

Paxton Series: The State Soil of Massachusetts

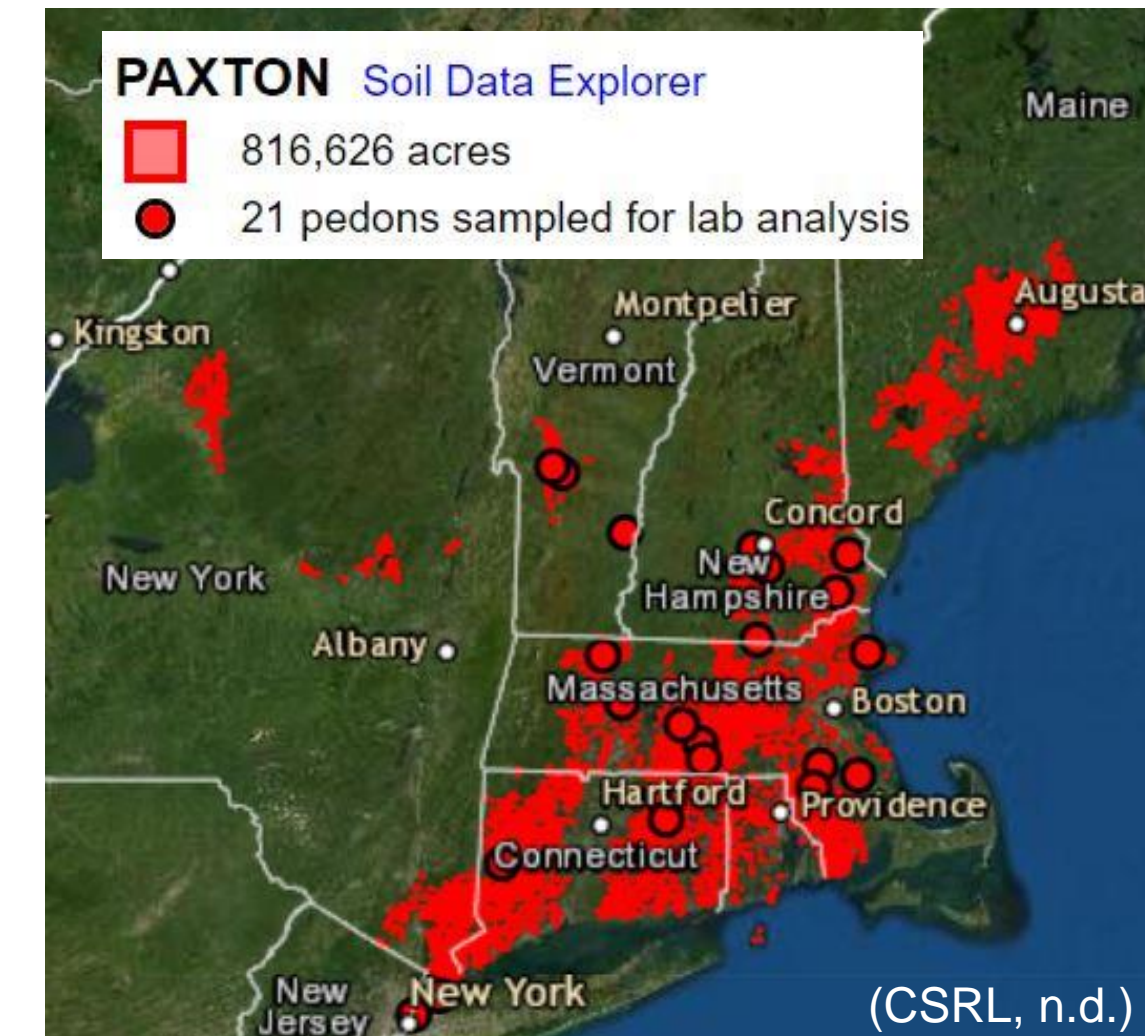
Soil Order and Taxonomy

- Paxton soils are in the order of Inceptisols (National Resources Conservation Service, n.d.-d), an order that covers approximately 17% of ice-free land (NRCS, n.d.-e).
- They are classified as coarse-loamy, mixed, active, mesic Oxyaquic Dystrudepts (NRCS, 2015; n.d.-d).
- Meaning (Soil Survey Staff, 2015):
 - The soil is mostly sand, with some silt and clay.
 - No one mineral dominates the series.
 - There is active development.
 - The average annual soil temperature (at 50cm) is greater than or equal to 8°C and less than 15°C.
 - Saturation of the soil can lead to a decrease in oxygen content.
 - The soil is acidic, lies in a humid region, and has low natural fertility.



