YELLOWSTONE GRID METADATA

CLASS I. DATA SET DESCRIPTORS

A. Data set identity: Prefire heterogeneity, fire severity, and early postfire plant reestablishment in subalpine forests of Yellowstone National Park, Wyoming

B. Identification codes for relevant data sets: YNPgrid89_data.txt, YNPgrid90_data.txt, YNPgrid91_data.txt, YNPgrid92_data.txt

C. Data set description

Principal Investigators: Monica G. Turner, William H. Romme, and Robert H. Gardner.

Contact Information:
Monica G. Turner,
Department of Zoology
432 Birge Hall
University of Wisconsin
Madison, WI 53706.
608-262-2592
turnermg@wisc.edu
http://landscape.zoology.wisc.edu/index.html

Citation: Turner, M. G., W. H. Romme, and R. H. Gardner. 1999. Prefire heterogeneity, fire severity and plant reestablishment in subalpine forests of Yellowstone National Park, Wyoming. International Journal of Wildland Fire 9:21-36.

Abstract: The 1988 fires in Yellowstone National Park provided an opportunity to study effects of a large infrequent disturbance on a natural community. This study addressed two questions: (1) How does prefire heterogeneity of the landscape affect postfire patterns of fire severity? and (2) How do postfire patterns of burn severity influence plant reestablishment? At three sites, 100 sampling points were distributed regularly in a 1-km x 1-km grid and sampled annually from 1989 to 1992. Information was recorded on fire severity (damage to trees, depth of ash and soil charring, and percent mineral soil exposed); pre-fire forest structure (forest successional stage; tree density; tree species; tree size; and evidence of pre-fire disturbance by mountain pine beetle [*Dendroctonus ponderosae* Hopk.] or mistletoe [*Arceuthobium americanum* Nutt. ex Engelm.]); postfire percent cover of graminoids, forbs, and low shrubs; number of lodgepole pine (*Pinus contorta* var. *latifolia* Engelm.) seedlings; and general topographic characteristics (slope and aspect).

D. **Key words**: fire severity, heterogeneity, disturbance, landscape ecology, Yellowstone National Park, Rocky Mountains, *Pinus contorta, Dendroctonus ponderosae, Arceuthobium americanum*

CLASS II. RESEARCH ORIGIN DESCRIPTORS

A. Overall project description

Identity: Prefire heterogeneity, fire severity, and early postfire plant reestablishment in subalpine forests of Yellowstone National Park, Wyoming

Originators: Monica G. Turner (contact information above), William H. Romme, and Robert H. Gardner..

Period of Study: 1989-1992

Objectives: (a) Study how prefire heterogeneity affects postfire patterns of fire severity, (b) Study how postfire pattern of burn severity influence plant reestablishment.

Abstract: Same as above.

Sources of funding: National Geographic Society (Grant No. 4284-90), National Science Foundation (BSR - 9016281 and BSR-90118381).

B. Specific subproject description

Site description/selection criteria: We selected three 1-km x 1-km study sites on the subalpine plateau of Yellowstone National Park, Wyoming in which a mosaic of fire severity was observed aerially (by MGT and WHR during helicopter flight in October 1998) and from the ground. Criteria for site selection included the presence of crown fire and unburned forest within each 1-km^2 area, similarity in substrate (glacial till composed primarily of rhyolite) and elevation (2300-2400 m), and accessibility (within 5 km of a road). The two most important environmental features controlling vegetation on the plateau are related to elevation and geological substrate (Despain 1990), with moisture generally increasing with elevation and soil fertility lower on rhyolite than on andesite substrate. Our study sites represent the dry and infertile end of the major gradients in YNP. The Mallard and Heart sites were embedded within a larger burn mosaic, whereas the Mystic grid was located at the edge of a large burn, capturing the transition between unburned forest and crown fire.

Site type: subalpine forested plateau

Geography: UTM Coordinates of sampling points A1 (SW corner) and J10 (NE corner) for each grid site:

Mallard: A1: 514,750 E 4,922,750 N; J10: 515,750 E 4,923,300 N

Mystic: A1: 509,450 E 4,925,750 N; J10: 510,450 E 4,926,750 N

Heart: A1: 533,450 E 4,907,550 N; J10: 534,450 E 4,908,550 N

Habitat: Coniferous forests dominated by lodgepole pine, although subalpine fir (*Abies lasiocarpa* (Hook.) Nutt.), Engelmann spruce (*Picea engelmannii* Parry), and whitebark pine (*Pinus albicaulis* Engelm.) may be locally abundant.

