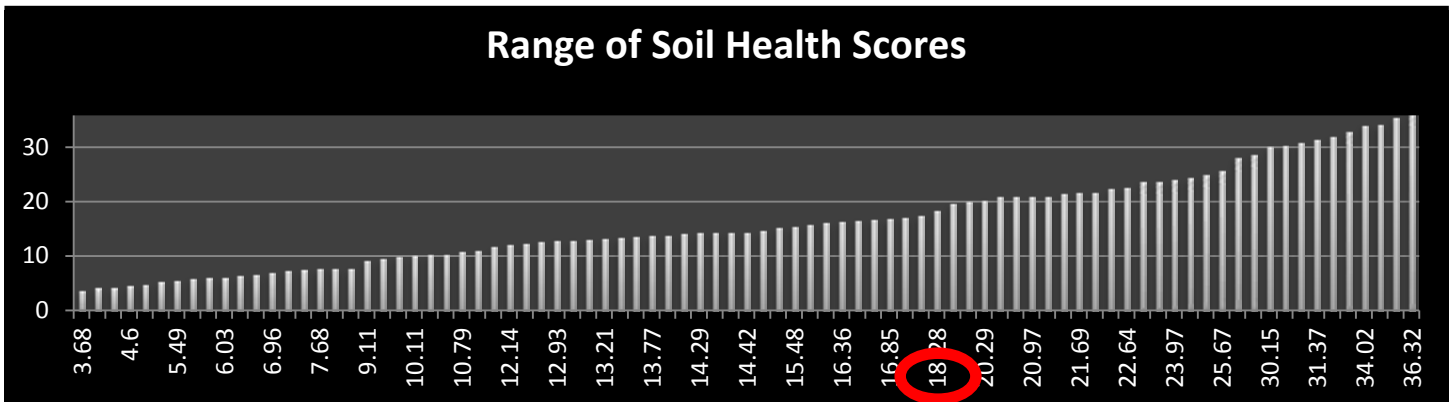


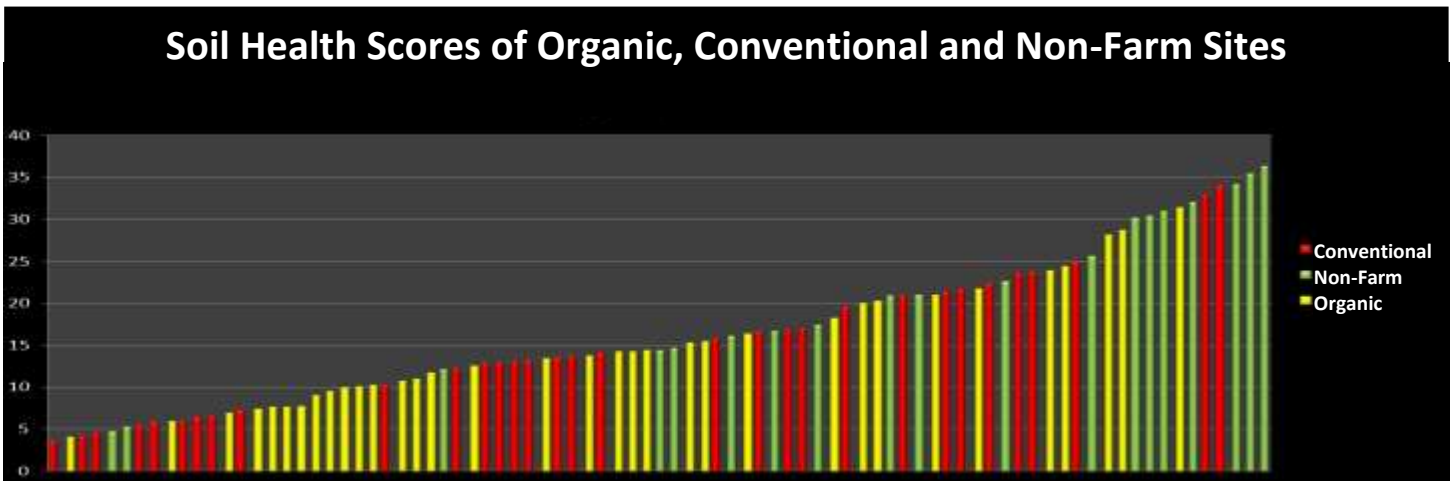
INSIGHTS FROM OUR BASELINE DATA

There is a great deal of variability in a citizen science project such as ours. Native soil types vary widely across the Front Range, and our growers use widely varying management systems. Half our growers are sampling soils in the spring, when plant roots are small, supplying minimal carbon sugars to a growing soil microbiome. The other half of our growers are sampling in the fall, when a large influx of root exudates feed plentiful soil microbes. This last spring was exceptionally wet. Our data will be much different when we encounter our next drought. The inherent variability in a citizen science project is why we are comparing each grower ONLY with themselves over a 10 year-long project.

Our preliminary findings are only a snapshot of current conditions on Boulder, Weld and Larimer County lands. They do NOT tell us whether our overall soil health is improving or degrading. That is why our growers will continue to test their soil over the next 10 years, so they can find out which direction their soil health is headed, and which practices improve their soil health the fastest and the most.

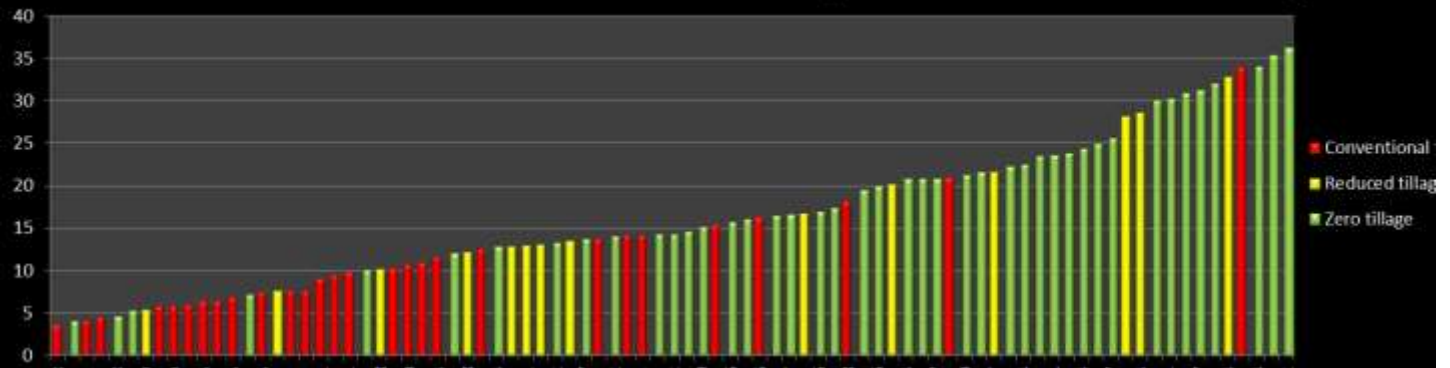


There's a huge range of soil health scores across our area, from a low of 3 to a high of 36. Scores over 18 are rare in Colorado, so we should be quite proud of our high scorers. This hopeful graph shows what's possible in our area. We CAN get good soil health scores and sequester more carbon here. There's lots of up-side potential for some of our lower scoring fields.



