PROPOSED METRICATION OF FOREST INVENTORY DIVISION'S STANDING SAMPLES SYSTEM

by F.A. Smale

July, 1975

mg 116159

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ALLISON, BRADSHAW, BURROWS, CALDER, FLIGG,
JELINEK, McMINN, SMALE, VARGA, VAUGHAN
M. WOODWARD, FOREST RESEARCH.

File: 0130550 - I

August 27, 1975

Amendment to the 2 lists dated August, 1975 which give the allocation of R.C.'s to new F.I.Z.

List Number 1 entitled:

List of Regions and Compartments in each of 12 Forest Inventory Zones

Page 2, left-hand side

After last zone C add:-

"C 33 10"

Change 4th line of Zone D to read:-

"D 33 1-9, 11-25"

List Number 2 entitled:

List of Regions and Compartments showing division by 12 Forest Inventory Zones

Page 2.

Delete penultimate line and substitute:-

"33 1-9, 11-25 D"

"33 10 C"

This amendment has been agreed to by Messrs. Burrows, Calder and Fligg because our Soo project field crew states that R33 C10 is clearly in the coast type forest, not interior. Several samples in that compartment have included broad-leaf maple.

F.A. Smale
Programmer Analyst

REPLACES LIST DATED MAY, 1975

0130550 - I

FOREST INVENTORY DIVISION

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August 1975

List of Regions and Compartments in Each of 12 Forest Inventory Zones

Zone	Region	Compartment
A	1	2,5-7A-E,8,9AB,10A,11,12A
A	31	20-34
A	49	17-28,32,33
A	50	1-17 ALL
A	51	1-15 ALL
A	52	1,5,8,9,12,15,20-22,27,29, 32,35,38,39,41,42,47,51,55, 58,60,62,63,68,72,75
A	53	1-68 ALL
A	54	1-67,69,70,76-82,111-115
A	61	1-125 ALL
A	62	1-32 ALL
A	63	1-47 ALL
A	64	1-6,8,22-71
A	75	1-10,15-17,84-95,97-110
A	76	1-7,9-23,31-33,40,47-58,60, 62-65
A	83	1-4,9-11,14-16,19
Zone B	1	1,3AB,4,10B,12B,13,14A-D, 15AB,16A-D,17,18AB,19A-E, 20AB,21A-F,22,23AB,24,25A-D, 26AB,27AB,28A-C,29,30A-D
B	2	1-69 ALL
B	3	1-3,4AB,5A-G,6,7,8A-E, 9A-C,10A-B,11AB,12A-G, 13A-D,14A-L,15AB,16AB, 17A-C ALL
B	4	1-39 ALL
B	5	1,2AB,3A-F,4A-C,5AB,6AB, 7A-C,8A-F,9A-C,10A-F, 11A-C,12AB,13AB,14AB, 15A-C,16,17A-C,18,19AB, 20-22 ALL
B	6	1A-H,1J-P,2A-C,3A-I,4A-H, 5A-D,6A-C,7AB,8A-F,9A-D, 10AB,11AB,12A-G,13A-D,14, 15A-D,16,17AB,18AB,19 ALL
B	7	1A-E,2A-C,3,4A-F,5AB, 6A-D,7AB,8A-C,9,10,11AB, 12A-C,13AB,14A-D,15AB, 16AB,17AB,18,19,20AB, 21A-D,22AB,23A-D,24A-K, 25,26AB,27A-F,28A-I,29-31 32A-G,33A-D,34A-C,35,36 A-D,37A-D,38A-C,39A-C ALL
B	8	1-10 ALL
B	27	10-13
B	28	1-41 ALL
B	29	1-26 ALL
B	30	1-15 ALL
B	31	1-19
B	32	1-16 ALL

Zone	Region	Compartment
B	49	1-16
Zone		
C	9	1-96,ALL(13A,21A,39A)
C	10	1,2AB,3A-G,4,5AB,6AB,7A-E,8, 9A-G,10A-D,11A-C,12A-C,13-15, 16AB,17AB,18,19AB,20,21 ALL
C	11	1A-D,2,3,4A-J,5-9,10A-E,11-18 ALL
C	12	1-19 ALL
C	26	1-22 ALL
C	27	1-9,16-34
C	33	10
Zone		
D	13	1-90 ALL
D	14	1-60
D	25	1-49 ALL
D	33	~~1-25 ALL~~ 1-9, 11-25
D	34	1-13 ALL
D	35	1-13 ALL
D	36	1-10 ALL
D	37	1,2,5,13
D	38	13,15
D	45	1-5
D	46	1-21 ALL
D	47	7-16,20-60
D	48	1-9
D	57	1,13-21

