

**Class B Soil Map Report
for 285 Northport Road,
Belfast, Maine**

March 2019

Prepared for:

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Certification Statement

The accompanying soil profile descriptions, soil survey map and this soil narrative report entitled "Class B Soil Map Narrative for 285 Northport Road", dated March 2019, were done in accordance with the standards adopted by the Maine Association of Professional Soil Scientists, February 1995, as amended and prepared by Ian Broadwater, C.S.S. #305.

1.0 Introduction

Nordic Aquafarms, Inc. (NAI) is proposing the construction of a commercial aquaculture business on land owned by various entities in Belfast, Maine. A majority of the land where the development is proposed is owned by the Belfast Water District (BWD) at 285 Northport Road in Belfast (see inset on soil map in Appendix D). Ransom Consulting Engineers and Scientists, Inc. (Ransom) has been retained by NAI to complete engineering and permitting of the proposed facility.

As part of a Site Location of Development Permit application, NAI needs a Class B High Intensity soil map prepared and included in the application in accordance with the soil survey standards of the Maine Association for Professional Soil Scientists (MAPSS, 2009). To prepare the soil map, Ransom retained Broadwater Environmental, LLC (BE-LLC) of South Portland, Maine. Ian Broadwater, owner, is a Certified Soil Scientist (SS305) in Maine.

This site was surveyed for wetlands by a Normandeau Associates, Inc. (Normandeau) of Portland, Maine in the late summer and fall of 2018. Information obtained during the wetland survey was used to supplement data collected during the soil mapping fieldwork. The soil mapping fieldwork indicates that wetland boundaries were consistent with hydric soil series boundaries as discussed in Section 3.0.

This report consists of this introduction, a discussion of the methodology used to complete the soil map, and a discussion of the Class B soil map resulting from the effort. Five appendices are also attached to this document and they include

- soil map unit descriptions,
- test pit logs,
- official published soil series description by the U.S. Natural Resource Conservation Service (NRCS),
- the Class B high intensity soil map resulting from this effort, and
- a figure showing the water courses on the site created by Normandeau.

2.0 Methodology

The document “Guidelines for Maine Certified Soil Scientists for Soil Identification and Mapping” (MAPSS, 2009), published by the Maine Association of Professional Soil Scientists, contains standards for the content of soil maps and accuracy information based on class of mapping completed. The guidelines describe five different levels of mapping (i.e., A through D, and L).

According to the guidelines (MAPSS, 2009), a Class B survey map should conform to the following criteria:

1. Map units will not contain dissimilar limiting individual inclusions larger than one acre. Dissimilar limiting inclusions may total more than one acre per map unit delineation, in the aggregate, if not continuous.
2. Scale of 1-inch equals 200 feet or larger (e.g. 1" = 100').

3. Ground control—test pits for which detailed data is recorded are located by means of compass by chaining, pacing, or taping from known survey points; or other methods of equal or greater accuracy.
4. Base map with 5-foot contour lines.

2.1 Field Procedures

Ian Broadwater, Maine Certified Soil Scientist SS305, completed the fieldwork to support the mapping in October 2018. Field observations were made using borings advanced by hand with a Dutch auger and 26 test pits dug using a mini-excavator. Soil observations were made to 48” below ground surface in all test pits, as deep as condition would allow. Limits to depth of auger borings were caused by extremely firm soils in natural soil profiles.

Circumstantial evidence of the soil depth was reviewed including the existing NRCS mapping of the site and vicinity. NRCS soil mapping shows soils with one parent material; marine/lacustrine sediment. The existing NRCS soil survey shows about 95% of the site mapped as Boothbay silt loam and a small inclusion of Swanville silt loam. No shallow to bedrock soil were mapped by the NRCS in the study area and no outcrops were observed nor surface rocks during the survey.

The general field procedures used to make this soil map follow those of the National Soil Survey Handbook (NRCS, 2017). The soils mapped are established soil series used in the State of Maine by the NRCS as depicted in the state soil catena revised 2016.

After soil series boundaries and characteristics were interpreted, map unit descriptions were created specific to this site and they are provided in Appendix A.

Soil test pit logs were completed for 26 locations and are provided in Appendix B. Test pits and soil type observations were located with a Trimble® GPS, capable of submeter accuracy.

2.2 Soil Map Units

The soil series interpretations provided are based on information in the soil series descriptions and technical information provided by the NRCS web soil survey. All limitations and constraints invoked by the NRCS for such interpretations also apply to this soil survey.

The map units observed are described in Appendix A. These descriptions are within the NRCS range for each official Soil Series Description unless otherwise noted. The taxonomic classification follows Keys to Soil Taxonomy (Soil Survey Staff, 2014). Information on soil morphology and physical characteristics were obtained from the NRCS Web Site. A large area of the site was found to have been disturbed. This map unit is described as a Udorthent (cut-and-fill area). Characteristics described are based on those observed on-site and not the NRCS description.

The soil map units used for this survey are consociations and complexes. Consociations are dominated by a single soil series and similar soils. A complex is two or more soils that are so intermingled that they cannot be mapped individually. No soil complexes were used on this map.

Several soil consociation map units are used on this map (i.e., Boothbay, Pushaw, and Swanville). In accordance with the soil mapping standards (MAPSS, 2009), the map units will have a minimum of 75% of the named soil or similar soils. The named soil will be the most common of all similar soils. The total number of dissimilar soils in any one mapping unit for consociations should not exceed 25% of the map unit of which no more than 15% is limiting. Similar soils are alike in most properties and share similar limitations such as depth to water table or content of organic matter. Dissimilar soils do not share limits of some important diagnostic properties of the named soil and may have different use or management requirements for a particular land use.

It is important to note that some dissimilar soils are more limiting in their use than the named soil. For instance, an inclusion of somewhat poorly drained soils can occur within a well-drained soil map unit.

Slope phases, when pertinent, are designated with a letter at the end of the map unit symbol. Designation may be A through E which refers to slope class. The topographic slope class range for each series is shown on the map legend.

The hydrologic group identifies soils having the same runoff potential under similar storm conditions. Soil properties that influence runoff are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. The soil series hydrologic groups are shown on the legend of the map in Appendix D. It should be noted that classification for Boothbay, Pushaw and Swanville in Maine could not be found so the hydrologic group for similar soils (i.e., Buxton, Lamoine, and Scantic) were used.

2.3 Wetland Survey and Hydric Soils

In preparation for this project, a wetland survey was conducted by Normandeau earlier in 2018. Some flagging was still present during the soil survey fieldwork. Delineated wetlands were found to coincide with the hydric-nonhydric soil boundaries. Hydric soils refer to those soil series the NRCS considers to be either poorly or very poorly drained. Hydric soil needs to be present to have a wetland although wetland boundary determination also considers other factors such as vegetation and hydrology that could result in a different boundary relative to hydric soils.

3.0 Summary of Findings

The following summarizes the results of the soil survey. Supporting data including soil map unit descriptions are provided in Appendix A; representative soil logs in Appendix B; official NRCS soil series descriptions in Appendix C, and the Class B soil map is in Appendix D.

In general, the site slopes from north to south and a majority is forested with a mix of deciduous and evergreen trees. Selective logging was ongoing during the field work. A network of woods roads is present in the forested portion of the site.

