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Technical Article 1

A METHOD FOR DIGITIZING INVENTORY PLOT LOCATIONS IN THE UTM COORDINATE SYSTEM

W. Brad Smith and Carol Weist¹

ABSTRACT

Methods used at the North Central Forest Experiment Station describe how to automate the digitizing of forest inventory plot locations in the Universal Transverse Mercator (UTM) grid system, and determine the cost and time required for the digitizing process.

Agencies that monitor the Nation's natural resources are faced with a rapidly increasing demand to provide analyses of resource data. To provide these analyses economically, analysts and researchers need to efficiently combine and coordinate resource data from other agencies using a common geographic reference system.

The Universal Transverse Mercator (UTM) grid, developed by the Department of the Army (1958), is becoming widely accepted as the best geographic reference system for these purposes. The UTM system divides the entire globe into a series of rectangular metric grids which may be subdivided to provide accurate coordinates of ground locations. Reference points for this system are located on all new USGS quadrangle maps. Procedures for determining UTM coordinates by hand have been described (Barnes 1980); however, this process can be tedious and time-consuming when the points being digitized are not systematically located. Personnel of the North Central Forest

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Experiment Station Resources Evaluation Unit have recently automated the process of digitizing map coordinates of forest inventory plot locations. The major objective was to provide a low cost process using personnel with non-programming backgrounds.

To create a process that could be easily used by non-programmers, a special FORTRAN computer algorithm called QUADIG was developed to interface with graphics software and hardware. This provided a means for entering, reviewing, and editing digitized forest inventory plot locations taken from US Geological Survey (USGS) quadrangle maps. A user's manual for QUADIG was prepared for training and reference.

Materials and Equipment²

Hardware:

- Bausch and Lomb Zoom transfer scope
- Tektronix 4014 Graphics terminal
- Tektronix 4952 Graphics tablet and controller
- Tektronix single-button crosshair cursor

Software:

- Tektronix AG-11 Graphics software
- University of Minnesota Computer Center system support routines
- QUADIG (FORTRAN program to interface graphics software, UCC support software and provide digital analysis and coordinate data transformation)

²Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture, and does not imply its approval to the exclusion of other products that may also be suitable.

Other materials:

- 1:20,000 scale black and white aerial photography with marked forest inventory plot locations
- 7-1/2 minute (1:24,000 scale) and 15 minute (1:62,500 scale) USGS quad maps of the area covered by the aerial photography.

METHODS

The Resources Evaluation Unit at North Central uses a double sampling procedure for forest inventory. In the first phase a uniform grid of 121 points (laid out on clear acetate) is superimposed on a township mosaic composed of several 1:20,000-scale black and white aerial photographs. All forest points are classified, stereoscopically, as to forest type, stand size, and density. A systematic random sample of these points is then drawn for the second or "ground check" phase of the procedure, in which points are visited on the ground by field crews. This ground check "corrects" the photo sample phase and provides accurate estimates of land area by ground land use.

Plot locations are transferred from the township mosaics to an appropriate 7-1/2 or 15 minute USGS quadrangle map using a Bausch and Lomb zoom transfer scope. The quad map with transferred plots is then taped securely to the graphics tablet.

Program QUADIG requests the following general information:

1. USGS quad map identification information
2. Resources Evaluation Unit reference data (survey unit, state, county, etc.)
3. UTM zone number
4. Latitude and longitude of the SE corner of the quad map

The program then requests the user to digitize the following quad map reference information:

1. Three UTM northing and easting reference lines, (two points per line from the quad map edges),
2. The location of the four quad map corners.

