TAP SCORE
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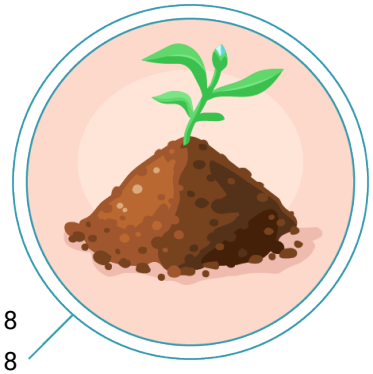
Soil, Water, Air Laboratory Sciences
1860 Leroy Ave, Berkeley, CA 94720



Tap Score ID #	ABC123	**Date Ordered**	July 21, 2018
Lab ID #	H173a	**Date Received**	July 29, 2018
Sample ID #	NAME - ABC123	**Date Completed**	August 9, 2018

Client Name	*Kate W.*	**Client Address**	*50 Bloomington Road*
Client Type	*Home Grower*	**Client City**	*Berkeley*
		Client State	*California*
Tests Performed	*Advanced Soil Test*	**Client Zip**	*94705*
		Current Irrigation	*Sprinkler and Handwater once per day*
Current Plants	*Tomatoes, beans, peas, peppers, squash/zucchini, lettuce, chard, kale, arugula, basil, borage and zinnias*	**Proposed Plants**	*Strawberries, blueberries, annual vegetables*

Report Summary: Report Summary: Based on what you intend to grow and reported plant problems, the best thing you can do to improve your soil health and overall quality is: maintain organic matter content, adjust watering schedule, add nitrogen and potassium. The concentration of all heavy metals tested was very low at levels not known to have adverse toxic effects. See "Recommendations" section below for insturctions on how to improve soil quality.

Parameter	Entry	General Optimal Levels *	Type	Function	Notes
pH	6.3	6 - 7.2	Key Indicator	A measure of how acidic or alkaline the soil is, pH controls how available nutrients are to plants.	pH falls within range preferred by most plants.
Electrical Conductivity (EC)	0.3 mmhos/cm	<2.0 mmhos/cm	Key Indicator	The ability to transmit current, EC correlates to soil particle size and texture.	Electrical conductivity is low, which indicates that salinity is not an issue for plant health.
Lime	<1%	0-2%	Key Indicator	Increases the pH of acidic soil, provids Mg and Ca for plants, helps improve water penetration.	Lime level is moderate. Plants can grow well at this level.
Texture Estimate	Clay Loam 31% sand 33% silt 36% clay	Loam (~40%–40%–20% concentration of sand-silt-clay)	Key Indicator	Impacts soil aeration and drainage capability.	This soil will drain at a low to very rate, which may cause it to easily waterlog. You may need to reduce your watering times to compensate for the slow drainage rate.
Organic Matter (OM)	9 %	>5%	Key Indicator	Contributes to soil's ability to hold onto nutrients. It is also related to soil's capacity to store water and provide drought resilience.	Organic matter is high. No additional compost is needed. Focus on protecting and replenishing the OM content rather than building up OM concentration. See "Recommendations" section below for instructions.
Carbon:Nitrogen Ratio (C:N ratio)	14.2:1	10:1	Key Indicator	Can significantly impact plant residue decomposition and nutrient cycling	While the soil's C:N ratio is slightly elevated, it shoud not be a problem for healthy plant growth.
Nitrate (NO3-N)	4.0 ppm	>30 ppm	Primary Macronutrient	Crucial for plant growth. Found in proteins, all plant cells, proteins, hormones, and chlorophyll.	Nitrate-nitrogen is low. See "Recomnmendations" section below for information about how you can increase your soil's nitrogen concentration.
Phosphorus (P)	66.3 ppm	4-15 ppm	Primary Macronutrient	Facilitates transfer energy from sunlight to plants, aids in root, growth, and speeds maturation.	Phosphorus is high. No additional P is needed. Excessive phosphorous will not harm plants, but can potentially impact nearby aquatic systems through run-off.
Potassium (K2O)	136.8 ppm	<250 ppm	Primary Macronutrient	Increases disease resistance of plants, helps form and move sugars, and can improve fruit quality.	Potassium is low. See "Recomnmendations" section below for information about how you can increase your soil's potassium concentration.

