

ECOLOGICAL OUTCOME VERIFICATION REPORT

BASELINE YEAR

(1st year of monitoring)

HOLISTIC MANAGEMENT CANADA

RM 3 Enniskillen
Adrienne J. Hanson
Glen Ewen, Saskatchewan Canada

Monitor: Bronwyn Green &
Dana Penrice

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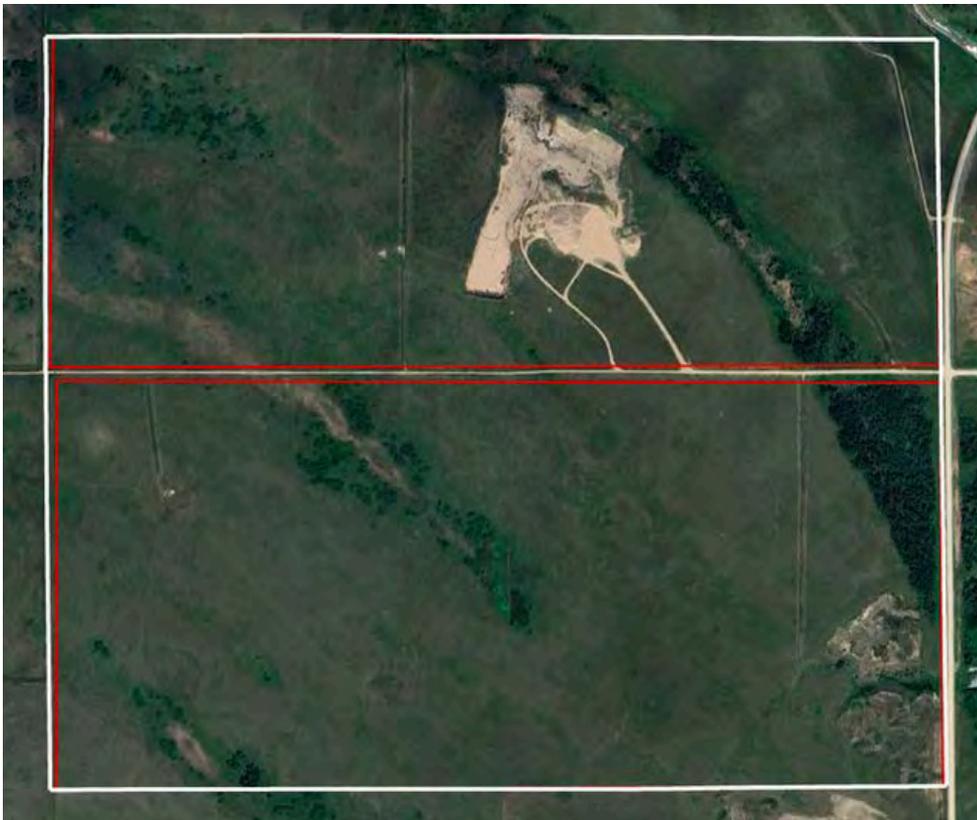
1. LAND BASE INFORMATION

RM 3 Enniskillen is located in the Aspen Parkland Ecoregion south of Glen Ewen, Saskatchewan, Canada. The land base covers 547 acres. The landbase is owned by the RM and will be split up into 30 paddocks. There has been no animal impact on this landbase for over two years, leaving it overrested after years of continuous grazing. The landbase is mostly perennial grassland pastures dominated by cool-season grasses and forbs with a small strip of open woodland. The land will be managed with animals in the near future.

FIG. 1 GRAZING LANDBASE

DESCRIPTION	ESTIMATED VERIFIABLE AREA (acres)	% TOTAL AREA
Grassland	443.8	92.83%
Open Woodland	34.3	7.17%
Total Verifiable	478.10	

FIG. 2 MAPS OF FARM



The farm is located in a non-brittle environment of 4 on the brittleness scale which is a measure of the distribution of precipitation throughout the year. The climate of this farm tends toward humid. This is important when predicting how the land ecosystem will respond with different management decisions.

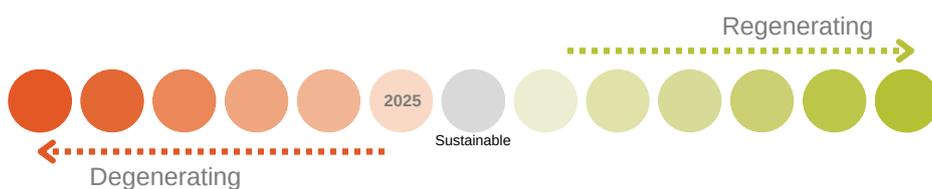


FIG. 3 GRAPH OF THE MOISTURE DISTRIBUTION IN THE AREA - VIRDEN (THE CLOSEST MAJOR TOWN)

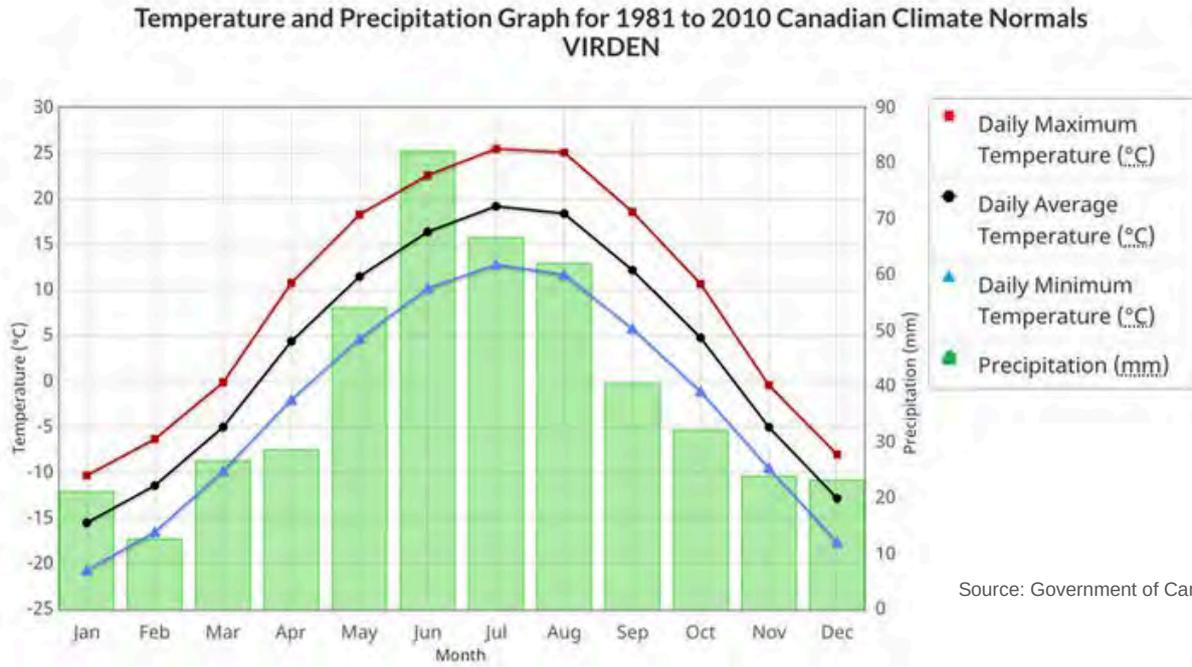


FIG. 4 GRAPH OF THE TOTAL MONTHLY PRECIPITATION IN THE AREA - VIRDEN (THE CLOSEST MAJOR TOWN)