Finally, for each plot location on the quad map, the plot number is entered from the graphics terminal keyboard followed by a digitized point from the cursor. QUADIG then determines the reference scale of the quad by triangulation. The plots digitized may be viewed on the screen of the graphics terminal at any time by switching from the "entry" mode of QUADIG to the "review" mode. In "review" mode all information about the quad entered or digitized thus far is displayed. The program produces an outline of the quad map with UTM reference lines, plot numbers and digitized plot locations. Quad identification information and the computed UTM's of the digitized plots are printed to the left of the map image (figure 1). If any locations have been missed, the operator can return to the "entry" mode of QUADIG and digitize the missing plots before removing the quad map from the tablet.

QUAD ID: MN7078 DATE: 80/04/15 EDITED: 80/04/15
 QUAD NAME: AKELEY, MINN. AMS7078 II SW V8720
 LAT: 4700 00 LONG: 9437.50 (SE CORNER)
 MAP YEAR: 1972 MAP SCALE RECIPROCAL: 24000
 UTM ZONE: 15 FOREST SURVEY UNIT: 3 PLOTS: 3

	Tablet coordinates	UTM coordinates	
UTM: 5213000N	(1946,1138) (3506,1177)	0367125E	5213000N
UTM: 5220000N	(1943,2291) (3501,2330)	0367282E	5220000N
UTM: 0372000E	(2776, 60) (2719,2346)	0372000E	5206330N
SW CORNER:	(1947, 58)	0366967E	5206443N
SE CORNER:	(3510, 62)	0376456E	5206231N
NE CORNER:	(3500,2350)	0376743E	5220122N
NW CORNER:	(1942,2345)	0367284E	5220328N
PLOT #: 01234	(2361,1759)	0369739E	5216707N
PLOT #: 01235	(2364, 950)	0369634E	5211795N
PLOT #: 01236	(3006, 669)	0373489E	5209992N

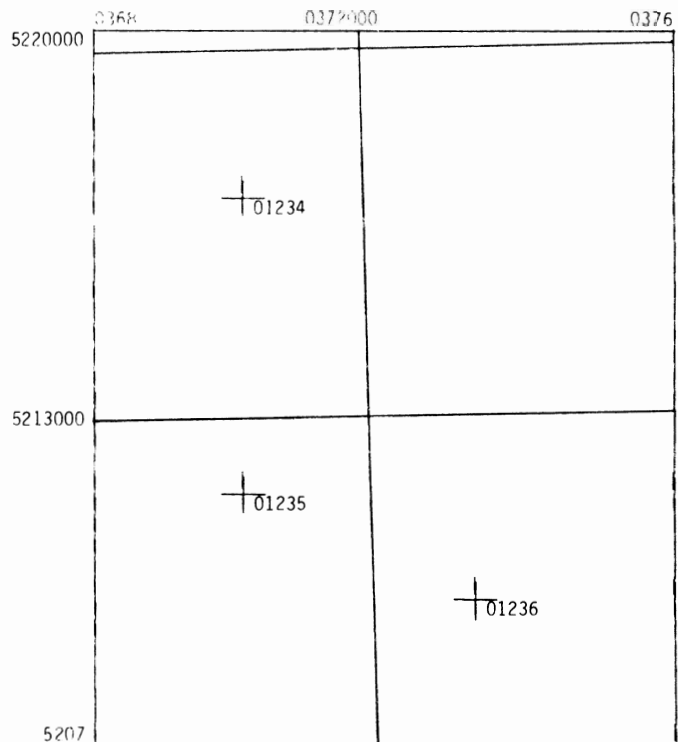


Figure 1.--Graphic display of digitized quad map.

To evaluate the process; 364 forest inventory plot locations were transferred to 13 quad maps for Ontonagon County, Michigan with the zoom transfer scope and then digitized with program QUADIG. Records were kept to analyze the time and cost of the process.

RESULTS

The average time required to transfer a plot location to a quad map was 0.8 minutes or \$0.12 per plot. The average time required to digitize a plot was 2.4 minutes of \$0.21 per plot. Computer processing costs amounted to about \$0.04 per plot. Thus, the total cost for transfer and digitizing was about \$0.37 per inventory plot. This includes set-up time. (All labor costs computed based on GS 4/1 at \$5.27 per hour.) These rates compare very favorably with recent statistical information on digitizing released by AgRISTARS (1980) and by the Southeastern Forest Experiment Station (Cost 1976). To date, 5,508 forest inventory plot locations in the Upper Peninsula of Michigan have been digitized by this method.

