chalaza is evident as a small hump on the margin near the small end of the seed, about 1 mm from the hilum.

Surface smooth; dull to semiglossy. Greenish brown or reddish brown.

Length 2.7--3.2 mm; width 2.1--2.8 mm; thickness 1.6-2.0 mm.

83.

Lespedeza cuneata (Dumont) G. Don

Sericea lespedeza

Fabaceae



Outline ovate, with a shallow notch near the wide end. Cross section ovate. Form ovoid, compressed, thinner toward the notched edge. The hilum, in the notch, is surrounded by a rim of translucent tissue. The diameter of the hilum with its rim is ± 0.2 mm. On each face there may be a faint groove extending from the notch toward the other end of the seed.

Surface smooth, somewhat glossy. Olive-brown or greenish; the area around the hilum is tinged red.

Length (1.3) 1.6--1.8 mm; width 1.0--1.3 mm; thickness 0.6--0.8 mm.

84.

Lespedeza stipulacea Maxim.

Korean lespedeza



Fabaceae

Outline broadly elliptical, with a shallow notch near one end. Cross section narrowly ovate. Form ellipsoid, compressed, thinner toward the notched long edge. The hilum, in the notch, is round, ± 0.2 mm in diameter, and has a distinct collar. On each face there may be a slight groove extending from the notch, parallel to the edge of the seed. The 2 faces may be flat or depressed.

Surface smooth, glossy. Dark red-brown to black; the hilum and a small area around it are pale with a reddish or greenish tinge.

Length 1.7--2.2 mm; width 1.4--1.7 mm; thickness 0.8--0.9 mm.

85.

Lotus corniculatus L.

Bird's-foot trefoil



Fabaceae

Outline somewhat ovate, with a small notch in one long edge. Cross section ovate. Form ovoid, slightly compressed, thinner toward the notched edge. The hilum, in the notch, is round, ± 0.2 mm in diameter.

Surface smooth, dull. Olive, dull brown, or dark brown, sometimes with small dark mottles. There is a small dark spot above the hilum, and a pale area surrounding the hilum.

Length 1.3--1.6 mm; width 1.0--1.3 mm; thickness 0.8--1.2 mm.

86.

Medicago lupulina L.

Black medick



Fabaceae

Outline ovate to somewhat reniform. Cross section ovate. Form ovoid, compressed, with a small notch on one long edge about $1/3$ the distance from the small end. The lower edge of the notch protrudes, and a slight linear depression may extend diagonally inward from the notch across each face. The small round hilum is in the notch.

Surface smooth, dull. Yellow-brown with green and orange tinges; the hilum is darker. Below the hilum there is a light colored V-shaped area, and there are small dark patches above and below the V. A pale streak extends across each face from the hilum toward the wide end of the seed.

Length 1.2--1.6 mm; width 0.9--1.2 mm; thickness 0.6--0.9 mm.

87.

Medicago minima (L.) Bartal.

Small bur-clover



Fabaceae

Outline kidney-shaped. Cross section ovate.

Reniform with a distinct curved notch in the inner margin near one end. The small round hilum is in the notch. Next to the hilum (closer to the center) the chalaza forms a conspicuous rounded extension of the margin. From the notch a slight groove runs across each face toward the far end of the seed.

Surface smooth, dull. Light orange-yellow; the chalaza and notch area are darker, and the grooves are pale.

Length 1.8--2.0 mm; width 0.9--1.0 mm; thickness 0.6--0.7 mm.

88.

Medicago sativa L.

Alfalfa



Fabaceae

Outline varies from somewhat reniform to ovate with a notch on one long edge near the wide end. Cross section ovate. Ovoid to reniform, compressed. The small round hilum is in the notch. There may be a slight groove extending from the hilum diagonally across each face.

Surface smooth, dull. With high magnification it appears finely textured. Dull orange-brown or olive; the area around the hilum is slightly darker.

Length 2.0--2.5 mm; width 1.3--1.6 mm; thickness 0.9--1.1 mm.

89.

Melilotus alba Medic.



White sweet clover

Fabaceae

Outline ovate, with a distinct large notch on one long edge near the broad end. Cross section ovate. Ovoid, slightly compressed, thinner toward the notched edge; the 2 faces are usually depressed. The small round hilum is in the notch. On each face a shallow groove extends from the hilum $\frac{2}{3}$ the distance to the small end of the seed.

Surface smooth, dull. Yellow-brown, greenish, or orangish. There is a small round dark spot above the hilum, and a dark V-shaped area below the hilum. The grooves are pale.

Length 1.8--2.0 mm; width 1.3--1.5 mm; thickness 1.0--1.1 mm.

90.

Melilotus officinalis (L.) Pall.

Yellow sweet clover



Fabaceae

Outline elliptical with a small notch in one long edge, near one end. Cross section ovate. Form ellipsoid, compressed, thinner toward the notched edge; the 2 faces may be slightly depressed. The round hilum is in the notch. A slight groove extends from the hilum diagonally across each face.

Surface smooth, dull. Dull orange-yellow to buff, sometimes with a green tinge; some seeds have small brown mottles. There is a small dark spot just below the hilum. There may be pale streaks extending diagonally from the hilum across each face.

Length 1.7--1.9 mm; width 1.0--1.3 mm; thickness 0.9--1.0 mm.

91.

Oxytropis lambertii Pursh

Purple locoweed



Fabaceae

Outline variable, but somewhat reniform with 2 unequal lobes. Cross section ovate. Form rounded, compressed, generally ovoid with a deep asymmetrical notch in one long edge. The very small round hilum is in the notch.

The surface is smooth and semi-glossy. Brown; paler in the notch area.

Length 1.8--2.2 mm; width 1.5--2.1 mm; thickness 0.7--1.0 mm.

92.

Strophostyles helvola (L.) Ell.

Wild bean

Fabaceae

Outline rectangular, the corners angular or rounded. Cross section square. Form oblong, slightly compressed. Two of the long angles are well-defined right angles; these alternate with 2 rounded angles. On one of the right angles there is a notch which starts near one end and occupies about 3/4 the length of the seed. The conspicuous elliptical hilum is in the notch. The hilum is a corky white area, ± 9 --10 mm long and 1.2 mm wide, surrounded by a smooth, shiny rim.

Surface smooth, hard, shiny, but more or less covered with dull scurfy tissue. This scurfy material can be rubbed off. The hard surface is dark brown; with magnification it is pale brown with small brown-black mottles. When the scurfy layer is present the seed appears dark brown, or sometimes paler.

Length 6.4--7.8 mm; width (from hilum to opposite angle) 3.9--4.1 mm; thickness 3.5--4.0 mm.

93.

Strophostyles leiosperma (T. & G.) Piper

Slick seed bean

Fabaceae

Outline a parallelogram with rounded corners, or a rounded oblong, or an oblong with one round end and one angular end. Cross section nearly round. Form cylindrical, or cylindrical with rounded ends. The conspicuous hilum is located along the length of the side. It is elliptical, ± 1.5 -- 2.0 long and 1 mm wide, with a very dark, slightly raised rim around a very pale, distinctly raised corky center. At one end of the hilum is a raised knob, ± 0.4 mm in diameter.

The surface is smooth and somewhat shiny. Gray to buff with many fine, small black mottles.

Length 3.0--4.2 mm, width (from hilum to opposite edge) 2.7--3.0 mm; thickness 2.1--2.7 mm.

94.

Trifolium campestre Schreb.

Low hop-clover

Fabaceae

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Outline ovate with a slight notch on one side near the small end. Cross section elliptical. Form ovoid, slightly compressed, with a shallow notch in one long edge. The small, indistinct hilum is located in the notch. A slight groove runs from the hilum diagonally toward the center of each face.

Surface smooth, with a waxy sheen. Orange-yellow; a few seeds have orange patches. There is a dark V-shaped mark below the hilum, and the grooves are pale.

Length 1.0--1.2 mm; width 0.7--0.8 mm; thickness 0.6--0.7 mm.

95.

Trifolium pratense L.

Red clover



Fabaceae

Outline ovate with a large notch in one side near the small end. Cross section ovate. Form ovoid, compressed, with a notch in one long edge. The hilum, in the notch, is small and round, ± 0.2 mm in diameter. On each face a slight groove extends from the notch toward the wide end of the seed.

Surface smooth, slightly glossy or dull. Varying from straw-colored, with or without faint purplish mottles, to solid dull purple.

Length 1.9--2.3 mm; width 1.4--2.0 mm; thickness 1.0--1.1 mm.

96.

Trifolium repens L.

White clover



Fabaceae

Outline variable, generally rounded with a broad shallow notch. Cross section ovate. Form ovoid, somewhat compressed, thinner toward the notched edge. The seed appears bent into a V-shape, with a notch and groove between the ends. The small round hilum is in the notch.

Surface smooth, dull; when viewed at 10x there is a slight sheen. Dull yellow or orange-brown. There is a dark spot below the hilum, and a pale streak from the notch across each face.

Length 0.8--1.1 mm; width 0.8--1.0 mm; thickness 0.5--0.7 mm.

97.

Vicia villosa Roth.

Hairy vetch

Fabaceae

Outline round. Cross section a broad ellipse. Form nearly globose, slightly compressed. The hilum is on a slightly elevated area along the margin between the 2 faces. The hilum is oblong, ± 1.5 --2.0 mm long and 0.5--0.7 mm wide, and has a narrow central line. The hilum is level with the surface except for a small groove around its edge.

Surface smooth, dull, with a fine velvety sheen. Brown-black; under magnification there is dark brown mottling on a brown or green-brown background.

Diameter 3.8--5.1 mm; thickness 3.3--4.3 mm.

98.

Gaura parviflora Dougl.

Velvety gaura

Unagraceae

The unit of dispersal is a capsule containing 3--4 seeds. Description of the capsule:

Outline long obovoid with the wide end extended into a narrow tip. Cross section with 4 convex sides, each with a small tooth in the center. Form obovoid, elongate, somewhat 4-sided with 4 rounded angles. The 4 faces meet in an acute apical tip. Near the tip the faces are depressed, making the angles more prominent. There is a central lengthwise ridge on each face. One side of the capsule is obliquely truncate at the base. The attachment point, in the truncate area, has a round rim and a hollow center.

Surface papery, dull, finely wrinkled. Light to medium tan, sometimes tinged with green.

Length 6.0--6.6 mm; thickness 1.7--2.4 mm.

99.

Oenothera biennis L.

Common evening primrose



Onagraceae

Outline variable, usually angular; may be oblong, trapezoidal, or triangular. Cross section variable, usually angular with 3 or 4 unequal sides. Form like a narrow truncate pyramid, a tetrahedron, or a form with 3 flat faces and one long curved face; in any case the angles between the faces are very narrowly winged.

Surface finely roughened, dull. There are several fine lengthwise wrinkles on each face, as well as irregular wrinkles near the angles. Dark orange-brown.

Length 1.0--1.7 mm; width 0.6--1.4 mm; thickness 0.5-1.0 mm.

100.

Oenothera laciniata Hill.

Cut-leaved evening primrose

Onagraceae



Outline irregular and angular, somewhat oblong or rhombic. Cross section variable, usually ovate or triangular. Form various, with both rounded and flat faces.

Surface areolate, dull; texture papery. Orange-brown.

Length 0.9--1.3 mm; thickness 0.7--1.0 mm.

101.

Acalypha monococca (Engelm.) P. Mill.

Slender copperleaf

Euphorbiaceae

Outline obovate with a pointed small end. Cross section round or slightly compressed. Form ovoid, slightly compressed; the dorsal face is distinctly convex, and the ventral face is convex, but divided in two by the lengthwise raphe. Near the small end the two faces meet in a marginal rim. The small end of the ventral face (the chalazal region) is depressed and has a conspicuous caruncle of translucent yellow tissue. The caruncle is a ridge from the tip about $\frac{1}{3}$ the length of the seed. The raphe is a narrow line, extending from the caruncle to the center of the broad end of the seed.

Surface with many wrinkled ridges, oriented lengthwise. These ridges are clearly visible with low magnification. Mature seeds appear to have a dark red coat, overlain with a thin glaucous grayish-white layer, so that the surface appears gray-brown and waxy. Less mature seeds may lack the caruncle; they are pale green with brown mottling, dull.

Length 1.7--1.8 mm; width 1.3--1.4 mm; thickness

1.1--1.3 mm.

102.

Acalypha ostryaefolia Kidd.

Hop-hornbeam copperleaf

Euphorbiaceae

Outline tear-drop shaped. Cross section nearly round. Form ovoid. On the ventral side a pale yellow translucent caruncle extends about $\frac{1}{3}$ the length from the small end. The raphe is visible as a narrow dark line from the caruncle to the wide end.

Surface slightly glossy, tuberculate; the tubercles arranged roughly in lengthwise rows. Glauous grey; under magnification there are reddish undertones.

Length 2.0--2.2 mm; width 1.5--1.7 mm; thickness 1.4--1.6 mm.

103.

Acalypha rhomboidea Raf.

Rhombic copperleaf

Euphorbiaceae

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Outline obovate with a fine tip at the small end. Cross section nearly round, or compressed so that one side is more convex than the other. Form ovoid, somewhat compressed; the dorsal face is slightly more convex and has a small tip which is curved over the end of the seed toward the flatter ventral face. On the ventral face there is a conspicuous narrow caruncle of yellowish translucent tissue which forms a ridge from the tip about $\frac{1}{3}$ the length of the seed. The narrow raphe runs from the caruncle to the center of the broad end of the seed.

Surface smooth, slightly glossy. With magnification a fine scalariform pattern can be seen. On the dorsal face this pattern is oriented lengthwise; on the ventral face it has no definite orientation. Dark gray to black overall; with magnification, individual seeds are seen to vary from gray-brown with black mottling to mostly black.

Length 1.7--1.8 mm; width 1.2--1.3 mm; thickness 1.0--1.1 mm.

104.

Acalypha virginica L.

Virginia copperleaf, Three-seeded mercury

Euphorbiaceae

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Outline ovate with a sharp tip. Cross section round or slightly compressed. Form like a slightly compressed tear drop. On the ventral face a conspicuous caruncle of translucent yellowish tissue extends from the tip $1/3$ to $1/2$ the length of the seed. The narrow raphe runs from the caruncle to the center of the broad end of the seed.

Surface finely roughened, dull. With magnification, the entire surface is seen to be covered with irregular round tubercles and has a waxy sheen. There appears to be a dark red-brown undercoat covered with a translucent grayish layer, so that the tubercles are dark and the low areas grayish; individual seeds vary from predominately brown to solid gray.

Length 1.8--2.1 mm; width 1.5--1.7 mm; thickness 1.3--1.5 mm.

105.

Croton capitatus Michx.

Woolly croton



Euphorbiaceae

Outline nearly circular to ovate, with a small sharp tip. Cross section biconvex. Form a broad sector; the dorsal side is strongly convex, and the ventral side has 2 slightly convex faces joined by the narrow lengthwise raphe. The two sides of the seed meet in a narrow rim around the periphery. At the pointed end of the seed, this rim extends over toward the ventral side. On the ventral side there is a prominent fan-shaped caruncle, with its broad end at the tip of the seed. Just beyond the point of the caruncle is the small hilum, with a bit of ragged tissue attached.

Surface smooth, glossy. At 10x magnification fine wrinkles are visible. Tan, mottled with dark brown; the rim and the raphe are lighter, and the caruncle is very pale.

Length 4.7--5.0 mm, width 4.6--4.8 mm; thickness 2.8--3.2 mm.

106.

Croton monanthogynus Michx.

One-seeded croton

Euphorbiaceae

Outline ovate; the small end is apiculate, and the caruncle extends beyond the small end. Cross section biconvex. Form ovoid, flattened, with 2 faces which meet in a rounded but well-defined rim. On one face there is a central lengthwise line, the raphe, and a flattened area near the small end. In this flat area, near the tip, there is a conspicuous caruncle. It is heart-shaped or triangular, pointing toward the tip. Just below the caruncle, the hilum appears as a small circular depression.

The surface of the seed is smooth and glossy. With magnification a fine mesh-like texture is visible. Dark gray-brown; there appears to be an outer hard, glaucous coat which is white or tan. The raphe is pale and the caruncle is pale and translucent.

Length 3.6--3.7 mm; width 2.6--2.8 mm; thickness 1.9--2.0 mm.

107.

Croton texensis (Kl.) Muell. Arg.

