

Appendix 1. Soil parameters. Types 1-89 are from the Yellowstone National Park soils map, types 90-192 are from the Greater Yellowstone Ecosystem soils map. Types 194-199 are for the small area not included in either of the above and are based on vegetation type.

Number	Name	Herbac- eous Rooting Depth - mm	Soil Depth - mm	Wilting Point Fraction	Field Capacity Fraction	Runoff Curve Number
1	Como-Struggle-McCort	1000	1524	0.051	0.111	65
2	Hanks-Struggle-Cryochrept	1000	1524	0.081	0.134	55
3	Granturk-Bottle-Cryochrept	250	400	0.099	0.176	55
4	Greyback-Igneous	1000	1524	0.111	0.224	65
5	Hobacker-Bedrock-Arropeak	1000	1524	0.111	0.224	60
6	Bedrock-Como	150	200	0.111	0.224	80
7	Bedrock-Hobacker	150	200	0.09	0.14	80
8	Bedrock-Hobacker-Badwater	150	200	0.12	0.26	80
9	Bedrock-Silvercliff	150	200	0.176	0.316	80
10	Bedrock-Arrowpeak	150	200	0.12	0.26	80
11	Josie-Whitcross-Bedrock	1000	1524	0.09	0.14	50
12	Ivywild-Jugson	1000	1524	0.111	0.224	65
13	Josie-Billycreek	1000	1524	0.111	0.224	55
14	Gateson-Pesowo-Eaglewing	1000	1524	0.144	0.284	55
15	Rittel-Rombo-Beartooth	1000	1524	0.144	0.284	55
16	Lolo-Bedrock-Pesowyo	1000	1524	0.12	0.26	65
17	Bedrock-Pesowyo-Lamedeer	150	200	0.09	0.14	80
18	Pesowyo-Sawbuck-Beartooth	1000	1524	0.099	0.176	65
19	Hobacker-Greyback-Shadow	1000	1524	0.111	0.224	60
20	Como-Bearmouth-Oxyaquic Cryochrept	1000	1524	0.081	0.134	60
21	Como-Bearmouth-Oxyaquic Cryochrept	1000	1524	0.102	0.218	65
22	Como-Matcher-Bearmouth	1000	1524	0.09	0.14	65
23	Shook-Badwater-Passcreek	1000	1524	0.099	0.176	55
24	Gallatin-Crayaquall-Histosol	1000	1524	0.12	0.26	55
25	Greyback-Shadow-Teton	1000	1524	0.111	0.224	65
26	Shook-Badwater-Passcreek	1000	1524	0.099	0.176	50
27	Hobecker-Sawfork-Greyback	1000	1524	0.111	0.224	65
28	Shadow-Taglake-Bedrock	1000	1524	0.09	0.14	65
29	Shook-OAsscreek-Aquic Cryoboralls	1000	1524	0.099	0.176	55
30	Jugson-Billycreek-Oxyaquic Cryochrept	1000	1524	0.081	0.134	50
31	Sula-Teton-McCort	1000	1524	0.099	0.176	50
32	Passcreek-Bedrock-Cryaquoll	1000	1524	0.144	0.284	55
33	CloudPeak-Bedrock-Cryaquept	1000	1524	0.144	0.284	65
34	Greyback-Shadow-Sawfork	1000	1524	0.111	0.224	65
35	Greyback-Cloud-Cryaquoll	1000	1524	0.12	0.26	65
36	Hoback-Sawfork-Shadow	1000	1524	0.111	0.224	65
37	Shadow-CloudPeak-PassCreek	1000	1524	0.099	0.176	55
38	Hoback-Cratermo-Ripple	1000	1524	0.227	0.364	65
39	Hoback-Shadow-Craquoll Cryoborall	1000	1524	0.099	0.176	65

Appendix 1. Continued

Number	Name	Herbac- eous Rooting Depth - mm	Soil Depth - mm	Wilting Point Fraction	Field Capacity Fraction	Runoff Curve Number
40	Teton-Bedrock-Qquic	1000	1524	0.123	0.275	55
41	Shadow-Ansel-Bedrock	1000	1524	0.144	0.284	65
42	Shadow-Ansel-Cryaaquept	1000	1524	0.144	0.284	65
43	Greyback-Shadow-Sedimentary	1000	1524	0.144	0.284	65
44	Como-Moran-Cryaquept	1000	1524	0.081	0.134	65
45	Shadow-CloudPeak-Bedrock	1000	1524	0.12	0.26	65
46	Greyback-Gallatin-Lionhead	1000	1524	0.111	0.224	65
47	Shadow-McCort	1000	1524	0.099	0.176	65
48	Greyback-Stubbs-CloudPeak	1000	1524	0.111	0.224	65
49	Gallatin-Badwater-Oxyaquic Cryoquept	1000	1524	0.12	0.26	55
50	Shadow-Bedrock-Taglake	1000	1524	0.111	0.224	65
51	Moran-Ivywild-Cryumbrepts	800	1524	0.118	0.259	60
52	Greyback-Igneous-Arrowpeak	1000	1524	0.111	0.224	65
53	Trude-Bottle-Bedrock	1000	1524	0.102	0.218	60
54	Shadow-Bedrock-Cryaquent	1000	1524	0.099	0.176	60
55	Moran-Bobtail	1000	1524	0.099	0.176	65
56	Gallatin-Bearmouth-Aquic Cryoboralls	1000	1524	0.111	0.224	55
57	Jugson-Tomichi-Cryaquoll	1000	1524	0.069	0.126	50
58	Sula-Ripple	1000	1524	0.111	0.224	55
59	Sula-Cratermo-Wallrock	1000	1524	0.111	0.224	55
60	Greyback-Rimtonm-Bedrock	1000	1524	0.111	0.224	60
61	Sawfork-Greyback-Bedrock	1000	1524	0.144	0.284	60
62	Hobacker	1000	1524	0.127	0.295	60
63	Shadow-Bedrock-Whitcross	1000	1524	0.111	0.224	60
64	Greback-Metamorphic-Arrowpeak	1000	1524	0.111	0.224	60
65	Greyback-Bearmoutnb	1000	1524	0.111	0.224	65
66	Hobacker-Gallatin-Bearmouth	1000	1524	0.111	0.224	65
67	Hobacker-Sawfork-Greyback	1000	1524	0.111	0.224	60
68	Shadow-Bedrock-Matcher	1000	1524	0.144	0.284	65
69	Trude-Whitcross-Bedrock	1000	1524	0.072	0.125	50
70	Cryorthoquents, Hydrothermal, Lithic Hydrothermal	350	400	0.102	0.191	80
71	Arrowpeak-Greyback-Lithic Eutorchrept	270	320	0.111	0.224	70
75	Cryorthent-Hydrothermal-Lithic Eutrochrept	150	200	0.081	0.134	80
76	Cryorthent-Hydrothermal-Hanks	150	200	0.111	0.224	80
78	Ivywild-Hydrothermal-Cryochrept	1000	1524	0.12	0.26	65
83	Oleo-Lasac-Hanks	1000	1524	0.127	0.295	55
84	Dashiki-Lasac-Hanks	1000	1524	0.118	0.259	55
85	Bedrock-Lasac-Castan	150	200	0.118	0.259	80
86	Rimton-Hanks-Bedrock	1000	1524	0.151	0.319	55

