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EDF Serial Number	ER-WAG7-76
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Number	(Revision 1)

Project/Task WAG 7 Data Compilation Tasks
 Subtask SDA Biotic Data Compilation - Revision 1

EDF Page 1 of 17

Title: <u>SDA Biotic Data Compilation (Revision 1)</u>			
SUMMARY: The summary briefly defines the problem or activity to be addressed in the EDF, gives a summary of the activities performed in addressing the problem and states the conclusions, recommendations, or results arrived at from this task.			
<p>This EDF documents a review and <i>summary</i> of biotic data specific to the RWMC Subsurface Disposal Area (SDA). The purpose of the review was to finalize data values for previously identified parameters supporting WAG 7 human health risk assessment modeling(DOSTOMAN). The parameters addressed by this EDF include:</p> <ul style="list-style-type: none"> Insect and animal burrow depths, densities, and volumes Burrow distribution with depth Plant root depth Plant root density and mass and distribution with depth Plant shoot mass Plant cover and density Plant species composition and successional patterns Plant root to shoot ratio Leaf abscission <p>The original scope and process covered in this EDF are detailed under Tasks 1 and 2 in the original EDF documentation (May 1995). This revision includes further evaluation of RWMC/SDA related publications and compilation of data values from pertinent studies for incorporation in DOSTOMAN biotic models. Where publications/data specific to the RWMC/SDA were not found, data applicable to the INEL in general were extracted from the most representative information available.</p> <p>The results of this survey are presented as 1) data compiled for the parameters of interest (Tables 1-10) and 2) a bibliography of the source references.</p>			
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			<i>5/2/96</i>
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			<i>5/2/96</i>

See Management Control Procedure (MCP) 6 for instructions on use of this form.

SUMMARY OF CONTENTS
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1. INTRODUCTION

This **EDF** documents a review/survey of available INEL/RWMC related biotic data. The purpose of the review was to compile site specific biotic data for parameters supporting **WAG 7** human and ecological risk assessment modeling. This **EDF** includes:

2. SCOPE

Tasks 1 and 2 as described in the March 3, 1995 letter NLH-01-95 (attachment 1)

Focused primarily on previous bibliographical compilations (TAB, ~~XXXX~~ Morris, VanHorn). References used as basis:

E&E slera

TDE - TAB-01-94

Previous annotated bibliographies

RESL studies - old and new ones

Only references ... SDA were concentrated on. Data for INEL sites other than the SDA were given lower priority. No in-depth data interpretation and searches, locate or transform supporting data were not performed.

3. PROCESS

As indicated above, several past efforts have been made to identify and compile site specific ecological data. This ... consisted of two basic ... 1) distillation of RWMC related publications from previous bibliographies, 2) compilation of actual data values published in these publications.

Individual references were ... for any of 12 basic parameters including:

IV. What we didn't do

4. SUMMARY OF RESULTS

Introduce Table 1. How many references reviewed. Highlighted ones contained pertinent data compiled here (what about those that contain useful data but weren't used and those that didn't) General overview of available data for INEL/SDA specific studies. Much data require review and re-interpretation of original data sets in a risk assessment context (examples).

Bibliography - attached

12 general parameters investigated

for each: define

what we looked for

what we found

problems with/limitations of the data

List of Tables
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1. Maximum Soil Depths for burrowing animal species - Current Scenario
2. Maximum soil depths for burrowing animal species - 130 yr - 200+yr Scenarios
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5. **SDA** ant burrow distribution for Current and 100 yr+scenarios
6. The fraction of soil excavated **by** small animals - Current Scenario
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10. The fractional root distribution for plants evaluated in DOSTOMAN modeling - 100 yr - 200 yr + Scenarios

Burrowing Animal Species Composition ^a	Maximum depth (cm)	Sources
Townsend's ground squirrel	138	Gano and States 1982; Reynolds and Wakkinen 1987
Ord's kangaroo rat	90	Reynolds and Laundre 1988
Deer mouse	50	Reynolds and Laundre 1988
Montane vole	155	Reynolds and Wakkinen 1987
Great Basin pocket mouse	193	Gano and States 1982
Harvester ant	270	Fitzner et al. 1979

BOLD indicates INEL specific data.

a. Mammal species composition based on studies by Groves and Keller, 1983 and 1988; Koehler 1988; Boone 1990; Boone and Keller 1993

Table 2. Maximum soil depths for burrowing animal species - 130 yr - 200+yr Scenarios.