mmhos/cm = millimhos/centimeter
ppm = parts per million

Parameter	Entry	General Optimal Levels*	Type	Function	Notes
Zinc (Zn)	27.9 ppm	>0.5 ppm	Micronutrient	Aids in the production of hormone responsible for stem elongation and leaf growth.	Zinc level is adequate. No additional Zn is needed at this time.
Iron (Fe)	126.0 ppm	>3 ppm	Micronutrient	Constituent of many compounds that regulate and promote growth in plants.	Iron level is adequate. No additional Fe is needed at this time.
Manganese (Mn)	3.2 ppm	>0.5 ppm	Micronutrient	Helps with photosynthesis.	Manganese level is adequate. No additional Mn is needed at this time.
Copper (Cu)	5.7 ppm	>0.2 ppm	Micronutrient	An essential component of plant enzymes.	Copper level is adequate. No additional Cu is needed at this time.
Boron (B)	0.50 ppm	>0.2 ppm	Micronutrient	Helps form cell walls.	Boron level is adequate. No additional B is needed at this time.
Molybdenum (Mo)	0.3 ppm	<39 ppm	Micronutrient	Helps bacteria and organisms in the soil convert nitrogen in the air to nitrogen compounds that plants can uptake.	Molybdenum level falls within acceptable range. Mo is a heavy metal, but very low concentrations in soil are not known to have adverse toxic effects.
Chromium (Cr)	0.3 ppm	<36 ppm	Micronutrient	Affects seed germination, plant growth, photosynthesis and nutrient uptake.	Chromium level falls within acceptable range. Cr is a heavy metal, but very low concentrations in soil are not known to have adverse toxic effects.
Cadmium (Cd)	0.08 ppm	<2.5 ppm	Non-essential element	High levels can lead to toxicity in plants, animals, and humans.	Cadmium level falls within acceptable range. Cd is a heavy metal, but very low concentrations in soil are not known to have adverse toxic effects.
Lead (Pb)	4.6 ppm	<400 ppm	Non-essential element	Heavy metal. High levels can lead to toxicity in plants, animals, and humans.	Lead level falls within acceptable range. Pb is a heavy metal, but very low concentrations in soil are not known to have adverse toxic effects.

mmhos/cm = millimhos/centimeter
ppm = parts per million

* Different plants in different conditions will require different nutrients at different concentrations. Consider these ranges to be general guidance values rather than absolute measures!

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Soil Health Recommendations

Customer ID: NAME - ABC123

Based on your soil report, steps you can take to improve your overall soil health, include:

- Maintain organic matter content
- Adjust watering schedule
- Add nitrogen
- Add potassium

How To Maintain Your Soil's Organic Matter:

Your Soil's Organic Matter Content: 9.3%

Given the texture of your soil (clay loam), the high concentration of organic matter speaks to the good gardening practices that have been established–as clay loams tend to be naturally low in OM. The key is not to drastically increase OM, but to maintain it. Maintaining the concentration of organic matter is one of the most beneficial things you can do to sustain your soil and plant health. Ways keep the organic matter concentration high include adding any of the following:

- Compost
- Manure
- Grass clippings or leaves

These proactive measures will enhance soil tilth (suitability for growing), which in turn allows air and water move through the soil–promoting successful root growth.

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Adjust Watering Schedule:

Your soil's texture: Clay Loam (31% sand - 33% silt - 36% clay)

Due to the high percentage of clay particles in the soil, your soil may drain at a low or very low rate. Due to the small particle size present in clay loams, this type of soil can be very dense. It is likely to swell to retain water and shrink when dry. Clay loams also can get easily waterlogged–which can decrease water uptake by plants. This may lead to wilting. You may want to decrease watering periods in order to limit the risk of waterlogging.

Additionally, maintaining the high organic matter content is one of the best things you can do to counter the difficulties of clay dominant soil. It will allow more air and water to circulate in the soil, decrease compaction, and improve drained texture.

