

Core/Profile: CY-1
 Location: U.S. 75 over Buffalo River
 Legal description: NW ¼ NW ¼ Section 32 T142N R48W
 County: Clay
 Parent material: Alluvium/lacustrine sediments
 Vegetation:
 Slope:
 Elevation: 861 feet
 Topo. Map: Georgetown
 Remarks: U.S. Highway 75 over Buffalo River at Georgetown; on north side of river on a low step; 122 feet south of NE bridge abutment; 18.7 feet below centerline

Depth cm(ft)	Horizon or Zone	Description
0-14 (0-.5)	A	very dark gray (10YR3/1) clay loam; weak, medium, granular to fine subangular blocky; friable to firm; slightly effervescent; clear lower boundary; rootlets; charcoal;
14-71 (.5-2.3)	AC	very dark grayish brown (10YR3/2) clay loam to silty clay loam; mottles are few, coarse, black (10YR2/1); weak, medium, subangular blocky to massive; friable to firm; strongly effervescent; gradual lower boundary; coarse, black mottles at base (slightly granular); rootlets common; few roots; charcoal.
71-229 (2.3-7.5)	CA	dark grayish brown (10YR4/2) clay loam to silty clay loam; mottles are few, fine, distinct, light brownish gray (10YR6/2); weak, medium, granular to massive; friable to firm; strongly effervescent; clear lower boundary; few rootlets; 50% recovery.
229-405 (7.5-13.3)	C	dark grayish brown (10YR4/2) clay loam; mottles are few, fine, distinct, light brownish gray (10YR6/2); massive; firm; strongly effervescent; gradual lower boundary; more dense than C1; shell fragments; gastropod and mollusk shells; few vertical roots, some plant matter; very faint bedding; alluvial.
405-442 (13.3-14.5)	2Cg	very dark gray (10YR3/1) clay loam; mottles are common, medium, distinct, dark reddish brown (5YR3/3); massive; firm; strongly effervescent; gradual lower boundary; many mollusk shells, some coarse; few gastropod shells; wood; some charcoal; small to medium pebbles common; charcoal collected near top of unit; few sand partings near top; roots; possible channel deposit.
442-497 (14.5-16.3)	3CAb	very dark gray (5Y3/1) clay loam to silty clay loam; mottles are few, coarse, distinct, black (10YR2/1) at base; common, medium, distinct, strong brown (7.5YR4/6); fine subangular blocky peds, more apparent with depth; friable; very slightly effervescent; clear lower boundary; plant matter including wood, plant fibers, and roots; shell fragments.
497-512 (16.3-16.8)	4Ob	similar to 3CAb only darker, more organic; much wood; abrupt to clear lower boundary; shell fragments; peaty; cf. <i>Picea sp.</i> wood, possibly a root, C-14 dated at 10,080±70 BP.
512-701 (16.8-23.0)	5Cg1	very dark gray (5Y3/1) silt loam to silty clay loam; laminations are common, fine to medium, distinct, gray (5Y5/1); massive; friable; very slightly effervescent; unknown lower boundary (end of tube); laminated; grades between silt loam and silty clay loam; few clay-rich laminations near base; lacustrine.
701-1158 (23.0-38.0)	6Cg2	very dark gray (5Y3/1) clay; massive; firm; slightly to strongly effervescent; unknown lower boundary (end of tubes); fractured, with shiny fracture surfaces; sticky; very few light brownish gray (10YR6/2) powdery mottles; black at top; almost no pebbles (very few); lacustrine.

Core/Profile: CY-2

Location: U.S. 75 over Buffalo River

Legal description: NW ¼ NW ¼ Section 32 T142N R48W

County: Clay

Parent material: Lacustrine sediments/alluvium

Vegetation:

Slope:

Elevation: 873 feet

Topo. Map: Georgetown

Remarks: U.S. Highway 75 over Buffalo River at Georgetown; on north side of river on high ground; 237 feet north of NE bridge abutment; 6.9 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-20 (0-.7)	A	black (10YR2/1) silty clay loam; weak, fine, subangular blocky; friable to firm; slightly effervescent; clear lower boundary; roots.
20-42 (.7-1.4)	AC	black (10YR2/1) silty clay loam; mottles are common, medium to coarse, distinct, grayish brown (10YR5/2); weak, fine, subangular blocky; friable to firm; strongly effervescent; abrupt lower boundary; rootlets; resembles A-horizon but with C-horizon colored mottles.
42-91 (1.4-3.0)	C1	grayish brown (10YR5/2) silt loam to silty clay loam; mottles are few, coarse, distinct, black (10YR2/1) at top of unit, and common, fine, faint, pale brown (10YR6/3); massive; friable; strongly effervescent; gradual lower boundary; grades between silt loam and silty clay loam; rootlets common; alluvial.
91-381 (3.0-12.5)	C2	grayish brown and pale brown (10YR5/2&6/3) silt loam to silty clay loam; massive; clay coatings are faint, thin, discontinuous, line few voids near top of unit; friable; strongly effervescent; gradual lower boundary; finely laminated; grades between silt loam and silty clay loam; cross-bedded laminations near base (\approx 300-375 cm); very few shell fragments near base; alluvial.
381-494 (12.5-16.2)	2C3	dark grayish brown (10YR4/2) clay loam; mottles are common, fine, faint, dark brown (7.5YR3/4) to strong brown (7.5YR4/6); massive; firm; strongly effervescent; clear lower boundary; few mollusk shells; bone at 408 cm; few laminated silt layers in transition zone at top; few small pebbles; more pebbles near base; coarsens with depth; fractured into blocks generally oriented horizontally; alluvial.
494-555 (16.2-18.2)	2C4	dark grayish brown (10YR4/2) silty clay loam to clay loam; mottles are few, fine, faint, dark brown (7.5YR3/2) to dark yellowish brown (10YR4/4); massive; firm; strongly effervescent; clear lower boundary; few silt lenses near base of unit; few small pebbles; laminated near base; alluvial.
555-796 (18.2-26.1)	3Cg	laminated dark gray (5Y4/1) and gray to light gray (5Y6/1) changing to very dark gray (5Y3/1) silt loam to silty clay loam; massive; friable to firm; strongly to slightly effervescent; clear lower boundary; finely laminated (dark and light layers); light layers are more silt-rich; few very dark gray clay layers; some black (10YR2/1) laminations (may be organic-rich); laminations less prevalent below 760 cm - mostly very dark gray (5Y3/1) silty clay loam; gastropod shells in last 75 cm; uppermost 5 cm are darker than rest of unit - may be a weak paleosol; lacustrine.
796-860 (26.1-28.2)	4CAb	very dark gray (10YR3/1) silty clay loam; weak, fine, subangular blocky grading upwards to massive; firm; slightly to strongly effervescent; abrupt lower boundary; gastropod shells; plant matter collected 796-808 cm and 860-872 cm; wood collected 811 cm and 872 cm; organic-rich, especially near base; may be shallow or ponded lacustrine; <i>Picea sp.</i> wood from 811 cm C-14 dated at 10,140±70 BP;
860-872 (28.2-28.6)	5Ob	similar to 4CAb only darker, more organic; more wood; peaty; wood pieces and seed fragments C-14 dated at 10,180±70 BP.
872-1058 (28.6-34.7)	6Cg1	laminated dark gray to very dark gray (5Y4/1-3/1) and gray (5Y5/1) silt loam to silty clay loam; massive; friable to firm; very slightly effervescent; abrupt lower boundary; weakly laminated; fine sand at top grading to silt loam and silty clay loam; similar to 3Cg; lacustrine.
1058-1189 (34.7-39.0)	7Cg2	black to very dark gray (5Y2.5/1-3/1) clay; massive; very firm; very slightly effervescent; unknown lower boundary (end of tubes); highly fractured into angular blocks; shiny; blacker at top; less fractured below 1130 cm; almost no pebbles (very few); few lenses of lighter silty clay loam near top - lenses are not fractured; few roots; lacustrine.

Core/Profile: KT-1

Location: T.H. 11 over Red River

Legal description: NW ¼ NW ¼ Section 29 T159N R50W

County: Kittson

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 791 feet

Topo. Map: Drayton

Remarks: T.H. 11 over Red River of the North; on east side of river at junction between T.H. 11 and County Road 18; on high terrace; 6.2 feet below center line; 33 feet east of bridge abutment

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	A	black (10YR2/1) clay loam; moderate, medium, granular; firm; slightly effervescent; clear lower boundary; roots; rootlets; few pebbles.
12-47 (.4-1.5)	Bt	black (10YR2/1) clay-rich clay loam; moderate, fine, subangular blocky; clay coatings are thin, discontinuous, coat ped faces; firm; very slightly effervescent; clear lower boundary; rootlets; borderline AB horizon.
47-87 (1.5-2.9)	CB	grayish brown to dark grayish brown (10YR5/2-4/2) clay loam; mottles are common, fine, distinct, white (10YR8/2), and few, medium to coarse, distinct, black (10YR2/1); weak, fine, subangular blocky in middle of unit, massive elsewhere; clay coatings are thin, discontinuous, coat few ped faces; firm; violently effervescent; gradual lower boundary; band of black soil from 52-54 cm.
87-131 (2.9-4.3)	C1	dark brown (10YR3/3) clay loam; mottles are common, medium, distinct, white (10YR8/2); massive; firm; violently effervescent; clear lower boundary; laminated; silt laminations common; disturbed in coring; few rootlets; either alluvial or weathered lacustrine sediments.
131-552 (4.3-18.1)	2C2	brown to dark brown (10YR4/3) silty clay loam; mottles are common, medium, distinct, dark brown (7.5YR3/2) and strong brown (7.5YR4/6), and common, coarse, faint, gray (10YR5/1); massive; firm; strongly effervescent; diffuse lower boundary; few rootlets; laminated; many silt laminations; oxidized laminations common; often gray (10YR5/1) surrounding root voids; can see ripples in few silt laminations; laminations are pale brown (10YR6/3), strong brown (7.5YR4/6), and light gray to gray (10YR6/1); few concretions; lacustrine.
552-899 (18.1-29.5)	2Cg1	dark gray (10YR4/1) silty clay; massive; firm; strongly effervescent; diffuse lower boundary; laminated; silt laminations common; upper boundary very diffuse; few oxidized laminations near top of unit; silt laminations are often grayish brown (10YR5/2); slickensides; more clay-rich with depth; silty clay loam top 50-100 cm; lacustrine.
899-1494 (29.5-49.0)	2Cg2	dark gray (10YR4/1) clay; massive; firm; slightly effervescent; unknown lower boundary (end of tubes); not laminated; slickensides; some fracturing.

Core/Profile: KT-2

Location: T.H. 11 over Red River

Legal description: NW ¼ NW ¼ Section 29 T159N R50W

County: Kittson

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 781 feet

Topo. Map: Drayton

Remarks: T.H. 11 over Red River of the North; on east side of river; on low terrace by river, below an escarpment; 283 feet west of east bridge abutment; 33 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-13 (0-.4)	AC	very dark gray (10YR3/1) silty clay loam; weak, fine, granular to massive; friable; slightly to strongly effervescent; abrupt lower boundary (color change); few small pebbles; few rootlets; poorly developed; 72% recovery.
13-66 (.4-2.2)	C1	very dark grayish brown (10YR3/2) silty clay loam; mottles are few, medium, faint, strong brown (7.5YR4/6); massive; friable; slightly to strongly effervescent; clear lower boundary; few large roots; rootlets; few faint laminations; overwash/alluvium; 72% recovery.
66-183 (2.2-6.0)	C2	very dark gray (10YR3/1) silty clay loam; mottles are common, fine, faint, strong brown (7.5YR4/6); massive; friable; slightly to strongly effervescent; clear lower boundary; some plant matter (grasses/roots/wood); piece of wood at base; similar to C1 and C3; overbank/alluvium; 72% recovery.
183-256 (6.0-8.4)	C3	very dark grayish brown (10YR3/2) silty clay loam; mottles are few, coarse, faint, very dark gray and black (10YR3/1-2/1), and common, fine, faint, strong brown (7.5YR4/6); massive; friable; slightly to strongly effervescent; clear lower boundary; similar to C1; some conchooidal fracturing; roots and rootlets; few faint laminations; 90% recovery; overbank/alluvium.
256-838 (8.4-27.5)	2C4	dark grayish brown (2.5Y4/2) silt loam to silty clay loam; mottles are common, medium, distinct, strong brown (7.5YR4/6), and few, medium, distinct, yellowish brown (10YR5/4), dark brown (7.5YR3/2), very pale brown (10YR7/3), and gray (10YR5/1); massive; friable to firm; strongly to slightly effervescent; diffuse lower boundary; laminated; laminated silt lenses common at top; oxidized laminations common; white silts coat fractures and vertical planes below 600 cm; silt laminations throughout; lacustrine.
838-1079 (27.5-35.4)	2Cg1	dark gray (5Y4/1) silty clay loam; massive; firm; slightly to strongly effervescent; gradual lower boundary; laminated; silt laminations common, often gray (10YR5/1) and calcareous; slickensides; some fracturing; lacustrine.
1079-1524 (35.4-50.0)	2Cg2	very dark gray (10YR3/1) silty clay to clay; mottles are very few, medium, distinct, pale brown (10YR6/3); massive; firm; slightly effervescent; unknown lower boundary (end of tubes); not laminated; slickensides; some fracturing; shiny.

Core/Profile: KT-3

Location: T.H. 175 over Red River

Legal description: SW ¼ NW ¼ Section 9 T161N R50W

County: Kittson

Parent material: Lacustrine sediment

Vegetation:

Slope:

Elevation: 790 feet

Topo. Map: Joliette

Remarks: T.H. 175 over Red River of the North; 0.5 mile east of east bridge abutment; 3.3 feet lower than center line; easternmost boring in transect

Depth cm(ft)	Horizon or Zone	Description
0-21 (0-.7)	A	black (10YR2/1) clay loam; weak, medium, granular; firm; noneffervescent; abrupt lower boundary; rootlets; 85% recovery.
21-61 (.7-2.0)	Bt1	black (10YR2/1) clay loam (clay-rich); mottles are few, coarse, faint, very dark gray (10YR3/1); strong, fine, subangular blocky; clay coatings are thick, continuous, coat ped; very firm; slightly effervescent; gradual lower boundary; rootlets; vertical rootlets common; shiny ped surfaces; 80% recovery.
61-85 (2.0-2.8)	Bt2	very dark grayish brown (10YR3/2) clay loam; few, fine, distinct, white (10YR8/2), soft calcareous concretions; moderate, medium, subangular blocky; clay coatings are thick, discontinuous, coat ped, more prevalent at top of unit; very firm; slightly to strongly effervescent; gradual lower boundary; few rootlets; ped are shiny from clays; 80% recovery.
85-186 (2.8-6.1)	CBk	dark grayish brown (2.5Y4/2) clay loam; many, medium to coarse, distinct, white (10YR8/2), soft calcareous concretions; weak, coarse, subangular blocky; friable to firm; very strongly effervescent; clear lower boundary; transitional horizon; few rootlets.
186-594 (6.1-19.5)	C1	brown to dark brown (10YR4/3) silty clay loam; mottles are common, medium, faint to distinct, grayish brown (10YR5/2), light gray (10YR7/2), and strong brown (7.5YR4/6); massive; firm; strongly effervescent; diffuse lower boundary; laminated; silt laminations common; oxidized mottles and laminations; fractured along bedding planes; lacustrine.
594-658 (19.5-21.6)	C2	dark grayish brown (10YR4/2) silty clay; mottles are common, fine to medium, faint, gray (10YR5/1); massive; firm; slightly effervescent; clear lower boundary; transitional unit; laminated; dense; lacustrine.
658-1204 (21.6-39.5)	2Cg	very dark gray (10YR3/1) clay; massive; very firm; slightly effervescent; unknown lower boundary (end of tubes); few silty light brownish gray (10YR6/2) mottles; slickensides common; some fracturing; not laminated; grades into a silty clay near base of boring.

Core/Profile: KT-4

Location: T.H. 175 over Red River

Legal description: SW ¼ NW ¼ Section 9 T161N R50W

County: Kittson

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 790 feet

Topo. Map: Joliette

Remarks: T.H. 175 over Red River of the North; 0.35 mile east of east bridge abutment; 3.0 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-16 (0-.5)	A	black (10YR2/1) clay loam; mottles are few, coarse, faint, very dark grayish brown (10YR3/2); weak, medium, granular; firm; slightly effervescent; abrupt lower boundary; root mat on top; rootlets; few worm burrows.
16-44 (.5-1.4)	Bt1	black (10YR2/1) clay-rich silty clay loam to silty clay; mottles are few, coarse, faint, very dark gray (10YR3/1); weakly developing columnar ped parting to moderate to strong, fine, subangular blocky; clay coatings are thick, continuous, coat ped; very firm; very slightly effervescent; clear lower boundary; common rootlets and roots.
44-58 (1.4-1.9)	Bt2	very dark gray (10YR3/1) clay-rich silty clay loam to silty clay; mottles are few, fine, faint, black (10YR2/1); moderate, medium, subangular blocky; clay coatings are thick, continuous, coat most ped; very firm; very slightly effervescent; clear lower boundary; few rootlets.
58-146 (1.9-4.8)	BCk	very dark gray and black (10YR3/1-2/1) clay loam; few, medium, distinct, light brownish gray (10YR6/2), soft calcareous concretions; massive to weak, medium, subangular blocky; firm; strongly effervescent; mottles are violent; gradual lower boundary.
146-250 (4.8-8.2)	C1	dark brown (10YR3/3) silty clay loam; mottles are common, medium, distinct, white (10YR8/1), and common, fine to medium, faint, strong brown (7.5YR4/6) and gray (10YR5/3); massive; clay coatings are thin, discontinuous, coat fracture surfaces in clay-rich bands; friable to firm; strongly effervescent; gradual lower boundary; faintly laminated; some fracturing into angular blocks in more clay-rich zones; lacustrine.
250-399 (8.2-13.1)	C2	brown to dark brown (10YR4/3) silty clay loam; mottles are common, coarse, faint, gray (10YR5/1), and common, medium, faint to distinct, strong brown (7.5YR4/6) and very pale brown (10YR7/3); massive; firm; strongly effervescent; gradual lower boundary; laminated; many silt laminations; oxidized mottles; concretions; lacustrine.
399-475 (13.1-15.6)	C3	dark grayish brown (10YR4/2) silty clay loam; mottles are common, fine, faint, dark yellowish brown (10YR4/4) near top of unit; massive; silt coatings are moderately thick, discontinuous, coat vertical fracture faces; firm; strongly effervescent; clear lower boundary; laminated; many silt laminations; transitional unit; lacustrine.
475-625 (15.6-20.5)	2C4	dark grayish brown to very dark grayish brown (10YR4/2-3/2) silty clay; massive; silt coatings are moderately thick, coat vertical fractures and infill fractures and voids; firm to very firm; strongly effervescent; gradual lower boundary; not laminated; white silts infilling fractures; slickensides; dense; very few small pebbles.
625-1204 (20.5-39.5)	2Cg	very dark gray (10YR3/1) silty clay to clay; massive; very firm; strongly effervescent; unknown lower boundary (end of tubes); few silty, light brownish gray (10YR6/2) mottles; slickensides; dense; very few small pebbles.

Core/Profile: KT-5

Location: T.H. 175 over Red River

Legal description: NE ¼ Section 8 T161N R50W

County: Kittson

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 787 feet

Topo. Map: Joliette

Remarks: T.H. 175 over Red River of the North; 0.13 mile east of east bridge abutment; 5.9 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-9 (0-.3)	A	black (10YR2/1) clay loam; weak, fine, granular; firm; noneffervescent; clear lower boundary; rootlets; roots.
9-22 (.3-.7)	AB	black (10YR2/1) clay loam; weak, medium, granular; very firm; noneffervescent; clear lower boundary; more clay-rich than A; roots; rootlets.
22-40 (.7-1.3)	Bt1	black (10YR2/1) clay-rich clay loam; mottles are few, coarse, faint, very dark gray (10YR3/1) at base of horizon; weak, fine, columnar parting to moderate, fine, subangular blocky; clay coatings are thick, continuous, coat pedes and fill pore spaces; very firm; very slightly effervescent; gradual lower boundary; rootlets; shiny.
40-67 (1.3-2.2)	Bt2	very dark gray (10YR3/1) clay loam to silty clay loam; mottles are few, coarse, faint, black (10YR2/1); weak, fine, subangular blocky; clay coatings are moderately thick, discontinuous, coat pedes; firm; slightly effervescent; gradual lower boundary; rootlets; derived from overwash.
67-105 (2.2-3.4)	CB	dark grayish brown to dark brown (10YR4/2-3/3) silty clay loam; mottles are common, coarse, faint, very dark gray (10YR3/1); weak, fine to medium, subangular blocky; clay coatings are moderately thick, discontinuous, coat pedes; firm; slightly to strongly effervescent; gradual lower boundary; few rootlets; structure stronger at top of unit; derived from lacustrine sediments.
105-177 (3.4-5.8)	Ck	dark grayish brown to olive brown (2.5Y4/2-4/4) silty clay loam; mottles are common, medium, faint, gray (10YR5/1) and strong brown (7.5YR4/6); common, medium, prominent, white (10YR8/2), soft calcareous concretions; massive; firm; strongly effervescent; gradual lower boundary; faintly laminated; few rootlets; lacustrine.
177-369 (5.8-12.1)	C1	olive brown (2.5Y4/4) silty clay loam; mottles are common, medium, faint to distinct, gray (10YR5/1), strong brown (7.5YR4/6), pale brown (10YR6/3), and few dark brown (7.5YR3/2); massive; firm; strongly effervescent; gradual lower boundary; laminated; silt laminations common; few oxidized laminations; few concretions; few rootlets; lacustrine.
369-607 (12.1-19.9)	C2	brown to dark brown (10YR5/3-3/3) silty clay loam to silty clay; mottles are few, medium, faint, dark brown (7.5YR3/2); massive; silt coatings are white, distinct, coat few large fracture surfaces and infill few fractures; firm; strongly effervescent; clear lower boundary; laminated; silt laminations common; some fracturing; darker with depth; denser with depth; often rootlets on fracture surfaces; lacustrine.
607-664 (19.9-21.8)	2C3	dark brown (10YR3/3) clay; massive; very firm; slightly to strongly effervescent; gradual lower boundary; not laminated; slickensides; shiny fracture surfaces; dense; few small pebbles.
664-1204 (21.8-39.8)	2Cg	very dark gray (10YR3/1) clay; massive; very firm; strongly effervescent; unknown lower boundary (end of tubes); not laminated; dense; slickensides; few small pebbles; few brown (10YR5/3) silty mottles.