Appendix 1. Continued

Number	Name	Herbac- eous Rooting Depth - mm	Soil Depth - mm	Wilting Point Fraction	Field Capacity Fraction	Runoff Curve Number
87	Winegar-Moran-Ivywild	1000	1524	0.127	0.295	55
88	Greyback-Betrock-Como	1000	1524	0.111	0.224	65
89	DystricCryochrept-Ansel-Billyrock	1000	1524	0.144	0.284	55
90	12-1A	1000	1016	0.12	0.26	60
91	12-1C	1000	1524	0.12	0.26	60
92	12-2A	1000	1524	0.12	0.26	60
93	12-2B	1000	1524	0.12	0.26	65
94	13-1A	1000	1524	0.12	0.26	65
95	13-2A	1000	1016	0.12	0.26	60
96	22-1A	1000	1524	0.09	0.14	65
97	22-1Ab	1000	1524	0.09	0.14	65
98	22-1B	1000	1524	0.09	0.14	65
99	22-1C	1000	1524	0.09	0.14	65
100	22-1Ca	1000	1524	0.12	0.26	65
101	22-1Cb	1000	1524	0.12	0.26	65
102	22-2A	1000	1524	0.12	0.26	60
103	22-3A	1000	1524	0.12	0.26	60
104	22-3C	1000	1524	0.09	0.14	65
105	22-3Ca	1000	1524	0.09	0.14	65
106	22-3Cb	1000	1016	0.09	0.14	65
107	25-1A	1000	1524	0.09	0.14	60
108	25-3A	1000	1524	0.2	0.34	65
109	34-1A	1000	1016	0.12	0.26	55
110	34-1B	1000	1524	0.12	0.26	60
111	34-1C	1000	1524	0.09	0.14	60
112	34-1D	1000	1524	0.09	0.14	60
113	34-2C	1000	1524	0.2	0.34	55
114	34-2D	1000	1524	0.12	0.26	60
115	34-3A	1000	1524	0.2	0.34	55
116	34-3B	1000	1524	0.2	0.34	60
117	34-4B	1000	1524	0.12	0.26	60
118	34-4C	1000	1524	0.2	0.34	60
119	35-1A	1000	1524	0.12	0.26	60
120	35-1B	1000	1524	0.17	0.27	60
121	35-1C	1000	1524	0.09	0.14	60
122	35-1E	1000	1524	0.12	0.26	60
123	35-2C	1000	1524	0.13	0.31	60
124	35-2E	1000	1524	0.13	0.31	60
125	35-3A	1000	1524	0.12	0.26	60

Appendix 1. Continued

Number	Name	Herbac- eous Rooting Depth - mm	Soil Depth - mm	Wilting Point Fraction	Field Capacity Fraction	Runoff Curve Number
126	35-3B	1000	1524	0.12	0.26	60
127	35-4C	1000	1524	0.13	0.31	65
128	46-1B	1000	1524	0.13	0.31	60
129	46-2A	1000	1524	0.13	0.31	60
130	46-3A	1000	1524	0.09	0.14	60
131	53-1A	1000	1524	0.09	0.14	60
132	53-1D	1000	1524	0.09	0.14	60
133	53-3A	1000	1524	0.2	0.34	60
134	53-3B	1000	1524	0.2	0.34	55
135	53-3C	1000	1524	0.2	0.34	55
136	54-1A	1000	1524	0.12	0.26	65
137	54-1B	1000	1524	0.09	0.14	65
138	54-1C	1000	1524	0.09	0.14	65
139	54-1E	1000	1016	0.12	0.26	65
140	54-1G	1000	1524	0.09	0.14	65
141	54-2B	1000	1524	0.2	0.34	60
142	54-2C	812	862.8	0.12	0.26	60
143	54-2D	1000	1524	0.13	0.31	65
144	54-2E	1000	1524	0.12	0.26	60
145	54-3A	1000	1524	0.13	0.31	65
146	54-3C	1000	1524	0.13	0.31	60
147	54-3D	1000	1524	0.2	0.34	60
148	54-3E	1000	1524	0.2	0.34	65
149	54-3F	1000	1524	0.12	0.26	65
150	54-5A	1000	1524	0.13	0.31	60
151	54-5C	1000	1524	0.12	0.26	60
152	61-2A	1000	1524	0.13	0.31	60
153	64-2A	1000	1524	0.12	0.26	55
154	64-2C	1000	1524	0.12	0.26	60
155	64-2Ca	1000	1524	0.12	0.26	60
156	66-1A	1000	1524	0.13	0.31	55
157	71-1A	1000	1524	0.13	0.31	55
158	71-1B	1000	1524	0.13	0.31	55
159	71-1C	1000	1524	0.12	0.26	55
160	71-1D	1000	1524	0.12	0.26	65
161	71-1E	1000	1524	0.2	0.34	55

