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WILDERNESS MANAGEMENT... a computerized system for summarizing permit information

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In summer 1971, the California and Intermountain Regions of the U.S. Forest Service began requiring permits to enter Wilderness and Primitive Areas in California. The permit system was adopted to gain additional public understanding and appreciation of wilderness areas through pre-entry contacts and to gather data useful in managing the areas. This was the first wide-scale application of such a permit requirement and as such provides resource managers and researchers with a larger data base on wilderness use than previously available.

Strong public acceptance and support¹ for the permit system was recognized at all of the 17 Wilderness Areas and the four Primitive Areas during the first summer of the program. The permits used during the first year required only a few items of information, including the name and address of party representative, number in party, area to be visited, date of visit, and point of entry and exit.

This report describes a computerized system jointly developed by U.S. Forest Service researchers and National Forest administrators to analyze these permits and to prepare summaries for wilderness management and research. All permits issued (23,936) for six of the wilderness areas were collected and used in developing and validating the system.

The Wilderness Information system is appropriate for data reduction and incorporation with planning at either the regional or national level. Although it was designed to summarize large volumes of permits, it might also be useful in smaller research or

¹The San Francisco Chronicle, January 24, 1972, p. 5.

Elsner, Gary H.

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Permits were first needed for visits to wilderness areas in California during summer 1971. A computerized system for analyzing these permits and summarizing information from them has been developed. It produces four types of summary tables: point-of-origin of visitors; daily variation in total number of persons present; variations in group size; and variations in length of stay. The Wilderness Information system was tested by analyzing 23,936 permits issued for six California wilderness areas in summer 1971.

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Retrieval Terms: wilderness management; wilderness users; recreation use; statistics; wilderness information system.

administrative studies. The system's four computer programs are available for either the CDC 7600 or the CDC 3100.² These programs and additional information are available upon request to: Director, Pacific Southwest Forest and Range Experiment Station, P.O. Box 245, Berkeley, California 94701. Attention: Computer Sciences Librarian.

²Trade names or commercial products or enterprises are mentioned solely for information. No endorsement by the U. S. Department of Agriculture is implied.

COMPUTER PROGRAMS

The Wilderness Information system consists of four computer programs (*fig. 1*): (a) COUNTY, which converts ZIP mailing codes to origin-of-visitors indexes; (b) TOTAL, which summarizes information on total number of registered persons in a wilderness on a given day; (c) ORIGIN, which produces a summary place-of-origin table, by number of people and visitor-days; and (d) LSTAY, which produces two distribution tables: one by length of stay, the other by group