Core/Profile: KT-6

Location: T.H. 175 over Red River

Legal description: NW ¼ Section 8 T161N R50W

County: Kittson

Parent material: Alluvium

Vegetation:

Slope:

Elevation: 773 feet

Topo. Map: Joliette

Remarks: T.H. 175 over Red River of the North; 157 feet west of east bridge abutment; 20.2 feet below center line; closest boring to river in transect

Depth cm(ft)	Horizon or Zone	Description
0-9 (0-.3)	AC	very dark grayish brown (10YR3/2) silty clay loam; weak, fine, granular to massive; firm; slightly to strongly effervescent; abrupt lower boundary; very weakly developed soil in top half of unit; silt is coarse; recent sediment.
9-24 (.3-.8)	2AC	very dark grayish brown (10YR3/2) silty clay loam; moderate, fine, granular; firm; slightly to strongly effervescent; clear lower boundary; roots; grasses; silt is coarse; structure is weaker near base.
24-48 (.8-1.6)	2CA	very dark grayish brown (10YR3/2) silty clay loam; mottles are few, coarse, faint, very dark gray (10YR3/1) at base; massive (fractured into angular blocks); firm; slightly to strongly effervescent; clear lower boundary; roots; laminated near base.
48-808 (1.6-26.5)	2C	very dark grayish brown (10YR3/2) silty clay loam to clay loam; mottles are few, fine, distinct, white (10YR8/2), calcareous; massive; friable to firm; strongly effervescent; gradual lower boundary; mostly silty clay loam; few flecks of charcoal; rootlets; few gastropod shells; shell fragments; few faint laminations; some fracturing; alluvial.
808-1189 (26.5-39.0)	2Cg	very dark gray (10YR3/1) silty clay loam to clay loam, unit appears slightly bluish in color; mottles are few, fine, faint, black (10YR2/1); massive; friable to firm; strongly effervescent; unknown lower boundary (end of tubes); few mollusk and gastropod shells; more dense than overlying units; few roots; alluvial.

Core/Profile: KT-7

Location: T.H. 171 over Red River

Legal description: SW ¼ SW ¼ Section 2 T163N R51W

County: Kittson

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 767 feet

Topo. Map: Pembina

Remarks: T.H. 171 over Red River of the North at St. Vincent; on east side of river; 0.2 mile west of east bridge abutment; 43 feet below center line; drillers' logs state that they drilled on south side of road, but map shows north side and all other borings are on north side of T.H. 171.

Depth cm(ft)	Horizon or Zone	Description
0-24 (0-.8)	AC	very dark grayish brown to very dark gray (10YR3/2-3/1) clay loam; mottles are few, fine, distinct, strong brown (7.5YR4/6); weak, medium, granular to massive; friable; strongly effervescent; clear lower boundary (color change); rootlets; few small pebbles; few fine laminations near base; 74% recovery.
24-168 (.8-5.5)	C1	very dark grayish brown (10YR3/2) loam; mottles are few, coarse, faint, very dark gray (10YR3/1) and dark gray (5Y4/1); massive; friable; strongly effervescent; diffuse lower boundary; grades between sandy clay loam, loam, and silt loam as sediment grades between coarse silt and very fine sand; few shell fragments; mollusk shells; few roots; rootlets; 74% recovery; alluvial.
168-512 (5.5-16.8)	C2	very dark grayish brown (10YR3/2) sand-rich silty clay loam to silt loam; mottles are common, medium, distinct, dark brown (7.5YR3/2-3/4); massive; friable; strongly effervescent; diffuse lower boundary; occasionally grades into loam or sandy clay loam as silt grades into very fine sand; few sand partings; few shell fragments; few faint laminations; 74% recovery; alluvial.
512-920 (16.8-30.2)	Cg1	very dark gray (10YR3/1) sand-rich silty clay loam to silt loam; mottles are few, medium, distinct, brown (10YR5/3) near top of unit; massive; friable; strongly effervescent; gradual lower boundary; slightly more clay-rich than C2 (both are near silt loam to silty clay loam boundary); grades between silt loam and loam as silt coarsens into very fine sand; few rootlets; few shell fragments; few faint laminations; grades into silty clay loam occasionally; alluvial.
920-1487 (30.2-48.8)	Cg2	very dark gray (5Y3/1) silt loam to silty clay loam; mottles are few, fine, distinct, black (10YR2/1); massive; friable; strongly effervescent; abrupt lower boundary; more dense than Cg1; faintly laminated; few shell fragments; gastropod shells; few sand partings; few rootlets; greenish with depth; wood collected from 1231-1234 cm; alluvial.
1487-1524 (48.8-50.0)	2Cg3	very dark gray (10YR3/1) clay; massive; firm; slightly effervescent; unknown lower boundary (end of tubes); few laminations; slickensides; shiny in more clay-rich zones; some fracturing; few silt laminations; lacustrine - deep water or off-shore facies.

Core/Profile: KT-8

Location: T.H. 171 over Red River

Legal description: SW ¼ SW ¼ Section 2 T163N R51W

County: Kittson

Parent material: Alluvium/lacustrine

Vegetation:

Slope:

Elevation: 767 feet

Topo. Map: Pembina

Remarks: T.H. 171 over Red River of the North at St. Vincent; on east side of river; 0.2 mile west of east bridge abutment; on north side of road; 40.0 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	AC	very dark grayish brown (10YR3/2) silty clay loam; massive; friable to firm; strongly effervescent; abrupt lower boundary; roots common; 80% recovery.
12-33 (.4-1.1)	2A	very dark gray (10YR3/1) clay loam; mottles are few, fine, faint, very dark grayish brown (10YR3/2); massive to weak, medium, granular; firm; strongly effervescent; clear lower boundary; few pebbles; many roots; 80% recovery.
33-53 (1.1-1.7)	2C	very dark grayish brown (10YR3/2) silty clay loam; mottles are few, coarse, faint, very dark gray (10YR3/1); massive; firm; strongly effervescent; clear lower boundary; roots common; few faint laminations; 80% recovery; alluvial.
53-91 (1.7-3.0)	3BAb	very dark grayish brown (10YR3/2) silty clay loam; weak to moderate, medium, subangular blocky to very weak prismatic; oxidation coatings are thin, moderately continuous, dark red to dark reddish brown (2.5YR3/6-2.5/4), coat ped faces; firm; strongly effervescent; clear lower boundary; faintly laminated; root common; slightly darker in color than overlying horizon; 80% recovery; alluvial.
91-158 (3.0-5.2)	4CA	very dark grayish brown (10YR3/2) silty clay loam; weak, medium, granular to fine subangular blocky; friable to firm; strongly effervescent; gradual lower boundary; cumulic; few laminations; rootlets common; alluvial.
158-579 (5.2-19.0)	4C	very dark grayish brown (10YR3/2) sand-rich silty clay loam to silt loam; mottles are common, fine, faint, brown to dark brown (7.5YR4/4-3/4), and few, medium, distinct, black (10YR2/1); massive; friable; strongly effervescent; diffuse lower boundary; faintly laminated; few rootlets; few shell fragments; gastropod shells; alluvial.
579-899 (19.0-29.5)	5Cg1	very dark gray (5Y3/1) silty clay loam to clay loam; mottles are few, fine, faint, black (10YR2/1), and very few, fine, distinct, brown (10YR5/3); massive; friable; strongly effervescent; abrupt lower boundary; faintly laminated; more dense than 4C; few rootlets; few shell fragments; alluvial.
899-1524 (29.5-50.0)	6Cg2	very dark gray (5Y3/1) clay; mottles are few, fine, distinct, gray (10YR5/1), silty; massive; very firm; strongly effervescent; unknown lower boundary (end of tubes); slickensides; some fracturing; few small to medium pebbles; not laminated; lighter in top 30 cm; irregular lens of silt loam from 1075-1090 cm; lacustrine - deep water or off-shore facies.

Core/Profile: KT-9

Location: T.H. 171 over Red River

Legal description: SW ¼ SW ¼ Section 2 T163N R51W

County: Kittson

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 773 feet

Topo. Map: Pembina

Remarks: T.H. 171 over Red River of the North at St. Vincent; on east side of river; 0.1 mile west of east bridge abutment; 31.1 feet below center line; truncated

Depth cm(ft)	Horizon or Zone	Description
0-4 (0.-1)	A	black (10YR2/1) silty clay loam; weak, medium, granular to massive; friable to firm; slightly effervescent; abrupt lower boundary; few roots; very thin horizon - sediment may have washed in from higher ground.
4-64 (0.1-2.1)	C1	brown (10YR5/3) silt loam; mottles are common, fine, distinct, dark brown to strong brown (7.5YR3/2-4/6); massive; friable; strongly effervescent; clear lower boundary; finely laminated; laminations often end in angular unconformities; few oxidized laminations; lacustrine - near-shore or shoreline facies.
64-137 (2.1-4.5)	C2	brown to grayish brown (10YR5/3-2.5Y5/2) silty clay loam; mottles are common, fine to medium, distinct, dark brown (7.5YR3/2) and strong brown (7.5YR4/6); massive; firm; strongly effervescent; unknown lower boundary (end of tube); laminated; silt laminations common; fracturing; many oxidized mottles; few small to medium pebbles.
137-183 (4.5-6.0)	C3	olive brown (2.5Y4/4) silt loam; mottles are few, fine, distinct, dark brown (7.5YR3/2); massive; friable; strongly effervescent; gradual lower boundary; finely laminated; few very fine sand laminations; many angular unconformities in laminations; lacustrine - near-shore or shoreline facies.
183-308 (6.0-10.1)	C4	brown to dark brown (10YR4/3) silty clay loam; mottles are common, fine, distinct to faint, dark brown (7.5YR3/2) and dark grayish brown (10YR4/2); massive; firm; strongly effervescent; gradual lower boundary; laminated; silt laminations common, often light yellowish brown (10YR6/4); few oxidized laminations; fewer laminations near base; lacustrine.
308-396 (10.1-13.0)	Cg1	dark grayish brown (10YR4/2) silty clay loam to silty clay; mottles are few, medium, faint, gray (10YR5/1); massive; firm; slightly effervescent; clear lower boundary; few silt laminations; vertical fracture faces coated with white (10YR8/1) silt; rootlets on fracture faces; few slickensides; lacustrine.
396-1509 (13.0-49.5)	2Cg2	very dark gray (10YR3/1) clay; massive; firm; slightly to strongly effervescent; unknown lower boundary (end of tubes); slickensides common; some fracturing; dense; few gray (10YR5/1) silty/clayey clasts; not laminated; lacustrine - deep water or off-shore lacustrine.

Core/Profile: KT-10

Location: T.H. 171 over Red River

Legal description: SW ¼ SW ¼ Section 2 T163N R51W

County: Kittson

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 775 feet

Topo. Map: Pembina

Remarks: T.H. 171 over Red River of the North at St. Vincent; on east side of river; 20 feet east of east bridge abutment; 10.6 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-14 (0-.5)	Ap	black (10YR2/1) clay loam; moderate, medium, granular; firm; strongly effervescent; abrupt lower boundary; many rootlets; few pebbles; 90% recovery.
14-39 (.5-1.3)	AB	black (10YR2/1) clay-rich silty clay loam; weak to moderate, fine, subangular blocky; clay coatings are moderately thick, moderately continuous, coat ped; firm; slightly effervescent; clear lower boundary; few omnidirectional rootlets; shiny; blacker than A horizon; 90% recovery.
39-134 (1.3-4.4)	CB	light brownish gray (10YR6/2) silt loam; mottles are few, coarse, distinct, very dark grayish brown (10YR3/2); weak, medium to coarse, subangular blocky; friable; violently effervescent; clear lower boundary; few omnidirectional rootlets; 90% recovery; lacustrine - shoreline or near-shore facies.
134-204 (4.4-6.7)	C1	dark yellowish brown (10YR4/4) silt loam; mottles are common, fine, distinct, strong brown to dark reddish brown (7.5YR4/6-5YR3/4); massive; friable; strongly effervescent; gradual, conformable lower boundary; laminated - clearly at top, faintly in rest of unit; oxidized mottles; fractured along bedding planes at top.
204-479 (6.7-15.7)	C2	brown to brown to dark brown (10YR5/3-4/3) silty clay loam; mottles are common, fine, distinct, strong brown and dark brown (7.5YR4/6&3/2), and common, medium, faint, gray (10YR5/1); massive; friable to firm; strongly effervescent; clear lower boundary; laminated; oxidized mottles; few small to medium pebbles; few lenses of laminated silts; grades into silt loam occasionally; lacustrine.
479-582 (15.7-19.1)	C3	brown to dark brown (10YR4/3) silty clay loam; mottles are common, fine, distinct, strong brown and dark brown (7.5YR4/6,3/2); massive; friable to firm; strongly effervescent; abrupt, unconformable lower boundary; laminated; laminations are skewed and rotated (as much as 90° - from horizontal to vertical); changes in angle are often abrupt; disturbance zone - probably post-deposition; lacustrine.
582-649 (19.1-21.3)	Cg1	very dark grayish brown (10YR3/2) silty clay; massive; firm; slightly effervescent; clear lower boundary; laminated (horizontally); near vertical laminations from C3 unit end abruptly on horizontal laminations of Cg, but color change is more gradual; silt laminations often light brownish gray (10YR6/2); more dense and more clay-rich than C2 and C3; few slickensides; lacustrine.
649-1524 (21.3-50.0)	2Cg2	very dark gray (10YR3/1) clay; massive; very firm; slightly effervescent; unknown lower boundary (end of tubes); dense; shiny; not laminated; slickensides common; few light brownish gray (10YR6/2), fine, silty mottles; very few small to medium pebbles; lacustrine - deep water or off-shore facies.

Core/Profile: KT-11

Location: U.S. 59 over North Branch of Two Rivers

Legal description: SE ¼ Section 12 T162N R48W

County: Kittson

Parent material: Alluvium/till

Vegetation:

Slope:

Elevation: 895 feet

Topo. Map: Lancaster

Remarks: U.S. 59 over North Branch of Two Rivers; in meander loop; 223 feet south of south bridge abutment; 16.8 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-20 (0-.7)	A	black (10YR2/1) sandy loam; weak, fine, granular to massive; friable; noneffervescent; clear lower boundary; massive near base; sand is very fine to fine; rootlets; 78% recovery.
20-36 (.7-1.2)	CA	black (10YR2/1) loamy sand; massive to single grain; very friable to loose; slightly effervescent; clear lower boundary; few rootlets; 78% recovery.
36-152 (1.2-5.0)	C1	dark brown (10YR3/3) fine sand to loamy sand; massive to single grain; very friable to loose; strongly to violently effervescent; clear lower boundary; few rootlets; darker, more dense, clay-rich band from 143-146 cm; 78% recovery.
152-189 (5.0-6.2)	C2	grayish brown (10YR5/2) loamy sand; mottles are common, fine, distinct, white (10YR8/2); massive; very friable; strongly to violently effervescent; clear lower boundary; 50% recovery.
189-290 (6.2-9.5)	C3	brown (10YR5/3) very fine sand; single grain; loose; strongly to violently effervescent; unknown lower boundary (end of tube); 50% recovery.
290-299 (9.5-9.8)	2CA	very dark grayish brown (10YR3/2) sandy loam; massive; very friable; strongly effervescent; abrupt lower boundary; more moisture than in surrounding horizons; shale at base; few oxidation coatings (strong brown [7.5YR4/6]).
299-341 (9.8-11.2)	2C1	grayish brown (10YR5/2) fine to medium sand; single grain; loose; strongly effervescent; clear lower boundary; faintly laminated; shell fragments; few oxidized mottles; root near base; fining upwards sequence; alluvial.
341-460 (11.2-15.1)	3C2	very dark gray (10YR3/1) fine to medium sand; mottles are few, coarse, faint, black (10YR2/1); single grain; loose; strongly effervescent; abrupt lower boundary; organic-rich; many rootlets; <i>Salix sp.</i> wood collected from 433-436 cm, C-14 dated at 2,840±40 BP; coarser/blacker near base; small pebbles common near base; stone line at base; shells; fining upwards sequence; alluvial.
460-579 (15.1-19.0)	4C3	dark grayish brown (10YR4/2) sandy loam diamicton; massive; friable; strongly effervescent; unknown lower boundary (end of tube); borderline with sandy clay loam; small to medium pebbles common; dense; few oxidized coatings (dark yellowish brown [10YR4/6]); pebbles are rounded; till.
579-594 (19.0-19.5)		stone line (boulder in driller's notes).
594-625 (19.5-20.5)	4C4	dark grayish brown (10YR4/2) sandy loam diamicton; massive; friable; strongly effervescent; clear lower boundary; few grasses collected from top; small to medium pebbles common; pebbles are rounded; bedded near base.
625-637 (20.5-20.9)	5C5	grayish brown (10YR5/2) fine sand; single grain; loose; strongly effervescent; abrupt lower boundary; sand lens.
637-652 (20.9-21.4)	6C6	dark gray (10YR4/1) sandy loam diamicton; massive; friable; strongly effervescent; abrupt lower boundary; borderline with sandy clay loam; small pebbles common; some bedding; sand lens/inclusion at 645 cm; till.
652-680 (21.4-22.3)	7C7	grayish brown (10YR5/2) fine sand; mottles are few, fine, distinct, dark yellowish brown (10YR4/6); single grain; loose; strongly effervescent; abrupt lower boundary; sand lens.
680-732 (22.3-24.0)	8Cg	very dark gray (10YR3/1) sandy clay loam diamicton; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); many small to medium pebbles; few small cobbles; clasts are rounded; oxidized coatings in top half are strong brown (7.5YR4/6); fractured angularly; dense; till.

Core/Profile: KT-12

Location: U.S. 59 over North Branch of Two Rivers

Legal description: SW ¼ NW ¼ Section 7 T162N R47W

County: Kittson

Parent material: Alluvium/till

Vegetation:

Slope:

Elevation: 914 feet

Topo. Map: Lancaster

Remarks: U.S. 59 over North Branch of Two Rivers; 939 feet north of north bridge abutment; 0.5 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-14 (0-.5)	A	black (10YR2/1) sandy loam; weak, fine, granular to single grain; very friable; noneffervescent; abrupt lower boundary; roots; rootlets; worm burrows.
14-32 (.5-1.0)	CA	very dark brown (10YR2/2) loamy sand; single grain; loose; noneffervescent; clear lower boundary; rootlets.
32-56 (1.0-1.8)	C	dark yellowish brown (10YR4/4) fine sand; mottles are common, fine, distinct, strong brown (7.5YR4/6); single grain; loose; strongly effervescent; clear lower boundary; rootlets; slightly loamy top 14 cm; worms; alluvium.
56-91 (1.8-3.0)	2C1	light gray (10YR7/2) sandy clay loam diamicton; mottles are common, fine, faint, white (10YR8/1), and few, fine, distinct, strong brown (7.5YR4/6); massive; firm; violently effervescent; diffuse lower boundary; hard when dry; pebbles common; few cobbles; rootlets; fractured; dense; weathered till.
91-323 (3.0-10.6)	2C2	brown to yellowish brown (10YR5/3-5/4) sandy loam diamicton; mottles are common, fine to medium, faint, strong brown (10YR4/6-5/6); massive; friable to firm; violently effervescent; clear lower boundary; fractures into platy blocks with oxidized coatings (strong brown [7.5YR5/6]); pebbles common; few cobbles; hard when dry; cobbles at base; dense; oxidized till.
323-619 (10.6-20.3)	2Cg1	dark gray to dark grayish brown (10YR4/1-4/2) sandy loam diamicton; massive; friable to firm; strongly effervescent; clear lower boundary; small to medium pebbles common; few sand lenses; dense; borderline with sandy clay loam; till.
619-732 (20.3-24.0)	2Cg2	dark gray (10YR4/1) sandy loam diamicton; massive; friable; strongly effervescent; unknown lower boundary (end of tubes); more sand than 2Cg1; sand lenses common; small to medium pebbles common; few large pebbles and cobbles; sand is fine to coarse; till.