Geology: Glacial till composed primarily of rhyolite

Watersheds/hydrology: N/A

Site history: The prior mountain pine beetle outbreak in YNP (Despain 1990) affected our study sites between 1971 and 1983. The summer of 1988 was the driest on record in YNP; precipitation in June, July and August was 20%, 79%, and 10%, respectively, of the 100-yr average (National Park Service 1988 Weather Station Data, Yellowstone National Park).

Climate: The climate is generally cool and dry; on the plateau, mean January temperature is -11.4˚ C and mean July temperature is 10.8˚ C (Dirks and Martner 1982). Mean annual precipitation is 56.25 cm with relatively moist springs and dry summers (Dirks and Martner 1982).

Sampling methods: Initial field sampling was conducted during July 1989. A 100-m interval grid was established at each study site (yielding 100 sampling points in each 1-km^2 grid) by locating the initial corner point at random. Each grid was oriented toward true north, and the corners of each grid were permanently marked with rebar and located by triangulation.

The 1989 field sampling used the following procedures. We established a 50-m^2 circular area centered on each sampling point within each grid. Within this circular plot, we recorded slope, aspect, prefire successional stage of the stand, burn severity, and number of trees (live + dead) taller than breast height (1.5 m) by species. Trees that were dead prior to the 1988 fires were deeply charred in many places on the stem, were almost completely lacking bark, and had few or no small branches and twigs (< 2 cm diameter). Trees that were alive prior to having burned in 1988 had no deep charring, generally retained their bark, and usually had at least some small twigs and branches. We also recorded visual estimates of prefire mountain pine beetle and mistletoe damage within the stand.

The circular plot was then subdivided into four quadrants (northeast, northwest, southwest, and southeast). Tree species, diameter at breast height (dbh), and damage level burn severity as indicated by tree damage were recorded for the two trees nearest to the center of each quadrant. Occasionally there was one or no trees within a quadrant, in which case fewer than two trees were sampled. Percent cover of graminoids, forbs, shrubs, litter, and exposed mineral soil were estimated visually within a 1-m^2 plot in each of the four quadrants, and the number of lodgepole pine seedlings and the dominant species by cover recorded. The depth of ash and depth to which the soil was charred were measured by excavating a small hole in the center of each 1-m^2 plot. Ash was recognizable by both color and texture, and charred soil was distinguishable by color. Data collected at each sampling point (i.e., within the four quadrats) were aggregated to provide a single value for each variable at each 50-m^2 circular plot.

The three grids were resampled during the summers of 1990, 1991, and 1992. The four corners of each grid were permanently marked in 1989, but the individual sampling points within the grid were not. Slope, aspect, prefire successional stage of the stand, and burn severity were recorded in 1990, 1991 and 1992 at each sampling point as described above for the 1989 sampling. Measurements of tree density, tree size, bark beetle damage, and mistletoe infestation were not repeated. Ground-layer vegetation was resampled, but a point-intercept method was used in place of the visual estimate of percent cover to assure consistency among individuals. At each sampling point, an 8-m line was extended perpendicular to the main north-south transect such that the center of the 8-m line coincided with the sampling point. Percent cover data were recorded within eight 0.25-m^2 point-intercept frames spaced at 1-m intervals along this line. We used a 0.5-m x 0.5-m point-intercept frame containing a total of 25 points (a modification of the method used by Floyd and Anderson [1982, 1987]). The plant species or cover type that occurred below each intercept point was recorded. Percent cover for each sampling point was determined by aggregating the data from the eight 0.25-m^2 plots.

Taxonomy and systematics: Dorn, R. D. 1992. Vascular plants of Wyoming. 2nd Edition. Mountain West Publishing, Cheyenne, Wyoming.

CLASS III. DATA SET STATUS AND ACCESSIBILITY

For internal use only.

CLASS IV. DATA STRUCTURAL DESCRIPTORS

A. 1989 Yellowstone Grid Data

Identity: YNPgrid89_data.txt

Size: YNPgrid89_data.txt : 7800 records, not including header row.