Texas croton

Euphorbiaceae

Outline broadly ovate with a short, blunt tip. Cross section biconvex. Form like a compressed sphere; one side is hemispherical, while the other side consists of 2 slightly convex faces meeting at an obtuse angle. The angle has a narrow line, the raphe. The 2 sides meet in a narrow rim. On the 2-faced side, just below the tip, is a prominent caruncle which is three-sided or heart-shaped, ± 1.1 mm wide. The indistinct hilum is below the caruncle.

The surface is smooth and somewhat lustrous. Solid gray-brown, or streaked and mottled with buff, gray-brown, light brown, and dark brown. The raphe is pale and the caruncle is translucent pale yellow.

Length 4.0--4.7 mm, width 3.5--4.0 mm, thickness 2.4--2.8 mm.

108.

Euphorbia corollata L.

Flowering spurge

Euphorbiaceae



Outline oblong to ovate, with a small rounded tip. Cross section nearly round. Form ovoid, nearly the same width for most of its length. The boundary between the dorsal and ventral faces is marked by a slight ridge. The dorsal face is convex. The ventral face is divided in half by a lengthwise line, the raphe. The wide end of the seed is slightly flattened. On the ventral face, near the small end, is a round depressed area, the chalaza. The hilum is in the depressed area, and there is a small caruncle at the edge of the hilum. The raphe runs from the hilum to the center of the broad end of the seed.

Surface with a thick, dull, granular yellowish-white coating which may appear distinctly punctate when seen with magnification. The raphe is dark. The coating becomes thinner with maturity and may be worn off. Without it the seed is finely textured and has a slight sheen. Black when outer coat is absent.

Length 2.7--2.9 mm; width 1.9--2.1 mm, width 1.8--2.0 mm.

109.

Euphorbia cyathophora Murray

Fire on the mountain



Euphorbiaceae

Outline ovate; one end is flattened, the other end has an abrupt narrow tip. Cross section round. Form ovoid to nearly globose, with a flat end. The hilum is indistinct, located in the center of a flat area near the small end of the seed. The flat area is ± 1 mm in diameter. From the hilum a narrow line extends to the center of the flat end of the seed.

Surface very rough and dull; there are many short, rather sharp projections of varying size. Under high magnification the hilum area appears finely crystalline. Medium to dark brown or brownish black; the projections are paler or orangish.

Length 2.6--2.9 mm; thickness 2.4--2.6 mm.

110.

Euphorbia dentata Michx.

Toothed spurge



Euphorbiaceae

Outline short ovate; flat at the wide end. Cross section nearly rhombic. Form ovoid, with one flat end; slightly compressed front to back. The ventral face is strongly convex, with a central lengthwise line, the raphe. The dorsal face has 2 slightly convex halves which meet at approximately a right angle. There is a rim where the dorsal and ventral faces meet. On the ventral face there is a large flat area, the chalaza, near the small end. In the center of this area is the conspicuous caruncle. It is heart shaped, pointing toward the small end of the seed, ± 0.6 mm wide, and yellowish with thin transparent yellow margins.

Surface strongly wrinkled, warty, and dull. At high magnification a fine colliculate pattern can be seen over the entire surface. Brown-black; the high relief areas are brown, while the low areas and the raphe are black.

Length 2.5--2.7 mm; width 2.3--2.6 mm; thickness 2.1--2.3 mm.

111.

Euphorbia esula L.

Leafy spurge

Euphorbiaceae



Outline ovate, or rounded oblong with a tip at one small end. Cross section round. Form oblong, rounded, with distinct dorsal and ventral faces. The dorsal face is convex with a small rounded tip. The ventral face of the seed has 2 flat or slightly convex halves separated by a lengthwise line, the raphe. At the small end of the ventral face is the depressed chalaza area. The elliptical hilum is in the depression. There is a very small caruncle at the end of the hilum near the tip of the seed. The raphe runs from the hilum to the center of the broad end of the seed.

Surface smooth, somewhat glossy. With magnification a fine reticulate pattern is visible. Pale gray-green with small yellow-brown flecks; the raphe is dark. The seed appears to have a dark coat overlain with a thin light-colored layer; the surface becomes darker with maturity.

Length 2.1--2.4 mm; width 1.7--1.8 mm; thickness 1.6--1.7 mm.

112.

Euphorbia maculata L.

Spotted spurge

Euphorbiaceae

Outline oblong, one end tapered to a blunt tip. Cross section 4-angled; 2 sides meet at a right angle, while the opposite 2 sides form a broader angle. Form elongate, 4-angled, 4-sided. The faces are slightly concave. The right angle has a distinct convex curve and ends in a small tip. The 2 faces which form the right angle are larger than the other 2 faces. Between the 2 smaller faces is a narrow dark line, the raphe.

Surface with about 3 large but faint crosswise wrinkles. The surface appears to have a dull whitish outer layer which has a very fine meshlike texture. Red-brown with a grayish or whitish cast.

Length 0.8--0.9 mm; width 0.6 mm; thickness 0.5--0.6 mm.

113.

Euphorbia marginata Pursh

Snow-on-the-mountain



Euphorbiaceae

Outline ovate. Cross section round. Form ovoid, with a rim around the small end, separating the ventral and dorsal faces. The rim is ± 1.7 mm long. On the ventral (flatter) face of the seed a distinct line, the raphe, extends from the rim to the large end. On the dorsal face there is a slight lengthwise central ridge. The hilum is on the ventral face, just below the rim.

Surface wrinkled; under high magnification it also appears finely roughened. There seems to be a glaucous membrane overlying a dark seed. Dark grayish brown; less mature seeds are greenish or whitish.

Length 3.2--3.5 mm; thickness 2.6--2.8 mm.

114.

Euphorbia nutans Lag.

Eyebane

Euphorbiaceae

Outline ovate. Cross section 4-sided, almost square, but with one rounded corner. Form oblong, tapered; three of the angles form smooth ridges while the fourth, more rounded angle has a narrow groove, the raphe. On this angle, near the small end of the seed, is the small indistinct hilum and a tiny caruncle.

Surface wrinkled crosswise. The wrinkles are barely visible without magnification, but are distinct at 4x. On each face there are ± 4 or 5 crosswise wrinkles, as well as some in other directions. Under magnification the entire surface appears finely granular and has a slight sheen. Brownish gray; the angles are paler, and the raphe dark.

Length 1.3--1.4 mm; thickness 0.8--0.9 mm.

115.

Euphorbia prostrata Ait.

Creeping spurge

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Euphorbiaceae

Outline bullet-shaped, with one straight end and 2 long gradually curved sides which meet in a blunt tip. Cross section square. Form elongate, 4-sided, 4-angled shape a flat base and bluntly pointed apex. It is broadest about 1/3 the distance above the base. The hilum is very small, located in the center of the base.

Surface with prominent crosswise wrinkles. At low magnification 5--8 wrinkles can be distinguished on each face. At high magnification the surface also appears finely striate and dull. Light gray-brown; the wrinkles and angles are light gray, and the low areas are light brown.

Length 1.0--1.1 mm; thickness 0.5--0.6 mm.

116.

Tragia betonicifolia Nutt.

Nettleleaf noseburn

Euphorbiaceae

Outline round. Cross section round. Form nearly spherical, with one flat area. The hilum, in the flat area, is an irregular elliptical scar, ± 0.8 mm long. The raphe, a narrow ridge ± 1 mm long, extends from one end of the hilum. There is a barely detectable ridge around the circumference of the seed, from the raphe to the hilum.

Surface smooth, with a slight sheen. When seen at 10x magnification it appears very finely granular and shiny; at high magnification it appears colliculate. Mottled light and dark red-brown, or light and dark gray-brown; the hilum is whitish, and the area around the hilum usually has a red or orange tinge.

Length 3.7--3.9 mm; width 3.4--3.6 mm; thickness 3.3 mm.

117.

Tragia ramosa Torr.

Noseburn

Euphorbiaceae

Outline round. Cross section round. Form spherical. The hilum is an irregular elliptical scar, ± 1 mm long. The raphe, a narrow ridge ± 0.8 mm long, extends from one end of the hilum.

Surface smooth, dull. When seen at 10x magnification it appears finely granular; at high magnification it appears colliculate and resinous. Red-brown, orange, and buff in large mottled patches; the hilum is whitish, and the area around the hilum is orange.

Diameter 3.1--3.4 mm.

118.

Tribulus terrestris L.

Puncture vine



Zygophyllaceae

The unit of dispersal may be the fruit, composed of 5 woody, indehiscent mericarps of varying size, or may be the single mericarp. There are several seeds in each mericarp.

Description of the mericarp:

Outline generally oblong with many short spines and 1 or 2 long spines. Cross section a wedge shape with 2 stout spines spreading at a wide angle from the corners of the broad end. Form sector-like, with 2 flat faces which meet at an angle of 45° or less; it is flattened at the base and narrowed toward the apex. There is a spine, ±3--5 mm long, flaring from the midpoint of the outer margin of each flat face.

Surface dull, conspicuously sculpted with many thin ridges and prominent tips. Each tip has a long white bristle, but these are easily broken off. The entire surface has a sparse covering of fine short white hairs. Tan.

Length 4.7--5.7 mm; width 3.5--6.0 mm; thickness 1.8--2.5 mm. (Length measured along the inner angle of the sector.)

119.

Oxalis dillenii Jacq.

Gray-green wood sorrel

Oxalidaceae

Outline elliptical. Cross section biconvex. Form ellipsoid, compressed, with one blunt end and one pointed end. The inconspicuous hilum is located at the pointed end of the seed.

Surface dull, with sharply defined ridges which are clearly visible at low magnification. There are about 9 crosswise ridges on each broad face; they are somewhat irregular and broken. There are also slight lengthwise ridges. The side margins sometimes include a narrow smooth area. Dark orange-brown with off-white ridges. (Immature seeds have glossy red-brown ridges with dull pale intervals.)

Length 1.1--1.2 mm; width 0.8--0.9 mm; thickness \pm 0.4 mm.

120.

Oxalis stricta L.

Yellow wood sorrel

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Oxalidaceae

Outline elliptical with an acuminate tip at one end. Cross section and oblong with convex sides. Form ellipsoid with one pointed end, compressed. The hilum is at the point.

Surface conspicuously ridged. There are about 9 sharp crosswise ridges on each face; these ridges are bent or interrupted by 2 or 3 faint lengthwise ridges. The margins of each broad face are narrowly rimmed, and each long edge has a groove or smooth area between the rims. The surface appears dull; at 10x magnification the ridges are shiny and the interspaces dull. Dark orange-brown.

Length 1.3--1.4 mm; width 0.8--0.9 mm; thickness 0.4--0.5 mm.

121.

Geranium carolinianum L.

Carolina cranesbill



Geraniaceae

Outline a rounded oblong with a very small tip on one end. Cross section nearly round. Form oblong, rounded. The hilum is very narrow, ± 0.7 mm long, and extends lengthwise from the center of one short side of the seed. Each end of the hilum projects as a slight tooth. From the hilum a narrow ridge runs to the other end of the seed.

Surface smooth, dull. With magnification a fine mesh pattern is visible. Dark red-brown or gray-brown; mesh paler.

Length 2.2--2.3 mm; width 1.4--1.6 mm; thickness 1.4--1.5 mm.

122.

Cicuta maculata L.

Water hemlock

Apiaceae

The fruit is a schizocarp composed of 2 mericarps which may be found singly or in pairs. Single mericarp:

Outline elliptic, with a flared apex. Cross section with one flat side and one strongly convex side. Form ellipsoid; ventral face flat and dorsal face convex, with 5 conspicuous ribs. On the ventral face there is a central ovate area which is slightly raised. This area is surrounded by a wide border of corky tissue. There is a narrow lengthwise line on the center of the ventral face. The raised area of the ventral face and the intervals between the ribs on the dorsal face are soft, and oily when crushed. The stylopodium is a conspicuous extension from the apex.

Surface dull. The ribs are smooth; the intervals appear granular or finely wrinkled. The ribs are yellow-brown to orange-brown, and distinctly lighter than the brown to dark brown intervals. The raised area on the ventral face is brown with a buff border.

Length 2.7--3.3 mm; width (across the ventral face)

1.7--2.0 mm; thickness 1.4--1.8 mm.

123.

Conium maculatum L.

Conium maculatum



Apiaceae

The fruit is a schizocarp, composed of 2 mericarps. The mericarps may be found singly or in pairs. Single mericarp:

Outline ovate to long ovate, with a conspicuous projection at the small end. Cross section with one straight side and one strongly convex side; the convex side has 5 distinct teeth. Form ovoid, flattened on the ventral side; the entire seed is slightly bent toward the flat face. There is a lengthwise central groove on the flat face. On the convex face there are 5 conspicuous lengthwise ribs. At the small end there is an irregular flaring tooth which is a remnant of the stylopodium.

The convex face is strongly ribbed. The ribs are smooth and may be straight or wavy. There are fine lengthwise wrinkles between the ribs. The surface is dull. Gray-brown; the ribs and stylopodium are paler and yellowish.

Length 2.5--3.0 mm; width (across the ventral face) 1.4--1.9 mm; thickness 1.1--1.5 mm.

124.

Daucus carota L.

Queen Anne's lace

Apiaceae



Fruit a schizocarp, composed of 2 mericarps. The mericarps are found singly. Mericarp:

Outline elliptical. Cross section like a disc with a missing sector, varying from about $3/5$ to $3/4$ of a circle. Form ellipsoid, curved, with a longitudinal sector removed. There is a deep lengthwise groove in the center of the concave (ventral) side. At one end this groove extends into a small bifid projection, the stylopodium.

Surface bristly with closely spaced, blunt, curved spines. The spines have papillate bases and are minutely retrorsely barbed. Among the spines on the convex face of the seed are 3 narrow lengthwise rows of appressed white hairs. Some mericarps also have hairs along the ventral groove. Surface dull when seen without magnification. Under high magnification the spines have a glassy luster. Yellowish or grayish pale brown.

Length 3.2--4.2 mm; width 1.7--2.6 mm; thickness 1.3--2.0 mm. (Measurements include the bristles.)

125.

Apocynum cannabinum L.

Indian hemp dogbane



Apocynaceae

Outline narrowly elliptical with an extended, slightly flared apex; there is a conspicuous but readily shed coma. Cross section a very narrow ellipse. Form ellipsoid, compressed, with a pointed base and a blunt apex which has a short spreading collar. A coma of silky white hairs, ± 2.5 cm long, arises from the collar.

Surface dull, striate. When viewed at high magnification it appears rough with lengthwise ridges and wrinkles. Very dark brown; at high magnification the surface is shiny with a mixture of red, brown, and black patches.

Length 5.3--6.2 mm; width 0.5--0.9 mm; thickness 0.4--0.6 mm.

126.

Asclepias subverticillata (A. Gray) Vail

Poison milkweed

Asclepiadaceae



Outline pear-shaped with a truncate small end. Cross section a curved line with a distinct hump in the center. Form like a very thin, flattened pear. The whole seed may be rolled around the lengthwise axis. There is a large central area, distinctly convex on one face, which is surrounded by a thin marginal wing. On the flatter face of the seed, the center of the seed coat appears to be adherent to the embryo, and there is a fine central lengthwise nerve from the truncate end toward the center. The attachment point is at the truncate end. There is a readily shed coma of many white silky hairs, ± 2.7 cm long, arising from the truncate end.

Surface smooth on the central convex area, but slightly wrinkled on the margins and the flat face. There is a papery sheen; the convex area is slightly shiny. The overall color is light red brown, with the convex area slightly darker than the margin. On the flat face there is a central long narrow area, dark brown, surrounded by a yellow-brown area and a medium brown wing.

Length 6.8--7.1 mm; width 3.7--4.2 mm; thickness
(central area) ± 0.7 mm; thickness (wing area) ± 0.2
mm.

127.

Asclepias syriaca L.

Common milkweed

Asclepiadaceae

Outline pear-shaped. Cross section a narrow ellipse or dish shape. Form like a thin, flattened pear, with a truncate small end and a very thin marginal wing. The whole seed is somewhat concave-convex. On the dorsal face the location of the embryo is visible as a convex central area, also pear shaped. This area is surrounded by a thin wing which has an inner flat band, ± 0.3 mm wide, and an outer, slightly wavy band, ± 0.7 mm wide. On the ventral side there is a fine central line from the truncate end to near the wide end of the seed. The attachment scar is next to the truncate end. There is a coma of many fine white silky hairs, ± 3 -- 3.5 mm long, spreading from the truncate end. The coma is readily shed, usually as a unit.