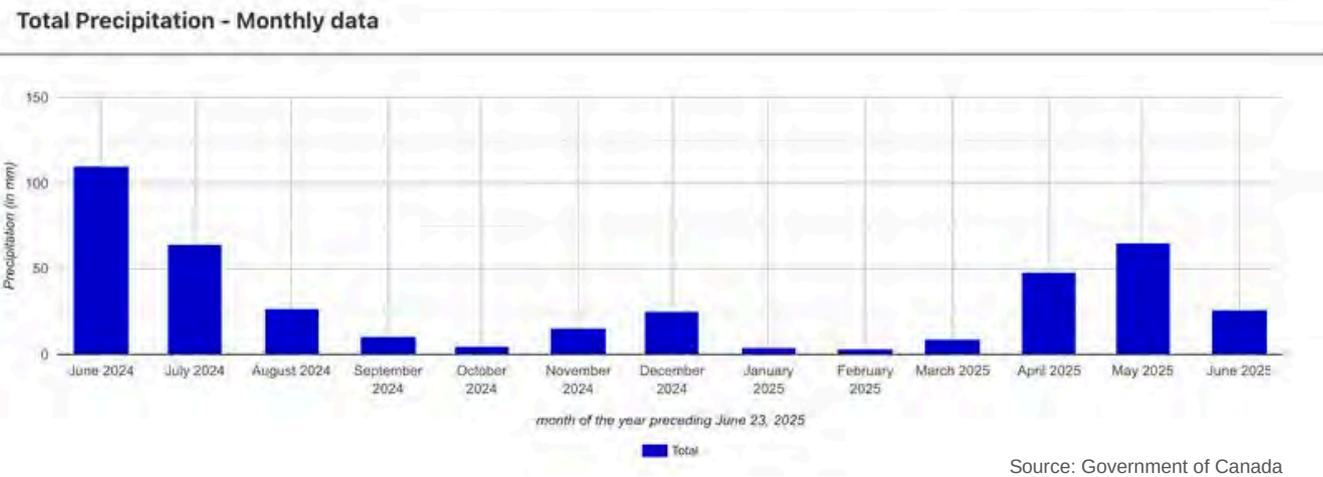
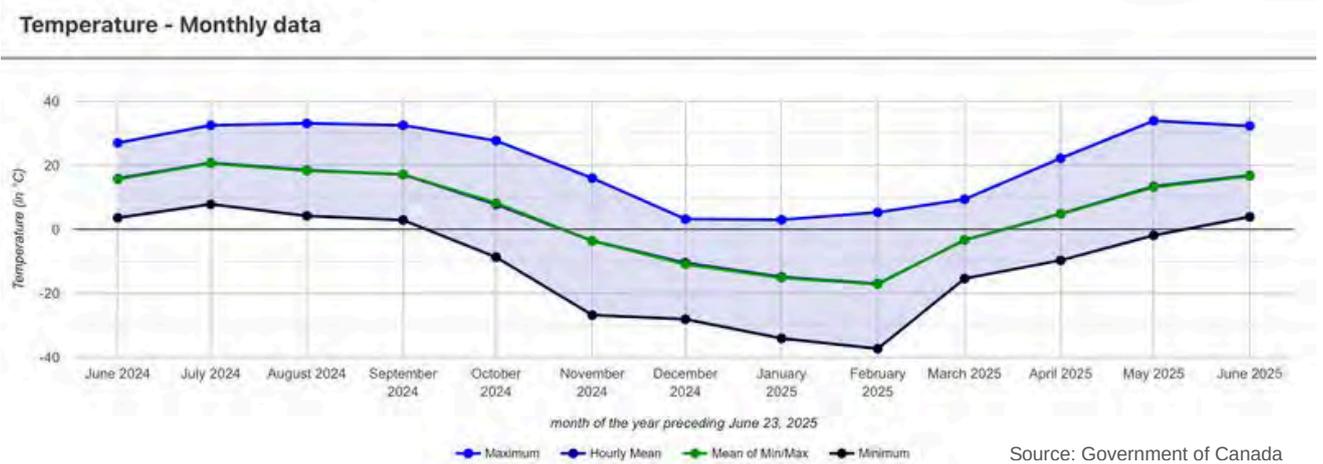


FIG. 5 GRAPH OF THE TOTAL MONTH TEMPERATURE IN THE AREA - VIRDEN (THE CLOSEST MAJOR TOWN)





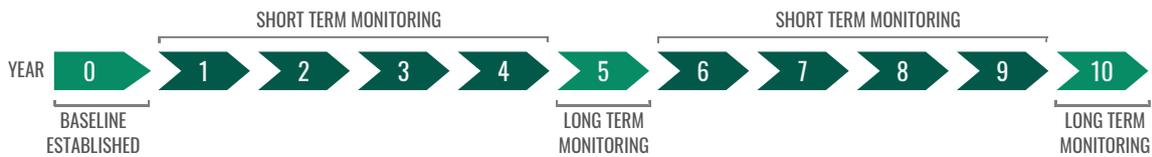
2. INTRODUCTION TO ECOLOGICAL OUTCOME VERIFICATION (EOV)

EOV was developed in collaboration with leading soil scientists, ecologists, agronomists, and an extensive network of regenerative land managers around the world. EOV is a practical and scalable soil and landscape assessment methodology that tracks outcomes in biodiversity, soil health, and ecosystem function (water cycle, mineral cycle, energy flow and community dynamics). EOV combines **Short-Term Monitoring (STM)** and **Long Term Monitoring (LTM)**.

STM measures “leading” indicators of ecological health that have predictive value about the direction of changes. This can greatly inform management based on ecological health. STM is carried out annually to show regenerative progress of the landbase.

LTM sites are fixed transects set up to track changes of “lagging” indicators that change over a longer period of time. These indicators include canopy cover by species, biodiversity indicators, water infiltration, soil carbon, and more. Because of the longer time period, this information may not support quick management correction, it does provide strong scientific validation of changes in the ecosystem processes. LTM is carried out at 5 yearly intervals.

FIG. 6 EO V MONITORING TIMELINE



Landscape function (Energy Flow, Water Cycle, Mineral Cycle and Community Dynamics) is assessed through the Ecological Health Index (EHI). EHI is assessed through an evaluation matrix customized to the Aspen Parkland Ecoregion.

FIG. 7 EHI ECOSYSTEM PROCESSES AND INDICATORS FOR THE ASPEN PARKLAND ECOREGION

ECOSYSTEM PROCESSES	INDICATORS
Water cycle Highest possible score: 30 Lowest possible score: -70	Bare Soil
	Litter Abundance
	Capping
	Wind Erosion
	Water Erosion
Mineral Cycle Highest possible score: 60 Lowest possible score: -30	Bare Soil
	Litter Abundance
	Litter Incorporation
	Living Organisms (Microfauna)
	Dung Decomposition
Mineral Cycle Highest possible score: 30 Lowest possible score: -30	Bare Soil
	Live Canopy Cover
Community Dynamics Highest possible score: 60 Lowest possible score: -70	Bare Soil
	Functional Group - Cool season & Warm season Grasses
	Functional Group - Legumes and Forbs (alfalfa, clovers)
	Functional Group - Trees and Shrubs (aspen, oak)
	Contextually Desirable Species (big bluestem, blue grama)
	Contextually Undesirable Species

Each indicator receives a score according to the degree of departure from the Ecoregion potential. The values are added to obtain a total score. The highest total EHI score for this Ecoregion is 120 and the lowest score is -140. EHI Values above 60 points reflect that ecosystem processes (water cycling, nutrient cycling, energy flow and community dynamics) are reasonably close to the potential of the site. Negative values indicate that ecosystem processes are ineffective, and far from the site's potential.

3. LAND BASE ASSESSMENT - SHORT TERM MONITORING

The results of the Ecological Outcomes Verification of RM 3 Enniskillen, carried out on June 18th, 2025 are presented. The methodology used corresponds to the EOv 3.0 protocol.

a) Ecological Health Index

A total of 10 EHI evaluations were carried out across 13 paddocks of RM 3 Enniskillen. As mentioned before, each site receives a score according to the degree of departure from the ecological area potential. The values from each monitoring site are added together to obtain a total score.

