A MULTIPLE RESOURCE INVENTORY FOR MULTIPLE USE LAND MANAGEMENT DECISIONS

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ABSTRACT.

In order for any resource agency to make sound multiple-use decisions a good inventory and analysis is needed. The Soil Vegetation Inventories Method (SVIM) was developed within the Bureau of Land Management to gather vegetation data for range, watershed, and partial wildlife habitat evaluation, Interphasing of BLM's Integrated Habitat Inventory and Classification System (6602) with SVIM provides wildlife personnel with an opportunity for exceptional habitat information gathering.

The system consists of four phases which include: preplanning and mapping; inventory; data compilation and summerization; and analysis of data. The inventory phase is further divided into intensive, extensive and wildlife hazards.

There are certain advantages and disadvantages which are part of this method in its present state of refinement. The disadvantages include economics, regional differential applicability and training level of personnel. However, these disadvantages seem to be overcome by the flexibility of the system.

INTRODUCTION

Land management agencies such as the Bureau of Land Management constantly make decisions which affect rangeland ecosystems. Through these decisions wildlife habitat can be either enhanced or degraded. To aid managers in the decision-making process the wildlife biologist must present a clear, complete analysis of the habitat and its uses.

The Soil Vegetation Method hereafter referred to as SVIM was developed within the Bureau of Land Management to gather vegetation data for range, watershed, and partial wildlife habitat evaluation. Interphasing of the BLM's 6602 Manual, the "Integrated Habitat Inventory and Classification System", hereafter referred to as 6602 with SVIM provides the biologist with an opportunity for exceptional habitat information gathering.

One opportunity for the field application of this sytem was provided in northeastern Nevada during 1979. The Saval Ranch Demonstration Project was developed to investigate the affects of livestock grazing and associated practices on the other resources. The first step was to intensively inventory the resources involved. SVIM was utilized to inventory the entire 19,675 hectares of the project. Wildlife habitat information was gathered with the system of SVIM and 6602.

INVENTORY AREA

The area inventoried extends from an elevation of 1,780 meters at the eastern toe of the alluvial fan to 2,470 meters at the ridgeline of the Independence Mountains (Figure 1). Major land forms for the ranch include mountains, mountain ridges, streams, canyons, and cut alluvial fans.

Located on the boundary between the upper Basin and Range and the Columbia Plateau, the Saval Ranch vegetation is influenced by the Great Basin sagebrush (*Artemisia* spp.),