YNPgrid90_data.txt : 13500 records, not including header row.

YNPgrid91_data.txt : 16800 records, not including header row.

YNPgrid92_data.txt : 17700 entries, not including header row

Format and storage mode: ASCII text, tab delimited. No compression scheme was used.

Missing value code: "."

Header information: See variable names in Section B.

Alphanumeric attributes: Uppercase

Special characters/fields: Missing data denoted as "."

Authentication procedures: Column sums (see tables below)

B. Variable Information

ALL DATA SETS

SITE: Name of sampling grid: MLRD=Mallard, MYST=Mystic and HART=Heart

TRANSECT: Letter identifying transect within sampling grid ranging from letters A through J oriented from west to east.

POINT: Number identifying sampling point within each transect. Each transect contained sampling points numbered 1 through 10 oriented from south to north.

YEAR: Year sampling took place.

SLOP: Topographic slope (degrees) at each sampling point.

ASPECT: Topographic aspect of sampling point. Values can include N, S, E, W, NW, NE, SW, SE or X. A value of X indicates a virtually flat topography.

BURNSEV: Burn severity classes were defined as follows:

0=unburned, no sign of fire effects;

1=light surface burn. Low-intensity surface fire in which canopy trees retain green needles and generally did not die, although some stems scorched. Soil organic layer still largely intact, though burned in small patches.

2=severe surface burn. High-intensity surface fire with extensive canopy tree mortality, but needles on canopy trees are not consumed by fire; pre-fire soil organic layer largely consumed, but soil covered by dead leaves fallen from the canopy after the fire.

3=crown fire. Needles of canopy trees completely consumed by fire; soil organic layer almost entirely consumed, and soil is bare with no litter.

SUCC: Prefire successional stage classes were derived from sampling a chronosequence of stands that originated following fires at various times in the last 400 years. The resulting classes are defined as follows:

LP0 (0-40 yrs) = Recently burned lodgepole pine stands in the grass to seedling/sapling stage before canopy closure; trees usually < 2 m in height.

LP1 (40-150 yrs) = Closed canopy of even-aged, often dense lodgepole pine; young pole stage.

LP2 (150-300 yrs) = Closed canopy dominated by lodgepole pine; overstory still largely intact; understory may contain small conifers, but is generally open and park like.

LP3 (>300 yrs)=Canopy quite irregular, predominantly of old lodgepole pine but containing some Engelman spruce, subalpine fir and whitebark pine in the pole-sized class; understory usually dense.

SF0, SF1, SF2, SF3 are pre-fire successional stages for spruce-fir forest. Additional categories included SHR=shrub, BOG=bog, and WET=open water.

1989 DATA SET

BEETLE: Pre-fire mountain pine beetle damage within the stand was visually estimated and categorized as follows: none (0%), light (1-10%), moderate (10-50%), or severe (>50%). Trees killed by bark beetles were identified from gallery etchings in the wood and/or by pitch tubes on the bark. Because of slow decomposition rates, trees killed by beetles as long as 20 years earlier were still readily recognizable.

MISTLETOE: Pre-fire mistletoe damage within the stand was visually estimated and categorized as follows: none (0%), light (1-10%), moderate (10-50%), or severe (>50%). Living trees infested with mistletoe were recognized by the presence of the parasite in the bark. Dead trees that had been infested were recognized from the abnormal growth patterns, i.e., witches brooms and swollen branches, that result from mistletoe infestation (Alexander and Hawksworth 1975).

PICO, ABLA, PIEN, NUMPIAL: Number of prefire *Pinus contorta, Abies lasiocarpa , Picea engelmannii,* and *Pinus albicaulis* (respectively) taller than breast height within 50 m^2 circular plot.

BPICO, BABLA, BPIAL: Number of prefire *Pinus contorta, Abies lasiocarpa* and *Pinus albicaulis* (respectively) smaller than breast height within 50 $meter^2$ circular plot.

FORB, GRASS, SHRUB, BARE, MIN: Estimated percent cover of forbs, graminoids, shrubs, litter, and exposed mineral soil respectively. Average of four measurements each within a 1 m^2 circular plot.