Surface papery, dull. On each face there are many fine irregular wrinkles which are short but distinct. These are visible without magnification. At high magnification the surface of the outer bands of the wings appears finely colliculate. The overall color is medium orange-brown. The dorsal face is orange brown with a slightly darker

outer band. On the ventral face, the embryo area is light orange with a central dark brown elongate area, while the inner band is dark orange brown, and the outer band is the same color as on the dorsal side. The wrinkles are dark.

Length 7.0--8.5 mm; width 4.1--5.2 mm; thickness ± 0.7 --1.0 mm.

128.

Asclepias verticillata L.

Whorled milkweed



Asclepiadaceae

Outline long-ovate or pear-shaped, with a truncate small end. Cross section a very thin dish shape, somewhat thicker in the center. Form thin, ovate with a very thin, slightly wavy marginal wing. The wing is ± 0.6 -- 0.9 mm wide. The whole seed is somewhat bent or curved around the lengthwise axis. The boundary between the central area and the margin is distinct on the convex face, with the center appearing swollen. On the concave face there is a fine central nerve extending from the truncate end $2/3$ the length of the seed. The attachment point is at the truncate end. There is a readily shed coma of many silky white hairs, ± 2.5 cm long, arising from the truncate end.

Surface papery, dull, and slightly wrinkled. The central areas are orange-brown. The margins are light orange-brown; often there is a band of dark brown on the inner part of the margins.

Length 5.1 -- 6.2 mm; width (measured while rolled) 2.2 -- 3.5 mm; thickness (of center area) ± 0.4 -- 0.5 mm.

129.

Cynanchum laeve (Michx.) Pers.

Sand vine, Climbing milkweed

Asclepiadaceae

Outline ovate or pear shaped, with a truncate small end. Cross section a thin line with a slight thickening in the center. Form thin, ovoid, with a truncate small end and a conspicuous but readily deciduous coma. On one face the embryo is visible as a slightly elevated central area, ovate in shape, ± 2.5 mm long and 1.5 mm wide. Around this ovate area is a broad wing which has a smooth inner band and a wavy outer band. On the other face of the seed the ovate central area is outlined but not elevated, and there is a narrow straight line which extends from the truncate end into the central area. The coma consists of many fine silky white hairs, ± 1.2 cm long.

Surface irregularly wrinkled, with a rough papery texture. Dark orange-brown. The outer band of the wing is a paler shade than the inner band and central area.

Length 5.4--6.0 mm; width 3.7--4.3 mm; thickness ± 0.2 mm.

130.

Datura stramonium L.

Jimson weed

Solanaceae

Outline like a circle with a large notch, or most of a circle with one straight edge. Cross section rounded triangular. Form like a wedge, narrowed toward one end; there is a notch in the thinner edge. The hilum is located in the notch, near the narrow end of the seed. The hilum is triangular, ± 1.2 mm long and 0.7 mm wide, pointing to the narrow end.

The surface is uneven and dull. It appears slightly ridged or wrinkled. At 10x magnification a fine mesh-like pattern is visible in addition to the larger wrinkles, and there is a slight sheen. Black; the area near the hilum is paler, and the hilum is orange.

Length 3.4--3.8 mm; width 2.8--3.2 mm; thickness 1.4--1.7 mm.

131.

Physalis heterophylla Nees

Clammy ground cherry

Solanaceae

Outline variable, generally ovate. Cross section narrowly elliptical. Form like a thin chip of irregular thickness. The edges are rounded, and the whole seed may be slightly bent. The hilum is a narrow ellipse, ± 0.7 mm long, on the margin of one long edge of the seed.

The surface is finely roughened and glossy. When seen with magnification it appears areolate or pitted.

Orange-yellow.

Length 1.8--2.4 mm; width 1.6--1.8 mm; thickness 0.2--0.5 mm.

132.

Physalis longifolia Nutt.

Common ground cherry



Solanaceae

Outline variable, but rounded and generally ovate. Cross section thin, elliptical. Form flattened, ovoid, thickness irregular, with a narrow marginal rim. The hilum is small and narrow, located in a small notch in the rim.

The surface appears smooth and dull when seen without magnification. At 10x, the surface appears to be covered with shiny granules. At high magnification, these appear to be closely spaced tubercles. Dull orange-yellow.

Length (1.5) 1.9--2.2 mm; width (1.2) 1.5--1.8 mm; thickness 0.6--0.8 mm.

133.

Solanum carolinense L.

Carolina horse-nettle



Solanaceae

Outline somewhat ovate but variable. Cross section narrowly elliptical. Form flat, ovoid, thickness irregular; the whole seed may be bent or curved. There is a shallow notch, ± 1 mm long, along one edge near the smaller end of the seed. The hilum is a deep elliptical pit in this notch.

Surface smooth, glossy. When seen with magnification a fine mesh-like pattern is visible. Yellow to orange-brown.

Length 1.9--2.8 mm; width 1.4--2.1 mm; thickness 0.6--0.8 mm. (The size varies considerably, with many apparently fully developed seeds smaller than the most common size, which is 2.7--2.8 mm in length.)

134.

Solanum eleagnifolium Cav.

Silver-leaf nightshade

Solanaceae



Outline variable, but usually ovate, 3-sided, or oblong. Cross section narrowly elliptical. Form a flat thin chip with smooth rounded edges. Usually both faces are slightly convex. There is a shallow notch in the margin near one small end of the seed. The hilum is a deep ovate cavity in this notch.

Surface smooth, semi-glossy. At high magnification it appears very finely textured. Medium or dark yellow-brown.

Length 2.6--3.5 mm; width 1.9--2.5 mm; thickness 0.6--0.8 mm.

135.

Solanum ptycanthum Dun. ex DC.

Black nightshade



Solanaceae

Outline asymmetrically ovate, with a blunt tip at the small end. Cross section an irregular ellipse. Form a rounded chip of irregular thickness. The inconspicuous hilum is located just below the tip, on the straighter edge of the seed.

Surface smooth, dull. When seen at 7x magnification, it appears finely pitted and shiny. At high magnification there appears to be a translucent shiny mesh laid over an opaque seed. Yellow-brown to orange-brown; the rim may appear darker.

Length 1.7--2.1 mm; width 1.4--1.6 mm; thickness 0.6--0.7 mm.

136.

Solanum rostratum Dun.

Buffalo bur



Solanaceae

Outline irregularly ovate, with one side nearly straight and slightly notched. Cross section a narrow oblong. Form flattened, ovoid. The hilum is in the notch.

Surface dull. At 7x magnification a fine reticulate pattern is visible. When seen at 10x magnification, the raised edges of the meshwork appear shiny or light colored, while the pits are very dark. Dark red-brown to black.

Length 2.4--2.7 mm; width 2.0--2.1 mm; thickness 0.9--1.0 mm.

137.

Solanum triflorum Nutt.

Cut-leaved nightshade

Solanaceae

Outline variable, but usually elliptical, with a short straight edge near one end of the ellipse. Cross section narrowly elliptical. Form flat, ellipsoid, thickness irregular. The 2 faces are slightly convex, and the margins are thin. The hilum, located on the straight part of the margin, is very narrow.

Surface finely roughened, dull. At high magnification small irregular tubercles are visible. Yellow-brown to brown.

Length 2.0--2.2 mm; width 1.2--1.5 mm; thickness 0.4--0.5 mm.

138.

Calystegia sepium (L.) R. Br.

subsp. *angulata* Brummitt

Hedge bindweed

Convolvulaceae

Outline obovoid. Cross section usually quarter round, sometimes nearly round. Form like a quarter sector of an obovoid form, with a distinctly extended base; some seeds appear to be half of an obovoid form. The dorsal face is convex; on the ventral side there are typically 2 flat faces which meet at an angle. The base is oblique on the ventral side and has 3 shallow lobes at the lower edge. The hilum, on the oblique area, is ± 0.9 mm long and 0.5 mm wide, crescent-shaped (with ends pointing downward); it is nearly level with the surface except for a narrow groove around the margin. All faces of the seed may appear shrunken or lumpy, and the angles are rounded.

Surface dull, finely roughened or scurfy at low magnification. At high magnification it has scattered warty projections on a finely textured background. Dark brown to black; the hilum is orange.

Length 4.6--5.1 mm; width 3.2--3.7 mm; thickness 3.0--3.6 mm.

139.

Convolvulus arvensis L.

Field bindweed



Convolvulaceae

Outline obovate with a truncate small end. Cross section quarter round. Form like a quarter sector of an obovoid form; typically there are 2 flat faces at right angles and a strongly convex face. Some seeds have an angle greater than 90° between the flat faces. The faces sometimes appear shrunken. At the small end there is a small flat area, oblique or at a right angle to the main angle of the seed. The hilum, placed crosswise in this flat area, is oblong, ± 0.5 mm long.

Surface very dull, uniformly covered with small rough irregular tubercles. Dark gray-brown; less mature seeds are reddish.

Length 3.3--3.7 mm; thickness 2.7--3.0 mm.

140.

Ipomoea hederacea Jacq.

Ivyleaf morning-glory

Convolvulaceae



Outline a half circle. Cross section a wedge, varying from about $1/6$ to $1/4$ of a circle, with a depression in the center of the curved edge. Form a sector, with 2 flat ventral faces which meet at an angle of 90° or less, and a convex dorsal face which has a lengthwise depression. There is a slight rim around the edge of the convex face. The entire seed appears somewhat wrinkled and irregular. The hilum is located in a shallow notch which occupies the lower third of the angle formed by the flat faces.

Surface dull, finely granular or scurfy. At 7x magnification a covering of short fuzzy brown hairs is visible. The hairs are more abundant near the angles. Dark brown-black.

Length 4.8--5.6 mm; width 3.4--4.2 mm; thickness 3.3--4.5 mm.

141.

Ipomoea lacunosa L.

White morning-glory

Convolvulaceae



Outline rounded triangular. Cross section a wedge, with an angle slightly less than 90° . Form a quarter sector, with 2 nearly flat faces on the ventral side and a broad, curved dorsal face which is distinctly bowed out in the middle and flat toward the base and apex. The faces usually appear lumpy or shrunken. There is a shallow notch in the angle, extending about $1/3$ the distance from the base. The hilum, in the notch, is circular, ± 0.9 mm in diameter, and is level with the surface except for a groove around the circumference.

Surface smooth, with a soft sheen. Black, tinged with red-brown.

Length 4.2--4.7 mm; width (across the dorsal face) 3.7--4.8 mm; Thickness 3.5--3.6 mm.

142.

Ipomoea purpurea (L.) Roth

Common morning-glory

Convolvulaceae

Outline semi-circular. Cross section a wedge with 2 long straight sides and a shorter curved or indented side. Form a sector, having 2 flat ventral faces which meet in an angle, and a rounded dorsal face which sometimes has a central furrow. The entire seed is somewhat wrinkled and irregular in form. There is flattened area at one end of the angle; the hilum, ± 0.7 mm in diameter, is in this area.

Surface dull, densely covered with tiny brownish transparent hairs and transparent granular processes, visible at 10x magnification. At lower magnification the surface may appear granular. Black to brown black.

Length 4.6--5.1 mm; width (of dorsal face) 2.8--4.1 mm; thickness 3.4--4.0 mm.

143.

Cuscuta indecora Choisy

Large alfalfa dodder



Cuscutaceae

Outline variable, usually asymmetrically round. Cross section is $1/4$ or $1/3$ of a circle. Form sector-like, with a convex dorsal face and 2 flat or slightly concave faces which meet in an angle on the ventral side. The angle is most commonly $\pm 120^\circ$, but may be smaller or larger; a few seeds are hemispheric. The edge where the convex face joins the flat faces is very rounded. The ventral side is obliquely truncate at the base. The hilum, in the truncate area, is a circular patch with a small whitish scar in the center.

Surface finely granular, scurfy, and dull. At high magnification a fine reticulate pattern can be seen. Dull yellow to orange-brown.

Length 1.5--1.8 mm; width 1.2--1.5 mm; thickness 0.9--1.2 mm.

144.

Cuscuta pentagona Engelm.

Field dodder

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Cuscutaceae

Outline ovate, often with a obliquely truncate base. Cross section ovate or like a broad wedge. Form sector-like, irregular; or ovoid, compressed. The dorsal face is convex, and the ventral side may be nearly flat or composed of 2 flat faces which form a large angle. The hilum, ± 0.3 mm in diameter, is in the truncate or notched area at the base of the ventral side.

Surface smooth, dull. At high magnification it appears finely colliculate. Orange-brown.

Length 1.1--1.2 mm; width (across the dorsal face) 0.9--1.1 mm; thickness 0.6--1.0 mm.

145.

Ellisia nyctelea L.

Waterpod

Hydrophyllaceae

Outline round. Cross section round. Form globose, but with one somewhat flattened area. The hilum is very small and inconspicuous.

Surface smooth, dull. At 7x magnification, a fine honeycomb-like pattern of ridges is visible, with the interspaces appearing glittery or shiny. Black.

Diameter 2.2.--2.8 mm.

146.

Lithospermum arvense L.

Corn gromwell

Boraginaceae

Outline pear-shaped. Cross section short ovate. Form pear-like, with the small end bent to one side, and the base slightly truncate at an oblique angle. There is a distinct ridge from the base to the apex; on the opposite face is a less prominent ridge from the apex halfway to the base. The truncate basal area is rhombic, ± 1.4 mm long and 1.0 mm wide. There is a slight rim around the basal area, with 2 small projections which are aligned with the ridges.

Surface covered with small tubercles and wrinkles. The wrinkles are mostly lengthwise. At low magnification the wrinkles and tubercles appear hard and shiny. The base is dull and finely textured. Light gray-brown overall; the ridges, wrinkles and tubercles are light colored, and the low relief areas and the base are darker.

Length 2.2--2.8 mm; thickness 1.3--1.8 mm.

147.

Verbena bracteata Lag & Rodr.

Prostrate vervain

Verbenaceae

Outline a rounded rectangle. Cross section like a quarter sector with a bulging curved side. Form oblong with 2 flat faces and one larger, strongly convex face; the edges of the convex face are distinctly rimmed. The hilum is a quarter-round area at the base.

Surface dull; with magnification the convex face is somewhat shiny. The convex face is strongly reticulate, and has 3 or 4 low lengthwise ridges; there are also a few irregular crosswise ridges, mostly near the basal end. When seen at 10x magnification, the flat faces appear to have a dense covering of white or reddish granules. At high magnification these are visible as distinct barb-like processes. Brown, with a whitish hilum.

Length 1.8--2.2 mm; thickness (across the convex face) 0.6--0.7 mm.

148.

Verbena hastata L.

Blue vervain

Verbenaceae

Outline elliptical. Cross section quarter-round. Form an elongate quarter sector. The dorsal face is convex and has a narrow flaring marginal wing. On the ventral side there are 2 flat faces which meet at a right angle, with a slight ridge along the angle. The hilum is a conspicuous whitish scar near the base on the ventral side.

Surface nearly smooth, somewhat shiny. On the convex face there are 3 faint lengthwise ridges, as well as several faint crosswise wrinkles near the apex. The flat faces may appear scurfy, with scattered white flecks. At high magnification these flecks appear to be short, thick appressed hairs. Orange-brown with a translucent marginal wing.

Length 1.7--1.9 mm; width 0.7--0.8 mm; thickness 0.4--0.5 mm.

149.

Verbena stricta Vent.

Hoary vervain

Verbenaceae

Outline a rounded oblong. Cross section quarter-round. Form an elongate sector, with a convex dorsal face; on the ventral side there are 2 flat faces which meet at a right angle. There is a thin rim all around the convex face. At the base of the angle on the ventral side there is a hollow area with a ragged remnant of the seed stalk.

Surface semi-glossy. On the convex face there are about 5 narrow lengthwise ridges and a reticulate pattern of wrinkles. The wrinkles are more prominent toward the apical end. The spaces between the wrinkles are finely textured. The flat faces appear sparsely to densely scurfy with white flecks. At high magnification these flecks are seen to be opaque, very short appressed hairs. Dark red-brown.

Length 2.7--3.1 mm; width 0.8--1.0 mm; thickness 0.7 mm.

150.

Verbena urticifolia L.

Nettle-leaved vervain

Verbenaceae

Outline a rounded oblong, somewhat narrower at the base than the apex. Cross section quarter-round. Form an elongate sector with a large, convex dorsal face and on the ventral side, 2 flat faces which meet at a right angle. The margin of the convex face has a narrow rim. The hilum is a quarter-round area at the base of the seed.

Surface smooth, dull. With magnification, the convex face appears shiny and has about 3 faint lengthwise ribs and a few irregular crosswise wrinkles, while the flat faces appear slightly granular or scurfy. Dull orange-brown.