Profile cross-section of a typical Inceptisol. (NRCS, n.d.-b)

Location and Prominence



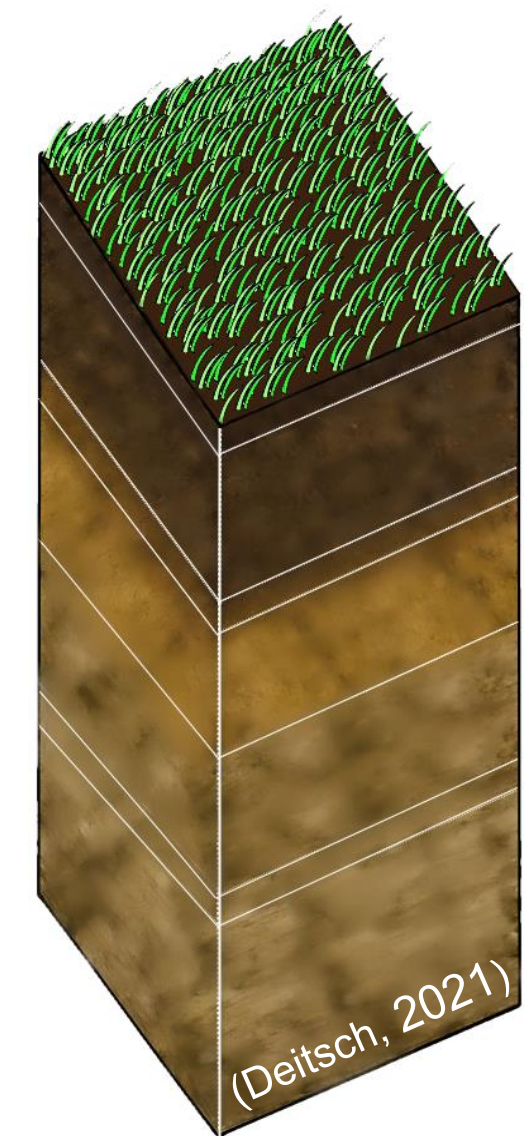
Extent of the Paxton series and its prominence in the New England area. (CSRL, n.d.)

- There are approximately 816,626 acres of Paxton soil across the New England area (CSRL, n.d.).
- 400,000 acres of the State of Massachusetts contain Paxton soil (NRCS, n.d.-d; SSSA, n.d.).
- Paxton can be found on convex slopes ranging from 0-45 percent (e.g., drumlins, ground moraines, hills, and till plains) throughout the region (NRCS, 2015; n.c.-c),
 - Notably not present in the Cape Cod, Martha's Vineyard, or Nantucket areas (NRCS, n.d.-c).



Brightest soil colors in the State of Massachusetts. Soil colors can be used to determine soil age, mineral composition, and processes taking place. (The colors in this image are based on the brightest soil color from sample depths of 5cm, 10cm, 15cm, 25cm, 50cm, 75cm, 100cm, and 125cm, and are not necessarily the color seen at the surface.) (NRCS, n.d.-a)

Soil Horizons and Profile



Horizons of Paxton soil, including some features (O, E, BC, E') that do not occur in all pedons. Horizon segments are not to scale. (Deitsch, 2021)

- The Paxton series is a young soil, still in development after the last glacial retreat (Soil Science Society of America, n.d.; SSS, 2015).
- A typical pedon has an Ap, Bw1, Bw2, and Cd horizon (NRCS, 2015).
 - Ap is usually dark brown (10YR 3/3), of moderate grain size, and is around 20cm deep.
 - Bw1 is dark, yellowish-brown (10YR 4/4), mostly fine, sandy loam and extends to about 38cm deep.
 - Bw2 is olive brown (2.5Y 4/4) and similar to Bw1. It extends to a depth of about 66cm, and has twice as much gravel content as Bw1.
 - Cd is olive (5Y 5/3), and can extend to around 165cm deep. It is very gravelly, fine sandy loam, with five times as much gravel as Ap or Bw1, and is very brittle.
- There are some pedons with variations of this structure, including an E, E', and/or BC horizon. All horizons are moderately to heavily acidic (NRCS, 2015).

Uses and Management

- Paxton has moderately high holding capacity, making it viable for cultivation, light construction, and pastureland (NRCS, 2015, n.d.-c; SSSA, n.d.).
- With cleared area and a gentle slope, a multitude of crops can be produced, including (NRCS, 2015, n.d.-c; SSSA, n.d.):
 - Apples
 - Birch
 - Corn
 - Hemlock
 - Hickory
 - Maples
 - Oaks
 - Pine
 - Silage
- The holding capacity can also create a perched water table, leaving potential for erosion, anaerobic conditions, and structural damage from frost expansion (NRCS, n.d.-c; SSSA, n.d.).
- Management of limitations are done, in some part, through use of:
 - Conservation tillage
 - Cover crops
 - Methods of strip cropping (NRCS, n.d.-c; SSSA, n.d.)

