

Results of Nevada Soil tests conducted in 2019
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Twenty-two soil tests were taken from three ranches in the Elko area, plus six soil tests were taken from the Reno and Carson City area. The purpose of these tests, were to see the difference between the soil nutrient and organic matter levels needed for the native forage grasses, and also see if the presence of weeds like cheatgrass, thistles and medusahead weed grass, was due to organic matter or nutrient levels different than those needed by the native grasses. In one case, the European weed thistles within a cattle pen thrived, when cattle manure drove the soil nutrient levels too high and became toxic to the native grasses. The thistles were resistant to those high levels, so formed a monoculture in that soil.

Protocol--

The tests were of soil from the top two inches of rangeland soils, sifted through a ¼ inch screen to remove vegetation and rocks, and a one quart sample was mailed to the Waypoint Lab at 4741 East Hunter Ave., Suite A, Anaheim, CA 92807 Phone (714) 282-8777 with the manager of project Annmarie Lucchesi – Office phone 408-727-0330.

There were three variations of the tests conducted: A-17 gave the major and minor nutrients and pH—N, P, K, Ca, Mg, Cu, Zn, Mn, Fe, B, and Sulfates, in a color bar-graph format and compared the amount of each nutrient found with a threshold "Sufficiency Factor". The Sufficiency Factor of "1.0" equals "Optimum" and below that number is rated from Very Low, Low, or Medium. Above 1.0, that is rated Very High.

The A-01 test is exactly like the A-17, except it excludes the minor nutrients, and only covers N, P, K, Ca, and Mg, plus pH. The A-19-1 covers the percentage of organic matter.

"Threshold" nutrient and organic matter for each native forage grass—Soil samples were taken from around the base of native grass seedlings, to determine what the soil nutrient threshold are for each species of native forage grass and what levels are required for their seedling's survival.

The soil sample locations around Elko, Nevada are noted in parentheses as Mitch plot, Jeff plot, Rachel plot and Town of Elko plot. The other plots are Spring Creek, Carson City and north of Reno, plus a 1993 plot north of Reno.

Soil organic matter in the top two inches, converted to metric tons of carbon sequestered per acre. Organic matter is 58% carbon, so every 1% organic matter in the top 2 inches equals 2.9 metric tons of sequestered carbon. 1% = 2.9 tons, 2% = 5.8 tons, 3% = 7.8 tons, 4% = 11.6 tons, etc. One "Carbon Credit" is one ton of sequestered carbon per hectare (2.5 acres).

Measuring the percentage of organic matter in Nevada soil--after burns or in areas with marginal forage plants like cheatgrass--the sequestered organic matter in the soil may provide a carbon-credit income for ranchers, especially during the years that is required for the native forage grasses to recover from fires. Also, some native grasses that are marginal for forage, like Great Basin Wild Rye, the soil carbon and the above-ground vegetation-carbon that is produced, by not harvesting or grazing those stands, may provide a greater income than forage production.

CHEATGRASS

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline	Qualitative Lime	
pH	7.5 s.u.									Medium

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS					NO3-N
			Very Low	Low	Medium	Optimum	Very High	
Available-N	20 ppm	0.3						12 ppm
Phosphorus (P) - Olsen	39 ppm	1.1						NH4-N 8 ppm
Potassium (K)	750 ppm	4.0						
Potassium - sat. ext.	2.7 meq/L							Total Exchangeable Cations(TEC) 106 meq/kg
Calcium (Ca)	1520 ppm	0.9						
Calcium - sat. ext.	4.2 meq/L							
Magnesium (Mg)	192 ppm	0.8						
Magnesium - sat. ext.	1.5 meq/L							
Copper (Cu)	0.9 ppm	0.7						
Zinc (Zn)	3 ppm	0.5						
Manganese (Mn)	2 ppm	0.2						
Iron (Fe)	9 ppm	0.2						
Boron (B) - sat. ext.	0.48 ppm	1.6						
Sulfate - sat. ext.	0.8 meq/L	0.3						
Exch Aluminum								

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen							USDA Soil Classification
		Gravel		Sand			Silt	Clay	
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002	
29 %	7.4 %								

CHEATGRASS TEST—Shows very low nitrogen, and very low manganese, iron and sulfates. However, the organic matter was high, at 7.4%. By adding the proper amounts of nitrogen, manganese, iron and sulfates, this cheatgrass site could potentially grow the native forage grasses and native forbs in the place of the cheatgrass. (Mitch plot)

POA THRESHOLD--

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.4 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	39 ppm	0.6					
Phosphorus (P) - Olsen	28 ppm	0.7					
Potassium (K)	486 ppm	2.6					
Potassium - sat. ext.	2.7 meq/L						
Calcium (Ca)	1430 ppm	1.0					
Calcium - sat. ext.	5.4 meq/L						
Magnesium (Mg)	136 ppm	0.7					
Magnesium - sat. ext.	1.7 meq/L						
Copper (Cu)	1.2 ppm	1.1					
Zinc (Zn)	2 ppm	0.5					
Manganese (Mn)	7 ppm	0.7					
Iron (Fe)	15 ppm	0.3					
Boron (B) - sat. ext.	0.31 ppm	1.0					
Sulfate - sat. ext.	0.9 meq/L	0.3					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Gravel		Weight Percent of Sample Passing 2mm Screen				
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Sand Coarse 0.5-1	Med. to Very Fine 0.05-0.5	Silt .002-.05	Clay 0-.002
34 %	4.06 %							

