

MAKING HERBARIUM SPECIMENS

Alison Mahoney© 9 September 2010

Darlene & William Radichel Herbarium (MANK)

Minnesota State University-Mankato

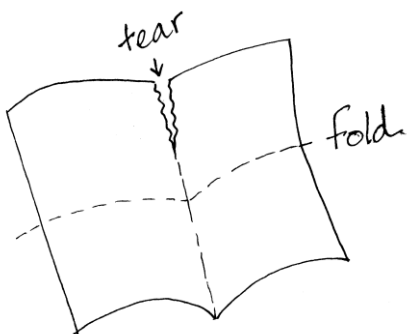
The Plant Press

Herbarium supply stores sell plant presses.

A very good plant press can be made with:

(1) Two 1/4" particle-board "end-boards." These may be 11 x 17" or slightly smaller. If you are collecting for a specific herbarium, make sure to find out the size of its mounting paper and make the press that size or slightly larger. See **Things to consider before you press.**

(2) A stack of corrugated cardboard dividers cut to 11.5 x 16.5" or smaller depending on the size of the herbarium's mounting paper. Figure a little more than 1 sheet per specimen. Make sure that when you cut these, the corrugations all run parallel to the *short side* of the cardboard. Moisture from the plants wicks into the cardboard. Air moving through the channels formed by the corrugations draws this moisture out of the press. This is an important part of the design.



(3) A length of heavy-weight cotton clothesline, 10 to 12' long. Make a 3-4" loop in one end of the rope (NOT a slip knot) and tie a knot in the other end to keep the rope from fraying. You don't want a slippery rope or a rope that is stiff and scratchy.

(4) A stack of newspaper. You will tear the newspaper into two halves along the sharp fold. Ideally, the single page of a newspaper, folded in half, should fit within the dimensions of your cardboard dividers. The size of the dividers dictates the maximum size of your finished specimen.

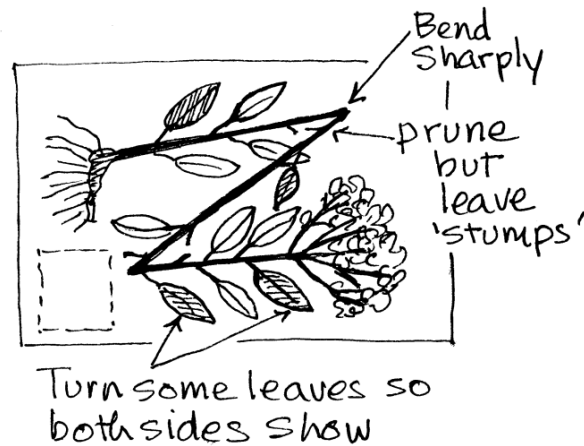
Things to consider before you press.

Specimen mounting papers come in several sizes. In the U.S., 11.5 x 16.5" is a common size. A good specimen will be pressed so that it fits comfortably within a 10.5 x 15.5" area. This allows a protective 1/2" margin around the plant. When plant parts are glued right up the edge of the paper, they get broken or shredded too easily. If you're collecting for a herbarium, make sure to find out the size of its mounting paper.

There must also be room on the specimen for a label, which is usually placed in the lower right hand corner of the paper. This is the place most people will reach for when taking specimens from their cabinets. Squeezing the label is better than squeezing any part of the plant. A common size for labels is 4-1/4 x 5-1/2" or smaller. When arranging a plant to be pressed, try to leave a corner open for the label.

Only relatively small plants will fit in a 10 x 15" area. Botanists sharply bend (not cut!) stems to form a V or zig-zag pattern. Sometimes a large plant will have to be glued onto two or more

mounting papers. When this is the case, each “sheet” will receive the *same* collection number and label information. Sheets will also clearly be marked “1 of 2” and “2 of 2” or as necessary, depending on the number of sheets that specimen filled. As you collect and press, you will be able to anticipate which specimens will require more than one sheet. Label your newspaper folders accordingly.



Collection notebook

Buy a sturdy notebook with archival-quality pages. Write with a pencil or permanent ink. *Never use ballpoint pen*, which has ink that never completely dries and can also fade. Whenever you collect plants, take your notebook with you. Specimens without collection data are worthless to a herbarium. See: **Recording data**.