NUMPICO1: Number of postfire *Pinus contorta* seedlings per m^2

ASH: Depth of ash in mm as distinguished by texture and color. Average of four measurements each within a 1 m^2 circular plot

CHAR: Depth of charred soil in mm as distinguished by color. Average of four measurements each within a 1m^2 circular plot

1990, 1991, and 1992 DATA SETS

FORB, EPAN, LUAR, ARCO, OFORB: Percent cover of various forb classifications. See tables below for species names.

GRASS, CAGE, CARO, CALA, OGRASS: Percent cover of various graminoid classifications. See tables below for species names.

SHRUB, VASC, AND OSHRUB: Percent cover of various shrub classifications. See tables below for species names.

BARE, MIN, CHARLIT, LITTER, LOG, ROOT, PEBB, COBB, BOULD, MOSS, AND WATER: Percent cover of various cover type classifications. See tables below for definitions.

PINE: Total number of postfire *Pinus contorta* seedlings per m^2).

ARCOSPR, ARCOSDL, CAGESPR, CAROSPR, CARXSDL, COPASDL, EPANSPR, EPANSDL, LUARSPR, LUARSDL, VASCSPR, CIARSPT, CIARSDL:

Number of sprouts per m^2 and/or number of seedlings per m^2 for various species. See tables below.

1991 and 1992 DATA SETS

PICO1, PICO2,, PICO3, PICO4 (*1992 only*), POTR1, POTR2, POTR3, POTR4 (*1992 only*): Number of *Pinus contorta* (PICO) and *Populus tremuloides* (POTR) seedling with a given age class per m^2

GADI, HIAL, LETT: Number of *Gayophytum diffusum, Hieracium albiflorum*, and *Lactuca serriola* per m^2

Table 1. 1989 Yellowstone Grid Data Descriptors

Variable Name	Variable definition	Units	Storage Type	Range for Numeric Values	Column sum
OBS	Unique integer code for each observation	N/A	Integer	1-300	N/A
YEAR	Year sampled	N/A	Integer	N/A	N/A
SITE	Name of grid	N/A	Character	N/A	N/A
TRANS	Transect letter label	N/A	Character	N/A	N/A
POINT	Sampling point	N/A	Integer	N/A	N/A
SLOP	Slope	degrees	Integer		N/A
ASP	Aspect	N/A	Character	N/A	N/A
BURN	Burn severity class	N/A	Character	N/A	N/A
SUCC	Successional stage classification	N/A	Character	N/A	N/A
BEETL	Percent prefire beetle damage	N/A	Integer (categorical)	N/A	355
MISTL	Percent prefire mistletoe damage	N/A	Integer (categorical)	N/A	408
PICO	Number *Pinus contorta* taller than breast height	No. / $50m^2$	Integer	0-62	2377
BPICO	Number *Pinus contorta* smaller than breast height	No. / $50m^2$	Integer	0-170	2004
ABLA	Number of *Abies lasiocarpa* taller than breast height	No. / $50m^2$	Integer	0-28	344
BABLA	Number of *Abies lasiocarpa* smaller than breast height	No. / $50m^2$	Integer	0-39	201
PIEN	Number *Picea engelmannii* taller than breast height	No. / $50m^2$	Integer	0-13	87
PIAL	Number *Pinus albicaulis* taller than breast height	No. / $50m^2$	Integer	0-11	102
BPIAL	Number *Pinus albicaulis* smaller	No. / $50m^2$	Integer	0-14	78

	than breast height				
FORB	Percent cover forbs	percent	Floating point	0-36.25	1150.375
GRASS	Percent cover grasses	percent	Floating point	0-85	2122.125
SHRUB	Percent cover of shrubs	percent	Floating point	0-62.5	915.375
BARE	Percent cover bare ground with litter	percent	Floating point	2.5-100	25415.625
MIN	Percent cover exposed mineral soil	percent	Floating point	0-100	15085.5
PINE	No. of post fire *Pinus contorta* seedlings per m^2	No./ m^2	Floating point	0-9.5	81
ASH	Depth of ash	mm	Floating point	0-19.5	371.75
CHAR	Depth of charred soil	mm	Floating point	0-39.25	2760.4187