NO POA--

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.1 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	33 ppm	0.8					
Phosphorus (P) - Olsen	23 ppm	1.0					
Potassium (K)	403 ppm	2.8					
Potassium - sat. ext.	0.7 meq/L						
Calcium (Ca)	1800 ppm	1.0					
Calcium - sat. ext.	4.8 meq/L						
Magnesium (Mg)	200 ppm	0.8					
Magnesium - sat. ext.	1.3 meq/L						
Copper (Cu)	1.6 ppm	1.1					
Zinc (Zn)	1 ppm	0.2					
Manganese (Mn)	4 ppm	0.3					
Iron (Fe)	12 ppm	0.2					
Boron (B) - sat. ext.	0.19 ppm	0.6					
Sulfate - sat. ext.	0.5 meq/L	0.2					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Gravel		Weight Percent of Sample Passing 2mm Screen				
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Sand Coarse 0.5-1	Med. to Very Fine 0.05-0.5	Silt .002-.05	Clay 0-.002
20 %	1.21 %							

POA THRESHOLD and bare area where Poa not growing-- TESTS 1 and 2

The major difference is the percentage of organic matter, from 4.06% where Poa is growing to only 1.21% where Poa does not grow nearby. By adding about 2.8% additional organic matter to the top two inches, may allow the Poa to grow and cover bare areas.

Whenever Poa rangelands in the Elko area drop below 4% organic matter in the top two inches of soil, then that population's future could be threatened. (Jeff plot)

TWO YEAR OLD COW POOP—

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.7 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	24 ppm	0					
Phosphorus (P) - Olsen	263 ppm	0.8					
Potassium (K)	413 ppm	0.4					
Potassium - sat. ext.	0.5 meq/L						
Calcium (Ca)	4970 ppm	1.0					
Calcium - sat. ext.	4.8 meq/L						
Magnesium (Mg)	446 ppm	0.6					
Magnesium - sat. ext.	1.3 meq/L						
Copper (Cu)							
Zinc (Zn)							
Manganese (Mn)							
Iron (Fe)							
Boron (B) - sat. ext.							
Sulfate - sat. ext.							
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Set	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
280 %								

COW POOP two years old—TEST 3 – Interesting that very low in nitrogen and low in potassium, but still high in phosphorus and calcium. (Jeff plot)

STIPA THRESHOLD—

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.3 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	8 ppm	0.1					
Phosphorus (P) - Olsen	23 ppm	0.6					
Potassium (K)	438 ppm	2.3					
Potassium - sat. ext.	1.1 meq/L						
Calcium (Ca)	1860 ppm	1.0					
Calcium - sat. ext.	5.8 meq/L						
Magnesium (Mg)	159 ppm	0.6					
Magnesium - sat. ext.	1.4 meq/L						
Copper (Cu)	1.1 ppm	0.8					
Zinc (Zn)	2 ppm	0.3					
Manganese (Mn)	4 ppm	0.3					
Iron (Fe)	12 ppm	0.2					
Boron (B) - sat. ext.	0.18 ppm	0.6					
Sulfate - sat. ext.	0.3 meq/L	0.1					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen							
		Gravel		Sand			Silt	Clay	U
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002	Cl
34 %	1.71 %								

STIPA threshold --TEST 4 – Stipa seedlings can survive in very low nitrogen and fairly low in organic matter, but needs normal amounts of potassium and calcium. When replanting or improving Stipa rangelands, especially after fires, add nutrients and organic matter until you match or exceed these thresholds, to assure the Stipa seedlings’ survival. (Jeff plot)

THISTLES in corral, compared to GREAT BASIN WILD RYE---THISTLES

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	7.1 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	105 ppm	2.1					
Phosphorus (P) - Olsen	37 ppm	1.2					
Potassium (K)	1520 ppm	7.4					
Potassium - sat. ext.	11.7 meq/L						
Calcium (Ca)	2350 ppm	0.9					
Calcium - sat. ext.	22.0 meq/L						
Magnesium (Mg)	302 ppm	0.9					
Magnesium - sat. ext.	7.1 meq/L						
Copper (Cu)	1.7 ppm	0.8					
Zinc (Zn)	2 ppm	0.2					
Manganese (Mn)	204 ppm	11.6					
Iron (Fe)	10 ppm	0.1					
Boron (B) - sat. ext.	0.26 ppm	0.9					
Sulfate - sat. ext.	11.0 meq/L	3.7					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
25 %	3.09 %							

THISTLES WITHIN CORRAL – the GREAT BASIN WILD RYE---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.8 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	35 ppm	0.7					
Phosphorus (P) - Olsen	24 ppm	0.8					
Potassium (K)	576 ppm	3.8					
Potassium - sat. ext.	2.9 meq/L						
Calcium (Ca)	1420 ppm	0.9					
Calcium - sat. ext.	8.2 meq/L						
Magnesium (Mg)	134 ppm	0.7					
Magnesium - sat. ext.	2.0 meq/L						
Copper (Cu)	0.6 ppm	0.5					
Zinc (Zn)	1 ppm	0.2					
Manganese (Mn)	6 ppm	0.6					
Iron (Fe)	5 ppm	0.1					
Boron (B) - sat. ext.	0.19 ppm	0.6					
Sulfate - sat. ext.	1.3 meq/L	0.4					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen							
		Gravel		Sand			Silt	Clay	C
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002	
24 %	1.43 %								

THISTLES within corral, compared to the Great Basin Wild Rye threshold – TESTS 5 and 6.

