

Soil Monolith Extraction, Preparation and Mounting



Manitoba Soil Science Society 2020 Summer and Winter Activity

Written instructions follow – as do videos:

Official instructions for monolith mounting is available at: Belohlavy, F. Making Soil Monoliths using white glue as a fixative. Soil Survey Horizons. Vol 35, Issue 3.

<https://acsess.onlinelibrary.wiley.com/doi/full/10.2136/sh1994.3.0074>

But our monoliths were extracted differently and I follow with the approach I was taught (principles are the same.)

Collecting and Extracting the Soil Monolith:

Video Step 1: Extracting soil monolith from the field

Tools: Dutch auger, knives, trowels putty knives, drywall saws, monolith extraction box, sledge hammer and rebar.

Dig a soil pit slightly deeper than the desired length of the soil monolith. When selecting an area to be the face of the monolith within the soil pit be sure to look for interesting features like mottles, distinct soil structure, roots and kortovenas. When you have selected the area that will be the face of your soil monolith start carving away the soil to match the dimensions of the extraction box.



Note: In sandier textured soils be gentle when scrapping the edges of the monolith.

Once an area has been carved away to fit the extraction box make sure the face that is going to sit in the back of the box is flat to sit flush in the box. Once flush place the box over the area of the soil to be extracted and scrap at an angle behind the monolith. Behind the box to help support the bottom, hammer the rebar into the soil. At the top of the pit take a dutch auger and auger into the soil at least 6 to 8 inches back and start auger to the bottom of the monolith. Watch the direction you are augering as you do not want to auger towards the soil monolith. When the auger has reached the bottom of the monolith gently with pressure push forward on the auger and aid the monolith into the extraction box.



Now that the monolith is settled in the extraction box, you will want to scrap back excess soil so it is not too heavy to carry out of the pit and field. Once excess soil is removed, wrap the monolith with saranwrap. Your monolith is now ready for transport and the next steps to mount your soil monolith.



Prepping and Mounting the Soil Monolith at Home (Videos and Steps 2 to 10):

Additional supplies you will need:

- White Elmer's glue (not carpenter's glue)
- Cheesecloth
- White latex paint and brushes – primer is optional.
- 4 screws (or reuse the ones you will have from disassembling the case)
- Tools – putty knives, knives, small screw drivers (Phillips for disassembling box), brushes, vacuum, squirt bottles (for water:glue mixtures), dentists pick

Video Step 2: Undressing the monolith and scrapping soil flush with the box

Tools: exacto knife, putty knives, knives, hack saw

Cut the saranwrap cover with an exacto knife and peel back to expose the soil. Trim back the soil flush with the top of the box. Do this while the soil is still moist. This is rather easy with the sand and loam soils but a challenge with clay soils since it has such strong structure and especially if it was dry when extracted. Try not to remove too many chunks while trimming back. Save some soil for later one to fix any booboos, Be sure to keep the different layers separate. Leave soil exposed to dry for several days. Save some soil from each horizon in case, you need to fill some cracks.



Video Step 3: First soaking with a dilute water: glue mixture

Tools: Squirt bottle, glue, water

Soil should be dry so the glue mixture will penetrate better. For sandy and loam soils, use a 5:1 water: white glue mixture. For clay soils, use a 10:1 mixture. Mix up with warm water for better mixing and penetration. Put into a squirt bottle, and then start at one end of profile, saturating

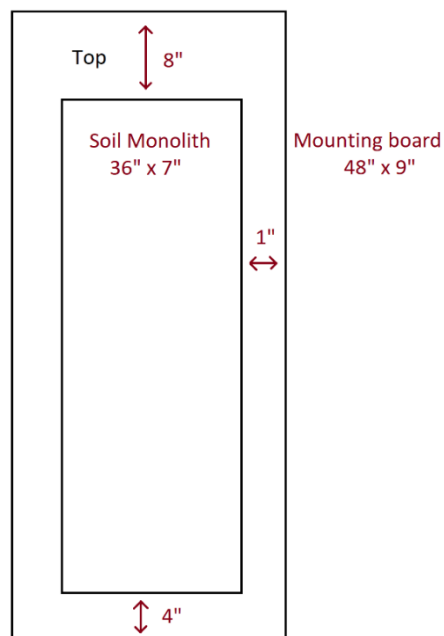
the soil until the entire profile is saturated. A 36" x 7" monolith will take at least 500 ml of the glue water solution to fully saturate. Be sure to wash out the squirt bottles thoroughly. Allow to dry for several days.