Appendix 1. Continued

Number	Name	Herbac- eous Rooting Depth - mm	Soil Depth - mm	Wilting Point Fraction	Field Capacity Fraction	Runoff Curve Number
162	71-2A	1000	1524	0.12	0.26	55
163	71-2B	1000	1524	0.12	0.26	55
164	71-2C	1000	1524	0.12	0.26	55
165	71-2D	1000	1524	0.12	0.26	55
166	82-2B	1000	1524	0.12	0.26	55
167	82-2C	1000	1524	0.2	0.34	55
168	84-1A	1000	1524	0.2	0.34	55
169	84-1B	1000	1524	0.09	0.14	55
170	84-2B	1000	1524	0.12	0.26	60
171	85-2A	1000	1524	0.12	0.26	60
172	85-2B	1000	1524	0.12	0.26	60
173	85-3A	1000	1524	0.12	0.26	60
174	85-3B	1000	1524	0.12	0.26	60
175	86-2A	1000	1524	0.12	0.26	55
176	86-2C	1000	1524	0.21	0.36	55
177	86-2D	1000	1524	0.2	0.34	55
178	86-2E	1000	1524	0.2	0.34	55
179	86-3B	1000	1524	0.12	0.26	55
180	86-3C	1000	1524	0.12	0.26	55
181	87-1A	1000	1524	0.12	0.26	60
182	87-1B	1000	1524	0.12	0.26	65
183	87-1D	1000	1524	0.12	0.26	65
184	87-2A	1000	1524	0.12	0.26	60
185	87-2B	1000	1524	0.12	0.26	65
186	87-2C	1000	1524	0.21	0.36	65
187	87-2D	1000	1524	0.2	0.34	65
188	87-2E	1000	1524	0.2	0.34	65
189	88-1A	1000	1524	0.09	0.14	60
190	88-2A	1000	1524	0.12	0.26	60
191	91-2B	1000	1524	0.12	0.26	65
192	93-1A	254	304	0.12	0.26	45
194	Barren, rocky	150	200	0.11	0.251	80
196	Coniferous forest	1000	1524	0.108	0.212	65
197	Sagebrush/grassland	1000	1524	0.15	0.3	60
198	Moist	1000	1524	0.13	0.254	65
199	Wetland	1000	1524	0.12	0.26	55

Appendix 2. Habitat types and their codes. Types 1-67 are as in Despain 1990 and Mattson et al 1985 . Types 68-94 are habitat types used by the US Forest Service as well as in Mattson et al. Type 95 was added as explained in the text. Types 96-98 are from the NLCD (Nesser et al. 2000).

Number	Code	Description
1	fds	Idaho fescue/tufted hairgrass - moist
2	fas	Idaho fescue/bluebunch wheatgrass- dry
3	4so	Lodgepole pine / Elk sedge - dry
4	ta	Big sagebrush / Bluebunch wheatgrass
5	at	Alpine tundra
6	fro	Idaho fescue / Richardson's needlegrass - moist
7	4ho	Lodgepole pine / Elk sedge
8	2so	Subalpine fir/ Ross's sedge
9	2ll/2h	Subalpine fir/grouse whortleberry-grouse whortleberry phase, subapline fir/elk sedge
10	2go/hs	Subalpine fir. Pinegrass, Hot springs vegetation
11	mfm	Mudflow mosaic - dry
12	pz/d	Shrubby cinquefoil- Silver sage/Tufted hairgrass - moist
13	5no/tf	Douglas fir/ Snowberry, Bigsagebrush/Idaho fescue, Sticky geranium phase
14	3lo	Whitebark Pine/ Grouse Whortleberry
15	kf/fd	Silver sage/Idaho fescue, Idaho fescue/Tufted hairgrass - moist
16	2go/fnz	Subalpine fir/Ross's sedge, Idaho Fescue/Bearded Wheatgrass- Sticky geranium phase
17	2do/2l	Wet forests Subalpine fir. Grouse whortleberry- grouse whortleberry phase
18	2l3/fn	Subalpine fir/grouse whortleberry-whitebark pine phase, Idaho fescue.bearded wheatgrass sticky geranium phase
19	2l3/2do	Subalpine fir.grouse whortleberry-whitebark pine phase, wet forest,
20	2do/2fo	Wet forests, subalpine Fir/ Western meadowrue
21	2ee/fn	Subalpine fir/Globe huckleberry- globe huckleberry phase, Idaho fescue/Bearded wheatgrass Sticky Geranium Phase - moist
22	2ll/2ee	Subalpine Fir/Grouse Whortleberry-Grouse Whortleberry Phase, Subalpine Fir/Globe Huckleberry-Globe Huckleberry Phase - moist
23	3lo/ts	Whitebark Pine/Grouse Whortleberry, Talus
24	3lo/at	Whitebark Pine/Grouse Whortleberry, Alpine tundra
25	2l3/at	Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Alpine tundra
26	3lo/fn	Whitebark Pine/Grouse Whortleberry, Idaho Fescue/Bearded Wheatgrass-Sticky Geranium Phase
27	2do/dw	Wet forests, Tufted Hairgrass/Sedge
28	3ho/ts	Whitebark Pine/Elk Sedge, Talus
29	3lo/dw	Whitebark Pine/Grouse Whortleberry, Tufted Hairgrass/Sedge
30	2l3/fd	Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Idaho Fescue/Tufted Hairgrass
31	3ho/fn	Whitebark Pine/Elk Sedge, Idaho Fescue/Bearded Wheatgrass-Sticky Geranium Phase
32	3lo/fn	Whitebark Pine/Grouse Whortleberry, Idaho Fescue/Bearded Wheatgrass
33	2l32dodw	Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Wet forests, Tufted Hairgrass/Sedge
34	2l3/ts	Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Talus
35	2cl	Subalpine Fir/Twinflower Habitat-Grouse Whortleberry Phase - moist