Within a cattle corral grew a monoculture of thistles, whereas outside of the corral were Great Basin Wild Rye plants growing well. Usually thistles grow in poorer soils than the natives thrive in. But, in this case, the thistles grow in over-fertilized soil, from the concentration of animal manure, and is in excessive amounts sfor optimum growth of the natives.

The Potassium is 7x normal, manganese is 12x normal and sulfates about 4x normal. The thistle organic matter percentage is about double the Great Basin Wild Rye area test. Adding more organic matter, like hay or straw, would help absorb the excess nutrients. Adding straw would also put natural herbicide-like allelochemicals from the straw into the soil, suppressing the thistle seedlings from growing. (Jeff plot).

PIPELINE poor soil--

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline	
pH	7.3 s.u.								

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	42 ppm	1.2					
Phosphorus (P) - Olsen	16 ppm	0.7					
Potassium (K)	647 ppm	3.6					
Potassium - sat. ext.	1.7 meq/L						
Calcium (Ca)	2770 ppm	1.2					
Calcium - sat. ext.	11.0 meq/L						
Magnesium (Mg)	212 ppm	0.7					
Magnesium - sat. ext.	2.5 meq/L						
Copper (Cu)	0.9 ppm	0.5					
Zinc (Zn)	1 ppm	0.1					
Manganese (Mn)	2 ppm	0.1					
Iron (Fe)	7 ppm	0.1					
Boron (B) - sat. ext.	0.31 ppm	1.0					
Sulfate - sat. ext.	0.8 meq/L	0.3					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen							
		Gravel		Sand			Silt	Clay	
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002	
18 %	1.64 %								

PIPELINE POOR SOIL – Test 7

A pipeline went through this area, but poor revegetation, because depending on what native forage grass you want to grow back, the phosphorus is below the thresholds, at only 16 PPM. If you want Stipa or Great Basin Wild Rye to grow back, you need at least 24 PPM, or about 50% more than exists. Also, if you want Poa, the organic matter is too low at 1.64% and needs to be brought up to at least 4%. The micronutrients are also too low, just a few parts per million off the mark for the survival of any native forage grasses. (Jeff plot).

Pole Creek Burn--

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	5.9 s.u.	[Bar]						

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	33 ppm	0.8	[Bar]				
Phosphorus (P) - Olsen	40 ppm	1.6	[Bar]				
Potassium (K)	461 ppm	2.9	[Bar]				
Potassium - sat. ext.	1.3 meq/L		[Bar]				
Calcium (Ca)	2050 ppm	1.0	[Bar]				
Calcium - sat. ext.	8.6 meq/L		[Bar]				
Magnesium (Mg)	242 ppm	0.9	[Bar]				
Magnesium - sat. ext.	2.8 meq/L		[Bar]				
Copper (Cu)	0.9 ppm	0.6	[Bar]				
Zinc (Zn)	1 ppm	0.2	[Bar]				
Manganese (Mn)	3 ppm	0.2	[Bar]				
Iron (Fe)	15 ppm	0.2	[Bar]				
Boron (B) - sat. ext.	0.23 ppm	0.8	[Bar]				
Sulfate - sat. ext.	0.4 meq/L	0.1	[Bar]				
Exch Aluminum			[Bar]				

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
21 %								

POLE CREEK BURN – Test 8

The nitrogen is a little low, and the organic matter may need to be raised, to get the native grasses to grow back properly. (Jeff plot).

POA THRESHOLD

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	5.8 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	77 ppm	1.3					
Phosphorus (P) - Olsen	25 ppm	0.7					
Potassium (K)	368 ppm	2.4					
Potassium - sat. ext.	2.2 meq/L						
Calcium (Ca)	1070 ppm	0.8					
Calcium - sat. ext.	6.4 meq/L						
Magnesium (Mg)	224 ppm	1.2					
Magnesium - sat. ext.	3.3 meq/L						
Copper (Cu)	1.0 ppm	1.0					
Zinc (Zn)	5 ppm	1.4					
Manganese (Mn)	22 ppm	2.6					
Iron (Fe)	43 ppm	1.2					
Boron (B) - sat. ext.	0.35 ppm	1.2					
Sulfate - sat. ext.	0.8 meq/L	0.3					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
30 %	4.97 %							

GREAT BASIN WILD RYE

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	5.9 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	47 ppm	0.7					
Phosphorus (P) - Olsen	36 ppm	0.8					
Potassium (K)	541 ppm	2.9					
Potassium - sat. ext.	3.0 meq/L						
Calcium (Ca)	1360 ppm	0.8					
Calcium - sat. ext.	4.3 meq/L						
Magnesium (Mg)	258 ppm	1.1					
Magnesium - sat. ext.	1.9 meq/L						
Copper (Cu)	1.1 ppm	0.9					
Zinc (Zn)	4 ppm	0.9					
Manganese (Mn)	27 ppm	2.6					
Iron (Fe)	33 ppm	0.7					
Boron (B) - sat. ext.	0.22 ppm	0.7					
Sulfate - sat. ext.	0.5 meq/L	0.2					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
36 %	6.11 %							