The portion of the site abutting Route 1 has been developed and modified. This area contains three buildings as well as an underground bunker used by the Belfast Water District. A dam is also present on the Little River adjacent to the Belfast Water District office that abuts the river.

The other two buildings on-site are maintenance garages. The vegetative cover on the developed portion is grass where it is not paved. Select old trees have been preserved in this area as well.

The developed portion of the site, abutting Route 1 (i.e., Northport Road) was mapped as a Udothent which is man-modified land. Fill was present along the paved areas and side slopes of the natural landscape have been cut to allow for the paved surfaces. An intermittent stream on the east side of the driveway appears to have been modified (e.g., channelized and/or straightened) at some point in the past.

A majority of the undeveloped portion of the site was found to be Pushaw silt loam, a somewhat poorly drained soil related to Boothbay silt loam by having the same parent material; marine sediment with a like mineral composition. Areas of Boothbay silt loam, a moderately well drained soil, were also found on the site as well but comprised much less of the site than Pushaw silt loam. It should be noted that when the NRCS mapped this area of Maine, Pushaw silt loam was not a recognized soil series which likely explains its absence on the NRCS mapping. Appendix A contains a description of the soil series and the characteristics of their occurrence on this site.

Wetlands identified by Normandeau (Normandeau, 2018) in 2018 on the site were found to contain Swanville silt loam, a poorly drained, hydric soil that is also derived from the same parent material. Swanville was also found in small amounts in select locations of ravines that are present on the site as discussed below.

There are several ravines present on the site and they are generally oriented north to south, mimicking the general site slope direction. The ravines have moderate to severe side slopes but, generally, there is not sediment in the lowest part of the ravines. The ravines likely developed many hundreds if not thousands of years ago.

As part of the wetland delineation by Normandeau, water courses on-site were evaluated, and a map was created showing these features (Appendix E). Both ephemeral and intermittent stream segments were identified, however, no perennial streams were identified. Two intermittent streams (S8 and S9) and two intermittent streams segments of S3 and S6 were identified by Normandeau as shown on the figure in Appendix E (Normandeau, 2018). These features had some sediment in their low points.

Additional evaluation of the water courses was completed by Normandeau in February 2019. The result was reclassification of S3 and S6 to intermittent as well as classifying S5 as intermittent (versus ephemeral as indicated in the delineation report completed in 2018). More importantly, a March 2019 memo from Normandeau to Ransom indicates that S3, S5, S6, S8 and S9 all meet the definition of a stream under the Natural Resources Protection Act. The March 2019 memo is included in Appendix E. Observations made during the fieldwork for this soil map in 2018 support these classifications. Water courses are also shown on the soil map in Appendix D.

Another notable feature on the site was a rocky area in the northwest corner of the site. The area was found to be small, localized and distinct which indicates it may have been a rock dump for the cleared fields north of the site.

References

MAPSS, 2009.” Guidelines for Maine Certified Soil Scientists for Soil Identification and Mapping”, Maine Association of Professional Soil Scientists, 2004, revised 2009.

Normandeau, 2018. “Nordic Aquaculture Wetland and Stream Delineation, and Vernal Pool Survey, Belfast, Maine” prepared by Normandeau Associates, Inc., Portland, Maine. August 2018.

NRCS, 2017. “National Soil Survey Handbook”, Natural Resource Conservation Service, 2017.

Soil Survey Staff, 2014. “Keys to Soil Taxonomy”, Natural Resource Conservation Service, 2014.

Appendix A-Soil Map Unit Descriptions

Attachment A-Soil Map Unit Descriptions

Boothbay silt loam-This soil series, a moderately well drained soil derived from marine sediments, was mapped in in three relatively small inclusions on the site. Each of these areas represent a high point in the landscape. Included in this map unit are areas of Pushaw silt loam which comprise less than 25% of the unit. All areas where this soil series was mapped were generally level with < an 8% slope.

Pushaw silt loam- This soil series, a somewhat poorly drained soil derived from marine sediments, was mapped on a majority of the undeveloped portion of the site. Several different slope phases were observed for this soil series up to a D class slope in the southwest portion of the site, along a ravine. A majority of the area mapped as Pushaw was fairly level with a slope of less than 8%. However, along the ravine landscape features, slopes ranging from 10% to 35% were observed. Included in this map unit are small areas of Boothbay silt loam and Swanville silt loam as well as recent alluvium in the intermittent stream segment.

Swanville silt loam- This soil series was found in the wetlands mapped by Normandeau. This soil is a poorly drained hydric soil that forms in marine sediment. It is related to Boothbay and Pushaw by mineral composition of the parent material. A large map unit of this series was found in the center of the site in a forested wetland. Included in this series are small inclusions of Pushaw silt loam and Swanville silt loam.

Udorthent-This soil is man-modified and developed. In the Udorthent unit, hill slopes were cut to make way for paved roads and areas. Granular fill was also brought in for the paved areas. A small gravel parking area for the walking trail around the Little River is present on the north side of the Udorthent map unit. An underground bunker is also present adjacent to Route 1, south of the driveway entrance. An intermittent stream flowing through a grassed area northeast of the driveway appears to have been channelized and/or straightened in the past. Recent alluvium in the stream thread is also present but likely comprises less than 1% of the map unit.

Appendix B-Test Pit Logs

Attachment B-Test Pit Logs

285 Northport Ave. Class B Soil Map Report

TP-1

0"-9" Silt loam (10YR 4/3); friable; moist; common f-m roots

9"-22" Silt loam (10YR 5/4); friable; moist; common concentrations (7.5YR 5/6) and depletions (10YR 7/1) at 20" bgs

22"-48" Silt loam (2.5Y 4/4); very firm; slightly plastic; slight prismatic structure; moist

Interpreted classification: Moderately well drained Boothbay Silt loam

TP-2

0"-10" Silt loam (2.5Y 5/4); friable; moist; common fine roots in top 3 inches

10"-15" Silt loam (2.5Y 6/3); firm; blocky structure; moist; @ 12" bgs, common concentrations (10YR 6/8) and depletions (2.5y 7/1)

15"-28" Silt loam (10YR 4/3); firm; moist; common depletions (2.5Y 7/1 to Gley 1 6/N) and concentrations on ped faces

28"- 50" Silt loam (10YR 4/3); very firm; moist; seep at 36"

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-3

0"-10" Silt loam (10YR 5/3); friable; few redox concentrations from 6"-10" bgs; moist; few fine roots

10"-14" Silt loam (10YR 4/3); firm; moist; common concentrations and many depletions (10YR 7/1) at 11" bgs

14"-32" Silt loam (10YR 4/2); very firm; common redox concentrations and depletions; blocky structure; moist

32"-50" Similar to above with less depletions with depth.

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-4

0"-13" Silt loam (10YR 3/2); friable; moist; @ 12" bgs, common concentrations (10YR 6/8); seep at 13" bgs

13"-19" Silt loam (2.5Y 5/4); friable; saturated; common concentrations (10YR 6/8) and depletions (2.5Y 7/1)

19"-36" Silt loam (10YR 4/3); firm; moist; common depletions (2.5Y 7/1) and concentrations (10YR 6/8)

36"- 50" As above with strong blocky structure; moist

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-5

0"-9" Silt loam (10YR 4/4); friable; moist; few fine roots in top 2";

9"-17" Silt loam (10YR 4/5); friable; moist; few redox concentrations

17"-36" Silt loam (10YR 4/3); firm; blocky structure; moist; common redox concentrations (10YR 6/8)

36"-50" Similar to above with a massive structure.