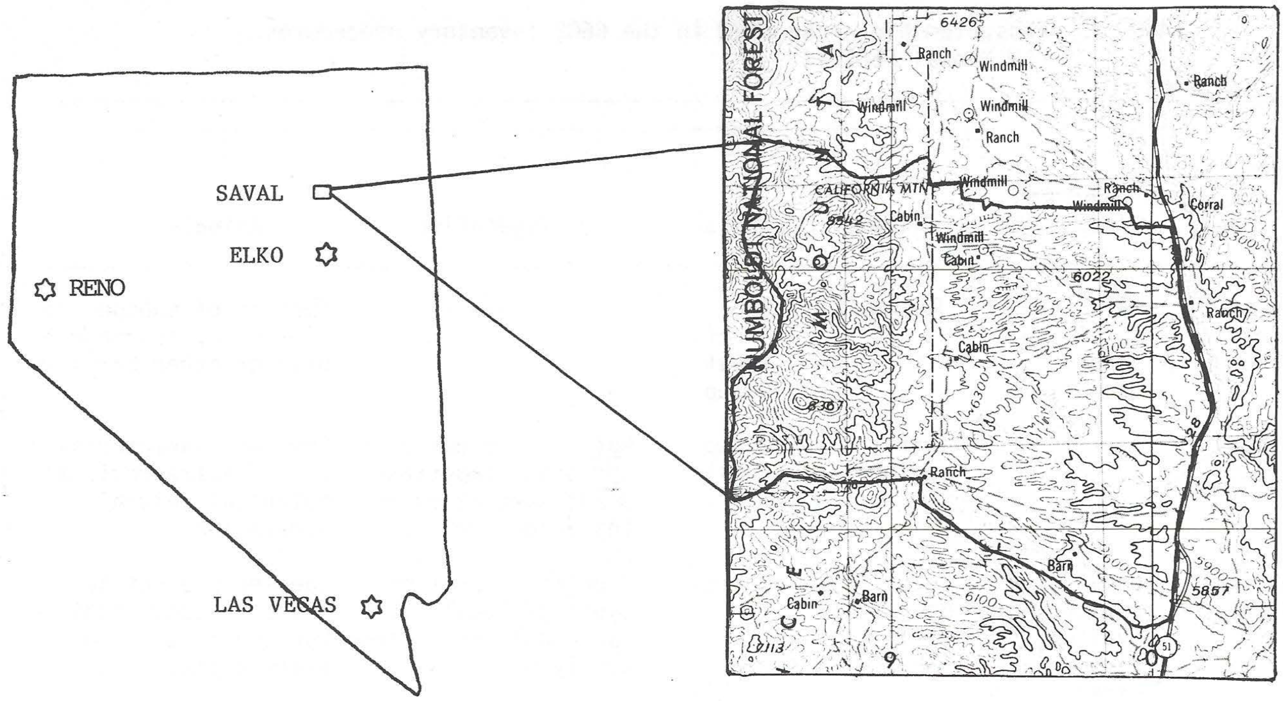
TABLE 1. Ecosystem hierarchy used in the 6602 inventory procedures. BLM Manual 6602.11

Ecosystem Hierarchy Level	Land and Water Forms	Climate	Soils	Vegetation	Animals
Physiographic Region	Major land form (mtn. ranges, basins)	Regional	Sub-Order, Great Group	-----	Species of subspecies limited by zoogeographic or other barriers
Association	---	Intra-regional	Group Family	Potentially dominant and other important plant species on an intra-regional basis	Species characteristic of intra-regional potential natural vegetation
Habitat Site	Local land & water form (valley, ridge, lake stream)	Local & micro-climate	Series	Species present because of local habitat conditions (range sub-type)	Species present because of local habitat conditions complete animal list
Special Habitat Feature	Anomalies	---	---	----	Species adapted or limited to a particular anomaly of the habitat

All literature available pertaining to wildlife and vegetation species to be found in the Saval Ranch area was reviewed and cataloged. The Nevada Department of Wildlife provided boundaries of mule deer summer use areas and sage grouse strutting ground locations as well as information on other wildlife species. This information was placed on overlays over a base map. Under an interagency agreement between the U.S. Forest Service, Bureau of Land Management, and the Soil Conservation Service, SCS completed an "order three" soils survey on the demonstration area. Soils information was provided on black and white aerial photographs accompanied by a narrative.

At this point wildlife, range, and soils personnel met to establish what information the inventory was to provide each resource and what of this could be gathered jointly or seperately. For the Saval inventory there was one mapping team made up of one range conservationist and one wildlife biologist. Two teams of two people each would gather the SVIM data with a three person wildlife team to inventory those specific components of a habitat site requiring individual consideration or Special Habitat Features (SHF). A special habitat feature is described within BLM Manual 6602 as a specific component of a habitat site requiring individual consideration, including geological anomalies, aquatic situations or structures, (Table 2). Some SHF's can be beneficial while others, dependent upon form or construction can be detrimental to wildlife.

