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### ***Initial Evaluation of Organic Soil Amendments for Disturbed Highway Slopes***

The primary goal is to evaluate the benefit of various types of organic soil amendments used to enhance revegetation of disturbed sites that lack topsoil and have exposed subsoils with very low fertility (Table 1).

In the past year, several fall and spring seedings were conducted at field test plots established along highway slopes in Western and Northern Idaho. A number of treatments and seed mixes were applied. Laboratory analyses were conducted on the organic soil amendments (Table 2). The Quattro H Fertil-Fibers and the Wolfkill Organic Mix are seed-meal/poultry-waste products with NPK of 6-4-1, but the Quattro product also contains humic acid. The Quattro C Fertil Fibers product (similar to the H fibers) is based primarily on seabird guano rather than on poultry manure. Biosol is a seed-meal product (NPK of 6-1-3) derived from 90% fungal mycelium (a by-product from manufacturing penicillin) and 10% potassium-magnesia.

Results and observations to date for the field tests are summarized below.

Near Viola US 95 - MP 354.6: Test 1 hydroseeded Oct. 9, 1996, 2-pass application; west-facing and east-facing cuts

Seed Mix #1: intermediate wheatgrass, creeping red fescue, meadow brome, Canada bluegrass, alfalfa

Seed Mix #2: same four grasses plus Highland bent grass, Kura clover

Treatments: yard-waste compost with wood-fiber mulch, Biosol with SoilGuard, straw e.c.b., Quattro Kiwi Power

**Results:** 1) no apparent differences in the seed mix performance; alfalfa and clover were sparse to nonexistent; 2) all areas that received Biosol and Kiwi Power performed well; 3) no apparent differences in revegetation density between SoilGuard and the straw e.c.b.; 4) areas treated with the compost and Kiwi Power showed no improvement over the pre-existing sparse vegetation (i.e., this treatment showed no benefit)

Near Viola US 95 - MP 354.6: Test 2 hydroseeded Apr. 25, 1997, 1-pass application; west-facing and east-facing cuts

Seed Mix #1: intermediate wheatgrass, sheep fescue, hard fescue, smooth brome, Sherman big bluegrass, timothy, annual ryegrass, alsike and white Dutch clover

Seed Mix #2: western wheatgrass, sheep fescue, Canada bluegrass, crested wheatgrass, creeping red fescue, Kura clover

Treatments: Quattro Fertil-Fibers nutrimulch, Quattro Kiwi Power, small amount of 16-12-12 fertilizer

**Results:** 1) Seed Mix #2 showed slightly better performance than #1; clover was sparse to nonexistent; 2) the Quattro products provided significant improvement over the pre-existing sparse vegetation conditions, particularly in establishing the bunch grasses.

Near Weiser US 95 - MP 89.6: Test 1 hydroseeded Oct. 30, 1996, 1-pass application; SE facing and NW facing cuts

Seed Mix #1: bluebunch wheatgrass, cereal barley, small burnet, blue flax, squirreltail, Indian blanketflower, bitterbrush, penstemon, white yarrow, basin sagebrush, rabbitbrush

Seed Mix #2: basin wildrye, small burnet, squirreltail, Sherman big bluegrass, cereal barley, blue flax, Indian blanketflower, bitterbrush, penstemon, white yarrow, basin sagebrush, rabbitbrush

Treatments: Quattro Fertil-Fibers nutrimulch, Quattro Kiwi Power, straw e.c.b.

**Results:** 1) Seed Mix #1 showed slightly better performance than #2; strongest performers were yarrow, cereal barley, and sagebrush; 2) plots with only Kiwi Power showed a small improvement over the pre-existing sparse vegetation; 3) plots with Kiwi Power and Fertil-Fibers showed significant improvement in revegetation, with the *best performance shown with the straw e.c.b.*; 4) Quattro products tended to reduce the alkalinity in the soil (reduce the pH) and to increase organic matter and plant-available nitrogen levels, as shown in Table 3.

Near Laclede US 2 - MP 182: Hydroseeded May, 1997, 1-pass application; SE facing cut with rock mulch

Seed Mix: western wheatgrass, sheep fescue, Canada bluegrass, crested wheatgrass, creeping red fescue, Kura clover

Treatments: Quattro Fertil-Fibers nutrimulch, Quattro Kiwi Power (applied over a 12-in. thick layer of rock mulch)

**Results:** 1) Germination rates were poor, and very little vegetation cover resulted (less than 15% by the end of summer). This suggests that soil amendments and seed probably should be applied *before* rock mulch is spread.

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Near Genesee US 95 - MP 332.5: Test 1 hydroseeded May 22, 1997, 1-pass application; minibenched east-facing cut  
Seed Mix #1: intermediate wheatgrass, sheep fescue, hard fescue, smooth brome, Sherman big bluegrass, timothy, annual ryegrass, alsike and white Dutch clover

Seed Mix #2: western wheatgrass, sheep fescue, Canada bluegrass, crested wheatgrass, creeping red fescue, Kura clover  
Treatments: Quattro Kiwi Power + Fertil-Fibers (with & without wood-fiber mulch), Kiwi Power + Wolfkill mix

**Results:** 1) no apparent difference between the plot with wood-fiber mulch and the one without it; 2) no significant difference between the Fertil-Fibers and Wolfkill treatments, except for more weeds (especially China lettuce) on the Wolfkill plot; 3) Seed Mix #2 showed slightly better performance than #1; 4) all three plots had excellent vegetation coverage and showed significant improvement over the pre-existing sparse vegetation conditions.