FIG. 8 MAPS OF SHORT TERM MONITORING SITES USED FOR EHI EVALUATION



FIG. 9 EHI ACROSS THE FARM

SITE	EHI SCORE
1 - Grassland	-15
2 - Grassland	-25
3 - Grassland	10
4 - Grassland	10
5 - Grassland	15
6 - Grassland	-10
7 - Grassland	-15
8 - Grassland	10
9 - Grassland	10
10 - Grassland	-5
AVERAGE EHI* adjusted to average paddock size	-3.75

FIG. 10 ECOSYSTEM FUNCTION ANALYSIS (HOW FAR ECOSYSTEM PROCESSES ARE FROM THEIR POTENTIAL ACROSS THE FARM)



While this graph shows potential areas of improvement, remember that all of these ecosystem functions are linked. For example, improving the community dynamics will improve energy flow which can affect the mineral and water cycle.



The Four Ecosystem Processes

FIG.11 ECOLOGICAL HEALTH INDICATORS & ECOSYSTEM PROCESSES GRAPH

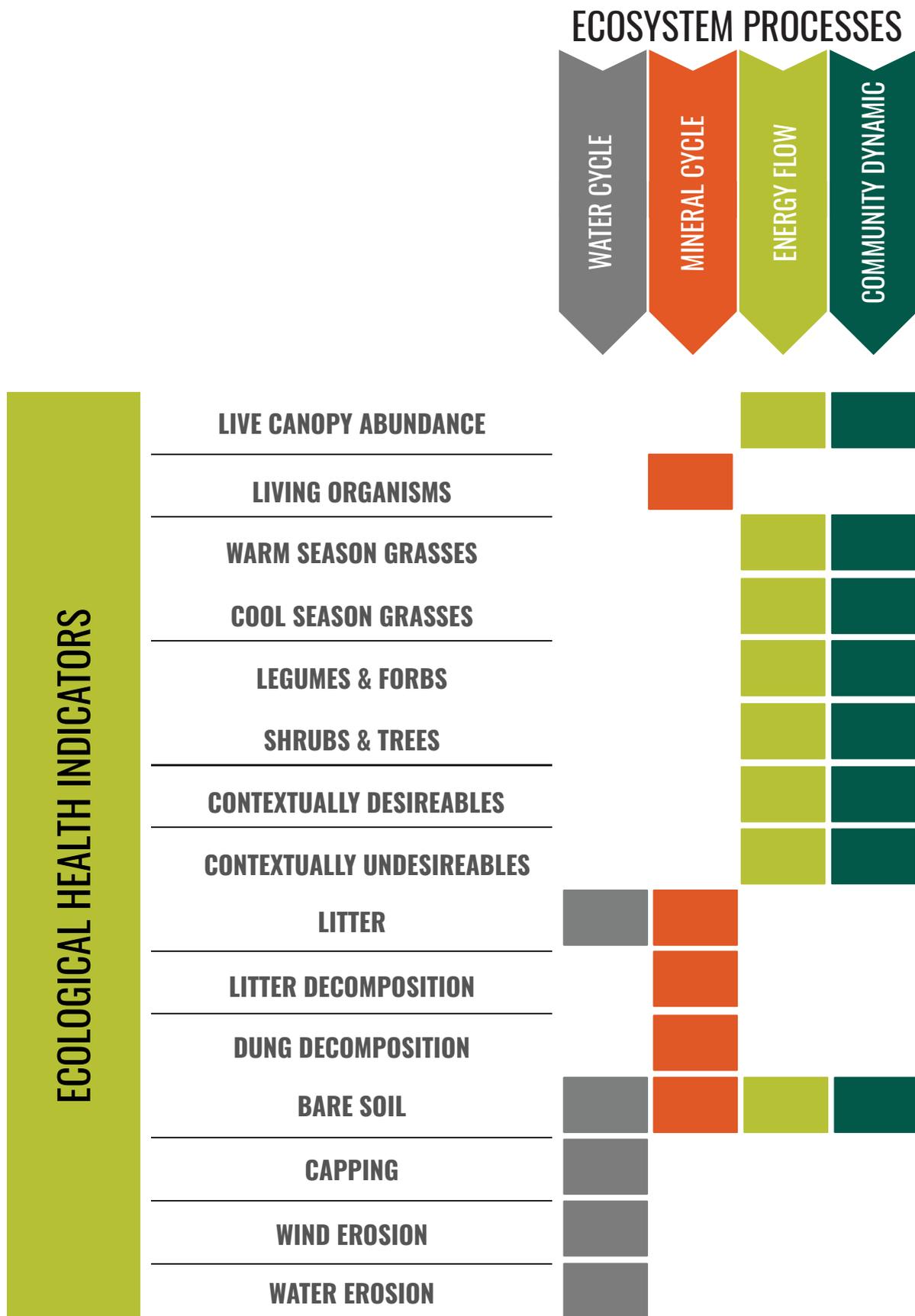


FIG. 12 BEST EHI SCORE ON THE FARM - STM SITE 5 HORIZONTAL, 45 DEGREE, STRAIGHT DOWN, AND SOIL PROFILE VIEWS





Compared to other sites on the landbase this site had an average amount of healthy, vigorous key species present but they were far from full potential. A moderate amount of young and flowering cool-season grasses, legumes, forbs and shrubs. The site has not been grazed for a few years so there was a lot of dead standing grass as a result of over-rest. This site had more diversity than most grassland sites across the landbase.



FIG. 13 WORST EHI SCORE ON THE FARM - STM SITE 2 HORIZONTAL AND 45 DEGREE VIEWS, AND STRAIGHT DOWN





STM Site 2 had minimal amount of canopy abundance and the plants were spaced far apart with bare soil in between that was exposed to the sun. The plants seemed to be slightly stunted or stressed. Minimal amount of litter abundance and litter decomposition. Microorganism activity was low. There was the most amount of bare ground at this site.





4. LAND BASE ASSESSMENT - LONG TERM MONITORING (BASELINE YEAR)

One LTM site was installed in the grasslands. The site was selected based on the methodology of EOVS 3.0 protocol. The following indicators were evaluated:

- Percentage of bare soil, litter and live canopy abundance
- Botanical composition by species and functional groups
- Species richness and Shannon-Wiener Index (biodiversity indexes)
- Distance to the nearest perennial plant
- Infiltration rate (mm/min)
- Soil Health Assessment samples (2 samples)

FIG. 14 LONG TERM MONITORING SITE 1 EHI SCORE BREAKDOWN - GRASSLAND

EHI	LTM SITE 1 EHI SCORE (GRASSLANDS)
Live Canopy Abundance	-10
Living Organisms (Microfauna)	0
Warm Season Grass Functional Group	-10
Cool Season Grass Functional Group	0
Legumes / Forbs Functional Group	0
Trees / Shrubs Functional Group	-10
Contextually Desirable Rare Species	0
Contextually Undesirable Species	0
Litter Abundance	0
Litter Incorporation	0
Dung Decomposition	0
Bare Ground	10
Capping	0
Wind Erosion	0
Water Erosion	0
EHI SCORE	-20

FIG. 15 ECOSYSTEM FUNCTION ANALYSIS (HOW FAR ECOSYSTEM PROCESSES ARE FROM THEIR POTENTIAL ACROSS THE FARM)



FIG. 16 PERCENTAGE OF COVER BY FUNCTIONAL GROUP

Bare Soil	0%
Litter	4.50%
Cryptogamics	0%
Warm Season Grasses	0%
Cool Season Grasses	76.02%
Legumes	0.75%
Other Forbs	17.56%
Sedges & Rushes	0%
Shrubs	1.16%
Trees	0%