Information about QUADIG may be obtained by contacting the Resource Evaluation Project at the North Central Forest Experiment Station, St. Paul, MN 55108.

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Technical Article 2

STREAMSIDE MANAGEMENT ZONE INVENTORY

Drusilla Hobbs and Thomas Halbach¹

The Washington State Forest Practice Board was charged with writing a comprehensive system of regulations which would, among others, encourage timber growth and achieve compliance with all applicable requirements of Federal and State law

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with respect to nonpoint sources of water pollution. The streamside management zone (SMZ) was defined by the Board as an area alongside forest streams where particular attention must be given to measures for protecting water quality.

During its deliberations on forest harvest regulations to protect water quality, the Board recognized that the riparian zone required special management consideration. The concept of a "streamside management zone" was developed as a compromise to protect both timber values and water quality interests along streams.

The SMZ width was set at 50 feet along large, high-use streams, and 25 feet along smaller streams classified as having "moderate value" for fisheries or domestic use. The regulations are designed primarily to protect water quality by protecting streambank integrity and by requiring that vegetation be left for temperature control.

To monitor the success of the regulations in meeting the state's water quality goal of "fishable-swimmable waters," the Washington State Department of Ecology randomly selected 50 streamside clearcuts for field evaluation. Fish and wildlife habitat, stream channel stability, vegetative composition, and windthrow were inventoried by an interdisciplinary field team.

The 50 sites displayed a wide range of variability in the extent and intensity of harvesting within the SMZ. At 12 of the sites, there was virtually no harvesting or disturbance within the SMZ. Conversely, 13 of the sites had no discernable boundary between the clearcut and the SMZ, and trees and shrubs were scarce or absent.

Wildlife ratings were low at sites where vegetation removal was extensive. Stream channel stability ratings were also reduced where trees and shrubs were removed from the upper banks. Temperature problems due to removal of shade-producing vegetation were apparent at two of the streams.

Twenty-three sites contained primarily deciduous trees (mostly red alder), 10 contained a mixture of deciduous and coniferous trees, 4 contained coniferous trees, and 13 sites had little or no tree cover. Salmonberry and elderberry were the most common shrub species.

Recent windthrow within the SMZ was recorded at 25 streams. The volume of SMZ trees which blew down ranged from 0.5-17 percent of the volume left after harvest. Most of the windthrown trees were red alder or western hemlock, and were less than 20 inches in diameter at breast height.

The long-term impacts of windthrown trees on fish habitat could not be determined at the time of this study; however, short-term impacts were evaluated. Positive impacts such as the creation of pools, and negative impacts from accelerated bank erosion were found. It was anticipated that positive effects would increase in the future, as many of the windthrown trees spanned the stream. As these trees work their way into the channel, additional pool habitat will be created.

Small streams with a 25-foot SMZ consistently received poorer rating than did larger streams with a 50-foot SMZ. This relationship may have one or several of the following explanations:

1. The 25-foot SMZ may provide less protection to riparian resources.
2. Operator concern or enforcement may be less along small streams.
3. Small streams may be more sensitive to logging impacts.
4. Small streams may inherently receive poorer ratings due to natural factors.

While an inventory of this type does not determine cause-effect relationships, it does provide the resource manager with valuable information. By characterizing the composition of the SMZ, the degree of riparian resource protection can be estimated.

Recommendations to increase the effectiveness of the SMZ regulations were developed, and include:

- Nonmerchantable trees and vegetation should be left within the SMZ, regardless of temperature sensitive status.
- The definition of SMZ should be expanded to include the protection of all public resources (water, fish, and wildlife), rather than being limited just to water quality.
- Research needs were highlighted; effective bufferstrip width, large organic debris requirements, and the cumulative effect of streamside harvesting were cited.