MEDUSAHEAD--

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.5 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	8 ppm	0.1	█				
Phosphorus (P) - Olsen	23 ppm	0.7	██████████				
Potassium (K)	380 ppm	2.4	████████████████████				
Potassium - sat. ext.	0.8 meq/L						
Calcium (Ca)	1180 ppm	0.8	██████████				
Calcium - sat. ext.	2.7 meq/L						
Magnesium (Mg)	265 ppm	1.3	██████████				
Magnesium - sat. ext.	1.3 meq/L						
Copper (Cu)	1.3 ppm	1.1	██████████				
Zinc (Zn)	2 ppm	0.5	██████████				
Manganese (Mn)	37 ppm	3.8	██				
Iron (Fe)	24 ppm	0.6	██████████				
Boron (B) - sat. ext.	0.23 ppm	0.8	██████████				
Sulfate - sat. ext.	0.5 meq/L	0.2	█				
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel Coarse 5-12 Fine 2-5	Sand Very Coarse 1-2 Coarse 0.5-1 Med. to Very Fine 0.05-0.5			Silt .002-.05	Clay 0-.002	C
27 %	3.34 %							

POA and GREAT BASIN WILD RYE vs MEDUSAHEAD weed grasss – Tests 9, 10, 11

A pasture consisting mostly the native Poa grass and some Great Basin Wild Rye, was sampled to establish the soil nutrient and organic matter thresholds, and then compared the soil nutrients where the Medusahead weed grass was growing nearby.

The thresholds for both the Poa and the Great Basin Wild Rye, with the exception of the sulfates, were all close to the optimum range. However, in the medusahead grass soil, the nitrogen was very low: only 8 ppm in the medusahead, vs 77 ppm in the Poa and 47 ppm in the Great Basin Wild Rye. The other major difference, was the organic matter percentage: only 3.34% in the Medusahead grass, vs 5% to over 6% in the Great Basin Wild Rye and Poa sites.

That means, that by adding about 40-70 ppm nitrogen in the top 2 inches of the medusahead soil, and adding about 2-3% or more organic matter, then the medusahead grass could potentially be converted to growing Poa or Great Basin Wild Rye in the future. (Rachel plot).

POA THRESHOLD---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	7.0 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	19 ppm	0.1					
Phosphorus (P) - Olsen	33 ppm	0.4					
Potassium (K)	502 ppm	1.4					
Potassium - sat. ext.	1.2 meq/L						
Calcium (Ca)	2640 ppm	1.0					
Calcium - sat. ext.	6.1 meq/L						
Magnesium (Mg)	176 ppm	0.5					
Magnesium - sat. ext.	1.3 meq/L						
Copper (Cu)	1.9 ppm	1.0					
Zinc (Zn)	36 ppm	4.8					
Manganese (Mn)	43 ppm	2.6					
Iron (Fe)	10 ppm	0.1					
Boron (B) - sat. ext.	0.21 ppm	0.7					
Sulfate - sat. ext.	0.6 meq/L	0.2					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
68 %	6.92 %							

POA THRESHOLD No. 2 – Test 12

A robust population of Poa was found in the Town of Elko, next to the Burger King at I-80, and producing a high organic matter percentage of 7%, and was thriving in low nitrogen and phosphorus levels of only 19 ppm and 33 ppm. For the micronutrients, this population was thriving in very high zinc (36 ppm) and very high manganese (43 ppm) plus very low iron (10 ppm). (Town of Elko plot).

PIPELINE POOR SOIL No. 2—Test 13--

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline	
pH	7.1 s.u.								

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	7 ppm	0.2					
Phosphorus (P) - Olsen	21 ppm	0.8					
Potassium (K)	349 ppm	2.1					
Potassium - sat. ext.	0.7 meq/L						
Calcium (Ca)	2150 ppm	1.1					
Calcium - sat. ext.	5.0 meq/L						
Magnesium (Mg)	121 ppm	0.4					
Magnesium - sat. ext.	1.1 meq/L						
Copper (Cu)							
Zinc (Zn)							
Manganese (Mn)							
Iron (Fe)							
Boron (B) - sat. ext.							
Sulfate - sat. ext.							
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen					
		Gravel Coarse 5-12 Fine 2-5	Very Coarse 1-2	Sand Coarse 0.5-1 Med. to Very Fine 0.05-0.5	Silt .002-.05	Clay 0-.002	C
23 %	2.37 %						

PIPELINE POOR SOIL No. 2—Test 14--

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline	
pH	7.2 s.u.								

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	5 ppm	0.1					
Phosphorus (P) - Olsen	22 ppm	0.9					
Potassium (K)	275 ppm	1.8					
Potassium - sat. ext.	0.6 meq/L						
Calcium (Ca)	2020 ppm	1.1					
Calcium - sat. ext.	5.9 meq/L						
Magnesium (Mg)	88 ppm	0.4					
Magnesium - sat. ext.	1.6 meq/L						
Copper (Cu)							
Zinc (Zn)							
Manganese (Mn)							
Iron (Fe)							
Boron (B) - sat. ext.							
Sulfate - sat. ext.							
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen					
		Gravel Coarse 5-12 Fine 2-5	Very Coarse 1-2	Sand Coarse 0.5-1 Med. to Very Fine 0.05-0.5	Silt .002-.05	Clay 0-.002	C
21 %	2.43 %						

PIPELINE POOR SOIL No. 2 – Test 13, 14.

