

Reexamining order level classification of soils formed in northeastern glaciomarine sediments

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Introduction

Concepts in soil genesis and classification need continued scrutiny and modification. Soil Taxonomy, the dominant soil classification system in the United States and many other nations, represents our current knowledge and understanding of soil formation. Two of the primary functions of soil classification are to organize our knowledge about soils and provide a common scientific language to relay our current concepts of soil properties and genesis. In order to maintain these functions as we learn more and more about soils, current concepts of soils and soil genesis need to be reconsidered and soil classification updated when new information warrants such actions.

In New England one of the current pedological debates is in regard to the classification and genesis of soils formed in glaciomarine sediments. These sediments were deposited during the retreat of the Laurentide ice sheet during the Late Wisconsinan. This surficial unit, known as the Presumpscot Formation, extends across a large part of eastern Maine and New Hampshire to elevations as high as 280 ft (85 m) above sea level (Figure 1). Soils formed in these deposits are currently classified as Inceptisols. This classification was based on the assumption that the majority of the clay observed in these soils was depositional (stratified). Recent arguments, however, are that these soils have argillic horizons and should be classified as Alfisols. Support for these arguments are what appears to be clay films (not stratified clay) in some of the B horizons of these soils.

This study examined diagnostic properties of soils formed in glaciomarine sediments deposited in New England to determine if these soils contained argillic or cambic diagnostic horizons.

Objective

- Determine the diagnostic and dynamic soil properties of glaciomarine sediments in the Presumpscot formation so that soil classification reflects these processes.

Methods

- Eight pedons from three sites along the southern shores of Maine and New Hampshire were described. (Example seen in Figure 2)
- Descriptions included horizon designations, depths, soil texture, soil color, soil structure, consistency, and presence, abundance, and color of redoximorphic features.
- Particle size distribution of each horizon described was done using the pipette method.
- Thin sections were prepared for selected horizons by Spectrum Petrographics Inc. (Vancouver, WA). Estimates of oriented clay were made using a point counting technique of at least three hundred observations along random transects.