Acknowledgements

I would like to thank Dr. Pamela Fletcher for presenting me with the opportunity to work on this project, and for her mentorship throughout my education. Thank you to Miss Elena Lazovskia-Hall for her expertise and validating my citations. I would also like to thank Miss Maggie Payne of the USDA Natural Resource Conservation Service in Massachusetts for sharing her advice and resources. Lastly, I'd like to thank my amazing wife, whose support and encouragement is invaluable.

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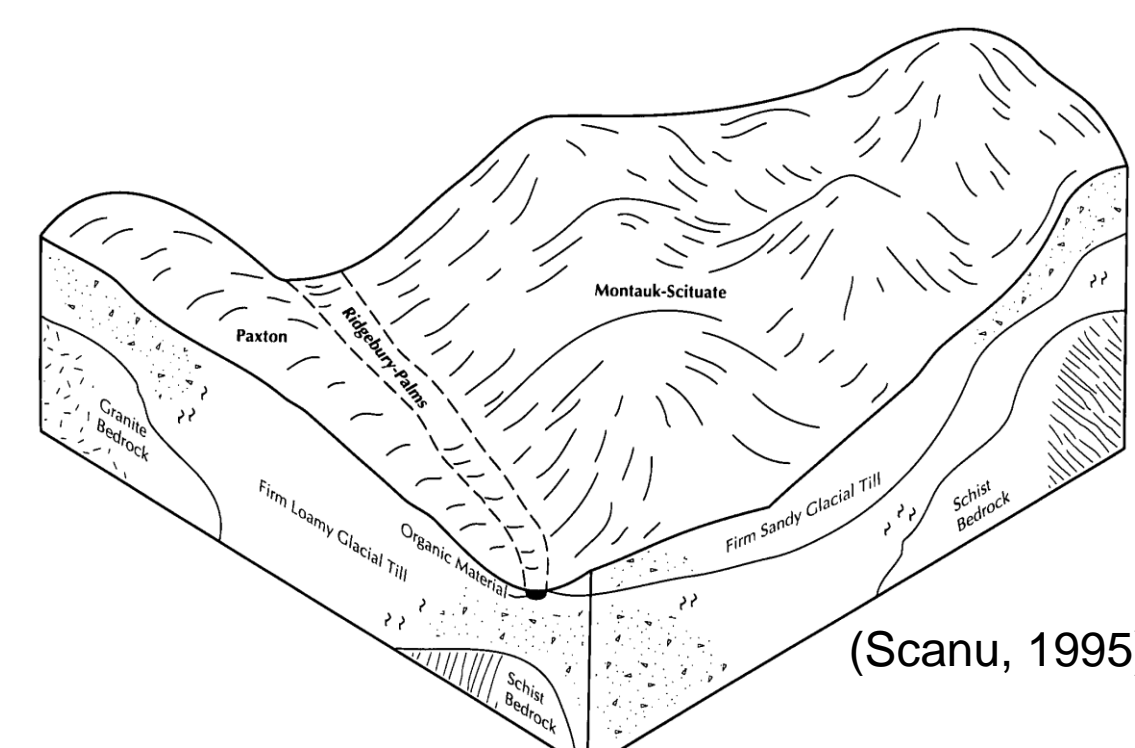
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Parent Material and Texture

- Paxton soil is formed around dense, glacial till.
- Lowest horizons comprise of eroded and compacted gneiss, granite, and schist (NRCS, n.d.-c; Scanu, 1995).
- Typical texture ranges from fine, sandy loam to coarser loam as it approaches the lowest horizon (NRCS 2015; SSSA, n.d.).



Example of Paxton soil and neighboring series with regard to underlying parent material and bedrock. (Scanu, 1995)

Issues and Concerns

- Thousands of acres have been lost to development of solar farms, and there could be anywhere from 70,000 to 150,000 acres destroyed to meet future solar needs (Abel, 2020; Gellerman, 2020).
- While there are some areas being used for dual purposes, with farming taking place beneath elevated solar panels, there is uncertainty about the long-term effects of these installations on soil health and arability.
- It is also noted that the main driver for soil degradation in Massachusetts is compaction as a result of conversion of greenspaces into residential and commercial areas, which can be expected to affect over 370,000 acres in the next 40 years (Zaltzberg & Newman, 2020).