Interpreted classification: Moderately well drained Boothbay Silt Loam

TP-5A

0"-2" Oe; moderately decomposed organic matter (10YR 2/1)

2"-14" Silt loam (10YR 5/3); friable; crumb structure; few f-c roots; moist; common redox concentrations (7.5YR 5/6) @ 13" bgs

14"-29" Silt loam (2.5Y 7/3); v. firm; moist; common redox concentrations and depletions (2.5Y 7/1)

29"-49" Silt loam (2.5Y 5/2); v. firm; moist; common redox concentrations (7.5YR 5/6) and Mg + staining of ped faces; 1" of water in bottom of pit after 5 minutes

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-6

0"-15" Silt loam (10YR 4/3); friable; crumb structure; moist; common redox concentrations (10YR 6/8) @ 11" bgs

15"-20" Silt loam (10YR 4/4); friable; moist; common redox concentrations

20"-48" Silt loam (10YR 4/2); firm; moist; common redox concentrations (10YR 6/8) and Mg + staining of ped faces

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-7

0"-1" Oi; slightly decomposed forest litter of various colors

1"-2.5" Oe; moderately decomposed organic matter (10YR 2/1)

2.5"-7" Silt loam (10YR 5/4); friable; crumb structure; moderate f-m roots in top of the horizon; moist

7"-18" Silt loam (10YR 6/4); friable; moist

18"-30" Silt loam (10YR 4/3); firm; moist; common redox concentrations (7.5YR 5/6) and depletions (10YR 7/1)

30"-53" Similar to above but few depletions and Mg + staining of ped faces; moist

Interpreted classification: Moderately well drained Boothbay Silt Loam

TP-8

0"-2" Oe; moderately decomposed organic matter (10YR 2/1)

2"-13" Silt loam (10YR 4/3); friable; moderate f-m roots in top of the horizon; moist; common redox concentrations (7.5YR 5/6) at 12" bgs

13"-23" Silt loam (2.5Y 6/3); firm; moist; many redox concentrations (7.5YR 5/6) and Mg + staining of ped faces

23"-50" Silt loam (2.5Y 6/2); v. firm; saturated; common redox concentrations (7.5YR 5/6) and Mg+ staining on ped faces

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-9

0"-2" Oe; moderately decomposed organic matter (10YR 2/1)

2"-13" Silt loam (10YR 6/2); friable; moist; common redox concentrations (10YR 6/8) at 9" bgs

13"-21" Silt loam (2.5Y 6/3); firm; moist; common redox concentrations (10YR 6/8) and depletions (10YR 7/1)

21"-50" Silt loam (2.5Y 5/2); v. firm; moist; common redox concentrations (10YR 6/8) and Mg+ staining on ped faces

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-10

0"-2" Oe; moderately decomposed organic matter (10YR 2/1)

2"-10" Silt loam (10YR 5/3); friable; moist

10"-19" Silt loam (10YR 5/2); firm; moist; common redox concentrations (10YR 6/8) at 13" bgs

19"-48" Silt loam (10YR 5/3); firm; moist; common redox depletions (10YR 7/1)

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-11

0"-2" Oe; moderately decomposed organic matter (10YR 2/1)

2"-12" Silt loam (10YR 5/3); friable; crumb structure; moist; common redox concentrations (7.5YR 6/8) at 7" bgs

12"-17" Silt loam (10YR 5/3); firm; weak blocky structure; saturated; common large depletions (2.5Y 7/1)

17"-27" Silt loam (10YR 4/3); v. firm; moist; common redox concentrations (10YR 6/8), depletions, and Mg+ staining on ped faces

27"-48" Silt loam (10YR 5/3); v. firm; subangular blocky structure; moist; common redox concentrations (10YR 6/8), depletions (2.5Y 7/1), and Mg+ staining on ped faces

Interpreted classification: Poorly drained Swanville Silt Loam

TP-12

0"-2" Oe; moderately decomposed organic matter (10YR 2/1)

2"-10" Silt loam (2.5YR 5/3); friable; crumb structure; moist; common redox concentrations (7.5YR 7/8) at 8" bgs

10"-24" Silt loam (2.5Y 5/3); firm; moist; common large redox depletions (10YR 6/2 to Gley 1 1/N)

24"-48" Silt loam (2.5Y 4/4); v. firm; moist; few redox depletions and Mg+ staining on ped faces

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-13

0"-2" Oe; moderately decomposed organic matter (10YR 2/1)

2"-15" Silt loam (10YR 5/3); friable; crumb structure; moist; common redox concentrations (7.5YR 5/6) at 10" bgs

15"-23" Silt loam (2.5Y 6/3); firm; weak blocky structure; moist; common redox concentrations (7.5YR 6/6)

23"-50" Silt loam (10YR 4/3); v. firm; strong blocky structure; moist; common depletions (2.5Y 7/2) and Mg⁺ staining on ped faces

Interpreted classification: Somewhat poorly drained Pushaw Silt Loam

TP-14

0"-2" Oe; moderately decomposed organic matter (10YR 2/1)

2"-10" Silt loam (10YR 5/3); friable; crumb structure; moist

10"-19" Silt loam (10YR 5/3); firm; platy structure; moist; common redox concentrations (7.5YR 5/6) at 11"

19"-49" Silt loam (10YR 4/3); v. firm; moist-dry; common depletions (2.5Y 6/1) and Mg⁺ staining on ped faces

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

TP-15

0"-2" Oe; moderately decomposed organic matter (10YR 2/1)

2"-16" Silt loam (10YR 5/3); friable; crumb structure; many f-m roots in top 4"; moist; common redox concentrations (7.5YR 6/6) at 12" bgs

16"-27" Silt loam (2.5Y 5/3); firm; moist; common redox depletions (2.5Y 7/1 to Gley 1 1/N)

27"-50" Silt loam (2.5Y 6/3); v. firm; subangular blocky structure; moist; common redox concentrations and few depletions (2.5Y 7/1)

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

TP-16

0"-1" Oe; moderately decomposed organic matter (10YR 2/1)

1"-4" Silt loam (10YR 4/4); friable; crumb structure; many fine roots; moist

4"-14" Silt loam (10YR 5/4); friable; crumb structure; moist;

14"-28" Silt loam (2.5Y 6/4); firm; subangular blocky structure; moist; common redox concentrations (10YR 6/8) at 15" bgs

28"-50" Silt loam (2.5Y 7/3); firm; subangular blocky structure; moist; common redox concentrations (10YR 6/8) and Mg⁺ staining on ped faces

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

TP-17

0"-1" Oe; moderately decomposed organic matter (10YR 2/1)

1"-4" Silt loam (10YR 5/3); friable; crumb structure; common f-m roots; moist

4"-15" Silt loam (10YR 4/3); friable; crumb structure; moist;

15"-25" Silt loam (2.5Y 5/4); firm; platy structure; moist; common redox concentrations (10YR 6/8) at 15" bgs

