INTERNAL REPORT 101

ANNUAL REPORT ON SITE CHARACTERIZATION

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C. T. Dyrness
USFS, Corvallis

This annual report summarizes progress in studies of site characterization, biological and environmental monitoring, and vegetation mapping on the H. J. Andrews Experimental Forest.

Our project for Biome 2 had the following objectives:

1. Characterization and mapping in detail of the composition and structure of the bryophytic and vascular plant communities in selected reference stands and plots at the H. J. Andrews Experimental Forest and the conducting of vegetation inventories within unit watersheds necessary for support of Biome 2 modeling effort;
2. Monitoring environmental and biological features (e.g. air and soil temperatures, phenology, and plant moisture stress) of the reference stands at H. J. Andrews for interpretation of other studies carried out in these same areas; and
3. Carrying out soil-vegetation mapping of the H. J. Andrews Forest with emphasis on the unit watersheds and characterizing, quantitatively, the plant communities already recognized.

Objective 1 required the establishment and characterization of reference stands. There are presently 19 reference stands (5 more than in year 1) which span the variation of soils and vegetation of the H. J. Andrews intensive site and the surrounding areas of the central Western Cascades. Particular emphasis was initially placed on stands representing communities present in unit

watersheds 2 and 10.

Reference stands are 30 m square with a 10 m buffer zone. Thus, each is 50 x 50 m and marked with aluminum stakes at 5 m intervals along the outer boundaries of the buffer zone to reduce trespassing.

Vegetation inventory within reference stands included trees, tall shrubs, low shrubs, herbs, and Bryophytes. For each stratum cover and frequency of component species were measured. Various linear measurements to be used in biomass studies have also been recorded for selected species of shrubs and herbs in all reference stands. Linear measurements including DBH and height of trees are completed for 12 reference stands. Cover and frequency data for all other strata and all stands have been collected.

The results of vegetation characterization of reference stands will be available as an Internal Report to be prepared in early Spring, 1973, upon completion of stem mapping in the remaining 7 reference stands.

In addition to reference stand inventories, vegetation inventories have been concluded on unit watersheds. Primary interest is on watershed 10 as this is the focal point of the Biome 2 modeling effort. Watershed 2 has also been studied but with less intensity than watershed 10.

Preliminary surveying of watershed 10 with staff compass, chain, and abney level was completed in 1970. During this survey, three base lines running north and south were established in the watershed. These base lines served as reference lines during establishment of a 25 m grid system in the summer of 1971, and spring of 1972. This was established with correction for slope over the entire 10.24 hectare watershed. During spring, 1972, aluminum corner stakes were installed to mark the 25 m grid corners.

During spring and early summer, 1972, stem mapping of all trees with a diameter breast high (DBH) of 15 cm or greater was completed, and all mapped trees were marked with numbered aluminum tags. During mapping, the species, DBH, grid section, x and y coordinates within whole watershed, and notes on the vigor and crown condition of each mapped tree were recorded. In addition, location of stumps and down logs were also recorded.

A stem map, with a scale of 1 inch equals 5 meters, was constructed and then photoreduced to 1 inch equals 10 m, a size more readily usable by IBP investigators working in watershed 10 during summer 1972. Heights of selected trees have also been measured by use of optical dendrometers. Stem mapping results will soon be available as an Internal Report.

Reconnaissance level soil and vegetation analysis has been completed on unit watersheds 6, 7, and 8 (see Internal Report 43) and on unit watersheds 2 and 3 (Internal Report submitted in summer of 1972, presently awaiting distribution).

Vegetation mapping of watershed 10 began in early summer of 1972. Mapping was completed using a reconnaissance technique and an open legend system of the map. Species and cover class combinations were listed for 4 strata within each spatially differentiated map unit. The strata studied included 2 canopy layers and 2 shrub layers. Notes on herbaceous material were recorded in some instances as an aid to assigning habitat names to the map units.

