Biological Analysis Report

Account ID: 606105

FORESTDALE FARM
450 S ASH LANE
FLAGSTAFF, AZ 86004

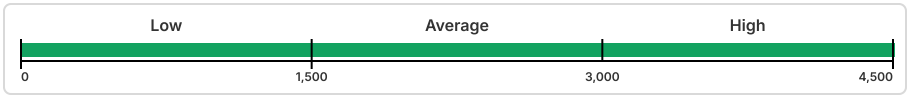
Report Type: PLFA Soil
Invoice Number: 1549143
Date Received: 10/1/2026
Date Reported: 10/5/2026
Lab ID: 6481

Results For: FORESTDALE FARM **Location:** M **Sample ID:** #1 FISH

Functional Group Biomass

Your Results:

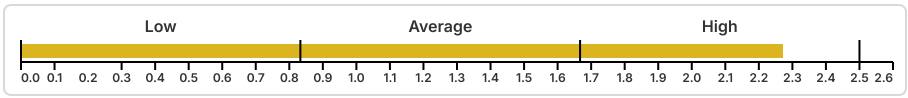
Total Living Microbial Biomass 6839 ng/g



Functional Group Diversity

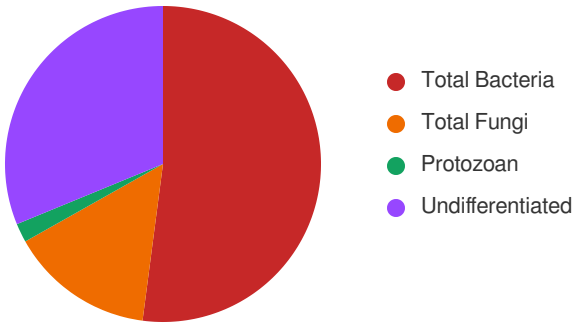
Your Results:

Functional Group Diversity Index 2.27



Functional Group Total Results

Functional Group	Biomass, ng/g	Percent
Total Bacteria	3561.13	52.07%
Gram (+)	1391.40	20.34%
Actinomycetes	454.05	6.64%
Gram (-)	2169.72	31.72%
Rhizobia	< 0.01	0%
Total Fungi	1010.81	14.78%
Arbuscular Mycorrhizal	268.87	3.93%
Saprophytes	741.94	10.85%
Protozoan	132.65	1.94%
Undifferentiated	2134.83	31.21%



Reviewed by: Stephanie Wootton **10/21/2026**

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Community Composition Ratios

All ratios should be looked at separately, but should also be taken into context and compared with one another to better understand the big picture. These are general guidelines and statements regarding soil microbial communities. In addition, the scales and ranges presented here are specific for the type of extraction and analytical methods used for PLFA analysis at Ward Laboratories, Inc. They will not necessarily reflect ranges derived from other methods of analysis or the literature. The scales can and should be adjusted slightly depending on the time of year and conditions at sampling along with the climate and soil type of specific regions where comparisons are being made. Conditions such as time of year, past and present crop, moisture, pH, and fertility should be noted or measured close to sampling for PLFA analysis for a more in depth interpretation of results.

Fungi : Bacteria

Your Results:

Fungi:Bacteria	**0.28**
Rating:	**Good (0.25+ → 0.3)**

Bacteria tend to dominate in systems with fewer organic inputs or residues possibly leading to a lower C:N ratio. In addition, bacteria can be more prominent in the early spring or late fall as soil temperatures are usually cooler and vegetation is less active or absent. Dry conditions, slightly alkaline to alkaline pH values, or increased land disturbance through prolonged and extensive tillage, grazing, or compaction may also favor bacteria. While bacteria are important and needed in the soil ecosystem, fungi are desired and more often considered indicators of good soil health. Increased use of cover crops and/or other organic inputs and less soil disturbance should help the soil support more fungi. Adjustments to pH may also be recommended in some more extreme circumstances.

Fungi:Bacteria Ratings

Scale	Rating
< 0.05	Very Poor
0.05+ → 0.1	Poor
0.1+ → 0.15	Slightly Below Average
0.15+ → 0.2	Average
0.2+ → 0.25	Slightly Above Average
0.25+ → 0.3	Good
0.3+ → 0.35	Very Good
> 0.35+	Excellent

Predator : Prey

Your Results:

Predator:Prey	**0.04**
Rating:	**Excellent (> 0.02+)**

This ratio is also expressed as protozoa to bacteria. Protozoa feed on bacteria which helps release nutrients, especially nitrogen. A higher ratio indicates an active community where base level nutrients are sufficient to support higher trophic levels or predators. However, this ratio will always be a relatively low number because the prey will greatly outnumber the predators.