Zone	Region	Compartment
E	15	1-14 ALL
E	16	1-4 ALL
E	17	1-8,10,11,18-25,27,28
E	18	11-16
E	23	1-3,16,17
E	24	1-17 ALL
Zone		
F	18	1-10,17-40
F	19	1-42 ALL
F	20	1-5 ALL
F	21	1-21,23-35,37-39
F	41	1-3,5,7,19,20
Zone		
G	14	61-63
G	17	9,12-17,26,29-42
G	21	22,36,40-50
G	22	1-17 ALL
G	23	4-15
G	37	3,4,6-12,14-21
G	38	1-12,14,16-35
G	39	1-28 ALL
G	40	1-17 ALL
G	41	4,6,8-13,21-83
G	42	1-37 ALL
G	43	1-15 ALL
G	44	1-5 ALL

Zone	Region	Compartment
G	45	6-15
G	56	21,25-51,54,55,55A-68
G	57	2-12,22-40
G	58	1-23 ALL
G	59	1-39,42,62-68,70,87-90
Zone		
H	47	1-6,17-19
H	48	10-91
H	49	29-31,34-40
H	54	68,71-75,83-110
H	55	1-95 ALL
H	56	1,2,5,16-20,22-24,52,53,69
H	59	139,140,143,144
H	60	8,10-12,14-37,41-180
H	66	1-10,13,17-21,26,27,33,35
H	67	1,2,5,6
H	68	37-40,44-50,55,56,59
Zone		
I	56	3,4,6-15
I	59	40,41,43-61,69,71-86,91-103, 105-138,141,142,145
I	60	1-7,9,38-40
I	66	11,12,14-16,22-25,28-32, 36-41,43-66,68-70,76,77, 83-88
I	68	1-36,41-43,51-54,57,58,60-126

Zone	Region	Compartment
I	69	1-129 ALL
I	73	83
I	74	1-61 ALL
I	77	1-40,45-52,64-66,72, 73,121-125,127,130-132,141-152
Zone		
J	64	7,9-20
J	65	1-130 ALL
J	66	34,67,71-75,78-82, 89-92
J	67	3,4,7-33
J	75	11-14,18-83,85,111
Zone		
K	76	8,24-30,34-38,41-45, 59,61,66-206
K	77	41-44,53-63,67-71, 74-120,126,128,129, 133-140,153-177
K	80	1-176 ALL
K	81	1-54 ALL
K	82	1-55 ALL
K	83	5-8,12,13,17,18,20-76
K	84	1-72 ALL
K	85	1-123 ALL
K	86	100-104,127-133,135-149
Zone		
L	70	1-78 ALL
L	71	1-77 ALL

Zone	Region	Compartment
L	72	1-80 ALL
L	73	1-82,84-116
L	78	1-105 ALL
L	79	1-191 ALL
L	86	1-99,105-126,134,150-190
L	87	1-87 ALL
L	88	1-86 ALL

REPLACES LIST DATED JUNE, 1975

0130550 - I

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Forest Inventory Division

August 1975

List of Regions and Compartments Showing Division by 12 Forest Inventory Zones

Region	Compartments	Zone
1	1	B
	2	A
	3AB,4	B
	5 - 7 A-E, 8, 9AB, 10A	A
	10B	B
	11, 12A	A
	12B - 30D	B
2	1 - 69 ALL	B
3	1 - 17C ALL (Includes Many Letters)	B
4	1 - 39 ALL	B
5	1 - 22 ALL (Includes Many Letters)	B
6	1A - 19 ALL (Includes Many Letters)	B
7	1A - 39C ALL (Includes Many Letters)	B
8	1 - 10 ALL	B
9	1 - 96 ALL (Includes 3 Letters)	C
10	1 - 21 ALL (Includes Many Letters)	C
11	1 - 18 ALL (Includes Many Letters)	C
12	1 - 19 ALL	C
13	1 - 90 ALL	D
14	1 - 60	D
14	61 - 63	G
15	1 - 14 ALL	E
16	1 - 4 ALL	E
17	1 - 8	E
	9	G
	10 - 11	E
	12 - 17	G