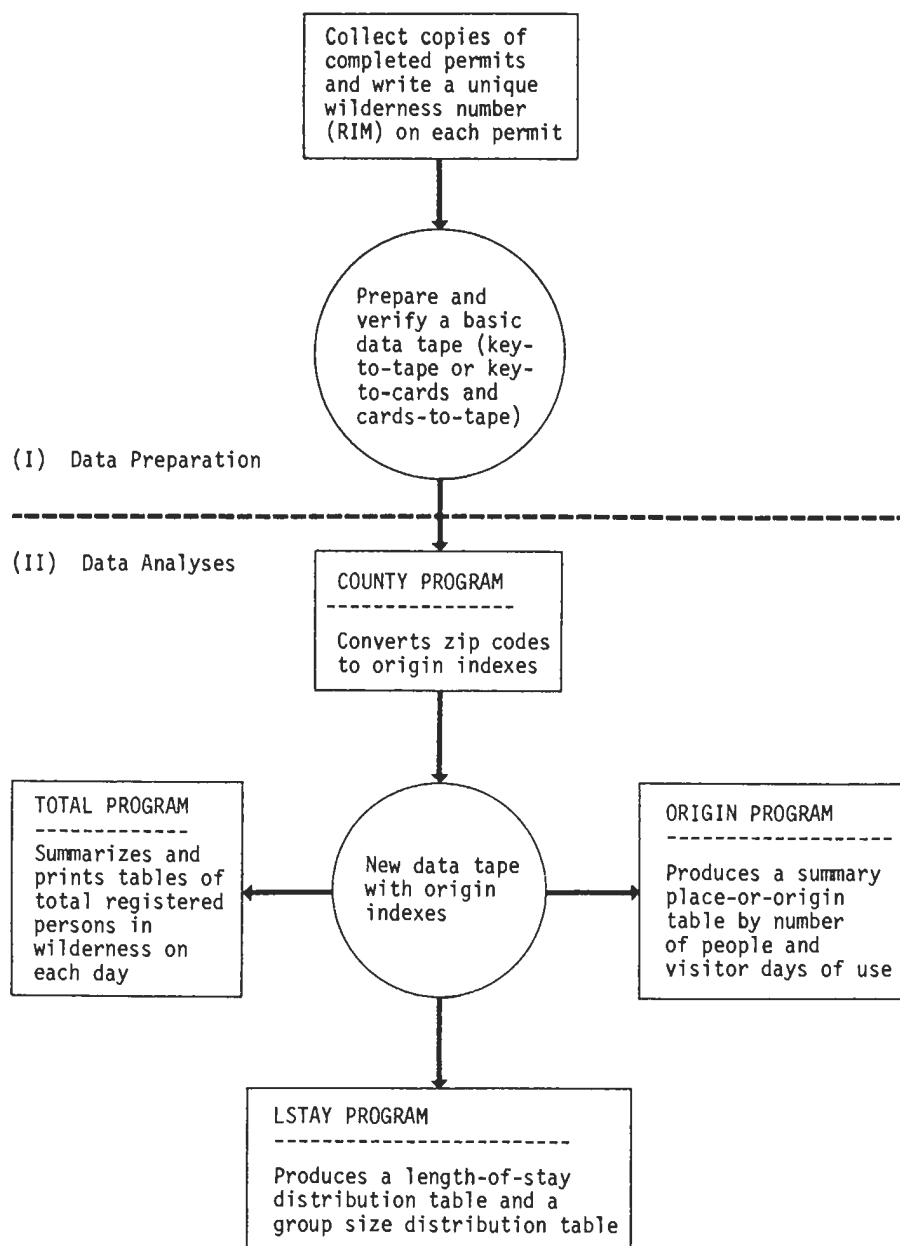


Figure 1—Work-flow in using the Wilderness Information system computer programs to summarize information from wilderness entry permits.

size. To apply these programs, the user carefully prepares the data for recording on magnetic tape, and follows the procedures set forth for each program.

The basic data used is a collection of the yellow copy of all issued permits. The Forest Service's California Region, headquartered in San Francisco, included a white copy for the visitor, a pink copy for the Ranger District where the trip started, and the yellow copy for the Regional Office and Experiment Station. Careful planning was necessary to inform issuing agents to forward the yellow copy of all completed forms to the Regional Office.

Since the data bank will often contain thousands of permits it may be most convenient to have the tape prepared directly and thus avoid several intermediate steps. If equipment is not available for the key-to-tape operation, then computer cards can be punched with the information and a tape prepared from these cards. The programs are designed so that the basic data tape need not be grouped or sorted according to either wilderness or date, but each record must contain a unique identifying number for the wilderness. The length and structure of this basic record can be modified by changing only one subroutine in the system.

This basic data tape is then processed with the COUNTY program and a new tape is made which has ZIP codes replaced with origin indexes. The origin index indicates the visitors' county of residence if he came from California, Arizona, Nevada or Oregon. Otherwise the origin index identifies the state of residence. The COUNTY programs are essentially the same as those used for campground registration analysis (Elsner 1971). But the Wilderness Information System programs are designed for the CDC 3100 and the CDC 7600 instead of the UNIVAC 1108 computer so that they can be easily implemented in other Regions of the Forest Service.

SUMMARIZED INFORMATION

The tape is used in preparing any of these four tables of summarized information: (1) origin of visitors, (2) persons present on each day; (3) length of stay variation; and (4) group size variation.

The three sets of programs used in producing the four tables are ORIGIN, TOTAL, and LSTAY. Each table is based upon all permits in the data bank that has the information relevant to that particular table. For example, if a permit has the ZIP code missing but all other data complete, then it will be used in preparing all tables except the point-of-origin table.