Near Genesee US 95 - MP 332.5: Test 2 broadcast-seeded Sep. 17, 1997; minibenched east-facing cut

Seed Mix : grass/shrub mix with intermediate wheatgrass, meadow brome, creeping red fescue, Canada bluegrass, woods rose, white Dutch clover, oregon grape, snowberry (also include a minor amount of wild flower mix)

Treatments: Two different seeding rates (60 and 120 lbs./acre); Quattro Kiwi Power only (no organic bulk used)

**Results:** 1) a minor amount of germination and new growth was observed five weeks after seeding; most new growth is expected next spring (site will continue to be monitored). Note: wild flower mix included at the request of the ITD Moscow Maintenance Shop.

S. of Moscow US 95 - MP 338.6: Hydroseeded Sep. 12, 1997, 1-pass application; soil-pinned site, west-facing cut

Seed Mix : grass/shrub mix with intermediate wheatgrass, meadow brome, creeping red fescue, Canada bluegrass, woods rose, white Dutch clover, oregon grape, snowberry

Treatments: Quattro Kiwi Power + Fertil-Fibers + Atlas SoilLok Tackifier;

Soil-pinned, geogrid-backed synthetic e.c.b. installed on Sep. 13, 1997 (150 sq. yds.)

**Results:** 1) site experienced considerable runoff during hydroseeding application due to clay soil and steepness of the cutslope; 2) installation of e.c.b. caused some damage to seed and amendments on hydroseeded slope; 3) some new growth of grass through the e.c.b. (about 15%) was observed five weeks after seeding.

Table 1. Typical results of laboratory soil fertility tests of disturbed highway cutslopes.

	Sat. Paste pH	Orgn. Mtrr. %	0.75N NaOAC Extraction		2M KCl Extraction	
			P	K	NO <sub>3</sub> -N	NH <sub>4</sub> -N
			[ µg/g ]		[ µg/g ]	
Horseshoe Bend Hill, SH 55	6.6	0.23	2.4	89	<0.4	1.6
Weiser Devil's Elbow A, US 95	4.3	0.66	<0.3	129	1.5	2.8
Weiser Devil's Elbow B, US 95	7.1	0.31	21.7	211	4.4	9.6
Genesee Borgen Rd., US 95	6.2	0.49	1.3	76	<0.4	3.2
N. of Moscow, US 95	6.5	0.46	1.9	96	<0.4	2.8
N. of Viola, US 95	6.9	0.47	2.9	67	<0.4	3.1
Mineral Mtn. Rest Area, US 95	6.4	0.42	3.2	41	<0.4	1.4
LaClede, US 2	6.4	0.56	2.3	44	<0.4	1.3

Table 2. Results of laboratory analyses of organic soil amendments (samples were treated as if they were actual soils -- Univ. of Idaho Analyt. Sci. Lab).

	Sat. Paste	Orgn. Mitr. %	0.75N NaOAC		2M KCl				Ammonium Acetate Extractable Cations				DTPA (Chelating Agent)							
			Extraction		Extraction				Extraction				Extraction							
			P	K	NO <sub>3</sub> -N	NH <sub>4</sub> -N	SO <sub>4</sub> -S	B	Ca	Mg	Na	K	Zn	Mn	Cu	Fe	C	H	N	
			[ µg/g ]		[ µg/g ]				[ cmol/kg ]				[ µg/g ]							
Quattro H Fert.Fibers	1	5.5	49	16000	18000	110	8400	7500	22	19	37	9.1	47	410	600	21	86	37	5.2	7.07
	2	5.7	48	16000	17000	100	8000	6300	21	18	29	9.1	41	340	440	20	78	36	5.2	6.84
	3	5.7	49	16000	18000	100	8700	7600	21	17	28	8.8	43	360	470	20	78	35	5.1	6.78
Biosol	1	2.8	66	2400	14000	6	3900	17000	9	15	7	47	38	10	8	3	63	42	5.8	6.60
	2	2.8	61	2500	15000	5	4000	28000	7	16	8	47	37	10	9	3	64	42	5.5	6.57
Wolfkill Organic Mix		5.9	61	10000	18000	9	4900	1600	20	82	21	11	37	190	110	32	94	35	4.8	7.02
Quattro C Fert.Fibers		7.2	52	5300	13000	47	2100	1400	10	49	28	11	42	55	34	7	27	34	4.5	5.93

Table 3. Results of laboratory soil fertility tests to evaluate Quattro organic soil amendments at U.S. 95 Weiser test site (Univ. of Idaho Analyt. Sci. Lab).

	Sat. Paste	pH	Orgn. Mtr. %	0.75N NaOAC		2M KCl		[ $\mu\text{g/g}$ ]
				Extraction		Extraction		
				P	K	NO <sub>3</sub> -N	NH <sub>4</sub> -N	
Oct. '96, Just Prior to Treatment								
North Cut	1	7.1	0.31	22	211	4.4	9.6	
	2	7.3	0.31	11	254	2.1	9.6	
South Cut	1	6.6	0.45	4	266	1.9	11.0	
	2	6.8	0.27	4	252	1.4	5.4	
May '97, Six Months Later								
North Cut	1	6.6	0.93	35	251	46.3	82.9	
	2	6.8	0.60	49	221	37.5	103.0	
South Cut	1	6.3	0.73	17	322	43.6	119.0	
	2	6.2	0.79	16	279	62.0	72.8	