Add Nitrogen:

Your soil's nitrate-nitrogen (NO3-N) concentration: 4.0 ppm

Nitrate is used by plants for growth and production and is critical for healthy growth. You should add 0.1 lb of nitrogen per 100 square feet of soil. For each 0.1 lb of N needed you can apply the following (per 100 square feet):

¼ lb of urea:

Urea is one of the most commonly used nitrogen-containing amendments. It is often inexpensive and provide the most nitrogen of typical soil amendments. It may be mixed with other fertilizers or applied on its own.

5 lb alfalfa meal pellets:

Made from fermented alfalfa plants, alfalfa meal pellets contain triacontanol–a natural growth hormone. This bioactivator can help plants absorb nutrients more effectively. Alfalfa plants should not be used on highly alkaline

soil–as it can raise the pH of soil. However, given your soil's pH–it is still a viable amendment option. Because many alfalfa products on the market are sprayed with herbicides, make sure to look for organic alfalfa pellets.

Other options:

Check with your local garden center or home improvement store to determine what organic fertilizers are available in your area. When calculating fertilizer rates, take the amount of N needed and divide by the % nitrogen in the fertilizer. For example, if your fertilizer contains 30% N, take 0.10 lbs (N needed) divided by 0.30 (N in the fertilizer) to get 0.3 lb of the 30% N fertilizer that is needed to apply per 100 sq.ft.

Add Potassium:

Your soil's potassium (K2O) concentration: 136.8 ppm

As one of the primary macronutrients required by plants, potassium is essential to ensure many facets of healthy plant growth and development. While the concentration found in your soil is above the minimum recommended threshold (~60 ppm) , we still recommended that you supplement your soil with potassium. Apply any of the following (per 100 square feet) to increase potassium concentrations:

0.05 cubic yards of composted manure:

Fresh manure can be very acidic and may burn plants. Composted (or aged) manure is less acidic, can quickly provide a variety of nutrients, and reduce soil erosion. Apply by incorporating composted manure into the top 6 to 8 inches of soil.

5 lb of greensand:

As a slow-release soil amendment, greensand is ideal for long-term soil maintenance (rather than if you are seeking immediate results). It largely consists of glauconite–a mineral high in potassium, as well as trace minerals such as iron and magnesium. It can also improve soil texture by loosening clay and increasing water retention capabilities. Not to be confused with regular sand. Best to apply prior to planting.

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Interpreting Your Soil Report:

Advanced Soil Test

Key Terms

Parts Per Million or PPM

Expression of concentration. Results for macro- and micronutrients are reported in parts per million (ppm). 1 ppm is equivalent to 1 milligram per kilogram.

Millimhos Per Centimeter or mmhos/cm

Unit of electrical conductance. 1 mmhos/cm is equal to the reciprocal of an ohm (a unit of electrical resistance). 1 mmhos/cm is also equivalent to 1 deciSiemen per meter (dS/m). Used for measurement of salts in soil.

Key Parameters

pH

What Is pH?
Represented on a logarithmic scale from 0 to 14, pH (potential hydrogen) measures the acidity or alkalinity of soil. The higher the number, the more alkaline your soil. The lower the number, the more acidic your soil is. A pH of 7.0 is neutral.

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Why Is pH Important?
Knowing the pH of your soil is crucial, as it determines whether or not essential nutrients are able to dissolve in the water within. Plants take up these essential nutrients only after they dissolve–making proper pH a key indication as to whether or not your soil is suitable for growing plants. If soil is either highly acidic (~below 5.0) or highly alkaline (~ above 7.5), crucial nutrients do not easily dissolve, leading to poor plant health, development, and/or reproduction.

What Is The Ideal Soil pH?
The desirable pH range for optimum plant growth varies amongst nearly every plant, shrub, and tree species. Unless your growing a large orchard of all cherry trees or a field of just strawberries, it's nearly impossible to give a hard and fast number as to what your soil's pH *should* be. That being said, most plants can grow successfully between a pH range of 6.0 and 7.2.