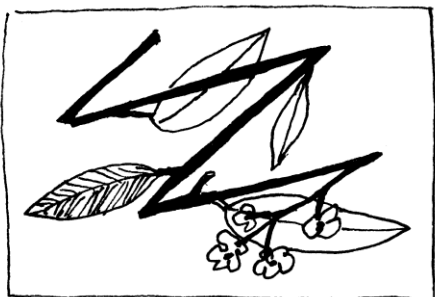
Collecting plants

In the days before plastic bags, collectors used “field presses,” which work very well. A field press consists of the end boards, newspaper, rope or straps, and a few sheets of corrugated cardboard (see: **The plant press**). Specimens are rough-pressed in the field in their newspaper folders and stacked on top of each other with only an occasional cardboard divider. The press is less bulky to carry. *Tie or strap field presses loosely!* Without the dividers, plants that are squeezed together too tightly may damage each other.

Today, collectors often take large plastic bags into the field. Paper tags on strings may be attached to each specimen giving a collection number and other information such as the collector’s name, a short-hand description of the site or habitat, and the collection date. *Use a pencil or permanent ink – never use a ballpoint pen!* Plants are placed in bags and pressed later. Leave the tags attached to the plants. These can be glued to the mounting paper. If an exhaustive collection is made in a relatively small area, the bags themselves can be carefully labeled and the numbers assigned to the specimens at the time they’re pressed.

Plants benefit with some lag time between collection and pressing because they’re a little “tamer” when they’re wilted. When using a field press, it is important to complete the pressing process the same day. Waiting longer often leads to shriveled leaves and stiff, uncooperative stems. If you have put plants into a plastic bag, they’ll stay moist longer and you can store them in a cool basement or a refrigerator for an extra day or two before pressing. But remember, the quality of the specimen goes down the longer you wait to press.

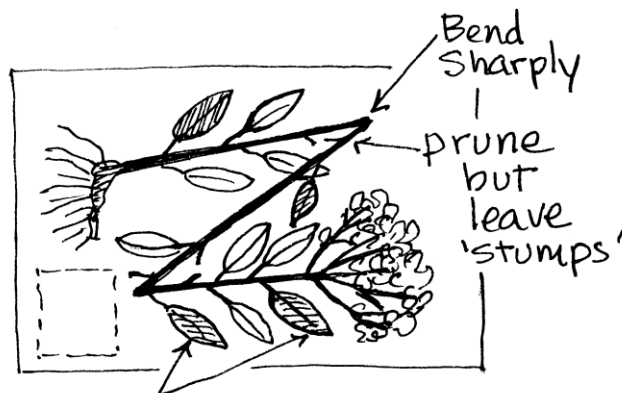
Pressing. Arrange one of the press end-boards, long sides at top and bottom, in front of you on a table. Set a cardboard divider on top of it. Take a single-sheet of newspaper; fold and place it on the cardboard so that the fold is at the top of the press and the open end is near your tummy. Write your name and collection number, species (if you know it), collection date, and other short-hand information *in pencil or permanent ink (never use a ballpoint pen)* along the outside bottom margin of the folded newspaper sheet.



Flowers may overlap leaves. Leaves never overlap flowers

Keep in mind that one side of your specimen will be glued down and the other will be visible. Leaves have upper and lower surfaces; make sure that you turn some of the leaves so that both surfaces will be visible. Make sure that all reproductive structures such as flowers or fruits face “upwards” and are clearly visible. Leaves may overlap stems, but leaves should never overlap reproductive structures. It is acceptable to trim some leaves off a densely-leafy plant. However, make sure to leave a short “stump” (petiole or leaf base) in place to show that they have been removed. Branches may also be clipped off; again, make sure to leave a short stump.

Now is the time you’ll wish you had four arms. Begin to arrange your specimen within the newspaper folder. Make sure that the entire specimen is contained within the area of the cardboard divider. (Remember that it must fit on the mounting paper with a half-inch margin all the way around it.) Do a little pruning, if necessary, leaving leaf and stem stumps attached. Sharply bend the stems to form a V or zig-zag that will allow the specimen to fit on the sheet. The sharp bends indicate that this plant had a straight stem. Only vine stems, which bend naturally, may be gently-curved when creating a specimen because this is their natural habit.



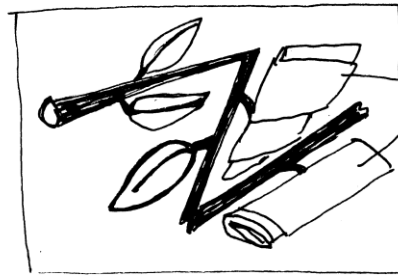
Turn some leaves so both sides show

Once your plant is arranged to your satisfaction, let the newspaper folder close over the top of it and put a cardboard divider on top of it. Weight it with a book while you prepare the newspaper folder for the next specimen. Continue alternating specimens and dividers until all your plants have been prepared. Top it with a final divider and the other end board. The press can accommodate a large number of specimens. Once they get more than 2’ high, however, they become difficult to handle.