Pipeline replanting several years ago, with erosion problems, and existing plants stunted from the lack of nutrients and adequate organic matter. Poor soil means no vegetation, and then soil also tested next to a Great Basin Wild Rye plant that sprouted but is stunted.

Nitrogen very low, only 5-7 ppm, whereas if you want Great Basin Wild Rye to thrive, you need at least 10 ppm. Magnesium at 88 ppm is about half what Great Basin Wild Rye needs. The organic matter was about 2.4% and depending on the native forage grass desired, needs organic matter to be added, to produce somewhere between 4% and 10%. (Mitch plot).

POA THRESHOLD No. 3—Test 15 - THRESHOLD—

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	5.6 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	9 ppm	0.1					
Phosphorus (P) - Olsen	25 ppm	0.4					
Potassium (K)	296 ppm	1.2					
Potassium - sat. ext.	0.8 meq/L						
Calcium (Ca)	1990 ppm	1.0					
Calcium - sat. ext.	3.6 meq/L						
Magnesium (Mg)	238 ppm	0.8					
Magnesium - sat. ext.	1.6 meq/L						
Copper (Cu)	2.1 ppm	1.4					
Zinc (Zn)	16 ppm	2.6					
Manganese (Mn)	86 ppm	6.6					
Iron (Fe)	77 ppm	1.3					
Boron (B) - sat. ext.	0.13 ppm	0.4					
Sulfate - sat. ext.	0.8 meq/L	0.3					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
51 %	10.7 %							

POA THRESHOLD No. 3 – Test 16 POOR--

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	5.7 s.u.	██████████						

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	8 ppm	0.2	██████████				
Phosphorus (P) - Olsen	16 ppm	0.6	██████████	██████████			
Potassium (K)	336 ppm	3.1	██████████	██████████	██████████		
Potassium - sat. ext.	0.6 meq/L						
Calcium (Ca)	1060 ppm	0.9	██████████	██████████	██████████		
Calcium - sat. ext.	2.5 meq/L						
Magnesium (Mg)	154 ppm	0.9	██████████	██████████	██████████		
Magnesium - sat. ext.	1.1 meq/L						
Copper (Cu)	1.2 ppm	1.3	██████████	██████████	██████████		
Zinc (Zn)	3 ppm	0.8	██████████	██████████	██████████		
Manganese (Mn)	35 ppm	4.4	██████████	██████████	██████████	██████████	
Iron (Fe)	28 ppm	0.8	██████████	██████████	██████████		
Boron (B) - sat. ext.	0.21 ppm	0.7	██████████	██████████	██████████		
Sulfate - sat. ext.	0.7 meq/L	0.2	██████████				
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Gravel		Weight Percent of Sample Passing 2mm Screen				
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Sand Coarse 0.5-1	Med. to Very Fine 0.05-0.5	Silt .002-.05	Clay 0-.002
21 %	2.62 %							

POA THRESHOLD No. 3 – Tests 15, 16

Checking where Poa was thriving and then nearby, where it the soil was bare. Phosphorus was different: 25 ppm where plants existed vs only 16 ppm in the bare soil. Plant in this area grew in very low nitrogen, only 8-9 ppm, but this low number may make this population vulnerable to cheatgrass or medusahead infestations in the future. All the other nutrients, except for the sulfates, were in the optimum ranges, and the manganese was about 4-7X normal. The major difference was the organic matter content: 10.7% where Poa grew, vs 2.6% in the nearby poor soil. This confirms, if you want to continue to have Poa grass as a Elko, Nevada native forage grass, your soil organic matter percentage in the top two inches of soil, must be at least 4%, and probably ideally between 7% and 10%. (Mitch plot).

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GREAT BASIN WILD RYE THRESHOLD No. 3---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.1 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	9 ppm	0.2	Very Low				
Phosphorus (P) - Olsen	14 ppm	0.4	Low				
Potassium (K)	426 ppm	2.9				Optimum	
Potassium - sat. ext.	1.8 meq/L						
Calcium (Ca)	1330 ppm	0.9				Optimum	
Calcium - sat. ext.	4.0 meq/L						
Magnesium (Mg)	177 ppm	0.9				Optimum	
Magnesium - sat. ext.	1.8 meq/L						
Copper (Cu)	1.4 ppm	1.2				Optimum	
Zinc (Zn)	4 ppm	1.0				Optimum	
Manganese (Mn)	32 ppm	3.3					Very High
Iron (Fe)	36 ppm	0.8				Optimum	
Boron (B) - sat. ext.	0.19 ppm	0.6					
Sulfate - sat. ext.	0.7 meq/L	0.2	Very Low				
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
27 %	6.06 %							

GREAT BASIN WILD RYE THRESHOLD No. 3 – Test 17

Very low nitrogen threshold numbers of only 9 ppm and low phosphorus levels of only 14 ppm. The other nutrients, except for the sulfates, are close to the optimum ranges. Similar to the first Great Basin Wild Rye organic matter threshold, the minimum percentage in the top two inches should be around 6%. (Mitch plot).