Core/Profile: KT-13

Location: U.S. 59 over North Branch of Two Rivers

Legal description: NW ¼ SW ¼ Section 7 T162N R47W

County: Kittson

Parent material: Alluvium/till

Vegetation:

Slope:

Elevation: 908 feet

Topo. Map: Lancaster

Remarks: U.S. 59 over North Branch of Two Rivers; 414 feet north of north bridge abutment; 4.0 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	A	very dark brown (10YR2/2) sandy loam; mottles are few, fine, distinct, brown (10YR5/3); weak, fine, granular; very friable; strongly effervescent; clear lower boundary; many rootlets; roots.
12-20 (.4-.7)	AC	dark brown (10YR3/3) sandy loam; mottles are few, fine, distinct, black (10YR2/1), and common, fine, distinct, brown (10YR5/3); weak, fine, subangular blocky to massive; friable; strongly effervescent; clear lower boundary; rootlets.
20-30 (.7-1.0)	C	brown (10YR5/3) sandy loam; mottles are common, fine, distinct, black (10YR2/1); massive; friable; violently effervescent; abrupt lower boundary; few pebbles; rootlets; recent sediment.
30-47 (1.0-1.5)	2A	black (10YR2/1) sandy loam; mottles are few, fine, distinct, brown (10YR5/3); weak, fine, subangular blocky to massive; very friable; slightly effervescent; mottles are strongly effervescent; gradual lower boundary; rootlets; few pebbles.
47-92 (1.5-3.0)	2AC	black to very dark brown (10YR2/1-2/2) sandy loam; mottles are few, fine, distinct, strong brown (7.5YR4/6); massive; very friable; very slightly effervescent; gradual lower boundary; few laminations; rootlets; few foots; not as loamy as 2A.
92-128 (3.0-4.2)	2CA	very dark grayish brown (10YR3/2) loamy sand; massive to single grain; very friable to loose; very slightly effervescent; gradual lower boundary.
128-149 (4.2-4.9)	3AC	black (10YR2/1) sandy loam; mottles are few, fine, faint, brown (10YR5/3), sandy; massive to weak, fine, subangular blocky; very friable; very slightly effervescent; clear lower boundary.
149-165 (4.9-5.4)	3C1	dark brown (10YR3/3) sandy clay loam to sandy loam; mottles are few, fine, distinct, black (10YR2/1) massive to single grain; very friable to loose; very slightly effervescent; clear lower boundary; oxidized; few rootlets.
165-204 (5.4-6.7)	3C2	yellowish brown (10YR5/4) loamy sand; mottles are few, fine, distinct, strong brown (7.5YR4/6); single grain; loose; very slightly effervescent; clear lower boundary; oxidized; sand is very fine; small pebbles common; few medium pebbles; few rootlets.
204-235 (6.7-7.7)	3C3	grayish brown (10YR5/2) very fine sand; single grain; loose; slightly effervescent; clear lower boundary; coarse sand at base.
235-320 (7.7-10.5)	4C4	grayish brown (10YR5/2) sandy loam diamicton; mottles are common, medium, distinct, yellowish brown (10YR5/6) and strong brown (7.5YR4/6); massive; friable; strongly effervescent; gradual lower boundary; few laminations; small to medium pebbles common; oxidized mottles; weathered till, may be alluvially reworked.
320-347 (10.5-11.4)	4C5	grayish brown (10YR5/2) sandy loam diamicton; mottles are common, medium, distinct, strong brown and dark brown (7.5YR4/6 and 3/2); massive; friable; strongly effervescent; abrupt lower boundary (color change); dense; small to medium pebbles common; oxidized mottles; some fracturing; till.
347-613 (11.4-20.1)	4Cg1	dark gray (10YR4/1) sandy loam diamicton; massive; friable; strongly effervescent; clear lower boundary; dense; small to medium pebbles common; few cobbles; borderline with sandy clay loam; few sand lenses; till.
613-747 (20.1-24.5)	4Cg2	very dark gray (10YR3/1) sandy clay loam diamicton; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); very dense; hard when dry; small to medium pebbles common; few large pebbles and cobbles; till.

Core/Profile: KT-14

Location: U.S. 75 over North Branch of Two Rivers

Legal description: SW ¼ SE ¼ Section 16 T162N R49W

County: Kittson

Parent material: Alluvium/lacustrine(?) sediments

Vegetation:

Slope:

Elevation: 790 feet

Topo. Map: Hill Siding

Remarks: U.S. 75 over North Branch of Two Rivers; on south side of river; 13.7 feet south of south bridge abutment; 12.1 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-9 (0-3)	A	very dark gray (10YR3/1) clay loam; mottles are few, medium, faint, gray (10YR5/1) near base; weak, medium, granular to massive; friable to firm; slightly effervescent; clear lower boundary; roots; weakly developed horizon; few small pebbles; gastropod shells.
9-60 (.3-2.0)	C1	grayish brown (10YR5/2) sandy clay loam; mottles are few, coarse, gray (10YR5/1) and very dark gray (10YR3/1), and few, medium, distinct, white (10YR8/2); massive; friable to firm; slightly to strongly effervescent; clear lower boundary; few sand lenses; grades into sandy loam near base; rootlets; few laminations; alluvial.
60-110 (2.0-3.6)	C2	grayish brown (10YR5/2) clay loam; mottles are common, fine, distinct, white (10YR8/2), and common, coarse, faint, gray (10YR5/1); massive; firm; slightly to strongly effervescent; gradual lower boundary; grades into silty clay loam near top and sandy clay loam near base; few laminations; alluvial.
110-277 (3.6-9.1)	C3	grayish brown (10YR5/2) clay loam; mottles are common, fine to medium, distinct, white (10YR8/2), and few, medium, faint, gray (10YR5/1); massive; firm; strongly effervescent; gradual lower boundary; few sand lenses; few rootlets; charcoal flecks; borderline with silty clay loam; alluvial.
277-421 (9.1-13.8)	C4	dark gray (10YR4/1) clay loam; mottles are many, fine, faint, dark yellowish brown (10YR4/4-3/4), and very few, fine, distinct, white (10YR8/2); massive; firm; strongly effervescent; abrupt lower boundary; few laminated sand lenses; few small pebbles; pebbles common in last 10 cm; more clay-rich from 305-330 cm; alluvial.
421-439 (13.8-14.4)	2C5	dark grayish brown (10YR4/2) coarse sand; massive to single grain; friable to loose; strongly effervescent; abrupt lower boundary; coarse mottles of dark gray (10YR4/1) clay-rich sediment; small pebbles common; alluvial.
439-747 (14.4-24.5)	3Cg	very dark gray (10YR3/1) clay; mottles are few, fine, distinct, light brownish gray (10YR6/2) silty; massive; very firm; very slightly effervescent; unknown lower boundary (end of tubes); highly fractured into angular blocks with shiny faces; few small pebbles; very few rootlets; slickensides common; fracture blocks more common near top of unit - probably not peds (too angular/often fractured conchoidally); blacker near top.

Core/Profile: KT-15

Location: U.S. 75 over North Branch of Two Rivers

Legal description: SW ¼ SE ¼ Section 16 T162N R49W

County: Kittson

Parent material: Alluvium/lacustrine(?) sediments

Vegetation:

Slope:

Elevation: 792 feet

Topo. Map: Hill Siding

Remarks: U.S. 75 over North Branch of Two Rivers; on north side of river; 45 feet north of north bridge abutment; 10.1 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	A	black (10YR2/1) clay loam; weak, medium, granular; friable; slightly effervescent; clear lower boundary; many roots and rootlets.
12-116 (.4-3.8)	CA	very dark grayish brown (10YR3/2) clay loam; mottles are many, fine to coarse, distinct, black (10YR2/1); massive to weak, fine, subangular blocky; firm; strongly effervescent; clear lower boundary; few laminations; roots; lens of organic fibers; may be a cumulic horizon; 60% recovery.
116-158 (3.8-5.2)	C1	very dark grayish brown (10YR3/2) clay-rich loam; mottles are common, medium, faint, black (10YR2/1); massive; friable; slightly effervescent; gradual lower boundary; not dense; few rootlets; alluvial.
158-381 (5.2-12.5)	C2	dark grayish brown (10YR4/2) sandy loam to sandy clay loam; mottles are common, fine, faint, dark yellowish brown (10YR4/4), and few, medium, distinct, black (10YR2/1); massive; friable; slightly to strongly effervescent; diffuse lower boundary; mostly sandy loam, but grades into sandy clay loam sometimes, especially near base; few sand lenses; sand is fine to very fine; few shell fragments; few rootlets; few organic lamellae; alluvial.
381-479 (12.5-15.7)	Cg1	very dark gray (10YR3/1) sandy loam to sandy clay loam; mottles are few, medium, distinct, black (10YR2/1); massive; friable; slightly to strongly effervescent; clear lower boundary; few rootlets; faintly laminated; few shell fragments; gastropod shells; alluvial.
479-515 (15.7-16.9)	Cg2	very dark gray (10YR3/1) clay loam; massive; firm; slightly to strongly effervescent; clear lower boundary; transitional unit; more clay-rich than Cg1; multiple sand lenses; sand ranges from very fine to coarse; pebbles common near base; wood/roots collected from 503 cm, C-14 dated at 3,240±50 BP; rootlets; alluvial.
515-732 (6.9-24.0)	2Cg3	very dark gray (10YR3/1) clay; mottles are few, fine, distinct, light brownish gray (10YR6/2); massive; very firm; strongly effervescent; unknown lower boundary (end of tubes); dense; fractured, especially near top; slickensides common; few small pebbles; darker and more dense near top.

Core/Profile: KT-16
 Location: U.S. 75 over North Branch of Two Rivers
 Legal description: SW ¼ SE ¼ Section 16 T162N R49W
 County: Kittson
 Parent material: Lacustrine sediments
 Vegetation:
 Slope:
 Elevation: 796 feet
 Topo. Map: Hill Siding
 Remarks: U.S. 75 over North Branch of Two Rivers; on north side of river; 280 feet north of north bridge abutment; 7.1 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	A	black (10YR2/1) silty clay loam; weak, fine, granular; friable; slightly effervescent; abrupt lower boundary; strong root mat; few large roots; 80% recovery.
12-33 (.4-1.1)	AC	very dark grayish brown (10YR3/2) clay loam; mottles are many, fine, faint, black (10YR2/1); weak, fine, granular; firm; strongly effervescent; abrupt lower boundary; rootlets common; roots; 80% recovery.
33-433 (1.1-14.2)	C	brown to dark brown (10YR4/3) clay; mottles are common, coarse, distinct, dark gray (10YR4/1), and few, fine, distinct, light brownish gray (10YR6/2), silty; massive; very firm; strongly effervescent; gradual lower boundary; dense; some fracturing; few fractures infilled with white silts (non-calcareous); few small pebbles; few rootlets in top few cm; slickensides; grayer with depth.
433-747 (14.2-24.5)	Cg	very dark gray (10YR3/1) clay; mottles are few, fine, distinct, light brownish gray (10YR6/2), silty; massive; very firm; strongly effervescent; unknown lower boundary (end of tubes); dense; slickensides; few pebbles; less dense/more fractured from 479-503 cm.

Core/Profile: KT-17

Location: T.H. 175 over Middle Branch of Two Rivers

Legal description: SW ¼ SE ¼ Section 9 T161N R48W

County: Kittson

Parent material: Aluvium

Vegetation:

Slope:

Elevation: 833 feet

Topo. Map: Lancaster

Remarks: T.H. 175 over Middle Branch of Two Rivers east of Hallock; on west side of river; 21 feet west of west bridge abutment; 8.9 feet below center line; on medium terrace

Depth cm(ft)	Horizon or Zone	Description
0-9 (0-.3)	AC	very dark grayish brown (10YR3/2) sandy loam; weak, medium, granular; friable; strongly effervescent; clear lower boundary; rootlets; few small pebbles.
9-22 (.3-.7)	C1	very dark grayish brown (10YR3/2) sandy loam to loamy sand; massive; friable; strongly effervescent; clear lower boundary; dense; few small cobbles; few rootlets; few pebbles.
22-131 (.7-4.3)	C2	dark grayish brown (10YR4/2) loamy sand to fine sand; mottles are common, coarse, distinct, very dark gray (10YR3/1); massive to single grain; friable to loose; strongly effervescent; abrupt lower boundary (color change); laminated; few very dark gray (10YR3/1) seams; sand is fine to very fine; few rootlets; some fracturing along bedding planes; recent alluvium.
131-213 (4.3-7.0)	Cg	very dark gray to dark gray (10YR3/1-4/1) sandy loam; mottles are common, coarse, distinct, black (10YR2/1); massive; friable; slightly to strongly effervescent; clear lower boundary; some organic matter; lenses containing plant matter (wood/stems/roots); sand ranges from fine to medium; sand lens from 162-168 cm; lag of gastropod shells at 168 cm; some wood/roots collected from near base; few laminations near top; alluvial.
213-259 (7.0-8.5)	2C	very dark grayish brown (10YR3/2) gravel; single grain; loose; strongly effervescent; unknown lower boundary (end of tubes); coarse sand in matrix; mostly small to medium pebbles; few large pebbles and small cobbles; clasts are mostly rounded; last 5-10 cm have finer sand matrix and fewer pebbles - possibly the top of a new unit; but it is unclear; refused at 259 cm; alluvial.

Core/Profile: KT-18

Location: T.H. 175 over Middle Branch of Two Rivers

Legal description: SE 1/4 SW 1/4 Section 9 T161N R48W

County: Kittson

Parent material: Till/alluvium

Vegetation:

Slope:

Elevation: 832 feet

Topo. Map: Hallock

Remarks: T.H. 175 over Middle Branch of Two Rivers east of Hallock; on west side of river; 0.5 mile west of west bridge abutment; 6.8 feet below center line; in meander scar

Depth cm(ft)	Horizon or Zone	Description
0-10 (0-.3)	A	black (10YR2/1) clay loam; moderate, medium, granular; friable; slightly effervescent; clear lower boundary; few small pebbles; rootlets; strong root mat on top.
10-101 (.3-3.3)	CA	black (10YR2/1) clay-rich silty clay loam to clay loam; mottles are lighter and darker shades of black; massive to weak, medium, angular blocky; very firm; strongly effervescent; abrupt lower boundary; many rounded, small to medium pebbles; few angular clasts; very dense and hard; many rootlets; few laminations.
101-162 (3.3-5.3)	2C	dark grayish brown (10YR4/2) silty clay loam to clay loam; mottles are common, fine to coarse, distinct, black (10YR2/1); massive; firm; strongly effervescent; clear lower boundary; faintly laminated; few rootlets.
162-180 (5.3-5.9)	3ACb	black (10YR2/1) silty clay loam; mottles are common, medium, distinct, dark grayish brown (10YR4/2); weak, medium, granular; firm; strongly effervescent; clear lower boundary; few roots; omnidirectional rootlets; piece of wood/bark(?) collected from 174 cm.
180-238 (5.9-7.8)	3C	very dark grayish brown (10YR3/2) silty clay loam; mottles are common, medium, distinct, black (10YR2/1), and common, medium to coarse, faint, dark yellowish brown (10YR4/6) and dark grayish brown (10YR4/2); massive; friable to firm; strongly effervescent; abrupt lower boundary; few roots; few black seams; some fracturing into fine blocks in more clay-rich zones; piece of wood at base.
238-247 (7.8-8.1)	4Ab	black (10YR2/1) loam to clay loam; weak, fine to medium, granular; friable; very slightly effervescent; clear lower boundary; many roots - some collected.
247-308 (8.1-10.1)	4ACb	very dark gray (10YR3/1) clay loam; mottles are many, coarse, faint, black (10YR2/1), and common, coarse, distinct, strong brown (7.5YR4/6); massive; friable; slightly effervescent; abrupt lower boundary (color change); faintly laminated; roots common.
308-351 (10.1-11.5)	4C1	gray (5Y5/1) silt loam to sandy loam; mottles are few, fine, faint, olive (5Y5/3); massive; friable; strongly effervescent; clear lower boundary; horizontal roots common; few rounded pebbles; few sand lenses; pebbles more common near top; reworked till.
351-381 (11.5-12.5)	4C2	light brownish gray (10YR6/2) silt to silt loam; mottles are few, coarse, distinct, yellowish brown (10YR5/4) massive; very friable; strongly to violently effervescent; abrupt lower boundary; silt is coarse, bordering on fine sand; fine sand lens at base; few small pebbles; few rootlets; reworked till.
381-427 (12.5-14.0)	5C3	grayish brown (2.5Y5/2) sandy loam to sandy clay loam diamicton; massive; firm; strongly to violently effervescent; unknown lower boundary (end of tubes); small to medium pebbles common; few large pebbles/small cobbles; dense; till.

Core/Profile: KT-19

Location: T.H. 175 over Middle Branch of Two Rivers

Legal description: NE ¼ NW ¼ Section 16 T161N R48W

County: Kittson

Parent material: Till

Vegetation:

Slope:

Elevation: 836 feet

Topo. Map: Hallock

Remarks: T.H. 175 over Middle Branch of Two Rivers east of Hallock; on west side of river in an abandoned meander; 0.5 mile west of west bridge abutment; 6.1 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	A	black (10YR2/1) clay loam; mottles are few, medium, faint, very dark grayish brown (10YR3/2); moderate, medium, granular at top; firm; slightly effervescent; abrupt lower boundary; weaker structure near base; dense lower half; few small pebbles; roots.
12-88 (.4-2.9)	C1	dark brown (10YR3/3) clay-rich silty clay to clay loam; mottles are few, medium, distinct, brown to dark brown (7.5YR4/4) and black (10YR2/1), and common, fine, distinct, white (10YR8/1); massive (highly fractured); very firm; strongly effervescent; gradual lower boundary; unit is fractured into angular blocks; block faces are shiny and some contain slicksides - probably not ped faces; few rootlets; few oxidized mottles; till.
88-287 (2.9-9.4)	C2	yellowish brown (10YR5/4) clay loam diamicton; mottles are common, medium, distinct, gray (10YR5/1) and dark brown (7.5YR3/2), and common, fine to coarse, faint, pale brown (10YR6/3); massive; firm; very strongly effervescent; gradual lower boundary; small to medium pebbles, common to many; few large pebbles; oxidized mottles; more clay-rich in top 20-30 cm; darker near top; till.
287-399 (9.4-13.1)	C3	brown (10YR5/3) clay loam diamicton; mottles are many, fine to coarse, faint, light yellowish brown (10YR6/4), and common, medium, faint to distinct, gray (10YR5/1) and white (10YR8/1); massive; firm; strongly to violently effervescent; abrupt lower boundary; more heavily mottled than C2; small to medium pebbles, common to many; few large pebbles; clasts include carbonates and exotics; clasts of sandy loam included in unit; sandier than C2; till.
399-436 (13.1-14.3)	2C4	very pale brown (10YR7/3) very fine sand; single grain; loose; strongly effervescent; clear lower boundary; faintly bedded; lower horizon disturbed in coring.
436-442 (143-145)	3C5	brown (10YR5/3) sandy clay loam diamicton; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); many small pebbles; borderline with sandy loam; sand is fine; till (different unit than C1-C3).
442-472 (14.5-15.5)		no recovery; refused at 472 cm.

Core/Profile: MA-1

Location: T.H. 220/1 over Snake River

Legal description: SE ¼ SE ¼ Section 31 T155N R49W

County: Marshall

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 804 feet

Topo. Map: Oslo NE

Remarks: T.H. 220/1 over Snake River in Alvarado; on eastern side of river; 193 feet east of east bridge abutment; 7.1 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	A	very dark grayish brown (10YR3/2) silty clay loam to clay loam; mottles are common, medium, distinct, grayish brown (10YR5/2); weak, fine, subangular blocky to massive; firm; strongly effervescent; clear lower boundary; root mass at top; few small pebbles; 80% recovery.
12-31 (.4-1.0)	CB	grayish brown (2.5Y5/2) silty clay loam; mottles are few, fine to medium, faint to distinct; very dark gray (10YR3/1), dark yellowish brown (10YR3/4), and pale brown (10YR6/3); weak, medium, subangular blocky to massive; clay coatings are thin, discontinuous, coat ped faces; firm; strongly effervescent; clear lower boundary; worm burrows filled with black sediment; 80% recovery.
31-149 (1.0-4.9)	C1	grayish brown (10YR5/2) silt loam to silty clay loam; mottles are common, coarse, distinct, strong brown (7.5YR4/6) and yellowish brown (10YR5/6); massive; friable; strongly effervescent; gradual lower boundary; laminated; many oxidized laminations; silt laminations common; few pebbles; angular bedding; lacustrine.
149-302 (4.9-9.9)	C2	grayish brown (10YR5/2) silty clay loam; mottles are common, fine, distinct, white (10YR8/1), and common, medium to coarse, distinct, dark reddish brown (5YR3/3) and light yellowish brown (10YR6/4); massive; firm; strongly effervescent; diffuse lower boundary; laminated; few silt laminations; few oxidized laminations; oxidized mottles; pipestems and concretions; lacustrine.
302-1204 (9.9-39.5)	Cg	very dark gray (10YR3/1) silty clay; massive; firm; very slightly effervescent; unknown lower boundary (end of tubes); oxidized mottles (strong brown [7.5YR4/6] and dark yellowish brown [10YR4/4]) in top 150 cm; few, thin silty laminations; occasionally grades into clay; fewer laminations with depth; lacustrine, deeper water facies than C1 horizon represents.

