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Use of Recreation Opportunity Planning to Inventory Arid Lands in Eastern Oregon - A Demonstration

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Use of Recreation Opportunity Planning to Inventory Arid Lands in Eastern Oregon - A Demonstration[1]

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Abstract.--This paper reports on the use of computer and hand drawn techniques for implementing the Recreation Opportunity Planning inventory and analysis phases for the Steens Mountain Recreation Lands. Techniques were compared for land classifications and time and monetary costs. Results show computer mapping less likely to result in classification errors, but more costly to conduct.

The USDI Bureau of Land Management and USDA Forest Service have recently adopted Recreation Opportunity Planning as their primary recreation inventory and evaluation methodology.[3] During its development, Recreation Opportunity Planning has undergone considerable refinement as it has been tried in new situations. One recent refinement of the inventory and analysis phases of Recreation Opportunity Planning has been the development of computer software for storage, retrieval, mapping, and tabulation of recreation resource data (Berry and Brown 1980). This computer program uses the Map Analysis Package (MAP, Tomlin and Berry 1979) and was developed to provide a cost and space efficient alternative to manual production of recreation opportunity maps, to manual preparation of tabular information, and to map overlay data storage. The purpose of this paper is to report findings from a study designed to compare manual and computer technologies in performing the Recreation Opportunity Planning inventory and analysis. In the process of generating data to compare these two technologies, the feasibility of using Recreation Opportunity Planning inventory and analysis on arid lands was demonstrated by applying it to the Steens Mountain Recreation Area in Southeastern Oregon. The objective of this study was to produce recreation opportunity maps by both hand drawn and computer mapping techniques under various information requirements and then compare the time and monetary costs associated with the two techniques.

The Steens Mountain Recreation Area, managed by the Burns District of the USDI Bureau of Land Management, covers approximately 960 square kilometers of a very sparsely populated landscape. The nearest community is about 95 kilometers away.

Steens Mountain is a fault block characterized by steadily rising terrain on its western slope and an abrupt escarpment on its eastern slope. The more accessible western slope offers a variety of recreation opportunities. Prime recreational attractions are several scenic vistas, rugged canyons, good fishing in the major streams and high mountain lakes, developed campgrounds, and many species of game and non-game wildlife. In 1979 the area received 25,535 visitor days[4] of use with fishing, hiking, camping, off-road vehicle use, and hunting as the most popular activities.

RECREATION OPPORTUNITY PLANNING INVENTORY AND ANALYSIS

The inventory and analysis phases of Recreation Opportunity Planning allow the planner to assess an area for its ability to provide recrea-

[1]Paper presented at the workshop on Arid land resource inventories: Developing cost-efficient methods. LaPaz, Mexico. November 30-December 6, 1980.

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[3]Recreation Opportunity Planning is described in these proceedings in the paper by Brown, P. J., B. L. Driver, and J. K. Berry, "Use of the recreation opportunity planning system to inventory recreation opportunities of arid lands."

[4]A visitor day represents 12 hours of recreation use by one person.

tion opportunities. These opportunities are arranged along a spectrum from modern-urban to primitive. In the most commonly used recreation opportunity inventory and analysis system six different opportunities are identified.[5] These are modern-urban, rural, roaded natural, semi-primitive motorized, semi-primitive non-motorized, and primitive.

In classifying lands for their recreation opportunities three categories of information are used. These are physical, social, and managerial setting. For example, to be classified as providing a primitive recreation opportunity an area must have the physical characteristics of being remote from the sights and sounds of man (about 4.5 kilometers from any road) and being of fairly large size (about 2000 hectares or greater); must have the social characteristic of few encounters among user groups (about two or fewer per day) and have the managerial characteristic of having no recreation facility developments.[6] Using the inventory of these specific recreation setting characteristics, maps can be produced by hand drawing or computer which show potential recreation opportunities based upon physical characteristics, current recreation opportunities based upon physical, social, and managerial characteristics, and changes in recreation opportunities provided due to changes in physical, social or managerial characteristics.

Mapping by hand drawing requires an individual to prepare overlays for each setting characteristic, to overlay the setting characteristic maps, and to delineate recreation opportunities based upon the criteria established. After recreation opportunity areas are delineated, a planimeter or other area measurement device can be used to calculate the amount of land providing each recreation opportunity.