Predator:Prey Ratings

Scale	Rating
< 0.002	Very Poor
0.002+ → 0.005	Poor
0.005+ → 0.008	Slightly Below Average
0.008+ → 0.01	Average
0.01+ → 0.013	Slightly Above Average
0.013+ → 0.016	Good
0.016+ → 0.02	Very Good
> 0.02+	Excellent

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Gram (+) : Gram (-)

Your Results:

Gram(+):Gram(-)	**0.64**

Rating: **Slightly Gram (-) Dominated (0.5+ -> 1)**

Gram (+) bacteria typically dominate early in the growing season and/or following a fallow period. They also survive better under certain environmental conditions or stressors such as drought or extreme temperatures due to their ability to form spores. Therefore, it is common to see higher values when the community is coming out of dormancy or is stressed. These values will typically begin to approach those of a more balanced bacterial community as the soil conditions become more favorable throughout the growing season. A gram (-) dominated soil may be due to anaerobic conditions or other stressors such as pesticide application or heavy metal contamination.

Gram(+):Gram(-) Ratings

Scale	Rating
< 0.5	Gram (-) Dominated
0.5+ → 1	Slightly Gram (-) Dominated
1+ → 2	Balanced Bacterial Community
2+ → 3	Slightly Gram (+) Dominated
3+ → 4	Gram (+) Dominated
> 4+	Very Gram (+) Dominated

Stress and Community Activity Ratios

Saturated : Unsaturated

Your Results:

Saturated:Unsaturated	**1.21**

Bacteria alter their membranes under various environmental conditions in order to maintain optimal fluidity for nutrient and waste transport into and out of the cell. Saturated fatty acids may reflect a better adapted community to current environmental conditions. Communities under stressed conditions will increase their proportion of unsaturated fatty acids. This will likely occur most often as a result of low soil moisture or drastic changes in temperature. In general, a higher number indicates a healthier and more stable community.

Monounsaturated : Polyunsaturated

Your Results:

Monounsaturated:Polyunsaturated	**12.89**

The ratio of monounsaturated to polyunsaturated fatty acids is used along with the sat:unsat ratio to further indicate the degree of community stress. A higher ratio indicates less stress, while a lower ratio would depict higher levels of prolonged stress due to conditions such as temperature, moisture, pH, or nutrient availability (starvation).

Pre 16:1w7c : cy17:0 - Pre 18:1w7c : cy19:0

Your Results:

Pre 16:1w7c:cy17:0	**2.68**
Pre 18:1w7c:cy19:0	**1.90**

Cyclo (cy) fatty acids are more prominent during stationary phases of growth or under high stress conditions that influence membrane fluidity and growth rates such as temperature, pH, moisture, and nutrient availability. In general, a higher number or all Pre16/Pre18 is better and indicates an actively growing community experiencing fewer stressors. These values are typically higher early in the growing season (planting) when the community is becoming active and experiencing fast growth. The values may begin to drop towards the end of the growing season (harvest) following a decrease in plant growth activity or as the community approaches a stationary growth phase as the temperature/moisture changes between the seasons.

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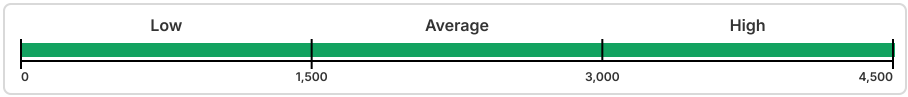
Report Type: PLFA Soil
Invoice Number: 1549143
Date Received: 10/1/2026
Date Reported: 10/5/2026
Lab ID: 6482

Results For: FORESTDALE FARM **Location:** M **Sample ID:** #5 NO FISH

Functional Group Biomass

Your Results:

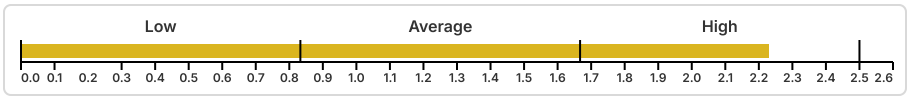
Total Living Microbial Biomass 8273 ng/g



Functional Group Diversity

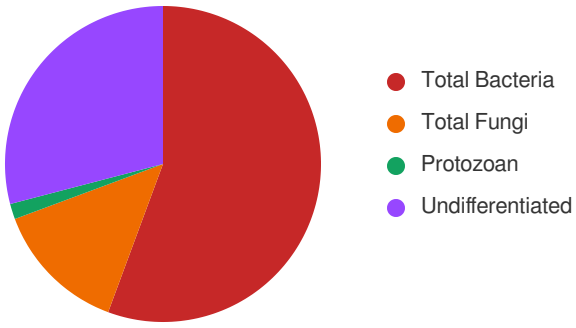
Your Results:

Functional Group Diversity Index 2.23



Functional Group Total Results

Functional Group	Biomass, ng/g	Percent
Total Bacteria	4603.36	55.64%
Gram (+)	1762.30	21.3%
Actinomycetes	588.09	7.11%
Gram (-)	2841.05	34.34%
Rhizobia	< 0.01	0%
Total Fungi	1133.40	13.7%
Arbuscular Mycorrhizal	359.61	4.35%
Saprophytes	773.79	9.35%
Protozoan	130.83	1.58%
Undifferentiated	2405.41	29.08%



