METHODOLOGY FOR DEFINING FISHERIES HABITAT CAPABILITY AND SUITABILITY

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ABSTRACT.

The General Aquatic Wildlife System (GAWS) is a systematic and uniform approach to the inventory and display of the aquatic habitat. A sampling procedure using cross-channel measured lines termed transects is used to measure the habitat categories of water surface, stream bottom, and streambank. The system provides for the display of the aquatic resource at various levels of planning using the Valley Bottomland Concept presently in use in the Intermountain Region of the Forest Service. The entire program has computer capability designed to serve the dual purpose of storage-retrieval without additional data manipulation and storage-retrieval with data manipulation through output programs which compute habitat ratings, streamflows, statistical measures, and standard descriptive features.

INTRODUCTION

Fish population survey work has been conducted on many waters of the United States. Geographic ranges of fish species are fairly well known or at least predictable, and management programs to perpetuate and enhance these resources are in effect.

Less well known with any precision and accuracy is the habitat resource available to, utilized, or occupied by these fish. The cause and effect relationship of man's activities which directly or indirectly affect the characteristics of the habitat is poorly understood. To improve our understanding of the aquatic resource, and a means to avoid ocular or eyeball appraisal, a method for sampling general fish habitat characteristics of streams was investigated beginning in 1960, by the U.S. Forest Service and reported for use by Herrington and Dunham, 1967. Since 1960, the basic method that later became known as the transect method and incorporated into the General Aquatic Wildlife System (GAWS), has been tested and expanded into systems that have been applied to instream flow needs, baseline inventory, project work, and land-use planning. The system does not singularly measure biomass and fish production but is designed to inventory and display fish habitat characteristics at different intensities in order to fit the needs and purposes of a given level of planning. If the level of planning deals with a specific project, then the inventory must be more specific, (Dunham and Collotzi, 1975) The program is not static and is continually being refined as new and better techniques become available.

Bailey, (1976) in his work, "A Regional Approach to Ecosystem Classification for Purposes of Resources Inventory - An Initial Effort," emphasizes the need for a hierarchial system which permits a choice of the degree of detail required to meet the purpose of a particular planning or decision level. Arnold, (1975), presented a similar view and recognized that such a system was needed for aquatic and wildlife resources. In principle, the problems associated with aquatic and wildlife resources are no different than those found in other resources.

An approach presented by Collotzi, (1976) emphasizes the importance of the valley bottom as a recognizable unit of land. Since that time, the approach has been refined and expanded to include a total system, which allows all disciplines to relate to the valley bottom. Platts, (1979) further emphasizes this need and presents an overview of what has been done to date.

In most inventories, the valley bottoms have not been given full consideration. Mapping has been done at a level which did not recognize most valley bottomlands. Therefore, the lesser stream-bottom lands were often lost in the large land masses. Cole,(1972) in his report, states:

> Valleys include some of the most sensitive portions of the landscape insofar as their response to disturbance. They are also the part of the landscape that receives the greatest use by man. We build most of our roads, trails, campgrounds, and buildings in the valleys. Many species of wildlife and fish are dependent for at least part of their annual life cycle on mountain valley habitat. Stream and water qualities are determined to a great extent on what takes place in the valleys. Land-use planning must recognize and provide for the qualities of valleys if management is to achieve its objectives.

The concern for inventory and display of habitat is a logical reflection of Forest Service agency responsibility and interest in the aquatic resource. Since April 17, 1941, when the Chief of the Forest Service, jointly with officials of the International Association of State Fish and Game Commissioners, defined a partnership role with the several states to conduct wildlife management within and on the National Forests, the desire for more definitive habitat programs has been clearly recognized within the Forest Service (36 CFR 241.2). The Multiple Use and Sustained Yield Act, Public Law 86-517 (74 Stat. 215) states, "That it is the policy of the Congress that the National Forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes." Section 2 of this Act states, "The Secretary of Agriculture is authorized and directed to develop and administer the renewable surface resources of the National Forests for multiple use and sustained yield of the several products and services obtained therefrom." The valuable wildlife and fish habitat provided and the outdoor recreation furnished by the lakes and streams of the National Forests make these among the most valuable areas under Forest Service administration. Because of Congressional direction, the Forest Service considers it is their responsibility to maintain and, where possible, to improve the renewable resources of these high value land and water areas.