FIG. 17 VEGETATION COVER BY FUNCTIONAL GROUPS

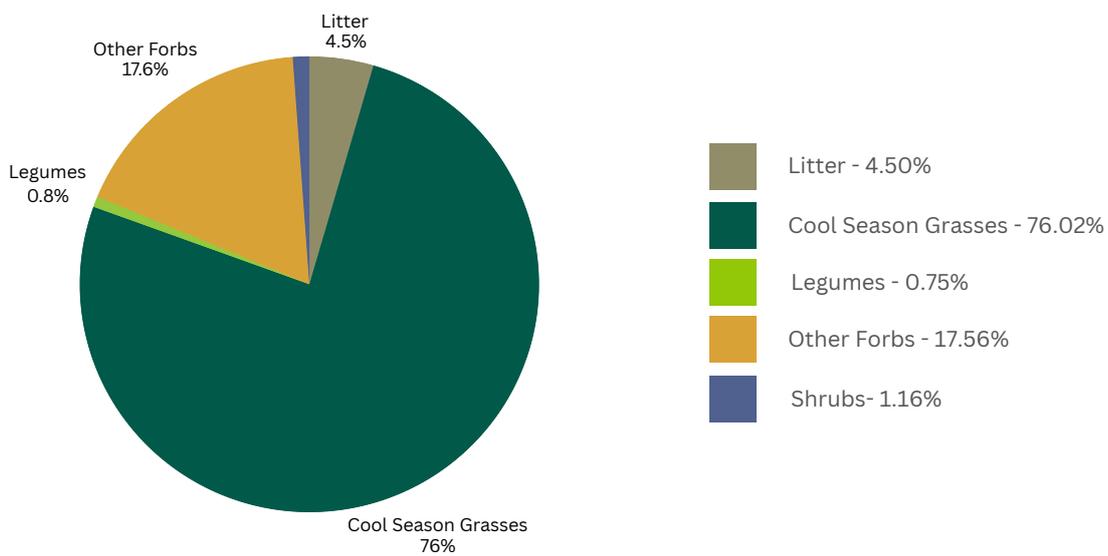


FIG. 18 WATER INFILTRATION

Rep	Time (min)	Rate (mm/min)
1	2.28	10.96
2	4.30	5.81
3	3.27	7.65
4	3.37	7.42
Average	3.31	7.96
Std. Dev.	0.72	1.87

FIG. 19 BIODIVERSITY INDICATORS

	LTM 1 EHI SCORE (GRASSLANDS)
Species Richness	28 (High)
Shannon-Weiner Index	1.38 (Low)
Present Functional Groups	4

5. SOIL HEALTH ASSESSMENT REPORTS - (BASELINE YEAR)

Two soil samples were collected at the identified LTM monitoring site. Samples were sent to Ward Laboratories Inc. for analysis.



FIG. 20 MAP OF SOIL SAMPLING SITES



FIG. 21 SOIL HEALTH ASSESSMENT REPORT - SAMPLE 1 & 2

LTM 1 - GRASSLAND - STAKE 7

Results For: PM 3 ENNISKILLEN Location: LTM 1 Sample ID: RME-GRASS-S7 Depth: 0-4 in

Soil Health Assessment							
WATER EXTRACT		AVAILABLE NITROGEN LBS/ACRE		SOIL HEALTH		SOIL HEALTH	
Total Nitrogen, ppm N	31.9	Nitrate, Lbs/Acre	11	Soil Respiration, ppm CO ₂ C	239.0	Microbially Active Carbon, % MAC	103.6
Organic Nitrogen, ppm N	21.4	Organic Nitrogen, Lbs/Acre	26	Water Stable Aggregates (Mod), %	99	Organic C:N	10.8
Organic Carbon, ppm C	231	Organic Nitrogen Release, Lbs/Acre	26	<i>Includes 0.25-2 mm diameter sand grains</i>		Organic Nitrogen Release, ppm N	21.4
Ammonium, ppm NH ₄ -N	1.5	Organic Nitrogen Reserve, Lbs/Acre	0	Cover Crop Suggestion (Legume/Grass) 20%/80%		Organic Nitrogen Reserve, ppm N	0.0
Nitrate, ppm NO ₃ -N	9.02			Soil Health Calculation	25.46	NH ₄ NO ₃	0.2

Soil pH 1:1	Soil pH Modified WDRF	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	Organic Matter LOI %	Phosphorus		Ammonium Acetate				Sulfate M-3 ppm S	DTPA-Sorbitol					CaNO ₃ Chloride ppm Cl	Sum of Cations me/100g	% Base Saturation				
					M-3	K ppm	Ca ppm	Mg ppm	Na ppm	Zn ppm		Fe ppm	Mn ppm	Cu ppm	B ppm	H			K	Ca	Mg	Na	
6.6	---	0.14	NONE	9.7	25	276	2213	387	8	12.3	3.17	33.8	4.9	0.46	--	---	15.0	0	5	74	21	0	

LTM 1 - GRASSLAND - STAKE 5

Results For: PM 3 ENNISKILLEN Location: LTM 1 Sample ID: RME-GRASS-S5 Depth: 0-4 in

Soil Health Assessment							
WATER EXTRACT		AVAILABLE NITROGEN LBS/ACRE		SOIL HEALTH		SOIL HEALTH	
Total Nitrogen, ppm N	30.5	Nitrate, Lbs/Acre	11	Soil Respiration, ppm CO ₂ C	211.0	Microbially Active Carbon, % MAC	99.3
Organic Nitrogen, ppm N	19.8	Organic Nitrogen, Lbs/Acre	23	Water Stable Aggregates (Mod), %	99	Organic C:N	10.8
Organic Carbon, ppm C	212	Organic Nitrogen Release, Lbs/Acre	24	<i>Includes 0.25-2 mm diameter sand grains</i>		Organic Nitrogen Release, ppm N	19.8
Ammonium, ppm NH ₄ -N	2.1	Organic Nitrogen Reserve, Lbs/Acre	0	Cover Crop Suggestion (Legume/Grass) 20%/80%		Organic Nitrogen Reserve, ppm N	0.0
Nitrate, ppm NO ₃ -N	8.78			Soil Health Calculation	23.47	NH ₄ NO ₃	0.2

Soil pH 1:1	Soil pH Modified WDRF	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	Organic Matter LOI %	Phosphorus		Ammonium Acetate				Sulfate M-3 ppm S	DTPA-Sorbitol					CaNO ₃ Chloride ppm Cl	Sum of Cations me/100g	% Base Saturation				
					M-3	K ppm	Ca ppm	Mg ppm	Na ppm	Zn ppm		Fe ppm	Mn ppm	Cu ppm	B ppm	H			K	Ca	Mg	Na	
7.0	---	0.15	NONE	11.3	24	388	2522	445	7	12.4	2.32	28.5	4.3	0.33	--	---	17.3	0	6	73	21	0	

Recommendation is to print your soil health assessment report and the example report to compare and highlight lows and highs of nutrients.

SUMMARY OF HANEY TEST INTERPRETATION GUIDE V1.0

Soil pH - Controls the availability of other nutrients in the soil - between 6.5 pH - 8 is ideal (neutral pH range). Over 8 or under 6 you start losing availability in the nutrients. A pH of 7 is neutral. As the pH drops soil becomes more acidic, whereas if it goes up it becomes more alkaline. In most states when the pH gets below 6, we begin to think about applying lime.

Soluble Salts 1:1 (electrical conductivity) - measurable dissolved solids that we can extract from the soil with water and measure the electrical conductivity of that water to give us this number. Soluble Salts concentration up to 2 start to damage plant growth, toxic to plant roots. 1.5 or higher you need to start fixing it because above 1.5 means we have a saline condition when the plant nutrient levels get too high the soluble salt readings will increase. A Soluble salt reading around 0.3 is to say you have a good living soil. If you're above 0.6 or 0.7, then you want to investigate what may be wrong, whether your nitrates or sulfates are too high, or something else is too high.