Community Composition Ratios

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Fungi : Bacteria

Your Results:

Fungi:Bacteria	0.25
Rating:	Slightly Above Average (0.2+ → 0.25)

Bacteria tend to dominate in systems with fewer organic inputs or residues possibly leading to a lower C:N ratio. In addition, bacteria can be more prominent in the early spring or late fall as soil temperatures are usually cooler and vegetation is less active or absent. Dry conditions, slightly alkaline to alkaline pH values, or increased land disturbance through prolonged and extensive tillage, grazing, or compaction may also favor bacteria. While bacteria are important and needed in the soil ecosystem, fungi are desired and more often considered indicators of good soil health. Increased use of cover crops and/or other organic inputs and less soil disturbance should help the soil support more fungi. Adjustments to pH may also be recommended in some more extreme circumstances.

Fungi:Bacteria Ratings

Scale	Rating
< 0.05	Very Poor
0.05+ → 0.1	Poor
0.1+ → 0.15	Slightly Below Average
0.15+ → 0.2	Average
0.2+ → 0.25	Slightly Above Average
0.25+ → 0.3	Good
0.3+ → 0.35	Very Good
> 0.35+	Excellent

Predator : Prey

Your Results:

Predator:Prey	0.03
Rating:	Excellent (> 0.02+)

This ratio is also expressed as protozoa to bacteria. Protozoa feed on bacteria which helps release nutrients, especially nitrogen. A higher ratio indicates an active community where base level nutrients are sufficient to support higher trophic levels or predators. However, this ratio will always be a relatively low number because the prey will greatly outnumber the predators.

Predator:Prey Ratings

Scale	Rating
< 0.002	Very Poor
0.002+ → 0.005	Poor
0.005+ → 0.008	Slightly Below Average
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0.01+ → 0.013	Slightly Above Average
0.013+ → 0.016	Good
0.016+ → 0.02	Very Good
> 0.02+	Excellent

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Gram (+) : Gram (-)

Your Results:

Gram(+):Gram(-)	**0.62**

Rating: **Slightly Gram (-) Dominated (0.5+ -> 1)**

Gram (+) bacteria typically dominate early in the growing season and/or following a fallow period. They also survive better under certain environmental conditions or stressors such as drought or extreme temperatures due to their ability to form spores. Therefore, it is common to see higher values when the community is coming out of dormancy or is stressed. These values will typically begin to approach those of a more balanced bacterial community as the soil conditions become more favorable throughout the growing season. A gram (-) dominated soil may be due to anaerobic conditions or other stressors such as pesticide application or heavy metal contamination.

Gram(+):Gram(-) Ratings

Scale	Rating
< 0.5	Gram (-) Dominated
0.5+ → 1	Slightly Gram (-) Dominated
1+ → 2	Balanced Bacterial Community
2+ → 3	Slightly Gram (+) Dominated
3+ → 4	Gram (+) Dominated
> 4+	Very Gram (+) Dominated

Stress and Community Activity Ratios

Saturated : Unsaturated

Your Results:

Saturated:Unsaturated	**1.07**

Bacteria alter their membranes under various environmental conditions in order to maintain optimal fluidity for nutrient and waste transport into and out of the cell. Saturated fatty acids may reflect a better adapted community to current environmental conditions. Communities under stressed conditions will increase their proportion of unsaturated fatty acids. This will likely occur most often as a result of low soil moisture or drastic changes in temperature. In general, a higher number indicates a healthier and more stable community.

Monounsaturated : Polyunsaturated

Your Results:

Monounsaturated:Polyunsaturated	**18.21**

The ratio of monounsaturated to polyunsaturated fatty acids is used along with the sat:unsat ratio to further indicate the degree of community stress. A higher ratio indicates less stress, while a lower ratio would depict higher levels of prolonged stress due to conditions such as temperature, moisture, pH, or nutrient availability (starvation).

Pre 16:1w7c : cy17:0 - Pre 18:1w7c : cy19:0

Your Results:

Pre 16:1w7c:cy17:0	**3.60**
Pre 18:1w7c:cy19:0	**2.77**

Cyclo (cy) fatty acids are more prominent during stationary phases of growth or under high stress conditions that influence membrane fluidity and growth rates such as temperature, pH, moisture, and nutrient availability. In general, a higher number or all Pre16/Pre18 is better and indicates an actively growing community experiencing fewer stressors. These values are typically higher early in the growing season (planting) when the community is becoming active and experiencing fast growth. The values may begin to drop towards the end of the growing season (harvest) following a decrease in plant growth activity or as the community approaches a stationary growth phase as the temperature/moisture changes between the seasons.

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