25"-49" Silt loam (2.5Y 5/4); firm; moist; common redox concentrations (10YR 6/8) and Mg+ staining on ped faces

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

TP-18

0"-1" Oe; moderately decomposed organic matter (10YR 2/1)

1"-3" Silt loam (10YR 5/3); friable; crumb structure; common f-m roots; moist

3"-12" Silt loam (10YR 4/3); friable; crumb structure; moist; common redox concentrations (10YR 6/8) at 10" bgs

12"-24" Silt loam (10YR 4/3); firm; moist; common redox concentrations (10YR 6/8) and depletions (10YR 7/1)

24"-53" Silt loam (2.5Y 6/3); v. firm; subangular blocky structure; moist; common redox concentrations (10YR 6/8) and Mg+ staining on ped faces

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

TP-19

0"-5" Silt loam (10YR 5/3); friable; common fine roots; moist

5"-11" Silt loam (10YR 5/4); friable; crumb structure; moist

11"-22" Silt loam (2.5Y 6/4); firm; subangular blocky structure; moist; common redox concentrations (7.5YR 7/6) at 18" bgs

22"-48" Silt loam (2.5Y 6/3); v. firm; platy structure; moist; common redox depletions (10YR 7/1)

Interpreted classification: Moderately Well Drained Boothbay Silt Loam

TP-20

0"-4" Silt loam (10YR 5/3); friable; crumb structure; common fine roots; moist

4"-11" Silt loam (10YR 4/3); friable; crumb structure; moist; common redox concentrations (7.5YR 7/8) and large depletions (10YR 7/1) at 8" bgs

11"-23" Silt loam (10YR 4/4); firm; subangular blocky structure; moist; common redox concentrations (7.5YR 7/8) and depletions (10YR 7/1)

23"-49" Silt loam (10YR 5/3); v. firm; platey structure; moist

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

TP-21

0"-1" Oe; moderately decomposed organic matter (10YR 2/1)

1"-7" Silt loam (10YR 5/4); friable; crumb structure; common f-m roots; moist

7"-13" Silt loam (10YR 5/3); friable; weak platey structure; moist; common redox concentrations (10YR 6/8) and depletions (10YR 7/1) at 11" bgs

13"-24" Silt loam (10YR 4/4); firm; moist; common redox depletions (10YR 7/1)

24"-49" Silt loam (10YR 5/3); v. firm; platey structure; moist; Mg+ staining on ped faces

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

TP-22

0"-1" Oe; moderately decomposed organic matter (10YR 2/1)

1"-5" Silt loam (10YR 5/4); friable; crumb structure; common f-m roots; moist

5"-12" Silt loam (10YR 6/4); friable; crumb structure; moist

12"-24" Silt loam (2.5Y 5/4); firm; weak platey structure; moist; common redox concentrations (7.5YR 7/8) and depletions (10YR 7/1) at 13" bgs

24"-49" Silt loam (2.5Y 5/3); v. firm; subangular blocky structure; moist; common redox depletions (10YR 7/1) and Mg+ staining of ped faces

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

TP-23

0"-1" Oe; moderately decomposed organic matter (10YR 2/1)

1"-5" Silt loam (10YR 5/3); v. friable; many f-m roots; moist

5"-11" Silt loam (10YR 5/4); friable; common f-m roots; moist

11"-20" Silt loam (2.5Y 5/3); firm; weak platy structure; moist; common redox concentrations (7.5YR 6/6) and depletions (10YR 7/1) at 12" bgs

20"-48" Silt loam (10YR 4/4); v. firm; moist; common redox depletions (10YR 7/1) and Mg+ staining of ped faces

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

TP-24

0"-1" Oe; moderately decomposed organic matter (10YR 2/1)

1"-6" Silt loam (10YR 5/3); friable; many f-m roots; moist

6"-16" Silt loam (10YR 5/4); friable; crumb structure; common f-m roots; moist; common redox concentrations (7.5YR 6/8) at 15" bgs

16"-33" Silt loam (2.5Y 5/4); firm; subangular blocky structure; moist; few roots; common redox concentrations (7.5YR 6/8) and depletions (10YR 7/1) at 12" bgs

33"-51" Silt loam (2.5Y 4/4); v. firm; platy structure; moist; common redox depletions (10YR 7/1), concentrations and Mg+ staining of ped faces

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam

Located just off-site

TP-25

0"-1" Oe; moderately decomposed organic matter (10YR 2/1)

1"-6" Silt loam (10YR 5/3); friable; many f-m roots; moist

6"-14" Silt loam (10YR 4/3); friable; few f-m roots; moist; common redox concentrations (7.5YR 6/8) at 13" bgs

14"-24" Silt loam (2.5Y 5/4); firm; moist; few roots; common redox concentrations (7.5YR 6/8) and depletions (10YR 7/1)

24"-48" Silt loam (Gley 1 4/5GY); v. firm; 5% coarse fragments as f-c gravel; moist; Mg+ staining of ped faces

Interpreted classification: Somewhat Poorly Drained Pushaw Silt Loam; Located just off-site

Appendix C-Official Soil Series Descriptions

LOCATION BOOTHBAY ME+VT

Established Series
GTH-KJL-REE
12/2010

BOOTHBAY SERIES

The Boothbay series consists of very deep, moderately well drained soils that formed in glaciolacustrine or glaciomarine deposits on lake plains and marine terraces. Estimated saturated hydraulic conductivity is moderately high in the surface and moderately high or moderately low in the subsoil and substratum. Slope ranges from 3 to 25 percent. Mean annual precipitation is about 1120 mm. Mean annual temperature is about 6 degrees C.

TAXONOMIC CLASS: Fine-silty, mixed, semiactive, frigid Aquic Dystric Eutrudepts

TYPICAL PEDON: Boothbay silt loam, on an east-facing 3 percent slope under grasses at an elevation of 57 meters. (Colors are for moist soil unless otherwise noted. When described on August 9, 2005, the soil was moist throughout.)

Ap -- 0 to 15 cm; dark yellowish brown (10YR 4/4) silt loam; pale brown (10YR 6/3) dry; moderate medium granular structure; very friable, slightly sticky, slightly plastic; many fine and very fine roots throughout; moderately acid (pH 5.6); clear smooth boundary (10 to 25 cm thick).

Bw1 -- 15 to 25 cm; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; very friable, slightly sticky, slightly plastic; common fine and very fine roots throughout; common very fine tubular pores; strongly acid (pH 5.5); clear smooth boundary.

Bw2 -- 25 to 46 cm; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and very fine roots throughout; common very fine tubular pores; strongly acid (pH 5.2); clear smooth boundary. (Combined thickness of the Bw horizons ranges from 15 to 71 cm.)

BC -- 46 to 56 cm; light olive brown (2.5Y 5/4) silt loam; moderate medium subangular blocky structure; friable, slightly sticky, moderately plastic; common fine and very fine roots throughout; common medium tubular pores; few medium prominent yellowish red (5YR 4/6) masses of iron accumulation in matrix surrounding few medium distinct grayish brown (2.5Y 5/2) areas of iron depletion; strongly acid (pH 5.1); clear smooth boundary (10 to 41 cm thick).