The median pH for U.S. soil is 6.3, but pH values vary quite significantly from region to region. There are some general trends across the country, however. The southeastern region of the nation tends to have the lowest pH and it generally increases as you move north and west. Environmental factors are largely determinant of how acidic your soil is. For example, soil tends to be more acidic (i.e. lower pH) where rainfall is higher and large amounts of vegetation grow.

Electrical Conductivity

What Is Electrical Conductivity?
Electrical conductivity (EC) is the ability of a material to transmit an electrical current. A soil's EC measures the salt content of the soil (i.e. its salinity)–EC increases proportionally as the concentration of soluble salts increase. While electrical conductivity does not provide a direct measure of specific salt compounds, it is reflective of the concentration of things such as nitrates, potassium, sodium, sulfate, and ammonia.

We recommend that your soil's EC falls below 2.0 mmhos/cm. Any higher, and it is likely your soil is too saline to ensure proper soil and plant health.

Why Is Electrical Conductivity Important?

EC levels can indirectly indicate the amount of water and water-soluble nutrients available for plant uptake in soil. Additionally, electrical conductivity impacts the activity of soil microorganisms, plant growth, crop yields, and crop sustainability.

Because salts move with water, areas of low drainage (such as soils with a high percentage of clay parties) tend to have a higher EC. As such, electrical conductivity strongly correlates to soil particle size and texture.

What Factors Influence Electrical Conductivity?
Many things can affect the electrical conductivity of soil. These factors include: soil temperature, local climate, soil type, texture and moisture level, salinity, irrigation, fertilizers, and soil depth. The Western U.S., as well as other arid areas where rainfall is low, are most likely to heave salt-affected soils (and therefore high EC).

Lime

What Is Lime?
The percentage of estimated lime is a measure of free lime–or calcium carbonate–in your soil. Soils with 0-1% estimated lime are considered low lime soils; 1-2% estimated lime is considered moderate; and >2% is considered high lime soils. Generally, high lime soils require higher application rates of fertilizer in order to provide adequate nutrients for crop growth, as nutrients can get tied up in the soil to the point where plants are unable to uptake them.

Why Is Lime Important?
Adequate lime is important because it reduces soil acidity, provides calcium and magnesium for plants, improves water penetration (especially in acidic soils), and can improve the uptake of primary macronutrients (nitrogen, phosphorus, and potassium) by plants.

Texture Estimate

What is Soil Texture?
Texture refers to both the dominant particle size in the soil, as well as their cohesiveness. The three main types of soil particles are sand, silt, and clay. Soils are almost always a combination of all three particle sizes.

Sandy Soils:

Dominant particle size: <2 to 0.005 mm
Feel: Gritty when rubbed between your fingers
Pore space between particles: Large
Drainage: High
Why it matters to soil health: Due to the large pore space between soil particles, water drains quickly from sandy soils. As a result, sandy soils do not tend to get waterlogged, but can be susceptible to drought.

Silt Soils:

Dominant particle size: 0.002 to 0.05 mm
Feel: Smooth when rubbed between your fingers. It often feels like flour when dry and slippery when wet
Pore space between particles: Medium
Drainage: Moderate
Why it matters to soil health: Silt's water retention ability often leaves a sufficient amount of moisture for plant roots and nutrient dissolution. However, because silt is easily compacted, it can limit air circulation.

Clay Soils:

Dominant particle size: <0.002 mm
Feel: Sticky and moldable when rubbed between your fingers
Pore space between particles: Small. However, due to the small particle size, there are generally more total pores than sandy soil–leading to lower density.
Drainage: Low
Why it matters to soil health: Clay soils hold on to water due to their small pore size and tend to get waterlogged. However, if they do dry out, they become very hard and difficult to till.

Why Is Soil Texture Important?

The ratio between the three different soil particle sizes directly determines the degree of drainage and aeration in the soil. Consequently, soil texture impacts how well plant roots are able to grow.

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What Is The Ideal Soil Texture?
The ideal soil texture is a balance of all three particle types. In general, the most desirable soil for gardening is called “loam.” These soils have a roughly 40%–40%–20%.ratio of sand-silt-clay.