Cover of the major species within the 4 strata was estimated by cover class. The major plants of each strata were listed in order of dominance followed by one digit indicating the combined cover class of that strata within the map unit. Example:

235
Psme 1
Tshe - Cach 3
Rhma 4
Gash Bene 4

where Psme, Tshe, Cach, Rhma, Gash, and Bene are code forms for Pseudotsuga menziesii, Tsuga heterophylla, Castanopsis chrysophylla, Rhododendron macrophyllum, Gaultheria shallon and Berberis nervosa, respectively. Each line represents one stratum composed or dominated by the species appearing on that line and having a combined cover class value of the terminal digit in each line. Cover classes are

as follows:

0 = 0% cover
1 = 1-5% cover
2 = 6-25% cover
3 = 26-50% cover
4 = 51-75% cover
5 = 76-95% cover
6 = 96-100% cover

Individual map units were visually identified and charted on base maps through use of the tag numbers appearing on the trees as well as on the previously completed stem map. At completion of the vegetation mapping 414 individual map units had been identified within watershed 10.

The individual delineations were then grouped into communities and these into combined habitat types for further use in the modeling effort. Seven communities were recognized and their areas have been determined. A complete vegetation map was finished during early fall of 1972.

The present status of the results is the same as that of the stem mapping described above for watershed 10. Both are included in one Internal Report due for submission soon. This report will include stem mapping, vegetation mapping, figures, tables, graphs, and appendices covering as many areas as possible, and it is intended to be a complete report of the intensive study of watershed 10 with data presented in a variety of usable forms to modelers, samplers, foresters, and the general scientific community.

Objective 2, the monitoring of environmental and biological features is essentially a continuation of Biome 1 studies conducted by Zobel ("Relation of Biologically Defined Environmental Measurements to Distribution and Productivity of Forest Ecosystems in the Central Oregon Cascades.")

Soil and air temperatures were taken in each reference stand. Continuous temperature measurements 1 m above ground (5 m in winter on deep snow areas) and at 20 cm in the soil were taken throughout 1972 using 30-day thermographs. The data for 1972 will be summarized for the growing season on each plot using the "optimum temperature day" technique of Cleary and Waring (1969), and monthly average temperatures for each plot determined. Data of this type for 1971 has now been summarized.

Biological monitoring in each reference stand included: (1) phenological observations and (2) plant moisture stress.

Phenological observations: At the beginning of the growing season the following observations were recorded for selected shrub and herb species: (a) Percentage of flower buds open and (b) degree of leafing out of deciduous species (especially the date of "bud break"). The species selected for observation included Cornus nuttallii, Holodiscus discolor, Rhododendron macrophyllum, Gaultheria shallon, Berberis nervosa, Vaccinium parvifolium, Vaccinium membranaceum, Linnaea borealis, Zerophyllum tenax, Achlys triphylla, and Cornus canadensis.

In addition, date of "bud break" has been recorded for 4 (if available) trees 1 to 2 m tall for each coniferous species in each reference stand. Every effort has been made to include Tsuga heterophylla, Pseudotsuga menziesii, and Abies amabilis in this sample.

To determine the date of the beginning and end of combined cell divisions, pins were placed in three 1-2 m trees per stand as well as some larger trees. The dates of beginning and cessation of growth can be determined by microscopic examination of thin sections taken in the vicinity of the pins. Such analysis of the 1971 pin blocks has now been completed and will soon begin on those of 1972. Tsuga heterophylla and Abies amabilis have been used for this purpose where they were available.

Plant moisture stress determinations: These determinations used the pressure-chamber technique for estimating xylem sap tension. Measurements have been made on four 1-2 m trees in most stands (Pseudotsuga menziesii, Tsuga heterophylla, or Abies amabilis where available) during the latter part of the growing season. The 1970-72 plant moisture stress data are summarized in an internal report titled "Variation in plant moisture stress associated with forest communities in the H. J. Andrews Experimental Forest" (Zobel et al.) which is in final stages of preparation.

Objective (3): Quantitative Characterization of Vegetation Classification Units. The vegetation classification work at the H. J. Andrews is of central importance to IBP research conducted at this intensive study site. We are using these vegetation units as our primary basis of stratification in much of our research. This approach also provides the basis for extrapolating research results geographically from a stand to larger units (i.e. watersheds).