Excess Lime Rating - liming quality of your soil. If you have a high pH, you'd possibly have an excess lime rating. This is a way of determining if you have a calcareous soil

Organic Matter, %LOI - average is 2% - 4%, above 5% is high. Organic or peat based soil can range from 30% - 40%. Organic matter is the measurement of the dead plant material in the soil. LOI = "loss on ignition". Test method is: Dry the soil out and weigh it. Put it in a furnace and burn it at over 500 degrees Fahrenheit. Causes organic matter to burn off. Then weigh it again and that gives us a % of organic matter that was present. This changes very slowly over time. So monitor this to see if it goes up over time. Less tillage/soil disturbance will increase your O.M. numbers trend upward. Benefits of more O.M.; better aggregation, better water infiltration/drainage, better aeration, less erosion, better water holding capacity, drought resiliency, active soil life improves nutrient available. *The important thing for farmers to understand is that each percent of organic matter contains at least 1,000 pounds of nitrogen (N) per acre in that 0- to 8-inch depth. This test has a 2.8% so that's 2,800 pounds of organic N stored in the top 8 inches of soil.

Soil Respiration CO₂-C, ppm C - 71 to 100 is above average, 101 to 200 is high. How much CO₂ the microbial biomass is giving off. The higher the number you get the more microbial biomass you have. The higher the better. Most agriculture soils are degraded and read under 200 ppm. Potential is up to 1000 ppm. A soil with a very low score may exhibit symptoms of slow residue breakdown. On the other hand, residue may cycle very quickly in soil with a high score. Therefore, residue management strategies and the soil respiration score one might strive for are going to be dependent on the type of production system you find yourself in.

Water Extract - The most readily available food source for your microbial population. Organic carbon and nitrogen is the food. If there isn't enough of those nutrients then the microbial will start eating organic matter and glues that hold your soil aggregates together. The water extractable organic nitrogen or WEON represents the pool of organic N that is available to the microbes. Think of organic N as amino acids and proteins, which are linked to the carbon or food that the microbes are eating. The water extractable organic carbon or WEOC is a measure of the organic carbon or food that is most readily available to the microbes. Much in the same way we measure protein in the foodstuff for livestock, the Haney Test is measuring the amount of protein available to the microbes. Feeding the microbes an N rich food source, such as manure or a low C:N ratio cover crop, allows them to better carry out many important functions in the soil that can benefit the crop and your pocketbook. One of these functions is N mineralization or the conversion of organic N into plant available forms such as nitrate and ammonium. In a healthy soil with greater biological function this can lead to a reduced need for synthetic N fertilizer.

- Total Nitrogen, ppm N: total amount of nitrogen in soil. Does not mean the total nitrogen that is available to plants.
- Organic nitrogen, ppm N: is tied up in a variety of forms, organic matter, microbial organisms, plant residue. Plants break down nitrogen through the process called mineralization into inorganic nitrogen that can then be taken up by the plant root. 10 - 40 ppm is typical.
- Total Organic Carbon, ppm C: 100 - 300 ppm is typical (Time of year & temperature of soil plays an important role)
- Ammonium-N, H₂O ppm C: 2 - 10 ppm is ideal
- Nitrate-N H₂O, ppm N: 10 - 30 ppm ideal

Calculations

Microbial Active Carbon (%MAC) - don't want at 100% because that means the microbial are running out of food, ideally 50 -75% is good. Above 75% and you risk your microbial population to run out of food (carbon) soon and may need to reintroduce soon

Organic C and N ratio - It is very important to note that there are a lot of different C:N ratios discussed in agriculture. This particular C:N ratio is that of the water extract performed as part of the Haney Test. This ratio is not the same as the total C:N ratio of your soil or the manure or cover crop you are using or even the C:N ratio of the organic matter in your soil. Decomposition and breakdown by microbes reduces the C:N ratio of the starting material.

ORGANIC C:N RATIO RANKING TABLE

Ratio Results	Ranking	N Implications	Management Needs
>20:1	Poor; too much organic C and/or not enough organic N	N tie up by microbes: No N credit given from WEON pool	Increase legumes in rotation or covers; reduce carbon inputs; graze longer to reduce carbon
Between 15:1 - 20:1	Marginal	Some N tie up; Slower mineralization; Lower N credit from WEON	Increase legumes in rotation or covers; reduce carbon inputs; graze longer to reduce carbon
Between 8:1 - 15:1	Good	Less N tie up; greater potential for N mineralization; higher credit from WEON	Make slight adjustments if near the boundaries to keep within range
Between 10:1 - 12:1	Ideal	Greatest potential for N mineralization from WEON pool; good balance of available energy and N for microbes	Increase intensity to drive both WEOC and WEON up together to help increase biological processes
<8:1	Poor; Too little organic C and/or too much organic N	Limited energy for microbial activity; N credit may still be high if soil respiration and WEON are also high	Increase carbon inputs; graze shorter to retain carbon

Ward Laboratories Inc. 2020, Haney Test Interpretation Guide v1.0,
<https://www.wardlab.com/wp-content/uploads/2020/02/Haney-Rev-1.0-Interpretation-Guide-PDF-1.pdf>

Soil Tests

Chemical extraction methods: M3, NH4OAc, DTPA,

Soil Fertility Ratings for Haney H3A Extraction Table

Compare your soil tests with the ratings in the tables below.

Nutrient	Very Low	Low	Medium	High	Very High
	-----ppm-----				
PO4-P	0 – 4	5 – 11	12 – 22	23 – 45	45+
ICAP Phosphorus	0 – 5	6 – 12	13 – 25	26 – 50	51+
Potassium, K	0 – 18	19 – 36	37 – 53	54 – 89	90+
Sulfate, S	0 – 3	4 – 6	7 – 10	11 – 14	15+
Magnesium, Mg	0 – 6	7 – 11	12 – 20	21 – 29	30+
Zinc, Zn	0 – 0.12	0.13 – 0.25	0.26 – 0.38	0.39 – 0.50	0.51+
Iron, Fe	0 – 2.0	2.1 – 4.0	4.1 – 9.0	9.0 – 20.0	20.1+
Manganese, Mn	0 – 0.5	0.6 – 1.0	1.1 – 2.0	2.1 – 3.0	3.1+
Copper, Cu	0 – 0.03	0.04 – 0.07	0.08 – 0.10	0.11 – 0.20	0.2+

Ward Laboratories Inc. 2020, Haney Test Interpretation Guide v1.0,
<https://www.wardlab.com/wp-content/uploads/2020/02/Haney-Rev-1.0-Interpretation-Guide-PDF-1.pdf>

- Potassium, Magnesium, Calcium: essential nutrients for plants
- Phosphorus: 25 - 50ppm is typical. Over 25 is high. This calculates what is available by plants. High levels make the phosphorus mobile and can cause problems to aquatic life from surface level run off. High levels can cause deficiencies in zinc and iron levels in the soil. Very high when animal manure is added.
- Potassium: 40 - 80 ppm, above 150 ppm is high (200 ppm is good for corn) some references say 150 - 250 is a good range
- Zinc: 2 - 25 ppm (1 - 3 is ideal)
- Iron: 50 - 100 ppm
- Manganese: 1.6 is sufficient. Above 3 and below 50 is ideal, if pH is above 7 there are usually manganese deficiencies
- Copper: 5 - 8 ppm (over 50 in sandy soil can cause root toxicity)
- Sulfate: 7 - 15 ppm is typical numbers, below 12 is ideal, other references say 2 - 10 is ideal
- Calcium: 430 - 540 ppm. Sandy soil is between 400 -500, Clay soil is above 2500 ppm. High levels indicate the greater soil clay content. Some references say 1000 - 2000 ppm is an ideal range
- Magnesium: 40 - 50 ppm, other reference says 60 - 180 ppm
- Sodium: 80 - 120 ppm (2000 ppm is way too high). You want this value as low as possible because sodium is bad for the soil. A lot of people associate sodium and salt together. Sodium is called a sodic soil and salts are called a saline soil. So there's a big difference in the terminology.
- Zinc: below 1ppm is ideal
- Iron: Iron is more soluble as the pH becomes more acidic, and this is a low pH, so the iron test is very high. We want the iron test above 4.5 ppm. If it's below 4.5, and you have a pH above 7, and high excess lime, you likely have iron deficiency chlorosis (IDC) problems.
- Copper: above 0.20 or above 0.6 is ideal