Length 3.3--3.6 mm; thickness (across the convex face) 1.5--1.6 mm.

151.

Glechoma hederacea L.

Ground ivy

Lamiaceae

Outline obovate. Cross section a quarter circle. Form an elongate sector; dorsal face convex, and the ventral side with 2 flat faces which meet in a lengthwise angle. The hilum, ± 0.2 mm in diameter, is located in a depression with a thin collar, near the base on the ventral side. A remnant of the white seed stalk may be present.

Surface smooth, with a slight sheen. Under high magnification it appears slightly roughened. Dull brown, with a faint dark midvein on the dorsal side and a dark area around the collar.

Length 1.6--1.7 mm; width 1.0--1.1 mm, thickness 0.6--0.7 mm.

152.

Lamium amplexicaule L.

Henbit



Lamiaceae

Outline long-obovate. Cross section a quarter circle. Form obovoid, sector-like, with a convex dorsal face; on the ventral side there are 2 flat faces which meet in a right angle. There is a narrow line along this angle. The apical end of the seed is obliquely truncate. There is a conspicuous caruncle which extends from the basal end along the 3 angles formed by the faces.

Surface smooth, dull. At high magnification a fine alveolate pattern is visible. Dark gray-brown, but with many distinct white mottles which are more abundant toward the apex; the caruncle is yellow.

Length 1.6--2.0 mm; width 0.9--1.0 mm; thickness ± 0.7 mm.

153.

Salvia reflexa Hornem.

Lance-leaved sage

Lamiaceae

Outline elliptical, with one end more rounded than the other. Cross section a quarter circle. Form an elongate sector, with a convex dorsal face; on the ventral side there are 2 flat faces which meet in a rounded right angle. The basal end of the seed is slightly pointed. Near the base on the angled side is a slightly elevated area; the hilum is an elongate scar in this area.

Surface smooth, dull. When seen at high magnification it is semi-glossy with scattered orange resinous dots. Tan with brown mottling; the hilum whitish.

Length 2.2--2.3 mm; width 1.5--1.6 mm; thickness 1.0--1.1 mm.

154.

Plantago lanceolata L.

Buckhorn plantain

Plantaginaceae



Outline elliptical to long ovate. Cross section like a thick dish. Form ellipsoid, flattened, slightly concave-convex, with the margins rolled toward the concave side. The hilum is an elliptical scar placed lengthwise in the center of the concave face. From the ends of the hilum a low ridge runs to each end of the seed.

Surface smooth when seen without magnification; at 10x it appears finely roughened. The concave surface is dull, but the convex face and the inrolled margins are shiny. Translucent, orange-brown; on the convex face there is a broad central lengthwise stripe which is paler and opaque, and the hilum is dark or black.

Length 2.0--2.3 mm; width 1.0--1.2 mm; thickness 0.5--0.7 mm. (Thickness measured from rim to high point of convexity.)

155.

Plantago patagonica Jacq.

Patagonian plantain

Plantaginaceae

Outline long ovate. Cross section dish-shaped. Form long-ovoid, with a smoothly convex dorsal face and a concave ventral face. There is a faint groove across the center of the convex face. On the concave face the hilum is visible as 2 small depressions in the center.

Surface finely roughened, dull. At high magnification a colliculate pattern is visible. Orange-brown, with a translucent margin; on the convex face, there is a paler central area, and on the concave face there is an orange central area surrounded by an ovate white ring and an orange border.

Length 1.9--2.1 mm; width 1.0--1.1 mm; thickness 0.6--0.7 mm.

156.

Plantago rugelii Dcne.

Rugel's plantain

Plantaginaceae

Outline variable; may be long triangular with either rounded or angular corners, an ellipse with one truncate end, or variously long and angular. Cross section a thin wedge or ellipse. From chip-like, irregular, with one strongly convex face and one convex or slightly concave face. These faces meet in a narrow rim around most of the periphery, but there is a narrow marginal face on one short edge. The hilum is an elliptical scar in the center of the less convex face of the seed.

Surface very finely wrinkled, dull. At high magnification there appears to be a translucent, somewhat shiny surface layer. Very dark red-brown to near black; hilum light brown.

Length 1.5--2.0 mm; width 0.8--0.9 mm; thickness 0.4--0.5 mm.

157.

Plantago virginica L.

Pale-seeded plantain

Plantaginaceae



Outline long ovate. Cross section a thin concave-convex lens shape. Form ovoid, compressed, thin, with margin extended toward one face to form one concave face and one convex face.

Surface smooth, but appears very finely textured under magnification. The convex face is shiny, the concave face dull. Light orange-brown, translucent near the the margins.

Length 1.6--1.8 mm; width 0.8--1.0 mm; thickness 0.5--0.6 mm.

158.

Verbascum blattaria L.

Moth mullein



Scrophulariaceae

Outline variable, roughly rectangular or trapezoidal. Cross section irregular, rounded. Form cylindrical, or truncate conical, with a flat base and more rounded apex. The hilum is at the center of the base. There are 7 or 8 lengthwise rounded ridges and about 6 crosswise ridges which intersect to form deep crosswise pits.

Surface dull, roughened by the ridges. At 25x magnification a finer pattern of small, mostly lengthwise wrinkles is also visible. There are fine striations, visible at 15x, which radiate from the hilum and extend lengthwise over the whole surface. Dark gray-brown; the rim of the base is black, and there is a small black spot at the centers of the apex and base.

Length 0.7--1.0 mm; diameter 0.4--0.7 mm.

159.

Verbascum thapsus L.

Common mullein

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Scrophulariaceae

Outline variable, oblong or elongate trapezoidal. Cross section round or angled. Form variable, somewhat like a truncate cone with an oblique base and a rounded apex. Hilum small, at the center of the base. There are 8--10 wavy lengthwise ridges which are intersected by several irregular crosswise ridges, forming oblong projections separated by deep grooves.

Surface conspicuously knobby, dull, and marked with a very fine reticulate pattern. Dark gray-brown.

Length 0.7--0.9 mm; diameter 0.4--0.5 mm.

160.

Veronica agrestis L.

Field speedwell

Scrophulariaceae



Outline ovate. Cross section dish shaped. Form thin, ovate, strongly concave-convex. The margins are sometimes rolled toward the concave face. The convex face has a faint central lengthwise ridge. In the center of the concave face there may be remnants of the funiculus.

Surface dull. The concave face is smooth; the convex face is covered with crosswise wrinkles, clearly visible at 7x magnification. Pale yellow.

Length 1.3--1.6 mm; width 1.0--1.3 mm; thickness ± 0.1 mm.

161.

Veronica arvensis L.

Corn speedwell



Scrophulariaceae

Outline ovate with a notch at the small end. Cross section a thin dish or V-shape, with a small knob at the center of the concave side. Form like an ovate chip, somewhat concave-convex. Hilum a raised ellipse, ± 0.4 mm long, in the center of the concave face.

Surface dull. When seen at 10x magnification, it has a waxy sheen. Both faces are covered with fine wrinkles which are visible at 7x magnification. Pale dull orange, somewhat translucent; the hilum is darker.

Length 0.9--1.2 mm; width 0.6--0.7 mm; thickness ± 0.3 mm.

162.

Veronica peregrina L.

Purslane speedwell

Scrophulariaceae

Outline elliptical. Cross section a very narrow ellipse with a small knob at the center of one long edge. Form like a very thin chip, variously bent. One face has a central ridge, extending from one end most of the length of the seed. The hilum is on this ridge.

Surface smooth, shiny. Light orange-brown, translucent; the ridge is red-brown.

Length 0.8--0.9 mm; width 0.4--0.5 mm; thickness 0.2--0.4 mm.

163.

Proboscidea louisianica (P. Mill.) Thell.

Devil's claw

Pedaliaceae

Outline obovate with ragged edges. Cross section narrowly ovate and rough. Form obovoid, compressed; one face is nearly flat, and the other face has a ridge which extends from the small end of the seed to the center. The seed is usually thicker toward the wide end. The hilum is a cavity in the end of the ridge, near the base of the seed.

Surface is very rough, with irregular angular knobs; glittery. There is also a fine overall reticulate pattern, which is visible at 7x magnification. Black.

Length 9.0--9.5 mm; width 5.4--6.0 mm; thickness 1.5--2.2 mm.

164.

Hedyotis crassifolia Raf.

Small bluets



Rubiaceae

Outline ovate. Cross section C-shaped. Form ovoid, hollow. There is a large round opening in one side, and the hilum is inside.

Surface dull, finely textured. At high magnification it appears distinctly reticulate with narrow ridges and shiny interspaces. Orange-brown.

Length 0.7--0.8 mm; width 0.5--0.7 mm; thickness 0.4--0.5 mm.

165.

Hedyotis nigricans (Lam.) Fosb.

Narrow-leaved bluets

Rubiaceae

Outline a rounded oblong. Cross section oblong or irregular. Form oblong, rounded, compressed, with thin margins. The seed is usually bent and generally irregular and wrinkled. There is a thin marginal wing around one small end. The hilum is near the center of one face.

Surface dull, finely textured. At 15x it appears shiny and a fine alveolate pattern is visible. Black.

Length 1.1--1.2 mm; width 0.5--0.6 mm; thickness ± 0.3 mm.

166.

Symphoricarpos orbiculatus Moench

Coral berry, Buckbrush

Caprifoliaceae



Outline biconvex. Cross section elliptical with one straight edge. Form ellipsoid, compressed, with one flat face and one convex face. There is a narrow tip at each end.

Surface smooth, dull. Under high magnification it appears finely textured. Pale tan.

Length 3.4--3.9 mm; width 2.0--2.2 mm; thickness 1.1--1.2 mm.

167.

Dipsacus fullonum L.

Common teasel

Dipsacaceae



Achene:

Outline nearly rectangular. Cross section square. Form like a long box with a ridge on each long angle. There is usually a lengthwise ridge on the center of each long face. The style base extends slightly beyond the depressed apex; a large ciliate stigma may be present. The attachment point is at the center of the base.

Surface conspicuously ridged, dull. There are very fine straight white hairs over the entire surface; these are visible at 10x magnification. Light brown, with pale ridges.

Length 3.1--3.7 mm; thickness 0.8--1.1 mm.

168.

Achillea millefolium L.

Yarrow

Asteraceae

Achene:

Outline long obovate. Cross section narrowly elliptic. Form obovate, compressed. The seed itself is obovate; it is enclosed in a larger membranous pericarp which has a marginal wing. There is a small round rim around the basal attachment point, a short apical collar, and a short beak. There is no pappus.

Surface membranous, slightly striate, with a sheen. The pericarp is white, but the seed is dark brown and visible through the pericarp.

Length 1.6--1.8 mm; width 0.4--0.5 mm; thickness 0.2--0.3 mm.

169.

Ambrosia artemisiifolia L.

Common ragweed

Asteraceae



The unit of dispersal is the bur, an involucre structure enclosing an achene.

Outline obovate with an extended beak. Cross section round or somewhat 3-sided. Form like a top. The beak, projecting from the center of the broad end, is ± 1 mm long and 0.5 mm broad at its base. Under high magnification several teeth are visible around an opening at the tip of the beak. From the widest part of the bur a series of (6--7) 8 pointed tubercles project upward. These tubercles are ± 0.3 mm long. There is an oblique, round attachment scar at the base of the bur.

Surface dull, striate. There are scattered white granules, mostly on the upper half. Fine white strigose hairs are present above the tubercles and on the beak. Dark gray-brown.

Length 3.5--3.9 mm; thickness 1.6--2.0 mm.

(The burs are often found in varying stages of deterioration. The tubercles are easily worn off. The achene itself is obovate with a small beak, smooth, light

brown; length ± 3.1 mm, beak ± 0.4 mm long.)

170.

Ambrosia grayi (A. Nels.) Shinnars

Bur ragweed

Asteraceae



The unit of dispersal is the bur, an involucre structure enclosing 2 achenes.

Outline obovate with stout spreading spines and 2 incurved teeth at the apex. Cross section round or slightly compressed, very spiny. Form obovate, with a narrow blunt base. At the apex there are 2 inwardly curved fine-tipped beaks, ± 1 mm long. On the body of the bur there are about 12--14 spreading spines, ± 1 mm long. The spines are narrower than the beaks and are usually hooked at the tip.

Surface tough, woody, dull; densely covered with transparent yellow resinous droplets which are visible at 10x magnification. There are scattered long white hairs. Light olive color.

Length 4.0--6.5 mm; diameter 2.8--3.7 mm.
(Measurements exclude spines and beaks.)

(There are 2 achenes in each bur. The achene is long ovate in outline, plano-convex in cross section. The surface is striate and streaked with black and dark brown.

Length ± 4.1 mm; width ± 1.8 mm; thickness ± 1.2 mm.)

171.

Ambrosia psilostachya DC.

Western ragweed

Asteraceae



The unit of dispersal is the bur, an involucre structure enclosing an achene.

Outline obovate with a small beak. Cross section round to rounded triangular. Form ovoid, irregular, with a narrow, oblique base from which a rounded keel runs halfway up the side, and with a small apical beak. Under magnification the beak appears papery, with several small teeth at the tip. It is ± 0.5 mm long and ± 0.3 mm broad at its base. Small tubercles may project upward from the widest area of the bur. There are 1 or 2 of these, or they may be absent; rudimentary tubercles may be visible with magnification. The tubercles are up to 0.3 mm long.

Surface dull, with a papery texture; there are a few irregular wrinkles. There are white strigose hairs; these are more abundant on the upper half of the bur and on the beak. Mottled dark and light gray-brown.

Length 3.2--3.5 mm; thickness 1.7--2.0 mm.

(The achene is obovate with a slight beak, smooth, very dark brown.)

172.

Ambrosia trifida L.

Giant ragweed

Asteraceae

The unit of dispersal is the bur, an involucre structure enclosing an achene.

Outline obovate with an extended beak. Cross section rounded and 5-sided. Form like a top, somewhat 5-sided, with a small blunt base and a narrow cuspidate beak. There are 5 lengthwise rounded angles which extend from the base to just above the broadest part of the bur. Each of these angles terminates in a small acute vertical tooth. Above this ring of 5 teeth there may be a second series of 1, 2, or 3 similar teeth, alternate with first series. The basal attachment scar is round.

Surface (lower portion of the bur) smooth, papery, with fine striations. The upper portion and the beak are wrinkled and have white strigose hairs, which are more abundant on the beak. Greenish-tan; there are deep purple streaks and mottles on the upper portion and between the angles on the lower part.

Length 5.6--6.3 mm; thickness 3.0--3.8 mm.

The achene is obovate with a very small apical beak,

smooth. Gray-brown; under magnification black and brown patches are evident.

173.

Arctium minus Bernh.

Common burdock

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Asteraceae

Achene:

Outline clavate. Cross section dish-shaped. Form clavate, very flattened, often curved to one side; one broad face is slightly convex, the other slightly concave. Both the base and the apex are truncate. The attachment scar, at the base, is ± 0.8 mm in diameter. There is a slight apical rim, ± 1 mm in diameter, and a very short beak. The readily deciduous pappus consists of barbed yellow bristles, ± 1.5 mm long.

Surface finely textured, with a slight sheen. There is usually a narrow central ridge on each broad face. With high magnification, many small lengthwise wrinkles or tubercles are visible. Mottled brown and very dark brown.

Length 5.7--6.1 mm; width 2.2--2.4 mm; thickness 0.8--1.0 mm.

174.

Artemisia ludoviciana Nutt.

White sage

Asteraceae

Achene:

Outline oblong to elliptical. Cross section 5-sided. Form 5-sided, elongate, tapered slightly to both the base and the apex. The whole achene is often slightly curved. There is a small apical collar.

Surface distinctly striate, with a silky luster. Yellow-brown, somewhat translucent.

Length 1.0--1.2 mm; thickness 0.4--0.5 mm.

175.

Aster ericoides L.

Heath aster

Asteraceae

Achene:

Outline oblong, but narrowed toward the base. Cross section very thin.

Form oblong, compressed, very thin, with one or both long edges curved inward to the narrow base. There is a small thin apical collar and a pappus of many minutely barbed capillary hairs, ± 3.6 mm long.

Surface covered by many short white appressed hairs which may give the achene a shiny appearance. Light brown; the pappus is tan.

Length 1.0--1.3 mm; width 0.3--0.4 mm; thickness ± 0.2 mm.

176.

Baccharis salicina T. & G.

Willow baccharis

Asteraceae

Achene:

Outline oblong, but apex obliquely truncate, and narrowed toward the base. Cross section several-sided. Form oblong, tapered to a narrow base; with 10 lengthwise ribs. There is a small thin flaring apical collar. At the center of the apex is a short style base. A pappus of about 25 fine straight straw-colored hairs, ± 7 mm long, arises from the collar.