As a result of reconaissance study, we have tentatively identified 14 forest communities in the Tsuga heterophylla zone and 9 communities in the Abies amabilis zone. Since the preliminary characterization of vegetation units is based solely on reconnaissance information (Franklin, Dyrness, and Moir, 1970), the next step was the collection of more quantitative data in stands representative of each of the forest communities. This involved sampling 68 Daubenmire-type plots during the summer of 1972, using selected subsamples of the reconnaissance plots initially used. Plots are located on areas uniform in soil characteristics, aspect and slope.

Daubenmire's (1959) procedures for estimating canopy coverage have been used. All trees on each macroplot have been tallied by species and DBH size class. The soil profile at each plot has been described according to procedures outlined by the soil conservation service (1951, 1962).

Cover and frequency data for each species will be summarized by forest community to provide a quantitative description of the unit. Soil data will also be used to characterize the site supporting a particular vegetation unit. In addition, the resulting descriptions of both soil and vegetation units will be extremely useful in characterizing the soil-vegetation mapping units used during further survey of the H. J. Andrews forest.

In addition to the analytic plots completed during 1972 additional information from earlier reconnaissance sampling has been compiled by Dyrness, Franklin, and Moir (unpublished Bulletin) regarding communities within the Central Western Cascades of Oregon. An Internal Report on soil-vegetation information will be submitted upon completion of the data collection and analysis in the Fall of 1973.

An additional study funded in part by our IBP NSF grant resulted in a masters thesis titled "Forest vegetation and soils of terraces and flood plains along the McKenzie River, Oregon" (Hawk, 1973). Data from this study will be presented at the northwest science meeting at Walla Walla, Washington, March, 1973.

An intensive study of the bryophytes of the H. J. Andrews Experimental Forest was iniated in 1971-72 by Sawbridge as the subject of a Doctoral Dissertation. Initial studies of an analytic nature were completed in reference stands in and around the H. J. Andrews Experimental Forest. Subsequent sampling in Daubenmire plots and reconnaissance plots has provided additional information for further characterization of forest communities.

The principal investigators in this study include, C. T. Dyrness, and J. F. Franklin (FSL, Corvallis, OR) and Dr. D. Zobel (Dept. of Bot. and Pl. Path., OSU). Additional field members include W. A. McKee (Blue River Ranger Station, IBP), D. Sawbridge and G. M. Hawk (Graduate students, OSU).

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APPENDIX I

LIST OF LITERATURE AVAILABLE OR IN
PROGRESS RESULTING FROM THIS STUDY

1) Internal Report: Vegetation characterization based on reference stand studies, H. J. Andrews. In progress. G. M. Hawk, D. Sawbridge.

2) Internal Report: Stem and vegetation mapping of watershed 10, H. J. Andrews. In progress. G. M. Hawk.

3) Internal Report 43: Soil-vegetation mapping of the Hi-15 Watersheds, H. J. Andrews, C. T. Dyrness, and G. M. Hawk. 1972.

4) Internal Report 49: Soil-vegetation mapping of unit watersheds 2 and 3, H. J. Andrews. G. M. Hawk, and C. T. Dyrness 1972. (In progress).

5) Dyrness, C. T., J. F. Franklin, and W. H. Moir. 1972. Forest communities of the central portion of the Western Cascades in Oregon. Unpublished bulletin.

6) Internal Report: Variation in plant moisture stress associated with forest communities in the H. J. Andrews Experimental Forest. Zobel, D., G. M. Hawk, W. A. McKee, and C. T. Dyrness 1972. In progress.

7) Internal Report: Analytic verification of reconnaissance descriptions of forest communities of the central western Cascades, Oregon. Dyrness, C. T., J. F. Franklin, G. Hawk, and D. Sawbridge. In progress.

8) Hawk, G. M. 1973. Forest vegetation and soils of terraces and floodplains along the McKenzie River, Oregon. Masters thesis, OSU 188 p.

9) Hawk, G. M. Successional study of plant communities occurring on floodplains, terraces and glacial outwash plains at the McKenzie River Oregon. In progress.

10) Sawbridge, D. W. phD thesis: provisional title (Bryophyte distribution in the H. J. A. Experimental Forest, Oregon).