Soil Health

- Soil Health Calculation: The soil health score is a summary of the soil respiration, WEOC and WEON measured by the Haney Test and represents the current health level of your soil based on these indicators. The score is aimed at providing a producer a quick reference regarding the health of their soil compared to other soils under different types of management. 0 - 50 is the range, most soils do not exceed 30. Ideal is above 7 as a baseline. Region plays a huge role in this. New Mexico soil because of temperature and soil type will score lower than Iowa soil because of that climate. Tip: Yield is not a great indicator for soil health.
- Cover Crop Suggestion: Suggestion of what to plant as your cover crop based on your soil test data. "The percentage of grass to legumes/brassicacis is based on two factors. First is the C:N ratio. If the ratio is below 8:1, then we are going to suggest a higher percentage of grasses to help increase the amount of carbon going into the system. On the other hand, if the ratio is above 20:1, then we are going to suggest a higher percentage of legumes to help provide you with the organic N needed to help you start the residue decomposition and nutrient cycling processes. If your C:N ratio falls in the desired range, then we base the mix of grasses to legumes from the soil health score. The number one factor going into the soil health score is soil respiration. Remember that respiration is an indicator of living microbial biomass. Therefore, if you have a high soil health score you likely have a high respiration value, meaning more microbes to feed and your soil's need for additional carbon inputs is greater. This leads to a higher amount of grass being recommended in the mix. If your soil health score and respiration is relatively low, but you are still balanced for C:N, then we want to add more legumes and brassicas because you have less microbes available to breakdown residue" Haney Test Interpretation Guide v1.0, 2020, p.11 - 12.
- Water Stable Aggregates (Mod) %: Measure on a scale of Class 1 - 6. Class 1 being less than 50% and Class 6 being greater than 75% structural integrity. Changes in aggregate stability may serve as early indicators of recovery or degradation of soils and, more generally, ecosystems. Perennial plants can often persist long after the soil and plant community have become too degraded to support plant regeneration, while recovery is often occurring long before desirable plants become reestablished. Calcium in the soil generally promotes aggregation, whereas sodium promotes dispersion. The quantity of calcium and sodium is specific to each type of soil and can vary greatly at different soils depths. Grazing.—Disturbance of the soil surface by grazing animals has both beneficial and detrimental effects on aggregate stability. Properly managed grazing can deposit litter and standing dead vegetation onto the soil surface, increasing soil surface organic matter content. Conversely, improper grazing removes protective plant litter cover exposing the soil surface to degradation and loss by erosion. Long-term improper grazing, which significantly reduces plant production, disrupts formation of aggregates by reducing the inputs of organic matter.

Sum of Cations me/100g: This is an indication of texture and the amount of organic matter in the soil. The clay and organic matter provide the CEC, and then the type of clay also affects the CEC or the sum of cations. If extremely high levels of a single cation exist, plant deficiencies of other cations may occur due to competition for plant uptake.

CEC - Cation Exchange Capacity: This measures the ability of the soil to store and release nutrients. This number also helps to define the soil's texture and composition. Sandy soil to loam soil CEC will vary from 1 to 40, but the most common range is from 13-25 CEC.

EX: 16.1 would indicate a silt-loam soil, and this soil is in fact a Muir silt loam.

% Base Saturation: H, K, Ca, Mg, Na: Percent base saturation is closely related to CEC and pH. This measurement indicates the nutrient supply and balance of cations for K, Mg, Ca, H, and Na. Soils with a high percent base saturation can be more fertile because they often have a higher pH and can contain greater amounts of these nutrients for use by plants.

H: Hydrogen below 30% is ideal

K: Potassium 5% is ideal

Ca: Calcium between 60 - 65% is ideal. If it's low it's because the hydrogen is high. If we apply lime, the calcium will replace hydrogen. Some people like to see 60% - 75%.

Mg: Magnesium between 10 - 18% or if the levels are good in the other test above, then you are good for saturation

Na: Sodium above 5% you have an issue

Resources:

[Understanding Soil Health Assessment - video](https://www.google.com/search?client=opera&q=wardlab+understanding+the+soil+health+assessment+report&sourceid=opera&ie=UTF-8&oe=UTF-8#fpstate=ive&vld=cid:6999db18,vid:fqlqQcmS4Us): <https://www.google.com/search?client=opera&q=wardlab+understanding+the+soil+health+assessment+report&sourceid=opera&ie=UTF-8&oe=UTF-8#fpstate=ive&vld=cid:6999db18,vid:fqlqQcmS4Us>

[Haney Test Analysis](https://www.wardlab.com/wp-content/uploads/2020/02/Haney-Rev-1.0-Interpretation-Guide-PDF-1.pdf): <https://www.wardlab.com/wp-content/uploads/2020/02/Haney-Rev-1.0-Interpretation-Guide-PDF-1.pdf>

[More info](https://www.striptillfarmer.com/articles/2331-how-to-read-a-soil-test-report): <https://www.striptillfarmer.com/articles/2331-how-to-read-a-soil-test-report>

6. SUMMARY

- The Landbase Ecological Health Index varied from 15 to -25, with an average of -3.75.
- EHI at the LTM sites represent the farm average.
- Infiltration rates are rapid.
- According to the interpretation guide the Shannon Wiener index is low.
- The Richness species is high.
- The number of Functional Groups present is medium.
- Average soil %LOI Living Organic Matter from the LTM site was 10.5%.
- Average Total Organic Carbon from the LTM site was 221.5 ppm.
- The land is currently stocked at 0 animal units.
- The carrying capacity was not calculating this year because there were no animals. However forage clippings were taken and can be calculated in the future.



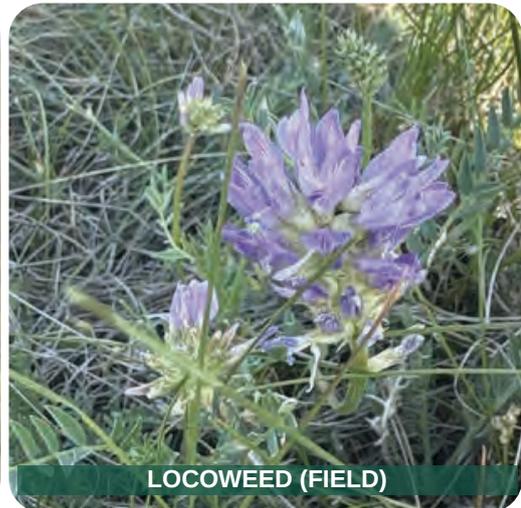


APPENDIX 1: SHORT TERM MONITORING PHOTOS

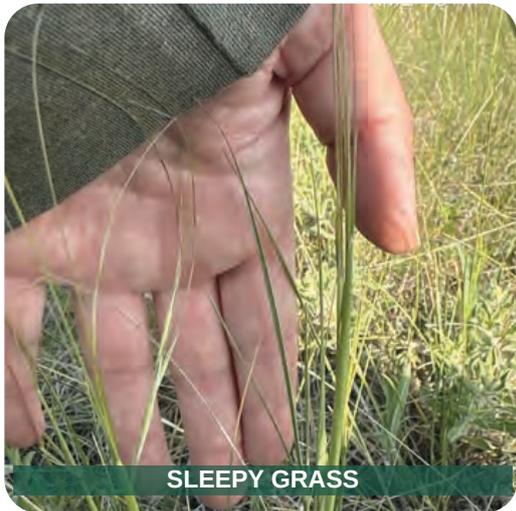
What to look for in the photos;

- canopy abundance (height & thickness)
- ground cover
- variety of plants
- soil texture & colour, root depth
- litter & litter incorporation

STM-1



STM-1



SLEEPY GRASS



JUNEGRASS



SAGEWORT (PRAIRIE)



GAURA (BIENNIAL)



FOXGLOVE (WILD)

