Introduction *Soil your undies* or *soil my undies* is an international gimmick to show that soil is alive and to guesstimate its vigor. A pair of brand-new 100% underpants is left underground to the mercies of soil biota, then retrieved after exactly two months for public display Here's one of many descriptions. Procedures vary. The only standards seem to be 60 days underground and material all-cotton except for elastic waistband. It's not clear to me whether the unmentionables used must be proper to females; several videos seem to show male briefs, which with the fly have more material. We did our first tests in summer 2018.

Methods Two pairs of new white cotton male's underwear were buried in our north park in August 2018 (a) on Aug 15 Fruit of the Loom boy's (that was all I could find all-cotton at Target or Walmart) (b) on Aug 22 Calvin Klein men's small size (32-34 ") Each pair was buried about 4 inches deep, laid flat with the sod replaced. No soil was put inside the cloth though this is done is at least one video. Both pairs were within 50 feet of where last year a soil sample had been submitted to a Comprehensive Analysis of Soil Health (CASH) at Cornell. On ten of the twelve dimensions that sample scored 93/100 or better. The overall score was 86 = OPTIMAL, pulled down from the high nineties by poor results for surface hardness and subsurface hardness, state-dependent variables.

Rainfall Aug 9 - Oct 21 totaled 14.3 " over 18 days (of 75) that saw precipitation. The one-day maximum was 2.5." The longest dry spell was Aug 19-Sept 4. Lambs grazed the pasture lightly until early October. The herbage later that month is shown in plate 5. Native grasses predominate with a good element of white clover, some wild violet and a scattering of pinkweed. The most recent soil amendment had been to spread, six months earlier, sheep barn floor waste that had been stockpiled outdoors uncovered for 4-8 months.

Results: the boy's briefs were exhumed on Oct 15 after 60 days under the sod. Plate 2 reveals a lot of cloth consumed, compared to the never-buried identical pair in plate 1. The seat is gone, though the front panel is relatively intact. The small adult pair was exhumed on Oct 21 after 59 days underground, much the worse for its residence in the sod. Compare plate 4 to plate 3. Six to eight earthworms were found in each site. Plate 5 shows the test site, referred to as an "undiesclosed location."

Conclusions: In both specimens, a substantial portion of the cotton cloth originally buried had completely disintegrated by sixty days due to activity of micro and macro-organisms in the soil.

Discussion: "Soil your undies" could become a metric about soil health. Right now, it's an earthy teaching point. If it's to be even an informal metric, it still needs validation. There are two prongs to this. One is to quantify how much material has been lost to soil organisms. Quantifying disappearance could be done by weighing before and after. That is not easy, because the exhumed remains have to be well-washed of dirt, yet vigorous washing without catching all loose fiber from the rinse water could exaggerate the extent of material loss. An eyeball evaluation is not enough, though it can distinguish "nearly all gone" [=> good soil] from "hardly touched" [=> poor soil].

The second prong is to compare the amount of material lost to traditional markers of soil health like organic matter content or respiration measured nearby at almost the same time. From the CASH study done in 2017 on soil from the "undisclosed location," we knew the soil was very good indeed. Those results are shown in Plate 1. Leaving out the hardness results, the sample averaged 97/100 on the other ten. As mentioned above, the average was much lower when the two hardness dimensions were brought in, but was at 86/100 still called "optimal." The hardness results last year may have been misleading; I may have used the penetrometer wrong and the soil may have been dryer than average.

Soil with high moisture content has lower penetration resistance. This year the soil tested less hard on surface and subsurface than last, because perhaps we'd had a bit more rain. On Oct 19 soil hardness within 20 feet of the sites was 100-150 psi at 6" depth, while probing to 300 psi went down 16-18." Rainfall Oct 9-19 had totaled 1.15 inches, nearly all on Oct 11.
On Oct 27, after another 0.1 inch of rain hours earlier, the penetrometer consistently got to 6" by 100 psi, nearly always to 12-14" by 200 psi and to 16-18" by 250 psi. Especially in the top six inches these readings were much better than last year's.

On the 2017 CASH, available water capacity was very high I suspect that penetrometer readings have to controlled for moisture content of the near-surface soil. On all our pastures if it hasn't rained for a long time Graeme often has to use a hammer to pound in the spiked posts for flexnet fencing. The soil expert at Cornell told me that some silt loam soils, though great in

other respects, can get very hard. SOM and forage testing in September 2018 in the larger pasture surrounding the "undisclosed location" again showed high SOM and high protein in the forage.

Given that the soil near the test sites is optimal and was probably softer this year than last, I was disappointed that the cotton cloth of the briefs had not been entirely consumed. At least one *soil your undies* web site claims that in really good soil nothing should be left but the elastic. I have seen one photo that shows nothing else. Some possible explanations:

- Time of year: in May to August the soil biota may be busier than in Aug-Oct .
- Quality of cotton: organic is best but expensive and hard to find. We did not use organic.
- Male's or female's. Men's briefs have three layers of cotton, women's, two
- Qualities of soil not measured in CASH. Our soil is not "organic," We don't use synthetic nitrogen fertilizers or plant-o-cides but do use chemical wormers, which might hurt soil life .

This little experiment, in which *soil your/my undies* is compared to last year's CASH, is inconclusive but appealing. CASH is quite costly. If procedures for *soil your/my undies* could be standardized (preferably using only women's panties) and 60-day outcomes validated in some places by CASH, this semi-joke soil test could be actually useful. Underpants may be better than a handkerchief because the elastic makes the pair easier to find and to hang up. A handkerchief might almost disappear A small tee-shirt with a hemmed collar could work as well as underpants and would certainly not be as awful to display afterwards.

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Comprehensive Assessment of Soil Health

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Grower:
Anchorage Farm
8 Mynderse St
Saugerties, NY 12477
sqs1@columbia.edu

Sample ID:	RR603
Field ID:	North Park NW Quadrant
Date Sampled:	10/09/2017
Given Soil Type:	HuC
Crops Grown:	PIE/PIE/PIE
Tillage:	no till
Coordinates:	Latitude: 42.082900000000
	Longitude: -73.949400000000

Measured Soil Textural Class: **silt loam**

Sand: **20%** - Silt: **64%** - Clay: **15%**

Group	Indicator	Value	Rating	Constraints
physical	Available Water Capacity	0.28	96	
physical	Surface Hardness	290	6	Rooting, Water Transmission
physical	Subsurface Hardness	300	50	
physical	Aggregate Stability	71.8	98	
biological	Organic Matter	5.6	99	
biological	ACE Soil Protein Index	11.9	94	
biological	Soil Respiration	1.1	93	
biological	Active Carbon	787	94	
chemical	Soil pH	6.4	100	
chemical	Extractable Phosphorus	21.1	100	
chemical	Extractable Potassium	129.3	100	
chemical	Minor Elements Mg: 285.1 / Fe: 7.6 / Mn: 6.1 / Zn: 0.9		100	

Overall Quality Score: **86** / Optimal

Plate 1: Boy’s underpants brand new

Plate 2. Underpants from same package as those in plate 1, after 60 days in the ground

Plate 3. Men’s adult small underpants lying in the burial site Aug 22

Plate 4. The same pair as in plate 3 after 59 days in the ground

Plate 5. The “undisclosed location” Post marks site of the second test pair on Oct 21 2018