The information presented in the origin-of-visitors table basically delineates the market area which the

wilderness serves. For example, we found that about 14 percent of the use at Desolation Wilderness was by residents of the closest county, El Dorado, in summer 1971 (*fig. 2*). Also we found that 12 percent of the use came from Sacramento County, 10 percent from Santa Clara County, 10 percent from Alameda County, and 7 percent from San Mateo County. Altogether, those five counties contributed more than 53 percent of the use. By adding all the items in column 5 for "other states" it was easy to determine that slightly more than 2 percent of the use came from Nevada, 0.81 percent from Oregon, 0.01 percent from Arizona, and more than 95 percent from California.

This type of information, whether in tabular or graphical form, has already seen extensive use by wilderness managers and planners - from assisting in defining the general nature of the population market the resource serves to providing a basis for the selection of public meeting locations. Research personnel are using these data to develop methods for predicting use at existing and proposed wilderness areas.

The second table which the system can prepare - persons with permits present on each day - may be of even greater interest to resource managers. It provides data necessary to have a quantitative understanding of total human use of the wilderness and the daily distribution of use throughout the season (*fig. 3*).

Because the peak-use periods are often an environmental concern, it is well to identify these periods in the planning process. For example, Desolation Wilderness had 2,888 permitted visitors on August 8, 1971. Although the peak-use days in the next years may not be identical, these data will provide an estimate of the periods requiring intensive management.

The last two tables on length-of-stay variation (*fig. 4*) and group-size variation (*fig. 5*) provide further information for site management and for an understanding of the type of use the wilderness is receiving. The statistics on such items as average stay per visit differ quite significantly from one wilderness to the next. For example, the average stay per visit of 5.6 visitor-days for Desolation Wilderness contrasts with the average stay per visit of 9.9 visitor-days at Marble Mountain Wilderness in northern California. Of six wilderness areas studied, the shortest average stay per visit was recorded at the San Jacinto Wilderness in southern California. These data and other analyses indicate that distance traveled to wilderness areas and length of stay are closely correlated.

The average group size visiting the Desolation Wilderness was observed to be four persons. This contrasts significantly with an average group size of 2.3

ORIGIN OF VISITORS
DESOLATION 1971

ORIGIN	NUMBER OF PERMITS	NUMBER OF PEOPLE	PERCENT OF TOTAL PEOPLE	AMOUNT OF USE(V/D)	PERCENT OF TOTAL USE
CALIFORNIA COUNTIES					
ALAMEDA	902	3382	10.88	18155	9.81
ALPINE	1	2	.01	2	.00
AMADOR	5	19	.06	1457	.79
BUTTE	21	52	.17	433	.23
CALAVERAS	1	2	.01	4	.00
COLUSA	8	24	.08	56	.03
CONTRA COSTA	647	2800	9.01	17231	9.31
EL DORADO	882	4192	13.48	25777	13.93
FRESNO	18	55	.18	469	.25
GLENN	1	6	.02	120	.06
HUMBOLDT	8	27	.09	70	.04
IMPERIAL	2	6	.02	120	.06
INYO	4	17	.05	85	.05
KERN	17	56	.18	368	.20
KINGS	3	6	.02	28	.02
LAKE	3	10	.03	54	.03
LOS ANGELES	392	1309	4.21	10371	5.61
MADERA	4	15	.05	105	.06
MARIN	332	1312	4.22	9026	4.88
MENDOCINO	6	18	.06	374	.20
MERCED	4	27	.09	33	.02
MONTEREY	26	87	.28	258	.14
NAPA	46	185	.60	944	.51
NEVADA	25	154	.50	784	.42
ORANGE	85	268	.86	1478	.80
PLACER	194	816	2.62	5210	2.82
PLUMAS	3	19	.06	152	.08
RIVERSIDE	18	64	.21	412	.22
SACRAMENTO	1067	4936	15.88	23177	12.53
SAN BENITO	3	10	.03	17	.01
SAN BERNARDINO	22	79	.25	841	.45
SAN DIEGO	52	148	.48	872	.47
SAN FRANCISCO	522	1778	5.72	11580	6.26
SAN JOAQUIN	92	449	1.44	2427	1.31
SAN LUIS OBISPO	8	16	.05	237	.13
SAN MATEO	490	1979	6.37	13818	7.47
SANTA BARBARA	20	59	.19	194	.10
SANTA CLARA	694	2967	9.54	18259	9.87
SANTA CRUZ	45	160	.51	1058	.57
SHASTA	3	7	.02	18	.01
SISKIYOU	1	4	.01	4	.00
SOLANO	74	307	.99	1117	.60
SONOMA	104	438	1.41	3653	1.97
STANISLAUS	38	173	.56	942	.51
SUTTER	10	37	.12	114	.06
TEHAMA	4	16	.05	204	.11
TULARE	4	22	.07	138	.07
TUOLUMNE	4	27	.09	154	.08
VENTURA	34	116	.37	735	.40
YOLO	215	903	2.90	3185	1.72
YUBA	9	20	.06	89	.05