If you are interested in additional information, contact Drusilla Hobbs, Washington State Department of Ecology, Mail Stop PV-11, Olympia, WA 98504.

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Technical Article 3

A USEFUL FUNCTION FOR MAKING GROWTH ESTIMATES WITH PARTIAL REPLACEMENT SAMPLING

Stephen J. Titus¹

ABSTRACT

Growth estimates and variances are easily computed for independent, permanent, or partial replacement samples using the APL function described here. An example is given to show the flexibility and ease of analysis.

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INTRODUCTION

One obstacle to using partial replacement sampling (Ware and Cunia 1962) is the apparent complexity of the formulas for the estimates of growth. The APL (A Programming Language, Gilman and Rose 1976) function described in this note provides a convenient and compact formulation which handles all combinations of partial replacement sampling and sampling with no permanent plots or no temporary plots.

Partial replacement sampling is usually thought of as consisting of three independent samples:

1. the set of U plots measured only at time 1,
2. the set of M plots measured at both time 1 and time 2,
3. the set of N plots measured only at time 2.

Based on these sets of sample data, Ware and Cunia (1962) present the estimator for growth. Their presentation implies that U, M, and N are all greater than zero, but this is not required. The estimators are valid if any one of U, M, N is zero or both U and N are zero since unnecessary terms disappear. Seen in this light, partial replacement sampling is a general procedure which includes a number of special cases that are already familiar. If both U and N are zero, then only permanent plots are present. If M is zero, then independent samples are used to estimate growth. If only U is zero, or only N is zero, this implies the case where one set of temporary plots is missing.

For those unfamiliar with APL, a few comments are necessary so that the discussion which follows will have more meaning. Additional references and examples of APL in forestry are described by Titus (1981). An APL expression is an instruction to evaluate one or more functions using variables or constants as inputs (arguments). In Figure 1, discussed below, indented lines are APL expressions which are transmitted to the computer following entry on a terminal keyboard; they are followed by the computer response or evaluation of the expression. In studying Figure 1, it is sufficient for the casual reader to note that each indented line is an expression which produces the result given on the line or lines following the expression. Functions are of two types, primitive (\uparrow , \downarrow , ρ) and defined (SPR, FMT), and SPRDATA is the only variable used here. Aside from executing the main analysis function SPR, all other expressions simply rearrange the data in fairly obvious ways. Figure 2 is included for those readers interested in the way APL is used to solve this sampling problem. However, even those who are not familiar with the APL language should appreciate the brevity of the solution and the general utility of the subordinate functions.

The function SPR is easily used and can be the basis for gaining additional insight into the relationships which make permanent plots and partial replacement sampling worthwhile. Figure 1 shows an example analysis based on a sample of

Figure 1. Example SPR Analysis

```

ρSPRDATA
30      6 5ρSPRDATA
22 26 24 23 19
20 25 21 19 18
24 26 23 27 22
26 30 26 23 23
30 32 29 34 28
30 33 29 27 26

      FMT 5 10 5 SPR SPRDATA
5.6506 .0407 .9844 .0357

      4 5ρ5+~5+SPRDATA
20 25 21 19 18
24 26 23 27 22
26 30 26 23 23
30 32 29 34 28

      FMT 10 0 10 SPR 5+~5+SPRDATA
5.6000 2.2378 .0000 .2671

      FMT 0 10 0 SPR 5+~5+SPRDATA
5.6000 .0711 .9844 .0476

      FMT 5 10 0 SPR ~5+SPRDATA
5.6279 .0814 .9844 .0507

      FMT 0 10 5 SPR 5+SPRDATA
5.6283 .0347 .9844 .0331

      FMT 15 0 15 SPR SPRDATA
5.8000 1.2438 .0000 .1923

      6 5ρ(15+SPRDATA),(~5+SPRDATA),15+~5+SPRDATA
22 26 24 23 19
20 25 21 19 18
24 26 23 27 22
30 33 29 27 26
26 30 26 23 23
30 32 29 34 28

      FMT 0 15 0 SPR (15+SPRDATA),(~5+SPRDATA),15+~5+SPRDATA
5.8000 .0876 .9418 .0510