C1 -- 56 to 71 cm; light olive brown (2.5Y 5/4) silt loam; firm, slightly sticky, moderately plastic; common medium prominent yellowish red (5YR 4/6) masses of iron accumulation in matrix surrounding common medium distinct grayish brown (2.5Y 5/2) areas of iron depletion; moderate medium plates; strongly acid (pH 5.1); abrupt smooth boundary.

C2 -- 71 to 165 cm; dark grayish brown (2.5Y 4/2) silty clay loam; firm, moderately sticky, moderately plastic; common medium prominent yellowish

red (5YR 4/6) masses of oxidized iron in matrix surrounding common medium faint grayish brown (2.5Y 5/2) areas of iron depletion; many coarse faint very dark gray (10YR 3/1) masses of iron-manganese on faces of plates; moderate thick plates; strongly acid (pH 5.1).

TYPE LOCATION: Penobscot County, Maine, Township of Carmel. From the intersection of Fuller Road and Horseback Road, 2600 feet north along Horseback Road and 800 feet east of it, in a hayfield behind the cemetery. USGS Carmel, ME topographic quadrangle; latitude 44 degrees 49 minutes 59 seconds N. and longitude 69 degrees 0 minutes 8 seconds W., NAD 1983.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 45 to 90 cm. Depth to bedrock is more than 150 cm. Rock fragment content throughout the soil is less than 5 percent by volume. Stones cover from 0 to 0.1 percent of the surface in most areas but may range up to 3 percent. Reaction ranges from strongly acid to slightly acid in the surface, strongly acid to neutral in the subsoil and substratum.

The Ap, or A horizon where present, has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 3 or 4. It is typically silt loam but is very fine sandy loam in some areas. It has weak or moderate fine or medium granular structure. Moist consistence is very friable or friable. It is slightly sticky and slightly plastic.

The Bw horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 3 to 6. It is typically silt loam but is very fine sandy loam in some areas. It has weak or moderate fine or medium subangular blocky or fine or moderate medium granular structure. Moist consistence is very friable or friable. It is slightly sticky and slightly or moderately plastic.

The BC horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 3 or 4. In some pedons the lower part of the horizon ranges to chroma 2. It is silt loam or silty clay loam. It has moderate or strong fine or medium subangular blocky, weak or moderate medium to very coarse prismatic, or weak or moderate medium to thick platy structure. Moist consistence is friable or firm. It is slightly or moderately sticky and slightly to very plastic.

The C horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 2 to 4. Chroma 2 is considered to be inherent in the parent material. It is silt loam or silty clay loam. Most pedons exhibit weak to strong, fine to coarse subangular or angular blocks, thick or very thick plates, or moderate or strong coarse or very coarse prisms, all of which are considered inherited from the parent material. Some pedons are massive. Moist consistence is friable or firm. It is slightly or moderately sticky and slightly to very plastic.

COMPETING SERIES: There are currently no series in the same family.

Soil series in related families include Buxton, Eelweir, Elmwood, and Kalurah. Buxton soils have a fine particle-size class. Eelweir soils are coarse-loamy. Elmwood soils are coarse-loamy over clayey. Kalurah soils are coarse-loamy and formed in calcareous till.

GEOGRAPHIC SETTING: The Boothbay soils are on lake plains and marine terraces. Slopes are typically 3 to 15 percent, but range up to 25 percent in some areas. The soils formed in glaciomarine and glaciolacustrine sediments of Wisconsin age. The climate is humid and cool temperate. The mean annual precipitation is 1010 to 1270 mm. The mean annual air temperature is 4 to 8 degrees C. The frost-free period is 110 to 160 days. Elevations typically range from 1.5 to 91 meters above sea level, but may range to as high as 366 meters in river valleys of north central Maine.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the somewhat poorly drained [Pushaw](#) soils at slightly lower elevations, and the poorly drained [Swanville](#), and very poorly drained [Biddeford](#) soils at lower elevations and in depressions. The somewhat poorly drained [Colonel](#) and the moderately well drained [Dixfield](#) soils formed in lodgment till and are in nearby higher, slightly convex positions on the landscape. The very

poorly drained [Wonsqueak](#) soils are in depressions and formed in organic material.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Moderately well drained. Surface runoff is low to moderate. The estimated saturated hydraulic conductivity class is moderately high in the surface and moderately low in the subsoil and substratum.

USE AND VEGETATION: Cleared areas are used mainly for hay production and pasture with limited row-crop production. Some areas are in urban land or are used for wildlife habitat. Native woodland vegetation is balsam fir, eastern white pine, paper birch, quaking aspen and sugar maple.

DISTRIBUTION AND EXTENT: Marine terraces and lake plains in southeastern Maine, and lake plains in north central Vermont; MLRA's 143 and 144B. The series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Waldo County, Maine, 1979.

REMARKS: In the previous revision, drainage class was narrowed by eliminating somewhat poorly. The type location is changed with this revision to better represent the single drainage class of moderately well. The classification at the Great Group level, Eutrudepts, is based on lab-determined base saturation of similar soils in the area.

Diagnostic horizons and features in this pedon include:

Ochric epipedon - from a depth of 0 to 15 cm (Ap horizon)

Cambic horizon - the zone from 15 to 56 cm (Bw and BC horizons)

Aquic feature - redox depletions with a chroma of 2 or less within 61 cm of the soil surface

Episaturation - a perched water table above the C horizon

National Cooperative Soil Survey
U.S.A.

LOCATION PUSHAW ME

Established Series
AAK/REE
06/2013

PUSHAW SERIES

The Pushaw series consists of very deep, somewhat poorly drained soils that formed in glaciolacustrine or glaciomarine deposits on lake plains and marine terraces. Estimated saturated hydraulic conductivity is moderately high in the surface and moderately high to moderately low in the underlying material. Permeability is moderate in the surface and moderately slow or slow in underlying material. Slope ranges from 0 to 8 percent. Mean annual precipitation is about 1120 mm. Mean annual temperature is about 7 degrees C.

TAXONOMIC CLASS: Fine-silty, mixed, semiactive, nonacid, frigid Aeric Epiaquepts

TYPICAL PEDON: Pushaw silt loam, on a 3 percent east facing slope under grasses at the edge of a cornfield at an elevation of 61 meters. (Colors are for moist soil unless otherwise noted. When described on September 14, 2004, the soil was moist throughout.)

Ap--0 to 18 cm; brown (10YR 4/3) silt loam; pale brown (10YR 6/3) dry; moderate medium granular structure; very friable, slightly sticky, slightly plastic; common fine and very fine roots throughout; very strongly acid (pH 4.8); clear wavy boundary (15 to 20 cm thick).

Bw1--18 to 25 cm; olive brown (2.5Y 4/3) silt loam; moderate fine and medium granular structure; very friable, slightly sticky, slightly plastic; common fine and very fine roots throughout; moderately acid (pH 6.0); gradual wavy boundary.

Bw2--25 to 38 cm; light olive brown (2.5Y 5/3) silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, moderately plastic; common fine and very fine roots throughout; common fine and medium, faint olive gray (5Y 5/2) iron depletions throughout; common fine, faint dark yellowish brown (10YR 4/4) masses of iron-manganese throughout; slightly acid (pH 6.2); clear wavy boundary. (Combined thickness of the Bw horizons is 15 to 41 cm.)