Core/Profile: MA-2

Location: T.H. 220/1 over Snake River

Legal description: SE ¼ SE ¼ Section 31 T155N R49W

County: Marshall

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 802 feet

Topo. Map: Oslo NE

Remarks: T.H. 220/1 over Snake River in Alvarado; on eastern side of river; 13.5 feet east of east bridge abutment; 8.5 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-8 (0-3)	Ap1	black (10YR2/1) silty clay loam; moderate, medium, granular; firm; strongly effervescent; clear lower boundary; grasses; roots; few small rounded pebbles; silt-rich; dense.
8-98 (.3-3.2)	Ap2	mottled black (10YR2/1) and brown (10YR5/3) loam; massive; friable; violently effervescent; clear lower boundary; many small rounded pebbles; very hard when dry; extremely dense; few rootlets; may be fill; 37% recovery.
98-110 (3.2-3.6)	CA	dark gray (10YR4/1) silty clay loam; mottles are common, coarse, faint and distinct, grayish brown (10YR5/2) and black (10YR2/1); massive; firm; violently effervescent; abrupt lower boundary; very dense; slightly laminated; silt-rich; recent sediment.
110-143 (3.6-4.7)	2ACb	very dark grayish brown (10YR3/2) silt loam to silty clay loam; mottles are few, fine, distinct, white (10YR8/2); weak, fine, subangular blocky to massive; clay coatings are moderately thin, discontinuous, coat some peds in middle of unit; friable; slightly effervescent; gradual lower boundary; few roots; few shell fragments; charcoal; 66% recovery.
143-180 (4.7-5.9)	2C1	very dark grayish brown (10YR3/2) silt loam to silty clay loam; mottles are few, fine, distinct, white (10YR8/2); massive; friable; slightly effervescent; clear lower boundary; few roots; few shell fragments; charcoal; few laminations; alluvial; 66% recovery.
180-411 (5.9-13.5)	3C2	brown (10YR5/3) silty clay loam to silty clay; mottles are common, coarse, distinct, dark gray (10YR4/1); common, medium, faint, strong brown (7.5YR4/6); and common, fine to medium, distinct, white (10YR8/2) and dark brown (7.5YR3/2); massive; clay coatings are thick, discontinuous, dark gray (10YR4/1), coat few fracture surfaces; firm; slightly effervescent; diffuse lower boundary; oxidized mottles; few vertical rootlets; partly laminated; lacustrine.
411-1173 (13.5-38.5)	3Cg	dark gray (10YR4/1) silty clay; mottles are few, coarse, faint, dark yellowish brown (10YR4/4) near top of unit, and few, fine, distinct, white (10YR8/2); massive; firm; slightly effervescent; unknown lower boundary (end of tubes); unoxidized; few thin laminations; few laminations are white (10YR8/2) or brown (10YR5/3) and silty; more clay-rich with depth; fewer laminations with depth; lacustrine.

Core/Profile: MA-3

Location: T.H. 220/1 over Snake River

Legal description: SW ¼ SE ¼ Section 31 T155N R49W

County: Marshall

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 805 feet

Topo. Map: Oslo NE

Remarks: T.H. 220/1 over Snake River in Alvarado; on western side of river; 123 feet west of west bridge abutment; 6.3 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-8 (0-.3)	A1	black (10YR2/1) clay loam to silty clay loam; moderate, medium, granular; firm; strongly effervescent; clear lower boundary; many rootlets; roots.
8-22 (.3-.7)	A2	black (10YR2/1) clay loam to silty clay loam; moderate, fine, subangular blocky; firm; strongly effervescent; clear lower boundary; many rounded pebbles; rootlets common.
22-40 (.7-1.3)	AB	black (10YR2/1) silty clay; mottles are few, medium, distinct, brown (7.5YR5/2) and pale brown (10YR6/3); weak to moderate, medium, angular blocky; clay coatings are thin, moderately continuous, coat ped faces; very firm; slightly to strongly effervescent; abrupt lower boundary; very dense; few roots; omnidirectional rootlets; few pebbles.
40-122 (1.3-4.0)	C1	grayish brown (10YR5/2) silt loam; mottles are few, coarse, faint, very dark grayish brown (10YR3/2), and common, fine, distinct, strong brown (7.5YR4/6); massive; friable; violently effervescent; gradual lower boundary; few roots; omnidirectional rootlets; laminated near base; some oxidized laminations; dense at top; lacustrine.
122-344 (4.0-11.3)	C2	grayish brown (10YR5/2) silty clay loam; mottles are common, fine to coarse, faint to distinct, strong brown (7.5YR4/6), brownish yellow (10YR6/6), and white (10YR8/1); massive; firm; strongly effervescent; diffuse lower boundary; laminated; many silt laminations; oxidized laminations and mottles; rootlets; fractured in more clay-rich zones; few concretions; lacustrine.
344-1189 (11.3-39.0)	Cg	dark grayish brown (10YR4/2) silty clay; mottles are common, medium to coarse, faint to distinct, strong brown (7.5YR4/6) and dark gray (10YR4/1) near top; massive; clay coatings are moderately thick, discontinuous, dark gray (10YR4/1), coat few fracture surfaces near top of unit; firm; slightly effervescent; unknown lower boundary (end of tubes); oxidized mottles down to 550 cm; laminated; few silty laminations; few rootlets at top; grayer with depth, 5YR4/1 at base; lacustrine.

Core/Profile: MA-4

Location: T.H. 220/1 over Snake River

Legal description: SW ¼ SE ¼ Section 31 T155N R49W

County: Marshall

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 798 feet

Topo. Map: Oslo NE

Remarks: T.H. 220/1 over Snake River in Alvarado; on western side of river; 10 feet west of west bridge abutment; 12.7 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-28 (0-.9)	A	black (10YR2/1) silty clay loam; moderate, medium, granular; friable to firm; strongly effervescent; clear lower boundary; roots; rootlets; wood; few pebbles; top half has coarser structure than lower half.
28-58 (.9-1.9)	Acum	very dark grayish brown (10YR3/2) silty clay loam; mottles are many, medium to coarse, distinct, grayish brown (10YR5/2); weak, fine, granular to massive; friable to firm; strongly to violently effervescent; abrupt lower boundary; packets of laminated silts; roots; wood; recent sediment.
58-107 (1.9-3.5)	2ACb	very dark grayish brown (10YR3/2) silty clay loam; mottles are very few, fine, distinct, white (10YR8/2); weak, fine, granular to weak, fine, subangular blocky; friable; strongly effervescent; gradual lower boundary; few roots; omnidirectional rootlets; appears to be buried by recent sediment.
107-329 (3.5-10.8)	2C	very dark grayish brown (10YR3/2) silty clay loam; mottles are common, fine, faint, dark brown (7.5YR3/4), and few, fine, faint, grayish brown (10YR5/2); massive; clay coatings coat pebbles at base; firm; strongly effervescent; clear lower boundary; oxidized mottles; mollusk shells; shell fragments; many medium-sized, rounded pebbles at base; charcoal fragments collected from base, 323-329 cm; poorly laminated; omnidirectional rootlets; alluvial; 70-80% recovery.
329-1173 (10.8-38.5)	3Cg	very dark gray (5Y3/1) silty clay; laminations are few, fine, distinct, grayish brown (10YR5/2), and mottles are few, medium, faint, dark brown (10YR3/3) at top of horizon; massive; firm; slightly to strongly effervescent; unknown lower boundary (end of tubes); unoxidized; few thin laminations; laminations are often grayish brown (10YR5/2) and silty; conchoidal fractures in more clay-rich zones; very few laminations below 840 cm; lacustrine.

Core/Profile: MA-5

Location: T.H. 1 over Red River

Legal description: SW ¼ Section 31 T155N R50W

County: Marshall

Parent material: Lacustrine sediments/alluvium (overwash)

Vegetation:

Slope:

Elevation: 808 feet

Topo. Map: Oslo

Remarks: T.H. 1 over Red River in Oslo; on east side of river; 256 feet east of east bridge abutment; 7.8 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-97 (0-3.2)	Acum	very dark grayish brown to very dark gray (10YR3/2-3/1) clay loam; mottles are many, fine to coarse, distinct, very pale brown to pale brown (10YR7/3-6/3); medium granular to fine subangular blocky; firm; violently effervescent; abrupt lower boundary; cumulic horizon; more developed soils, 22-27 cm and 53-61 cm; many omnidirectional rootlets; grasses; roots.
97-131 (3.2-4.3)	2Btb	black (10YR2/1) clay loam; mottles are few, coarse, faint, very dark gray (10YR3/1); moderate, medium, angular blocky; clay coatings are thin, discontinuous, coat ped faces; firm; slightly to strongly effervescent; clear lower boundary; few small pebbles; omnidirectional rootlets; very hard when dry.
131-165 (4.3-5.4)	2Btkb	clay loam to silty clay loam; mottles are few, medium, distinct, light gray (10YR7/2); weak, fine, subangular blocky; clay coatings are distinct, thick, shiny, moderately continuous, coat ped faces; firm; slightly to strongly effervescent; clear lower boundary; increased clay content; soft carbonate-rich concretions; few omnidirectional rootlets; few small pebbles; small piece of bone.
165-183 (5.4-6.0)	2BCkb	very dark grayish brown (10YR3/2) clay-rich silty clay loam to clay loam; mottles are few, medium, distinct, very pale brown (10YR8/3); weak, medium, subangular blocky to massive; firm; strongly effervescent; gradual lower boundary; few soft carbonate-rich concretions.
183-253 (6.0-8.3)	2Ck	grayish brown to light olive brown (2.5Y5/2-5/4) silt loam to silty clay loam; mottles are few, coarse, distinct, very dark grayish brown (10YR3/2) at top, and many, fine, faint, very pale brown (10YR7/3); massive; friable; violently effervescent; gradual lower boundary; faint bedding; may be alluvially reworked lacustrine sediments.
253-594 (8.3-19.5)	3C1	brown (10YR5/3) silt loam; mottles are common, medium to coarse, distinct, strong brown to dark brown (7.5YR4/6-3/2), and few, medium, distinct, yellowish brown (10YR5/6) and light gray (10YR7/2); massive; friable; strongly effervescent; diffuse lower boundary; laminated; fractures along bedding planes; oxidized mottles and laminations; silt laminations common; many angular unconformities in fine silt laminations; few carbonaceous pebbles (in discrete beds); many silty clay loam laminations; some Mn oxides coating few fracture surfaces; more clay-rich near base; lacustrine.
594-893 (19.5-29.3)	3C2	brown (10YR5/3) silty clay loam; mottles are few, medium, distinct, very dark grayish brown (10YR3/2); massive; silt coatings are white (10YR8/1), distinct, coat vertical, curved fracture faces and infill few other fractures (more common at top of unit); friable to firm; strongly effervescent; clear lower boundary; laminated; fractured into coarse blocks in some areas; few oxidized mottles near top of unit (strong brown [7.5YR4/6]); silt laminations common; lacustrine.
893-1189 (29.3-39.0)	3Cg	very dark gray (5Y3/1) silty clay loam; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); laminated; silt laminations common, often light brownish gray to grayish brown (10YR6/2-5/2); occasional angular unconformities in silt laminations; lacustrine.

Core/Profile: MA-6

Location: T.H. 1 over Red River

Legal description: SW ¼ Section 31 T155N R50W

County: Marshall

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 808 feet

Topo. Map: Oslo

Remarks: T.H. 1 over Red River in Oslo; on east side of river; easternmost core in transect; near trees; 299 feet east of east bridge abutment; 7.8 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-42 (0-1.4)	A	black (10YR2/1) clay loam to silty clay loam; strong, medium, granular to fine subangular blocky; firm; slightly to strongly effervescent; clear lower boundary; roots; rootlets; very dark grayish brown (10YR3/2) at base; 80% recovery.
42-81 (1.4-2.7)	AB	very dark grayish brown (10YR3/2) clay loam to silty clay loam; mottles are few, medium, distinct, white (10YR8/1), carbonate-rich, and many, fine to medium, faint, black (10YR2/1); weak, medium, subangular blocky; clay coatings are thin, discontinuous, coat ped faces in lower half of unit; firm; strongly effervescent; clear lower boundary; rootlets; more clay-rich near base; 80% recovery.
81-180 (2.7-5.9)	Btk	black and very dark gray (10YR2/1-3/1) silty clay; mottles are common, medium, distinct, white (10YR8/1); moderate, medium, subangular blocky parting to fine subangular blocky; clay coatings are thick, shiny, continuous, coat ped faces and fill pore spaces; very firm; slightly effervescent; mottles are violently effervescent; gradual lower boundary; soft carbonate-rich concretions; few omnidirectional rootlets; color alternates between black and very dark gray every 20 to 30 cm; color shifts may relate to depositional beds; 80% recovery.
180-271 (5.9-8.9)	Ck	grayish brown to light olive brown (2.5Y5/2-5/4) silty clay loam to silt loam; mottles are many, fine, faint, white (10YR8/2), and common, medium, faint, dark gray (10YR4/1); massive; friable to firm; violently effervescent; diffuse lower boundary; laminated; few rootlets; grayer (10YR5/2) at top; may be alluvially reworked lacustrine sediments.
271-302 (8.9-9.9)	2C1	grayish brown to light olive brown (2.5Y5/2-5/4) silty clay loam; mottles are common, fine, distinct, strong brown (7.5YR4/6) and white (10YR8/2); massive; firm; strongly effervescent; abrupt lower boundary; laminated; few oxidized laminations; silt laminations common, often very pale brown (10YR8/3); lacustrine.
302-472 (9.9-15.5)	2C2	brown (10YR5/3) silty clay loam; mottles are common, coarse, distinct, strong brown (7.5YR4/6) and grayish brown (10YR5/2); massive; clay coatings are distinct, discontinuous, grayish brown (10YR5/2), coat few fracture surfaces; firm; strongly effervescent; diffuse lower boundary; oxidized mottles; few medium-sized weathered pebbles; pipestems; concretions; fractured conchoidally into medium to coarse blocks; sparsely laminated; few silt laminations; oxidized root voids; lacustrine(?)
472-492 (15.5-26.0)	2C3	brown (10YR5/3) silty clay loam; mottles are few, medium, distinct, strong brown (7.5YR4/6) and dark brown (7.5YR3/2); massive; firm; slightly to strongly effervescent; clear lower boundary; oxidized mottles; laminated; silt laminations common; Mn oxides; ripples in several ailt laminations, approximately 1 cm from crest to crest; oxidized root voids; lacustrine.
792-820 (26.0-26.9)	2Cg1	dark gray (10YR4/1) silty clay loam to coarse silt; massive; firm to friable; slightly to strongly effervescent; abrupt lower boundary; 24 cm of silty clay loam over 3 cm of coarse silt; silty clay loam is massive and coarsely fractured with no laminations; few laminations in lowermost silty clay loam and in coarse silt; fining upwards sequence possibly from an underwater debris flow(?)
820-835 (26.9-27.4)	2Cg2	dark grayish brown (10YR4/2) silty clay loam to fine sand; massive; firm to friable; strongly effervescent; abrupt lower boundary; laminated silty clay loam in top 9 cm with laminated sand/coarse silt in lower 6 cm; band of gypsum(?) 2 mm thick on lower boundary; lacustrine.
835-881 (27.4-28.9)	2Cg3	dark gray (10YR4/1) silty clay loam to coarse silt; massive; firm to friable; strongly effervescent; abrupt lower boundary; similar to 2Cg1; non-laminated silty clay loam on top of laminated silt loam and silt; possibly a fining upwards sequence(?) lacustrine.

Depth cm(ft)	Horizon or Zone	Description
-----------------	--------------------	-------------

MA-6 (Continued)

881-1061 (28.9-34.8)	2Cg4	very dark gray (10YR3/1) silty clay loam; massive; firm; strongly effervescent; clear lower boundary; laminated; silt laminations, light brownish gray (10YR6/2) and common; between 939 cm and 951 cm, laminations are swirled (resembles soft sediment deformation features from turbidity currents); lacustrine.
1061-1204 (34.8-39.5)	2Cg5	very dark gray (10YR3/1) silt loam to silty clay; massive; friable to firm; strongly effervescent; unknown lower boundary (end of tubes); laminated; unit grades between silty clay and silt loam every 30-50 cm; fractured in clay-rich zones; lacustrine.

Core/Profile: MA-7

Location: T.H. 1 over Red River

Legal description: SW ¼ Section 31 T155N R50W

County: Marshall

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 790 feet

Topo. Map: Oslo

Remarks: T.H. 1 over Red River in Oslo; on east side of river near river's edge; 244 feet west of east bridge abutment; 17 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-7 (0.-2)	C	very dark grayish brown (10YR3/2) silty clay loam; massive; firm; strongly effervescent; abrupt lower boundary; laminated; recent sediment; grayish brown (10YR5/2) laminations.
7-42 (.2-1.4)	2Acum	black (10YR2/1) silty clay loam to clay loam; mottles are few, medium, faint, dark grayish brown (10YR4/2); moderate, medium, granular; firm; strongly effervescent; abrupt lower boundary; few silt lenses; rootlets; cumulic; slightly massive at top.
42-76 (1.4-2.5)	2AC	very dark grayish brown (10YR3/2) silty clay loam; mottles are common, medium to coarse, faint, very dark gray (10YR3/1); massive; firm; strongly effervescent; clear lower boundary; cumulic horizon; rootlets; laminations; few bands with weak subangular blocky structure.
76-98 (2.5-3.2)	3Ab	black (10YR2/1) clay-rich loam; mottles are few, fine, faint, dark grayish brown (10YR4/2); weak, medium, subangular blocky; friable; strongly effervescent; clear lower boundary; less dense than surrounding units; disturbed in coring; rootlets.
98-138 (3.2-4.5)	3ACb	very dark grayish brown (10YR3/2) clay-rich loam; mottles are common, fine, faint, grayish brown (10YR3/2), and few, coarse, faint, black (10YR2/1); massive; friable to firm; strongly effervescent; clear lower boundary; cumulic horizon; silt lenses; faintly laminated.
138-259 (4.5-8.5)	3C1	very dark grayish brown (10YR3/2) silty clay loam to clay loam; mottles are common, fine to medium, faint, grayish brown (10YR5/2); massive; friable to firm; strongly effervescent; gradual lower boundary; laminated; rootlets; silt lenses; few fine sand lenses; charcoal; silt is coarse, bordering on fine sand; alluvial.
259-762 (8.5-25.0)	3C2	very dark grayish brown (10YR3/2) silty clay loam to clay loam; mottles are common, fine, faint, grayish brown (10YR5/2), and common, coarse, faint, gray (10YR5/1); massive; friable to firm; strongly effervescent; gradual lower boundary; few faint laminations; gastropod shells; few rootlets; charcoal collected from 287 cm; silt is occasionally coarse, bordering on fine sand; few silt/fine sand lenses; few lenses of sandy loam, including several between 675 cm and 762 cm that contain mollusk and gastropod shells and shell fragments; some zones of silt loam; alluvial.
762-1033 (25.0-33.9)	3Cg	dark gray (2.5Y4/0) silt loam to loam; massive; friable to firm; strongly effervescent; clear lower boundary; gastropod and mollusk shells common; several lenses of sandy clay loam; rootlets; some plant matter including roots, seeds(?), leaves, and wood(?) - some collected; at least one large (3 cm across) mollusk - collected at 966 cm; clay-rich end of silt loam and loam - some silty clay loam and clay loam; faint laminations; several fine to medium sand lenses; 2 large pieces of wood, sand, and shells at base of horizon; alluvial; cf. Lauraceae wood from 1006-1015 cm C-14 dated at 1,280±70 BP; Ulmaceae (<i>Celtis</i> sp. or <i>Ulmus</i> sp. possible) wood from 1027 cm C-14 dated at 1,260±80.
1033-1189 (33.9-39.0)	4C	brown (10YR5/3) silty clay loam; mottles are common, medium, distinct, strong brown (7.5YR4/6); laminations are often grayish brown (10YR5/2) or silty and white (10YR8/1); massive; firm; strongly effervescent; unknown lower boundary (end of tubes); few weathered pebbles near top; laminated (laminations are at oblique angles - core may be crooked); few silt laminations; few oxidized laminations; some fracturing; few slickensides; possible "clod" of lacustrine sediment reworked into alluvium or erosional remnant.