```

20 plots from which volumes per acre in cunits (hundreds of cubic feet) have been derived. The sample consists of 5 temporary plots measured only in 1970, 10 permanent plots measured in both 1970 and 1980, and 5 temporary plots measured only in 1980. Assume the data list (vector) is assigned to the APL variable SPRDATA (reshaped in Figure 1 for convenient printing) with the convention that sample observations are listed in the following sequence:

1. plots measured only at time 1,
2. permanent plots measured at time 1,
3. permanent plots measured at time 2 (same order as in 2.),
4. plots measured at only time 2.

The list of data together with the corresponding numbers of plots for each category are the arguments (inputs) to the function SPR. The number of permanent plots, which is the same at both measurements, needs to be listed only once. Evaluating the APL expression SN SPR DATA, where SN (the left argument) is a vector of three sample sizes and DATA (the right argument) is a vector of data values, produces a result vector with elements:

1. the estimate of growth,
2. the variance of the growth estimate,

Figure 2. SPR and Related Functions

```

R←S SPR D;U;M;N;DM;AV1;AV12;AV2;RHO;SD1;SD2;T;BC;B;C
U←S[1]
M←S[2]
N←S[3]
DM←⊖(2,M)ρU+(~N)⊖D
AV1←AVF U+D
AV12←AVF DM
AV2←AVF (~N)+D
RHO←COR COV DM
SD1←SD COV(U+D),, 0 ~1 ⊖DM
SD2←SD COV((~N)+D),, 0 1 ⊖DM
T←((M+N)×M+U)-U×N×RHO×2
C←((M×M+U)+N×M×RHO×SD1+SD2)÷T
B←((M×M+N)+U×M×RHO×SD2+SD1)÷T
U←U+U=0
N←N+N=0
M←M+M=0
BC←(-1+B),B,C,1-C
R←BC LTR AV1,AV12,AV2
R←R,(+/(SQ BC×SD1,SD1,SD2,SD2)÷U,M,M,N)+2×B×C×RHO×SD1×SD2÷M
R←R,RHO,(SQRT R[2])÷R[1]

      FMT:4ω
      AVF:(+fω)÷1+(ρω),1
      COR:T
      :2≥1+ρT←ω÷T∘.×T-SD ω
      : (T≠1)×T-(1+2+T)[1]
      COV:(SSQ ω-TρAVF ω)÷~1+1+T+ρω
      SD:SQRT TRACE ω
      :1=ρρω
      :SQRT ω
      LTR:α+.×ω
      SSQ:(⊖ω)+.×ω
      SQRT:ω×.5
      TRACE:1 1 ⊖ ω
      SQ: ω×2

```

3. the correlation between permanent plot measurements,
4. the relative standard error (RSE).

Figure 1 shows the sample data and seven different analyses, each formatted (using the function FMT) to print with four digits to the right of the decimal. Before each analysis the appropriate data is selected (†) or deleted (‡) in accordance with the number of plots (U, M, N). The first evaluation correctly estimates that the periodic five year growth for partial replacement sampling is 5.6506 cunits with estimated variance 0.0407. The expression which produces these results may be read as "format (FMT) the growth estimates produced by function SPR based on U = 5, M = 10, N = 5 (left argument to SPR) and data in variable SPRDATA (right argument to SPR)." Correlation between measurements on the 10 permanent plots is 0.9844, and the RSE is 0.0357 ((SQRT 0.0407) ÷ 5.6506).