Computer mapping requires an individual to prepare a map for each setting characteristic and to digitize it into a computer ready format. These data are read using the MAP computer program which adapts the digitized data to a grid-cell format. The planner then develops recreation opportunity maps and tabular summaries by combining and modifying the base maps through a series of analytic operations available in the MAP package. A general model for conducting the inventory is presented in Berry and Brown (1980), but the specific analytic operations necessary should depend on the planning situation. Analysis can be performed from remote job entry terminals or by submitting cards.

In conducting the inventory and analysis for the Steens Mountain Area, information was obtained from discussion with managers, topographic maps, and aerial photographs. The inventory required complete information on the existing road system, trails and other transportation features, irreversible evidences of man (e.g. reservoirs, mines, etc.), renewable resource modifications (e.g. livestock grazing), recreation user densities and contact levels, and types and locations of recreation management activities. Individuals trained in both manual and computer techniques performed the inventory and analysis. Records of time and monetary costs were kept. All hand mapping was performed using 7.5 minute USGS topographic maps and acetate overlays. Resource data were digitized using a model GP 6-4 Sonic Digitizer and a 4051 Tektronix Computer was used to convert coordinates to the Universal Transverse Mercator System. All subsequent computer analyses of data were performed on a CDC-CYBER 173 computer at Oregon State University.

RESULTS

Since the Steens Mountain Recreation Area is not characterized by extensive facility development, high user densities, or diverse and extensive renewable resource modification, the recreation opportunity inventory was relatively simple to perform. The most important criteria for classifying the area's recreation opportunities were remoteness and size of area.

Figures 1 and 2 show the Steens Mountain Recreation Area zoned for the type and distribution of recreation opportunities it currently provides. Figure 1 was hand drawn and Figure 2 was computer produced. These maps are quite similar, as they should be. Most of the area offers a semi-primitive motorized (SPM) form of recreation with about 60 percent of the more than 108,000 hectares inventoried offering this type of recreation (table 1). About one quarter of the area provides a semi-primitive non-motorized type of opportunity (SPNM) while the remainder of the area provides a roaded natural (RN) type of opportunity.

Both technologies for producing the recreation opportunity map detected a band of area providing roaded natural opportunities looping into the area from west to east. This coincides with the main access road into the area. The rugged east slope of the area which is largely inaccessible and most of the canyon and gorge areas were zoned as providing semi-primitive non-motorized recreation opportunities. The remainder of the area which is criss crossed with jeep trails and secondary roads was identified as providing semi-primitive motorized opportunities.

Although there was considerable similarity between figures 1 and 2, there were some differences. Particularly noticable on the hand drawn map was the absence of the large SPNM zone just north of the RN loop. Additional differences, of considerably less magnitude, can be found between the maps. Only about two percent of the total area was classified differently using the two techniques (table 1). There was two percent more SPNM area on the hand drawn map and one percent more each of SPN and RN on the computer map.

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[5]Greater and fewer types of opportunity have been used when special needs have arisen.

[6]Other criteria and their standards will be forthcoming in Chapter 500 of the USDA Forest Service Land Management Planning Handbook (FSH 1909.12).

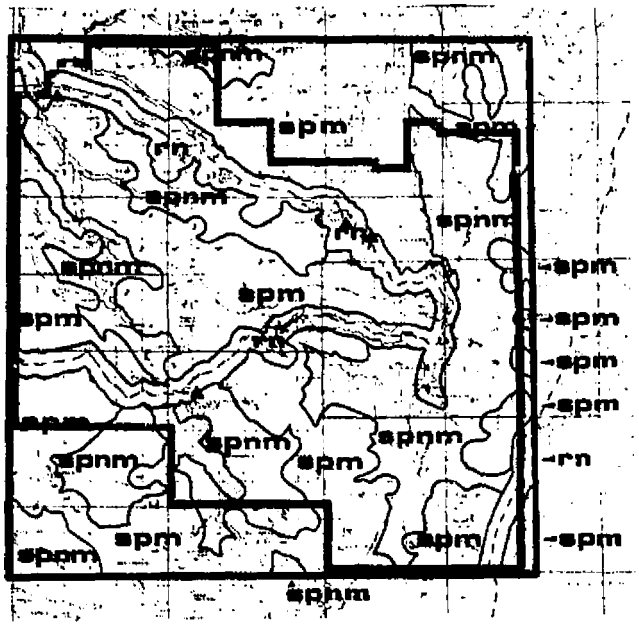

Figure 1.--Hand drawn recreation opportunity areas of Steens Mountain. Recreation opportunities shown are RN, roaded natural; SPM, semi-primitive motorized; and SPNM, semi-primitive non-motorized. The outside dark heavy line denotes the demonstration area boundary while the inside line is the legally defined Steens Mountain Recreation Lands.