Figure 2—Example of an "Origin of Visitors" table that can be produced by the ORIGIN computer programs. The table is for the Desolation Wilderness, California, summer 1971.

ORIGIN	NUMBER OF PERMITS	NUMBER OF PEOPLE	PERCENT OF TOTAL PEOPLE	AMOUNT OF USE(V/D)	PERCENT OF TOTAL USE
NEVADA COUNTIES					
CHURCHILL	7	98	.32	228	.12
CLARK	5	12	.04	56	.03
DOUGLAS	49	147	.47	668	.36
LYON	1	3	.01	120	.06
MINERAL	1	2	.01	4	.00
ORMSBY	16	45	.14	146	.08
WASHOE	128	473	1.52	2091	1.13
OREGON COUNTIES					
BENTON	3	9	.03	32	.02
CLACKAMAS	1	2	.01	4	.00
DESCHUTES	1	4	.01	16	.01
DOUGLAS	1	35	.11	770	.42
LANE	4	9	.03	66	.04
MARION	1	2	.01	4	.00
MULTNOMAH	7	37	.12	586	.32
WASCO	1	2	.01	2	.00
ARIZONA COUNTIES					
MARICOPA	5	8	.03	22	.01
OTHER STATES					
ARIZONA	6	13	.04	74	.04
COLORADO	9	26	.08	168	.09
DISTRICT OF COLUMBIA	12	31	.10	162	.09
FLORIDA	9	32	.10	245	.13
GEORGIA	1	1	.00	12	.01
HAWAII	3	11	.04	14	.01
IDAHO	1	2	.01	4	.00
ILLINOIS	30	79	.25	490	.26
INDIANA	8	24	.08	73	.04
IOWA	4	10	.03	38	.02
KANSAS	4	12	.04	24	.01
KENTUCKY	1	2	.01	8	.00
LOUISIANA	2	3	.01	70	.04
MARYLAND	4	14	.05	31	.02
MINNESOTA	9	28	.09	55	.03
MISSOURI	5	16	.05	98	.05
NEW MEXICO	3	6	.02	18	.01
NEW YORK	45	106	.34	1013	.55
NORTH CAROLINA	3	4	.01	16	.01
OHIO	9	23	.07	79	.04
OKLAHOMA	2	7	.02	46	.02
PENNSYLVANIA	9	24	.08	54	.03
TENNESSEE	1	3	.01	6	.00
TEXAS	15	41	.13	295	.16
UTAH	4	9	.03	30	.02
VIRGINIA	3	9	.03	131	.07
WASHINGTON	24	53	.17	332	.18
WISCONSIN	7	15	.05	142	.08
WYOMING	2	16	.05	72	.04
TOTAL	7639	31089	100.00	185024	100.00

PERMITS WITH VALID GROUP SIZE AND STAY INFORMATION 7608
 PERMITS WITH MISSING OR INVALID ZIP CODE 268
 TOTAL PERMITS CONSIDERED 7975