STM-2



SOIL PROFILE



BLANKETFLOWER



LOCOWEED (FIELD)

STM-2



BEDSTRAW (NORTHERN)



FOXGLOVE (WILD)



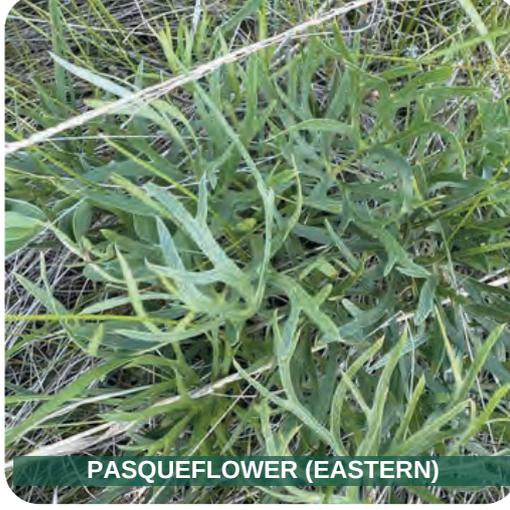
ANEMONE (CUTLEAF)

STM-3



SOIL PROFILE

STM-4



STM-5



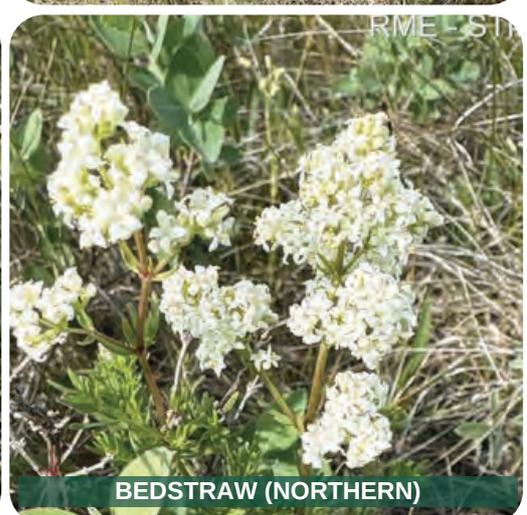
STM-6



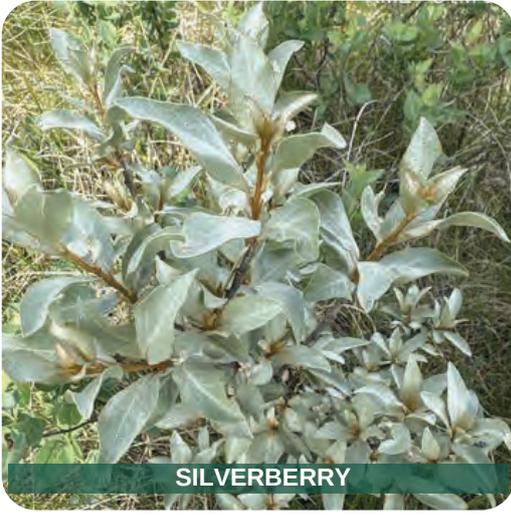
STM-7



STM-8



STM-8



SILVERBERRY



VETCH (AMERICAN)

STM-9



Jun 18, 2025 at 10:00
+49.175935, -102.0
RME -



Jun 18, 2025 at 10:00
+49.175935, -102.0
RME -



Jun 18, 2025 at 10:00
+49.175935, -102.0
RME -



SOIL PROFILE

STM-10



Jun 18, 2025 at 10:00
+49.170797, -102.0
RME - S



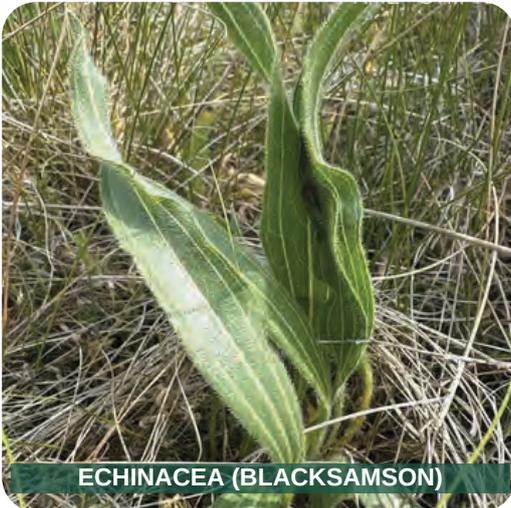
Jun 18, 2025 at 10:00
+49.170797, -102.0
RME - S



Jun 18, 2025 at 10:00
+49.170797, -102.0
RME - S



SOIL PROFILE



ECHINACEA (BLACKSAMSON)



SLEEPY GRASS



APPENDIX 2: LONG TERM MONITORING PHOTOS

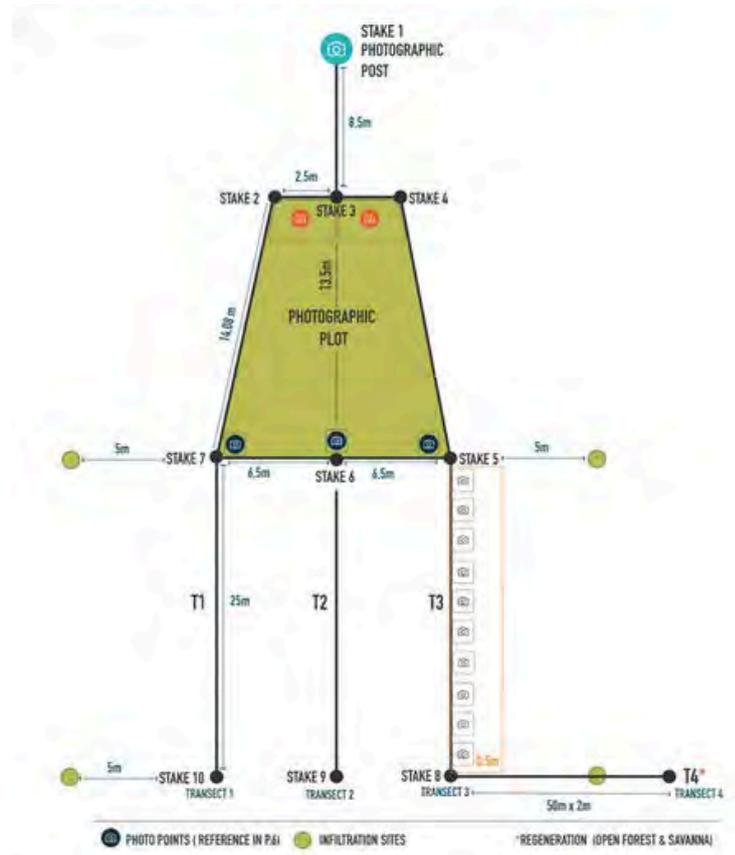
Diagram of Long Term Monitoring Site

LTM SITE 1:

Grassland Long Term Monitoring Site is located at Short Term Site #10.

We chose a site that scored closest to the average of the 10 Short Term Sites on the farm. The average was -3.75.

STM site 10 scored -5.