SQUIRRELTAIL THRESHOLD---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.0 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	13 ppm	0.1					
Phosphorus (P) - Olsen	18 ppm	0.3					
Potassium (K)	571 ppm	2.1					
Potassium - sat. ext.	1.7 meq/L						
Calcium (Ca)	2340 ppm	0.9					
Calcium - sat. ext.	4.5 meq/L						
Magnesium (Mg)	305 ppm	0.9					
Magnesium - sat. ext.	1.7 meq/L						
Copper (Cu)	1.5 ppm	0.8					
Zinc (Zn)	10 ppm	1.3					
Manganese (Mn)	52 ppm	3.2					
Iron (Fe)	56 ppm	0.8					
Boron (B) - sat. ext.	0.22 ppm	0.7					
Sulfate - sat. ext.	0.8 meq/L	0.3					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
52 %	6.69 %							

SQUIRRELTAIL THRESHOLD – Test 18

This grass is able to thrive in very low nitrogen (13 ppm) and very low phosphorus levels (18 ppm) with all of the rest of the nutrients, except for the sulfates, close to the optimum range. The soil organic matter content needs to be 6.7% or more. (Mitch plot).

INDIAN RICEGRASS THRESHOLD---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline	
pH	7.3 s.u.								

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS					
			Very Low	Low	Medium	Optimum	Very High	
Available-N	53 ppm	0.9						
Phosphorus (P) - Olsen	12 ppm	0.4						
Potassium (K)	607 ppm	2.3						
Potassium - sat. ext.	1.4 meq/L							
Calcium (Ca)	3690 ppm	1.1						
Calcium - sat. ext.	10.0 meq/L							
Magnesium (Mg)	229 ppm	0.5						
Magnesium - sat. ext.	1.9 meq/L							
Copper (Cu)	1.0 ppm	0.4						
Zinc (Zn)	1 ppm	0.1						
Manganese (Mn)	2 ppm	0.1						
Iron (Fe)	6 ppm	0.1						
Boron (B) - sat. ext.	0.21 ppm	0.7						
Sulfate - sat. ext.	0.8 meq/L	0.3						
Exch Aluminum								

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
28 %	2.28 %							

INDIAN RICEGRASS THRESHOLD – Test 19

Optimum nitrogen at 53 ppm and very low phosphorus at 12 ppm, optimum calcium at 3900 ppm, medium magnesium at 229 ppm and with low to very low micronutrients. Can thrive in low organic matter, a minimum of only 2.28%, below 2.0% these seedlings cannot survive. (Spring Creek, NV).

GUMPLANT (*Grindelia*) THRESHOLD---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.7 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	7 ppm	0.1					
Phosphorus (P) - Olsen	21 ppm	0.7					
Potassium (K)	230 ppm	1.6					
Potassium - sat. ext.	1.2 meq/L						
Calcium (Ca)	1240 ppm	1.1					
Calcium - sat. ext.	8.4 meq/L						
Magnesium (Mg)	61 ppm	0.4					
Magnesium - sat. ext.	2.1 meq/L						
Copper (Cu)	1.5 ppm	1.7					
Zinc (Zn)	22 ppm	6.5					
Manganese (Mn)	12 ppm	1.6					
Iron (Fe)	8 ppm	0.2					
Boron (B) - sat. ext.	0.30 ppm	1.0					
Sulfate - sat. ext.	1.1 meq/L	0.4					
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt	Clay
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5	.002-.05	0-.002
24 %	3.67 %							

GUMPLANT (*Grindelia*) THRESHOLD – Test 20

This plant can thrive in very low nitrogen (7 ppm) but needs adequate phosphorus (21 ppm) adequate calcium (1240 ppm) and can survive in very low magnesium (only 61 ppm) but needs optimum micronutrients. A very common Great Basin flowering shrub, a very important summer and fall nectar plant for insects and native pollinators. (Carson City).

CRESTED WHEATGRASS THRESHOLD---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	7.0 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	17 ppm	0.3					
Phosphorus (P) - Olsen	20 ppm	0.7					
Potassium (K)	203 ppm	1.3					
Potassium - sat. ext.	0.8 meq/L						
Calcium (Ca)	1460 ppm	1.1					
Calcium - sat. ext.	7.8 meq/L						
Magnesium (Mg)	48 ppm	0.3					
Magnesium - sat. ext.	1.7 meq/L						
Copper (Cu)							
Zinc (Zn)							
Manganese (Mn)							
Iron (Fe)							
Boron (B) - sat. ext.							
Sulfate - sat. ext.							
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel Coarse 5-12	Gravel Fine 2-5	Very Coarse 1-2	Sand Coarse 0.5-1	Med. to Very Fine 0.05-0.5	Silt .002-.05	Clay 0-.002
25	%							

CRESTED WHEATGRASS POOR---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.9 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	13 ppm	0.4					
Phosphorus (P) - Olsen	15 ppm	0.7					
Potassium (K)	117 ppm	1.4					
Potassium - sat. ext.	0.4 meq/L						
Calcium (Ca)	666 ppm	1.1					
Calcium - sat. ext.	6.8 meq/L						
Magnesium (Mg)	29 ppm	0.3					
Magnesium - sat. ext.	1.3 meq/L						
Copper (Cu)							
Zinc (Zn)							
Manganese (Mn)							
Iron (Fe)							
Boron (B) - sat. ext.							
Sulfate - sat. ext.							
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel Coarse 5-12	Gravel Fine 2-5	Very Coarse 1-2	Sand Coarse 0.5-1	Med. to Very Fine 0.05-0.5	Silt .002-.05	Clay 0-.002
17	%							

CRESTED WHEATGRASS THRESHOLD – Tests 21, 22

An exotic perennial grass, used to be sown on tens of millions of acres in the Great Basin, able to grow in poor nutrient soils, but once established, produces natural herbicide-like allelochemicals that keeps the native forage grasses and native forbs from growing back. Planted areas over time have a significant loss of their topsoil--the bare botanically-sterilized spaces between the plants cause wind and water erosion, plus the plants do not contribute to the topsoil-building process.