Figure 2--Cont'd

PERSONS PRESENT ON EACH DAY DESOLATION 1971													
		MONTH											
		1	2	3	4	5	6	7	8	9	10	11	12
D A Y	I	1	2	0	0	2	2	2	658	2103	1242	126	3
		0	0	0	0	2	2	2	1131	1800	1288	238	2
I	I	0	0	0	0	2	2	7	1989	1877	1481	220	2
		0	0	0	0	2	2	10	2272	2051	2144	122	2
I	I	0	0	0	0	2	2	20	2018	2093	2229	119	2
		0	0	0	0	2	2	15	1165	2181	1768	127	2
I	I	0	0	0	0	2	2	6	1140	2639	901	117	2
		0	0	0	0	2	2	10	1191	2888	733	196	2
I	I	0	0	0	0	2	2	10	1411	2263	730	283	2
		0	0	0	0	2	2	12	1966	1977	794	272	2
I	I	0	0	0	0	2	2	12	1872	2043	890	159	0
		0	0	0	0	2	2	22	1206	2214	786	48	0
I	I	0	0	0	0	2	2	22	1296	2265	328	43	0
		0	0	0	0	2	2	25	1516	2593	308	47	0
I	I	0	0	0	0	2	2	26	1519	2434	336	60	0
		0	0	0	0	2	2	23	1729	1761	364	128	0
I	I	0	0	0	0	2	2	37	2076	1891	496	151	0
		0	0	0	0	2	2	42	1945	1960	697	55	0
I	I	0	0	0	0	2	2	84	1316	2020	676	44	0
		0	0	0	0	2	3	93	1391	2167	360	44	0
I	I	0	0	0	0	2	2	93	1424	2393	285	27	0
		0	0	0	0	2	2	116	1370	2185	233	30	0
I	I	0	0	0	0	2	2	135	1565	1967	234	96	0
		0	0	0	0	2	2	183	2083	1952	335	84	0
I	I	0	0	0	0	2	2	452	2032	1991	451	75	0
		0	0	0	0	2	2	740	1553	1940	389	20	0
I	I	0	0	0	0	2	2	770	1586	1932	183	20	0
		0	0	0	0	2	2	508	1656	2067	154	20	0
I	I	0	0	0	0	2	2	508	1764	1770	147	20	0
		0	0	0	0	2	2	552	1901	1420	127	20	0
I	I	0	0	0	0	2	2	2271	1277			5	0
		0	0	0	0	2	2						0

7939 PERMITS USED IN ABOVE TABLE

36 NOT USED BECAUSE OF INSUFFICIENT INFORMATION

Figure 3—Example of a "Persons Present on Each Day" table that can be produced by the TOTAL programs.

LENGTH OF STAY VARIATION DESOLATION 1971				
LENGTH OF STAY (VISITOR DAYS)*	NUMBER OF PERMITS	NUMBER OF PEOPLE	PERCENT OF TOTAL PEOPLE	CUMULATIVE PERCENT OF TOTAL PEOPLE
1	1435	5731	18.0	18.0
2	3078	12774	40.1	58.1
3-4	932	3451	10.8	69.0
5-6	605	2320	7.3	76.3
7-8	342	1189	3.7	80.0
9-10	249	1148	3.6	83.6
11-12	447	2191	6.9	90.5
13-14	160	852	2.7	93.2
15-16	96	339	1.1	94.2
17-18	66	218	.7	94.9
19-20	37	109	.3	95.2
21-22	30	128	.4	95.6
23-24	30	107	.3	96.0
25-26	109	360	1.1	97.1
27-28	31	118	.4	97.5
29-30	17	85	.3	97.8
31-32	14	51	.2	97.9
33-34	16	60	.2	98.1
35-36	8	26	.1	98.2
37-38	12	62	.2	98.4
39-40	14	33	.1	98.5
41-42	9	25	.1	98.6
43-44	8	20	.1	98.6
45-46	8	24	.1	98.7
47-48	6	18	.1	98.8
49-50	3	31	.1	98.9
OVER 50	110	366	1.1	100.0
TOTAL	7872	31470	100.0	100.0

AVERAGE STAY PER VISIT = 5.7 VISITOR DAYS

AVERAGE STAY PER GROUP = 23.2 VISITOR DAYS

PERMITS USED IN ABOVE TABLE = 7872

PERMITS NOT USED BECAUSE GROUP SIZE MISSING = 72

PERMITS NOT USED BECAUSE STAY INFORMATION MISSING = 31

*A VISITOR DAY EQUALS 12 VISITOR HOURS

Figure 4—Example of a "Length of Stay Variation" table that can be produced by the LSTAY programs.