BCg--38 to 46 cm; dark grayish brown (2.5Y 4/2) silty clay loam; strong fine and medium subangular blocky structure; friable, slightly sticky, moderately plastic; common fine and very fine roots throughout; few fine prominent dark reddish brown (5YR 2.5/2) manganese coatings on faces of peds; common fine and medium faint grayish brown (2.5Y 5/2) iron depletions throughout; common medium prominent yellowish brown (10YR 5/6) masses of oxidized iron throughout; slightly acid (pH 6.3); clear smooth boundary (8 to 20 cm thick).

BC--46 to 66 cm; olive (5Y 4/3) silty clay loam; strong medium and coarse subangular blocky structure; friable, slightly sticky, very plastic; few fine and very fine roots between peds; common fine distinct brown (10YR 4/3) masses of iron-manganese in matrix; common fine distinct gray (2.5Y 5/1) iron depletions on faces of peds; few fine prominent dark reddish brown (5YR 2.5/2) manganese coatings on faces of peds; slightly acid (pH 6.4); gradual wavy boundary. (0 to 15 cm thick).

C--66 to 165 cm; olive (5Y 4/3) silty clay loam; massive; firm, slightly sticky, very plastic; few fine and very fine roots throughout; common fine faint olive brown (2.5Y 4/4) masses of iron-manganese with diffuse boundaries surrounding iron depletions with clear boundaries; common fine distinct gray (2.5Y 5/1) iron depletions in matrix; neutral (pH 6.6).

TYPE LOCATION: Penobscot County, Maine, Township of Corinth. From the intersection of Maine Rt. 11/43 and

Notch Road, site is 4800 feet southeast along Notch Road and 1000 feet northeast from road in a grassed area at the edge of a cornfield. USGS West Corinth topographic quadrangle; lat. 44 degrees 59 minutes 17 seconds N. and long. 69 degrees 2 minutes 8 seconds W., NAD 83.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 46 to 91 cm. Depth to bedrock is more than 150 cm. Rock fragment content throughout the soil is less than 5 percent by volume. Stones cover from 0 to 0.1 percent of the surface in most areas but may range up to 3 percent. Reaction ranges from very strongly acid to slightly acid in the solum and strongly acid to neutral in the substratum.

The Ap, or A horizon where present, has hue of 10YR or 2.5Y, value of 3 to 5 and chroma of 3 or 4. It is typically silt loam but is very fine sandy loam in some areas. It has weak or moderate fine or medium granular structure. Moist consistence is very friable or friable. It is slightly sticky and slightly plastic.

The Bw horizon has hue of 10YR or 2.5Y, value of 3 to 6 and chroma of 3 to 6. It is silt loam or silty clay loam. It has weak or moderate fine or medium subangular blocky, or fine or moderate medium granular structure. Moist consistence is very friable or friable. It is slightly sticky and slightly or moderately plastic.

The BCg horizon has hue of 2.5Y or 5Y, value of 2 to 5 and chroma of 1 or 2. It is silt loam or silty clay loam. It has weak or moderate medium to very coarse prismatic, or moderate or strong fine or medium subangular blocky structure. Moist consistence is friable or firm. It is slightly or moderately sticky and slightly to very plastic.

The BC horizon, where present, has hue of 2.5Y or 5Y, value of 2 to 5 and chroma of 3 to 6. It is silt loam or silty clay loam. It has weak or moderate medium to very coarse prismatic, or moderate or strong fine or medium subangular blocky structure. Moist consistence is friable or firm. It is slightly or moderately sticky and slightly to very plastic.

The C horizon has hue of 2.5Y or 5Y, value of 4 or 5 and chroma of 3 or 4. It is silt loam or silty clay loam. Typically the C horizon is massive but some pedons exhibit weak to strong, fine to coarse subangular or angular blocks, thick or very thick plates, or moderate or strong coarse or very coarse prisms, all of which are considered inherited from the parent material. Moist consistence is friable or firm. It is slightly or moderately sticky and slightly to very plastic.

The Cg horizon, where present, has hue of 2.5Y or 5Y, value of 4 or 5 and chroma of 1 or 2. It is silt loam or silty clay loam. Typically the Cg horizon is massive but some pedons exhibit weak to strong, fine to coarse subangular or angular blocks, thick or very thick plates, or moderate or strong coarse or very coarse prisms, all of which are considered inherited from the parent material. Moist consistence is friable or firm. It is slightly or moderately sticky and slightly to very plastic.

COMPETING SERIES: There are currently no series in the same family. Soil series in related families include [Boothbay](#), [Lamoine](#), [Pemi](#), [Roundabout](#), [Scantic](#), [Swanton](#), [Swanville](#) and [Whately](#). Boothbay soils lack a gleyed horizon within 50 cm of the mineral soil surface. Lamoine soils have more than 35 percent clay in the particle-size control section. Pemi soils lack a horizon with a moist value and chroma of 3 or more between the mineral surface horizon and a depth of 75 cm and have less than 18 percent clay in the particle-size control section. Roundabout soils have less than 18 percent clay in the particle-size control section. Scantic soils have more than 35 percent clay in the particle-size control section and lack a horizon with a moist value and chroma of 3 or more between the mineral surface horizon and a depth of 75 cm. Swanton soils have less than 18 percent clay in the upper part of the particle size control section and 35 percent or more clay in the lower part. Swanville soils have a gleyed horizon, the upper boundary of which is immediately underlying the mineral surface horizon or within 25 cm of the mineral surface. Whately soils have less than 18 percent clay in the upper part of the particle size control section and 35 percent or more clay in the lower part and lack a horizon with a moist value and chroma of 3 or more between the mineral surface horizon and a depth of 75 cm.

GEOGRAPHIC SETTING: The Pushaw soils are on lake plains and marine terraces. Slope ranges from 0 to 8 percent. The soils formed in glaciomarine and glaciolacustrine sediments of Wisconsin age. The climate is humid and cool temperate. The mean annual precipitation is 1010 to 1270 mm. The mean annual air temperature is 4 to 8 degrees C. The frost-free period is 110 to 160 days. Elevations typically range from 1.5 to 91 meters above sea level, but may

range to as high as 366 meters in river valleys of north central Maine.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the related moderately well drained [Boothbay](#) soils on slightly higher elevations, somewhat poorly drained [Lamoine](#) soils on similar landscape positions, and poorly drained [Scantic](#) and [Swanville](#) soils on slightly lower elevations. The very poorly drained [Biddeford](#) soils are on lower elevations and depressions. Pushaw soils are in a drainage sequence with Boothbay and Swanville soils. The somewhat poorly drained [Colonel](#) and the moderately well drained [Dixfield](#) soils formed in dense glacial till and are in nearby higher, slightly convex positions on the landscape. The very poorly drained [Wonsqueak](#) soils are in depressions and formed in organic material.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Somewhat poorly drained. Surface runoff is medium to high. The estimated saturated hydraulic conductivity class is moderately high in the surface and moderately high to moderately low in the substratum. Permeability is moderately rapid in the surface and moderately rapid to moderately slow in the substratum.