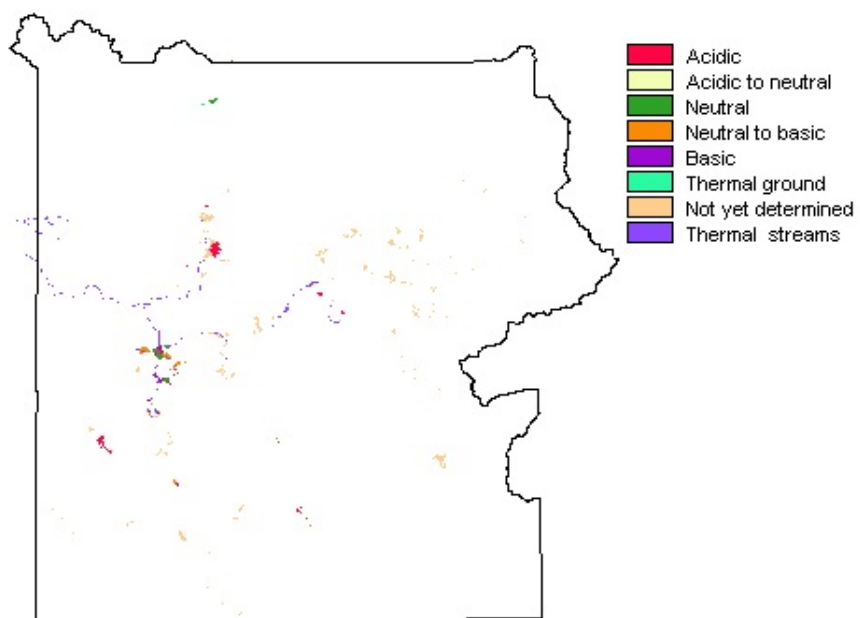
Appendix 2 continued.

Number	Code	Description
36	2do	Wet forests
37	2do/2ee	Wet forests, Subalpine Fir/Globe Huckleberry-Globe Huckleberry Phase
38	2ee	Subalpine Fir/Globe Huckleberry-Globe Huckleberry Phase - moist
39	2fo	Subalpine Fir/Western Meadowrue- moist
40	2go	Subalpine Fir/Pinegrass
41	2ho	Subalpine Fir/Elk Sedge
42	2l3	Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase
43	2l3/dw	Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Tufted Hairgrass/Sedge
44	2lg	Subalpine Fir/Grouse Whortleberry-Pinegrass Phase
45	2ll	Subalpine Fir/Grouse Whortleberry-Grouse Whortleberry Phase
46	2ll/2do	Subalpine Fir/Grouse Whortleberry-Grouse Whortleberry Phase, Wet forests
47	3ho	Whitebark Pine/Elk Sedge
48	4po	Lodgepole Pine/Bitterbrush
49	5go	Douglas-fir/Snowberry
50	5jj	Douglas-fir/Shiny-leaf Spirea, Shiny-leaf Spirea Phase
51	5mo	Douglas-fir/Mallow Ninebark
52	5no	Douglas-fir/Snowberry
53	aom	Bluebunch Wheatgrass/Sandberg's Bluegrass-Needle-and-Thread Phase - dry
54	dw	Tufted Hairgrass/Sedge - wet
55	dw/ww	Tufted Hairgrass/Sedge, Sedge bogs - wet
56	fa	Idaho Fescue/Bluebunch Wheatgrass - dry
57	fn	Idaho Fescue/Bearded Wheatgrass - moist
58	fng	Idaho Fescue/Bearded Wheatgrass-Sticky Geranium Phase - moist
59	hs	Hot springs vegetation
60	iw	Willow/Sedge
61	kf	Silver Sage/Idaho Fescue - moist
62	ppx	Pitchstone Plateau Complex
63	tf	Big Sagebrush/Idaho Fescue
64	tfg	Big Sagebrush/Idaho Fescue-Sticky Geranium Phase - moist
65	ts	Talus
66	wa	Water
67	ww	Sedge bogs - wet
68	PIFL	Limber Pine
69	PIFL/AGSP	Limber Pine/Bluebunch wheatgrass
70	PIFL/FEID	Limber Pine/Idaho fescue
71	PIFL/JUCO	Limber Pine/Common juniper
72	PSME/AGSP	Douglas fir/Bluebunch wheatgrass
73	PSME/FEID	Douglas fir/Idaho fescue
74	PSME/CARU	Douglas fir/ Pinegrass
75	PSME/AGL	Douglas fir/Globe huckleberry

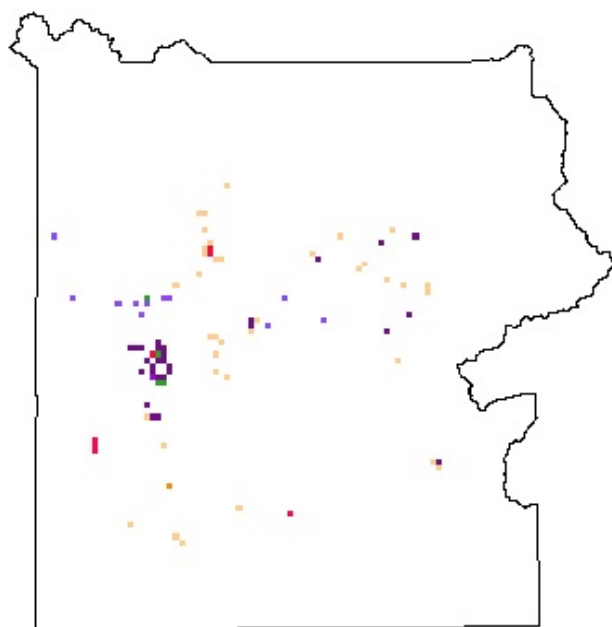
Appendix 2 Continued.