Burrowing Animal Species Composition ^a	Maximum depth (cm)	Sources
Townsend's ground squirrel	140	Gano and States 1982; Reynolds and Wakkinen 1987
Ord's kangaroo rat	90	Reynolds and Laundre 1988
Deer mouse	50	Reynolds and Laundre 1988
Montane and Sagebrush vole	155	Reynolds and Wakkinen 1987
Great Basin pocket mouse	193	McKenzie et al. 1982
Northern pocket gopher	100	
Least chipmunk	31	Laundre 1989
Badger	250+	
Rabbits	150	
Marmot	50	
Harvester ant	270	Fitzner et al. 1979

BOLD indicates INEL specific data.

a. Mammal species composition based on studies by Groves and Keller, 1983 and 1988; Koehler 1988; Boone 1990; Boone and Keller 1993; McKenzie et al. 1982.

Table 3. Burrowing animal populations - Current Scenario.

Burrowing Animal Species'	Population (individuals/ha) ^a	Number New Burrows (per/yr) ^c
Townsend's ground squirrel	5	.75
Ord's kangaroo rat	5	.87
Deer mouse	17	.87
Montane vole	30	.87
Great Basin pocket mouse	15	.75
Harvester ant colonies	13 ^b	.1 ^d

BOLD indicates MEL specific data.

a. Mammal species composition and populations based on studies by Groves and Keller, 1983 and 1988; Koehler 1988; Boone 1990; Boone and Keller 1993.

b. Blom et al. 1981.

c. Mckenzie et al. 1982.

d. Fitzner et al. 1979.

Table 4. Burrowing animal populations - 130yr-200+yr Scenarios.

Burrowing Animal Species'	Population (individuals/ha) ^a				Number New Burrows(per/yr)
	130yr	150yr	200yr	200+ y	
Townsend's ground squirrel	5	5	5	5	0.75
Ord's kangaroo rat	8	8	5	5	0.87
Deer mouse	17	17	30	30	0.87
Montane vole	30	30	10	10	0.87
Great Basin pocket mouse	15	15	25	25	0.75
Northern pocket gopher	7	7	7	7	0.75
Least chipmunk	3	3	8	8	0.75
Badger	1	1	1	1	2
Rabbits	O	O	O	O	0.75
Marmot	O	O	O	O	0.75
Harvester ant colonies	20^b	30^b	36^b	36^b	.1 ^d

BOLD indicates INEL specific data.

a. Mammal species composition and populations based on studies by Groves and Keller, 1983 and 1988; Koehler 1988; Boone 1990; **Boone** and Keller 1993.

b. Blom et al. 1981

c. McKenzie et al. 1982

d. Fitzner et al. 1979

Table 5. SDA ant burrow distribution for Current and 100 yr + scenarios.

Depth	Fractional distribution of burrow system below ground	
	Current Scenario (Disturbed) ^a	100yr-200yr + Scenarios (Undisturbed) ^a
0-15 cm	0.21	0.21
15-30cm	0.21	0.21
30-45 cm	0.21	0.21
45-90 cm	0.15	0.15
90-135 cm	0.09	0.09
135-180 cm	0.09	0.09
180-225 cm	0.04	0.04
225-270 cm	0.03	0.03

Average burrow volume per colony per year (m³) = 0.0024 (Fitzner et al. 1979)

BOLD indicates INEL specific data.,

a. McKenzie et al. 1982.

Table 6. The fraction of soil excavated by small animals - Current Scenario.

Depth (cm)	Townsend's ground squirrel'	Ord's kangaroo rat'	Deer mouse ^a	Montane vole'	Great Basin pocket mouse ^b
Soil type	Disturbed	Disturbed	Disturbed	Disturbed	Disturbed
0-15	0.045	0.16	0.38	0.46	0.21
15-30	0.072	0.13	0.29	0.46	0.21
30-45	0.034	0.23	0.25	0.07	0.21
45-90	0.24	0.47	0.08	0	0.23
90-135	0.6	0	0	0	0.08
135-180	0.12	0	0	0	0.05
180-225	0	0	0	0	0.02
225-270	0	0	0	0	0
Total burrow volume (L)	29.2	9.8	2.4	2.7	3.0

BOLD indicates INEL specific data.

a. Reynolds and Laundre 1988.

b. McKenzie et al. 1982.

Table 7. The fraction of soil at depth excavated by small animals - 100yr - 200+yr Scenarios.