Region	Compartment	Zone
	18 - 25	E
	26	G
	27 - 28	E
	29 - 42	G
18	1 - 10	F
	11 - 16	E
	17 - 40	F
19	1 - 42 ALL	F
20	1 - 5 ALL	F
21	1 - 21	F
	22	G
	23 - 35	F
	36	G
	37 - 39	F
	40 - 50	G
22	1 - 17 ALL	G
23	1 - 3	E
	4 - 15	G
	16 - 17	E
24	1 - 17 ALL	E
25	1 - 49 ALL	D
26	1 - 22 ALL	C
27	1 - 9	C
	10 - 15	B
	16 - 34	C
28	1 - 41 ALL	B
29	1 - 26 ALL	B
30	1 - 15 ALL	B
31	1 - 19	B
	20 - 34	A
32	1 - 16 ALL	B
33	~~1 - 25 ALL~~ 1-9, 11-25	D
33	10	C
34	1 - 13 ALL	D

Region	Compartment	Zone
35	1 - 13 ALL	D
36	1 - 10 ALL	D
37	1 - 2	D
	3 - 4	G
	5	D
	6 - 12	G
	13	D
	14 - 21	G
38	1 - 12	G
	13	D
	14	G
	15	D
	16 - 35	G
39	1 - 28 ALL	G
40	1 - 17 ALL	G
41	1 - 3	F
	4	G
	5	F
	6	G
	7	F
	8 - 18	G
	19 - 20	F
	21 - 83	G
42	1 - 37 ALL	G
43	1 - 15 ALL	G
44	1 - 5 ALL	G
45	1 - 5	D
	6 - 15	G
46	1 - 21 ALL	D
47	1 - 6	H
	7 - 16	D
	17 - 19	H
	20 - 60	D
48	1 - 9	D
	10 - 91	H

Region	Compartment	Zone
49	1 - 16	B
	17 - 28	A
	29 - 31	H
	32 - 33	A
	34 - 40	H
50	1 - 17 ALL	A
51	1 - 15 ALL	A
52	1 - 75 ALL (Many Gaps in Numbers)	A
53	1 - 68 ALL	A
54	1 - 67	A
	68	H
	69 - 70	A
	71 - 75	H
	76 - 82	A
	83 - 110	H
	111 - 115	A
55	1 - 96 ALL	H
56	1 - 2	H
	3 - 4	I
	5	H
	6 - 15	I
	16 - 20	H
	21	G
	22 - 24	H
	25 - 51	G
	52 - 53	H
	54 - 68 (Includes 55A)	G
	69	H
57	1	D
	2 - 12	G
	13 - 21	D
	22 - 40	G
58	1 - 23 ALL	G
59	1 - 39	G
	40 - 41	I
	42	G
	43 - 61	I
	62 - 68	G

Region	Compartment	Zone
	69	I
	70	G
	71 - 86	I
	87 - 90	G
	91 - 103	I
	104 (Does not Exist)	-
	105- 138	I
	139 - 140	H
	141 - 142	I
	143 - 144	H
	145	I
60	1 - 7	I
	8	H
	9	I
	10 - 12	H
	13 (Does not Exist)	-
	14 - 37	H
	38 - 40	I
	41 - 180	H
61	1 - 125 ALL	A
62	1 - 32 ALL	A
63	1 - 47 ALL	A
64	1 - 6	A
	7	J
	8	A
	9 - 20	J
	21 (Does not Exist)	-
	22 - 71	A
65	1 - 130 ALL	J
66	1 - 10	H
	11 - 12	I
	13	H
	14 - 16	I
	17 - 21	H
	22 - 25	I
	26 - 27	H
	28 - 32	I
	33	H
	34	J
	35	H
	36 - 41	I
	42 (Does not Exist)	-
	43 - 66	I
	67	J
	68 - 70	I
	71 - 75	J

Region	Compartment	Zone
	76 - 77	I
	78 - 82	J
	83 - 88	I
	89 - 92	J
67	1 - 2	H
	3 - 4	J
	5 - 6	H
	7 - 33	J
68	1 - 36	I
	37 - 40	H
	41 - 43	I
	44 - 50	H
	51 - 54	I
	55 - 56	H
	57 - 58	I
	59	H
	60 - 126	I
69	1 - 129 ALL	I
70	1 - 78 ALL	L
71	1 - 77 ALL	L
72	1 - 80 ALL	L
73	1 - 82	L
	83	I
	84 - 116	L
74	1 - 61 ALL	I
75	1 - 10	A
	11 - 14	J
	15 - 17	A
	18 - 83	J
	84 - 95	A
	96	J
	97 - 110	A
	111	J
76	1 - 7	A
	8	K
	9 - 23	A
	24 - 30	K
	31 - 33	A
	34 - 39	K