ASSUMPTIONS

The basic assumptions are:

That by applying the transect method, key habitat variables related to aquatic organism production can be inventoried and displayed.

That the transect method can be used to measure variation of physical features within and between streams.

That the aquatic resource can best be displayed using the Valley Bottomland concept presently being used in the Intermountain Region of the Forest Service.

PROCEDURES

The inventory is a sampling procedure using cross-channel type measured lines termed transects to quantify habitat variables. Measurements are made along a transect across the stream channel at a 90^{o} angle to its centerline.

The three habitat categories of water surface, stream bottom, and streambanks are recognized. Habitat variables are identified, classified, and by following directions on the field forms, qualitative/quantitative classifications and measurements are noted and then recorded as:

Water Surface
- Pools
- Riffles (classification under development)
- Depth
- Flora
- Velocity

Stream Bottom
- Size gradations
- Imbeddedness (classification under development)

Streambanks
- Riparian vegetation
- Stability
- Soil Class

Survey work consists of sample data grouped from a five-transect line station. The five-transect line station will provide data for a cluster sample. These transects originate at 20-meter intervals along a streamside baseline which is established for this purpose. This procedure will give results which characterize the habitat, with these advantages:

1. Characterize habitat within the 80-meter length of channel.
2. Can make inferences about habitat within the stream segment thus inventoried.
3. Reduced number of samples required to adequately describe a drainage, an individual stream, or a stream segment.
4. Facilitates use of statistical procedure designed for normally distributed populations.

The General Aquatic Wildlife System (GAWS) has been designed in the Intermountain Region to serve the dual purposes of storage-retrieval without additional data manipulation and storage-retrieval with data manipulation through output programs which compute habitat ratings, streamflows, statistical measures, and standard descriptive features. All field forms are geared to input-output formats. Key to using the program is an identification code for each water. Such a code was established for all streams in the Intermountain Region.

Maps to be used in the field are constructed as described in the "Valley Bottomland Inventory Technical Guide", 1979. These maps, in addition to aerial photographs and geological survey maps, are used to determine sample stations prior to entering the field.

An action plan which includes inventory specifics and expected use of survey data is written to assure accomplishment to the desired level of precision and accuracy.

The field crew locates points on streambanks that coincide approximately with the sample station points marked on the aerial photos or maps.

Possible bias is eliminated by having the crew establish the first transect a given distance upstream from the point first identified on the ground.

DISCUSSION

Data once collected in this systematic manner are usable in a variety of ways. After several schemes were employed to display and apply habitat data, computational procedures were settled upon which result in a rating or score for habitat variables. The concept of habitat rating is similar in appeal to the stream rankings prepared by many of the states which emphasize fishing and fish production aspects of the resource. However, this habitat rating does not consider production levels, access, angling success, and similar factors. Analysis is not restricted to the ratings though, and reporting consists of correlations with valley bottom, discharge and instream flow, fish species, landforms, and localized project impacts.

Land-use planning has necessitated the development of a system to display aquatic resources for interaction with other resources. The valley bottomland concept provides for this interaction and a way for incorporating the various resources into several levels of planning. The proposed system recognizes that all valley bottomlands can be stratified into logical units. This systematic approach to the stratification of the valley bottom for the first time allows all resources within the valley bottom to be evaluated simultaneously on an equal basis with other resources and land management activities. In addition, these units can easily be recognized by the land manager as well as the biologist.

CONCLUDING COMMENTS

Habitat work in aquatic wildlife is rapidly accelerating. Methodologies, criteria, and standards are evolving which, for the first time, will provide the land manager with an accurate description of the habitat resource.

Up until this time, there has not been an adequate display of the aquatic resource within a logical classification system that successfully considers all resources simultaneously on an equal basis.

The valley bottomland classification system provides for the interaction of all resources within the valley bottom. The aquatic environment within the valley bottom is inventoried and characterized using the transect method. The level of planning determines the intensity of the inventory.

Stratification of the valley bottomland into logical units has resulted in identifying some of the variability in the aquatic habitat. It further attempts to define the habitat capability and its ability to withstand forest activities.

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