Organic sites (median Soil Health Score 13.62), the yellow bars on the graph, use only organically certified compost, manure, fertilizers and pesticides. **Conventional sites** (median Soil Health Score 13.67), the red bars, use all kinds of compost, manure, fertilizers and pesticides. **Non-Farm sites** (median Soil Health Score 20.97), the green bars, are where no crop is grown, like uncultivated abandoned farm fields, forests, or grasslands. Our Organic and Conventional growers have the same median soil health score of 13.6. So based on our current snapshot, organic growing methods are NOT better than conventional growing methods in terms of soil health. However the Non-Farm group beat them both.

Soil Health Scores of Conventional, Reduced and Zero Tillage



When our 96 sites are analyzed according to tillage intensity, a clear pattern emerges. Our **Zero Tillage** sites, (median Soil Health Score 20.05), the green bars on the graph, include irrigated pastures and hayfields, as well as dryland Open space grasslands and forests. Our “Non-Farm” sites in the previous graph all are included in this zero tillage category. **Reduced Tillage** sites (median Soil Health Score 13.39), the yellow bars on the graph, included growers using strip-till with herbicides and GMO’s, small garden plots with only hand-tool-tillage, and chisel and key-line plowing, which disturbs the soil less. **Conventionally Tilled** sites (median Soil Health Score 9.76), the red bars on the graph, include growers who use moldboard plows and lots of mechanical cultivation. Median Soil Health Scores fall as tillage intensity increases between our 3 tillage categories, so we can conclude that more intense tillage has a detrimental effect on soil health.