Region	Compartment	Zone
	40	A
	41 - 46	K
	47 - 58	A
	59	K
	60	A
	61	K
	62 - 65	A
	66 - 206	K
77	1 - 40	I
	41 - 44	K
	45 - 52	I
	53 - 63	K
	64 - 66	I
	67 - 71	K
	72 - 73	I
	74 - 120	K
	121 - 125	I
	126	K
	127	I
	128 - 129	K
	130 - 132	I
	133 - 140	K
	141 - 152	I
	153 - 177	K
78	1 - 105 ALL	L
79	1 - 191 ALL	L
80	1 - 176 ALL	K
81	1 - 54 ALL	K
82	1 - 55 ALL	K
83	1 - 4	A
	5 - 8	K
	9 - 11	A
	12 - 13	K
	14 - 16	A
	17 - 18	K
	19	A
	20 - 76	K
84	1 - 72 ALL	K

Region	Compartment	Zone
S5	1 - 123 ALL	K
S6	1 - 99	L
	100 - 104	K
	105 - 126	L
	127 - 133	K
	134	L
	135 - 149	K
	150 - 190	L
S7	1 - S7 ALL	L
S8	1 - S6 ALL	L

BRITISH COLUMBIA FOREST SERVICE

FOREST INVENTORY DIVISION

COMPUTER PROCEDURES REQUIRED TO CONVERT THE EXISTING STANDING SAMPLES SYSTEM FROM IMPERIAL TO METRIC UNITS

Prepared by: F.A. SMALE

July, 1975

"It is too much trouble to give the listing in vertical columns. I'll make it read right across the page.")

Even though, with outside help, it would be possible to go metric in 1976, there is still no assurance that we shall be able to devote as much time as is desirable to our Volume and Depletion section projects. A 1977 start has many advantages -

(a) complete satisfaction of Volume and Depletion requirements.

(b) smooth change-over from Imperial to metric with programs being ready ahead of time rather than being produced in a rush and possibly later than really needed.

(c) all programming done within our division.

It seems that even in 1977 we would still be the guinea pigs of the forest industry as far as mass metrication is concerned; also, we would even then be three years ahead of the national target date.

This write-up is primarily for personnel who are not directly involved with data processing.

FOREWORD

Several meetings were held between April and June 1975 by personnel designated to form a committee to "Study Metrication and its effect on the Data Compilation and Processing section and Sampling and Classification in general." Members are G. Allison, W. Bradshaw, I. Burrows, C. Calder, D. Fligg and F. Smale. Copies of this write-up are being distributed to the Forester i/c Inventory Division and the committee members. It is believed that it reflects all decisions made by the committee. If there is disagreement on any point, a written submission should be made to the writer by August 29, 1975 at the latest. Absence of a submission will be taken to indicate full agreement with the proposed procedures.

It is urged that metric measurements by our field crews be delayed until the summer of 1977. With a programming staff of only two (and yet the Inventory division uses two-thirds of all computer time taken by the whole Forest Service) and our current commitments to the Volume and Depletion section, a change to metric in 1976 is undesirable from the data processing point of view. It has been suggested that some programming assistance might be available within the Forest Service. Previous experience with outside help (in 1967) has not been encouraging and we would prefer to do all programming within the division. There seems to be two main problems with outside assistance and, if it is to be used, the following points would have to be made - (a) our work must have a certain priority and not be used as a fill-in when the person has nothing better to do and (b) it should be done the way we request it and not changed at the whim of the programmer. (Example of previous problems:

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S E C T I O N 1

GENERAL OUTLINE OF

METRICATION OF

STANDING SAMPLES SYSTEM

GENERAL OUTLINE

By the end of 1975, we shall have about 50,000 standing samples comprising roughly 5 million trees, which were measured in the obsolescent Imperial units. They are in inches to the nearest one-tenth for diameter at breast height of 4.5 feet and total tree height is to the nearest foot. There are two files of these samples which date back to 1953; one contains basic tree data and the other comprises species and total sample volumes to 46 specifications by various minimum diameter limits, merchantability and different types of cull.

Our aim is to convert the existing data file to metric values for diameter, height and whole stem tree volume. The results file will not be converted since our new diameter limits in centimetres are not identical to existing ones in inches. There will be no mass re-computation of the data file until 2 or 3 years after metrication has taken place. This is because we are expecting a new approach to calculating gross merchantable volume by formula instead of factors. In the meantime, only new samples will be computed metrically together with any old ones which fall in the current year's units. Nothing can be done on a zonal basis (e.g. average volumes, stand and stock tables, etc.) until all samples have been recomputed. Any unsatisfied areas in a unit which do not have local averages will use the metric equivalent of our final zonal averages in Imperial measure.