Depth (cm)	Townsend's ground squirrel'	Ord's kangaroo rat'	Deer mouse'	Voles'	Great Basin pocket mouse ^b	Northern pocket gopher	Least chipmunk ^d
Soil type	Disturbed	Disturbed	Disturbed	Disturbed	Disturbed		
0-15	0.08	0.21	0.22	0.17	0.21	0.23	.38
15-30	0.18	0.29	0.44	0.23	0.21	0.23	.38
30-45	0.08	0.14	0.25	0.27	0.21	0.23	.23
45-90	0.11	0.36	0.09	0.2	0.23	0.26	0
90-135	0.52	0	0	0	0.08	0.04	0
135-180	0.03	0	0	0	0.05	0	0
180-225	0	0	0	0	0.02	0	0
225-270	0	0	0	0	0	0	0
Total burrow volume (L)	29.2	9.8	2.4	2.7	3	2.7	7.0

BOLD indicates INEL specific data.

a. Reynolds and Laundre 1988.

b. McKenzie et al. 1982.

c.

d. Laundre 1989

Table 8. Estimated parameters for the uptake of plant species for the SDA - Current and 100yr-200yr + Scenarios.

Plant Species	Root to Shoot Ratio	Fraction litterfall (yr ⁻¹) ^d	Fraction root death (yr ⁻¹) ^e	Current Scenario		100yr + Scenarios			
				Max. root depth (cm)	Fraction of total biomass ^f	Max. root depth (cm)	Fraction of total biomass 130 yrs ^g	Fraction of total biomass 150yrs ^h	Fraction of total biomass 200yrs + ⁱ
Crested wheatgrass (AGCR)	8 ^a	1	0.5	150 ^c	0.75	75 ^a	0.55	0.30	--
Russian thistle (SAKA)	1.4 ^a	1	1	172 ^f	0.25	172 ^f	0.15	--	--
Sagebrush (ARTR)	1.3 ^a	0.50 ^c	0.5	--	--	225 ^e	0.05	0.10	0.20
Green Rabbitbrush (CHVI)	1.3 ^a	0.85 ^c	0.5	--	--	200 ^e	0.11	0.06	0.05
Bluebunch wheatgrass (AGSP)	8 ^a	1	0.5	--	--	160 ^c	0.03	0.15	0.35
Needle & thread grasses (STXX)	9 ^a	1	0.5	--	--	183 ^c	0.02	0.09	0.10
Other grasses	9 ^a	1	0.5	--	--	200 ^h	0.05	0.10	0.04
Forbs	1.5 ^a	1	0.8 ^a	--	--	160 ^c	0.02	0.10	0.15
Other shrubs	1.5 ^a	1	0.8 ^a	--	--	240 ^c	0.02	0.10	0.11
Community above ground biomass (kg/ha)				1490		1490		2030	1000
Community root to shoot ratio				6.35		5.57		5.70	5.22

BOLD indicates INEL specific data.

- a. Hull and Klomp 1974
- b. Becker et al. 1994
- c. Pearson 1965
- d. Estimated.
- e. Reynolds and Fraley 1985.
- f. Klepper et al 1985.
- g. Arthur 1982; Arthur and Markham 1983.
- h. Abbott et al. 1991
- i. McKenzie et al 1982.
- j. McKenzie et al 1985.
- k. Klepper et al 1979.
- l. Composition and percent biomass based on successional increments - Arthur 1982, Anderson and Inouye 1988, Anderson 1991.

Table 9. The fractional root distribution for plants evaluated in DOSTOMAN modeling - Current Scenario.

Depth (cm)	Crested wheat grass'	Russian thistle'
0-15	0.35	0.22
15-30	0.25	0.21
30-45	0.1	0.21
45-90	0.23	0.23
90-135	0.04	0.1
135-180	0.03	0.02
180-225	0	0.02
225-270	0	0

BOLD indicates INEL specific data.

a. Reynolds 1990

Table 10. The fractional root distribution for plants evaluated in DOSTOMAN modeling - 100yr - 200yr+ Scenarios.

Depth (cm)	Crested wheatgrass ^a	Russian thistle ^a	Sagebrush ^a	Green rabbitbrush ^b	Bluebunch wheatgrass ^a	Needle & thread grasses ^a	Other Grasses ^a	Forbs ^a	Other shrubs ^b
0-15	0.35	0.22	.21	.13	<i>0.35</i>	.25	.35	0.22	.13
15-30	0.25	0.21	.20	.10	0.25	.25	.25	0.21	.10
30-45	0.1	0.21	.20	.07	0.1	<i>.10</i>	.11	0.21	.07
45-90	0.23	0.23	.23	.45	0.23	.20	.23	0.23	.45
90-135	0.04	0.1	.13	.20	0.04	.05	.03	0.1	.20
135-180	0.03	0.02	.02	.04	<i>0.03</i>	<i>.03</i>	<i>.03</i>	<i>0.02</i>	<i>.04</i>
180-225	0	0.02	.01	.02	<i>0</i>	<i>.02</i>	<i>.01</i>	<i>0.02</i>	<i>.01</i>
225-270	0	0	.01	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>.01</i>

BOLD indicates INEL specific data.

a. Reynolds 1990.

b. McKenzie et al. 1982

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