Kastner (1979), prepared the SVIM preinventory analysis describing the techniques to be followed. The SCS soil survey completed at the Order 3 level with range sites correlated to phases of soil series was the base for the inventory. Soil associations which usually contain two or more range sites are mapped into soil map units (SMU). These SMU's were drawn onto 1:24,000 scale black and white aerial photographs. Since the basic SVIM inventory unit is a site writeup area (SWA), the soil map unit was the basic SWA. Stratification of site writeup area within a soil map unit consisted of grouping by range site, condition class, present vegetation types, and key or crucial big game habitat areas (Figure 2). Range sites being based on potential ecological climax vegetation are correlated to habitat



Scale: 1" = 116 miles

Scale 1" = 4 miles

FIGURE 1. Location and map of the Saval Ranch Demonstration Project.

wheatgrass-bluegrass (*Agropyron* spp.-*Poa* spp.), sagebrush steppe, and Great Basin pine forest (*Pinus* spp.) vegtation types or associations. Broad vegetative subtypes are mid-grass, short-grass, sedge (*Carex* spp.), big sagebrush (*Artemisia tridentata* spp.), low sagebrush (*Artemisia arbuscula* and *longiloba*), black sagebrush (*Artemisia nova*), other sagebrush, mixed mountain shrub, willow (*Salix* spp.), aspen (*Populus tremuloides*), and rock outcrops. These vegetation types were only a component within ecosystems appearing on the study area. Table 1 provides hierarchial flow for the ecosystem.

METHODS

The inventory system consists of four phases which include: preplanning and mapping; inventory; data compilation and summerization; and analysis of data. The wildlife inventory phase is further divided into intensive, extensive and wildlife hazards.

Preplanning consists of setting objectives, literature reviews, gathering data from other agencies, level of inventory needed, training requirements, and interresource understanding of standards to be used while mapping. Infrared photographs at a scale of 1:24,000 with accompanying U.S.G.S. quadrangles at 1:24,000 are the best mapping aids.

The wildlife objectives in this inventory were to:

1. Describe as concisely as possible the ecological characteristics of a sample of habitat sites and special habitat features.

2. Rate the habitats for their use and condition as they apply to key species such as mule deer and sage grouse.

3. Use the data to predict and evaluate the impacts of prescribed grazing management practices on the habitat and wildlife species involved.

4. Establish studies needed to record the impacts of grazing management practices on wildlife and wildlife habitat.

TABLE 2. Examples of special habitat features used for the Saval Ranch inventory.

NATURAL	MANMADE
A02 - Cave	*B02 - Fence
A05 - Cliff	B04 - Salting Area
A09 - Insect Mounds	*B09 - Building
A11 - Salting Area	B10 - Bird Ramp
*A12 - Seep	*B18 - Mining Activity
*A13 - Cold Spring	B20 - Perches
*A15 - Snag or Group of Snags	B21 - Road
A16 - Talus Slope	*B32 - Windmill
A24 - Bluff	B34 - Water Gap
*A29 - Hot Spring	*B35 - Stock Water Pond
*A32 - Temporary Pond	*B42 - Pipeline
*A33 - Small Natural Ponds	*B43 - Material Site
*A34 - Small Group of Trees or Shrubs	*B52 - Stockwater Tanks
*A35 - Small Group of Trees - Riparian	*B56 - Abandoned Homestead
*A36 - Dry Meadow (not typed as vegetative type)	
A37 - Dry Wash	
*A39 - Raptor Nest Tree	
A41 - Rock or Boulder Outcrop	
*A57 - Strutting Grounds	
*A58 - Wet Meadow (not typed as vegetative type)	