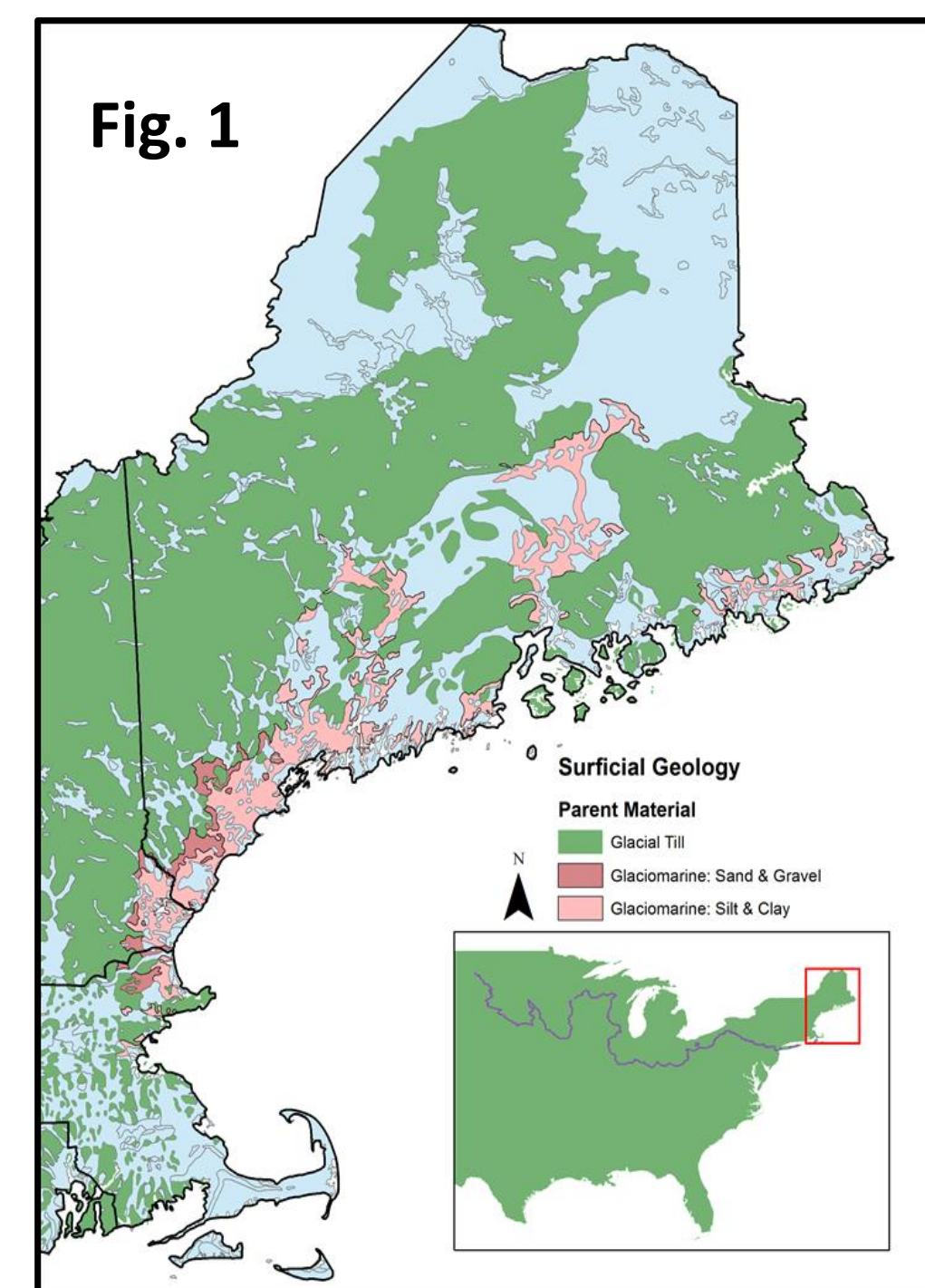


Fig. 1

Results

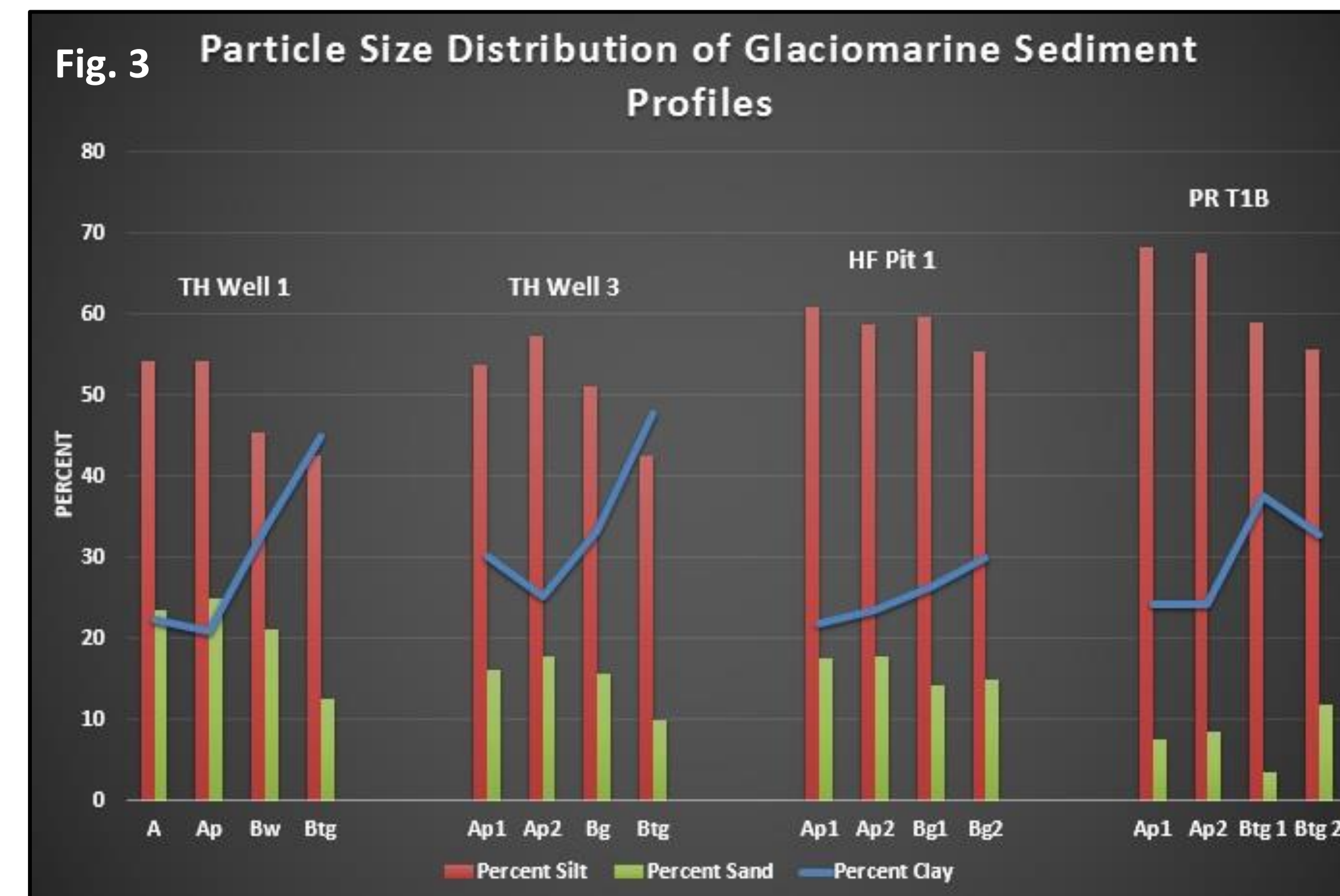


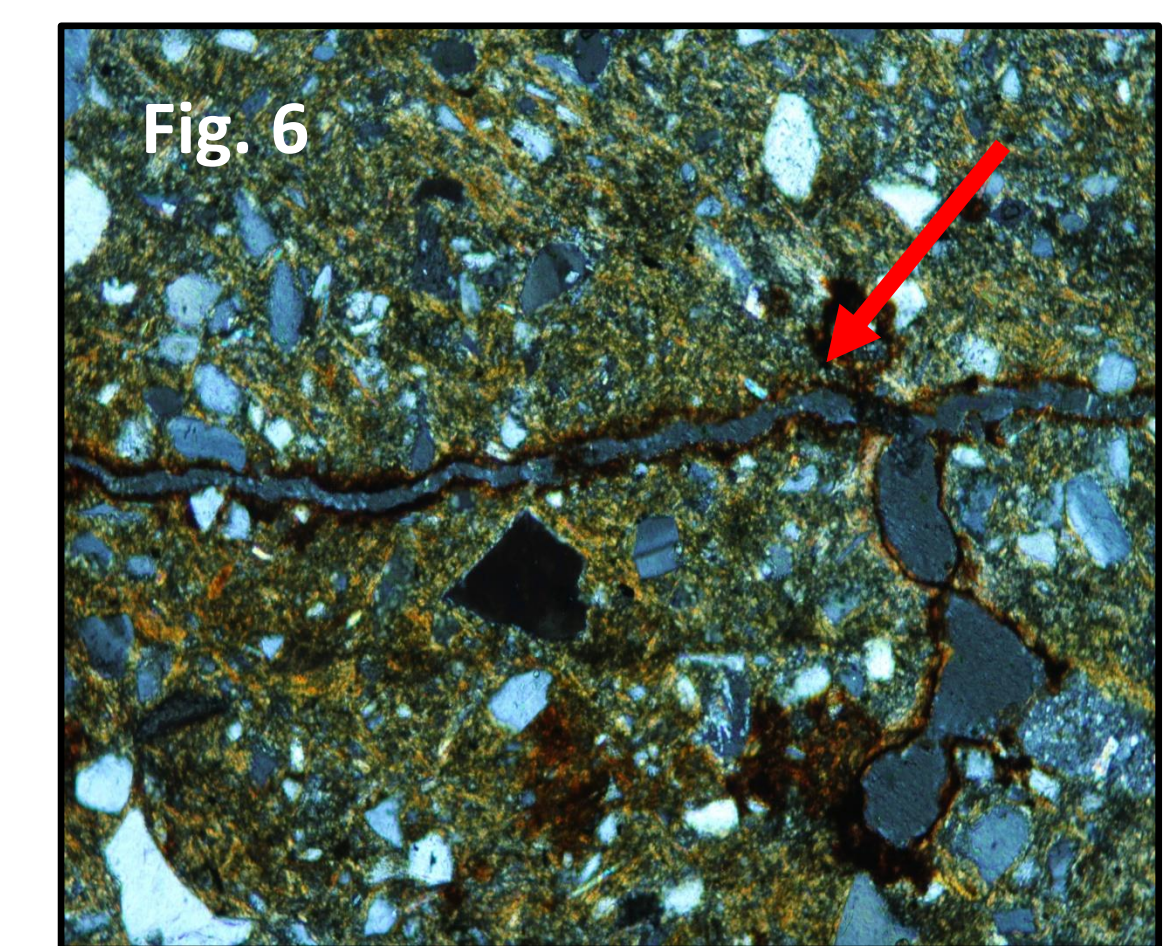