Irrigated and Dryland Median Soil Health Scores

Tillage	Irrigated	Dryland
Zero Tillage	20.94	17.26
Reduced Tillage	15.21	7.88
Conventional Tillage	9.94	6.53

When our 96 samples are grouped according to tillage intensity, and then examined for the effects of supplemental irrigation, another pattern emerges. Sites receiving supplemental irrigation water all had higher medians than comparable dryland sites in their same tillage category. Supplemental irrigation water improves soil health scores and soil carbon sequestration. Water is LIFE!

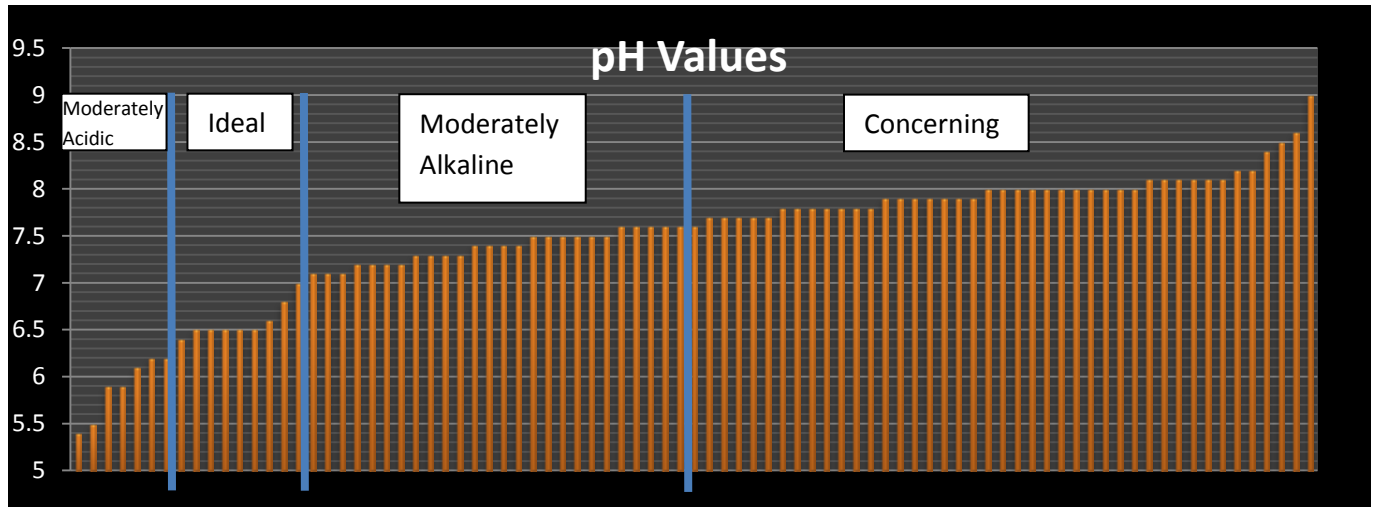
Based on these two previous graphs, our two big takeaways from the CSSHP so far are: 1) If you have supplemental life-giving irrigation water, you can expect a better Soil Health Score, and 2) If you disturb your soil less and till less intensively, you can expect a better Soil Health Score.