Help!

You'll feel very awkward the first time you try to wrestle a plant into a press. Experience will make it easier. Here are a few tips:

- Tear extra newspaper into small squares (2-5") and place them in a bowl of water. As needed, use them to "stick down" leaves or flowers as you arrange other parts of the plant. The newspaper patches dry along with the specimen and slip right off.
- Use books or zip-lock bags full of dry beans to weigh down parts of the specimen while you arrange other parts.
- A small rectangle of paper with a slit cut in it can be used to keep bent stems in place as you work.
- Thick stems will hold the press open. Leaves in this gap will usually shrivel. To create pressure on the leaves, fold one or more newspaper pages over and over to create a pad. Place the pad over the leaves beside stems.



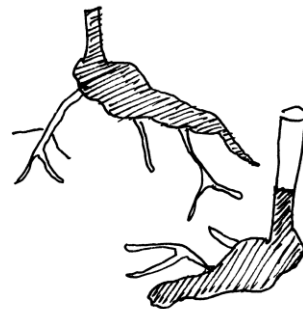
Newspaper pads
apply pressure
to leaves beside
thick stems

Create a triangular-shaped pad to slide into the angle of a bent stem. The fit doesn't have to be perfect. I save these pads in a box and reuse them.

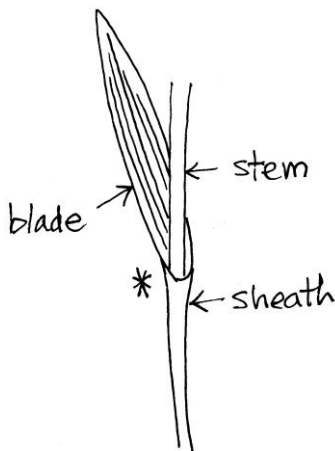
- If your specimen has a particularly heavy root or stem, slice through it lengthwise with a single-edged razor blade or sharp knife. Press both halves. This will decrease lumpiness in the press and speed the drying process.



cut bulky
roots or rhizomes
in half
lengthwise

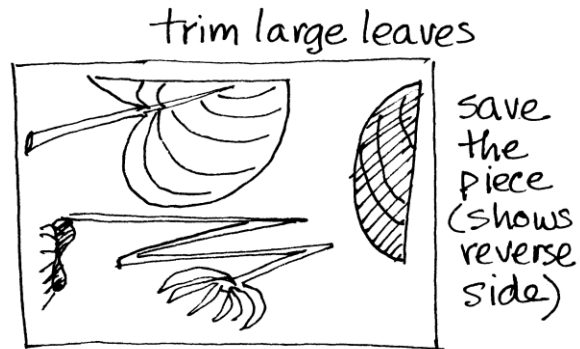


Press both
halves



- If you are collecting a grass or sedge, make sure that the areas where leaf blades and their sheaths part company (*) are visible on the "good side" of the specimen. There are important taxonomic characters in this area. It is also important to collect at least some of the underground parts of these plants.

- If you have a plant with very large leaves, you may fold a portion of the leaf over so that both upper and lower surfaces are visible. Or, you may cut a leaf near (but not on) its midvein to help the specimen fit in the press.
- For trees and shrubs, just take small branches. Make sure there are *reproductive structures* on the branches. Don't try to press big cones. Tie a label onto large cones and store them separately.



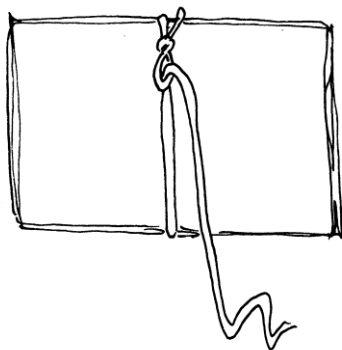
- If you have a very juicy specimen, use blotters rather than cardboard during the first couple of days in the press. Change the blotters daily and let them dry in the sun. Blotters may be purchased from a herbarium supply company.
- Put two or three cardboard dividers on each side of bulky specimens so they don't leave their impressions on their neighbors. Blotters can also be used to even out the pressure.

Tie or strap your press.