Since differences are apparent between maps the obvious question is which map is correct? Since the maps are very similar if the large SPNM area omitted from the hand drawn map is added, either map might be considered as acceptable. Most of the differences in zoning were due to either (1) making judgments about lands along the borders between two classes, and (2) lack of precision in computer mapping resulting from the size of the grid-cells (about 9 hectares).

Once managers have information on current recreation opportunities they might ask how opportunities will change in response to specific management actions. This is the case in the Steens Mountain Recreation Area where managers have proposed closure of some roads. We assessed the effect of these closures by remapping the area assuming road closures were in effect and comparing this map to the original map. Figures 3 and 4 are the new maps considering the road closures. There is considerable similarity between these maps. Differences which exist can be seen by comparing figures 5 and 6, which show only the changes in classification from the original maps (figures 1 and 2).

The primary effect of the road closures was an increase in semi-primitive non-motorized recreation at the expense of semi-primitive motorized recreation (table 2). The computer technique shows an SPNM increase of about 6 percent while for the hand

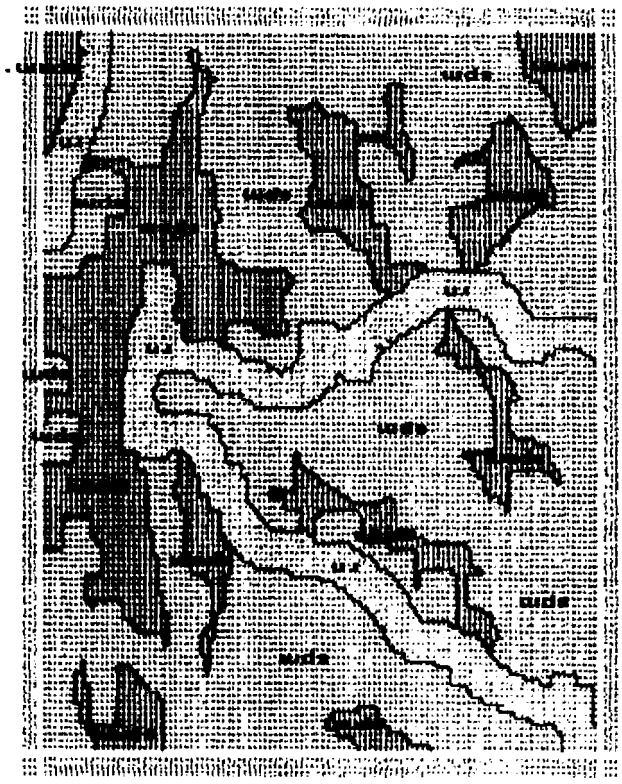

Figure 2.--Computer drawn recreation opportunity areas of Steens Mountain. Recreation opportunities shown are RN, roaded natural; SPM, semi-primitive motorized; and SPNM, semi-primitive non-motorized.

Table 1.--Comparison between computer and hand drawn recreation opportunity areas.

Type of Opportunity	Hand Drawn Technique		Computer Technique	
	Hectares	Percent	Hectares	Percent
Semi-Primitive Non-Motorized	28,679	26.9	26,771	25.2
Semi-Primitive Motorized	62,605	58.8	63,601	59.9
Roaded Natural	15,166	14.3	15,789	14.9
	106,450	100	106,161	100

Table 2.--Comparison between computer and hand drawn recreation opportunity areas after road closure for Steens Mountain.

Type of Opportunity	Hand Drawn Technique		Computer Technique	
	Hectares	Percent	Hectares	Percent
Semi-Primitive Non-Motorized	36,345	34.1	33,285	31.4
Semi-Primitive Motorized	55,577	52.2	56,049	52.8
Roaded Natural	14,528	13.7	16,827	15.8
	106,450	100	106,161	100

Table 3.--Comparison of net change in area for computer and hand drawn recreation opportunity areas due to proposed road closures.