USE AND VEGETATION: Cleared areas are used mainly for hay production and pasture with limited row-crop production. Some areas are in urban land or are used for wildlife habitat. Native woodland vegetation is balsam fir, eastern white pine, northern white cedar, red spruce, white spruce and white birch.

DISTRIBUTION AND EXTENT: Marine terraces and lake plains in Maine; MLRAs 143 and 144B. The series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Northern Hancock and Western Washington County Area Maine, 2007.

REMARKS: The series recognizes somewhat poorly drained Aeric Epiaquepts formed in fine-silty glaciolacustrine or glaciomarine deposits. These soils were formerly mapped as Boothbay, which had a dual drainage class of moderately well and somewhat poorly drained. The series is named for Pushaw Lake, a large lake in south-central Penobscot County, Maine.

Diagnostic horizons and features in this pedon include:

1. Ochric epipedon - from a depth of 0 to 18 cm (Ap horizon).
2. Cambic horizon the zone from 18 to 66 cm (Bw, BC and BCg horizons).
3. Aeric feature matrix color chroma of 3 at 18 to 38 cm (Bw1 and Bw2 horizons).
4. Aquic feature redox depletions with a chroma of 2 or less at 25 cm below the soil surface, and matrix chroma of 2 due to reduced conditions at 38 to 46 cm (BCg horizon).
5. Ep saturation - a perched water table above the C horizon

ADDITIONAL DATA: Primary characterization data from pedon 05NO231, samples 05NO1348-1351 from Penobscot County, Maine, SSL, Lincoln, NE, 12/05.

National Cooperative Soil Survey
U.S.A.

LOCATION SWANVILLE ME+VT

Established Series

Rev. GTH-KJL-WDH

08/2013

SWANVILLE SERIES

The Swanville series consists of very deep, poorly drained soils that formed in glaciolacustrine or glaciomarine deposits on lake and marine plains and marine terraces. Slope ranges from 0 to 8 percent. Saturated hydraulic conductivity ranges from moderately high or high in the surface horizon and moderately low in the underlying material.

Mean annual temperature is about 7degrees C, and mean annual precipitation is about 1118 mm at the type location.

TAXONOMIC CLASS: Fine-silty, mixed, active, nonacid, frigid Aeric Epiaquepts

TYPICAL PEDON: Swanville silt loam, on a 2 percent slope in a hayfield. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 15 cm; dark brown (10YR 3/3) silt loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; very friable; many fine roots; few fine and medium prominent light brownish gray (2.5Y 6/2) iron depletions and few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation in the lower 5 cm; slightly acid; abrupt wavy boundary. (10 to 25 cm thick.)

Bw--15 to 23 cm; olive (5Y 5/3) silt loam, pale olive (5Y 6/4) crushed, and gray (5Y 5/1) faces of peds; weak fine and medium granular structure; friable; common fine roots; common fine and medium faint light olive gray (5Y 6/2) iron depletions and few fine prominent yellowish brown (10YR 5/6) masses of iron accumulation; slightly acid; clear wavy boundary. (7 to 25 cm thick)

Bg--23 to 38 cm; olive gray (5Y 5/2) silt loam, gray (5Y 6/1) faces of prisms, and olive (5Y 5/3) crushed; strong very coarse prismatic structure parting to weak fine and medium subangular blocky; friable; few fine roots; many fine and medium faint light olive gray (5Y 6/2) iron depletions; common fine prominent light olive brown (2.5Y 5/4) and few fine prominent yellowish brown (10YR 5/4) masses of iron accumulation; few very fine and fine pores with gray (5Y 5/1) coatings; dark reddish brown (5YR 3/2) oxide coatings on 10 percent of faces of peds within prisms; moderately acid; gradual wavy boundary. (15 to 41 cm thick)

BC--38 to 56 cm; olive (5Y 4/4) silt loam, gray (5Y 5/1) faces of prisms, and olive (5Y 4/3) crushed; strong very coarse prismatic structure parting to weak thick and very thick platy; friable; few fine roots; common fine distinct olive gray (5Y 5/2) and few fine prominent dark grayish brown (2.5Y 4/2) iron depletions; few fine prominent light olive brown (2.5Y 5/6) masses of iron accumulation; few very fine and fine pores with gray (5Y 5/1) coatings; dark reddish brown (5YR 3/2) oxide coatings on 25 percent of faces of peds within prisms; moderately acid; gradual wavy boundary. (13 to 30 cm thick).

C1--56 to 117 cm; olive (5Y 4/3) silt loam, gray (5Y 6/1) faces of prisms, and olive (5Y 5/3) crushed; strong very coarse prismatic structure parting to weak thick and very thick platy; firm; many fine and medium faint olive gray (5Y 5/2) iron depletions; few fine prominent light olive brown (2.5Y 5/6) and few fine prominent dark yellowish brown (10YR 4/4) masses of iron accumulation; few very fine and fine pores with light olive gray (5Y 6/2) coatings; dark reddish brown (5YR 3/2) oxide coatings on 25 percent of the faces of plates within prisms; moderately acid; gradual wavy boundary. (20 to 99 inches thick)

C2--117 to 165 cm; olive (5Y 4/4) silt loam, gray (5Y 6/1) faces of prisms, and olive (5Y 5/3) crushed; strong very coarse prismatic structure parting to weak very thick platy; firm; many fine and medium distinct olive gray (5Y 5/2) and few fine prominent dark grayish brown (2.5Y 4/2) iron depletions; few fine prominent yellowish brown (10YR 5/6) masses of iron accumulation; dark reddish brown (5YR 3/2) oxide coatings on 50 percent of faces of plates within prisms; slightly acid.

TYPE LOCATION: Waldo County, Maine; Town of Swanville; Maine Route 141, one mile south of Swan Lake; 300 feet east of road; USGS Brooks East topographic quadrangle; lat. 44 degrees 30 minutes 26 seconds N. and long. 69 degrees 00 minutes and 06 seconds W., NAD 27.

RANGE IN CHARACTERISTICS: Thickness of the solum typically from 50 to 100 cm, with a few pedons ranging to 46 cm. Depth to bedrock is more than 152 cm. Rock fragment content throughout the soil is less than 5 percent by volume. Stones cover from 0 to 3 percent of the surface. Reaction is very strongly acid to neutral in the solum, and moderately acid to neutral in the substratum but some subhorizons within 100 cm are moderately acid to neutral.

The Ap horizon, or A horizon where present, has hue of 10YR to 5Y, value of 3 to 6, and chroma of 1 to 3. It has weak or moderate, very fine to coarse granular or strong very fine and fine subangular blocky structure. It is silt loam or very fine sandy loam and consistence is very friable or friable.

The E horizon, where present, has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. The E horizon has weak or moderate, very thin to thick platy, very fine to medium granular, or subangular blocky structure. It is silt loam or very fine sandy loam and consistence is very friable or friable.

The B and BC horizons have hue of 10YR to 5Y, value of 3 to 6, and chroma of 1 to 4, but one or more subhorizons have a chroma of 2 or less on faces of peds within 20 inches of the mineral soil surface. Redox concentrations are faint to prominent. They are very fine sandy loam, silt loam, or silty clay loam. Structure is weak to strong, medium to very thick platy, very fine to medium subangular or angular blocky, or fine or medium granular. Some pedons have primary structure that is moderate or strong, coarse or very coarse prismatic. Consistence is friable or firm.

