

## APPENDIX

TABLE A1

Introduced species detected in the original Langenheim (1953, 1962) data set and the full data set of Zorio (2015) in four high-elevation plant communities in the East River Basin, Colorado, U.S.A. Species are arranged alphabetically by family. Weber and Wittmann (2012) and Shaw (2008) were used for plant identification. The presence (×) or absence (0) of each species in each community type from both the original (Langenheim, 1962), denoted 1950, and the new survey, denoted 2014, are included. Community abbreviations appear in order of the lowest elevation to highest elevation community type. SB: sagebrush, SF: spruce-fir, UH: upland-herbaceous, AL: alpine.

	1950				2014			
	SB	SF	UH	AL	SB	SF	UH	AL
<b>Asteraceae</b>								
<i>Lactuca serriola</i>	0	0	0	0	x	0	0	0
<i>Taraxacum officinale</i>	x	0	x	0	x	x	x	x
<i>Triogopogon dubius</i>	0	0	0	0	x	0	0	0
<b>Brassicaceae</b>								
<i>Descurainia sophia</i>	0	0	0	0	x	0	x	0
<i>Thlaspi arvense</i>	0	0	0	0	x	0	0	0
<i>Trifolium repens</i>	0	0	0	0	x	0	x	0
<b>Poaceae</b>								
<i>Anisantha tectorum</i>	0	0	0	0	x	0	0	0
<i>Bromopsis inermis</i>	0	0	0	0	x	x	x	0
<i>Poa pratensis</i>	0	0	0	0	x	0	x	0

TABLE A2

Summary of location (decimal degrees) and environmental variables for each site in the original (Langenheim, 1953) and new surveys. Communities are abbreviated as follows: sagebrush (SB), spruce-fir (SF), upland-herbaceous (U). The alpine community (A) is divided into 3 separate transects. Transects in alpine sites were sampled along the same contour in three 100 m lengths for safety. Start coordinates for each transect leg are denoted by the site number and letter. This deviates from the three other habitats that were sampled by running four 75 m transects at right angles from a center point.

Site #	Lat	Long	Aspect	Slope (%)	Elevation (m)	Substrate
SB1	38.7486	-106.8422	SW	7	2583	Sandstone
SB2	38.7903	-106.8698	SW	2.78	2598	Shale
SB3	38.7895	-106.8725	SW	5.18	2586	Alluvium
SB4	38.8253	-106.8735	SE	21.65	2909	Landslide
SB5	38.8200	-106.8688	SE	15.42	2683	Sandstone
SB6	38.8430	-106.8243	E	19.17	2838	Glacial Drift
SB7	38.8404	-106.8269	E	27.65	2878	Gravel
SB8	38.8430	-106.8243	SE	22.35	2876	Glacial Drift
SB9	38.8561	-106.9099	E	0.56	2751	Shale
SB10	38.8587	-106.9078	SE	1.66	2760	Sandstone
SB11	38.5827	-106.9128	SW	2.42	2735	Sandstone
SB12	38.8659	-106.8730	E	7.4	2873	Sandstone
SB13	38.8665	-106.8906	NW	7.46	2856	Gravel
SB14	38.8947	-106.8954	SE	13.34	2805	Sandstone
SB15	38.9011	-106.8768	S	10.07	2801	Sandstone
SB16	39.9018	-106.8790	SE	6.47	2834	Shale
SB17	38.9002	-106.8784	W	2.08	2791	Sandstone
SB18	38.9142	-106.8393	S	17.72	2978	Limestone
SB19	38.9160	-106.8554	S	20.23	2968	Granitoid
SB20	38.9074	-106.8599	SE	15.56	2873	Glacial Drift
SB21	38.8966	-106.8880	SE	9.66	3052	Landslide
SB22	38.6932	-106.8588	SW	0.41	2542	Sandstone
SB23	38.7045	-106.8480	W	13.39	2528	Sandstone
SB24	38.9664	-106.9708	SE	17.18	3074	Limestone
SB25	38.9692	-106.9685	SE	15.52	3080	Gravel
SB26	38.9726	-106.9633	W	22.81	3109	Rhyolite
SB27	38.9608	-106.9830	SW	4.02	2928	Limestone
SF1	38.9723	-106.9616	NW	16.07	3119	Sandstone
SF2	38.9753	-106.9573	W	14.65	3131	Sandstone
SF3	38.9766	-106.9552	W	24.9	3164	Sandstone
SF4	38.9719	-106.9813	W	29.51	3313	Sandstone
SF5	38.9946	-106.9890	W	15.59	3316	Shale
SF6	38.9934	-106.9917	W	14.15	3265	Shale
SF7	39.0037	-106.9954	W	12.52	3214	Sandstone
SF8	39.0042	-106.9933	W	7.81	3302	Glacial Drift
SF9	39.0090	-106.9991	S	7.74	3154	Glacial Drift
SF10	38.8471	-106.8617	W	7.31	3157	Sandstone
SF11	38.8416	-106.8823	SW	8.19	3038	Shale
SF12	38.8531	-106.8671	E	7.93	3105	Sandstone