Core/Profile: MA-8

Location: T.H. 1 over Red River

Legal description: SW ¼ Section 31 T155N R50W

County: Marshall

Parent material: Alluvium

Vegetation:

Slope:

Elevation: 790 feet

Topo. Map: Oslo

Remarks: T.H. 1 over Red River in Oslo; on east side of river near river's edge; 237 feet west of east abutment; on lower ground north of T.H. 1; 17.0 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	C	very dark grayish brown (10YR3/2) sandy clay loam; massive; strongly effervescent; clear lower boundary; laminated; sand lenses; few rootlets; laminations are pale brown (10YR6/3); recent sediment.
12-30 (.4-1.0)	2Ap	black (10YR2/1) clay loam; massive; firm; strongly effervescent; abrupt lower boundary; fractured into medium angular blocks; more dense than underlying units; rootlets.
30-174 (1.0-5.7)	2Acum	very dark grayish brown to black (10YR3/2 2/1) clay loam; weak, fine, subangular blocky to massive; friable to firm; strongly effervescent; gradual lower boundary; many pale brown (10YR6/3) sand laminations; more developed soil from 40-80 cm (still has a few sand lenses); more cumulic below 80 cm; rootlets; roots; 60-80% recovery; borderline sandy clay loam.
174-253 (5.7-8.3)	2C1	very dark grayish brown (10YR3/2) sandy clay loam to loam; massive; friable to firm; strongly effervescent; clear lower boundary; finely laminated; fine sand laminations common; sand is very fine, bordering on coarse silt; laminations are often pale brown (10YR6/3); 60% recovery; alluvial.
253-701 (8.3-23.0)	2C2	very dark grayish brown (10YR3/2) clay loam to silty clay loam; mottles are few, coarse, faint, dark gray (10YR4/1); massive; friable to firm; strongly effervescent; clear lower boundary; faintly laminated; silt is coarse, occasionally grading into fine sand; few more clay-rich lenses; gastropod and mollusk shells; few lenses of sandy clay loam near base - lenses contain more shell fragments; alluvial.
701-1006 (23.0-33.0)	2Cg1	dark gray (5Y4/1) clay-rich silt loam to loam; massive; friable to firm; strongly effervescent; gradual lower boundary; few clay-rich bands; gastropod and mollusk shells; some sandy clay loam bands often containing medium sand and many shells; silt is coarse, bordering on fine sand; faintly laminated; alluvial.
1006-1189 (33.0-39.0)	2Cg2	dark gray (2.5Y4/0) sandy clay loam to clay loam; massive; friable to firm; strongly effervescent; unknown lower boundary (end of tubes); many silty clay loam bands, up to 10 cm thick; many gastropod and mollusk shells in sandier zones; faintly laminated; few carbonized rootlets; darker than 2Cg1; alluvial.

Core/Profile: MA-9

Location: T.H. 317 over Red River

Legal description: NW ¼ NW ¼ Section 20 T157N R50W

County: Marshall

Parent material: Alluvium

Vegetation:

Slope:

Elevation: 790 feet

Topo. Map: Big Woods NW

Remarks: T.H. 317 over Red River; on eastern side of river; core closest to river's edge; 90 feet east of bridge abutment; 14.1 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-17 (0-.6)	A1	very dark gray (10YR3/1) clay loam; weak, medium, granular; firm; strongly effervescent; clear lower boundary; many roots and rootlets.
17-28 (.6-.9)	A2	very dark gray (10YR3/1) clay loam; moderate, fine, angular blocky; clay coatings are thin, discontinuous, coat few peds near base; firm; strongly effervescent; clear lower boundary; many rootlets; dense.
28-46 (.9-1.5)	BA	black (10YR2/1) clay loam; weak, fine, prismatic parting to moderate, fine, angular blocky; clay coatings are moderately thick, discontinuous, coat ped faces; firm; slightly effervescent; clear lower boundary; rootlets; much blacker than surrounding horizons; few roots.
46-82 (1.5-2.7)	BC	very dark gray (10YR3/1) clay loam; mottles are few, very fine, faint, dark brown (7.5YR3/4); weak, fine, angular blocky; clay coatings are thin, discontinuous, coat ped faces; firm; strongly effervescent; gradual lower boundary; rootlets; dense at top.
82-762 (2.7-25.0)	C	very dark grayish brown (10YR3/2) silty clay loam to clay loam; mottles are few, fine, distinct, light gray (10YR7/2), carbonate-rich; massive; firm; strongly effervescent; diffuse lower boundary; few omnidirectional rootlets; few gastropod shells; shell fragments; some conchoidal fractures in more clay-rich zones; changes to very dark gray (10YR3/1) around 580 cm (more unoxidized); few pockets of clay; siltier at top; alluvial.
762-1049 (25.0-34.4)	Cg1	dark gray (5Y4/1) clay loam; mottles are few, fine, distinct, very dark gray (2.5Y3/0); massive; firm; strongly effervescent; diffuse lower boundary; shell fragments; gastropod shells; charcoal; charcoal collected 829 847 cm; alluvial.
1049-1420 (34.4-46.6)	Cg2	dark gray (5Y4/1) silty clay loam; mottles are few, fine, distinct, very dark gray (2.5Y3/0) and gray (5Y5/1); massive; friable to firm; strongly effervescent; clear lower boundary; conchoidally fractured into large blocks (2-4 cm in diameter); clay coatings on some vertical faces with slickensides; gastropod and mollusk shells; few pockets of silt loam; few large roots; last 20 cm contains many shells, few small pebbles and woody roots (some collected); alluvial; cf. <i>Fraxinus sp.</i> wood from 1408-1420 cm C-14 dated at 4,070±80 BP.
1420-1481 (466-48.6)	2Cg3	dark gray (5Y4/1) sandy clay loam; massive; firm; strongly effervescent; clear lower boundary; many small pebbles; many gastropod and mollusk shells; some of unit is oxidized, but it is probably post-extraction; charcoal - some collected; alluvial.
1481-1493 (48.6-49.0)	3Cg4	dark gray (5Y4/1) silty clay loam; massive; friable to firm; strongly effervescent; unknown lower boundary (end of tubes); similar to Cg2 unit; alluvial.

Core/Profile: MA-10

Location: T.H. 317 and T.H. 220 Junction

Legal description: NE ¼ NE ¼ Section 21 T157N R50W

County: Marshall

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope: 0-2%

Elevation: 788 feet

Topo. Map: Big Woods NE

Remarks: At junction between T.H. 317 and T.H. 220; on north side of T.H. 317; 6.1 feet below center line; approximately 200 meters south of Snake River

Depth cm(ft)	Horizon or Zone	Description
0-10 (0-.3)	A	dark gray to dark grayish brown (10YR4/1-4/2) clay loam; weak, medium, granular; firm; strongly effervescent; clear lower boundary; roots.
10-32 (.3-1.0)	CA	dark gray to dark grayish brown (10YR4/1-4/2) clay loam; mottles are few, fine, distinct, light gray (10YR7/1); massive to weak, fine to medium, subangular blocky; clay coatings are thick, discontinuous, coat ped faces near base; firm; slightly to strongly effervescent; abrupt lower boundary (color change); amount of clay varies every 5-10 cm; structure is more prevalent in clay-rich zones; part of a cumulic sequence.
32-50 (1.0-1.6)	2A	black (10YR2/1) clay loam; mottles are few, fine, distinct, light gray (10YR7/1); weak, medium, granular to weak, fine to medium, subangular blocky; clay coatings are thick, discontinuous, coat ped faces; firm; slightly to strongly effervescent; clear lower boundary; few rootlets; more clay-rich than surrounding horizons; developed in a cumulic sequence.
50-76 (1.6-2.5)	2CAk	dark gray (10YR4/1) clay loam; many, coarse, distinct, light gray (10YR7/1), soft calcareous concretions; weak, fine, subangular blocky to massive; clay coatings are thick, discontinuous, coat ped faces; firm; strongly to violently effervescent; clear lower boundary; mottles dominate characteristics; few rootlets; developed in a cumulic sequence.
76-122 (2.5-4.0)	3ABkb	black to very dark gray (10YR2/4 3/1) clay loam; common, coarse, distinct, light gray (10YR7/1), soft calcareous concretions; weak, fine, subangular blocky to massive; clay coatings are moderately thick, discontinuous, coat some ped faces; firm; strongly effervescent; clear lower boundary; alternating bands of mottled clay loam and more clay-rich black clay loam every 10-20 cm; developed in a cumulic sequence.
122-168 (4.0-5.5)	3CBkb	dark grayish brown (10YR4/2) silty clay loam; mottles are common, fine, distinct, light brownish gray (10YR6/2); weak, coarse, subangular blocky; clay coatings are thin, discontinuous, coat ped faces and line root voids; friable to firm; strongly to violently effervescent; gradual lower boundary; few black mottles at top.
168-207 (5.5-6.8)	3C1	dark grayish brown (10YR4/2) silty clay loam; mottles are common, fine, faint to distinct, dark yellowish brown (10YR4/4) and light brownish gray (10YR6/2); massive; friable to firm; strongly effervescent; clear lower boundary; some fracturing near base.
207-610 (6.8-20.0)	4C2	brown (10YR5/3) silty clay loam; mottles are common, medium to coarse, faint, yellowish brown (10YR5/4) and light brownish gray (10YR6/2), and few, fine, distinct, dark brown (7.5YR3/4); massive; firm; strongly effervescent; diffuse lower boundary; fractured along bedding planes at top; laminated; silt laminations and oxidized laminations common; some angular unconformities in laminations; few oxide concretions; lacustrine.
610-1494 (20.0-49.0)	4Cg	dark grayish brown (10YR4/2) silty clay; mottles are common, medium to coarse, faint, dark yellowish brown (10YR4/4) at top of unit; massive; firm; slightly to strongly effervescent; unknown lower boundary (end of tubes); some fracturing; many fracture surfaces near top coated with white (10YR8/1) silt; laminated; some silt laminations; few oxidized laminations near top; color changes to very dark gray (10YR3/1) by 870 cm; few zones of silty clay loam; lacustrine.

Core/Profile: MA-11

Location: T.H. 317 between Red River and Snake River

Legal description: SE 1/4 SW 1/4 Section 16 T157N R50W

County: Marshall

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 791 feet

Topo. Map: Big Woods NE

Remarks: T.H. 317 midway between Red River and Snake River; 0.7 miles west of junction between T.H. 317 and T.H. 220; 7.1 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-14 (0-.5)	A	black (10YR2/1) clay loam; moderate, medium, granular; firm; slightly to strongly effervescent; abrupt lower boundary; many roots; gastropod shells.
14-78 (.5-2.6)	CAk	dark brown (10YR4/1) clay loam; mottles are common, coarse, distinct, light gray (10YR7/2), calcareous; weak, fine, subangular blocky; clay coatings are thick, discontinuous, coat ped faces; firm; strongly to violently effervescent; clear lower boundary; alternating bands of black, more clay-rich sediments every 15 to 20 cm (bands are 5-10 cm thick, have stronger structure and few mottles); rootlets; roots; cumulic horizon.
78-134 (2.6-4.4)	2ABkb	black (10YR2/1) clay loam; few, medium, distinct, light gray (10YR7/2), soft calcareous concretions; weak, fine to medium, subangular blocky; clay coatings are thick, discontinuous, coat ped faces; firm; slightly to strongly effervescent; clear, irregular lower boundary; clay-content varies, alternating every 10-15 cm; rootlets; few roots.
134-180 (4.4-5.9)	2C1	dark grayish brown (10YR4/2) silty clay loam to clay loam; mottles are few, fine, distinct, white (10YR8/1), and few, medium, faint, very dark gray (10YR3/1); massive; clay coatings are weak, thin, discontinuous, coat few fracture surfaces; firm; strongly effervescent; gradual lower boundary; fractured into angular blocks; few worm burrows filled with black sediment; few oxidized mottles.
180-247 (5.9-8.1)	2C2	grayish brown (10YR5/2) silty clay loam; mottles are common, fine, faint, dark yellowish brown (10YR4/4), and common, fine, distinct, white (10YR8/1); massive; clay coatings are weak, thin, discontinuous, coat few fracture surfaces; firm; strongly effervescent; gradual lower boundary; crudely laminated; fractured along bedding planes; few silt laminations near base; lacustrine.
247-485 (8.1-15.9)	2C3	brown to dark brown (10YR4/3) silty clay loam; mottles are common, medium to coarse, faint to distinct, very dark grayish brown (10YR3/2), yellowish brown (10YR5/6), white (10YR8/1), and strong brown (7.5YR5/8); massive; few silt coatings on vertical faces - dark gray (10YR4/1); friable to firm; strongly effervescent; diffuse lower boundary; laminated; many silt laminations; some angular unconformities in laminations; many oxidized laminations; laminations vary in texture from silt to silty clay; lacustrine.
485-838 (15.9-27.5)	2C4	dark grayish brown (10YR4/2) silty clay to silty clay loam; mottles are few, coarse, faint, brown to dark brown (10YR4/3); massive; firm; very slightly effervescent; diffuse lower boundary; fractured in more clay-rich zones; laminated, but laminations are less prominent than in 2C3; oxidized laminations few to common; few silt laminations near base; lacustrine.
838-1494 (27.5-49.0)	2Cg	very dark gray (5Y3/1) silty clay loam; massive; firm; very slightly effervescent; unknown lower boundary (end of tubes); thin, light brownish gray (10YR6/2) silt laminations every cm or so; fractured into angular blocks in clay-rich zones; few zones are more laminated and silt-rich; lacustrine.

Core/Profile: MA-12

Location: T.H. 317 near Red River

Legal description: SE ¼ SE ¼ Section 17 T157N R50W

County: Marshall

Parent material: Overwash/lacustrine sediments

Vegetation:

Slope:

Elevation: 792 feet

Topo. Map: Big Woods NW

Remarks: T.H. 317 east of Red River; west of T.H. 220 and Snake River; no notes on elevation

Depth cm(ft)	Horizon or Zone	Description
0-18 (0-.6)	A1	black (10YR2/1) clay loam; moderate, medium, granular; firm; very slightly effervescent; clear lower boundary; roots; 3 cm of clay loam (similar in color and in features to C1 horizon) on top of root mat - may be recent deposit or disturbance related to drilling.
18-91 (.6-3.0)	A2	black (10YR2/1) clay loam; weak, medium, subangular blocky to moderate, medium, granular; firm; very slightly effervescent; gradual, irregular lower boundary; omnidirectional rootlets; 50% recovery.
91-125 (3.0-4.1)	C1	dark grayish brown (10YR4/2) clay-rich clay loam to silty clay loam; mottles are few, fine, distinct, black (10YR2/1); massive; firm to very firm; slightly effervescent; clear lower boundary; fractured conchoidally; few rootlets; not laminated; 50% recovery.
125-174 (4.1-5.7)	2C2	grayish brown (10YR5/2) silt loam to silty clay loam; mottles are common, fine, faint to distinct, dark yellowish brown (10YR4/6) and white (10YR8/2); massive; friable to firm; strongly effervescent; gradual lower boundary; laminated; few rootlets; lacustrine.
174-308 (5.7-10.1)	2C3	brown (10YR5/3) silty clay loam; mottles are common, coarse, faint, brown to dark brown (7.5YR4/4), and common, fine to medium, distinct, white (10YR8/1); massive; firm; strongly effervescent; gradual lower boundary; laminated; oxidized laminations common; silt laminations; lacustrine.
308-466 (10.1-15.3)	2C4	brown to dark brown to yellowish brown (10YR4/3-5/4) silty clay loam; mottles are many, coarse, distinct, strong brown (7.5YR4/6); common, medium, distinct, gray (10YR5/1); and common, fine, distinct, very dark brown (10YR2/2); massive; firm; very slightly effervescent; gradual lower boundary; oxidized mottles common; few silt laminations; crudely laminated at top; few oxide concretions; pipestems; lacustrine.
466-579 (15.3-19.0)	2C5	brown to dark brown (10YR4/3) silty clay to silty clay loam; mottles are few, fine, distinct, very dark brown (10YR2/2); massive; white (10YR8/1) noncalcareous silt coatings coat curved fracture faces and line linear fracture zones; firm; very slightly effervescent; gradual lower boundary; laminated; few oxidized laminations; lacustrine.
579-914 (19.0-30.0)	2C6	dark brown (10YR3/3) silty clay loam; massive; few silt coatings lining fractures near the top; firm; slightly effervescent; diffuse lower boundary; laminated; few silt laminations; few oxidized laminations (dark yellowish brown [10YR4/4] to very dark brown [10YR2/2]); zones of more clay-rich or more silt-rich sediment; lacustrine.
914-1408 (30.0-46.2)	2Cg1	very dark gray (10YR3/1) silty clay loam; massive; firm; slightly to strongly effervescent; clear lower boundary; few silt laminations (light brownish gray [10YR6/2]); fractured into coarse blocks with slickensides in places; lacustrine.
1408-1494 (46.2-49.0)	3Cg2	very dark gray (10YR3/1) clay; massive; very firm; very slightly effervescent; unknown lower boundary (end of tubes); not laminated; no pebbles observed; slickensides; few light brownish gray (10YR6/2) silty mottles; deep water or off-shore lacustrine.

Core/Profile: MA-13

Location: T.H. 220 over Snake River

Legal description: SE ¼ SE ¼ Section 16 T157N R50W

County: Marshall

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 782 feet

Topo. Map: Big Woods NE

Remarks: T.H. 220 over Snake River; 0.2 miles north of Junction of 220 and 317; on north side of river on lower ground; 12.3 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-15 (.0-.5)	A	black (10YR2/1) silty clay; massive; firm; slightly effervescent; clear lower boundary; grasses, roots, and plant fibers; thin O horizon developing on top; 80% recovery.
15-22 (.5-.7)	AC	black to grayish brown (10YR2/1-5/2); clay loam to silty clay loam; mottles are common, fine, distinct, white (10YR8/2), and few, medium, faint, dark yellowish brown (10YR4/4); moderate, fine, subangular blocky; firm; strongly effervescent; abrupt lower boundary; crudely laminated; few small pebbles; transition zone between A and C horizons, with structure; roots; 80% recovery.
22-283 (.7-9.3)	C1	brown (10YR5/3) silt loam to silty clay loam; mottles are common, coarse, distinct, strong brown (7.5YR4/6) to dark reddish brown (5YR3/3); laminations are white (10YR8/1), light yellowish brown (10YR6/4), and dark grayish brown (10YR4/2); massive; clay coatings are distinct, thick, discontinuous, gray (10YR5/1), coat few vertical fracture faces; friable to firm; strongly effervescent; diffuse lower boundary; finely laminated; many silt laminations and oxidized laminations; some angular unconformities in silt laminations; pisoliths; pipestems; roots; oxidized mottles; lacustrine.
283-561 (9.3-18.4)	C2	brown to dark brown (10YR4/3) clay-rich silty clay loam; mottles are common, fine to medium, distinct, dark brown (7.5YR3/2), and common, medium to coarse, distinct, gray (10YR5/1); massive; clay coatings are distinct, thick, discontinuous, gray (10YR5/1), coat few vertical fracture faces; firm; very slightly effervescent; clear lower boundary; laminated; oxidized mottles; fractures conchoïdally into medium blocks; few silt laminations; laminations are dark gray (10YR4/1), dark brown (7.5YR3/2), and few white (10YR8/1); very few rootlets; few silt laminations; lacustrine.
561-997 (18.4-32.7)	Cg1	very dark gray (10YR3/1) silty clay loam to silty clay; mottles are very few, coarse, distinct, dark yellowish brown (10YR4/4), oxidized, at top of horizon; massive; firm; slightly effervescent; diffuse lower boundary; laminated; laminations are often silty and grayish brown (10YR5/2); some fracturing into large blocks; occasional silt coatings on fracture surfaces; some faulting - offset laminations; slickensides common below 823 cm; more clay-rich with depth; lacustrine.
997-1189 (32.7-39.0)	Cg2	very dark gray (5Y3/1-10YR3/1) silty clay to clay; massive; firm; slightly effervescent; diffuse lower boundary; slickensides common; sticky; few laminations near top; no pebbles visible; lacustrine.
1189-1524 (39.0-50.0)	Cg3	very dark gray (5Y3/1) clay; mottles are very few, fine, distinct, grayish brown (10YR5/3), silty; massive; very firm; slightly effervescent; unknown lower boundary (end of tubes); no laminations or pebbles visible; some slickensides; deep water or off-shore lacustrine.