Number	Code	Description
76	PSME/LIBO	Douglas fir/Twinflower
77	PSME/CAGE	Douglas fir/Elk sedge
78	PSME/JUCO	Douglas fir/common juniper
79	PSME/ARCO	Douglas fir/Arnica
80	ABLA/PICEA /ninebark	Spruce-fir/ninebark
81	ABLA/PICEA /MISC	Spruce-fir/misc. forbs
82	ABLA/PICEA /VACA	Spruce-fir/dwarf huckleberry
83	ABLA/PICEA /CARU	Spruce-fir/Pinegrass
84	ABLA/PICEA /JUCO	Spruce-fir/Common juniper
85	PIAL/MISC	White pine/ misc forbs
86	PIAL/CARU	White pine/pinegrass
87	POTR	Aspen
88	WETFORB	Wet forb meadow
89	MOISTFORB	Moist forb meadow
90	DRYFORB	Dry forb meadow
91	FEIDhigh	High elevation Idaho fescue grassland
92	AVAL	Avalanche chutes
93	AGRIC	agriculture
94	URBAN	urban
95	Riparian	100m about stream channel
96	Conifer	Misc. conifer forest
97	Herbaceous	Misc. herbaceous/grassland
98	Shrub	Misc. shrubland

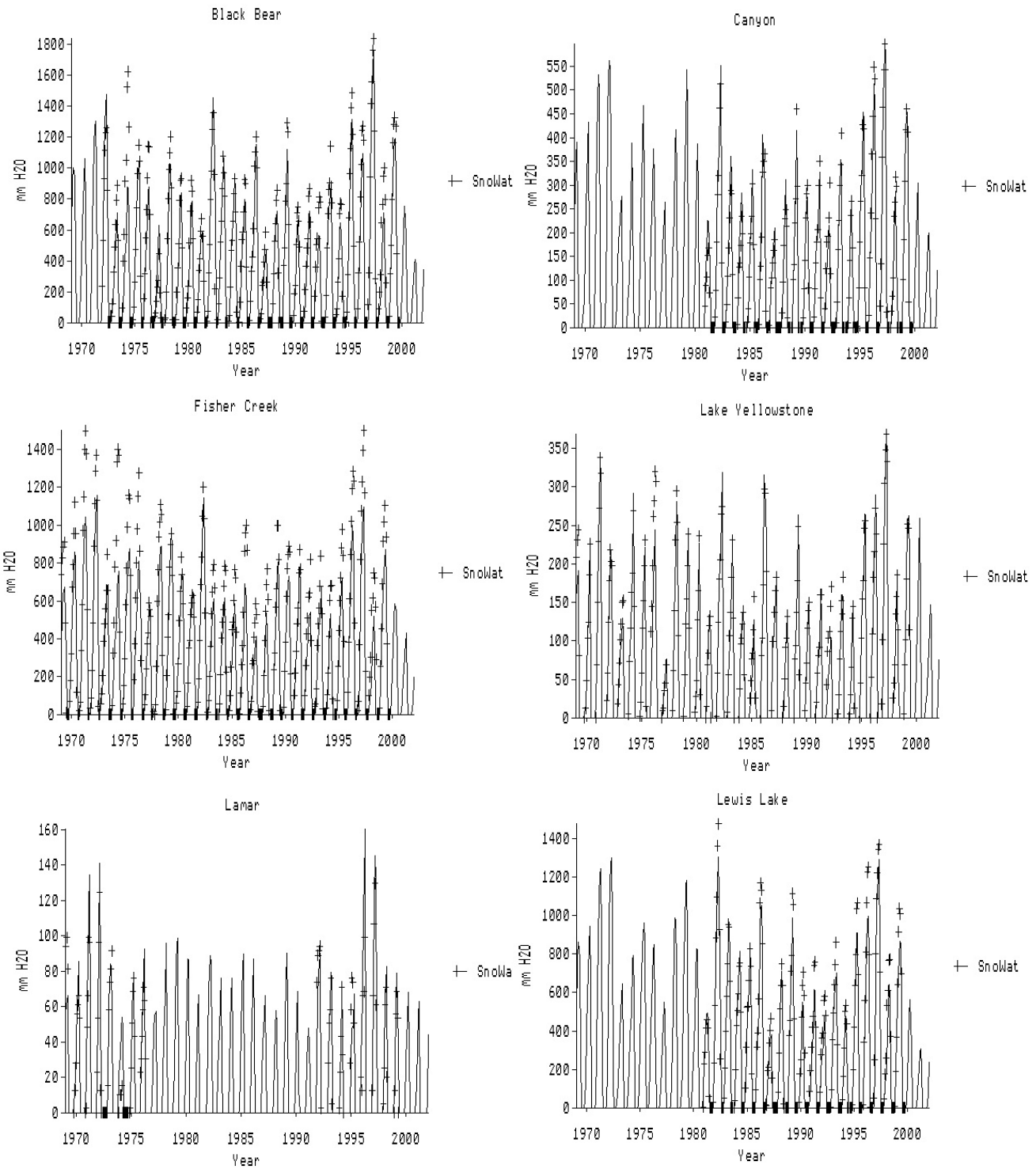
A)