**TABLE A2**

**Continued**

Site #	Lat	Long	Aspect	Slope (%)	Elevation (m)	Substrate
SF13	38.9354	-106.7688	SW	21.82	3266	Sandstone
SF14	38.9337	-106.7720	SE	11.29	3271	Sandstone
SF15	38.9360	-106.7722	E	9.28	3397	Sandstone
SF16	38.9279	-106.7864	SW	1.06	3435	Sandstone
SF17	38.9280	-106.7740	E	4.22	3210	Sandstone
SF18	38.9248	-106.7940	NE	2.99	3253	Sandstone
SF19	38.9175	-106.8280	S	8.97	3269	Sandstone
SF20	38.9239	-106.8505	W	25.11	3041	Sandstone
SF21	38.9397	-106.8829	W	6.27	3258	Sandstone
SF22	38.9632	-106.8450	W	15.61	3323	Sandstone
SF23	38.9608	-106.8343	W	15.59	3519	Sandstone
SF24	38.9581	-106.8349	W	13.52	3506	Sandstone
SF25	38.9158	-106.7817	W	14.31	3409	Sandstone
SF26	38.9146	-106.8727	W	15.21	3154	Sandstone
SF27	38.9135	-106.8725	W	24.1	3165	Sandstone
SF28	38.9134	-106.8710	W	26.1	3218	Sandstone
SF29	38.9176	-106.8667	W	13.13	3272	Sandstone
SF30	38.9485	-106.8615	E	9.28	3052	Sandstone
SF31	38.9456	-106.8741	W	15.21	3001	Sandstone
SF32	38.9283	-106.9881	W	29.51	3113	Sandstone
U1	38.9650	-106.7684	S	9.23	3553	Sandstone
U2	38.9650	-106.7704	S	11.6	3523	Sandstone
U3	38.9667	-106.7679	SW	22.77	3611	Sandstone
U4	38.9603	-106.7746	E	21.65	3563	Sandstone
U5	38.9592	-106.7781	S	27.22	3605	Sandstone
U6	38.9629	-106.7810	SE	10.36	3615	Sandstone
U7	38.9651	-106.7837	SE	7.05	3657	Sandstone
U8	38.9565	-106.7856	E	9.98	3652	Sandstone
U9	38.9528	-106.7862	N	8.18	3618	Sandstone
U10	38.9501	-106.7856	E	7.24	3626	Sandstone
U11	38.9507	-106.7884	N	16.19	3671	Sandstone
U12	38.9278	-106.7887	NW	7.13	3420	Sandstone
U13	38.9262	-106.7898	SE	21.37	3365	Sandstone
U14	38.8522	-106.8486	S	24.81	3362	Sandstone
U15	38.8589	-106.8427	SE	24.37	3360	Sandstone
U16	38.8625	-106.8386	SE	32.26	3408	Sandstone
U17	38.9518	-106.8833	S	28.04	3440	Sandstone
U18	38.9431	-106.8813	S	29.06	3123	Sandstone
U19	38.9483	-106.8796	S	22.88	3371	Sandstone
U20	38.9508	-106.8761	S	22.83	3435	Sandstone
U21	38.9679	-106.8261	SW	28.02	3850	Plutonic
U22	38.9552	-106.8356	NE	26.89	3604	Sandstone
U23	38.9591	-106.8307	NW	14.4	3591	Sandstone