Table 2. 1990 Yellowstone Grid Data Descriptors

Variable Name	Variable definition	Units	Storage Type	Range for Numeric Values	Column sum
OBS	Unique integer code for each observation	N/A	Integer	1-300	N/A
YEAR	Year sampled	N/A	Integer	N/A	N/A
SITE	Name of grid	N/A	Character	N/A	N/A
TRANS	Transect letter label	N/A	Character	N/A	N/A
POINT	Sampling point	N/A	Integer	N/A	N/A
SLOP	Slope	degrees	Integer		N/A
ASP	Aspect	N/A	Character	N/A	N/A
BURN	Burn severity class	N/A	Character	N/A	N/A
SUCC	Successional stage classification	N/A	Character	N/A	N/A
FORB	Total percent cover of forbs	Percent	Floating point	0-71	2199
EPAN	Percent cover of *Epilobium angustifolium*	Percent	Floating point	0-43	635
LUAR	Percent cover of *Lupinus argenteus*	Percent	Floating point	0-19.5	304.5
ARCO	Percent cover of *Arnica cordifolia*	Percent	Floating point	0-7	116
OFORB	Percent cover of other forbs (except EPAN, ARCO and LUAR)	Percent	Floating point	0-66.5	1141
GRASS	Percent cover of graminoids	Percent	Floating point	0-96.5	4154
CAGE	Percent cover of *Carex geyeri*	Percent	Floating point	0-50	1341.5
CARO	Percent cover of *Carex rossiix*	Percent	Floating point %	0-32.5	209
CALA	Percent cover of *Calamagrostis* spp.	Percent	Floating point %	0-75	1815.5
OGRASS	Percent cover of all other graminoids (all but CAGE, CARO, CALA)	Percent	Floating point %	0-87.5	793

SHRUB	Percent cover of all shrubs	Percent	Floating point %	0-72.5	996
VASC	Percent cover of *Vaccinium scoparium*	Percent	Floating point %	0-72.5	855.5
OSHRUB	Percent cover of all other shrubs (except VASC)	Percent	Floating point %	0-22	140.5
BARE	Percent cover of bare ground	Percent	Floating point	0-99	15225.5
MIN	Percent cover of exposed mineral soil	Percent	Floating point	0-88	7073.5
CHARLIT	Percent cover of charred litter	Percent	Floating point	0-49.5	2446.5
LITTER	Percent cover of unburned litter	Percent	Floating point	0-90.5	8661.5
LOG	Percent cover of logs	Percent	Floating point	0-63	2481
ROOT	Percent cover of roots	Percent	Floating point	0-20.5	234.5
PEBB	Percent cover of pebbles	Percent	Floating point	0-32.5	607
COBB	Percent cover of cobbles	Percent	Floating point	0-61	327
BOULD	Percent cover of boulders	Percent	Floating point	0-32	178.5
MOSS	Percent cover of moss	Percent	Floating point	0-41.5	342.5
WATER	Percent cover of water	Percent	Floating point	0-34.5	61.5
PINE	Total number of postfire *Pinus contorta* seedlings per m^2	No. / m^2	Floating point	0-32	324.5
ARCOSPR	Number of *Arnica cordifolia* sprouts per m^2	No. / m^2	Floating point	0-26	440
ARCOSDL	Number of *Arnica cordifolia* seedlings per m^2	No. / m^2	Floating point	0-14	69.5
CAGESPR	Number of *Carex geyeri* sprouts per m^2	No. / m^2	Floating point	0-64	1819
CAROSPR	Number of *Carex rossiix* sprouts per m^2	No. / m^2	Floating point	0-27	435

CARXSDL	Number of *Carex* spp. seedlings per m^2	No. / m^2	Floating point	0-13	61
COPASDL	Number of *Collinsia parviflora* seedlings per m^2	No. / m^2	Floating point	0-8	12.5
EPANSPR	Number of *Epilobium angustifolium* sprouts per m^2	No. / m^2	Floating point	0-42	766.5
EPANSDL	Number of *Epilobium angustifolium* seedlings per m^2	No. / m^2	Floating point	0-24	179
LUARSPR	Number of *Lupinus argenteus* sprouts per m^2	No. / m^2	Floating point	0-18	174
LUARSDL	Number of *Lupinus argenteus* seedlings per m^2	No. / m^2	Floating point	0-1	5
VASCSPR	Number of *Vaccinium scoparium* sprouts per m^2	No. / m^2	Floating point	0-156	2715.5