The C horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 to 4. It is silt loam or silty clay loam and some pedons have thin layers that range from silt to fine sand. Redox concentrations are faint to prominent. It has weak to strong, medium to very thick platy, moderate very fine angular blocky, or moderate or strong coarse or very coarse prismatic structure, all of which is inherited from the parent material, or the horizon is massive. Consistence is friable or firm.

COMPETING SERIES: Swanville is currently the only member of this family. The [Lamoine](#) and [Roundabout](#) series are in similar families. Lamoine soils have more than 35 percent clay in the particle-size control section and Roundabout soils have less than 18 percent clay in the particle-size control section.

GEOGRAPHIC SETTING: Swanville soils are on lake and marine terraces. Slope ranges from 0 to 8 percent. The soils formed in glaciolacustrine or glaciomarine deposits of Wisconsin age. The climate is humid and cool temperate. Mean annual precipitation ranges from 914 to 1219 mm and mean annual temperature ranges from 5 to 8 degrees C. The frost-free season ranges from 90 to 160 days. Elevation ranges from 2 to 457 m above mean sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Biddeford](#), [Boothbay](#), [Elmwood](#), [Lyman](#), [Salmon](#), and [Tunbridge](#) soils. Biddeford soils are very poorly drained. Boothbay soils are moderately well drained or somewhat poorly drained soils in the same drainage sequence. Elmwood soils have a coarse-loamy over clayey particle-size control section. Lyman soils are somewhat excessively drained, formed in glacial till, and are shallow to bedrock. Salmon soils are well drained and have less clay. Tunbridge soils are well drained, formed in glacial till, and are moderately deep to bedrock. Biddeford soils are in depressions and the other soils are all in higher positions on the landscape.

DRAINAGE AND PERMEABILITY: Poorly drained. Saturated hydraulic conductivity ranges from moderately high or high in the surface horizon and moderately low in the underlying material.

USE AND VEGETATION: Cleared areas are used mainly for hay and pasture. Small areas are used for silage corn or other row crops. The remaining areas are forested and the common tree species are eastern white pine, white spruce, and red spruce. Hemlock, gray birch, red maple, sugar maple, white oak, balsam fir, and tamarack are also present to a lesser extent.

DISTRIBUTION AND EXTENT: Maine and Vermont. (MLRAs 143 and 144B). The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Waldo County, Maine, 1979.

REMARKS: A 1998 revision changed the classification from Fine-silty, mixed, nonacid, frigid Aeric Haplaquepts to Fine-silty, mixed, nonacid, frigid Aeric Epiaquepts. Some soils formerly mapped as Raynham and Scantic will now be included with the Swanville series.

Diagnostic horizons and features recognized in this pedon are:

1. Ochric epipedon - the zone from 0 to 15 cm (Ap horizon).
2. Cambic horizon - the zone from 15 to 38 cm (Bw and Bg horizons).
3. Nonacid - the pH is 5.0 or more in 0.01M calcium chloride throughout the profile.
4. Aquic conditions - redoximorphic features throughout the profile.
5. Episaturation - a perched water table above the C horizon.

ADDITIONAL DATA: Source of data used in establishing the taxonomic classification and range in characteristics is Maine Agricultural Experiment Station Technical Bulletin 94.

Soil Interpretation Records are no longer maintained but included Swanville ME0075; and Swanville, stony, ME0098.

12/3/2018

National Cooperative Soil Survey
U.S.A.

Official Series Description - SWANVILLE Series

Appendix D-Class B Soil Map

Appendix E-Water Courses Figure By Normandeau



Belfast Aquaculture Project Wetland and Stream Survey

- Eckrote Easement**
 - Centerline
 - Permanent easement 25' wide
 - Temporary easement 40' wide
- US Route 1 Temp-by-Pass 2018 Wetland Survey Date**
 - May 3-4
 - July 24
 - August 27-28
- Stream Under Culvert**
- Drainage**
- Intermittent Stream**
- Current Pipeline Route**
- Palustrine Wetlands**
- Salt Marsh**
- Cobble Beach**
- Army Corps Data Plot**



Memorandum

Friday, March 01, 2019

TO: Elizabeth Ransom, Ransom Consulting
FROM: Benjamin Griffith, NHCWS
SUBJECT: Stream Review, February 28, 2019

On February 28, I visited the project site located at and adjacent to the Belfast Water District property on Northport Road in Belfast, Maine to document stream characteristics on the project site. In addition to documenting stream characteristics, riparian restoration locations and vegetation were identified.

Flow was assessed at S3, S5, S6, S8, S9, and S10. Additionally, S8 was reviewed for aquatic animals. Due to deep snow and thick ice covering the remaining streams, a thorough aquatic fauna assessment was not feasible in the other streams or drainages. Additionally, stream widths were measured upstream and downstream and at the crossing of three existing culverts and photographed each location.

S3, S5, S6, S8, and S9 all contained flowing water. With the exception of S8, streams were covered with approximately 2 inches of ice, but flows could either be heard underneath the ice (S6 and S9) or a small hole broken through the ice layer allowed for sampling of the streambed beneath the frozen channel (S3 and S5). During the aquatic fauna survey, snails were located on the undersurface of rocks within the channel of S8, meeting the criteria for aquatic animals. These streams also had flowing water in December, January, and May and at this time it is reasonable to conclude that they meet the 6 months of continuous flow criteria, and are therefore jurisdictional.

Stream widths were measured for the crossings of drainages S8 and S9 at the Route 1 crossing, drainage S8 at the driveway crossing on the Eckrote property, and at the proposed culvert location on the project site. For each stream crossing, the width was measured immediately upstream, immediately downstream, and 50 feet upstream and 50 feet downstream of the culvert. Additionally, if there were notable variations in stream width those were documented as well.

Table 1. Stream width measurements in feet at proposed and existing crossings

Location	Immediately Upstream	Immediately Downstream	50 Feet Upstream	50 Feet Downstream	Additional Locations
S8 Driveway Culvert	5	6	15	4	25 Feet Upstream: 7 Culvert length: 28 ft Driveway width: 17 ft
S9 Route 1 Culvert	5	5	11	6	75 Feet Upstream: 4
S8 Route 1 Culvert	6	9	12	5	
S9 New Crossing	N/A	N/A	7	4	At Crossing: 9

Due to the season, riparian vegetation was limited primarily to woody species. Dominant species within the riparian area include red maple and quaking aspen in the tree stratum and multiflora rose and speckled alder in the shrub stratum. Other species noted in the riparian zone included black ash, red oak, paper birch, meadowsweet, white pine, rough-stemmed goldenrod, and sensitive fern. During the August field review, spotted touch-me-not was also noted as being dominant in the riparian area. A map showing the riparian planting locations is attached, which total approximately 1 acre.

Attachments: Map of riparian planting areas

CC: Adele Fiorillo, Normandeau Associates
Maureen McGlone, Ransom Environmental



Belfast Aquaculture Project Riparian Restoration Areas

- FieldEdge
- Stream Under Culvert
- - - Intermittent
- Restoration Area
- Belfast Water District Property
- Eckrote Property
- Perkins Property
- Palustrine Wetlands