The first time you apply pressure to your specimens, don't cinch the press as tight as you can. Let the plants get used to the idea that they're going to be flattened. Open the press the next day to check all your specimens. You'll be able to adjust them to improve their quality. If you're using blotters, change damp ones for dry ones or replace them with corrugated dividers.

After 12 to 24 hours you can apply some real pressure to the press. Many people kneel on large presses as they cinch the straps or tie the rope. I'm not sure it's possible to make it "too tight."

If you're using clothesline, follow these directions for a tight press. Remember that the first time you strap your press, you'll want to make it snug but *not* as tight as you might.

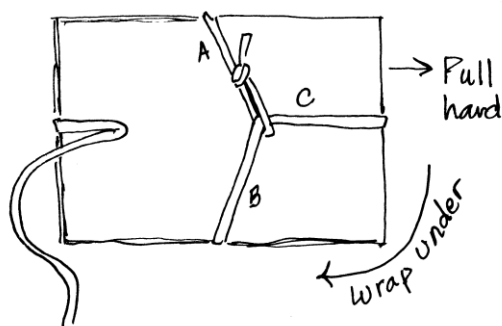
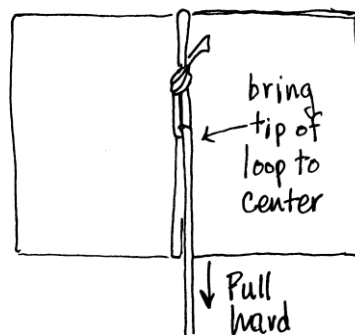


With the long side of the press towards you, wrap the rope around the press and pass the free end of the rope through the loop. (Don't use a slip-knot. The loop must stay open.) The loop should be at the far side of the press. Pull the rope snug and arrange it so that the tip of the loop is to the far side of the center of the press. Practice will tell you how far off center: it will depend on how many and how bulky your specimens are.

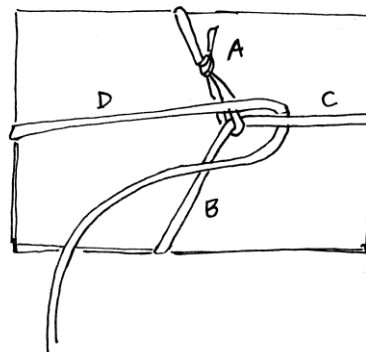
If you want to kneel on your press, now is the time to do it.

If you follow these

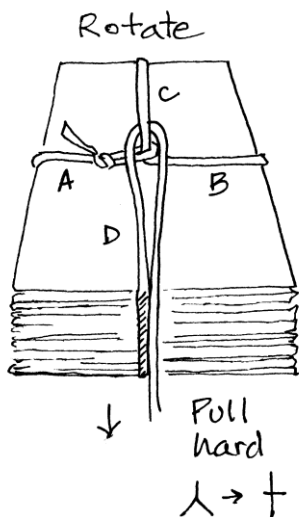
instructions, however, you probably won't need to. Pull the free end of the rope hard towards you until the tip of the loop works its way to the center of the press. Don't let it slide into position, *stretch* it into position by putting tension on the rope so it squeezes the press. You won't get it right the first time. Loosen and adjust the position of the loop until the rope is tight when the loop is pulled into position.



Keeping tension on the rope, pull it hard to the right (or left) until the rope forms a shallow sideways Y. Wrap the rope around the bottom of the press and bring it up on the other short side. Pass the free end of the rope over the loop and under the stem of the Y (arm C).



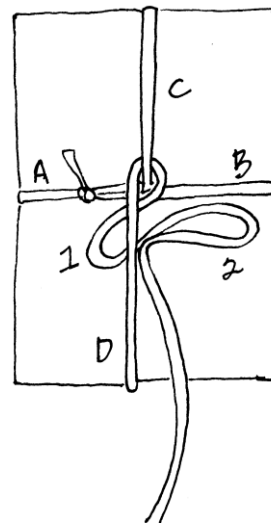
Rotate the press so that the Y is upside down and pull the free end of the rope hard towards you until the Y squares up and becomes a +.



There should now be a lot of pressure on the press. If it isn't tight, do it again.

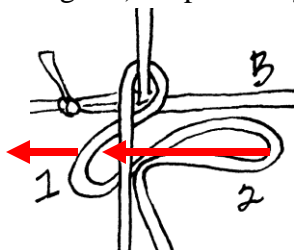
Tying the knot.