Table 3. 1991 Yellowstone Grid Data Descriptors

Variable Name	Variable definition	Units	Storage Type	Range for Numeric Values	Missing value code
OBS	Unique integer code for each observation	N/A	Integer	1-300	N/A
YEAR	Year sampled	N/A	Integer	N/A	N/A
SITE	Name of grid	N/A	Character	N/A	N/A
TRANS	Transect letter label	N/A	Character	N/A	N/A
POINT	Sampling point	N/A	Integer	1-10	N/A
SLOP	Slope	degrees	Integer		N/A
ASP	Aspect	N/A	Character	N/A	N/A
BURN	Burn severity class	N/A	Character	N/A	N/A
SUCC	Successional stage classification	N/A	Character	N/A	N/A
FORB	Total percent cover of forbs	Percent	Floating point	0-73	4383
EPAN	Percent cover of *Epilobium angustifolium*	Percent	Floating point	0-58	2391
LUAR	Percent cover of *Lupinus argenteus*	Percent	Floating point	0-22.5	308.5
ARCO	Percent cover of *Arnica cordifolia*	Percent	Floating point	0-18	229
OFORB	Percent cover of other forbs (except EPAN, ARCO and LUAR)	Percent	Floating point	0-48	1504
GRASS	Percent cover of graminoids	Percent	Floating point	0-83	3994.5
CAGE	Percent cover of *Carex geyeri*	Percent	Floating point	0-47.5	1378.5
CARO	Percent cover of *Carex rossiix*	Percent	Floating point	0-18	191.5
CALA	Percent cover of *Calamagrostis* spp.	Percent	Floating point	0-0	0
OGRASS	Percent cover of all other graminoids (all but CAGE, CARO, CALA)	Percent	Floating point	0-83	2424.5
SHRUB	Percent cover of all	Percent	Floating	0-83.5	1259

	shrubs		point		
VASC	Percent cover of *Vaccinium scoparium*	Percent	Floating point	0-80	1049
OSHRUB	Percent cover of all other shrubs (except VASC)	Percent	Floating point	0-25	210
BARE	Percent cover of bare ground	Percent	Floating point	0.5-95	13336
MIN	Percent cover of exposed mineral soil	Percent	Floating point	0-95.5	6167
CHARLIT	Percent cover of charred litter	Percent	Floating point	0-19.5	611
LITTER	Percent cover of unburned litter	Percent	Floating point	0-83.5	8083
LOG	Percent cover of logs	Percent	Floating point	0-52	2349
ROOT	Percent cover of roots	Percent	Floating point	0-20	308.5
PEBB	Percent cover of pebbles	Percent	Floating point	0-63	881.5
COBB	Percent cover of cobbles	Percent	Floating point	0-44.5	323
BOULD	Percent cover of boulders	Percent	Floating point	0-12.5	147.5
MOSS	Percent cover of moss	Percent	Floating point	0-35	621.5
WATER	Percent cover of water	Percent	Floating point	0-10.5	11
PINE	Total number of postfire *Pinus contorta* seedlings per m^2	No. / m^2	Floating point	0-29	253
PICO 1	Number of 1st year *Pinus contorta* per m^2	No. / m^2	Floating point	0-14	58
PICO2	Number of 2nd year *Pinus contorta* per m^2	No. / m^2	Floating point	0-18	87
PICO3	Number of 3rd year *Pinus contorta* per m^2	No. / m^2	Floating point	0-6	100.5
POTR1	Number of 1st year *Populus tremuloides* per m^2	No. / m^2	Floating point	0-.5	1
POTR2	Number of 2nd year	No. /	Floating	0-1.5	6.5