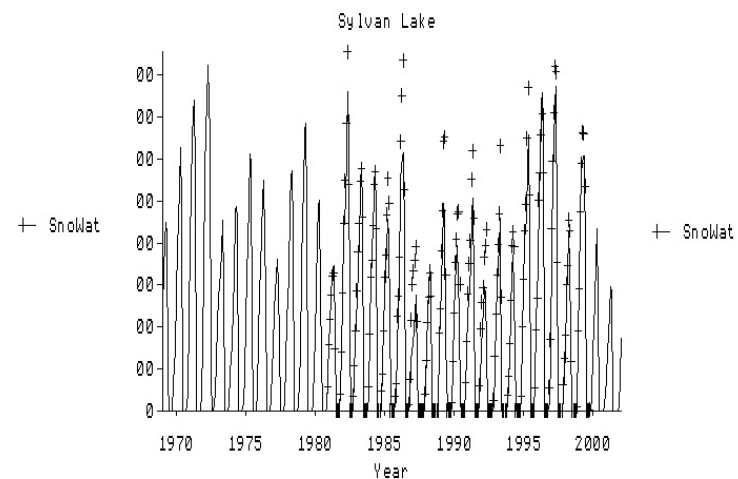
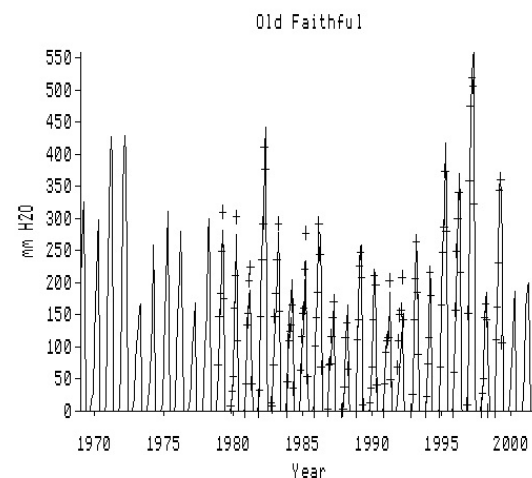
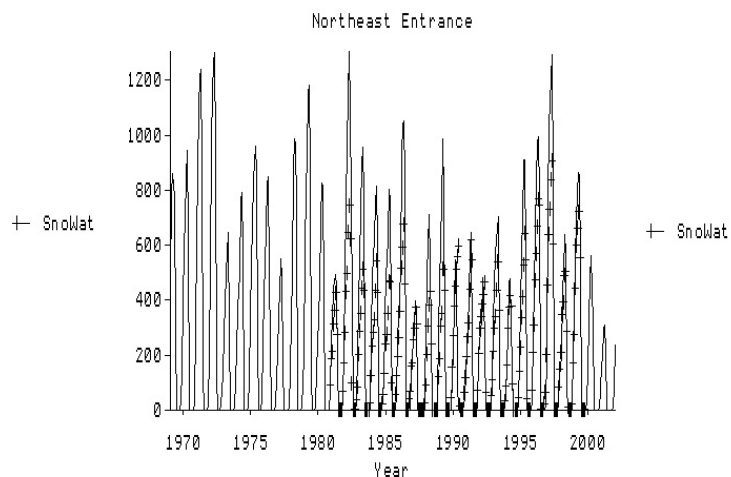
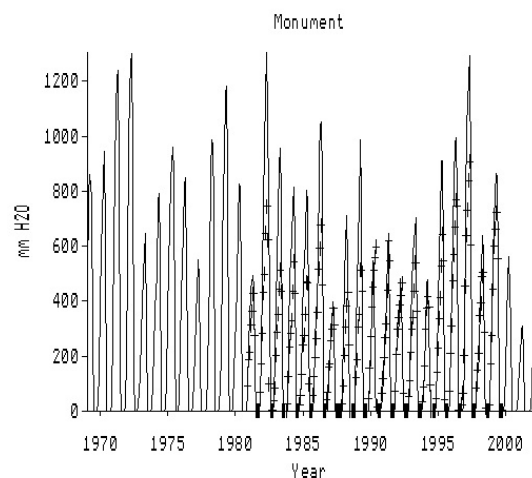
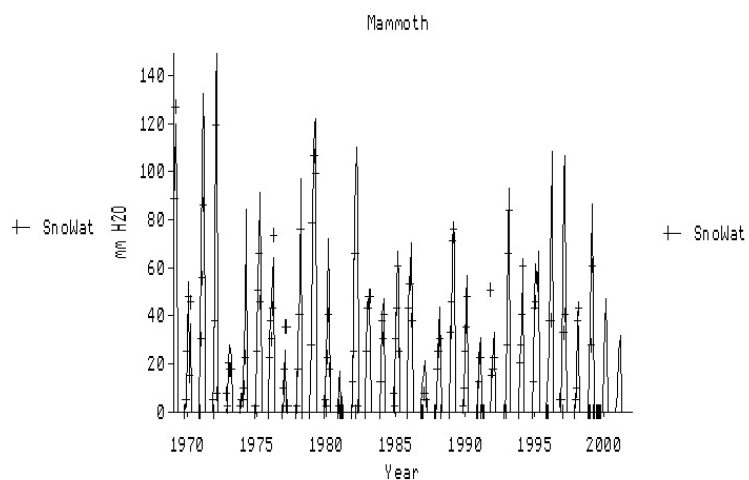
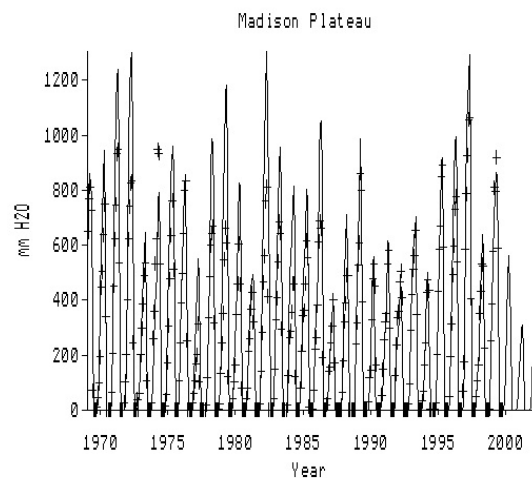
B)