It has been decided to make do with our present 3,000 or so height/diameter tables. Agreement was made to re-constitute them with elements containing the metric D.B.H equivalent at 1.3 m. derived from

Imperial measure at 4.5 feet. This is not a straight conversion due to butt taper and the increase predicted at the lower point of measurement varies by species. New metric volume constants are being produced and both the merchantability and cull factors are being derived from re-scaled graphs. They are, of course, in 5 cm. classes instead of 2 inch classes. A new method is being adopted for the handling and application of merchantability and cull factors, although naturally the resulting volume is unchanged.

Whilst converting to metric units, the opportunity is being taken to institute other changes. The break-down of British Columbia into zones is being changed from 7 to 12 and samples will be re-allocated according to these new Forest Inventory zones A-L. ~~Stocking class 3 and 4 instead of 2 is being put on samples which have lodgepole pine as their leading species (type groups 28-31).~~ A revision is being made in unit number from 3 digits to 4; the fourth one will often be zero but may be used as a sub-code to designate an original smaller unit which is now included in a larger one.

Computation of samples is being made easier from the clerical point of view because all the special control cards (G1 to G5) which used to accompany each unit are dispensed with. Some of the information will be automatically set by the programs and the rest will form part of the declaratives as it should have done all along had we realized how relatively unchanging the information is. Another improvement is that we shall dispense with the "three-generation" set-up of batch compilation throughout the season. This will eliminate the worry of using the correct colour sequence of Job Control Language cards and also less tapes will be

tied up throughout the year. Each run will involve modifying two season's tapes - data and results. After every fifth batch, both tapes will be backed up. Our Compilation section will need two storage areas for data cards. The first will be a small one where each batch of cards is kept until 5 runs have been made. When the tapes have been duplicated, boxes of cards will be transferred to the main holding area. They will remain there until sometime in the following winter when the season's wind-up has been successfully completed. In the case of old samples which are being recomputed, the extract cards should be kept in a convenient spot until back-up has taken place.

There is a different approach to editing our sample data. Previously, anything which had a possible error was initially rejected and had to be re-submitted with a notation that an "error" (or two or three) was allowable. In future, only errors which inhibit computing will cause the sample to be rejected; all lesser error indicators will be noted but the sample will still be computed. The onus is on Compilation section personnel to study the error lists carefully and re-submit any samples which were computed but did contain a genuine error.

Tree class will no longer be attached to each of our 5 million or so trees. Instead, they will be stored by record types 0 to 5 where record type <u>is</u> the tree class. This not only saves space, but makes extraction of say veterans or dead potential trees simple instead of having to check each tree in the sample.

Our data file will be bigger than before because we are giving up fixed decimal and binary storage and sticking to one byte per character. The results file will be reduced to about two-thirds of its present size

despite switching to character representation only. This is because we are reducing our 46 levels (so many of them were never used) to 15 which have been voted the most desirable. There will not only be a reduction in computing time, but each subsequent use of the file will be easier and quicker because one is not dragging a lot of unwanted information around. For the record, the following have been selected as our "bread and butter" presentations.

Level	D.B.H. Limit in centimetres	Specification	Approx. equiv. D.B.H. in inches
1	7.5+	Whole stem volume.	3.1+
2	12.5+	Whole stem volume.	5.1+
3	12.5+	Close gross utilization to a 10 cm. top.	5.1+
4	12.5+	Close utilization less decay only to a 10 cm. top (approx. 4")	5.1+
7	17.5+	Whole stem volume.	7.1+
8	17.5+	Close gross utilization to a 10 cm. top.	7.1+
10	17.5+	Close utilization less decay only to a 10 cm. top.	7.1+
9	17.5+	Close gross utilization to a 15 cm. top.	7.1+
13	17.5+	Close utilization less decay only to a 15 cm. top. (approx. 6")	7.1+
20	22.5+	Close utilization less decay only to a 10 cm. top.	9.1+
23	22.5+	Close utilization less decay only to a 15 cm. top.	9.1+
32	27.5+	Close utilization less decay only to a 10 cm. top.	11.1+
36	27.5+	Intermediate utilization less decay, waste and breakage to a 20 cm. top. (approx. 8")	11.1+
44	32.5+	Close utilization less decay only to a 10 cm. top.	13.1+
48	32.5+	Intermediate utilization less decay, waste and breakage to a 20 cm. top.	13.1+

It will be seen that whole stem volume is provided for the first three levels. Close less decay to a 10 cm. (approx. 4 inch) top is the most frequently occurring presentation, being found at 12.5+, 17.5+, 22.5+, 27.5+ and 32.5 cm. + levels. This approximates to our existing 5.1+, 7.1+, 9.1+, 11.1+ and 13.1 inch + offerings. Comparison of the 10 cm. and 15 cm. (old 4 and 6 inch) tops for close less decay is available at 17.5 cm. + and 22.5 cm. + (old 7.1 and 9.1 inch +).