Surface ribbed, dull. At high magnification fine lengthwise striations are visible between the ribs. Light yellow; the ribs and collar are paler than the body.

Length 1.4--1.5 mm; thickness 0.4--0.5 mm.

177.

Bidens bipinnata L.

Spanish needles

Asteraceae

Achene:

Outline a very narrow ellipsoid with 2, 3, or 4 awns flaring from the apex. Cross section rhombic. Form 4-sided, very long, 4-sided, narrowed slightly to both the base and the apex. The base is obliquely truncate. The attachment scar, in the truncate area, is large and has a smooth circular rim. The pappus of 2, 3, or 4 stout awns, ± 1.5 -- 3.5 mm long, arises from the apex. The awns are retrorsely barbed with stiff transparent spines which are ± 0.5 mm long. There are about 8 lengthwise ridges on the body of the achene; one on each of the 4 lengthwise angles, and usually one on the center of each face.

Surface smooth, dull. At high magnification it appears finely papillate. Dull brown, appearing mottled at high magnification; the truncate area and the awns are pale.

Length (0.8) 1.1 -- 1.6 mm; width 0.9 -- 1.2 mm; thickness 0.8 -- 1.0 mm.

178.

Bidens frondosa L.

Beggar-ticks



Asteraceae

Achene:

Outline obovate with 2 prominent awns spreading from the apex. Cross section very thin, concave-convex or biconvex. Form oblong, very thin, slightly bent. There is a lengthwise ridge in the center of each face. The base is truncate with a smooth rim. The 2 rigid awns of the pappus, about 2.5--4.5 mm long, are retrorsely barbed. The apex is concave with the concavity extending up the inner surface each awn. A small remnant of the style may be present at the center. There may be a small tooth on the rim of the concave area at the center of each face.

Surface scabrous, very dull. It appears warty under magnification. At high magnification the entire surface appears finely striate. There are sparse short straight brownish hairs arising from the midribs and warts. The awns have short stout retrorse barbs in 3 rows. Dark brown to brownish black; the awns are paler.

Length 4.7--7.3; width 1.5--2.8 mm; thickness 0.5--0.8 mm.

179.

Carduus nutans L.

Musk thistle



Asteraceae

Achene:

Outline elliptical, curved. Cross section variable, somewhat elliptical. Form ellipsoid, compressed, curved; sometimes faintly 4- or 5-sided. The attachment point is a 5-sided hollow at the base. The apex is obliquely truncate and has a distinct, thin, slightly flaring collar. There is a large conical style base at the center of the apex. This beak is ± 0.7 mm broad at the base and projects ± 0.5 mm beyond the collar. The pappus, which is readily shed, consists of many fine bristles arising from the collar. The pappus bristles are straight and tannish-white, about 15 mm long. At high magnification many fine, very short barbs are visible on the bristles.

Surface smooth, very shiny. There are many slight lengthwise ridges. Straw-colored; the style base is yellow-brown or orange, and with magnification dark, faint, lengthwise dotted stripes can be seen on the body of the achene.

Length (including beak) 3.4--4.5 mm; width 1.3--1.9

mm; thickness 0.8--1.3 mm.

180.

Centaurea cyanus L.

Cornflower

Asteraceae

Achene:

Outline oblong but somewhat tapered to the base, and with a large notch missing from one side near the base; there is a pappus of bristles about as long as the achene. Cross section elliptical. Form oblong, compressed, with a narrow base and truncate apex. Along one margin, near the basal end, is a conspicuous notch, ± 1.2 -- 1.5 mm long. There is a deep cavity in this notch at the attachment point. At the apical end there is a thin, slightly flaring collar, ± 0.2 mm long. The pappus of many broad bristles arises from within the collar. The bristles are short-plumose and vary from ± 0.4 -- 3.0 mm in length.

Surface smooth, shiny, with faint narrow lengthwise ridges. It is covered with many fine short white hairs which are easily worn off. There is also a tuft of white hairs at the base of the achene. Glauous pale reddish brown; the collar and notch area are hairless and straw colored. The pappus is dull orange to purplish.

Length (excluding pappus) 3.2 -- 4.0 mm; width 1.2 -- 1.8

mm; thickness 0.9--1.3 mm.

181.

Centaurea repens L.

Russian knapweed



Asteraceae

Achene:

Outline oblong, but tapered to a narrow base. Cross section a narrow oblong. Form oblong, compressed, very thin, narrowed to the base and truncate at the apex. There are several lengthwise ridges on each face. The deciduous pappus is a ring of bristles arising from the apex. These bristles are white to straw-colored, slightly flattened and short-plumose. They are of mixed length, from ± 0.3 --1.3 mm.

Surface covered with many fine soft white hairs. Gray-brown.

Length 2.1--2.4 mm; width 0.6--0.7 mm; thickness ± 0.3 mm.

182.

Cichorium intybus L.

Chicory



Asteraceae

Achene:

Outline long-triangular with more or less curved sides. Cross section somewhat angular with about 3--5 unequal sides. Form oblong, narrow at the base and truncate at the apex, irregularly curved, ridged, and angled. There are about 10 lengthwise ridges. The pappus is a fringe of membranous rounded teeth, ± 0.2 mm long, around the apical end. Within this fringe is a smooth flat ring, with a short style remnant, ± 0.1 mm long, in the center. The attachment point is at the base.

Surface smooth, with a slight sheen. At 10x magnification it appears finely textured. At high magnification a fine pattern of crosswise wrinkles is visible. Gray-brown, with pale base and apex; with magnification light and dark brown mottling is apparent. The pappus is off-white.

Length (including the pappus) 2.1--3.0 mm; thickness 0.7--1.4 mm.

183.

Cirsium altissimum (L.) Spreng.

Tall thistle

11

Asteraceae

Achene:

Outline roughly oblong, but narrowed toward the base and slightly narrowed toward the apex. Cross section biconvex to rhombic. Form ellipsoid, with one straight long edge; the other long edge is curved, or bent inward near the apex. The attachment point is at the base. The apex is truncate at a slight angle. There is a thin apical collar ± 0.1 mm long. A blunt beak, ± 0.4 mm in diameter, extends ± 0.3 mm beyond the collar. The deciduous pappus of many bristles is white, ± 2.7 cm long, and feathery with very fine soft hairs $\pm 2-3$ mm long.

Surface highly glossy in the apical fifth and slightly glossy in the lower portion; it is finely striate. Light yellow in the apical fifth, light brownish straw-colored in the lower portion.

Length (including beak) (4.6) 4.9--5.1 mm; width 1.8--1.9 mm; thickness 0.8--1.0 mm.

184.

Cirsium arvense (L.) Scop.

Canada thistle

111

Asteraceae

Achene:

Outline elliptical, but the apex is truncate. Cross section rounded and often 3- or 4-sided. Form ellipsoid, slightly compressed, often 4-sided; the whole achene is often curved to one side. The base is small and blunt. The apex is truncate and has a thin apical collar, ± 0.2 mm long. The beak extends ± 0.2 mm beyond the collar. The deciduous pappus arises from the collar. It consists of many tan bristles, ± 2.8 cm long, which are feathery with many fine soft hairs, ± 2 mm long.

Surface finely striate, glossy. Light brown; the collar is yellow.

Length (including the beak) 3.3--4.0 mm; width 1.0--1.2 mm; thickness 0.7--0.9 mm.

185.

Cirsium ochrocentrum A. Gray

Yellow-spine thistle

Asteraceae

Achene:

Outline somewhat elliptical but with a truncate apex. Cross section elliptical. Form ellipsoid, compressed. The attachment scar is an ovate cavity in the oblique base. The apex is oblique and there is an apical collar, ± 0.2 mm long and ± 1.4 mm in diameter. The beak, ± 0.4 mm in diameter, projects ± 0.3 mm beyond the collar. The pappus, which arises from the collar, is readily shed and tends to fall as a unit. It consists of many tan bristles, ± 2.3 cm long, which are feathery with many fine soft hairs, ± 1 mm long.

Surface glossy, but finely roughened with faint ridges. Light orange-brown with fine red-brown streaks; the collar is yellow.

Length 4.9--5.5 mm; width 2.7--3.1 mm; thickness 1.5--1.8 mm.

186.

Cirsium undulatum (Nutt.) Spreng.

Wavyleaf thistle

Asteraceae



Achene:

Outline roughly elliptical, but tapering to an acute base and obliquely truncate at the apex. Cross section ovoid. Form ellipsoid, compressed, sometimes slightly curved. There is a thin flaring apical collar, ± 0.7 mm long, and a conspicuous beak, ± 0.6 mm in diameter, which extends ± 0.5 mm beyond the collar. The deciduous pappus arises from the collar. It consists of many straight white or slightly tawny hairs, ± 3.5 cm long, which are feathery with many fine soft hairs, ± 0.3 -- 0.5 mm long.

Surface smooth, glossy. There are faint lengthwise striations, and under magnification the surface appears slightly rugose. Pale straw color; the collar is paler, and there are a few pale narrow lengthwise stripes, with darker mottling between the stripes.

Length 5.3--6.3 mm; width 2.2--2.5 mm; thickness 1.0--1.5 mm.

187.

Cirsium vulgare (Savi) Ten.

Bull thistle

Asteraceae

Achene:

Outline roughly oblong, but narrowed toward the base and swollen near the apex. Cross section variable, somewhat 4-angled. Form spindle-like, straight or slightly curved. The apex is truncate obliquely or at a right angle. There is a thin apical collar, ± 0.1 mm long, and an apical beak which is ± 0.3 mm in diameter and extends ± 0.2 -- 0.3 mm beyond the collar. The deciduous pappus consists of many straight white hairs, ± 1.4 -- 2.0 cm long, which are feathery with many very fine soft hairs, ± 0.2 -- 0.5 mm long.

Surface smooth, glossy; there are slight lengthwise striations. Dull orange-brown to pale gray-brown; the collar is paler and there are a few dark, narrow lengthwise streaks.

Length 3.2 -- 4.0 mm; width 1.2 -- 1.3 mm; thickness 0.8 -- 1.0 mm.

188.

Conyza canadensis (L.) Cronq.

Horseweed

Asteraceae

Achene:

Outline oblong, but narrowed toward the base, and with a persistent pappus of hairs extending from the apex.

Cross section elliptical. Form oblong, compressed, with thin side margins. There is a smooth circular rim around the basal attachment point. At the apex there is a small collar. The pappus, arising from the collar, is a ring of about 20 minutely barbed hairs, ± 2 mm long.

Surface smooth, with a silky sheen. There are many short appressed white hairs. Pale straw color; the basal rim, collar, and pappus are off-white.

Length 1.0--1.2 mm; width ± 0.3 mm; thickness ± 0.2 mm. (Measurements exclude the pappus.)

189.

Conyza ramosissima Cronq.

Spreading fleabane

Asteraceae

Achene:

Outline oblong, but tapered to a narrow base and with a persistent pappus of hairs spreading from the apex. Cross section a very thin ellipse. Form oblong, compressed, with a narrowed, obliquely truncate base. The 2 long edges are narrowly winged. The attachment point, at the base, is small and round. There is a slight apical collar. The pappus, arising from the collar, consists of minutely barbed hairs, ± 2.2 mm long.

Surface covered with many short, straight appressed hairs. The hairs have a soft sheen when seen with magnification. Pale yellow.

Length 1.2--1.3 mm; width 0.3 mm; thickness 0.1--0.2 mm.

190.

Erigeron strigosus Muhl. ex Willd.

Daisy fleabane

Asteraceae

Achene:

Outline a rounded oblong, slightly wider at the apex. Cross section a thin ellipse, or somewhat rhombic. Form oblong, compressed, very thin, with narrow marginal wings on the long edges. There is a slight lengthwise ridge on the center of each face. There is a smooth circular rim surrounding the basal attachment point. The pappus consists of an inner ring of bristles and an outer ring of membranous teeth. There are about 10 of these bristles, ± 1.7 mm long, and minutely upwardly barbed; they are easily broken off. The teeth are flaring, ± 0.1 mm long, and persistent. There is a very small style remnant at the center of the apex.

Surface finely striate, with a silky sheen. There are scattered short, white appressed hairs. Pale straw color, somewhat translucent.

Length 0.8--0.9 mm; width 0.3 mm; thickness 0.1--0.2 mm.

191.

Grindelia squarrosa (Pursh) Dun.

Curly top gumweed

Asteraceae

Achene:

Outline roughly oblong, usually curved, with the sides tapered to a blunt-tipped base. Cross section variable, usually rhombic. Form oblong, compressed, often bent, with a narrow base and obliquely truncate apex. The long edges are slightly winged. The attachment point, at the base, is small and round. There is a slight thin apical collar and small style beak, ± 0.1 mm long.

Surface smooth, papery, with a silky luster. There are several fine lengthwise ridges. Pale grayish tan.

Length 2.9--4.0 mm; width 1.6--2.3 mm; thickness 0.8--1.4 mm.

192.

Gutierrezia dracunculoides (DC.) Blake

Broomweed

Asteraceae

Achene:

Outline obovate. Cross section round to 3-sided. Form obovoid, tapered to a narrow point at the base; sometimes slightly compressed. There is a small attachment scar at the tip of the base. The pappus is a ring of short membranous teeth extending from the apex. It is ± 0.1 mm long and 0.3 mm in diameter.

Surface dull, but at high magnification it appears finely reticulate and glittery. The achene is noticeably hairy with about 6--8 distinct rows of bristly white hairs. Dark brown, with pale stripes underlying the rows of hairs.

Length 1.9--2.2 mm; thickness 0.8--1.1 mm.

193.

Helenium autumnale L.

Sneezeweed

Asteraceae

Achene:

Outline triangular, with lacerate teeth from the wide end. Cross section round to elliptical. Form conical, slightly compressed, with 5 distinct ribs. The apex is flat. The pappus is a persistent crown of 5 membranous teeth. The teeth are lacerate and awn-tipped, ± 1 mm long.

Surface conspicuously ribbed; there are long, straight, appressed hairs on the ribs. There are transparent resinous droplets on the surface of the grooves between the ribs. These droplets are visible at 10x magnification. The hairs and droplets are shiny. Orange-brown; the ribs are lighter colored and the pappus is pale orange.

Length 1.0--1.2 mm; diameter 0.5--0.6 mm.
(Measurements exclude the pappus.)

194.

Helianthus annuus L.

Common sunflower

Asteraceae

Achene:

Outline a rounded long triangle. Cross section rhombic, or biconvex with narrow wings. Form oblong, compressed, narrowed to a small base and with wing-like side margins. Along the center of each face is a prominent broad lengthwise ridge. The apical end is nearly flat. There is a small, slightly elevated apical collar, ± 0.5 mm in diameter, which includes a short style base. The pappus is very easily shed. It consists of 2 acute, lacerate white teeth, ± 2.5 -- 3.0 mm long, on either side of the apical rim.

Surface initially covered with many soft straight white hairs. These hairs are ± 0.5 mm long, oriented lengthwise and uniformly distributed over the surface. However these hairs are easily worn off; when they are absent, the surface is nearly smooth and has a slight sheen. With magnification, the surface appears striate. There are about 20 fine lengthwise grooves on each broad face of the seed. The spaces between the grooves are

rough, and at high magnification appear finely tuberculate. Gray-brown, but whitish when hairs are present; there is a pale smooth area at the base, and the apical rim is whitish.

Length 4.0--4.9 mm; width 2.3--2.6 mm; thickness 1.4--1.9 mm.

195.

Helianthus ciliaris DC.

Texas blueweed

Asteraceae



Achene:

Outline a rounded oblong, narrowed toward the base. Cross section biconvex to rhombic. Form somewhat oblong, compressed, widest and thickest near the apex, and thin near the margins. The basal attachment scar is small and oblique. There is a slight apical collar, ± 0.5 mm in diameter.

Surface finely striate, shiny. With magnification small rounded tubercles can be seen. Silvery gray, or mottled light and dark brown.

Length 2.8--3.2 mm; width 1.8--2.0 mm; thickness 1.1--1.3 mm.

196.

Helianthus petiolaris Nutt.

Plains sunflower

Asteraceae



Achene:

Outline obovate. Cross section elliptical to rhombic. Form obovoid, compressed, with a prominent rounded lengthwise ridge on the center of each face. Each face is concave between the ridge and the side margins. The attachment area is oblique at the base. It has a smooth rim with a distinct notch which runs from front to back. There is a very small round apical collar, ± 0.7 mm in diameter.