**TABLE A2**

**Continued**

Site #	Lat	Long	Aspect	Slope (%)	Elevation (m)	Substrate
U24	38.9712	-106.8471	SW	23.35	3484	Plutonic
U25	38.9493	-106.9135	SE	2.4	3529	Shale
U26	38.9457	-106.9190	E	1.29	3429	Shale
U27	38.0123	-106.9870	S	26.66	3369	Glacial Drift
U28	38.9980	-106.9811	S	25.71	3465	Sandstone
U29	39.0153	-106.9903	SW	7.13	3515	Sandstone
U30	39.0245	-106.9871	SW	10.48	3367	Sandstone
A1	38.9720	-106.8195	N	22.48	3777	Sandstone
A2a	38.9714	-106.7658	N	23.96	3775	Limestone
A2b	38.9718	-106.7665	“	“	“	“
A2c	38.9722	-106.7673	“	“	“	“
A3a	38.9643	-106.7591	E	34.73	3874	Sandstone
A3b	38.9650	-106.7597	“	“	“	“
A3c	38.9660	-106.7606	“	“	“	“
A4a	38.9571	-106.7534	SW	28.83	3871	Plutonic
A4b	38.9579	-106.7534	“	“	“	“
A4c	38.9589	-106.7532	“	“	“	“
A5a	38.9499	-106.7549	E	32.66	3897	Plutonic
A5b	38.9491	-106.7549	“	“	“	“
A5c	38.9482	-106.7552	“	“	“	“
A6a	38.9453	-106.7524	S	26.69	4004	Plutonic
A6b	38.9445	-106.7521	“	“	“	“
A6c	38.9437	-106.7519	“	“	“	“
A7a	38.9521	-106.7540	E	27.56	3852	Plutonic
A7b	38.9514	-106.7549	“	“	“	“
A7c	38.9507	-106.7552	“	“	“	“
A8a	38.9542	-106.7540	E	36.98	4013	Plutonic
A8b	38.9533	-106.7539	“	“	“	“
A8c	38.9525	-106.7543	“	“	“	“
A9a	38.9650	-106.7926	N	28.14	3763	Sandstone
A9b	38.9656	-106.7933	“	“	“	“
A9c	38.9663	-106.7939	“	“	“	“
A10a	38.9649	-106.7895	SE	31.76	3691	Sandstone
A10b	38.9649	-106.7906	“	“	“	“
A10c	38.9647	-106.7917	“	“	“	“
A11a	38.9608	-106.7925	E	28.05	3778	Sandstone
A11b	38.9599	-106.7926	“	“	“	“
A11c	38.9589	-106.7926	“	“	“	“
A12a	38.9574	-106.7917	NE	17.91	3755	Sandstone
A12b	38.9566	-106.7912	“	“	“	“
A12c	38.9558	-106.7908	“	“	“	“
A13a	38.9544	-106.7908	E	21.9	3849	Sandstone
A13b	38.9536	-106.7909	“	“	“	“