Metrication of the Standing Samples system falls into three phases and sections 2, 3 and 4 of this write-up are presented by that break-down. Phase 1 gets us to the stage where the existing data file has been converted (diameter, height and whole stem volume per tree) and we are ready to compute samples. Since the results file is not being converted initially, phase 2 will only enable us to handle samples which have been computed metrically, i.e. on a unit basis but not by zones. That will come in phase 3 when all samples have metric results. The timing of phases 1 and 2 is important because 1 must be completed by the start of a field season (to get old samples in current units recomputed and to be able to send back listings of new samples to the field). Having been committed to metrication, phase 2 must then be on time to enable integration with the revised area system by the time we are ready to work on the first metric unit report. Phase 3 is not critical and is dependent on a change in merchantability estimation and, when this is available, we can get zonal averages, zonal stand tables, etc. In the meantime, we can make do with rough conversions of zonal averages in Imperial measure.

The program numbering system for our metric work will be as follows:

FIRST DIGIT. This is "J" as set by the data centre. Indicates forestry department.

SECOND DIGIT. This will be "I" for Inventory.

THIRD DIGIT. Insert "M" for metric.

FOURTH DIGIT. Programmer's surname initial.

FIFTH DIGIT. Insert "S" for Standing Samples.

SIXTH AND SEVENTH DIGITS. Serial number 00-99 to cover 100 programs concerned with the Standing Samples file.

When completing columns 75-79 of the coding sheet, positions 3 and 4 of the 7 digit sequence will be dropped. Thus, the 17th program might be designated JIMVS17 on the Job card and abbreviated to JIS17 on the coding sheet.

The fifth digit for other systems will be:

A = Area

D = Decay - felled trees

V = Volume - felled trees

If it is desirable to give numbers to sort/merge routines, they should be prefixed "X". When 100 numbers have been used, we can continue with the "Y" and "Z" series.

"For all metric conversion programs we shall use computer account number 1302500. This will give us the actual cost of conversion if required. Later, we shall revert to 01, 02, 03 for the last 2 digits which will give a break-down by volume, depletion, area, etc. for production runs in metric which were not necessitated by conversion (e.g. new samples which have to be computed anyway). Getting metric volumes of old samples would rightly be chargeable to code 00".

S E C T I O N 2

PROCEDURE AND

PROGRAMS FOR

PHASE 1

OUTLINE OF PHASE 1 PROCEDURES AND A FEW BASIC DETAILS ON SOME OF THE PROGRAMS INVOLVED

This write-up is provided for those who would prefer to read about the process rather than see it graphically in appendix 38. At the end of phase 1, we shall be in a position to compute samples and produce tree listings and volume statements in metric units - nothing beyond that.

1. On completion of the final year of computing in Imperial units, the year's data and results files will be sorted and merged with the main files as usual. Duplicate samples will be eliminated. The two files will be matched on R.C.S. identity.

2. Before producing any of the usual outputs, there will be a special check made on our data file. This will be to learn the following:
   (a) Have all samples been recomputed to 46 volume levels (i.e. done in 1969 or later)?
   (b) List any samples with incorrect computing dates (it is known that, due to a control card error, we have some dated 1910!)
   (c) List any samples which have one of the "new" project numbers which are used to describe two or three old units (e.g. 169, 193, 194, 195, 196). It was thought that only the "old" unit numbers appeared but in one place (Texada Is.) this has been found to be untrue.
   (d) List all samples containing trees coded class 5 (veterans).
   (NOTE: OTHER THINGS MAY BE CHECKED IF THEY ARE THOUGHT OF IN THE MEANTIME)

   If any samples do not have 46 volume levels, they will be

recomputed immediately and introduced into the main files before anything further is done. If there is any reason why they should not remain in the system, then they will be dropped.

3. Both the data and results files will now be handled as follows:

(a) Any incorrect (pre 1968) dates will be changed either to the current one or to a pre-determined one.

(b) Change any 3 digit unit numbers which do not designate the old (smaller) one back to what they should be, e.g. from 194 Quadra to 102 Sayward as the case may be.

(c) Put on the new 4 digit unit number for all samples in positions 149-152 of the header record.