Video Step 4: Second soaking with stiffer water: glue mixture

Tools: Squirt bottle, glue, water

Treat again with the solution in a thicker mixture, 3:1 for sand and loams and about 5:1 for clay. This will penetrate less. Again this will take at least 500ml of the water glue solution. Be sure to wash out the squirt bottles thoroughly. Allow to dry for several days. While you wait outline your mounting board. Apply masking tape or use a sharpie outline the profile on the mounting board – about 7" wide by profile length (36") – so you can centre your profile within it. Be sure to leave adequate room on the top, sides and bottom for labels.



Video Step 5: Removing the boards and gluing to mounting board

Tools: Drill or screwdriver, cheesecloth, undiluted glue, screws (under 2" in length)

Unscrew the plywood sides confining your soil. Apply a thick layer of glue to the soil face and a double thickness of cheesecloth, working it into the glue. Additional glue is placed on top of the cheesecloth. Then position the mounting board above the soil (this can be tricky and help is useful). Then place 4 screws through the mounting board and into the soil. Finally place weights (bricks, books, etc) on the mounting board. Let dry for several days.



Video Step 6: Flip the soil and start prepping the face

Tools: Screwdrivers, dentist picks, knives, putty knife, brushes, vacuum.

Once dry, remove weights and gently turn over the monolith, with the mounting board on the bottom. The remainder of the box should lift off easily with a little soil. Once soil is exposed, prepare the soil profile to expose representative structure and features (like roots, wormholes, mottles, krotovenas). I use a dentist's pick – but small screwdrivers can work also. There is little structure to the sands and shaving smooth with a putty knife is good. Vacuum or brush to remove loose soil.



Video Step 7: Third gluing of soil

Tools: Glue, water, putty knife, picks, knives

Add more glue (5:1 water: glue). Use the thinner mixture to penetrate deeper. Let dry.



Video Step 8: Touch ups and final gluing.

Tools: Glue, water, putty knife, picks, knives, soil saved from earlier steps

If there are any booboos where you were too aggressive in preparing the face, you can glue aggregates into place using full strength glue or make up "body filler" from some crushed soil and add 3:1 water: glue solution to make a slurry. Be sure to check all sides of monolith. Apply the thicker mixture last (3:1) to the whole monolith. Check the top of the monolith for any loose aggregates and apply glue water mixture. Let dry.



Video Step 9: Painting

Scrape or sand glue or misplaced soil off the board. Then apply white latex paint to the board – generally 2 coats, the first one primer. Or you can use an all in one latex – primer paint.



Step 10: Labelling

Glue labels on your monolith board – the soil name and texture and horizon labels.

Generally the labels are printed up on paper, then laminated and glued to the board. Some may prefer to label with black paint, Sharpie or otherwise. You may even wish to record the day and occasion of your hunt and where you bagged your trophy. If you would like black labels like in the picture below for your monolith please contact Megan at megan.westphal@gov.mb.ca.



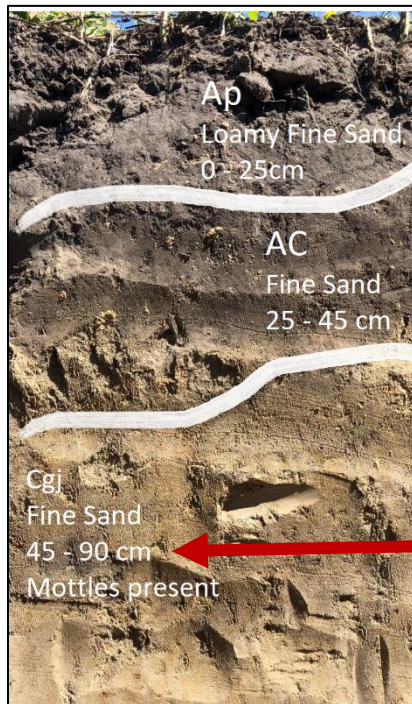
Following are the soil descriptions and labels. Note the label placements are based on colour and texture and so you may need to adjust their placement to fit “your trophy”.

Almasippi Series (ASS)

The Almasippi series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately calcareous, uniform, sandy (FS, LFS) lacustrine sediments over a lacustrine clay substrate usually within 3 metres of the surface which impedes downward water movement. These soils occur in middle to lower slope positions of level to very gentle slopes on undulating landscapes and have rapid permeability, low surface runoff, and a high water table during the growing season. Almasippi soils are moderately eroded, non-stony, and occasionally saline. They have low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes trembling aspen, bur oak and tall prairie grasses. The majority of these soils are currently used for crop production.

In a representative profile of Almasippi soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Apk horizon, 15 to 20 cm thick, a light brownish gray AC horizon, 10 to 15 cm thick and a yellowish brown Ckgj horizon, with prominent mottles. A typical profile also contains a light coloured Cca horizon below the AC horizon.