Core/Profile: MA-14

Location: T.H. 220 over Snake River

Legal description: NE ¼ SE ¼ Section 16 T157N R50W

County: Marshall

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 788 feet

Topo. Map: Big Woods NE

Remarks: T.H. 220 over Snake River; 0.4 miles north of junction of 220 and 317; on north side of river on higher ground; 6.0 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-20 (0-.7)	A	black (10YR2/1) clay-rich clay loam; mottles are few, medium, distinct, dark brown (10YR3/3) near base; moderate, medium, granular; firm; strongly to slightly effervescent; clear lower boundary; roots; rootlets.
20-53 (.7-1.7)	AB	dark grayish brown (10YR4/2) clay-rich clay loam; mottles are few, fine, distinct, very dark gray (2.5Y3/1); weak, fine, subangular blocky; clay coatings are thin, faint, discontinuous, coat ped faces; firm; strongly to slightly effervescent; clear, irregular lower boundary; few pebbles; rootlets.
53-140 (1.7-4.6)	CBk	dark grayish brown (2.5Y4/2) clay loam; mottles are many, fine to coarse, distinct, white (10YR8/1), and few, fine, distinct, strong brown (7.5YR4/6) to dark brown (7.5YR3/4); massive to weak, medium, subangular blocky; clay coatings are moderately thick, moderately continuous, gray (10YR5/1), coat ped faces; friable to firm; strongly to violently effervescent; gradual lower boundary; laminated at base; few small carbonate pebbles/concretions(?) ; rootlets.
140-198 (4.6-6.5)	C1	grayish brown (10YR5/2) silty clay loam; mottles are few, medium, faint to distinct, dark yellowish brown (10YR4/4), strong brown (7.5YR4/6), and white (10YR8/1); massive; clay coatings are distinct, moderately thick, discontinuous, gray (10YR5/1), coat some fracture faces; firm; strongly effervescent; diffuse lower boundary; laminated; silt laminations common; few weathered carbonate pebbles/concretions(?) ; rootlets; oxidized mottles and laminations; fractures along bedding planes and perpendicular to bedding planes; lacustrine.
198-600 (6.5-19.7)	C2	brown to grayish brown (10YR5/3-5/2) silty clay loam; mottles are few, fine to medium, faint, dark yellowish brown (10YR4/4), and few, fine, distinct, dark brown (7.5YR3/2); massive; clay coatings are distinct, moderately thick, discontinuous, gray (10YR5/1), coat fracture surfaces; silt coatings are distinct, moderately thick, discontinuous, white (10YR8/1), coat other fracture surfaces; firm; slightly effervescent; clear lower boundary; laminated; few silt laminations; few oxidized laminations; few weathered carbonate pebbles, often parallel to bedding; oxidized mottles; few rootlets; fractured into coarse blocks; curved vertical fracture faces coated with white silts (not carbonate-rich); white silts also infill few smaller fractures; lacustrine.
600-853 (19.7-28.0)	Cg1	very dark gray (10YR3/1) silty clay loam; laminations are faint, fine, pale brown to light brownish gray (10YR6/3-6/2); massive; firm to friable; slightly effervescent; very diffuse lower boundary; laminated; silt laminations common; some fracturing into coarse blocks; few patches of silt loam; ripples visible in some silt laminations; few slickensides; lacustrine.
853-1052 (28.0-34.5)	Cg2	very dark gray (5Y3/1) silty clay; massive; firm; slightly to strongly effervescent; very diffuse lower boundary; laminated; silt laminations often light brownish gray (10YR6/2); some ripples visible in silt laminations; few slickensides; few patches of silty clay loam; silt laminations are carbonate-rich; deep-water or off-shore lacustrine.
1052-1289 (34.5-42.3)	Cg3	very dark gray (5Y3/1) silty clay; massive; firm; slightly effervescent; gradual lower boundary; very few laminations; few slickensides; no pebbles visible; 2 fine sand lenses at base; lacustrine.
1289-1509 (42.3-49.5)	2Cg4	very dark gray (5Y3/1) clay; mottles are very few, fine, distinct, brown (10YR5/3) silty; massive; firm; non-effervescent; unknown lower boundary (end of tubes); not laminated; slickensides; sticky; no pebbles visible; some fracturing; deep water or off-shore lacustrine.

Core/Profile: MA-15

Location: T.H. 220 over Snake River

Legal description: NE ¼ SE ¼ Section 16 T157N R50W

County: Marshall

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 780 feet

Topo. Map: Big Woods NE

Remarks: T.H. 220 over Snake River; 0.45 miles north of junction of 220 and 317; on north side of river on lower ground; 13.6 feet lower than center line

Depth cm(ft)	Horizon or Zone	Description
0-50 (0-1.6)	Acum	black (10YR2/1) clay loam; mottles are few, coarse, faint, very dark gray (10YR3/1) to very dark grayish brown (10YR3/2); moderate, medium, granular to fine subangular blocky; firm; slightly to strongly effervescent; clear lower boundary; few organic-rich lenses with plant matter; multiple buried black units (every 5 cm or so); roots; rootlets; grasses, some bedding.
50-116 (1.6-3.8)	AC	very dark gray (10YR3/1) silty clay to silty clay loam; mottles are few, fine, distinct, white (10YR8/1), carbonate-rich; massive (highly fractured); clay coatings are thin, continuous, coat fractures (unit is clay-rich overall); firm; slightly to strongly effervescent; abrupt lower boundary; highly fractured into angular blocks (½-2 cm across); many fractures are conchoidal; roots and rootlets; very hard when dry; few faint laminations.
116-131 (3.8-4.3)	2Ab	black (10YR2/1) silty clay loam to clay loam; moderate, fine, granular to fine subangular blocky; firm; slightly effervescent; clear lower boundary; charcoal; roots; rootlets; charcoal collected from top of unit (probably modern).
131-149 (4.3-4.9)	2C	very dark grayish brown (10YR3/2) silty clay loam to clay loam; mottles are common, medium, faint, very dark gray (10YR3/1); massive; firm; slightly to strongly effervescent; clear lower boundary; faintly laminated; roots; some charcoal; alluvial.
149-274 (4.9-9.0)	3ACb	very dark grayish brown (10YR3/2) silty clay loam to clay loam; mottles are common, very fine, distinct, dark red (2.5YR3/6); moderate, fine, granular to massive; friable to firm; slightly effervescent; diffuse lower boundary; several large roots; rootlets; top 10 cm are very dark gray (10YR3/1).
274-479 (9.0-15.7)	3C	very dark grayish brown (10YR3/2) silty clay loam to clay loam; massive; friable to firm; slightly to strongly effervescent; abrupt lower boundary; few roots; many omnidirectional rootlets; gastropod shells; shell fragments; charcoal flecks collected from 351-357 cm; few small pebbles; accumulation of pebbles last 5 cm, rounded, mostly carbonates with few exotics; alluvial.
479-792 (15.7-26.0)	4Cg1	very dark gray (10YR3/1) silty clay loam; mottles are few, coarse, faint, dark brown (10YR3/3) near top of unit; massive; firm; strongly effervescent; diffuse lower boundary; slickensides; laminated; light brownish gray (10YR6/2) silt laminations common; few rootlets; lacustrine.
792-1082 (26.0-35.5)	4Cg2	very dark gray (5Y3/1) silty clay; massive; firm; slightly to strongly effervescent; clear lower boundary; very few laminations; slickensides; silt laminations; fine sand lens near base; lacustrine.
1082-1494 (35.5-49.0)	5Cg3	very dark gray (5Y3/1) clay; massive; firm; slightly to strongly effervescent; unknown lower boundary (end of tubes); not laminated; some fracturing; very few pebbles (only one found); few, fine, silty, gray mottles; deep water or off-shore lacustrine.

Core/Profile: NR-1
 Location: U.S. 75 over Wild Rice River
 Legal description: SW ¼ NW ¼ Section 18 T144N R48W
 County: Norman
 Parent material: Lacustrine sediments
 Vegetation:
 Slope:
 Elevation: 866 feet
 Topo. Map: Halstad
 Remarks: U.S. Highway 75 over Wild Rice River, north of Hendrum; 167 feet south of bridge over river; 77 feet east of center line of T.H. 75

Depth cm(ft)	Horizon or Zone	Description
0-30 (0-1.0)	A	black (10YR2/1) clay loam; moderate, medium to coarse, granular; friable to firm; noneffervescent; clear lower boundary; many rootlets.
30-41 (1.0-1.3)	AC	black (10YR2/1) clay loam; mottles are common, fine, distinct, brown to dark brown (10YR4/3); moderate, medium, granular; friable to firm; strongly effervescent; clear lower boundary; transition zone; many rootlets.
41-47 (1.3-1.5)	C	brown to dark brown (10YR4/3) clay loam; mottles are common, fine, distinct, black (10YR2/1); friable to firm; violently effervescent; abrupt lower boundary; rootlets; horizon disturbed in coring; sticky.
47-90 (1.5-3.0)	2Ab	black (10YR2/1) silty clay; moderate, fine to medium, subangular blocky; clay coatings are thin, discontinuous, coat some ped; firm; slightly effervescent; abrupt lower boundary; rootlets; developing weak columnar structure.
90-198 (3.0-6.5)	2CB	brown to dark brown (10YR4/3) silty clay; mottles are common, fine, distinct, white (10YR8/2); weak, coarse, subangular blocky at top to weak, medium, subangular blocky to prismatic at base; clay coatings are moderately thick, discontinuous, coat ped faces; firm; strongly to violently effervescent; gradual lower boundary; may be a BC horizon, but structure is quite weak and clay coatings are patchy.
198-250 (6.5-8.2)	2C1	brown (10YR5/3) silty clay; mottles are common, fine, distinct, white (10YR8/2); massive; clay coatings are moderately thick, discontinuous, line root voids; silt coatings are thin, discontinuous, line root voids; firm; strongly to violently effervescent; diffuse lower boundary; few laminations; few silt lenses; alluvial.
250-451 (8.2-14.8)	2C2	dark grayish brown (10YR4/2) silty clay to silty clay loam; mottles are common, fine to medium, distinct, light brownish gray (10YR6/2), and few, fine, faint, dark yellowish brown (10YR4/4); massive; clay coatings are distinct, moderately thick, discontinuous, coat some fractures and line some root voids; very firm; strongly to violently effervescent; gradual lower boundary; silt laminations common; fractured into angular blocks in more clay-rich sections; few pebbles; silt lenses are light brownish gray (10YR6/2); alluvial.
451-533 (14.8-17.5)	2C3	dark grayish brown (10YR4/2) silty clay to silty clay loam; mottles are few, fine, distinct, very dark brown (10YR2/2) and light brownish gray (10YR6/2); massive; clay coatings are faint, thin, discontinuous, coat very few surfaces (scattered); firm; strongly to violently effervescent; diffuse lower boundary; faintly laminated; few pisoliths; few small pebbles; few gastropod shells; clay content varies with depth; alluvial.
533-771 (17.5-25.3)	2Cg1	very dark gray (10YR3/1) silty clay to silty clay loam; mottles are few, fine, distinct, white (10YR8/2); massive; firm; strongly effervescent; clear lower boundary; small pebbles common near top; not visibly laminated; gastropod shells; charcoal flecks collected 546-555 cm, 585 cm, and 600 cm; alluvial.
771-1198 (25.3-39.0)	3Cg2	dark grayish brown to very dark gray (10YR4/2-3/1) silty clay to clay; mottles are few, fine, distinct, white (10YR8/2), and few, fine, faint, brown to dark brown (7.5YR4/4); massive; clay coatings are distinct, shiny, coat conchoidal fractures; very firm; strongly effervescent; unknown lower boundary (end of tubes); fractured into blocks, often fractured conchoidally; small clasts of carbonate-rich silt common; 914-1000 cm has few vertical voids (root voids?) filled with sand-sized carbonate-rich crystals (calcite); very few small pebbles; slickensides; deep water or off-shore lacustrine.

Core/Profile: NR-2

Location: U.S. 75 over Wild Rice River

Legal description: SW ¼ NW ¼ Section 18 T144N R48W

County: Norman

Parent material: Lacustrine sediments/alluvium

Vegetation:

Slope:

Elevation: 857 feet

Topo. Map: Halstad

Remarks: U.S. Highway 75 over Wild Rice River, north of Hendrum; south side of river, 112 feet north of south bridge abutment; 18 feet below bridge; in low area near river

Depth cm(ft)	Horizon or Zone	Description
0-6 (0-2)	C	very dark gray (10YR3/1) silty clay loam; massive; friable; strongly effervescent; abrupt lower boundary; many roots; laminated.
6-19 (.2-.6)	2A	very dark gray to black (10YR3/4 2/1) clay loam; moderate, medium, granular; firm; strongly effervescent; clear lower boundary; many roots.
19-134 (.6-4.4)	2CA	mottled very dark gray (10YR3/1) and grayish brown (10YR5/2) clay loam; mottles are many, coarse, distinct; massive (fractured); firm; strongly to violently effervescent; clear lower boundary; disturbed; few patches of laminated sediments - laminations no longer horizontal; fractured into fine to medium angular blocks; few small to medium pebbles; rootlets.
134-146 (4.4-4.8)	3ACb	very dark gray (10YR3/1) clay loam; mottles are common, fine, faint, black (10YR2/1); massive; firm to very firm; strongly effervescent; clear lower boundary; dense at top; rootlets; small pebbles few to common.
146-274 (4.8-9.0)	3C1	dark grayish brown (10YR4/2) silt loam to silty clay loam; mottles are few, medium, faint, grayish brown (10YR5/2) silt lenses, and few, coarse, faint, very dark gray (10YR3/1); massive; firm; strongly effervescent; diffuse lower boundary; few rootlets; laminated near top; few roots; gastropod shells; alluvial.
274-518 (9.0-17.0)	3C2	dark grayish brown (10YR4/2) silty clay to silty clay loam; mottles are few, fine, distinct, dark brown (7.5YR3/2), and common, fine, faint, brown to dark brown (7.5YR4/2); massive; firm; strongly effervescent; gradual lower boundary; faintly laminated; gastropod shells; shell fragments; few rootlets; sticky; few patches of loamier (more sand) sediment; grayer near base (5Y4/1); alluvial.
518-558 (17.0-18.3)	3C3	very dark grayish brown (10YR3/2) loam to clay loam; mottles are few, fine, faint, dark brown (10YR2/2); massive; friable to firm; strongly effervescent; gradual lower boundary; many shells - gastropod and mollusk; very small pebbles common; charcoal; rootlets; alluvial.
558-756 (18.3-24.8)	3Cg1	very dark gray (5Y3/1) silt loam to silty clay loam; mottles are few, fine, faint, dark yellowish brown (10YR3/4); massive; friable; strongly effervescent; abrupt lower boundary; gastropod and mollusk shells; rootlets common; grades into loam in places; fractured; horizontal roots; plant matter (roots/grasses/leaves/wood); some plant matter collected; faintly laminated; more sand at base; alluvial.
756-1189 (24.8-39.0)	4Cg2	dark gray (5Y4/1); clay; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); sticky; deep water or off-shore lacustrine.

Core/Profile: NR-3

Location: U.S. 75 over Marsh River

Legal description: SW ¼ NE ¼ Section 19 T146N R48W

County: Norman

Parent material: Alluvium/till

Vegetation:

Slope:

Elevation: 849 feet

Topo. Map: Shelly

Remarks: U.S. Highway 75 over Marsh River near Shelly; on south side of river, 25 feet south of south bridge abutment; lowest step by river; 17.7 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	A1	black (10YR2/1) clay-rich loam; moderate, medium, granular; friable; slightly effervescent; clear lower boundary; roots.
12-27 (.4-.9)	A2	black to very dark gray (10YR2/4 3/1) clay rich loam to silt loam; mottles are common, fine, faint, dark grayish brown (10YR4/2) at base of horizon; moderate, fine to medium, granular; friable; very slightly effervescent; clear lower boundary; roots; omnidirectional rootlets.
27-75 (.9-2.5)	AC	dark grayish brown (10YR4/2) loam to silt loam; weak, medium, subangular blocky to massive; friable; strongly effervescent; gradual lower boundary; rootlets common.
75-177 (2.5-5.8)	C1	dark grayish brown (10YR4/2) silt loam to loam; mottles are common, fine, distinct, very pale brown (10YR7/3), and few, coarse, faint, very dark grayish brown to black (10YR3/2-2/1); massive; friable; strongly effervescent; gradual lower boundary; few omnidirectional rootlets; charcoal; few shell fragments; alluvial.
177-305 (5.8-10.0)	C2	dark grayish brown (10YR4/2) silt loam to silty clay loam; mottles are common, fine, faint, brown (10YR5/3), and few, fine, distinct, black (10YR2/1); massive; friable; strongly effervescent; clear lower boundary; few rootlets; laminated; many silt laminations, few clay laminations; alluvial.
305-680 (10.0-22.3)	C3	dark grayish brown (10YR4/2) sandy clay loam to loam; mottles are few, fine, distinct, black (10YR2/1), few, fine, distinct, dark red (2.5YR3/6), and common, fine, distinct, very pale brown (10YR7/3); massive; friable; strongly effervescent; clear lower boundary; laminated; few thin sand seams; occasionally grades into loam or clay loam; shell fragments, gastropods and mollusks; few rootlets; several sand lenses near base; clay with wood and shell fragments from a large mollusk shell at base of unit; charcoal collected 347-366 cm; alluvial.
680-719 (22.3-23.6)	2C4	brown to dark brown (10YR4/3) gravel and sand; mottles are common, coarse, distinct, strong brown (7.5YR4/4); massive to single grain; friable; strongly effervescent; clear lower boundary; many small to medium pebbles, rounded and angular; shell fragments from large mollusks; partly oxidized; pebbles include carbonates and granites; wood collected from base of horizon; ring porous hardwood from lower boundary (717-723 cm) C-14 dated at 3,060±60 BP.
719-1173 (23.6-38.5)	3Cg	dark gray (5Y4/1) clay; massive; firm; slightly to strongly effervescent; unknown lower boundary (end of tubes); few small pebbles; few, fine, grayish brown (10YR5/2) siltier mottles; till.

Core/Profile: NR-4

Location: U.S. 75 over Marsh River

Legal description: SW ¼ NE ¼ Section 19 T146N R48W

County: Norman

Parent material: Lacustrine sediments/till

Vegetation:

Slope:

Elevation: 862 feet

Topo. Map: Shelly

Remarks: U.S. Highway 75 over Marsh River near Shelly; on north side of river, 43 feet north of north bridge abutment; 5.1 feet below center line; on high ground

Depth cm(ft)	Horizon or Zone	Description
0-29 (0-1.0)	A	black (10YR2/1) clay loam; moderate, medium, granular; friable to firm; slightly effervescent; clear lower boundary; rootlets common; few worm burrows.
29-46 (1.0-1.5)	AC	mottled black (10YR2/1) and brown to dark brown (10YR4/3) silty clay loam; weak, medium, granular to weak, fine, subangular blocky; friable; strongly to violently effervescent; clear lower boundary; ends in brown to dark brown (10YR4/3) lens (4-5 cm thick); rootlets common; browner with depth.
46-60 (1.5-2.0)	2ABb	black to very dark gray (10YR2/4 3/1) silty clay loam; mottles are few, fine, distinct, white (10YR8/2), carbonate-rich; weak, fine to medium, granular; friable; strongly to violently effervescent; clear lower boundary; rootlets common; blacker at top.
60-87 (2.0-2.9)	2Btgb1	very dark grayish brown (10YR3/2) silty clay; mottles are common to many, fine, distinct, white (10YR8/2), carbonate-rich; weak to moderate, fine to medium, subangular blocky; clay coatings are thin, discontinuous, coat few ped faces; firm; violently effervescent; gradual lower boundary; omnidirectional rootlets; may be a weak Bt.
87-149 (2.9-4.9)	2Btgb2	dark grayish brown (10YR4/2) silty clay; mottles are common, fine, distinct, very pale brown (10YR7/3), carbonate-rich; moderate, medium to coarse, subangular blocky; clay coatings are thin, distinct, discontinuous, coat ped faces; firm; violently effervescent; abrupt lower boundary (color change); omnidirectional rootlets; charcoal flecks; some charcoal collected (137-149 cm).
149-195 (4.9-6.4)	3ACkb	black (10YR2/1) silty clay loam to silty clay; mottles are few, medium, distinct, white (10YR8/2), carbonate-rich; weak subangular blocky to massive; clay coatings are moderately thick, discontinuous, line root voids and coat a few ped(?) faces; firm; strongly effervescent; diffuse lower boundary; few omnidirectional rootlets; very few small pebbles; charcoal (few flecks).
195-280 (6.4-9.2)	3Ck	grayish brown to brown (10YR5/2-5/3) silty clay loam to silty clay; mottles are common, fine, distinct, white (10YR8/2), carbonate-rich; massive; clay coatings are thin, discontinuous, coat few surfaces (fracture surfaces); firm; strongly effervescent; gradual lower boundary; fractured in more clay-rich zones; grayer near top; coarse sand lens near base; lacustrine.
280-466 (9.2-15.3)	3C1	dark gray, very dark gray, and dark grayish brown (10YR4/1-3/1 to 2.5Y4/2) silty clay to clay; mottles are common, fine to medium, distinct, dark reddish brown (5YR3/3), and common, fine, distinct, white (10YR8/1-8/2); massive; very firm; strongly effervescent; abrupt lower boundary; laminated; very thin (1/2-2 mm), white (10YR8/1) silt laminations common; patches of oxidation, often surrounding root voids; fractures along bedding planes; darker with depth; 1-2 cm of laminated fine sand at base; few microripples; lacustrine.
466-753 (15.3-24.7)	4C2	dark gray to dark grayish brown (10YR4/1-4/2) clay to clay loam; mottles are common, fine to medium, faint, dark yellowish brown (10YR4/4), and few to common, medium to coarse, distinct, strong brown (7.5YR4/6) and dark brown (7.5YR3/2); massive; very firm; strongly effervescent; gradual lower boundary; small to medium pebbles, few to common; oxidized root voids; white powdery coatings on some surfaces (not carbonate-rich); fewer pebbles with depth; less mottled at depth; mottled at base (with next unit); till.
753-905 (24.7-29.7)	4Cg1	very dark gray (5Y3/1) clay; massive; very firm; strongly effervescent; diffuse lower boundary; few small pebbles; few pale brown (10YR6/3) powdery mottles; till.
905-1189 (29.7-39.0)	4Cg2	brown (10YR5/3) to dark gray (10YR4/1) clay to clay loam; mottles are few, medium, distinct, gray to light gray (10YR6/1); massive; very firm; strongly effervescent; unknown lower boundary (end of tubes); few small to medium pebbles; few pale brown (10YR6/3) powdery mottles; grayer with depth (top is brown, the rest is dark gray); till.