This technique and knot are also used to tie stacks of herbarium specimens snugly before they're shipped to another herbarium. Using the correct knot is important because the tension on a cord or rope will also pull the wrong kind of knot so tight that you won't be able to untie it. This knot keeps the press snug but loosens very easily.



Always keeping tension on the free end of the rope, poke a shallow loop (loop 1) under arm D near the center of the press. Create another loop (loop 2) next to loop 1 on the other side of D with the free end of the rope. Pass loop 2 over D and through (under the far edge of) loop 1. As you pull loop 2 upwards, let loop 1 slip until it's

snug around the base of loop 2. *Don't pull the loose end of the rope through loop 1 or you'll have a very difficult time untying that knot.* Leave loop 2 intact and standing up. If the loose end is long and trailing, bunch it up and tuck it under one of the four arms, or wrap it loosely around the press and tuck the end under an arm. To release the knot, unwind the loose end, and pull it so that loop 2 slips back out of loop 1.



Drying your specimens.

The press is designed so that air flowing through the channels in the corrugated dividers wicks away moisture from the plants. Most herbaria have specially-designed dryers that introduce low heat at the bottom. Presses are placed on racks and the warm air moves upwards through the cardboard. The heat generated by a 100-watt incandescent light bulb held 12-18" below a press will dry most plants in 24 to 36 hours. Thicker, juicier plants may take longer. Don't bake your press! Prolonged and/or high heat will scorch plants and make them brittle.

You don't need a fancy drier. Put your press outside on a sunny day with the flat, dark side of one press end facing the sun. Turn the press around and realign it every few hours. Make sure the bottom of the press is elevated so that air can circulate upward through the corrugations –

setting it on lawn furniture with a mesh surface works well. If you're drying plants indoors, set the press in a sunny window on one short end and aim a fan through the corrugations. Rig a contraption with a goose-necked lamp and two chairs. Be careful, however. Don't put the light too close. Never leave a press and heat source unattended if you have any doubts at all about safety.

You will want your specimens to dry as soon as possible. Mold and mildew are quick to form on plants in presses that don't receive attention. Check your press daily and remove plants that seem dry. Plants become brittle when they remain over a heat source too long.

MAKING HIGH-QUALITY SPECIMENS

Reproductive structures.

Most plants are identified using taxonomic characters of reproductive structures. *Pressed specimens that don't have reproductive structures are usually worthless.* If you don't see a reproductive structure, don't collect the plant. Go back later in the season, or visit earlier in the season next year.

Reproductive structures for flowering plants are *flowers* and *fruits*. For gymnosperms (evergreen trees and shrubs in Minnesota) these are male and/or female *cones*. For ferns and other seedless vascular plants, these are *sori*, *sporangia*, and/or *cones*.

Roots and underground structures.

Often the only way to identify a plant is by taxonomic characters of its root/rhizome system. It is therefore best to dig up at least some of the underground parts of herbaceous perennials, biennials, and annual plants. However, be careful! If you don't see at least 15 other individuals of the species in the immediate area, don't dig up the plant. Clip off a stem or take a picture and find out what the plant is. *Never collect **any** part of an endangered plant species.*

RECORDING DATA

Beautifully-pressed specimens may be worthless if certain data are not recorded and supplied with them. As a collector, you will want to assign a unique number to each of your plant specimens. There are several ways to keep track of this in the field/as you press.

(1) Tie a paper tag on each specimen with your name, collection number, and collection date on it and record data in your notebook; this system is best for days when you are collecting relatively few specimens in more than one area and placing them together in a single plastic bag.

(2) Make a field press and enter basic information as above on the specimen's newspaper folder.

(3) Place plants in a large plastic bag and number them as you remove them. Make sure, however, that ALL the plants in the bag came from the same place on the same day and that you have recorded information about their collection in a notebook (see below). As each plant comes out of the bag, press it and list it in your notebook with its number. Record basic information on the newspaper folder immediately.

Some collectors have fancy numbering systems with prefixes that indicate the collection year or the collector's monogram or the collection site. The commonest, simplest, and, in my opinion, best system, is to start with the number 1 and just keep going. You'll always know how many specimens you've prepared and you won't befuddle the herbarium. If you want to know when and where you collected a plant, simply refer to your notebook, which lists plants in numerical order (more or less!). It is better to skip a number than to use a number twice, although appending twice-used numbers with –A and –B easily solves that problem.