Soil Health Score Medians and Soil Texture

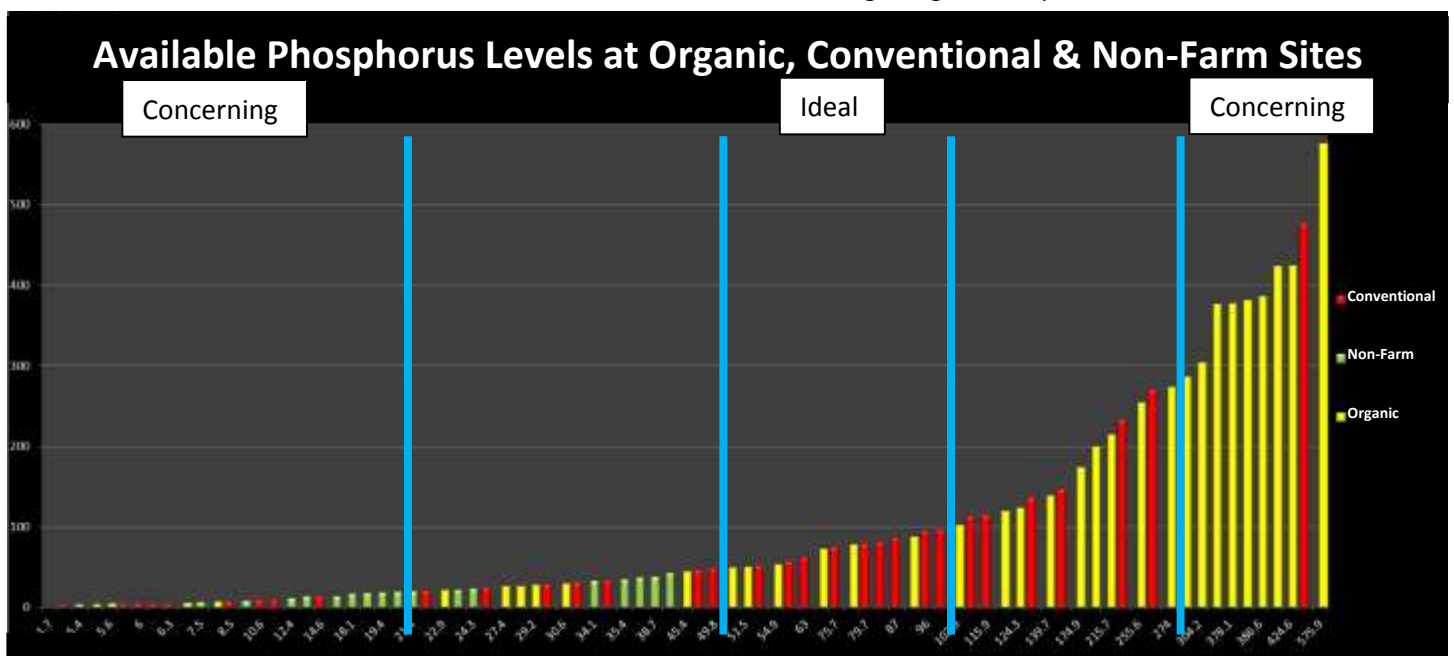


We also examined the effects of soil texture on Soil Health Scores, and no surprise, our loamiest soils have the better Soil Health Scores. This graph shows the medians of the Soil Health Scores of all the different soil types. The loamy median has the longest bar and highest median, and scores fall off above and below loam, to clay and sand which have the lowest Soil Health Scores. Loam soils are made up of sand, silt and clay particles. Because of this mix of different sized soil particles,

loams allow water, air and roots to penetrate easily. Loams also retain moisture, nutrients and organic matter better than other soil types.



The Front Range is known for its alkaline soils and we are certainly seeing that. Less than 20% of our sites have pH values in the “Ideal” or “Moderately Acidic” Range, and many of those are forested sites in the mountains. The vast majority of our sites have alkaline soils, and about half of all our sites are in the “Concerning” range, with a pH above 7.7.



The final trend in our preliminary findings pertains to Phosphorus. At high levels, Phosphorous can pollute waterways and at very high levels it interferes with plant uptake of Iron and Zinc. Optimal values for Available Phosphorous are generally between 50 and 100. Values above 300 are concerning and warrant attention. Excessive soil Phosphorus is a common problem in organic production because of the relatively high concentration of Phosphorus in manure and some compost. All our Non-Farm sites had quite low Phosphorous levels (<50). However, 10 sites (9 organic and 1 conventional) had Phosphorus levels above 300. These growers are advised to

- Switch to low-Phosphorus amendments
- Incorporate legume cover crops to boost nitrogen but not Phosphorus
- Ensure adequate buffer strips along fields to slow and absorb nutrient run-off and protect waterways
- Run plant tissue analyses for Iron and Zinc if deficiencies are suspected