* Intensively inventoried special habitat features

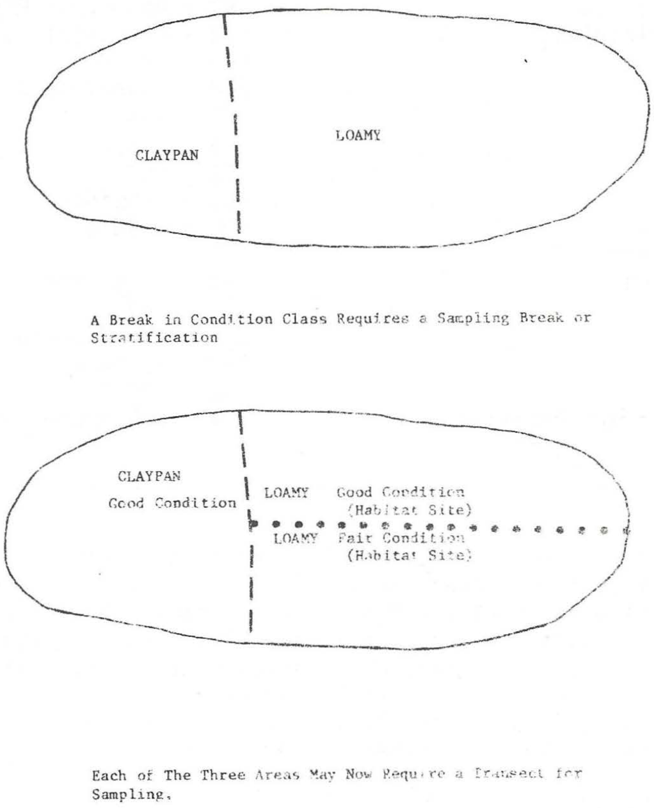


FIGURE 2. The soil map unit usually consisted of two or more range sites (habitat types) and is the site writeup area.

types. The range site is condition classed using the present vegetation composition in relation to the potential thereby equating the condition class of a range site to being a habitat site.

The minimum size delineation for SWA's was typically 65 hectares. Subdivision of the soil map unit by range sites(s), condition class, etc stopped when the 65 hectare minimum size was reached with the data averaged for the delineation. For example: if division of a range site into condition class would result in a SWA of less than 65 hectares, an average condition class was assigned to the SWA. Exceptions to the minimum size were riparian areas which were mapped down to .8 hectare and big game browse stands in critical areas were delineated down to 4 hectares.

Condition classification and present vegetation mapping was accomplished using a visual estimate of composition by weight of current years growth. During this phase all SHF's such as riparian areas less then .8 hectare in size, rock outcrops, etc. were spot mapped for wildlife review. Habitat site names were given to the range site condition class using the scientific abbreviations of the codominant plant species and the landform code. The landform codes are listed on Table 3. Transects for the SVIM inventory were established at this time also.

TABLE 3. Standard land form and wetland-riparian form code list.

ALF - Alluvial Fan	KRS - Karst
ALP - Alluvial Plain	LCP - Lacustrine Plain
BAL - Badland(s)	MSA - Mesa
BFE - Basin Floor External	MTN - Mountain
BFI - Basin Floor Internal	OLR - Lake Riparian
BMR - Bog Marsh Riparian	ORR - Reservoir Riparian
BPR - Beaver Pond Riparian	OSR - Perennial Stream Riparian
BTT - Butte	PED - Pediment
CAL - Caldera(s)	PEP - Peneplain or Plateau
CAN - Canyon	PMT - Piedmont
CES - Cuesta	PYA - Playa
DOM - Dome	RDG - Ridge
FPL - Flood Plain	SBS - Subsidence
GCR - Glacial Cirque	SDL - Saddle
CMR - Glacial Morraine	SDN - Sand Dune
GOW - Glacial Outwash	SNK - Sink Hole
GTO - Glacial Trough	SRP - Scarp
GUL - Gully	SUR - Sub-Riparian
HBK - Hogback	TRC - Terrace
HIL - Hill	VAL - Valley
IPR - Intermittent Playa Riparian	WMR - Wet Meadow Riparian
ISR - Intermittent Stream Riparian	

The actual SVIM data gathering was completed utilizing a step point transect combined with weight estimate and vegetation characterization plots. Minimal sampling was a 200 point transect, three characterization plots, and 10 weight estimate plots with two per transect being clipped and weighed. Sizes of weight estimate plots were 9.6 square feet on terrestrial vegetation types and .96 square feet on riparian vegetation. Shrub and tree characterization plots were 1/100 acre in terrestrial vegetation and 1/200 in riparian zones. Grass and forbs were characterized within the weight estimate plots. To insure maximum plant diversity and identification the transects were run during the months of June, July and August.