The threshold for Crested Wheatgrass is very low at 13 ppm, and phosphorus is medium at 20 ppm, and the magnesium is very low at 29-48 ppm. (Carson City).

GREAT BASIN WILD RYE—THRESHOLD No. 4---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.9 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS					
			Very Low	Low	Medium	Optimum	Very High	
Available-N	11 ppm	0.3						
Phosphorus (P) - Olsen	6 ppm	0.3						
Potassium (K)	149 ppm	1.1						
Potassium - sat. ext.	0.2 meq/L							
Calcium (Ca)	1540 ppm	0.9						
Calcium - sat. ext.	2.7 meq/L							
Magnesium (Mg)	309 ppm	1.3						
Magnesium - sat. ext.	1.2 meq/L							
Copper (Cu)								
Zinc (Zn)								
Manganese (Mn)								
Iron (Fe)								
Boron (B) - sat. ext.								
Sulfate - sat. ext.								
Exch Aluminum								

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel		Sand			Silt .002-.05	Clay 0-.002
		Coarse 5-12	Fine 2-5	Very Coarse 1-2	Coarse 0.5-1	Med. to Very Fine 0.05-0.5		
18 %	0.89 %							

GREAT BASIN WILD RYE—POOR---

Test	Result	Strongly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Slightly Alkaline	Moderately Alkaline	Strongly Alkaline
pH	6.4 s.u.							

EXTRACTABLE NUTRIENTS

Test	Result	Sufficiency Factor	SOIL TEST RATINGS				
			Very Low	Low	Medium	Optimum	Very High
Available-N	2 ppm						
Phosphorus (P) - Olsen	13 ppm	0.5					
Potassium (K)	142 ppm	1.1					
Potassium - sat. ext.	0.6 meq/L						
Calcium (Ca)	988 ppm	0.9					
Calcium - sat. ext.	5.3 meq/L						
Magnesium (Mg)	170 ppm	1.1					
Magnesium - sat. ext.	2.4 meq/L						
Copper (Cu)							
Zinc (Zn)							
Manganese (Mn)							
Iron (Fe)							
Boron (B) - sat. ext.							
Sulfate - sat. ext.							
Exch Aluminum							

Cu, Zn, Mn and Fe were analyzed by DTPA extract.

PARTICLE SIZE ANALYSIS

Half Sat	Organic Matter	Weight Percent of Sample Passing 2mm Screen						
		Gravel Coarse 5-12 Fine 2-5	Very Coarse 1-2	Sand Coarse 0.5-1	Med. to Very Fine 0.05-0.5	Silt .002-.05	Clay 0-.002	Clay <0.002
22 %	1.7 %							

GREAT BASIN WILD RYE—THRESHOLD No. 4 – Tests 23, 24.

This threshold was taken from Carson City, and the nitrogen (11 ppm) was very low, as was the phosphorus at 6-13 ppm, and the potassium (>140 ppm), calcium (>1500 ppm), and magnesium (>300 ppm) were all in the optimum range. The organic matter was low at <1%, but young seedlings probably need higher percentages. (Carson City).

GREAT BASIN WILD RYE – THRESHOLD No. 5---

Lab Number: 08933

Sample ID: GBWR organic only - Mitch Humboldt River top 2 in

Date Sampled:

Analysis	Result	Quantitation Limit	Method	Date and Time Test Started
Organic Matter (Titration) , %	3.67		WALK-BLACK	10/09/2019 16:18

Method Reference:

Methods of Soil Analysis, Part 3 - Chemical Methods, 2nd Ed. Rev. Soil Science Society of America, Black, C.A et al. 1982, pages 995-996.

Comments:

GREAT BASIN WILD RYE – THRESHOLD No. 5 – Test 25

Testing the organic matter from the top two inches, threshold for seedlings was 3.7% or about 11 tons of sequestered carbon per acre. (Mitch plot).

GREAT BASIN WILD RYE – THRESHOLD No. 6--

Lab Number: 08934
Sample ID: GBWR organic only - Mitch Humboldt River 2-4 inch

Date Sampled:

Analysis	Result	Quantitation Limit	Method	Date and Time Test Started
Organic Matter (Titration) , %	2.88		WALK-BLACK	10/09/2019 16:18

Method Reference:
Methods of Soil Analysis, Part 3 - Chemical Methods, 2nd Ed. Rev. Soil Science Society of America, Black, C.A et al. 1982, pages 995-996.
Comments:

GREAT BASIN WILD RYE – THRESHOLD No. 6 – Test 26

Testing the organic matter from 2 inches deep to 4 inches deep, the threshold was 2.88% or about another 8.4 tons of sequestered carbon per acre, to a total of nearly **20 tons of sequestered carbon per acre**, down to four inches deep. That does not include the carbon sequestered in the soil below four inches deep, or the carbon produced by the above-ground vegetation. (Mitch plot).