Organic Matter

What Is Organic Matter?
Soil organic matter (OM) is any material that originated from living organisms. It consists of both living and dead material–including decomposing plant residue and soil-dwelling organisms. Organic matter decomposes more quickly in warm, humid climates and it decomposes more slowly in cool, dry climates.

Why Is Organic Matter Important?
Soil organic matter contributes to a soil’s ability to hold onto nutrients, is related to soil structure, reduces compaction, prevents erosion, and improves water infiltration and water-holding capacity.

Increasing organic matter in your soil takes time, patience, and dedication. A single soil treatment is unlikely to make a lasting improvement of soil organic matter. It usually takes repeated applications of organic mulch or compost over several years. While it does take some effort, improving your soil’s organic matter content can drastically improve your overall soil health.

Carbon:Nitrogen Ratio

What Is The Carbon:Nitrogen Ratio?
The Carbon:Nitrogen ratio (C:N ratio) is the ratio of the mass of carbon-to-nitrogen in soil. For example a C:N ratio of 12:1 means that there are 12 units of carbon (C) for each unit of nitrogen (N) in the soil.

Why Is The Carbon:Nitrogen Ratio Important?
The C:N ratio of everything in and on the soil, can significantly impact plant residue decomposition and nutrient cycling (of nitrogen in particular). Soil microbes are very sensitive to a balanced C:N ratio. Subsequently, balancing the amount of carbon and nitrogen in your soil determines how successfully microbial populations can live in your soil (and contribute to its overall health).

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What Is the Ideal Carbon:Nitrogen Ratio ?

The ideal C:N ratio of agricultural soils averages about 10:1. This is considered an indication of a dynamic equilibrium condition that can and should be maintained.

Macronutrients

What Are Macronutrients?

Macronutrients refer to the elements that are required in large quantities by plants to ensure healthy growth and development. These nutrients include: nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), sulfur (S), magnesium (Mg), carbon (C), oxygen (O), hydrogen (H). Nitrogen, phosphorus, and potassium are Primary Macronutrients–as they are most crucial for healthy plants and deficiencies in any of them can severely limit crop yields and overall health.

Micronutrients

What Are Micronutrients?

Also known as trace minerals, micronutrients are essential elements needed by plants in very small quantities. Essential micronutrients include: boron (B), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), and zinc (Zn). The necessary amount of each micronutrient varies by plant, and is affected by factors like rainfall, sunlight, soil temperature, and soil pH.

Despite the low amount required, critical plant functions may be limited if micronutrients are insufficient–including reduced growth and abnormalities.

Heavy Metals

What Are Heavy Metals?

Heavy metals occur naturally, but rarely at toxic levels. Human activity such as mining, manufacturing, and the use of synthetic products (e.g. pesticides, paints, batteries) however, can all increase heavy metal contamination of soil to potentially dangerous concentrations.

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What Are Heavy Metals Important?

Not all heavy metals are toxic to humans. In small amounts, metals such as iron, copper, manganese, and zinc are essential for ensuring good health. However, metals like lead and chromium can be detrimental (especially for prolonged exposure at elevated concentrations). You can be exposed to heavy metals in soils either by working with the soil (dermal exposure) or eating plants that uptake them.

How Can You Limit The Risks Associated With Heavy Metals In Soil?

If you find that it has an elevated-lead concentration, there is hope. A few steps you can take to decrease contamination risks to both you and your plants, include:

- Add compost. Adding organic matter to contaminated soil will dilute the overall lead concentration in the soil. This subsequently reduces the amount of lead absorbed by your plants.
- Thoroughly wash your fruits and vegetables with clean water. This reduces exposure to lead dust on the plants, but not any lead that as accumulated within them. Alternatively, you can peel off their skins or remove hard to clean areas.
- Maintain the optimal pH and nutritional conditions for the plants you are growing. Note: slightly alkaline soils hold more lead and make it harder for plants to uptake it–so they may be preferable if you are concerned about lead leaching into your crops.
- Opt for a raised-bed garden if your soil's lead levels are higher than the recommended safety levels.

Have more questions? Send us a message at hello@simplewater.us and our team of engineers, chemists, and horticulturalists can help!