The step point transect recorded basal hits and canopy hits on three canopies up to 7 feet. Characterization information included average availability, average phenology, average utilization, average height, average crown diameter, age class, and form class. A minimum of five plants of each species were characterized while recording the total plants for each species present in the plot. Pellet groups were counted by the inventory crews in a five foot wide swath along the axis of the step point transect. Weight estimate was divided into four height classes: 0 to 3 feet, 3 to 4-1/2 feet, 4-1/2 feet to 7 feet, and 7 feet plus. A minimum sampling level of $\pm$25 percent of the average vegetation production with a 75 percent confidence level was established for this particular inventory. Wildlife observations were recorded by the inventory crews by transect for later recordation on the appropriate 6602 form.

As shown in Table 2 special habitat features were stratified into those to be extensively inventoried and those that were to be intensively inventoried.

Those features included in the extensive category were studied as to their general characteristics which included habitat site name, acreage of SHF, SHF Code, location to 1/4 of a 1/4 section, other habitat sites involved, map or photo reference, and general description of the feature. Animal species whose general and specific uses are benefited by the feature as well as those discouraged are recorded.

For those SHFs which were considered to be hazards or in conflict with wildlife a separate Wildlife Hazard/Conflict form was also used. A wildlife hazard is any man-caused activity, use or feature that could cause unnecessary mortality to wildlife. Wildlife conflicts are any man-caused activity, use or feature which lowers the quality or quantity of wildlife habitat. An example of a hazard would be a watering trough lacking an escape ramp or float while a conflict could be a material site or gravel pit. Special Habitat Features which are or include water sources were intensively inventoried on an additional terrestrial water record. Along with the basic information provided on the SHF form this record included information as to water type, size, amount of flow, use by wildlife, conflicts from other uses, needed improvements, adjacent and aquatic vegetation.

Other intensively inventoried special habitat features on Table 2 were those which were vegetative in nature. All the extensive data were collected as well as vegetation information. A modified SVIM transect was used to gather the data. The minimum length was 100 paces rather than 200. The feature was inventoried along the longest axis with four characterization plots per 100 paces and no weight estimate. Since the SVIM teams were recording production on the same but larger sites we believed that wildlife would not need to duplicate this portion of the inventory. One other change was rather than restrict the grass and forb characterization plot to .96 or 9.6 square feet, 4.8 or other multiples of .96 could be utilized if conditions deemed it necessary. Most wildlife habitat studies are as concerned with annual plant species as they are with perennial species, therefore, annuals were not lumped together. All plant species encountered on a transect were recorded individually without regard to growth habit.

Live trap sampling for small mammals was undertaken on a representative sample of SHFs as well as a minimum of two representatives of each habitat site. The trapping covered two seasons with all species trapped being recorded by special habitat feature and/or habitat site. Relative abundance and diversity of small mammals per habitat site was established from these data. Page et al., (1978) demonstrated that this particular information could be most helpful in indicating the condition of various habitat types.

SUMMARIZATION AND ANALYSIS

The SVIM data collected were stratified into 48 strata. For this inventory a stratum was established for each condition class of each range site. These strata represent the basic standard Habitat Site which is "a grouping of habitat sites based on similiarity of vegetation and landform." Riparian areas and woodlands were stratified individually. Each SHF was stratified individually so that analysis could be performed on each feature singularly.

Table 4 is a listing of the summary analysis performed on the vegetative data by the Denver Service Center computer. Those steps taken on the special habitat features are not as extensive and are so indicated. If needed diversity indices can be calculated from the data. Using this information and a habitat requirement checklist we can calculate a preference for an animal species for particular habitats or for the presence of a specific plant species.