Surface covered with abundant hairs. They are yellowish, soft and straight, ± 1 mm long, and are easily worn off. Without the hairs, the surface is smooth and has a slight sheen. At 10x magnification small tubercles in narrow lengthwise rows are visible. Dark gray, with pale mottling near the edges; some achenes are paler and mottled all over.

Length 6.1--7.0 mm; width 2.0--2.9 mm; thickness 1.0--1.5 mm.

197.

Heterotheca latifolia Buckl.

Camphor weed



Asteraceae

This species produces achenes of two distinct forms in the same inflorescence.

Ray achenes:

Outline elliptic, with a blunt base and small-tipped apex. Cross section a narrow wedge. Form unequally 3-sided and 3-angled, elongate, tapering to both the base and the apex. The 2 large ellipsoid faces are flat or slightly depressed and meet in a narrow angle. They are joined to a narrow curved face by 2 prominent angles. At the base is the circular rimmed attachment scar. There is no pappus.

Surface finely striate, with a silky luster. At high magnification a sparse covering of very short brown hairs can be seen. Light yellowish or grayish brown.

Length 2.4--2.7 mm; width 1.1--1.4 mm; thickness 0.4--0.7 mm.

Disc achenes:

Outline obovate, with a pointed base and a truncate

broad end. Cross section very thin. Form obovoid, compressed, thin. There is a very small attachment point at the base. There is an apical rim, a small beak, and a persistent pappus in 2 series, arising from the rim. The pappus consists of a ring of thin white teeth, ± 0.5 mm long, and a ring of yellowish minutely barbed capillary hairs, ± 0.5 mm long. There is usually a central line or ridge on each face.

The surface has a moderate covering of long straight white hairs, aligned lengthwise. Light brown with darker ridges.

Length 2.1--2.5 mm; width 0.8--1.1 mm; thickness ± 0.2 mm.

198.

Iva annua L.

Marsh elder

Asteraceae



Achene:

Outline pear-shaped, but variable in proportions. Cross section plano-convex. Form like a compressed, 2-sided pear. Usually one face is distinctly convex and the other face flat or slightly concave; the 2 faces meet in a narrow margin. The attachment point is at the small end of the achene. There are 3 lengthwise ridges on each face, though sometimes the center ridge is obscure.

Surface dull; smooth, apart from the ridges. With magnification it appears finely textured or striate. Medium or dark gray-brown, finely mottled.

Length 2.7--3.8 mm width 2.1--2.9 mm; thickness 0.8--1.0 mm.

199.

Iva xanthifolia Nutt.

Marsh elder



Asteraceae

Achene:

Outline obovate. Cross section elliptical. Form clavate, slightly compressed, with a narrow blunt base, a small marginal rim, and a lengthwise ridge from base to apex on each face.

Surface finely textured, dull. At 10x magnification, a pattern of fine shiny tubercles, arranged in lengthwise rows, is visible. There are a few coarse white hairs near the apex. Black, tinged with purple; the basal attachment point is white.

Length 2.5--2.8 mm; width 1.3--1.8 mm; thickness 1.0--1.2 mm.

200.

Kuhnia eupatorioides L.

False boneset

Asteraceae

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Achene:

Outline oblong but narrowed toward the base. Cross section variable, generally oblong. Form oblong, compressed, flaring slightly from the base to the apex. There is a smooth knob around the basal attachment point. At the apex there is a small flared apical collar with a persistent pappus of about 20 plumose tan bristles, ± 5.5 mm long, and a conspicuous cup-shaped style base.

Surface ribbed, striate, with a sparse covering of short white hairs. The hairs are more abundant toward the apex. Dark gray to black.

Length 3.2--4.1 mm; width 0.5--0.7 mm; thickness 0.3--0.5 mm.

201.

Lactuca saligna L.

Willow-leaved lettuce

Asteraceae

Achene:

Outline elliptical, but broadest above the middle; there is a long filiform extension of the apical beak which may be present, wholly or partly. Cross section a very narrow ellipse. Form ellipsoid, flattened, thin, widest near the apex. There is a very narrow wing on the side margins. There is a smooth rim around the truncate basal attachment point. The filiform portion of the beak is ± 2.5 mm long; the readily deciduous pappus consists of many fine white bristles spreading from the end of the beak. The bristles are ± 3 --5 mm long and appear jointed when seen at high magnification.

Surface with a slight sheen. There are 5--8 narrow ribs on each face. The ribs and wings are barbed near the apex. Light brown, with yellow ribs and wings, and a white beak.

Length 2.7--3.0 mm; width 0.6--0.8 mm; thickness ± 0.1 mm. (Measurements exclude the beak and pappus.)

202.

Lactuca serriola L.

Prickly lettuce

Asteraceae

Achene:

Outline oblanceolate with a small beak. Cross section narrowly elliptic or concave-convex. Form elongate, very thin, narrow at the base and rounded at the apex. The 2 long sides have narrow marginal wings. There are about 5--7 lengthwise ribs on each face. At the apex there is a fine white extension, ± 3.0 -- 3.5 mm long. The pappus of many very fine white bristles, ± 3 mm long, arises from the end of the extension. The pappus and all or part of the extension may be broken off.

Surface ribbed, dull. Both the ribs and the marginal wings are minutely upwardly barbed; toward the apex these barbs extend into short straight white hairs. Light olive brown; the ribs and wings are pale yellow.

Length 2.7 -- 3.0 mm; width 0.7 -- 0.9 mm; thickness ± 0.1 -- 0.2 mm. (Measurements exclude the extension and pappus.)

203.

Silphium integrifolium Michx.

Whole-leaf rosin weed

Asteraceae

Achene:

Outline obovate; at the wide end there are 2 prominent teeth with a large V-shaped notch between them. Cross section very narrow. Form obovoid, compressed, very thin; the whole achene may be curved. There is a small ridge from the base to the apex on each face. There is a very thin marginal wing, ± 1.0 mm wide, which is extended to form the pointed apical teeth. The notch between the teeth is ± 3.5 mm wide and includes the style base.

Surface slightly striate, with a soft sheen. The wing is stiff and papery, becoming lacerate toward the apex. Fine short hairs may be present on both faces. Gray; the wing is light brown.

Length 1.0--1.1 cm; width 6.1--7.3 mm; thickness ± 0.1 mm.

204.

Silphium laciniatum L.

Compass plant

Asteraceae



Achene:

Outline a rounded oblong or triangle; at the wide end there are 2 teeth with a rectangular notch between them. Cross section a narrow curved line, thicker in the center. Form trapezoidal to rounded triangular, compressed, very thin, with the whole achene or the margins curved toward one face. A central lengthwise rib may be present on one or both faces. There is a small pointed tip at the basal attachment point. At the apex there are 2 distinct teeth; the rectangular notch between the teeth includes an elliptical depression. The rim of the depression is ragged or has 2 lacerate teeth on each side.

Surface smooth, lustrous. With magnification it appears striate and finely textured. The ventral face, except for the margins, has a dense covering of white strigose hairs. Streaked purple and green; the color of the ventral surface is obscured by the hairs.

Length 1.1--1.2 cm; width 7--9 mm; thickness ± 1.1 mm.

205.

Silphium perfoliatum L.

Cup plant



Asteraceae

Achene:

Outline obovate; at the wide end there are 2 small acute teeth with a U-shaped notch between them. Cross section a very narrow ellipse. Form obovoid, compressed, thin, often bent. On each face there is a rounded ridge extending from the base about 1/2 the length of the achene. There is a very thin marginal wing, ± 0.5 mm wide, which extends to form the apical teeth. The notch between the teeth is ± 1.5 mm wide and includes the style base.

Surface smooth, with a soft sheen. It is finely striate and has many small red-brown resinous dots, visible with magnification. The wing is stiff and papery. Gray-brown; the wing is light brown.

Length 8.9--10.3 mm; width 6.2--7.3 mm; thickness ± 1.0 mm.

206.

Solidago rigida L.

Stiff goldenrod

Asteraceae

Achene:

Outline oblong, but narrowed toward the base. Cross section oblong or 5-sided. Form oblong, compressed. There is a small thin flaring apical collar; the persistent pappus of minutely barbed white hairs, ± 4 mm long, spreads from the collar.

Surface with closely spaced smooth lengthwise ridges; there are about 8 ridges on each of the 2 broad faces, and the interspaces are very narrow. The ridges are pale tan, the interspaces brown.

Length 2.4--3.0 mm; width 0.5--0.9 mm; thickness 0.3--0.5 mm.

207.

Sonchus asper (L.) Hill

Prickly sow thistle

Asteraceae

Achene:

Outline somewhat elliptical, gradually tapered to the base and abruptly narrowed at the apex. Cross section a very thin ellipse. Form ellipsoid, compressed; the margins are winged and there are 3 fine lengthwise ribs on each face. There is a small white apical collar, ± 0.2 mm in diameter. The pappus of many fine soft white hairs, ± 7 mm long, spreads from the collar.

Surface smooth, dull. When seen at 10x magnification it appears very finely roughened and has a slight sheen. At high magnification minute barbs on the marginal wings and a few barbs on the ribs are visible. Light to medium red-brown, with paler wings and ribs.

Length 2.7--3.0 mm; width 1.3--1.5 mm; thickness ± 0.3 mm.

208.

Taraxacum laevigatum (Willd.) DC.

Red-seeded dandelion

Asteraceae

Achene:

Outline elliptical, but narrowed toward the base. Cross section biconvex or concave-convex, thin and ridged. Form ellipsoid, compressed, sometimes curved. There are about 10 lengthwise ridges on the achene, interspersed with about 5 grooves, all irregularly spaced. The base is truncate with a small dark sunken attachment scar. A filiform extension, ± 7 --8 mm long, projects from the apex but is easily broken. The pappus consists of many hairs spreading from the end of the extension. These hairs are ± 5 mm long, white, and finely barbed.

Surface finely textured, dull. Each of the ridges has about 5 thin upwardly directed teeth. These teeth are larger and more flared toward the apex. Orange-brown.

Length 3.8--4.0 mm; width 0.7--0.9 mm; thickness ± 0.4 mm. (Measurements exclude the extension and pappus.)

209.

Taraxacum officinale Weber

Common dandelion

Asteraceae

Achene:

Outline elliptical. Cross section a thin oblong. Form oblong or spindle-like, compressed, with about 10 lengthwise ridges. A filiform extension, ± 6.5 -- 7.0 mm long projects from the apex but is easily broken. The pappus consists of many fine hairs spreading from the tip of the extension. These hairs are ± 5 mm long, white, and finely barbed.

Surface dull. When seen at high magnification it appears finely striate. The ridges are slightly toothed near the basal end, with the teeth becoming more prominent toward the apex. In the apical $1/3$ the teeth are flaring and upwardly directed. Dull olive.

Length 3.3 -- 4.0 mm; width 0.6 -- 1.0 mm; thickness ± 0.4 mm. (Measurements exclude the extension and pappus.)

210.

Tragopogon dubius Scop.

Goat's beard

Asteraceae



Achene:

Outline a very thin ellipse, often curved, with an oblique base and a long apical stalk ending in spreading hairs. Cross section 5-angled. Form ellipsoid, very long, somewhat 5-sided, variously bent or curved, with an oblique base and an extended beak. The base is hollow and has a small remnant of a stalk. There are 10 lengthwise ribs; 5 of these form distinct angles which alternate with 5 less-defined ribs. From the beak arise many firm bristles, ± 2.3 -- 2.7 cm long. These bristles are feathery with short soft hairs. The beak is usually persistent on the achene, but the bristles are readily shed.

Surface rough, dull. All 10 ribs are covered by thin flaring upwardly directed teeth. At 20x magnification these teeth appear to be covered with tiny scales which are oriented lengthwise. Buff to dull brown, with the beak and bristles paler; the teeth are sometimes paler than the spaces between them.

Length (including beak) 2.9--3.4 cm; length (toothed

portion only) 1.2--1.4 cm; thickness 1.5--1.6 mm.

211.

Vernonia baldwinii Torr.

Western ironweed

Asteraceae

Achene:

Outline oblong, narrowed toward the base. Cross section elliptic or 5-sided. Form terete or slightly, narrowed slightly to the blunt base. There is a smooth rim around the basal attachment point. The apex is flat, and the pappus is persistent on a very short apical collar. The pappus consists of 2 series of shiny, purple, barbed bristles. The inner series is ± 6 mm long; the outer series is ± 1 mm long. There are about 5 narrow ribs on the body of the achene.

Surface dull. There are very fine hairs on the ribs, visible with high magnification. In the intervals between the ribs there are many small clear resinous droplets. Yellow-brown; there are some dots or streaks of purple, mostly in the intervals.

Length 2.4--2.8 mm; width 0.8--1.1 mm; thickness 0.6--0.9 mm. (Measurements exclude the pappus.)

212.

Vernonia fasciculata Michx.

Ironweed

Asteraceae



Achene:

Outline oblong, narrowed toward the base. Cross section round or elliptical, distinctly toothed. Form terete or slightly compressed, narrowed slightly to the blunt base. There is a circular rim at the basal attachment point. The apex is flat, and the pappus is persistent on a very short apical collar. The pappus of shiny, purple, barbed bristles is in 2 series. The inner series is ± 6 mm long; the outer series is ± 1 --2 mm long. There are about 10 prominent narrow ribs on the body of the achene.

Surface dull. There are some very fine hairs on the ribs, visible with high magnification. In the intervals between the ribs there are many small yellow resinous droplets. Yellow-brown; there are small flecks of purple in the grooves.

Length 3.0--3.6 mm; width 0.8--1.0 mm; thickness 0.6--1.0 mm. (Measurements exclude the pappus.)

213.

Xanthium spinosum L.

Spiny cocklebur



Asteraceae

The unit of dispersal is a bur (an involucre structure) with 2 chambers, one achene in each chamber.

Bur:

Outline elliptical and spiny. Cross section elliptical. Form ellipsoid, slightly compressed, with a blunt base. At the apex there are 2 acute beaks, ± 0.5 mm long; typically, just below one of the beaks is a stout straight spine, 1--3 mm long. There are many spreading spines, ± 1.5 --2.0 mm long; these are straight except for a distinct hook-shaped curve at the tip. Surface uneven, shiny. It has fine lengthwise ridges, but is mostly covered with many tangled short white hairs and yellow resinous droplets. Light yellow-brown.

Length 1.0--1.2 cm; width ± 7.0 mm; thickness ± 6.0 mm. (Measurements include the spines and beaks.)

The achenes are elliptical in outline and plano-convex in cross section. Dark gray, striate. Length ± 9 mm; width ± 2 mm; thickness ± 1 mm.

214.

Xanthium strumarium L.

Cocklebur

Asteraceae



The unit of dispersal is a bur (an involucral structure) with 2 chambers, one achene in each chamber.

Bur:

Outline long ovoid, with many hooked spines, and with 2 hooked teeth spreading from the apex. Cross section round. Form long-ovoid, tapered to a small blunt attachment point at the base, very spiny. There are 2 beaks, each ± 5 mm long and curved inward to a hooked tip; the beaks form a V at the apex.

Surface dull, covered with many curly hairs. The bases of both the spines and the beak are also hairy. Light brown.

Length 2.2--2.8 cm; diameter 1.4--1.7 cm.

(Measurements include the spines and beaks.)

The achenes are compressed ellipsoid in form, broadest below the middle, with a small basal attachment point. Cross section plano-convex. The seed itself is tan, but it is enclosed in a striate papery pericarp which is

silvery-black. The pericarp has lengthwise ridges and is tapered to a fine tip at the apex. Length ± 10 mm; width ± 3 mm; thickness 1.2 mm.

215.

Aegilops cylindrica Host.

Goat grass

Poaceae

Usually found as a spikelet of 2 or 3 florets firmly attached to a segment of the rachis.

The spikelet and associated rachis form a cylindrical unit. The rachis has ± 9 slightly barbed nerves; it flares and becomes thicker toward the top. The spikelet fits closely into the rachis. Two nearly equal glumes and the awns of 2 lemmas are visible. The glumes are thick and firm, with ± 7 slightly barbed nerves. Each glume has a bifid apex with the outer tooth expanded into a barbed awn. The lemma is membranous, firm; there is a short awn from the back of the lacerate, bifid apex. The palea is membranous, thin. It is concave, adherent to the caryopsis and has a ciliate margin. The length of the awns varies greatly with the position on the rachis. Awns of glumes range from ± 4 mm long (lower spikelets) to ± 10 mm (upper spikelets), with that of the uppermost spikelet much longer, ± 6 cm. The awns of the lemmas range from ± 1.5 mm to 7 mm long. Straw colored or greenish.