BLUE BUNCH WHEATGRASS – THRESHOLD--

Lab Number: 08941
Sample ID: BBWG North Reno-Organic

Date Sampled:

Analysis	Result	Quantitation Limit	Method	Date and Time Test Started
Organic Matter (Titration) , %	2.02		WALK-BLACK	10/09/2019 16:18

Method Reference:
Methods of Soil Analysis, Part 3 - Chemical Methods, 2nd Ed. Rev. Soil Science Society of America, Black, C.A et al. 1982, pages 995-996.
Comments:

BLUE BUNCH WHEATGRASS – THRESHOLD – Test 27

A common native forage grass in the Great Basin, with a test of the organic matter in a stand north of Reno, with 2.02%, which translates to about six tons of sequestered carbon in the top two inches of soil. However, this IS NOT a threshold for this grass, because there were no seedlings in the population. The 2% organic matter in the soil, but is not enough for the seedling survival for this grass. Tests from soil north of Reno in 1993, found that this grass needs a minimum of 6.9% organic matter, as well as 32 ppm of nitrogen, 34 ppm of phosphorus, 340 ppm of potassium, 3330 ppm of calcium, and 636 ppm of magnesium for seedling survival. (North of Reno).

The test results and this report as PDF files linked here:

[Tests 1-27 HERE.](#)

[Test on Cheatgrass soil HERE.](#)

[This report as a PDF file HERE.](#)

CONCLUSION—

Western rangeland soil nutrients have not been investigated in very much detail until now, to determine exactly what the individual native forage grasses need, in terms of the nutrients and organic matter in the top two inches of soil for seedling survival.

At the same time, sagebrush fires, cheatgrass, and other weed grasses like medusahead, may not be “invasive” plants--only a symptom of the lack of the proper soil nutrients and/or organic matter. And, if those materials are added back to the soil, to the proper levels needed by the native forage grasses and native forbs, may cure many of these problems immediately.

The second phase should be test plots within medusahead and cheatgrass areas after burns, or after a pipeline is built--to have the native grasses and native forbs cover the burn scar faster than the weed grasses.

Acknowledgement—This report was produced from a grant from the State of Nevada, NRRC. Many thanks for the help from the Elko ranchers--Rachel Buzzetti, Jeffrey Knight and Mitch Heguy, whose assistance was essential for gathering the soil samples for this report.

PHOTOS--



Getting the soil sample for the Nutrient-Threshold test, from the base of grass seedlings.



Test 3 – Two year old cow poop—nitrogen is gone, but phosphorus and calcium is still there.



Test 5 - Great Basin Wild Rye outside of corral, with solid thistles inside where the soil is too rich.



Test 5 – The thistle solution here could be--adding straw or hay to absorb the excess nutrients.



Test 7 – Replanted pipeline with no native grasses, and organic matter and micronutrients too low. Depending on the native forage grass desired, grasses will not grow back until the proper levels of organic matter and micronutrients are put back on this project site. Until the native grasses are planted back, this site will always be vulnerable to invasions of cheatgrass and other weeds.



Test 8 – Pole Creek Burn - Like the pipeline test No. 7--adding a few percentage of organic matter along with a few parts per million of the micronutrients--bringing the copper, zinc, manganese and iron up to optimum levels--could be the critical addition that can help the native forage grasses to grow back.



Test 12 – Pristine Poa stand in Elko at the Burger King next to I-80. Surprisingly low soil nitrogen and phosphorus levels for this stand, and a high organic matter content of 7%. To protect Poa as forage in rangelands, measure soil organic matter periodically, and do not drop levels below 4%.



Test 13 – Another replanted pipeline with poor results. The nitrogen and organic matter are too low for the native grass seedling survival, leaving bare spaces to cause erosion and allow weeds like cheatgrass to get established.



Test 13 – Erosion gully forms where nitrogen and organic matter were too poor for native seedling survival, not providing adequate cover, with very small native grass plants. Rancher is observing that the gully produced a head-cut, that will work its way up the whole hillside over time. Shows that if projects are not done correctly, they can cause domino-effect environmental damages on a large scale area.



Test 13 – Four year old stunted Great Basin Wild Rye, barely surviving with nutrient and organic matter levels too low. Another reason for this failure—the wrong Great Basin Wild Rye ecotype was planted for this pipeline project in the Elko area. This ecotype is “Modoc Blue” collected from Sage Hen Summit along US 395 in Modoc County in a higher rainfall area of 12 inches, and 300 miles to the west. Not using local ecotypes of native seeds, is a principle cause of project failures for fire rehab. and pipeline projects, currently running at 70% failures in the Great Basin (USGS David Pilliod 2017 report).



Test 19 – Indian ricegrass north of Reno along highway roadside.



Test 20 – Gumplant or Grindelia, an important nectar plant for native pollinators in summer and fall.



Tests 23, 24 – Sifting the soil samples from the Great Basin Wild Rye near the Humboldt River.



Test 25 – Bluebunch wheatgrass north of Reno, notice there are only old plants, no seedlings seen.



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