**TABLE A2**

**Continued**

Site #	Lat	Long	Aspect	Slope (%)	Elevation (m)	Substrate
A13c	38.9522	-106.7912	“	“	“	“
A14a	38.9509	-106.7909	E	38.2	3766	Sandstone
A14b	38.9500	-106.7905	“	“	“	“
A14c	38.9492	-106.7901	“	“	“	“
A15a	38.9517	-106.7904	E	31	3750	Sandstone
A15b	38.9509	-106.7903	“	“	“	“
A15c	38.9500	-106.7901	“	“	“	“
A16a	38.9480	-106.7889	NE	27.55	3781	Sandstone
A16b	38.9487	-106.7896	“	“	“	“
A16c	38.9495	-106.7903	“	“	“	“
A17a	38.9455	-106.7881	E	24.55	3830	Sandstone
A17b	38.9464	-106.7876	“	“	“	“
A17c	38.9471	-106.7882	“	“	“	“
A18a	38.9360	-106.7833	E	27.37	3645	Sandstone
A18b	38.9357	-106.7843	“	“	“	“
A18c	38.9366	-106.7855	“	“	“	“
A19a	38.8682	-106.8327	E	21.38	3628	Sandstone
A19b	38.8690	-106.8334	“	“	“	“
A19c	38.8704	-106.8338	“	“	“	“
A20a	38.8758	-106.8292	E	23.69	3714	Sandstone
A20b	38.8773	-106.8297	“	“	“	“
A20c	38.8787	-106.8294	“	“	“	“
A21a	38.8797	-106.8296	N	3.23	3662	Sandstone
A21b	38.8807	-106.8297	“	“	“	“
A21c	38.8807	-106.8297	“	“	“	“
A22a	38.8842	-106.8306	E	15.34	3650	Sandstone
A22b	38.8831	-106.8297	“	“	“	“
A22c	38.8823	-106.8291	“	“	“	“
A23a	38.8880	-106.8314	SW	5.98	3673	Sandstone
A23b	38.8868	-106.8308	“	“	“	“
A23c	38.8860	-106.8309	“	“	“	“
A24a	38.8870	-106.8394	E	8.85	3666	Sandstone
A24b	38.8858	-106.8365	“	“	“	“
A24c	38.8855	-106.8352	“	“	“	“
A25a	38.9724	-106.8278	N	20.59	3751	Plutonic
A25b	38.9731	-106.8282	“	“	“	“
A25c	38.9740	-106.8287	“	“	“	“
A26a	38.9696	-106.8267	S	17.22	3897	Plutonic
A26b	38.9703	-106.8271	“	“	“	“
A26c	38.9712	-106.8275	“	“	“	“
A27a	38.9661	-106.8256	E	27.69	3811	Sandstone
A27b	38.9669	-106.8257	“	“	“	“
A27c	38.9678	-106.8253	“	“	“	“

**TABLE A2**  
**Continued**

Site #	Lat	Long	Aspect	Slope (%)	Elevation (m)	Substrate
A28a	38.9604	-106.8260	E	28.37	3829	Plutonic
A28b	38.9613	-106.8259	"	"	"	"
A28c	38.9621	-106.8259	"	"	"	"
A29a	38.9558	-106.8276	SE	31.53	3739	Sandstone
A29b	38.9551	-106.8280	"	"	"	"
A29c	38.9542	-106.8284	"	"	"	"
A30a	38.9556	-106.9176	S	30.28	3839	Sandstone
A30b	38.9551	-106.9165	"	"	"	"
A30c	38.9545	-106.9161	"	"	"	"
A31a	39.0002	-106.9807	W	32.88	3549	Sandstone
A31b	39.0001	-106.9795	"	"	"	"
A31c	38.9998	-106.9785	"	"	"	"
A32a	38.9998	-106.9739	W	28.64	3646	Sandstone
A32b	39.0004	-106.9747	"	"	"	"
A32c	39.0009	-106.9756	"	"	"	"
A33a	38.9857	-106.9730	SE	38.26	3641	Sandstone
A33b	38.9848	-106.9710	"	"	"	"
A33c	38.9852	-106.9722	"	"	"	"
A34a	38.9859	-106.9687	E	25.14	3694	Sandstone
A34b	38.9847	-106.9683	"	"	"	"
A34c	38.9834	-106.9678	"	"	"	"
A35a	38.9858	-106.9694	E	34.92	3735	Sandstone
A35b	38.98671	-106.9717	"	"	"	"
A35c	38.98646	-106.9703	"	"	"	"