The remaining analyses are included to show the effect of the presence or absence of the different samples. Two analyses are made ignoring both the 1970 and 1980 temporary plots, one assuming (erroneously) that the permanent plots are independent, and the other treating them (correctly) as permanent plots. Estimated periodic growth is the same for each (5.6000), but the variances are 2.2378 and 0.0711 respectively.

Note that the sample of 10 permanent plots alone is nearly as precise as partial replacement sampling with 10 permanent plots and 5 temporary plots at each measurement time (variance 0.0407). Two analyses are made augmenting the 10 permanent plots with 5 temporary plots, first including only the temporary plots from 1970 and then including only the temporary plots from 1980. The periodic growth estimates (5.6279 and 5.6283) differ slightly from the partial replacement estimates (5.6506) and the variance estimates also show greater variability. Finally, two analyses are made using all 20 plots, assuming first that they are independent, and then that they are paired (reordering the data is necessary to maintain pairing of the original 10 permanent plots). The correlation coefficient decreases slightly and the variance is not quite as low since five of the plots are actually not paired. Even those unfamiliar with APL notation should appreciate the ease with which these analyses have been made. The function SPR is not limited by size of samples, and it handles all combinations of values for U, M, and N.

The remaining discussion shows generally how the growth estimates and its variance are obtained using the approach of Ware and Cunia (1962). All combinations of permanent and temporary plots are included in the general formula for estimating growth:

$$\text{GROWTH} \leftarrow (A, B, C, D) \text{ LTR AV1, AV12, AV2}$$

This expression may be read as "growth is a linear transformation of the 4 sample means AV1, AV2, AV12." The sample means of temporary plots measured at time 1 and 2 are AV1 and AV2, respectively, and AV12 is a two element vector containing the sample means for each measurement of the permanent plots. A, B, C, D are the coefficients for the transformation (weights applied to each sample mean). The function LTR accomplishes the transformation by computing the sum of products of corresponding elements of its left and right arguments. In order that the transformation results in an estimate of growth, two restrictions are necessary ($1 = A + B$ and $1 = C + D$), and B and C (or A and D) must be selected to minimize the variance of the growth estimate (Ware and Cunia 1962, pg. 10-11);

$$\text{VARGROWTH} \leftarrow (+ / (\text{SQ} (A, B, C, D) \times \text{SD1, SD1, SD2, SD2}) \div U, M, M, N) + 2 \times B \times C \times \text{RHO} \times \text{SD1} \times \text{SD2} \div M$$

where:

SD1 - standard deviation of volume (time 1 U + M plots),

SD2 - standard deviation of volume (time 2 M + N plots),

RHO - correlation between paired measurements (M plots),

U - number of plots measured only at time 1,

M - number of plots measured at both time 1 and 2,

N - number of plots measured only at time 2,

SQ - square the values of the expression to the right,

+ / - sum the values of the expression to the right.

This expression simply states that the variance of the growth estimate is a weighted sum of variances and covariance ($\text{RHO} \times \text{SD1} \times \text{SD2}$) for the sample data. If any one of U, M, N or both U and N is zero, the estimates may still be generated after slight modifications are made to avoid dividing by zero.

These expressions for the growth estimate and its variance are the primary expressions around which the function SPR is built. Figure 2 shows the character representation of SPR and related subordinate functions which have been defined using the "direct definition" convention (Titus 1981). SPR has a direct relationship to the usual notation for partial replacement sampling (except that C used here is equivalent to Ware and Cunia's A) so the computational aspects are clear without being cluttered up with such technical details as how to add up a sequence of squared deviations one by one. The solution is seen in its entirety by using to full advantage the primitive functions of the APL language augmented by some useful direct definition statistical functions which evaluate the covariance matrix COV, the correlation matrix COR, the row averages of a matrix AVF, and the standard deviation SD.