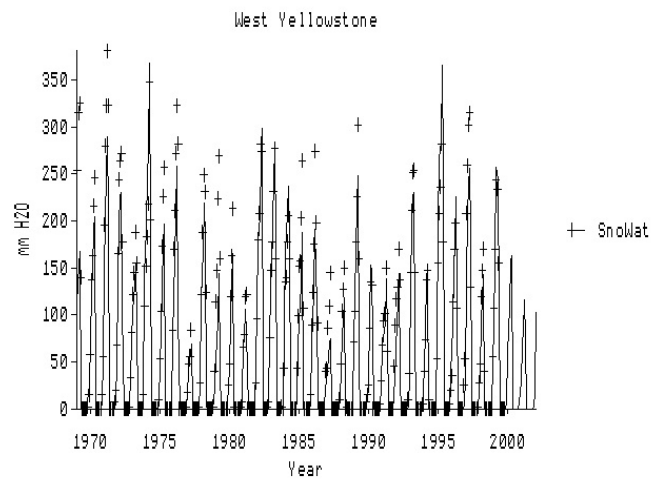
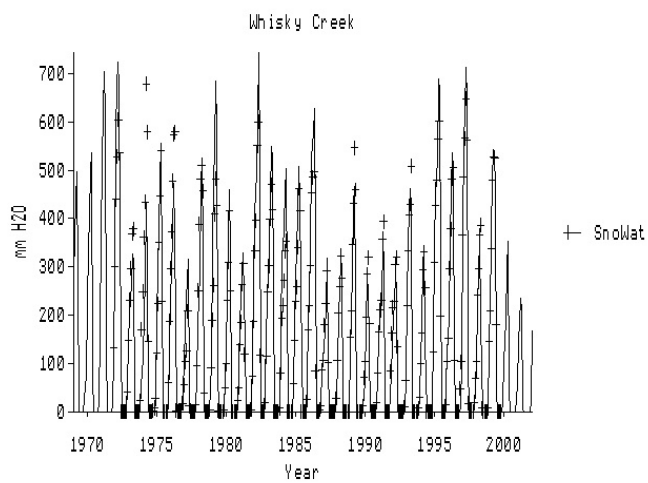
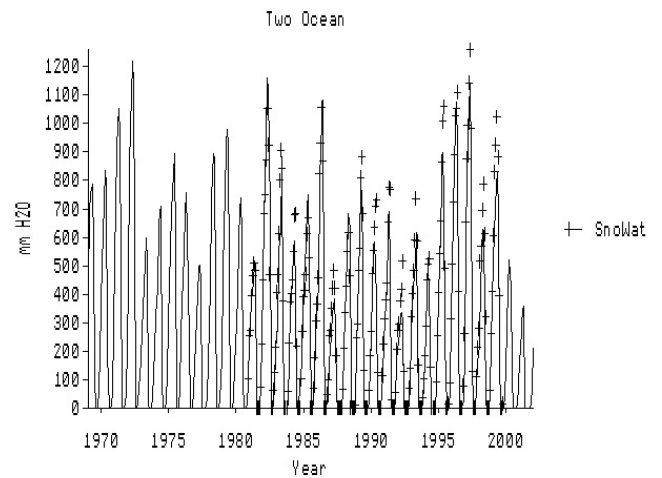
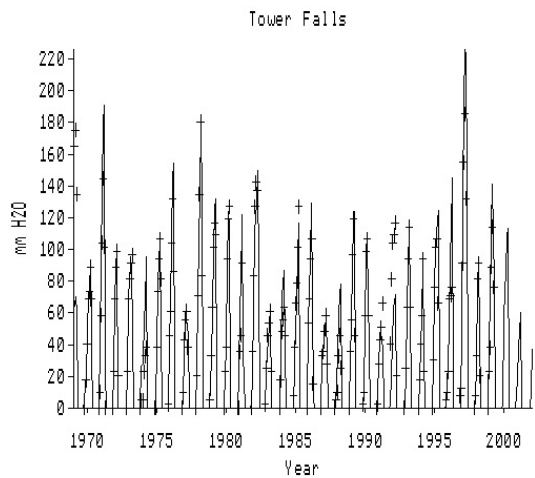
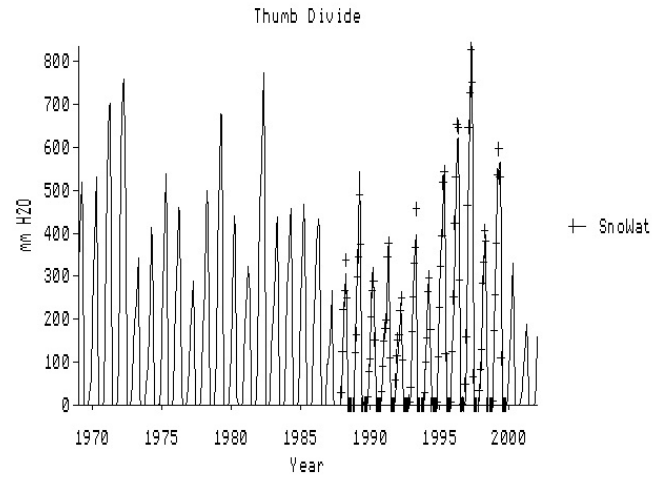
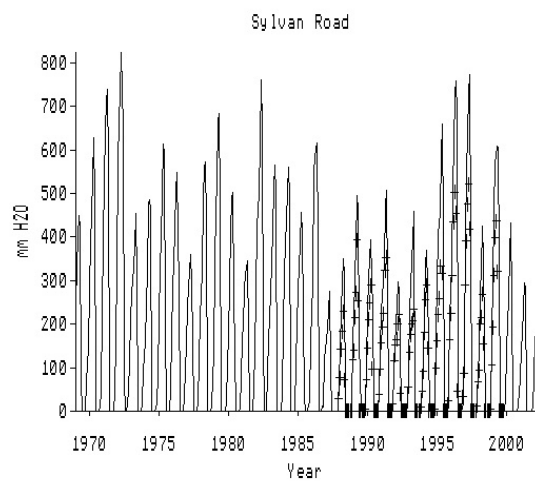


Appendix 3. Thermal areas map at 1 km resolution A) 100 m resolution and B) 1km resolution.