Length (entire unit) 9.5--10.5 mm; diameter ± 3 mm.

The lemma is ± 9.5 mm long, 2.5 mm wide.

216.

Agropyron repens (L.) Beauv.

Quackgrass

Poaceae

May be found as a floret or as a spikelet. Floret:

Outline elliptical, broadest below the middle. Cross section C-shaped. Form ellipsoid, convex on the dorsal side and concave on the ventral side. The caryopsis has a U-shaped cross section. The lemma (convex side) is ± 9 -- 10 mm long, 1.0 -- 1.2 mm wide, with ciliate margins, and an awn from the apex. The basal attachment area is oblique, 3-sided. The rachilla may be present; it is pubescent and ± 1.0 mm long.

Both the lemma and palea are thin and firm, with obscure nerves. At high magnification the lemma appears very finely tuberculate. Straw colored; the caryopsis is brown.

Length ± 10.0 mm; width ± 1.7 mm.

217.

Bromus inermis Leyss.

subsp. *inermis*

Smooth brome

Poaceae

Floret:

Outline elliptical, widest above the middle. Cross section a slightly curved line. Form ellipsoid, thin, flat. The lemma is 3-nerved and has very thin marginal wings which are inrolled in the lower half. The palea is 3-nerved, slightly shorter than the lemma and is adherent to the caryopsis. The basal attachment area is oblique, with the circular scar visible on the palea side. The rachilla is usually present and is about 1/3 the length of the floret.

The lemma and palea appear smooth and membranous. The rachilla and the nerves of the lemma and palea are minutely scabrous with short hairs which are visible at 10x magnification. Light yellow-brown, with the dark brown caryopsis evident through the palea. The lemma margins are transparent; the rachilla and attachment area are pale.

Length 9.5--10.6 mm; width 1.9--2.7 mm; thickness 0.4--0.5 mm.

218.

Bromus japonicus Thunb. ex Murr.

Japanese brome

Poaceae

Found as a spikelet of about 6--10 florets, or as a floret. The floret:

Outline a narrow ellipse with a long awn from the apex. Cross section C-shaped. Form long-ellipsoid, with one concave face. The lemma, on the convex face, is rhombic, with a bifid apex. It is 7-nerved and has transparent inrolled margins. A minutely barbed awn, ± 1.0 -- 1.2 cm long, arises from the back of the lemma, about $1/4$ the distance below the apex. The palea is thin and adherent to the caryopsis. The base of the floret is oblique, with a round attachment scar. The rachilla may be present in the groove on the palea side.

The lemma and palea are membranous, smooth, and have a slight luster. There are scattered very short hairs on the lemma; the palea has scattered marginal hairs, ± 0.5 mm long. Straw-colored.

Length 7.9--9.0 mm; width 1.0--1.6 mm. (Measurements exclude the awn.)

219.

Bromus secalinus

Cheat

Poaceae



Found as a floret:

Outline ellipsoid. Cross section U-shaped. Form ellipsoid, folded lengthwise, with a deep groove on the ventral side. The lemma is rounded and slightly keeled. It has a straight or reflexed scabrous awn, $\pm 5-7$ mm long, which arises just below the apex. The palea has ciliate margins; it is thin and adherent to the caryopsis. There is a smooth white rim at the base, visible from the dorsal side. On the ventral side there is a circular attachment scar at the base. The rachilla is conspicuous, ± 1.5 mm long; it lies above the groove and is curved outward.

The lemma is thin and membranous, with translucent margins. Tan or greenish; the caryopsis is brown.

Length 7.5--7.9 mm; width (side to side) 0.9--1.7 mm; thickness (dorsal-ventral) 1.7--2.1 mm.

220.

Bromus tectorum L.

Downy brome

Poaceae

Found as a spikelet of about 4--7 florets, or as a floret. Floret:

Outline narrowly elliptical, widest just above the middle, and with a long awn from the apex. Cross section C-shaped. Form long-ellipsoid, thin. The floret appears to be rolled around the lengthwise axis and then reflexed. The lemma is elliptical with a bifid apex and thin transparent margins. It has 7 nerves. A minutely barbed stiff awn arises from the back of the lemma, ± 2 mm below the apex. The awn may be straight or reflexed. The palea is elliptical and 3-nerved. There is a thin smooth callus area at the base, with a round attachment scar. The rachilla, ± 2 mm long, may be present.

The lemma and palea are membranous and dull. The lemma has straight white hairs, with longer hairs near the margins. The palea has scattered long hairs on its margins. Tan, with a red tinge.

Length 10.5--12.1 mm; width 1.1--1.5 mm.

(Measurements exclude the awn.)

221.

Chloris verticillata Nutt.

Windmill grass

Poaceae

Caryopsis:

Outline elliptical. Cross section rounded triangular. Form long-ellipsoid, 3-sided, with two flat faces and one curved face. The scutellum is a depressed area at the base of the angled side of the seed. The scutellum extends $1/3$ -- $2/3$ the length of the seed. It has a central lengthwise ridge and a very small rim.

The surface is finely striate and appears somewhat glossy when seen with magnification. Translucent yellow; the basal end of the curved face is brown.

Length 1.4--1.6 mm; thickness 0.5--0.6 mm.

222.

Cynodon dactylon (L.) Pers.

Bermuda grass



Poaceae

Floret:

Outline somewhat elliptical; one long edge is nearly straight, the other distinctly curved. Cross section a narrow triangle. Form ellipsoid, compressed, with two broad faces and one very narrow face. The lemma encloses the broad faces and is keeled along the curved edge. The palea clasps the narrow face. The rachilla lies along the palea and is about $3/4$ the length of the floret.

The lemma and palea appear slightly striate and have a sheen. At high magnification a striate-reticulate pattern is visible. The keel of the lemma is pubescent. Purplish brown.

Length 1.9--2.2 mm; width 0.8--0.9 mm; thickness 0.4--0.5 mm.

223.

Digitaria ciliaris (Retz.) Koel.

Southern crabgrass

Poaceae

Found as a spikelet with 2 florets. Spikelet:

Outline long-elliptical with a blunt base and narrow apex, widest below the middle. Cross section plano-convex. Form long-ellipsoid, broadest below the middle, with one flat face. The first glume is ± 0.4 -- 0.5 mm long. The second glume is 3-nerved, narrow, ± 2.2 mm long, and has conspicuous marginal hairs. The sterile lemma is as long as the spikelet; it has 3 nerves and ciliate margins. The glumes and sterile lemma are thin and membranous. The fertile lemma is firm, and has an acuminate tip and inrolled membranous margins which clasp the firm palea. Only a narrow triangular area of the palea is visible.

The glumes and sterile lemma are lusterless. Greenish, tinged with purple. The lemma and palea are smooth and slightly shiny. When seen with magnification the surface of the lemma appears finely roughened with lengthwise rows of tiny pits. Both the lemma and the palea are straw-colored or greenish.

Length 3.0 -- 3.6 mm; width 0.9 -- 1.0 mm; thickness

0.4--0.6 mm.

224.

Digitaria ischaemum (Schreb ex Schweigg.)

Schreb. ex Muhl.

Smooth crabgrass

Poaceae

Found as a spikelet:

Outline elliptical with a blunt base and pointed apex. Cross section plano-convex. Form ellipsoid with one flat face. The first glume is lacking. The second glume and the sterile lemma are both membranous, greenish, lightly pubescent, and as long as the floret. The glume is 3-nerved and the sterile lemma 5-nerved. The fertile lemma and the palea are thin but firm and shiny. The very thin inrolled margins of the lemma clasp the palea, permitting only a small strip of the palea to show. The lemma and palea are black. The lemma margins are whitish.

The surface of both lemma and palea appears striate when seen at low magnification, but distinctly scalariform at high magnification.

Length 1.9--2.0 mm; width 0.9--1.0 mm; thickness 0.4--0.5 mm.

225.

Digitaria sanguinalis (L.) Scop.

Hairy crabgrass

Poaceae

Typically found as a spikelet:

Outline long elliptical with a lanceolate tip and blunt base. Plano-convex in cross section. Form long ellipsoid, flat on one face, and with a long tapered apex. The first glume is very small, ± 0.4 mm long, with an acute tip. The second glume is more than half as long as the spikelet, has 3 nerves, pubescent margins, and a lanceolate tip. The sterile lemma is as long as the spikelet, with 3 prominent nerves and ciliate margins. The glumes and sterile lemma are membranous. The fertile lemma and palea are firm and clasp the grain securely.

The glumes and sterile lemma are tan and lusterless. The lemma and palea are nearly smooth, with fine striations, dull olive in color, and with a slight sheen.

Length 2.7--3.0 mm; width 0.8--0.9 mm; thickness 0.4--0.5 mm. (Measurements of entire spikelet.)

226.

Echinochloa crusgalli (L.) Beauv.

Barnyard grass

Poaceae



Unit of dispersal is a floret or spikelet.

Spikelet: The first glume (on the flat side) is about 1/2 as long as the spikelet, 3-nerved, with an acute tip. The second glume is as long as the spikelet, 3-nerved, with a tapered tip. The sterile lemma is as long as the spikelet and clasps the fertile floret. It is 3-nerved, with the central nerve extended into a very long awn. The glumes and sterile lemma are membranous, covered with short hairs, and have spiny nerves.

Floret: Outline elliptical with a long tapered apex. Cross section plano-convex. Form ellipsoid with one long tip. There is one flat face; the other face is strongly convex or has a hump in the center, but is thin toward the apex. The lemma margins clasp the palea, enclosing the grain.

The lemma and palea are smooth and very shiny. They are tan with faint striate markings. The lemma has 3--5 faint, pale lengthwise stripes.

Length 3.5--4.2 mm; width 1.6--2.0 mm; thickness

1.1--1.4 mm.

227.

Eleusine indica (L.) Gaertn.

Goosegrass

Poaceae

Caryopsis:

Outline elliptical. Cross section heart-shaped. Form elongate, somewhat 3-sided. There are 2 flat faces which join at about 45° in a rounded angle. The third face has a distinct V-shaped lengthwise furrow. The apex is rounded. Near the base on the grooved side is a flattened area with the round, slightly elevated attachment scar, ± 0.1 mm in diameter. At the base on the angled side the scutellum is an indented area oblique to the angle. The scutellum and the flattened area together form a blunt tip at the base of the grain.

Surface covered with 2 sets of arched concentric ridges. These arches begin at the scutellum, rise toward the apex on each side and descend to the furrow. There are about 10 arches on each face. The ridges are narrow and wavy. At high magnification a reticulate pattern is visible between the ridges, and the surface appears shiny. Dark orange brown. At high magnification the ridges are dark and the interspaces are light or medium orange.

Length 1.0--1.3 mm; width 0.4--0.5 mm; thickness
0.5--0.6 mm (Width measured across both flat faces.)

228.

Elymus canadensis L.

Canada wild rye

Poaceae

Floret:

Outline elliptical with a very long straight awn from the apex. Cross section ellipsoid, with a rectangular notch in one long edge. Form ellipsoid, elongate, flattened. The lemma is 3-nerved and has a straight scabrous awn, ± 3 mm long, extending from the apex. The margins of the lemma curve over the palea. The palea has a rounded apex and recurved side margins which form a groove. The base is oblique, with the attachment point visible on the palea side. The rachilla, and sometimes a sterile floret, may be present in the groove.

The lemma and palea are membranous and dull. Tan. The lemma has fine short white hairs; the palea is glabrous.

Length (not including awn) 6.8--7.5 mm; width 1.1--1.6 mm; thickness 0.8--1.0 mm.

229.

Eragrostis cilianensis (All.) E. Mosher

Stinkgrass

Poaceae

Usually found as a caryopsis:

Outline ovate. Cross section round or slightly compressed. Form ovoid with a tiny tip at the base; slightly compressed sideways. The scutellum is a depressed area on the dorsal face, extending from the base 1/3 or more the length of the grain. There is a distinct narrow ridge in the center of the scutellum.

Surface smooth, dull. At high magnification a low-relief reticulate pattern is visible. Orange-brown. There is a dark spot, the attachment point, near the base.

Length 0.5--0.6 mm; width 0.4--0.5 mm; thickness ± 0.4 mm.

230.

Festuca octoflora Walt.

Six-weeks fescue

Poaceae

Floret (disarticulation is above the glumes, so these are lacking in the floret):

Outline elliptical with a truncate base and tapered, awned apex. Cross section C-shaped. Form narrowly ellipsoid, rolled, with the dorsal face convex and the ventral face deeply grooved. The lemma (dorsal face) is inrolled to meet the edges of the concave palea. An awn, ± 0.5 -- 0.7 mm long, extends from the apex of the lemma. The rachilla is usually present (on the palea side); it is ± 0.5 mm long and has a broad flat apex. The basal attachment area is smooth and elliptical.

The lemma is minutely scabrous. Yellow-brown, translucent, with the caryopsis visible as an orange area.

Length (including awn) 2.6 -- 3.9 mm; width 0.5 -- 0.6 mm; thickness 0.4 -- 0.5 mm.

231.

Hordeum pusillum Nutt.

Little barley

Poaceae

The unit of dispersal is usually a segment of the rachis with a fertile spikelet between 2 sterile spikelets.

The sterile florets are pedicellate and narrowly elliptical. The first glumes are lanceolate and awned. The second glumes are awn-like. The lemmas and paleas are narrow.

The fertile spikelet is long-elliptical in outline with a long awn from the apex. Cross section plano-convex. Form long-ellipsoid shape, flat on one face. It has a blunt base, long tapered apex, and is widest just below the middle. Both glumes and the lemma of the fertile floret are awned; the awns up to 7 mm long. The lemma clasps the palea. The palea has a lengthwise groove; a rachilla segment is in the groove. The rachilla segment is about 3/4 the length of the floret.

The lemma is striate and has fine, short bristles. The palea is smooth. Both lemma and palea are papery and dull. Buff colored.

Length 5.9--7.0 mm; width 1.6--1.8 mm; thickness

1.0--1.2 mm. (Measurements of the fertile floret,
excluding the awn.)

232.

Panicum capillare L.

Common witchgrass

Poaceae



Floret:

Outline elliptical, with an acute apex and blunt base. Cross section rounded elliptical. Form ellipsoid, compressed front to back, and with one face somewhat flattened. The lemma, on the more convex face, has 5 nerves. The lemma margins clasp the 2-nerved palea. At the base there is a small crosswise elongate attachment scar.

The surface of the lemma and palea is smooth and very shiny. Both are dark gray with pale yellow nerves, margins, and base. When seen at high magnification, the gray areas appear finely streaked.

Length 1.3 mm; width 0.8 mm; thickness 0.6--0.7 mm.
(Measurements of entire floret.)

233.

Panicum dichotomiflorum Michx.

Fall panicum

Poaceae



Found as a spikelet or a floret.

Spikelet: Elliptical with a narrow apex. The glumes and sterile lemma are loose and papery in texture. They are buff to green in color, or sometimes purplish. The first glume is blunt, $1/4$ to $1/3$ as long as the spikelet. The second glume has 5--7 distinct nerves. The sterile lemma has about 5 nerves. Length of the spikelet is ± 2.6 mm.

Floret: Outline elliptical, with a blunt base and acute tip. Cross section elliptical. Form ellipsoid, somewhat compressed, with one face convex, and the other nearly flat. The lemma, on the convex face, clasps the palea, enclosing the grain. The lemma has 5 distinct nerves and 2 faint nerves, which all converge toward the apex. The 3 nerves on each side of the central nerve originate from a lateral point near the base.

The lemma and palea are smooth and shiny. With magnification the surface appears striate. The color is light to dark olive; the nerves, apex, and base are paler.

Length 2.0--2.1--mm; width 0.8--0.9 mm; thickness
0.5--0.6 mm. (Measurements of the floret.)

234.

Panicum miliaceum L.

Broom-corn millet

Poaceae

Floret:

Outline elliptical. Cross section elliptical. Form short-ellipsoid, compressed, with a blunt base and acute apex. It is thickest above the middle, appearing obovate in edge view. The V-shaped basal attachment scar is visible from the palea side. The lemma and palea are firm and completely enclose the caryopsis. The lemma has 7 faint nerves: 1 central, 1 near each margin, and a pair on each side of the center, all converging at the apex. The palea has 4 nerves.

Both lemma and palea are very smooth and shiny. When viewed at high magnification, a very fine, low-relief scalariform pattern is visible. Orange; the margins of the lemma are pale.