	Populus tremuloides per m^2	m^2	point		
POTR3	Number of 3rd year *Populus tremuloides* per m^2	No. / m^2	Floating point	0-5	27.5
ARCOSPR	Number of *Arnica cordifolia* sprouts per m^2	No. / m^2	Floating point	0-36	587
ARCOSDL	Number of *Arnica cordifolia* seedlings per m^2	No. / m^2	Floating point	0-2	7.5
CAGESPR	Number of *Carex geyeri* sprouts per m^2	No. / m^2	Floating point	0-101	2195.5
CAROSPR	Number of *Carex rossiix* sprouts per m^2	No. / m^2	Floating point	0-22	196.5
CARXSDL	Number of *Carex* spp. seedlings per m^2	No. / m^2	Floating point	0-5.5	25
COPASDL	Number of *Collinsia parviflora* seedlings per m^2	No. / m^2	Floating point	0-2.5	2.5
EPANSPR	Number of *Epilobium angustifolium* sprouts per m^2	No. / m^2	Floating point	0-62	2469.5
EPANSDL	Number of *Epilobium angustifolium* seedlings per m^2	No. / m^2	Floating point	0-106	1052.5
LUARSPR	Number of *Lupinus argenteus* sprouts per m^2	No. / m^2	Floating point	0-14	161
LUARSDL	Number of *Lupinus argenteus* seedlings per m^2	No. / m^2	Floating point	0-44	345
VASCSPR	Number of *Vaccinium scoparium* sprouts per m^2	No. / m^2	Floating point	0-137	2941
CIARSPT	Number of *Cirsium arvense* sprouts per m^2	No. / m^2	Floating point	0-2	5
CIARSDL	Number of *Cirsium arvense* seedlings per m^2	No. / m^2	Floating point	0	0
GADI	Number of *Gayophytum diffusum*	No. / m^2	Floating point	0-122	1633

	per m^2				
HIAL	Number of *Hieracium albiflorum* per m^2	No. / m^2	Floating point	0-5	8.5
LETT	Number of *Lactuca serriola* per m^2	No. / m^2	Floating point	0-2.5	6.5

Table 4. 1992 Yellowstone Grid Data Descriptors

Variable Name	Variable definition	Units	Storage Type	Range for Numeric Values	Column sum
OBS	Unique integer code for each observation	N/A	Integer	1-300	N/A
YEAR	Year sampled	N/A	Integer	N/A	N/A
SITE	name of grid	N/A	Character	N/A	N/A
TRANS	Transect letter label	N/A	Character	N/A	N/A
POINT	Sampling point	N/A	Integer	1-10	N/A
SLOP	Slope	degrees	Integer		N/A
ASP	aspect	N/A	Character	N/A	N/A
BURN	Burn severity class	N/A	Character	N/A	N/A
SUCC	Successional stage classification	N/A	Character	N/A	N/A
FORB	Total percent cover of forbs	Percent	Floating point	0-66.5	5039
EPAN	Percent cover of *Epilobium angustifolium*	Percent	Floating point	0-57	3308
LUAR	Percent cover of *Lupinus argenteus*	Percent	Floating point	0-13.5	261.5
ARCO	Percent cover of *Arnica cordifolia*	Percent	Floating point	0-8.5	128
OFORB	Percent cover of other forbs (except EPAN, ARCO and LUAR)	Percent	Floating point	0-47.5	1341.7
GRASS	Percent cover of graminoids	Percent	Floating point	0-85	4243.5
CAGE	Percent cover of *Carex geyeri*	Percent	Floating point	0-52.5	1733
CARO	Percent cover of *Carex rossiix*	Percent	Floating point	0-31	309
CALA	Percent cover of *Calamagrostis* spp.	Percent	Floating point	0-0	0
OGRASS	Percent cover of all other graminoids (all but CAGE, CARO, CALA)	Percent	Floating point	0-85	2201.5
SHRUB	Percent cover of all	Percent		0-82.5	1243.6