LTM SITE: 1



PHOTOGRAPHIC STAKE 1:



1

PHOTOGRAPHIC STAKE 2:



2

3

4

PHOTOGRAPHIC STAKE 4:



7

6

5

PHOTOGRAPHIC STAKE 7:



PHOTOGRAPHIC STAKE 6:



PHOTOGRAPHIC STAKE 5:





T3

1

2

3

4

5

6

7

8

9

10



T3

1

2

3

4

5

6

7

8

9

10



T3

1

2

3

4

5

6

7

8

9

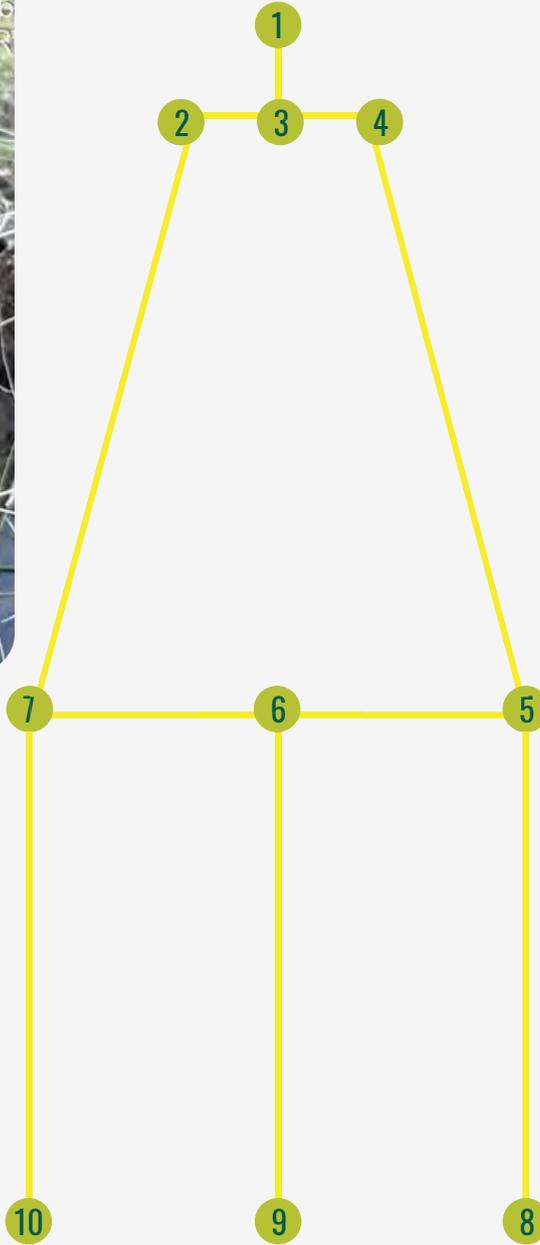
10

SOIL DESCRIPTION PHOTOS

STAKE 7:



STAKE 5:



STAKE 10:



STAKE 8:



PLANTS FOUND AT SITE

These photos help us to catalogue the plants that we saw this year so we can document their health and vigor as well as monitor if those species are increasing or decreased over time.



WORMWOOD (COMMON)



WALLFLOWER (WESTERN)



ROSE (PRAIRIE)



PLUM (GROUND)



BLANKETFLOWER



BLANKETFLOWER



BIGSEED BISQUITROOT



DOTTED GAYFEATHER



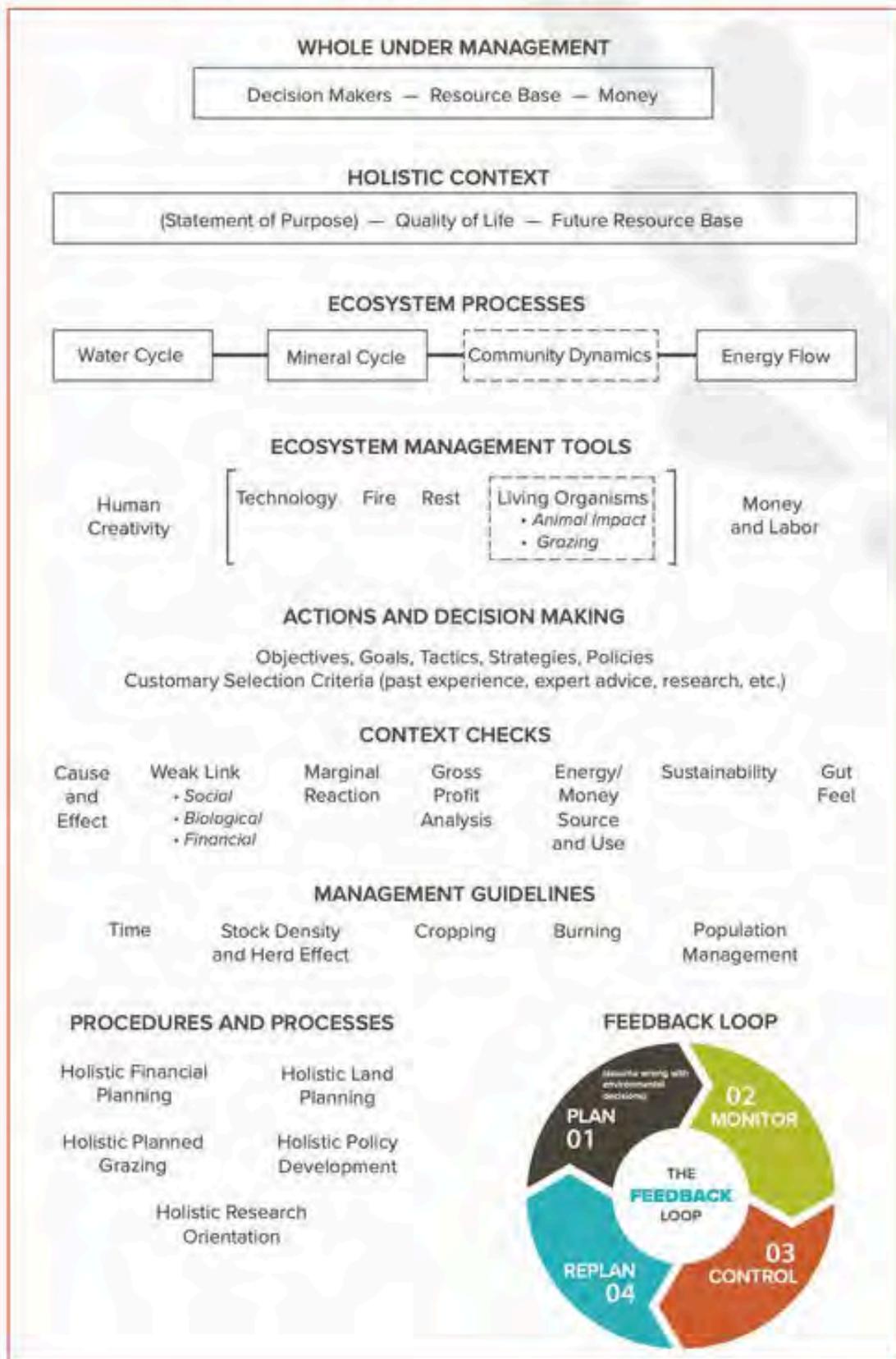
MUSTARD (TREACLE)

APPENDIX 3: INDICATOR INTERPRETATION GUIDES

INDICATOR	UNIT	LOW	MEDIUM	HIGH	VERY HIGH
		Average Score	<0	1-30	30-60
EHI	INTERPRETATION	High to extreme departure from Ecoregion potential. Ecosystem processes affected	Moderate departure from Ecoregion potential. Ecosystem processes affected.	Light to moderate departure from Ecoregion potential. Most Ecosystem processes perform about 60% of all potential	Light departure from Ecoregion potential. Effective Ecosystem processes. Healthy land.
	Nº of Species	<15	15-25	25-35	>35
SPECIES RICHNESS	INTERPRETATION	Low Biodiversity	Moderate Biodiversity	High Biodiversity	Biodiversity at full expression
	Index	<1,5	1,5-2,5	2,0-2,5	>2,5
SHANNON-WEAVER INDEX	INTERPRETATION	Cover is dominated by few species	Moderate dominance of some species	Cover is distributed relatively even between species	Cover is well distributed between species
	Minutes/25mm	>30	10-30	3 to 10	<3
INFILTRATION RATE	mm/hr	<50	50-150	150-500	>500
	INTERPRETATION	Moderate to very slow infiltration rate	Moderately rapid infiltration rate	Rapid infiltration rate	Very rapid infiltration rate



HOLISTIC MANAGEMENT FRAMEWORK



As you review this report and integrate this data into your management decisions, we encourage you to review the Holistic Management framework. Our educators are available to support you one-on-one or through a course. Reach out through our website.