Core/Profile: PL-1

Location: T.H. 220 over Sand Hill River

Legal description: SE ¼ NW ¼ Section 30 T148N R48W

County: Polk

Parent material: Alluvium/till

Vegetation:

Slope:

Elevation: 849 feet

Topo. Map: Climax

Remarks: T.H. 220 over Sand Hill River near Climax; on low ground on west side of river; 41 feet east of west bridge abutment; no notes on elevation

Depth cm(ft)	Horizon or Zone	Description
0-68 (0-2.2)	A	black (10YR2/1) silty clay loam; strong, medium, granular; firm; strongly effervescent; gradual lower boundary; many rootlets.
68-104 (2.2-3.4)	Bt	black (10YR2/1) silty clay loam; moderate, fine, subangular blocky; clay coatings are thin, discontinuous, coat ped faces; firm; strongly effervescent; clear lower boundary; rootlets; ped part from a very weak columnar structure.
104-131 (3.4-4.3)	CB	dark grayish brown (10YR4/2) silty clay loam; mottles are common, fine, faint, black (10YR2/1); weak, medium, subangular blocky to massive; firm; strongly effervescent; gradual lower boundary; transitional layer; rootlets.
131-253 (4.3-8.3)	C1	dark grayish brown (10YR4/2) silty clay loam; mottles are common, fine, faint, very pale brown (10YR7/3), and few, fine, faint, strong brown (10YR4/6); massive; firm; strongly effervescent; clear lower boundary; organic-rich, black (10YR2/1) lens at base of horizon; many silt laminations; few clay-rich, fractured zones (5-10 cm thick), often very dark gray (10YR3/1); alluvial.
253-390 (8.3-12.8)	C2	very dark grayish brown (10YR3/2) silty clay loam; mottles are common, fine, distinct, white (10YR8/1); massive; firm; strongly effervescent; clear lower boundary; charcoal collected at base; gastropod and mollusk shells near base; faint laminations visible in a few areas; some fracturing; few sandier zones (sandy clay loam); alluvial(?)
390-579 (12.8-19.0)	2C3	very dark grayish brown (10YR3/2) clay loam to clay diamicton; mottles are common, fine, faint, brown to dark brown (7.5YR4/4); massive; very firm; strongly effervescent; unknown lower boundary (end of tubes); dense; pebbles common, all sizes; clasts include carbonates, igneous, and metamorphic rocks; till.

Core/Profile: PL-2

Location: T.H. 220 over Sand Hill River

Legal description: SW ¼ NW ¼ Section 30 T148N R48W

County: Polk

Parent material: Till

Vegetation:

Slope:

Elevation: 859 feet

Topo. Map: Climax

Remarks: T.H. 220 over Sand Hill River near Climax; on high ground on west side of river; 625 feet east of Golf Course Lane; 7.2 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-27 (0-.9)	A1	black (10YR2/1) silty clay loam; moderate, medium, granular; firm; slightly effervescent; clear lower boundary; rootlets; 3 cm band of mottled black and grayish brown (10YR2/1 and 5/2) soil at base of horizon - strongly effervescent.
27-134 (.9-4.4)	A2	black (10YR2/1) silty clay loam; mottles are few, distinct, fine, grayish brown (10YR5/2) from 70-76 cm only; massive to weak, fine, subangular blocky; firm; slightly effervescent; clear lower boundary; few rootlets; very black.
134-180 (4.4-5.9)	Bt	black (10YR2/1) silty clay loam to clay loam; moderate, fine, subangular blocky; clay coatings are moderately thick, shiny, moderately continuous, coat ped faces and fill pore spaces; firm; very slightly effervescent; clear lower boundary; very black; clay-rich; few rootlets.
180-201 (5.9-6.6)	CB	very dark grayish brown (10YR3/2) silty clay loam to clay loam; mottles are few, coarse, faint, black (10YR2/1), at top of unit; massive; clay coatings are thin, discontinuous, fill pore spaces; firm; strongly effervescent; abrupt lower boundary; fingers of black extend into top few cm of unit; transitional unit.
201-232 (6.6-7.6)	2C1	grayish brown (10YR5/2) silty clay loam to silty clay; mottles are common, fine, faint, yellowish brown (10YR5/4); massive; firm; strongly effervescent; abrupt lower boundary (color change); fine sand lens top 10 cm - violently effervescent; rest of unit is clay-rich; some fracturing into fine blocks, several with shiny surfaces; few pebbles; till or alluvially reworked till.
232-308 (7.6-10.1)	2C2	brown to dark brown (10YR4/3) silty clay; mottles are common, fine, faint, strong brown (7.5YR4/6) and dark gray (10YR4/1), and few, coarse, faint, pale brown (10YR6/3); massive; firm; slightly to strongly effervescent; gradual lower boundary; clay-rich; fractured into fine blocks, often fractured conchoidally; fracture surfaces are shiny and some have slickensides; small pebbles, few to common; till (?).
308-442 (10.1-14.3)	2C3	dark grayish brown (10YR4/2) clay; mottles are few, medium, distinct, white (10YR8/1), and common, medium, faint, strong brown (7.5YR4/6) and gray (10YR5/1); massive; firm; slightly to strongly effervescent; diffuse lower boundary; sticky; clay-rich; few pebbles; white, very-fine, non-calcareous crystals fill voids and fractures; not visibly laminated (difficult to obtain a fresh face to examine); till (?).
442-594 (14.5-19.5)	2Cg	very dark gray (10YR3/1) clay; mottles are few, medium, distinct, white (10YR8/1), and common, medium, distinct, strong brown (7.5YR4/6) at top of unit; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); clay-rich; few pebbles; dense; till(?).

Core/Profile: PL-3

Location: Alt. 75 over Red Lake River

Legal description: NW ¼ NW ¼ Section 36 T150N R47W

County: Polk

Parent material: Lacustrine sediments/till

Vegetation:

Slope:

Elevation: 875 feet

Topo. Map: Crookston SW

Remarks: Alt. 75 over Red Lake River near Crookston; south of river; on high ground approximately 0.4 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-18 (0-.6)	A	black (10YR2/1) silty clay loam; weak, fine to medium, subangular blocky; firm; slightly effervescent; abrupt lower boundary; many fine rootlets; dense.
18-86 (.6-2.8)	CA	grayish brown to dark grayish brown (10YR5/2-4/2) clay to silty clay loam; mottles are common, medium, distinct, black (10YR2/1); moderate, fine, granular; firm; violently effervescent; clear lower boundary; dense at top; less dense in rest of unit; resembles a C horizon with granular structure; vertical roots.
86-265 (2.8-8.7)	C1	grayish brown to dark grayish brown (10YR5/2-4/2) silty clay; mottles are common, medium, distinct, strong brown (7.5YR4/6), few, fine, distinct, very dark brown (10YR2/2), and many, medium, distinct, yellowish brown to very pale brown (10YR6/4-7/3); massive structure (fractures along bedding planes); firm; strongly effervescent; gradual lower boundary; laminated; conchoidal microfractures (1-2 mm blocks); thin yellowish brown to very pale brown (10YR6/4-7/3) silt lenses; manganese (?) oxide staining; other oxidation patches; lacustrine.
265-427 (8.7-14.0)	C2	yellowish brown to dark yellowish brown (10YR5/4-4/4) silt; laminations are many, coarse, distinct, light brownish gray (10YR6/2), and mottles are few, fine, distinct, dark brown (10YR3/4); massive; very friable; strongly effervescent; abrupt lower boundary; mostly finely laminated silts; few silty clay laminations; oxidized laminations common; medium pebble at base of horizon; silt is coarse; lacustrine.
427-671 (14.0-22.0)	2Cg1	dark gray (5Y4/1) clay; massive; firm; strongly effervescent; gradual lower boundary; sticky; dense; uniform; by 610 cm down clay is slightly bluer and contains few, fine, pale brown (10YR6/3), silty mottles.
671-1189 (22.0-39.0)	2Cg2	very dark gray (5Y3/1) clay; massive; clay coatings are continuous, coat pebble voids; firm; strongly effervescent; unknown lower boundary (end of tubes); small pebbles common; some sand, but not enough for a clay loam; by 1035 cm, medium to large pebbles are present; some shale clasts; till.

Core/Profile: PL-4

Location: Alt. 75 over Red Lake River

Legal description: NW ¼ NW ¼ Section 36 T150N R47W

County: Polk

Parent material: Alluvium/till

Vegetation:

Slope:

Elevation: 848 feet

Topo. Map: Crookston SW

Remarks: Alt. 75 over Red Lake River near Crookston; on north side of river in an abandoned channel; closest core to river; 17.4 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-7 (0-2)	C	grayish brown (10YR5/2) loamy sand; mottles are few, medium, distinct, black (10YR2/1); massive to single grain; very friable to loose; strongly effervescent; abrupt lower boundary; wood; roots; recent deposit.
7-20 (.2-.7)	2A	black (10YR2/1) loam; mottles are few, medium, faint, very dark grayish brown (10YR3/2) near base; weak, medium to coarse, granular to fine subangular blocky; firm; slightly effervescent; clear lower boundary; many roots; mottled at base.
20-72 (.7-2.4)	2AC	very dark grayish brown (10YR3/2) sandy loam; mottles are few, fine, faint, brown (10YR5/3); weak, medium, subangular blocky and weak, medium, granular (varies with depth; friable; strongly effervescent; clear lower boundary; many roots; wood; few small pebbles; structure varies (blocky at top, granular in middle); some angular fracturing near top; more dense at top).
72-86 (2.4-2.8)	2CA	dark grayish brown (10YR4/2) loamy sand; massive to single grain; very friable to loose; strongly effervescent; abrupt lower boundary; mollusk shells; shell fragments; few rootlets.
86-216 (2.8-7.1)	2C1	brown (10YR5/3) fine sand; single grain; loose; strongly effervescent; gradual lower boundary; shell fragments; wood fragments; mollusk shells; poor recovery (60-75%); alluvial.
216-390 (7.1-12.8)	2C2	very dark grayish brown (10YR3/2) fine sand and sandy loam; mottles are few, medium, faint, dark yellowish brown (10YR4/4); single grain; loose; strongly effervescent; clear lower boundary; interbedded lenses of loamy sand and sandy loam; shell fragments; mollusk and gastropod shells; horizontal roots in some sandy loam lenses; few charcoal flecks; poor recovery (60-75%); alluvial.
390-594 (12.8-19.5)	2C3	dark grayish brown (10YR4/2) medium to coarse sand; single grain; loose; strongly effervescent; abrupt, irregular lower boundary; shell fragments; last 12 cm contains clayey lenses and small to medium pebbles; few flecks of charcoal; very poor recovery (approximately 30%); alluvial.
594-1189 (19.5-39.0)	3Cg	very dark gray (5Y3/1) clay; massive; clay coatings are continuous, coat pebble holes; firm; strongly effervescent; unknown lower boundary (end of tubes); small pebbles, few to common; some shale; few medium pebbles; few, fine, brown (10YR5/3) mottles; till.

Core/Profile: PL-5

Location: Alt. 75 over Red Lake River

Legal description: SW ¼ SW ¼ Section 25 T150N R47W

County: Polk

Parent material: Alluvium/till

Vegetation:

Slope:

Elevation: 851 feet

Topo. Map: Crookston SW

Remarks: Alt. 75 over Red Lake river near Crookston; on north side of river in lowland

Depth cm(ft)	Horizon or Zone	Description
0-14 (0-.5)	Ap1	very dark gray (10YR3/1) loam; weak, medium, granular; friable; strongly effervescent; clear lower boundary; roots; worm burrows.
14-30 (.5-1.0)	Ap2	very dark gray (10YR3/1) loam; massive; firm; strongly effervescent; clear lower boundary; fractured into angular blocks; dense; many rootlets; compacted; sand is fine; 75% recovery.
30-48 (1.0-1.6)	A	black to very dark gray (10YR2/4 3/1) clay rich loam; weak, medium, granular; friable to firm; slightly to strongly effervescent; clear lower boundary; sand is very fine; few rootlets; 75% recovery.
48-128 (1.6-4.2)	AC	very dark grayish brown (10YR3/2) clay-rich loam; mottles are few, fine, faint, black (10YR2/1), and few, medium, faint to distinct, pale brown (10YR6/3); massive; friable to firm; strongly effervescent; clear lower boundary; faint laminations; siltier near base; few gastropod shells; 75% recovery.
128-165 (4.2-5.4)	C1	very dark grayish brown (10YR3/2) clay-rich loam to clay loam; mottles are few, fine, faint to distinct, pale brown (10YR6/3); massive; friable to firm; violently effervescent; gradual lower boundary; sand is very fine, bordering on coarse silt; dense; alluvial; 75% recovery.
165-244 (5.4-8.0)	C2	dark grayish brown (10YR4/2) sandy loam to loam; mottles are few, fine, faint, brown to dark brown (7.5YR4/4); massive; friable; strongly effervescent; gradual lower boundary; several fine sand lenses (up to 8 cm thick); few small pebbles; texture grades between sandy loam, loam, and occasionally sand; some sand is very fine, bordering on coarse silt; faint laminations; shell fragments; alluvial; 75% recovery.
244-351 (8.0-11.5)	C3	grayish brown (10YR5/2) fine loamy sand; mottles are common, medium, distinct, dark yellowish brown (10YR4/4); massive; very friable; strongly effervescent; gradual lower boundary; several sandy loam to silt loam lenses (grades into finer lenses); mollusk and gastropod shells; faint laminations; alluvial; 75% recovery.
351-579 (11.5-19.0)	C4	brown to dark brown (10YR4/3) medium sand; mottles are few, coarse, distinct, dark yellowish brown (10YR3/4); single grain; loose; strongly effervescent; unknown lower boundary (end of tube); some coarse sand; few thin lenses of dark gray (10YR4/1) clay to clay loam near top; alluvial; 50-75% recovery.
579-732 (19.0-24.0)		no recovery.
732-765 (24.0-25.1)	2Cg1	dark gray (10YR4/1) gravel and sandy clay loam; single grain to massive; loose to firm; strongly effervescent; abrupt lower boundary; small to medium, rounded pebbles; few lenses of clay and sandy clay loam; few pockets of sand; alluvial.
765-1189 (25.1-39.0)	3Cg2	dark gray (10YR4/1) clay; massive; firm to very firm; strongly effervescent; unknown lower boundary (end of tubes); few small to medium pebbles; sticky; few, fine, brown (10YR5/3) mottles; some shale; till.

Core/Profile: PL-6

Location: Alt. 75 over Red Lake River

Legal description: SW ¼ SW ¼ Section 25 T150N R47W

County: Polk

Parent material: Alluvium/till

Vegetation:

Slope:

Elevation: 851 feet

Topo. Map: Crookston SW

Remarks: Alt. 75 over Red Lake River near Crookston; north of river; furthest boring from water's edge; north of snow dump road

Depth cm(ft)	Horizon or Zone	Description
0-39 (0-1.3)	A	black (10YR2/1) clay loam; weak, medium, subangular blocky; granular at top; friable; slightly effervescent; clear lower boundary; roots; rootlets; few brown to dark brown (10YR4/3) mottles near base (worm burrows); top 20 cm may be an Ap horizon (slightly platy).
39-49 (1.3-1.6)	C	brown (10YR5/3) fine sand; single grain; loose; slightly effervescent; clear lower boundary; few rootlets.
49-67 (1.6-2.2)	2CA	very dark gray (10YR3/1) clay loam; massive to weak, medium to coarse, granular; firm; slightly to strongly effervescent; gradual lower boundary; few flecks of charcoal; CA not used to designate a depositional horizon; 85% recovery.
67-152 (2.2-5.0)	2C1	very dark grayish brown (10YR3/2) sandy clay loam; mottles are few, coarse, faint, pale brown (10YR6/3), and few, fine, distinct, white (10YR8/2) and dark yellowish brown (10YR4/4); massive; friable to firm; strongly effervescent; gradual lower boundary; few laminations; charcoal at 139 cm; 85% recovery.
152-280 (5.0-9.2)	2C2	dark grayish brown (10YR4/2) loam; mottles are few, fine, distinct, white (10YR8/2), carbonate-rich; massive; friable; strongly to violently effervescent; gradual lower boundary; sand is very fine; occasionally grades into loamy sand; 86% recovery; alluvial.
280-421 (9.2-13.8)	2C3	grayish brown (10YR5/2) loamy sand; mottles are common, fine, faint, dark yellowish brown (10YR4/4), and many, coarse, faint, dark gray (10YR4/1); massive; very friable; strongly effervescent; clear lower boundary; sand is fine; occasionally unit grades into a sandy loam or loam; few shell fragments; faint laminations; gastropod shells; 76% recovery; alluvial.
421-472 (13.8-15.5)	3C4	dark grayish brown (10YR4/2) coarse sand; single grain; loose; strongly effervescent; gradual lower boundary; small pebbles few to common; few shell fragments; 50% recovery; alluvial.
472-579 (15.5-19.0)	3C5	dark grayish brown (10YR4/2) coarse sand and gravel; single grain; loose; strongly to violently effervescent; unknown lower boundary (end of tube); many small to medium pebbles; piece of red tubing in sample; shell fragments; 50% recovery; alluvial.
579-732 (19.0-24.0)	3C6	brown to dark brown (10YR4/3) fine sand to coarse sand and gravel; single grain; loose; strongly effervescent; unknown lower boundary (end of tube); shell fragments; may be fining upwards sequence; 122 cm not recovered; alluvial.
732-884 (24.0-29.0)		no recovery.
884-1189 (29.0-39.0)	4Cg	very dark gray (5Y3/1) clay; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); few small to medium pebbles; few brown (10YR5/3) silty(?) mottles; till.

Core/Profile: PL-7

Location: T.H. 220 over Red Lake River

Legal description: NW ¼ SE ¼ Section 17 T151N R49W

County: Polk

Parent material: Lacustrine and overbank sediments

Vegetation: Pine trees

Slope:

Elevation: 823 feet

Topo. Map: Grand Forks

Remarks: T.H. 220 over Red Lake River; north side of river; in East Grand Forks; ½ mile south of U.S. Highway 2; 82 feet north of north bridge abutment; 1.7 feet below center line; on high ground

Depth cm(ft)	Horizon or Zone	Description
0-16 (0-.5)	Ap	black (10YR2/1) silty clay loam; weak, fine, granular; firm; slightly effervescent; clear lower boundary; dense; roots; omnidirectional rootlets; root voids; 75% recovery.
16-44 (.5-1.4)	A	black (10YR2/1) silty clay loam; weak, medium, subangular blocky to massive; clay coatings are thin, discontinuous, coat few ped faces; friable; strongly effervescent; clear lower boundary; rootlets; 75% recovery.
44-62 (1.4-2.0)	AC	very dark grayish brown (10YR3/2) silt loam; mottles are few, medium, distinct, black (10YR2/1); massive; friable; violently effervescent; gradual lower boundary; few rootlets; few root voids partly lined with black sediment; 75% recovery.
62-140 (2.0-4.6)	C1	brown (10YR5/3) silt loam; massive; friable; strongly effervescent; gradual lower boundary; few rootlets; 75% recovery.
140-216 (4.6-7.1)	C2	dark yellowish brown (10YR4/4-3/4) silt loam; mottles are many, fine, faint, grayish brown (10YR5/2), and few, medium, distinct, black (5YR2.5/1); massive; friable; strongly effervescent; gradual lower boundary; finely laminated; oxidized; few rootlets.
216-372 (7.1-12.2)	C3	grayish brown to brown (10YR5/2-5/3) silty clay loam; mottles are few, medium, distinct, black (10YR2/1), and common, coarse, distinct, dark reddish brown (5YR3/4); massive; friable to firm; strongly to slightly effervescent; gradual lower boundary; pisoliths and pipestems; many oxidized mottles; Fe concretions.
372-591 (12.2-19.4)	C4	brown to dark grayish brown (10YR5/3-4/2) silty clay; mottles are few, coarse, faint, gray (10YR5/1), and common, coarse, faint, dark yellowish brown (10YR4/6); massive; firm; slightly effervescent; gradual lower boundary; few silt laminations (thin and faulted); few root voids; roots and stems in clay-rich zone from 425-450 cm; more finely laminated near base; lacustrine.
591-646 (19.4-21.2)	Cg1	dark gray (10YR4/1) silt loam; mottles are common, medium, distinct, light brownish gray and light yellowish brown (10YR6/2&6/4); massive; friable; strongly effervescent; gradual lower boundary; finely laminated silts and silt loam; some oxidized laminations, but mostly unoxidized; lacustrine.
646-1158 (21.2-38.0)	Cg2	very dark gray (5Y3/1) silty clay; laminations are common, fine, distinct, very pale brown (10YR7/3); massive; firm; strongly effervescent; clear lower boundary; very thin silt laminations every 1-2 cm; lacustrine.
1158-1189 (38.0-39.0)	2Cg3	very dark gray (5Y3/1) very fine sand to loamy sand; massive to single grain; very friable to loose; strongly effervescent; unknown lower boundary (end of tubes); laminated at very top; sand is very fine, bordering on coarse silt.