Large specimens requiring more than one sheet will still have the same collection number. For example, *Mahoney 265 '1 of 3,' Mahoney 265 '2 of 3,' and Mahoney 265 '3 of 3'* represent the "same collection" mounted on three "sheets." It is also possible that you will collect a single plant with many stems that can be separated and mounted onto more than one sheet – creating more than one complete specimen. These "duplicate" collections are valuable because one can be kept in the herbarium and the other can be traded for a specimen from another herbarium. Again, each duplicate sheet will receive the *same* collection number. Note, however, that if you collect the *same species* on *another occasion on another site*, this specimen will have a *new* number.

Here are the data you will want to record:

- Your name.
- Your collection number.
- The date you collected the plant.
- Plant family (if known).
- Scientific name (if known) and author (if known).
- Common name (if known).
- Location. Provide the nearest municipality (town, city, etc), county, and state. Then give directions from an intersection that appears on a map (no unnamed dirt roads). Give the distance and exact driving/hiking directions. Give cardinal directions ("north side of the road" or "marshy area about 500 yards southeast of the intersection"). Although you may give a street address, it is also good to give directions in miles from a mapped intersection; houses/addresses may not always be obvious or permanent – especially in rural areas.
- Other locators. GPS coordinates, Latitude & Longitude, Township, Range, and Section are useful and should be recorded when known. Note that GPS coordinates DO NOT replace good old-fashioned map directions. One of the most valuable functions of label data is to allow other botanists to find your collection site again. GPS coordinates never pinpoint the exact location and one must have a unit or a computer to find the site. About 99.9% of the time, botanists will approach your site in cars. Driving directions are easy and expedient and do not require any fancy technology.
- Habitat description. These kind of data are also really valuable. Include vegetation type: (i.e. coniferous forest, deciduous woods, bog, wet meadow, upland meadow, prairie, woods' edge, fallow field, roadside, vacant lot, disturbed second growth woodland, river-bank, marsh, along railroad tracks, etc.). Include elevation and/or attitude (i.e. north-facing slope, steep slope, ditch, low-lying ground, exposed, south-facing sandstone cliff face, rock outcrop, etc.). Soil type and moisture (i.e. loam, sand, clay, rocky, pebbly,

gravelly, hard, soft, wet, saturated, dry, etc.) if the plant is growing in water, note how deep it is and whether the plant is underwater or emergent, note whether a plant is splashed by running water, or whether it appears in or beside pools that dry up over the summer.

- Associated species. This is easy when you collect “everything” in bloom from a given area. Once you identify what you’ve collected you will know the associated species.
- Ephemeral characters. Colors of floral parts, scents, stickiness, etc. are characters that will probably fade or change on pressed specimens. Make note of them. Also note insects and/or animals present on the plants at the time of collection, especially pollinators. Note how the plants were spaced (in clumps, patches, widely-spaced, highly localized, or widely-distributed).

Here’s an example from my notebook (TRS and Lat/Long were filled in later with the help of a map and a computer program). I kept track of mileage on my car’s odometer. My assistant and I collected blooming species and put them in a plastic bag. As we took them out of the bag and pressed them, I gave them collection numbers. Later, I checked their identifications and provided family names and authors for the finished labels.

2006 MN, LINCOLN COUNTY COLLECTION SITES with K.K. assisting

25 August; collection nos. 676 – 682, also out of order 705 – 707.

MN, Lincoln Co., Lake Benton. Collinson Wildlife Management Area; East side of 180th St, 0.5 miles north of Co Rd 13 (intersection 1 mile east of US Hwy 75)

Township/Range/Section: T 110N R 45W Sec. 17 Lat/Long: N 44° 20.11’ W 96° 18.1’

Low-lying, open area close to the road with scattered clumps of *Typha* and prairie vegetation.

Associated species: *Andropogon gerardii*, *Sorghastrum nutans*, *Galium boreale*, *Asclepias* spp., *Solidago rigida*

- 676 *Helianthus grosseserratus* (?) – Sawtooth sunflower
- 677 *H. nuttallii* ssp. *rydbergii* – Nuttall’s or Rydberg’s sunflower
- 678 *Prenanthes racemosa* – Purple rattlesnake-root
- 679 *Symphyotrichum lanceolatum* (= *Aster lanceolatus*) – Lance-leaf aster
- 680 *Gentiana andrewsii* – Bottle gentian
- 681 *Liatris punctata* – Dotted blazing star
- 682 *Lycopus* sp. – Water horehound
- 705 *Thalictrum* sp. – Meadow rue
- 706 *Solidago mollis* (?) – Soft goldenrod
- 707 *Spartina pectinata* (?) – Prairie cordgrass; santu’hu tan’ka (Lakota)