(d) Put the new Forest Inventory Zone (A-L) in position 153 of the header record ~~(this currently contains the type group sub-code which is no longer required)~~.

(e) Change elements "1" and "2" to "I" and "M" respectively.

See bottom of page 9

(f) Anything else which becomes necessary between now and the time this job is done.

At this point, the usual output will be produced for the Sample Compilation section, Growth section and the Volume and Depletion section. This includes three indices, zonal averages (old zones 1-6, 9), unit averages for growth, unit stand and stock tables, unit analyses of pathological indicators, etc. In addition, there will be a new set of zonal averages by the 12 zones (A-L) breakdown; also, a 12 zone stand and stock table presentation for the first time.

4. The main data file will be converted to the format of our new system. Change-over will be made from our present 3 types of records

to the proposed maximum of 8 types. When converted, it will have the same skeletal form as the output of new samples from the edit program with one exception. We will include the tree volume on all old samples although it is automatically re-calculated when the sample is re-processed to get new gross and net total volumes. Although height table number will be transferred to the new record format, the old W.S.V./C.I. and D.W.B. table numbers will not. Basal areas, average diameters and stem counts by 6 Imperial diameter limits cannot be converted accurately to the 6 new metric limits so will not be transferred. The data file records for each sample will eventually become complete as each sample is recomputed metrically.

"Drop any trees which have a D.B.H. less than the quoted minimum D.B.H. tallied".

During change of format, all diameters, heights and volumes of the five million or so trees will be converted from Imperial units to metric units. Height and volume are straight conversions as follows:

1 foot = 0.3048 m.
1 cu. foot = 0.0283168 cubic metres

With diameter, it is not a simple conversion of 1 inch = 2.54 cm. It has been decreed that diameter, which was measured in inches at 4.5 feet, must be predicted in centimetres at 1.3 m. which is 4.2651 feet. To achieve this, we shall use Demaerschalk's formula and constants published in February, 1975. The diameter break points (between first and second per hectare factors) will vary by species. Nine inches, at 4.5 feet above germination point, does not convert to the same number of centimetres for each species when expressed at a height of 1.3 m. Appropriate break points will be allocated during conversion.

(NOTE: VOLUME FILE WILL NOT BE CONVERTED)

Transfer item (e) concerning elements to the bottom of page 9. It will be done for the metric file only (item 4 of conversion). No change will be made on the Imperial data and results files.

5. Change format of existing height/diameter tables on tape file. Alter the element values (inches at 4.5 feet) to centimetres at 1.3 m. (see appendix 1). Produce listings of metric height/diameter tables (see appendix 2). Re-create disk file of metric height/diameter tables in table number sequence.

6. Put the new metric whole stem volume constants and merchantability factors from cards to expanded format on tape (see appendices 3 and 4). Sort by table number, check for duplicate numbers ~~and do some editing of data.~~ When tape is error-free, produce listings of W.S.V./C.I. tables (see appendix 5). Create disk file of W.S.V./C.I. tables in table number sequence.

7. Put the unit allocation of age groups and series numbers for D.W.B. factors from cards to expanded tape format (see appendices 14 and 15). Sort by unit number, check for duplicate numbers ~~and do some editing of data.~~ When tape is error-free, produce listings of unit age break/series information for D.W.B. application (see appendix 16). Create disk file of age break/series data in unit number sequence.

8. Put the new metric decay, waste and breakage factors from cards to expanded format on tape (see appendices 7 and 8). Sort by table number, check for duplicate numbers ~~and do some editing of data.~~ When tape is error-free, produce listings of D.W.B tables for internal use (see appendix 9). Also, listings of these D.W.B. tables with amended heading information for printing on multilith masters to get copies for public distribution (see appendix 10). Create disk file of D.W.B. tables in table number sequence.

9. Program to extract samples from data file by zone, unit, region, compartment or sample.

10. Editing of newly punched samples. It is planned that this program will do more than its predecessor. The aim is to have its output in the same format as our master data file although many things must be left out until main computing of the sample occurs. We shall no longer need separate routines to compute new samples and recompute existing ones. Now, the input from both sources to the main computing procedure will be identical. It is also proposed that we eliminate control cards entirely. Much of the information they gave was unchanging and should form part of the program. It also shifts the responsibility of allocating correct D.W.B. factors from the Sample Compilation section to the V & D section. The latter, who provide factors on a local or zonal basis, will now be the sole arbiters of how and where they are applied.