	shrubs				
VASC	Percent cover of *Vaccinium scoparium*	Percent	Floating point	0-68	903.2
OSHRUB	Percent cover of all other shrubs (except VASC)	Percent	Floating point	0-59.5	340.4
BARE	Percent cover of bare ground	Percent	Floating point	11-98.5	13387
MIN	Percent cover of exposed mineral soil	Percent	Floating point	0-84.5	5393
CHARLIT	Percent cover of charred litter	Percent	Floating point	0-20.5	561
LITTER	Percent cover of unburned litter	Percent	Floating point	0-83.5	8080
LOG	Percent cover of logs	Percent	Floating point	0-51.5	2450
ROOT	Percent cover of roots	Percent	Floating point	0-19.5	188.5
PEBB	Percent cover of pebbles	Percent	Floating point	0-70.5	883.5
COBB	Percent cover of cobbles	Percent	Floating point	0-12.5	193
BOULD	Percent cover of boulders	Percent	Floating point	0-39	128.2
MOSS	Percent cover of moss	Percent	Floating point	0-39	894
WATER	Percent cover of water	Percent	Floating point	0-9	9.5
PINE	Total number of postfire *Pinus contorta* seedlings per m^2	No. / m^2	Floating point	0-20	231
PICO1	Number of 1^{st} year *Pinus contorta* per m^2	No. / m^2	Floating point	0-11	35.5
PICO2	Number of 2^{nd} year *Pinus contorta* per m m^2	No. / m^2	Floating point	0-11	48
PICO3	Number of 3^{rd} year *Pinus contorta* per m^2	No. / m^2	Floating point	0-5	80.5
PICO4	Number of 4^{th} year *Pinus contorta* per m^2	No. / m^2	Floating point	0-5.5	67
POTR1	Number of 1^{st} year	No. /	Floating	0-1	1

	Populus tremuloides per m^2	m^2	point		
POTR2	Number of 2nd year *Populus tremuloides* per m^2	No. / m^2	Floating point	0-2.5	4
POTR3	Number of 3rd year *Populus tremuloides* per m^2	No. / m^2	Floating point	0-1.5	5.5
POTR4	Number of 4th year *Populus tremuloides* per m^2	No. / m^2	Floating point	0-18	28.5
ARCOSPR	Number of *Arnica cordifolia* sprouts per m^2	No. / m^2	Floating point	0-35	524.5
ARCOSDL	Number of *Arnica cordifolia* seedlings per m^2	No. / m^2	Floating point	0-12	23.5
CAGESPR	Number of *Carex geyeri* sprouts per m^2	No. / m^2	Floating point	0-123	1666
CAROSPR	Number of *Carex rossiix* sprouts per m^2	No. / m^2	Floating point	0-18	185
CARXSDL	Number of *Carex spp.* seedlings per m^2	No. / m^2	Floating point	0-7	51
COPASDL	Number of *Collinsia parviflora* seedlings per m^2	No. / m^2	Floating point	0-25	52
EPANSPR	Number of *Epilobium angustifolium* sprouts per m^2	No. / m^2	Floating point	0-65	3599
EPANSDL	Number of *Epilobium angustifolium* seedlings per m^2	No. / m^2	Floating point	0-188	1108.5
LUARSPR	Number of *Lupinus argenteus* sprouts per m^2	No. / m^2	Floating point	0-27	314
LUARSDL	Number of *Lupinus argenteus* seedlings per m^2	No. / m^2	Floating point	0-35	140.5
VASCSPR	Number of *Vaccinium scoparium* sprouts per m^2	No. / m^2	Floating point	0-112	1656
VASCSDL	Number of *Vaccinium*	No. /	Floating		19.5

	scoparium seedlings per m^2	m^2	point		
CIARSPT	Number of *Cirsium arvense* sprouts per m^2	No. / m^2	Floating point	0-7.5	13
CIARSDL	Number of *Cirsium arvense* seedlings per m^2	No. / m^2	Floating point	0-7.5	9
GADI	Number of *Gayophytum diffusum* per m^2	No. / m^2	Floating point	0-3955	14690.5
HIAL	Number of *Hieracium albiflorum* per m^2	No. / m^2	Floating point	0-0	0
LETT	Number of *Lactuca serriola* per m^2	No. / m^2	Floating point	0-2	5

LITERATURE CITED

Despain, D. G. 1990. Yellowstone Vegetation:† Consequences of Environment and History in a Natural Setting. Roberts Rinehart Publishing Co., Boulder, Colorado.

Dirks, R. A. and B. E. Martner. 1982. The climate of Yellowstone and Grand Teton National Parks. Occasional Paper No. 6, U. S. National Park Service, Washington, D. C.

Dorn, R. D. 1992. Vascular plants of Wyoming. 2nd Edition. Mountain West Publishing, Cheyenne, Wyoming.

Floyd, D. A. and J. E. Anderson. 1982. A new point interception frame for estimating cover of vegetation. Vegetatio 50:185-186.

Floyd, D. A. and J. E. Anderson. 1987. A comparison of three methods for estimating plant cover. Journal of Ecology 75:221-228.