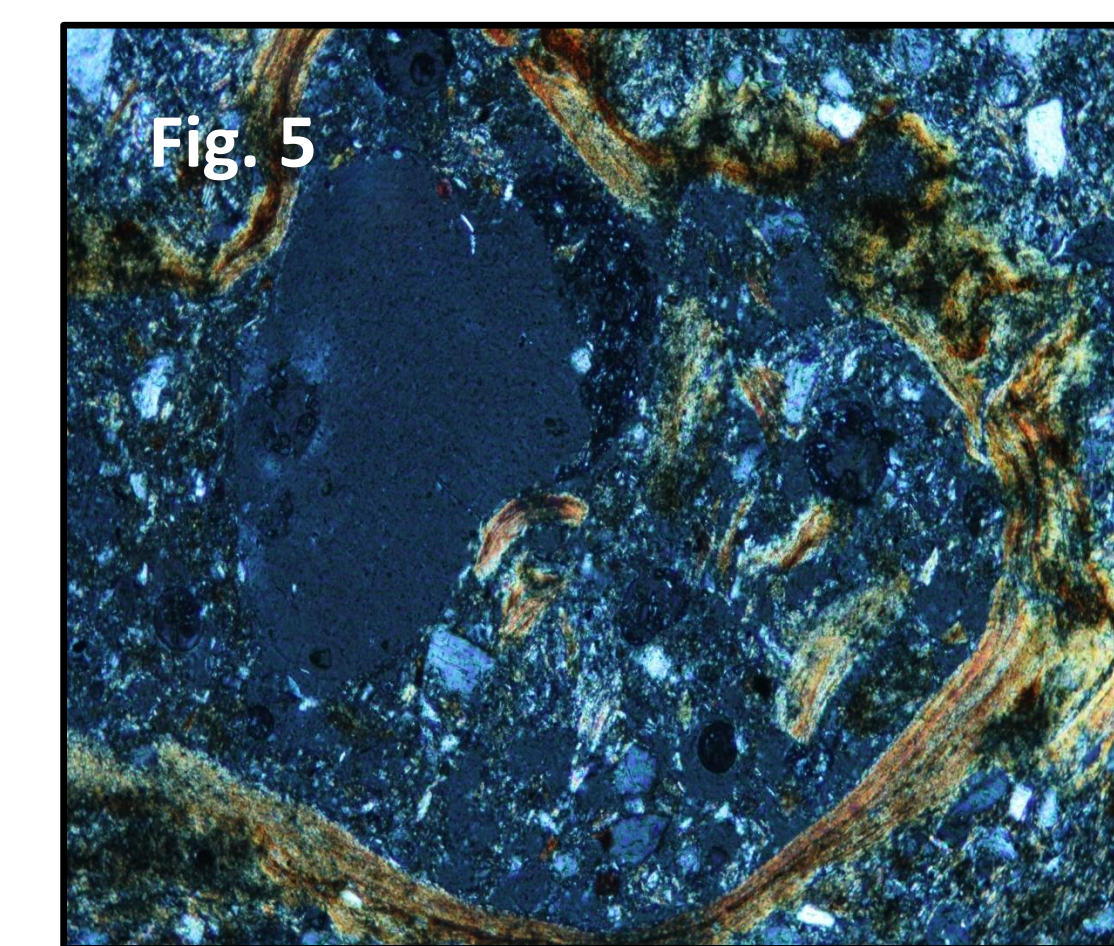
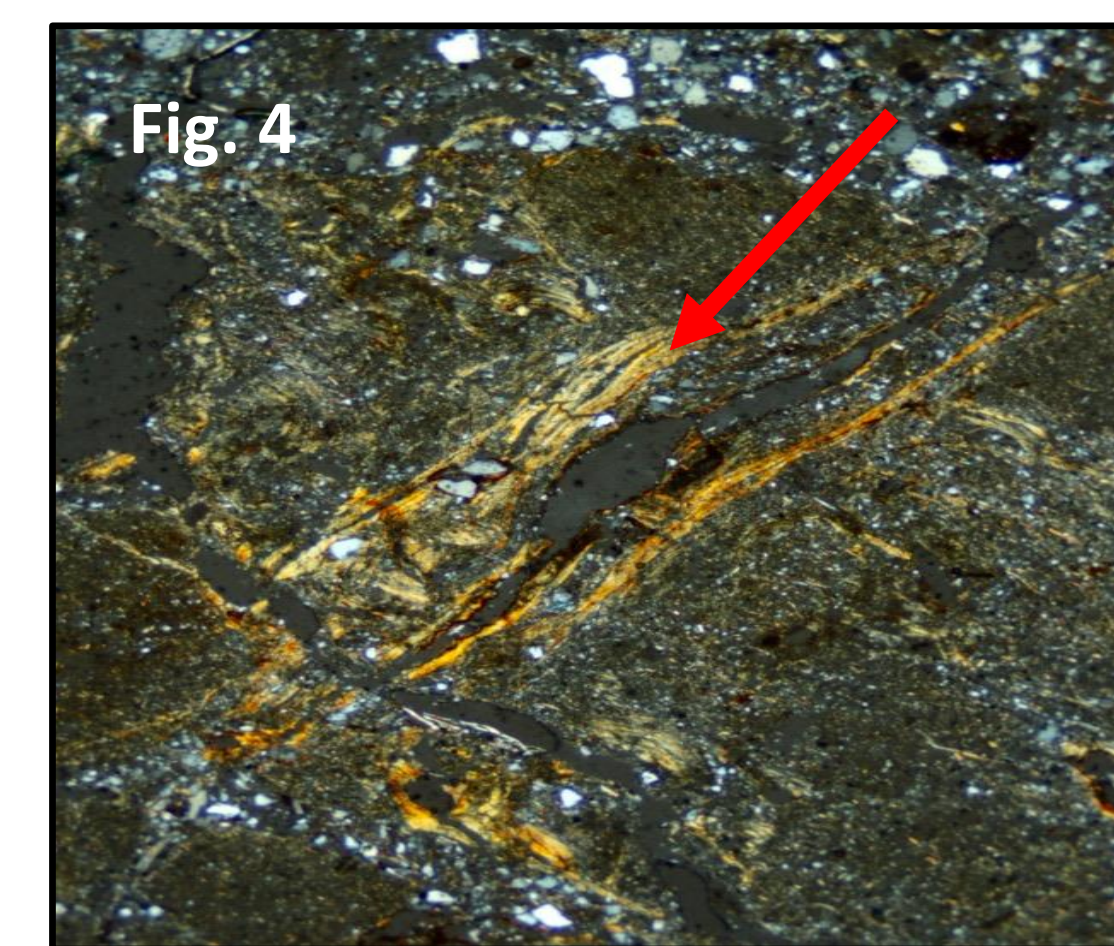
Figure 3 shows the particle size distribution of each pedon by horizon. These pedons are representative of the eight pedons examined. Laboratory analysis showed 7 out of 8 pedons had a 20% relative increase in clay from the illuvial horizon.