Type of Opportunity	Hand Drawn Changes in Classifications		Computer Changes in Classifications	
	Hectares	Percent	Hectares	Percent
Semi-Primitive Non-Motorized	7666	7.2	6514	6.1
Semi-Primitive Motorized	-7028	6.6	-7552	7.1
Roaded Natural	- 638	0.6	1038	1.0

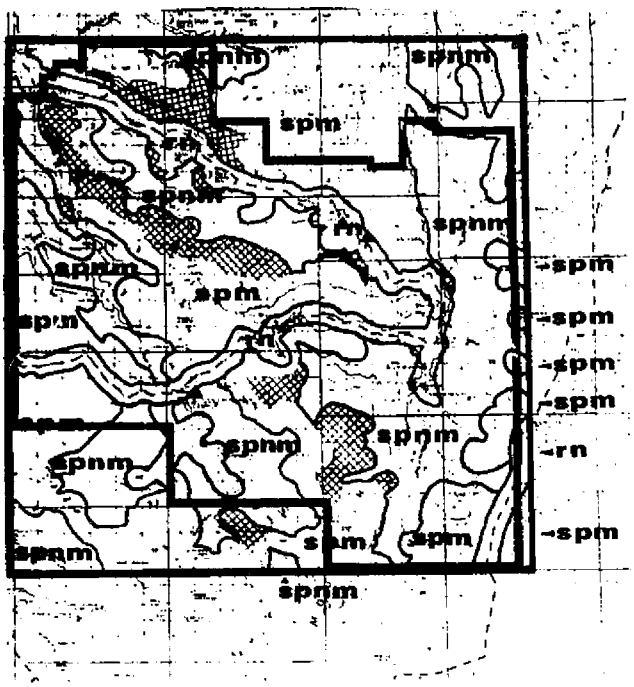

Figure 3.--Hand drawn recreation opportunity areas of Steens Mountain assuming proposed road closures. Recreation opportunities shown are RN, roaded natural; SPM, semi-primitive motorized; and SPNM, semi-primitive non-motorized. The outside dark heavy line denotes the demonstration area boundary while the inside line is the legally defined Steens Mountain Recreation Lands. Hatched areas are areas which changed from their initial classification (figure 1).

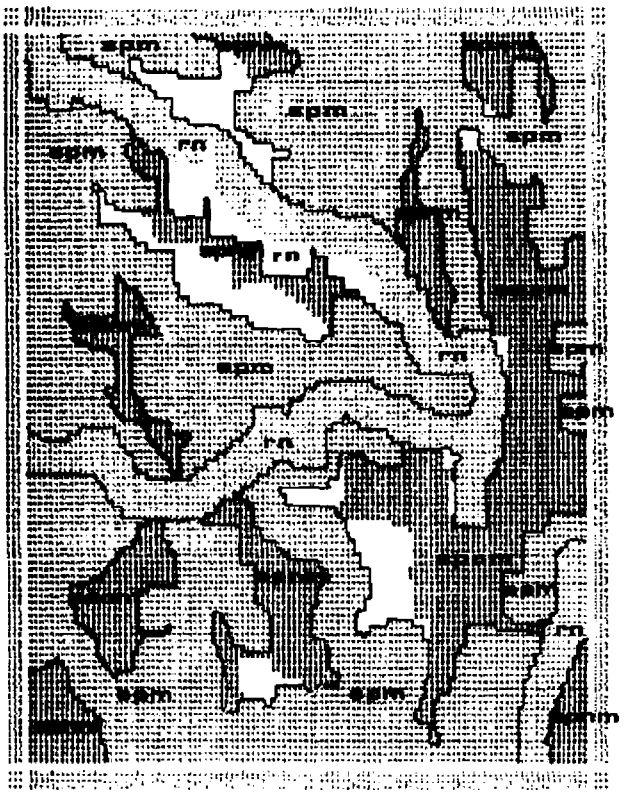

Figure 4.--Computer drawn recreation opportunity areas of Steens Mountain assuming proposed road closures. Recreation opportunities shown are RN, roaded natural; SPM, semi-primitive motorized; and SPNM, semi-primitive non-motorized. White areas within the map boundaries are areas which changed from their initial classification (figure 2).