Figure 5—Example of a "Group Size Variation" table that can be produced by the LSTAY programs.

GROUP SIZE VARIATION DESOLATION 1971			
GROUP SIZE (NUMBER OF PEOPLE)	NUMBER OF GROUPS	PERCENT OF TOTAL GROUPS	CUMULATIVE PERCENT OF TOTAL GROUPS
1	646	8.2	8.2
2	2905	36.9	45.1
3	1216	15.4	60.6
4	1228	15.6	76.2
5	568	7.2	83.4
6	424	5.4	88.8
7	180	2.3	91.0
8	152	1.9	93.0
9	73	.9	93.9
10	89	1.1	95.0
11- 15	152	1.9	97.0
16- 20	149	1.9	98.9
21- 25	47	.6	99.5
26- 30	23	.3	99.7
31- 35	7	.1	99.8
36- 40	8	.1	99.9
41- 45	1	.0	99.9
46- 50	2	.0	100.0
51- 75	2	.0	100.0
76-100	0	0.	100.0
101-125	0	0.	100.0
126-150	0	0.	100.0
151-175	0	0.	100.0
176-200	0	0.	100.0
OVER 200	0	0.	100.0
TOTAL	7872	100.0	100.0
AVERAGE GROUP SIZE = 4.0 PEOPLE			
PERMITS USED IN ABOVE TABLE = 7903			
PERMITS NOT USED BECAUSE GROUP SIZE MISSING = 72			

persons for the Ventana Wilderness which is located about halfway between San Francisco and Los Angeles on the Pacific Coast and 6.5 persons for the San Geronio Wilderness which is only about 1-hour's driving time east of Los Angeles. The median (or most frequent) group size was 2.0 for each of the six Wilderness Areas studied.

COMPARISON TABLES

Tables can be prepared for each wilderness separately and selected information can be quickly combined for the preparation of comparison tables (*table 1*). Data shown in the table on average stay, average group size, and peak usage are based upon *all* permits issued for six wilderness areas during summer 1971.

Table 1—Selected information from computer-generated summary tables for six California wilderness areas

Wilderness	Total registered visitors	Average stay (days)	Average group size	Highest use day	
				Visitors	Day (1971)
Desolation	31,470	2.8	4.0	2,888	Aug. 8
San Jacinto	17,180	1.1	5.0	1,439	June 26
Ventana	9,759	2.5	2.3	773	July 4
Yale Mountain	4,879	5	4.4	608	July 4
San Geronio	31,167	1.1	6.5	2,636	July 17
Emigrant	6,276	5	4.3	1,424	Aug. 14

As such, they are probably highly reliable estimates. The first column on total registered visitors is similarly derived from the total collection of permits. If the percent of visitors who obtained permits varies across wilderness areas, then the final estimates of total usage may have slightly different relationships than that shown in this first column.

The complete set of tables for the six wilderness areas studied—Desolation, San Jacinto, Ventana, Marble, San Geronio, Emigrant—are available from this Station upon request.

When the system is used to summarize a total collection of permits issued for a wilderness area, the data will not only be quite reliable, but will provide a sound basis for studying alternative sampling designs for future analyses.

Acknowledgments: An initial list of useful and needed items on wilderness management information was prepared by Warren Walters of the Division of Recreation, California Region, U.S. Forest Service, San Francisco, California. Discussion with Carl Westrate, also with the Division of Recreation, resulted in an over-all design of the computerized system. Michael R. Travis, of the Pacific Southwest Forest and Range Experiment Station, was responsible for most of the development, validation, and trial implementation of the system.

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The Author _____

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