The APL function described here illustrates the generality of the partial replacement formulas for estimating growth, including both permanent and independent samples. It crystallizes the analysis around three essential elements: sample sizes, data, and the analysis function. With APL the data are easily entered and manipulated, and the analysis is effected by entering a single short APL expression. The numerical example described here cuts through computational details and shows the gains in precision (reduction in variance) which may be achieved when growth is estimated from different combinations of permanent and temporary plots. The analysis function SPR may be treated as a "black box", or it may be studied and compared to the theoretical presentation made by Ware and Cunia (1962). Understanding the workings of the analysis function is easier than it would be using other computer languages since only a dozen or so primitive functions and nine defined functions, which provide basic statistical computations, are used in completing the analysis.

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Titus, S. J. 1981. The use of APL in forest sampling and mensuration. The Forestry Chronicle 57(2):71-76.

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REMOTE SENSING INSTRUCTION MATERIALS

Remote sensing instructional materials covering: "Remote Sensing Laboratory Manual," "Instructor's Key for Remote Sensing Laboratory Manual," "35mm Slide Sets in Remote Sensing," "Guide and Explanation for Remote Sensing Slide Sets" are available. The materials are designed for college classes and special courses. For additional information on costs and availability contact Remote Sensing Enterprises, P. O. Box 2893, La Habra, California 90631.

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SURVEY OF REMOTE SENSING AND MAPPING FIRMS

In July 1981, the American Society of Photogrammetry mailed a confidential questionnaire to more than 1,000 U. S. firms in the mapping sciences: photography, surveying, mapping and remote sensing. Questions cover general capabilities, policies, salaries, fringe benefits, etc. Any firm that did not receive a copy of the questionnaire is asked to request one from Pat Stoneburner, ASP, 105 N. Virginia Ave., Falls Church, VA 22046, phone (703) 534-6617. Participating firms will receive a free copy of the complete results. Others may purchase the results by ordering them in advance. Price: ASP Member \$50; Nonmember \$100.

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CLASSIFICATION

Several papers on classification are contained in the 1980 Proceedings of the Society of American Foresters National Convention on Land Use Allocation, Progress, People, Politics, Professionals. Among those articles of interest are:

Stone, Earl L. Societies need for classification in resolving land use allocation. p. 154-158.

Bedell, John C. Application of modified ecoclass in Arizona and New Mexico. p. 170-171.

Daubenmire, R. The scientific basis for a classification system in land use allocation. p. 159-162.

Driscoll, Richard S. The quest for a uniform classification system for land use allocation. p. 179-185.

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Hall, Frederick C. Application of a classification system based on plant community types (associations) with special reference to wildlife, range, and timber management. p. 163-169.

The proceedings are offered for sale at \$18.00/copy, post-paid by the Society of American Foresters, 5400 Grosvenor Lane, Washington, D.C. 20014.

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CURRENT LITERATURE

Please order directly from sources given in (). For journal articles, contact your local library for availability.

GENERAL

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MEETINGS, WORKSHOP, AND SYMPOSIA

November 29-December 4, 1981. Forty Ninth Annual Meeting, Soil Science Society of America. (Atlanta, Georgia). Contact: SSSA, 667 S. Segoe Road, Madison, WI 53711.

November 30-December 3, 1981. Seventy Second Annual Western Forestry Conference. Theme: Western Land Use in a Changing Society. (Sun Valley, Idaho). Contact: Western Forestry and Conservation Association, Forest Counsel Steele Barnett, 1326 American Bank Building, Portland, OR 97205. Phone (503) 226-4562.