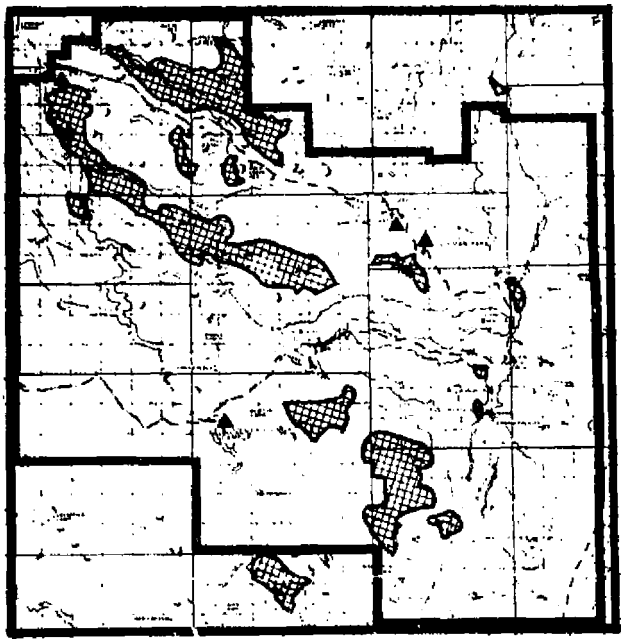

Figure 5.--Hand drawn areas which changed from their initial classification (figure 1) due to proposed road closures. Recreation opportunities shown are RN, roaded natural; SPM, semi-primitive motorized; and SPNM, semi-primitive non-motorized. The outside dark heavy line denotes the demonstration area boundary while the inside line is the legally defined Steens Mountain Recreation Lands. All changes resulted in additions to the SPNM class.

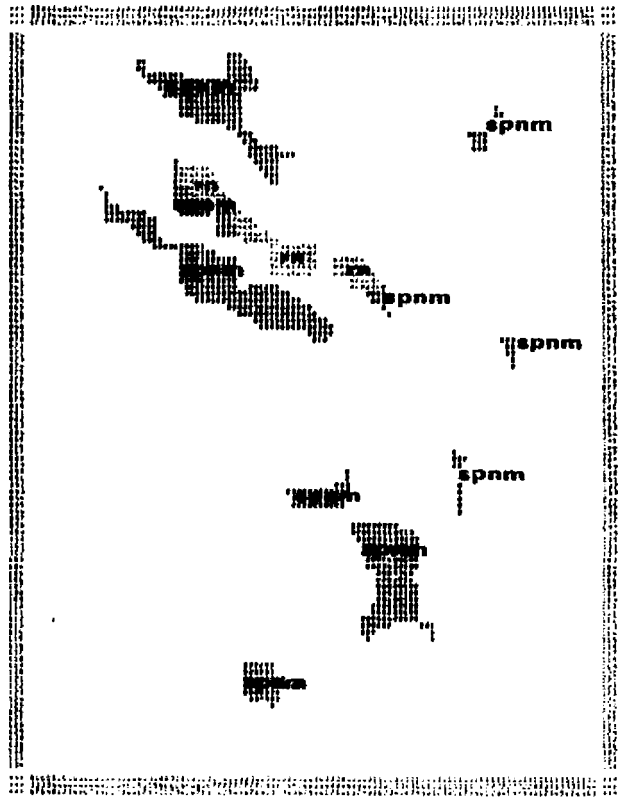

Figure 6.--Computer drawn areas which changed from their initial classification (figure 2) due to proposed road closures. Recreation opportunities shown are RN, roaded natural; SPM, semi-primitive motorized; and SPNM, semi-primitive non-motorized. All changes except three small changes, resulted in additions to the SPNM class.

drawn map technique it was 7 percent (table 3). The biggest difference between the techniques was in indicating the effect on roaded natural opportunities. Computer estimates indicated a 1.0 percent increase while the hand drawn map technique produced a .6 percent decrease. Since each estimate of impact was based on original maps which were slightly different, these differences were understandable.

The time and monetary costs invested in producing the recreation opportunity maps for the Steens Mountain Recreation Area are shown in table 4. In considering these values one should keep in mind that they are specific to the Steens Mountain case and might not be applicable to other mapping situations. These data indicate that the computer technology took less time than hand drawn mapping but cost considerably more. The labor costs were actually less for the computer method but the costs of digitizing and preparing an error free data base were substantial.