Length 2.9--3.2 mm; width 2.0--2.2 mm; thickness 1.5--1.7 mm.

235.

Panicum virgatum L.

Switchgrass

11

Poaceae

Found as a spikelet or a floret.

Floret: Outline long-ovate. Cross section plano-convex. Form long ovoid with one flat face. The lemma, on the convex side, has margins which clasp the palea. The lemma margins are shaped so that the exposed area of the palea has an hourglass shape. The base is obliquely truncate, making the round attachment scar visible on the flat face. From the convex side, the base appears as a small callus tip.

The lemma and palea are smooth and shiny. Faint lengthwise striations are visible with magnification. Both the lemma and palea are pale straw-colored; 5 pale nerves may be visible on the lemma.

Length 2.8--3.0 mm; width 0.9--1.1 mm; thickness 0.6--0.8 mm.

236.

Setaria faberii Herrm.

Giant foxtail



Poaceae

Found as a spikelet or floret.

Spikelet: Ellipsoid overall. The first glume is ± 1 mm long, 3-nerved. The second glume (convex face) is ± 2 mm long, 5-nerved. The sterile lemma is the full length of the floret, 5-nerved, with rolled margins. The glumes and sterile lemma are membranous.

Floret: Outline elliptical, with acute ends. Cross section plano-convex. Form ellipsoid, with one nearly flat face and one strongly convex face. In edge view, the floret appears thickest at or just below the middle. The lemma, on the convex face, clasps the palea, completely enclosing the caryopsis. The attachment scar is at the base on the flat side.

Both the lemma and the palea are hard and shiny. With magnification, small papillae arranged in lengthwise rows are visible. The lemma also has fine cross-corrugations. On the palea there is a narrow smooth lengthwise strip on either edge, next to the lemma margins. Usually gray-brown, but may be light brown or pale green. There

may be 2 pale lengthwise stripes on the lemma.

Length 2.5--2.8 mm; width 1.4--1.5 mm; thickness
1.0--1.2 mm.

237.

Setaria glauca (L.) Beauv.

Yellow foxtail

Poaceae



Found as a spikelet or a floret.

Spikelet: Ellipsoid. The first glume is ± 1 mm long, 3-nerved. The second glume (convex face) is ± 1.5 mm long with a blunt tip, 3-nerved. The sterile lemma is the full length of the floret, 5-nerved. The glumes and sterile lemma are thin and papery, greenish.

Floret: Outline elliptical with acute ends. Cross section plano-convex with the convex side very strongly so. Form ellipsoid, very short, with one flat face. The lemma, on the convex face, clasps the palea, enclosing the caryopsis. The attachment point is at the base.

Both the lemma and the palea are firm and dull. With magnification they appear somewhat shiny. Both are finely papillate. The lemma is cross-corrugate with rough ridges, distinctly visible with magnification. The palea is finely striate and slightly cross-corrugate. Dark gray-brown with paler ridges, base, and lemma margins.

Length 2.6--2.8 mm; width 1.5--1.6 mm; thickness 1.0--1.2 mm.

238.

Setaria viridis (L.) Beauv.

Green foxtail

Poaceae

Found as a spikelet or floret.

Spikelet: The first glume is ± 0.7 mm long, 3-nerved. The second glume (convex face) is nearly the length of the floret, 5-nerved. The sterile lemma is the full length of the floret, 5-nerved. The glumes and sterile lemma are thin and papery.

Floret: Outline elliptical with acute ends. Cross section plano-convex. Form ellipsoid with one flat face. There is a slightly elevated round area near the base on the convex face. The lemma (on the convex face) clasps the palea, enclosing the caryopsis. The attachment point is at the base.

Both the lemma and the palea are firm and appear shiny when seen with magnification. There are 3 faint longitudinal ridges on the lemma. Both the lemma and the palea have a fine striate pattern of papillae. When seen at high magnification, the lemma and palea appear slightly cross-corrugate. On the palea there is a smooth, shiny lengthwise strip on either edge, next to the lemma margins. Usually tan with paler ridges; but may vary from pale green

to brown.

Length 1.8--1.9 mm; width 1.0 mm; thickness 0.6--0.7 mm.

239.

Sorghum bicolor (L.) Moench

Shattercane

Poaceae

Found as a single fertile spikelet with 2 pedicellate sterile spikelets attached.

Outline short ellipsoid, the apex acute. Cross section rounded triangular. Form ellipsoid. The glumes completely enclose the floret. The first glume (dorsal face) is somewhat flattened; the ventral face is bulging and slightly ridged. The side margins of the first glume are folded around the second glume. The margins of the second glume are inrolled. The lemma and palea are membranous, very thin. There are 2 pedicels appressed to the ventral face. Each pedicel may bear a lanceolate sterile spikelet. These are nerved, membranous, ± 3.5 mm long, and slightly exceed the fertile spikelet. The caryopsis is ellipsoid, dull, brown, ± 3 mm long.

The glumes are very hard, smooth, and shiny. There are stiff fine yellowish or reddish hairs which are more abundant near the base, apex, and side margins. The pedicels have abundant silky hairs. Dark red-brown to black, with scattered white granules.

Length 4.3--5.5 mm; width 2.8--3.2 mm; thickness
2.4--2.8 mm.

240.

Sorghum halepense (L) Pers.

Johnson grass

Poaceae

Found as a single fertile spikelet with 2 pedicellate sterile spikelets attached.

Outline ellipsoid, the apex acuminate; broadest at or just below the middle. Cross section rounded triangular. Form ellipsoid. The glumes completely enclose the floret. The first glume (dorsal face) is flat; the second glume has a central lengthwise hump which extends into a ridge near the apex. The side margins of the first glume are folded around the second glume. The margins of the second glume are inrolled. The lemma and palea are membranous and very thin. There may be a bent awn from the apex of the lemma, but it is readily deciduous. There are 2 pedicels appressed to the ventral face; they may bear sterile spikelets which are lanceolate, membranous, ± 4.5 mm long, exceeding the fertile spikelet. The caryopsis is obovate, dull, brown, ± 2 mm long.

The glumes are firm, smooth, and shiny. A fine scalariform pattern is visible at high magnification. There are silky hairs on the pedicels, and few on the

glumes of the fertile spikelet. Straw colored or purplish, or with purple streaks or blotches.

Length 4.5--4.8 mm; width 1.5--2.0 mm; thickness 1.1--1.4 mm.

CONCLUSIONS

Careful examination of the seeds and seed-like fruits of a wide range of weedy plants permitted discrimination of each species in nearly every case. The variation observed among seeds of any given species did not obscure their own distinctive character to the extent that the seeds could be mistaken for those of another species. There were a few pairs of closely related species which were difficult to distinguish, notably *Polygonum amphibium* and *Polygonum pennsylvanicum*, and *Verbascum thapsus* and *Verbascum blattaria*.

Many weed seeds are dispersed within a fruit or fruit-like structure. These fruits function much like seeds, and were treated as seeds in this study. However, they are not like seeds anatomically. In general, fruits appeared to be more variable (within a species) than true seeds. Perhaps for reasons related to internal constraints on development, the appearance of seeds seems to be relatively unaffected by environmental variations. Fruits, such as the achenes of the Asteraceae, can vary markedly in size and shape depending on their position in the inflorescence.

The differences between true seeds and seed-like

fruits also makes it difficult to describe them in strictly comparable terms. For example, a seed has a hilum, while a fruit has only an attachment point or region. Fruits often have spines, awns, or hairs on the surface; these are rare on seed surfaces. Seed surfaces often have well-defined, though small-scale, patterns or textures; there is a great variety of these. Achene surfaces often lack any particular pattern; those that are sculptured are limited to a few variations, usually involving lengthwise ridges.

For most species, only a single sample of about 10 seeds was examined and measured. No conclusions can be drawn from these limited observations concerning the average size of the seeds. However, for a number of species which are widespread or cosmopolitan weeds, there are other published descriptions and measurements available. The measurements obtained in this study were compared casually to some of those reported by other authors. While there were no drastic differences noted, many of the samples of Kansas weed seeds in this study appeared to have a larger average size than the seeds of the same species from other regions. (Most published measurements were made from seeds of the eastern United States.)

The careful study of seeds and seed-like fruits can

provide a useful means of identifying weedy plants, as well as permitting the identification of isolated seeds. Though seeds are often inconspicuous, they are actually quite distinctive. Standardized terminology and methods of measurement would make the inclusion of seed characters more useful in keys and in comparative studies. More information on seeds could often be incorporated in descriptions of plants in regional floras and weed manuals. Attention to the characters of seeds and fruits could likewise contribute to taxonomic studies.

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APPENDIX A: GLOSSARY

*Terms illustrated in Appendix B

Accumbent The embryo bent, with the hypocotyl against the edges of the 2 cotyledons.

Achene A dry, indehiscent, 1-seeded fruit.

***Alveolate** Surface with shallow rounded indentations with narrow ridges between them.

Apex The upper end, or the end opposite the hilum (the attachment point of a fruit) regardless of actual orientation.

***Areolate** Surface with rounded indentations and distinct ridges between them; more pronounced relief than alveolate, but less than reticulate.

Aril A fleshy outgrowth from the funiculus.

Attachment point The place at the base of a fruit which was attached to the receptacle of the flower. The attachment point may be scar-like but is not a true hilum.

Awn A conspicuous terminal bristle.

Base The lower end, or the attachment end regardless of actual orientation.

Beak A long, firm tip. In describing the achenes of the

Asteraceae, "beak" is sometimes used to mean the remnant of the style base which is typically present at the apex; in most Asteraceae achenes this beak is small, either blunt or pointed, but in achenes of the Lactuceae the beak is long and blunt.

Bract A modified, often reduced, leaf in an inflorescence.

Bur An involucre structure, resembling a fruit, but derived from an inflorescence; it is firm, indehiscent and completely encloses one or more fruits.

Caruncle A fleshy outgrowth in the area of the micropyle; often conspicuous in seeds of the Euphorbiaceae.

Caryopsis A grain, the fruit of the Poaceae; in a caryopsis the seed coat is fused to the pericarp.

Chalaza Area of the ovule where the integuments and nucellus join the funiculus; may be noticeable as a raised area on the seed surface.

Collar A thin, raised circular band.

*Colliculate Surface completely covered with small rounded elevations in low relief.

Coma A tuft of fine hairs.

Dorsal The outer or lower face.

Embryo The rudimentary immature plant contained in the seed.

Filiform Slender, thread-like.

Floret A small flower in a dense inflorescence; in the

Poaceae, some of the floret parts may be persistent on the fruit (caryopsis), sometimes completely enclosing it. In the Asteraceae some parts of the floret, e. g., the pappus, may persist on the achene.

Funiculus The stalk attaching the ovule to the ovary wall.

Glumes Sterile bracts subtending a spikelet (Poaceae).

Hilum The scar on the seed surface, where the immature seed (i.e., the ovule) was attached to the funiculus.

Incumbent The embryo bent, with the hypocotyl against the broad side of the cotyledons.

Involucre A cluster of bracts subtending an inflorescence.

Lacerate An irregular margin, appearing torn.

Lemma The outer one of 2 bracts subtending an individual grass floret.

Mericarp A 1-seeded unit of a schizocarp.

Ovary The ovule-bearing area of the pistil.

Ovule The embryonic seed, consisting of the nucellus, integuments and eventually the embryo sac.

Palea The inner one of 2 bracts subtending a grass floret.

***Papillae** Small, rounded surface projections in moderate relief.

Pappus In fruits (achenes) of the Asteraceae, an apical crown of scales, teeth, bristles, hairs, or awns; it is a modified calyx.

- Perianth The petals and sepals of a flower collectively.
- Pericarp The fruit wall, derived from the ovary wall.
- Plumose Feather-like, with fine hairs.
- Processes Fine projections or extensions of any kind.
- *Punctate Minutely pitted.
- Rachilla The axis of a grass spikelet.
- Rachis The main axis of a grass inflorescence.
- Raphe A ridge or line on the seed surface formed by the part of the funiculus which is persistent and fuses to the seed coat; usually noticeable in seeds of the Euphorbiaceae.
- *Reticulate A net-like texture, with the network distinctly raised from the surface.
- Retorse Oriented backward or downward.
- Schizocarp A dry, dehiscent fruit which separates into 1-seeded units at maturity.
- Seed A mature ovule.
- Seed coat Outer covering of the seed, derived from the integument(s) of the ovule.
- Spikelet A unit of an inflorescence, composed of 1--many florets (Poaceae).
- Strigose With stiff, straight, appressed hairs which are swollen at the base.
- Stylopodium An enlarged base of the style, persistent in the fruit (e.g., in the Apiaceae).

*Tubercle A knobby surface projection.

*Scalariform A ladder-like pattern.

Seed stalk Funiculus, the stalk attaching the ovule to the ovary wall.

Style The elongated portion of the pistil, between the ovary and the pollen-receptive area, the stigma.

*Striations Very fine grooves or scratches.

Ventral The inner or upper face. Opposite to dorsal.

APPENDIX B:
ILLUSTRATIONS OF OUTLINE SHAPES,
THREE-DIMENSIONAL SHAPES,
AND SURFACE TEXTURES

Outline shapes

Round (circular)

Symmetrical in all directions.



Elliptical

Elongate; side margins
symmetrically curved; widest
at or near the midpoint.



Ovate

Elongate; side margins
symmetrically curved; widest
below the midpoint.



Obovate

Inverted ovate; widest
above the midpoint.



Lanceolate

Narrowly ovate.



Ob lanceolate

Narrowly obovate.

Pear shaped



Tear-drop shaped



Reniform (kidney shaped)



Cordate (heart shaped)



Square

Rectangular and equilateral.



Oblong

Rectangular, elongate; side margins straight and parallel.



Rhombic

With 4 sides and 4 angles; widest at or near the midpoint.



Trapezoidal



Triangular

With 3 sides and 3 angles; may be symmetrical or not.



Biconvex



V-shaped



Concave-convex



U-shaped



Planoconvex

C-shaped

Bases and apices

Acute

Pointed; the straight margins form an angle of 45° to 90° .



Acuminate

Pointed; the straight margins form an angle of less than 45° .



Cuspidate

Pointed; the concave margins form a narrow tip.



Rounded

Smooth curve.

Truncate

As if cut off at right angles to the longitudinal axis.



Apex rounded and base truncate.



Apex truncate and base rounded.

Three-dimensional shapes

Globose



Hemispherical

Ellipsoid



Ovoid



Sector (of a globose form)

Terete
(cylindrical)



Clavate



Sector (of an elongate form)

Spindle-like



Disc

Reniform



Conical



Chip-like

Surface textures



Punctate



Granular



Areolate



Papillate



Alveolate



Tuberculate



Reticulate



Colliculate



Striate



Scalariform

APPENDIX C:
ALPHABETICAL LIST OF SPECIES
WITH DESCRIPTION NUMBERS

Abutilon theophrasti 48
Acalypha monococca 101
Acalypha ostryaefolia 102
Acalypha rhomboidea 103
Acalypha virginica 104
Achillea millefolium 168
Aegilops cylindrica 215
Agropyron repens 216
Amaranthus graecizans 19
Amaranthus hybridus 20
Amaranthus palmeri 21
Amaranthus retroflexus 22
Amaranthus rudis 23
Amaranthus spinosus 24
Ambrosia artemisiifolia 169
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WEED SEEDS OF KANSAS:
DESCRIPTIONS OF 240 SPECIES
AND KEYS FOR IDENTIFICATION

by

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ABSTRACT

Two hundred forty species of weedy plants which occur in Kansas and which reproduce by seed were selected for study. Collections of at least one sample of seeds were made from living populations for each of 176 of these species. Voucher specimens of whole plants from the same populations were made at the same time. Seed samples of the remaining 64 species were obtained from other collectors or from herbarium specimens of the plants. Each sample of seeds was examined under magnification and measured. For those species in which fruits rather than seeds are the usual units of dispersal, the fruits were collected and examined in the same manner as seeds. Detailed descriptions were prepared for each species. The descriptions include the shape of the seed (both in outline and in cross section), its three-dimensional form, and any external structures visible, as well as surface texture and color of the seed, and any other features of the surface. Descriptive terms were defined and used consistently throughout the study. The length, width, and thickness of each seed was measured, and the descriptions report the range of measurements obtained. A dichotomous key was

constructed on the basis of the characters observed and measured. Use of the key requires a means of measuring and of magnifying seeds. The key and descriptions provide the information needed to identify seeds and seed-like fruits which may be found apart from the whole plants. The key permits identification, usually to the species level, of seeds and fruits of any of the 240 species included in the study.