- November 30-December 11, 1981. International Statistical Institute, Forty Third Biennial Session, (includes meetings of Bernoulli Society for Mathematical Statistics and Probability, International Association for Statistical Computing and International Association of Survey Statisticians), Buenos Aires, Argentina. Contact: ISI Permanent Office, 428 Prinses Beatrixlaan, 2270 AZ Voorburg, Netherlands.
- December 1-2, 1981. Spotlight Briefing: Human Resources in Information Systems. (Roosevelt) Hotel, New York). Contact: Ms. Joan Merrick, Datamation Spotlight Briefing, Center for Management Research, 850 Boylston Street, Chestnut Hill, MA 02167. Phone (617) 738-5020.
- December 15-17, 1981. Young Plantation Management. Contact: Conference Assistant, School of Forestry, Oregon State University, Corvallis, OR 97331. Phone (503) 754-3709.
- January 13-15, 1982. California's Urban Dilemma. 24th Annual Meeting, California Chapter of the Soil Conservation Society of America, (Riverside, Calif.). Contact: Jason N. Jackson, Soil Conservation Service, 1735 Main Street, Suite C, Ramona, CA 92065.
- February 7-13, 1982. Annual Society for Range Management Meeting. (Calgary, Alberta). Contact: SRM, 2760 West Fifth Ave., Denver, CO 80204.
- February 15-18, 1982. The Third Symposium on Environmental Concerns in Rights-of-Way Management. Call for papers. (San Diego, California). Contact: Allen F. Crabtree, Environmental Enforcement Division, Michigan Dept. of Natural Resources, Mason Building, 6th Floor, Lansing, MI 48909. Phone (517) 373-3503.
- March 14-20, 1982. Annual Convention American Society of Photogrammetry and American Congress on Surveying and Mapping. (Denver, CO). Contact: American Society of Photogrammetry, 105 North Virginia Ave., Falls Church, VA 22046.
- May 18-20, 1982. Microcomputers--A New Tool for Foresters. Contact: John W. Moser, Jr., Dept. of Forestry and Natural Resources, Purdue University, West Lafayette, IN 47907. Phone (317) 494-3596.
- June 25-26, 1982. Wildlife Values of Gravel Pits Symposium. Contact: Northwest Agricultural Experiment Station, University of Minnesota, Crookston, MN 56716.
- June 28-July 1, 1982. The Impact of Waste Storage and Disposal on Ground-water Resources. Contact: Ms. Julia Belli Mier, U.S. Geological Survey, 521 West Seneca Street, Ithaca, NY 14850. Phone (607) 272-8722; FTS 882-4222.
- Mid-July, 1982. Multivariate Analysis Short course. Contact: W. E. Frayer, College of Forestry and Natural Resources, Colorado State University, Fort Collins, CO. Phone (303) 491-6637.
- August 9-11, 1982. Inventory for Legal Purposes. (Tenative). Contact: Dr. Harry V. Wiant, Jr., College of Agriculture and Forestry, Morgantown, WV 26506.
- August 23-27, 1982. Auto Carto IV (ISP Comm. IV) Symposium. (Washington, D. C.). Contact: American Society of Photogrammetry, 105 N. Virginia Ave., Falls Church, VA 22046.
- September 19-25, 1982. American Society of Photogrammetry, American Congress on Surveying and Mapping Fall Technical Meeting. (Miami Beach, FL). Contact: ASP, 105 North Virginia Ave., Falls Church, VA 22046.
- August 8-12, 1983. Resource Inventories for Monitoring Change and Trends: An International Workshop. Contact: John F. Bell, School of Forestry, Oregon State University, Corvallis, OR 97330. Phone (503) 754-4036; FTS 425-4036.
- May 14-18, 1984. Second International Rangelands Congress. Adelaide, South Australia. Contact: Conference Secretariat, CISRO, Private Bag, Deniliquin NSW, Australia 2710.

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WANTED--Materials for the Newsletter--Technical articles, news items, current literature, and meeting notices. All articles received are to be grammatically and technically correct. Send your material to Resources Evaluation Newsletter, Rocky Mountain Forest and Range Exp. Stn., 240 West Prospect Street, Fort Collins, CO 80526. Phone (303) 221-4390, ext. 202 or FTS 323-1201.

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Some views expressed in this Newsletter may not necessarily reflect the position of all of the sponsoring agencies.

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