The time and monetary costs for revising the maps to consider the proposed road closures are shown in table 5. The time involved in the computer technique again was less while the monetary costs of the computer technique were substantially higher than the hand drawn mapping technique. In this case the actual computer map development was much more costly than such tasks as digitizing and base data revision.

CONCLUSION

Our involvement in conducting the recreation opportunity inventory and analysis for the Steens Mountain Recreation Area leads us to conclude that Recreation Opportunity Planning can be easily adapted to arid land situations. Our work indicates that recreation opportunity mapping of arid lands is tenable using either computer or hand mapping techniques and that the time and costs involved would not be deemed excessive.

Managers can expect different results when using computer and hand mapping techniques for Recreation Opportunity Planning inventory and analysis. It seems likely that the tedium of hand mapping leads to mistakes in classification of

Table 4.--Comparison of time and monetary costs associated with computer and hand drawn techniques for performing Recreation Opportunity Planning inventory and analysis.

Technique	Costs			Time (hours:minutes)
	Materials/ Operations		Labor	
COMPUTER MAPPING TECHNIQUE				
Digitizing	$ 88.00		$ 59.00[1]	12:15
Base Data Set Up	54.50		23.00[1]	4:45
Map Development	44.50		16.00[2]	3:00
Data Storage	8.50			
Sub Totals	195.50		98.00	
TOTAL		$293.50		20:00
HAND MAPPING TECHNIQUE				
Materials	34.50			
Labor Zoning			63.50[2]	11:45
Measuring			67.50[1]	14:00
Sub Totals	34.50		131.00	
TOTAL		$165.50		25:45

[1]Based on U. S. Government 1980 GS-4 Wage Rate

[2]Based on U. S. Government 1980 GS-5 Wage Rate

Table 5.--Comparison of time and monetary costs associated with computer and hand mapping techniques of assessing impacts of road closures.

Techniques	Costs			Time (hours:minutes)
	Materials/ Operations		Labor	
COMPUTER MAPPING TECHNIQUE				
Digitizing	$ 22.50		$ 23.00[1]	4:45
Base Data Revision	10.00		8.00[2]	1:30
Map Development	45.50		11.00[2]	2:00
Data Storage	8.50			
Map Comparisons	16.50		8.00[2]	1:30
Sub Totals	103.00		50.00	
TOTAL		$153.00		9:45
HAND MAPPING TECHNIQUE				
Materials	13.00			
Labor Zoning			35.00[2]	6:30
Measuring			28.50[2]	5:15
Sub Totals	13.00		63.50	
TOTAL		$ 76.50		11:45

[1]Based on U. S. Government 1980 GS-4 Wage Rate

[2]Based on U. S. Government 1980 GS-5 Wage Rate

areas or in their measurement. On the other hand, hand mapping is superior for cases where classification of an area might be done outside rigid specification of criteria, as when evaluations are made using personal knowledge of onsite conditions.

Computer mapping is advantageous in that it is highly improbable that errors will be made in measurement or in implementing criteria. However, the lack of precision in computer mapping will undoubtedly result in some error in estimating sizes of areas. Additionally, injecting judgments into the classification process, although possible, is not as easily accomplished as with the hand mapping technique.

The time and monetary costs involved in computer mapping do not justify its use as a substitute for hand mapping techniques. However, we found that about one half the cost of the computer technique was attributable to setting up the data base. If that expense were eliminated, there would be little difference in the cost of computer versus hand mapping. Therefore, if managers are currently using computer mapping analysis of their resources, and have base data digitized or by grid-cell, it might be advantageous to use the computer technique.

Since neither technique could be labeled totally error free, it is our conclusion that Recreation Opportunity Planning inventory and analysis would be made more accurate using a combination of computer and hand mapping technologies. Recreation Opportunity Planning maps could be produced on computer based systems and serve as base maps which could be further modified based on other criteria and judgments. In this way Recreation Opportunity Planning classifications would be made with accurate implementation of classification criteria while allowing easy, and cost effective, modification of maps.

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RESUMEN

En este artículo se informa el uso de la computadora y de las técnicas de dibujo a mano para implementar el inventario de Planificación de Oportunidades Recreativas y las fases de análisis para las Tierras Recreativas en las Montañas Steens. Las tecnicas fueron comparadas en cuanto a clasificación de tierras,y costos monetarios y de tiempo. Los resultados demuestran que habría menos errores de clasificación si se utiliza la cartografía por computadora, pero que este método resultaría más costoso.