TABLE 4. Summary of analysis applied to data gathered.

1. Percent production/adjustment factor by phenology stage.

*2. Vegetation characterization summary by strata:
   a. Number of plants per species by form and age class, density
   b. Average height: calculated per species as a weighted average based upon the number of plants at any given height
   c. Average crown: trees and shrubs only by species
   d. Weighted average percent availability

3. Average phenology and utilization by transect.

*4. Total production for transect, Site Writeup Area, allotment.

5. Strata average adjusted air dry production.

*6. Species list by strata.

7. Total available product for the Site Writeup Area

*8. Range ecological condition for strata and allotment.

*9. Ground cover for strata.

10. Soil Surface Factor for strata (erodability).

11. Apparent trend for strata and allotment.

*12. Summary of present condition for allotment.

* Those items of particular importance to habitat analysis.

With the habitat requirement checklist in combination with the analyzed data we can indicate at which disclimax stage in the ecological scale of climax a given wildlife species would be in its optimum habitat. If the analysis shows the habitat to not be optimum we will begin to know which direction should be taken to better reach the management objective (Kerr 1979).

Using the special habitat feature data animal species occurrence by habitat site, water, and transect data we are able to separate out those items which appear to be important or critical to be further studied. For example, certain slope, aspect, plant species, water combinations may be of critical importance to specific animal species.

CONCLUSIONS

Due to its broad scope of application there are certain disadvantages that are inherent with the system. These disadvantages include economics, regional differential applicability and the training level of personnel.

Economical or cost considerations as they are used by management to decide on the inventory to be used are a disadvantage to this system. Due to its relatively higher cost the system could be modified, restricted or discounted as a method to be undertaken. With the cost per acre being the prime prerequisite for use or nonuse the trememdous data gathering ability of this system could be overlooked.

Applicability of the inventory to all ecosystems or regionals is a second major problem. Standardized definitions and procedures are not always adequate for all situations. Different regions exhibit different vegetation communities, climatic conditions, and terrain characteristics. With these differences come differences in vegetation analysis techniques and descriptions of animal/habitat relationships. Developing a computer program to incorporate the needed modifications is a slow difficult process.

The level of training of inventory personnel has a direct bearing on the quality of the inventory. Correct identification of plant and animal species are a critical aspect of any inventory procedure. Ability to recognize animal/habitat interrelationships is critical to the success of this sytem. The level of pre-inventory training that is required will affect how far your inventory time and money will go.

Although this system has some drawbacks at the present time, it has one very significant strong point in its flexibility. By flexibility we mean that data from other agencies in the same ecosystem can be utilized as a support base. By the same token, data accumulated with this inventory system can be utilized by other agencies. Different resources are working together to gather the same basic data, therefore sharing the workload. Should management decide to not use SVIM for range, wildlife habitat information could still be collected by wildlife personnel through modification and specialization of the system.

For one of the first times we are able to quantify a more total association between the animal and its habitat. This is of particular importance when dealing with endangered species, critical habitats, or sound multiple use decisions. The impacts of land use decisions can also be quantified and evaluated.

LITERATURE CITED

Bureau of Land Management. 1979. 4412.14 Physical resource studies - soil-vegetation inventory method. Washington, D.C.

________. 1978. 6602 Integrated habitat inventory and classification system. Washington, D.C.

Kastner, W.J. 1979. Saval Ranch research and evaluation area SVIM pre-inventory analysis. (unpublished memo) BLM. Elko, NV pp. 1-10.

Kerr, R.M. 1979. Mule deer habitat guidelines. Tech. Note. BLM. Denver Service Center (336) pp. 1-61.

Page, J.L. et al. 1978. The influence of livestock grazing on nongame wildlife. Cal-Neva Wildlife Transactions. pp. 159-173.