Almasippi soils occur in close association with Skelding Longplain and Lelant soils. They are similar to Willowcrest soils by having a Gleyed Black Chernozem profile developed in sands but differ from them in having no Bm horizon. Almasippi soils were previously mapped as Black Meadow associates of the Almasippi in the Carberry (1957) soil report.



Alternative Labels:

Almasippi Loamy Sand

0 to 6-8"	Apk
6-8" to 10"-14"	AC
10-14" to 36" or bottom	Cca

Can also leave blank, as 90cm is the length of the monolith.

Red River Series (RIV)

The Red River series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform, clayey (C, HC), lacustrine deposits. These soils occur in level to upper positions of level to very gentle slopes on level landscapes and have slow permeability, slow to moderate surface runoff and a medium water table during the growing season. Red River soils are non-eroded, non-stony and may be saline. They have a high available water holding capacity, medium organic matter content, and medium natural fertility. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a black, to very dark gray, clayey Ap horizon, 15 to 20 cm thick, a very dark gray, clayey Ah horizon, 8 to 10 cm thick, a thin, dark gray, calcareous, clay, AC horizon, 6 to 10 cm thick and a dark grayish brown, calcareous, clay Ckgj horizon with faint mottles are present. The parent material is typically a clay texture. A typical profile contains frequent tonguing of the A horizon into the C horizon.

Red River soils occur in very close association with Scanterbury, Morris and Osborne soils. They are similar to the above soils by having developed on the same parent material but differ because of drainage and profile development. Red River soils were previously mapped as the Red River Association in the Winnipeg-Morris Map Sheet, Report No. 5, 1953.



Alternative Labels:

Red River Clay

0 to 6-8"	Ap
6-8" to 9"-12"	AC
9-12" – 36" or blank	Ckgj

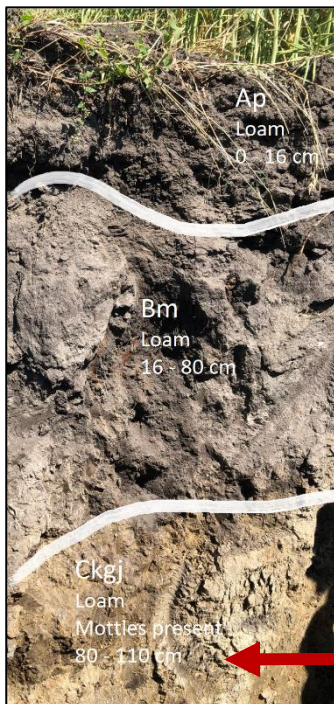
Can also leave blank, as 90cm is the length of the monolith.

Dezwood Series (DZW)

The Dezwood series consists of moderately well to well drained Orthic Dark Gray Chernozem soils developed on moderately to strongly calcareous, deep, uniform, loamy (L, CL, SiCL) mixed shale, limestone and granite till deposits. These soils occur in middle and upper positions of gentle to moderate slopes on hummocky landscapes and have medium to moderately slow permeability moderate to rapid surface runoff and a medium water table during the growing season. Dezwood soils are slightly eroded and slightly stony. They have medium available water holding capacity, medium organic matter content and medium to high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-popular groves. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by a dark grayish brown Ah or Ap horizon, 15 to 20 cm thick, occasionally a thin light gray Ae horizon, 2 to 4 cm thick, a pale brown Bt horizon, 20 to 40 cm thick, and a light gray Cca horizon 15 to 30 cm thick. The parent material is typically light gray mixed till with few coarse fragments.

Dezwood soils occur in close association with Ferris and Nikkel soils. They are similar to Pembina soils by having been developed in a calcareous mixed regional till but differ from them by having a luvisolic Ae horizon greater than 5 cm thick in undisturbed profiles. Dezwood soils were previously mapped as gray black associates of the Pembina Association in the reconnaissance soil survey of South-Central Manitoba (1943).



Alternative Labels:

Dezwood Loam

0 to 6-8" Ap

6-8" to 14"-24" Bt

14"-24" – bottom Cca

Measurement from field characterization. Monolith only 90cm. Can also leave blank.

For more information about Manitoba's soil and how to characterize soils please see the following resources:

Government of Manitoba's Soil Survey Website:

<https://www.gov.mb.ca/agriculture/soil/soil-survey/>

Manitoba's Manual for Describing Soils in the Field:

https://www.gov.mb.ca/agriculture/soil/soil-survey/pubs/manual_for_describing_soils_in_the_field.pdf

AgriMaps: an interactive map with Manitoba soil survey data and related interpretations

<https://agrimaps.gov.mb.ca/agrimaps/>

The Canadian System of Soil Classification:

https://sis.agr.gc.ca/cansis/publications/manuals/1998-cssc-ed3/cssc3_manual.pdf