Table 1 shows the estimates of oriented clay coatings of the representative pedons. Point counts of the B horizons showed more than 1% of oriented clay coatings along channels and other continuous voids of all eight pedons. These illuvial clay estimates are conservative.

Figure 4 is a photograph of a selected area in the HF Pit 1 Bg2 thin section. This picture highlights the linear pattern of the clay indicative of depositional clay.

Figure 5 highlights a clay film around a void, indicative of illuvial clay. Taken from TH Well 1 Btg.

Figure 6 is an example of a pore lining, a redoximorphic feature, from TH Well 3 Btg1.



Discussion

These soils are currently mapped at the order level as Inceptisols (cambic diagnostic horizons), but observation and analysis suggest that the Alfisol classification (argillic horizons) may be more appropriate. These soils represent a large area along the northern coast of New England where development has become more rapid. Developing guidelines for use and management should reflect the processes occurring and in this case it does not. We call for a change in classification of these soils at the order level to Alfisols.

Table 1	Stratified clay (%)	Illuvial clay coatings (%)
TH Well 1		
Btg	11.5	3.3
TH Well 3		
Btg	5.6	2.8
HF Pit 1		
Bg2	4.4	2.8
PR T1B		
Btg1	6.2	2.6



Fig. 2

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 Devin, S.C. and T.C. Sandford. 1990. Stability of Natural Slopes in the Presumpscot Formation.
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