Appendix 4. Observed (points) and simulated (lines) snow water content at SNOTEL sites.

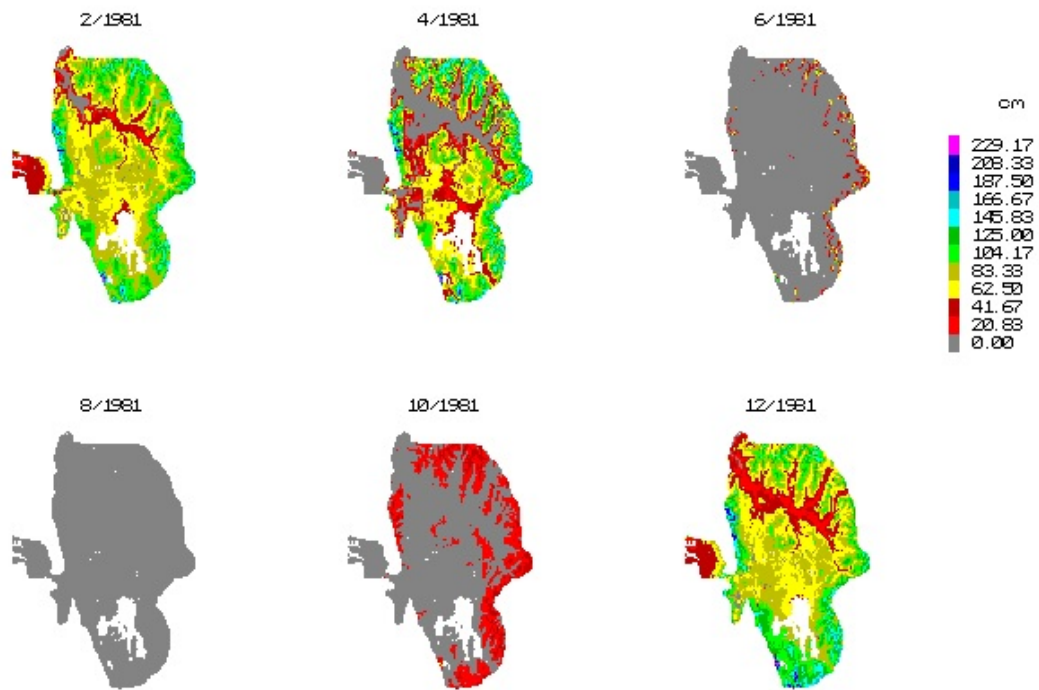




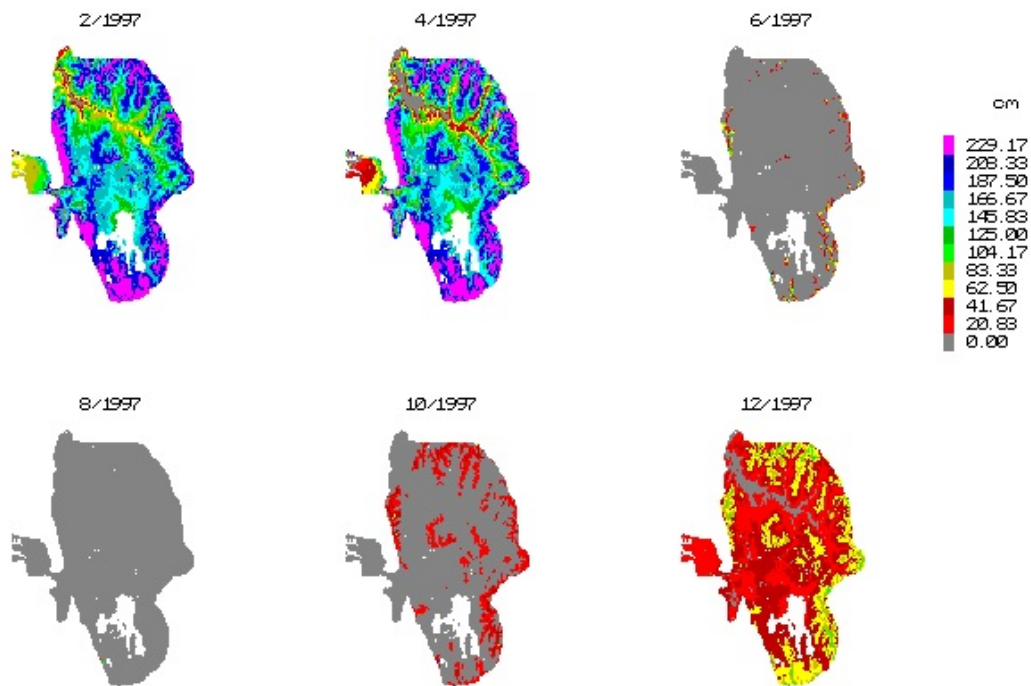
Appendix 4 (cont.).

Appendix 4 (cont.).

Snow Depth



Snow Depth



Appendix 5. Example bimonthly snow depths in 1981 and 1997.