Core/Profile: PL-8

Location: T.H. 220 over Red Lake River

Legal description: NW ¼ SE ¼ Section 17 T151N R49W

County: Polk

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 795 feet

Topo. Map: Grand Forks

Remarks: T.H. 220 over Red Lake River; north side of river; in East Grand Forks; ½ mile south of U.S. Highway 2; 325 feet south of north bridge abutment; 35 feet below center line; on low ground near river

Depth cm(ft)	Horizon or Zone	Description
0-37 (0-1.2)	Acum	very dark gray (10YR3/1) silt loam to silty clay loam; weak, fine, subangular blocky; weakly granular at very top; friable to firm; strongly effervescent; clear lower boundary; crudely laminated; few lenses with small rounded pebbles; more clay-rich near base; few angular pebbles; rootlets; 90% recovery.
37-92 (1.2-3.0)	BC	very dark grayish brown (10YR3/2) silty clay; mottles are few, fine, distinct, white (10YR8/2), at base of horizon; weak, medium, prismatic parting to medium subangular blocky; clay coatings are thin, discontinuous, coat some ped faces; firm; strongly effervescent; abrupt lower boundary; roots; charcoal; darker at base (84-92 cm); 90% recovery.
92-149 (3.0-4.9)	C1	dark gray (10YR4/1) silty clay; laminations are common, medium, distinct, yellowish brown (10YR5/6) and white (10YR8/2), and mottles are common, medium, faint, dark yellowish brown (10YR4/4); massive; firm; strongly effervescent; clear lower boundary; laminated; silt laminations common; many angular unconformities in laminations; alluvial, yet some laminations resemble lacustrine laminations.
149-274 (4.9-9.0)	C2	dark gray to dark grayish brown (10YR4/1-4/2) silty clay to silty clay loam; laminations are common, medium, distinct, yellowish brown (10YR5/6), and mottles are common, medium, faint, dark yellowish brown (10YR3/6); massive; white silt coatings on coarse curved vertical faces in top half of unit; dark reddish brown (5YR 2.5/2) oxidation coatings on coarse curved vertical faces in bottom third of horizon; firm; strongly effervescent; gradual lower boundary; top half not laminated; bottom half laminated; siltier near base (less clay); alluvial, yet some laminations resemble lacustrine laminations.
274-402 (9.0-13.2)	2C3	very dark gray (10YR3/1) silty clay; laminations are common, medium, distinct, brown to pale brown (10YR5/3-6/3); massive; firm; strongly effervescent; gradual lower boundary; laminated; few silt laminations; few sand laminations near base; angular unconformities common in laminations; ripples near top (approximately 280 cm); alluvial.
402-472 (13.2-15.5)	2C4	dark grayish brown (2.5Y4/2) loamy sand; mottles are common, medium, faint, dark brown (7.5YR3/4); massive to single grain; very friable to loose; strongly effervescent; gradual lower boundary; sand is very fine; lenses of very dark gray to dark gray (10YR3/1-4/1) silty clay loam; crudely laminated; alluvial.
472-579 (15.5-19.0)	2Cg1	dark gray (5Y4/1) silt loam to silty clay loam; mottles are few, medium, faint, dark yellowish brown (10YR3/4); massive; friable; strongly effervescent; clear lower boundary; laminated; few sand lenses; silty clay at top; laminations are often light and dark gray; pocket of plant matter near base (roots, wood, bark?) collected; 86% recovery.
579-863 (19.0-28.3)	3Cg2	dark gray (5Y4/1) fine sand; single grain; loose; strongly effervescent; abrupt lower boundary; not laminated; slightly loamy at base; core segment labeled 24.0'-24.5' all very dark gray clay (may be mislabeled?); 80% recovery; alluvial.
863-1204 (283-39.5)	4Cg3	very dark gray (5Y3/1) clay; mottles are few, fine, distinct, brown (10YR5/3), powdery (silt?); massive; very firm; slightly effervescent; unknown lower boundary (end of tubes); not laminated; no pebbles found; lacustrine.

Core/Profile: PL-9

Location: T.H. 220 over Red Lake River

Legal description: NW ¼ SE ¼ Section 17 T151N R49W

County: Polk

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 797 feet

Topo. Map: Grand Forks

Remarks: T.H. 220 over Red Lake River; south side of river; in East Grand Forks; ½ mile south of U.S. Highway 2; 563 feet north of south bridge abutment; 31 feet below center line; on low ground by river

Depth cm(ft)	Horizon or Zone	Description
0-10 (0-.33)	A	very dark gray (10YR3/1) clay loam; moderate, medium, granular; firm; strongly effervescent; clear lower boundary; few pebbles; rootlets; 85% recovery.
10-34 (.33-1.1)	AB	very dark grayish brown (10YR3/2) clay loam; weak to moderate, medium, prismatic; clay coatings are thin, discontinuous, coat ped faces; firm; strongly effervescent; gradual lower boundary; rootlets; few gastropod shells; 85% recovery.
34-62 (1.1-2.0)	C1	dark brown (10YR3/3) loamy sand; massive to single grain; friable to loose; strongly effervescent; clear lower boundary; 85% recovery; alluvial.
62-710 (2.0-23.3)	C2	dark grayish brown (10YR4/2) loam, sandy loam, and loamy sand; mottles are few, fine, faint, dark gray (10YR4/1) and dark yellowish brown (10YR3/4); massive; friable; strongly effervescent; diffuse lower boundary; grades between loam and sandy loam every 20-50 cm; many sand and loamy sand lenses; few rootlets; few flecks of charcoal; shell fragments; gastropod shells; occasional laminations visible; 82% recovery; alluvial.
710-884 (23.3-29.0)	Cg1	dark gray (5Y4/1) loam and sandy loam; massive; friable; strongly effervescent; gradual lower boundary; similar to C2 only not oxidized; plant matter (wood, roots, fibers) collected 826-832 cm; plant matter scattered throughout core; few sand lenses; few shell fragments; 85% recovery; alluvial.
884-975 (29.0-32.0)	2Cg2	dark gray (5Y4/1) medium to coarse sand; single grain; loose; strongly effervescent; abrupt lower boundary; pebbles common; slightly loamy; shell fragments; tube had 54% recovery, but most of lost sample was probably from this unit; alluvial.
975-1036 (32.0-34.0)	3Cg3	dark gray (5Y4/1) silt loam; mottles are few, medium, distinct, dark yellowish brown (10YR4/6), and few, fine, distinct, white (10YR8/2); massive; friable; strongly effervescent; unknown lower boundary (end of tube); faintly laminated; few small pebbles; tube had 54% recovery (much of loss may be from 2Cg2 sand unit); alluvial.
1036-1061 (34.0-34.8)	4Cg4	dark gray (5Y4/1) fine to medium sand; single grain; loose; strongly effervescent; abrupt lower boundary; alluvial.
1061-1189 (34.8-39.0)	5Cg5	dark gray (5Y4/1) silty clay loam; mottles are common, medium, faint, black (10YR2/1), and few, medium, distinct, dark reddish brown (5YR3/4); massive; friable; strongly effervescent; unknown lower boundary (end of tubes); fractured in more clay-rich zones; few gastropod shells; organic-rich lens at 1110 cm, contains wood (collected some); occasional faint laminations; few sand partings; alluvial.

Core/Profile: PL-10

Location: T.H. 220 over Grand Marais Creek

Legal description: NW ¼ NW ¼ Section 1 T152N R50W

County: Polk

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 815 feet

Topo. Map: Oslo SE

Remarks: T.H. 220 over Grand Marais Creek; south of County Road 21; on north side of river on low ground; 8 feet below center line of T.H. 220; 91 feet north of NE bridge abutment

Depth cm(ft)	Horizon or Zone	Description
0-10 (0-.3)	C	very dark grayish brown (10YR3/2) silty clay loam; mottles are few, fine, faint, dark grayish brown (10YR4/2); massive; friable; strongly effervescent; abrupt lower boundary; laminated; recent deposits; 83% recovery.
10-26 (.3-.9)	2A	black (10YR2/1) clay loam; mottles are few, fine, distinct, grayish brown to dark grayish brown (10YR5/2-4/2); weak, medium, granular at top to moderate, medium, subangular blocky at base; firm; strongly effervescent; clear lower boundary; base is laminated; few gastropod shells; base may be cumulic; 83% recovery.
26-146 (.9-4.8)	2AC	black (10YR2/1) clay loam; mottles are many, fine, distinct, grayish brown (10YR5/2), and few, fine, distinct, dark brown (7.5YR3/4); moderate to weak, medium, granular; firm; strongly effervescent; abrupt lower boundary; roots common; rootlets; very mottled in most of unit (less mottled in a few places); few small pebbles; 83% recovery.
146-162 (4.8-5.3)	3Ab	black (10YR2/1) silty clay loam; moderate, fine to medium, granular; friable; strongly effervescent; abrupt lower boundary; less clay than surrounding horizons; rootlets; 80% recovery.
162-244 (5.3-8.0)	3ACb	mottled black (10YR2/1) and grayish brown (10YR5/2) silty clay loam; moderate, medium, granular; friable; strongly effervescent; abrupt lower boundary; many rootlets; few roots; few small pebbles; 80% recovery.
244-485 (8.0-15.9)	3C	grayish brown (2.5Y5/2-10YR5/2) silty clay loam; mottles are common, fine, faint, greenish gray (5GY5/1) around rootlets, and common, fine, faint, brown to dark brown (10YR4/3); massive; friable; strongly effervescent; clear lower boundary; few horizontal rootlets; often gleyed around rootlets; few pebbles; more clay-rich near base; some conchooidal fracturing; few gastropod shells; alluvial.
485-512 (15.9-16.8)	4ACb	very dark gray (10YR3/1) silty clay loam; mottles are common, fine, distinct, grayish brown (10YR5/2); weak, medium, subangular blocky to massive; friable; strongly effervescent; clear lower boundary; few very small pebbles; clay-rich; few rootlets.
512-783 (16.8-25.7)	4C1	gray to dark grayish brown (5Y5/1-10YR4/2) silt loam to silty clay loam; mottles are common, medium to coarse, distinct, strong brown (7.5YR4/6), and few, fine, distinct, white (10YR8/2) at top; massive; friable; strongly effervescent; gradual lower boundary; few rootlets; silt loam at top (first 100 cm or so) then grading between silt loam and silty clay loam; grayer at top, more oxidized with depth; few pebbles; faintly laminated; alluvial.
783-1189 (25.7-39.0)	5C2	dark grayish brown to brown to dark brown (10YR4/2-4/3) silty clay; mottles are common, fine, distinct, white (10YR8/2), and common, medium, faint, dark yellowish brown (10YR4/6); massive; firm; strongly effervescent; unknown lower boundary (end of tubes); laminated; few laminations are white (10YR8/1), silty, and carbonate-rich; lacustrine.

Core/Profile: PL-11

Location: T.H. 220 over Grand Marais Creek

Legal description: NW ¼ NW ¼ Section 1 T152N R50W

County: Polk

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope:

Elevation: 823 feet

Topo. Map: Oslo SE

Remarks: T.H. 220 over Grand Marais Creek; just south of County Road 21; same elevation as center line of T.H. 220

Depth cm(ft)	Horizon or Zone	Description
0-40 (0-1.3)	A	black (10YR2/1) silty clay loam; strong, medium, granular; friable; strongly effervescent; clear lower boundary; many rootlets; structure is weaker last 10 cm; worm burrows.
40-81 (1.3-2.7)	AC	dark grayish brown (10YR4/2) silty clay loam; weak, fine to medium, granular to massive; friable; extremely violently effervescent; gradual lower boundary; rootlets common.
81-137 (2.7-4.5)	C1	grayish brown (10YR5/2) silt loam; massive; friable; strongly to violently effervescent; gradual lower boundary; rootlets common.
137-216 (4.5-7.1)	C2	brown to dark brown (10YR4/3) silt loam; mottles are common, coarse, distinct, strong brown (7.5YR4/6) to dark reddish brown (2.5YR2.5/4); massive; friable; strongly effervescent; gradual lower boundary; laminated; oxidized laminations every 1-2 cm; few small pebbles; alluvial.
216-326 (7.1-10.7)	2C3	dark grayish brown (10YR4/2) silty clay loam; mottles are common, fine to coarse, distinct, strong brown (7.5YR5/6), pale brown (10YR6/3), and dark reddish brown (2.5YR2.5/4); massive; friable to firm; strongly effervescent; gradual lower boundary; laminated; highly fractured near base (more clay-rich); conchoidal fractures; few small pebbles; few rootlets; lacustrine.
326-704 (10.7-23.1)	2C4	dark grayish brown to very dark gray (10YR4/2-3/1) silty clay; mottles are common, fine, distinct, strong brown (7.5YR5/6); massive; firm; strongly effervescent; gradual lower boundary; laminated; laminations are white (10YR8/1), brown (10YR5/3), light yellowish brown (10YR6/4), and a few black (10YR2/1); several silt laminations, few clay-rich zones with fewer laminations; some diapir-like structures from loading; lacustrine.
704-1149 (23.1-37.7)	2Cg1	very dark gray (10YR3/1) silty clay; massive; firm; slightly effervescent; clear lower boundary; laminated; laminations are brownish gray (10YR5/2) and thin; laminations are less prominent last 200-300 cm; lacustrine.
1149-1204 (37.7-39.5)	3Cg2	very dark gray (10YR3/1) clay; mottles are very few, fine, brownish gray (10YR5/2); massive; very firm; slightly effervescent; unknown lower boundary (end of tubes); shiny; sticky; close to black; a couple laminations, mostly uniform clay; some slickensides; may be deep water or off-shore lacustrine.

Core/Profile: PL-12

Location: T.H. 220 over Grand Marais Creek

Legal description: NW ¼ SW ¼ Section 31 T153N R49W

County: Polk

Parent material: Lacustrine sediments

Vegetation:

Slope:

Elevation: 814 feet

Topo. Map: Oslo SE

Remarks: T.H. 220 over Grand Marais Creek; north of County Road 21; on east side of river on low ground; 8.7 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-47 (0-1.5)	A	black (10YR2/1) silty clay loam to clay loam; strong, medium, granular; firm; strongly effervescent; clear lower boundary; roots; rootlets; few shell fragments; 84% recovery.
47-78 (1.5-2.6)	Btk1	dark grayish brown (10YR4/2) clay loam; mottles are common to many, fine to medium, distinct, white (10YR8/2), and few, fine, distinct, strong brown (7.5YR5/6); moderate, fine, angular blocky to subangular blocky; clay coatings are moderately thick, discontinuous, coated faces; firm; violently effervescent; gradual lower boundary; rootlets; few worm burrows; very hard when dry; 84% recovery.
78-107 (2.6-3.5)	Btk2	dark grayish brown (10YR4/2) silty clay; mottles are common, fine to medium, distinct, white (10YR8/2), and common, fine to medium, distinct, brown to dark brown (7.5YR4/4); moderate, medium, angular blocky; clay coatings are moderately thick, discontinuous, coated faces; firm; violently effervescent; gradual lower boundary; rootlets; worm burrows filled with black sediment; 84% recovery.
107-579 (3.5-19.0)	C	brown to dark brown (10YR4/3) silty clay; mottles are common, coarse, faint, dark yellowish brown (10YR4/4-6); massive; firm; strongly effervescent; diffuse lower boundary; laminated; many laminations are very thin, white (10YR8/1), silty, and carbonate-rich; few oxidized laminations; few horizontal roots at top; lacustrine.
579-881 (19.0-28.9)	Cg1	very dark gray (10YR3/1) silty clay; mottles are few, fine, distinct, white (10YR8/2) and light brownish gray (10YR6/2) laminations; massive; firm; strongly effervescent; diffuse lower boundary; similar to C; laminated; few oxidized laminations; many laminations are carbonate-rich; fewer laminations with depth; lacustrine.
881-1204 (28.9-39.5)	2Cg2	very dark gray (5Y3/1) clay; massive; very firm; very slightly effervescent; unknown lower boundary (end of tubes); sticky; some fracturing; fracture surfaces are smooth and shiny; few brown (10YR5/3) mottles; some slickensides; lacustrine.

Core/Profile: WL-1
 Location: U.S. 75 over Otter Tail River
 Legal description: NE ¼ SW ¼ Section 4 T132N R47W
 County: Wilkin
 Parent material: Till
 Vegetation:
 Slope:
 Elevation: 961 feet
 Topo. Map: Wahpeton
 Remarks: U.S. Highway 75 over Otter Tail River in Breckenridge; south of river, 324 feet south of south bridge abutment; on a patch of high ground

Depth cm(ft)	Horizon or Zone	Description
0-31 (0-1.0)	A	black (10YR2/1) clay loam; moderate to strong, medium, granular; friable to firm; very slightly effervescent; clear lower boundary; many rootlets; large root at base; top 10 cm contains many small pebbles (recent sediment/fill).
31-55 (1.0-1.8)	AC	very dark grayish brown (10YR3/2) clay loam; mottles are many, fine to coarse, faint, black (10YR2/1); moderate, medium, granular; firm; slightly to strongly effervescent; gradual lower boundary; transition zone; roots.
55-143 (1.8-4.7)	CA	dark grayish brown (2.5Y4/2) clay loam; mottles are common, fine to coarse, faint, black (10YR2/1); massive to weak, medium, granular; clay coatings are few, faint, thin, discontinuous, coat few fracture planes and line some root voids; firm; violently effervescent; gradual lower boundary; few omnidirectional rootlets; worm burrows filled with sediment; some microfracturing in clay-rich zones.
143-305 (4.7-10.0)	C1	brown (10YR5/3) silty clay loam; mottles are common, medium, distinct, brown to dark brown (7.5YR4/4), and few, medium, dark grayish brown (10YR4/2); massive; friable to firm; strongly effervescent; gradual lower boundary; fracturing prevalent near top along horizontal planes; patches of oxidation; few small pebbles; few roots; few lenses of SCL; crudely bedded; sand partings near base; may be alluvially reworked till.
305-796 (10.0-26.1)	2C2	yellowish brown (10YR5/4) clay loam diamicton; mottles are few, coarse, distinct, gray (10YR5/1) and dark red (2.5YR3/6), and few, medium, faint, very dark brown (10YR2/2); massive; firm; strongly effervescent; clear lower boundary (color change); small to medium pebbles common; some shale; some charcoal flecks; oxidized; till (probably DML).
796-1189 (26.1-39.0)	2Cg	very dark gray (10YR3/1) clay loam diamicton; massive; very firm; slightly to strongly effervescent; unknown lower boundary (end of tubes); small to medium pebbles common; unoxidized; some shale; till (probably DML).

Core/Profile: WL-2

Location: U.S. 75 over Otter Tail River

Legal description: NE ¼ SW ¼ Section 4 T132N R47W

County: Wilkin

Parent material: Alluvium/till

Vegetation:

Slope:

Elevation: 952 feet

Topo. Map: Wahpeton

Remarks: U.S. Highway 75 over Otter Tail River in Breckenridge; south of river, 46 feet south of south abutment; 11.9 feet below center line; on low ground

Depth cm(ft)	Horizon or Zone	Description
0-79 (0-2.6)	Acum	black to very dark gray (10YR2/4 3/1) loam to sandy loam; mottles are few, fine, distinct, strong brown (7.5YR4/6); massive; weak, fine, granular at top; friable; strongly effervescent; abrupt lower boundary; interbedded lenses of fine sand; few siltier lenses; laminated; roots; few small pebbles; large root at base; few patches of oxidation; 62% recovery.
79-122 (2.6-4.0)	2CA	very dark gray (10YR3/1) silt loam; massive; friable; strongly effervescent; unknown lower boundary (end of tube); slightly organic-rich; plant matter collected in last 5 cm; few gastropod shells; 62% recovery; wood from 116-122 cm C-14 dated as Modern.
122-427 (4.0-14.0)	3C1	dark gray (2.5Y4/0) medium to coarse sand; single grain; loose; strongly effervescent; unknown lower boundary (end of tube); fine at top; few small pebbles; shell fragments; few vertical roots; gastropod shells; unoxidized; alluvial; 20-60% recovery.
427-555 (14.0-18.2)	4C2	dark yellowish brown (10YR4/4) clay loam diamicton; mottles are few, medium, distinct, gray (10YR5/1), and few, fine, distinct, dark reddish brown (5YR3/4); massive; firm; strongly effervescent; clear lower boundary (color change); small to medium pebbles common; charcoal flecks; some shale; oxidized; few large pebbles and cobbles; till (probably DML).
555-1189 (18.2-39.0)	4Cg	very dark gray (10YR3/1) clay loam diamicton; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); small to medium pebbles common; few large pebbles and cobbles; shale; till (probably DML).