Appendix 17 shows the proposed Metric Sample Record field sheet. From this, ~~three~~ four types of cards are punched (see appendix 18 for lay-outs and refer to section 5 for a detailed description of card columns). All trees in the sample will be read to a temporary disk file and blanks will be translated to zeros. Two position species designation will be changed to one position alphabetic A-P in main species code (Note: until we expand our allowable species from 16, the supplementary species code may be left as zero).

Sample will then be sorted by species, tree class and D.B.H. Unless the height has been punched for a given tree, allocation of height will be made from the designated tables. For the next few years we shall be making do with made-over height/diameter tables. Results will be quite accurate even though the process of getting them may

seem strange. Depending on the element of the table where each tree's metric D.B.H. is located, we shall come up with the height in feet as before and then simply multiply by the factor of 0.3048 to get metres. Height will not really be to the nearest decimetre as it would be by ground measurement but will actually go up in 0.3 (and occassionally 0.4) metre increments (i.e. the equivalent of a foot). Thus, trees may be allocated heights of say 26.2 m. or 26.5 m. (equivalent of 86 and 87 feet) but can never receive heights of 26.3 m. or 26.4 m. This was understood and accepted by the metric committee.

Minimum D.B.H. tallied will be recorded as 7.5 cm. for regular samples and 9.1 cm. for growth samples (identified by "G" in hundreds position of sample number). Pathological codes 000-255 will be allocated according to the 8 digit binary configuration made from the absence (0) or presence (1) of indicators. (For more details, see Section 6 - Output Records - types 0-5, positions 64-66). All growth samples will have their diameters predicted at 1.3 m. by using the Demaerschalk formula. This amended D.B.H. is the one which will be assigned to the tree from the time it enters the system; actual measurement will occur once only - on the punched cards.

Some of the existing edit checks, which are time and core consuming and have not proved very useful, may be dropped after consultation with the i/c Sample Compilation section. New ones may be added. In the past, it has been the practice to reject every sample which has a possible error. It is now proposed that unless the error is definite (e.g. non-existent table or no pathological remarks with tree class 2)

"will"
the sample be computed. This will let things by such as age in tens 31 (where maximum allowable has been set at 30). There will be two types of errors - definite and possible - and the former will be marked with an asterisk (see appendix 19). There will also be 2 lists of samples, one of those which had possible errors but have been computed anyway and another of those which had definite errors and have been rejected. The onus will be on Compilation section personnel to consider the "possible errors" carefully and re-submit any samples where an indicated possible error proves to be a real one. Allowable limits will have to be set concerning the new method of allocating height tables by number rather than key. How many age classes and how many threes of metres may it vary either side of the sample designation before it is rejected? Also, will the use of a different species table automatically cause rejection or will some be allowable? (e.g. using a cottonwood table for fir trees).

On completion of the edit routine, each sample will be accepted or rejected on the basis of the type of error(s) detected. For those accepted, a tape of type B, S, and 0-5 records will be produced (see appendices 20-22). Following is a summary of those items to be included and those to be omitted.

TYPE B RECORD

INCLUDE POSITIONS 1-12, 19-29, 38-54, 58-73

OMIT POSITIONS 13-18, 30-37, 55-57, 74-162

TYPE S RECORD

INCLUDE POSITIONS 1-12, 19-29, 38-54

OMIT POSITIONS 13-18, 30-37, 55-162

TYPE 0, 1, 2, 3, 4, 5 RECORDS

INCLUDE POSITIONS 1-12, 19-29, 38-57, 64-73, 80-89, 96-105, 112-121, 128-137, 144-153, 160-162

OMIT POSITIONS 13-18, 30-37, 58-63, 74-79, 90-95, 106-111, 122-127, 138-143, 154-159

All of the missing positions will be completed in the main sample computation program which follows.

11. Calculating whole stem, gross merch. and net usable volumes to 15 presentation levels. Computing basal areas, average diameters and stem counts to 6 diameter limits. Allocating type group, growth group, age class, height class, stocking class, etc. Calculating site (and type group) to all 6 diameter limits.

Input to this program consists of new samples which have been edited and put to tape, or old samples which have been extracted from the main data file on to a work tape. Both are treated in exactly the same way and no control cards are needed in either case. Output consists of a tape of data records (completed for new samples and up-dated for old) - see appendices 20-22 - and a tape of results records (volumes) - see appendix 24. In addition, two print-outs are made; these are noted as items 12 and 13 in this section.

All trees have their whole stem volume calculated, but only those coded 0 (an old designation), 1 or 2, figure in any further computations. Tree classes 3, 4, 5, (dead and veterans) are not included in total species volumes, basal areas, stem counts or average diameters. Whole stem volume is calculated in cubic metres to 3 decimal

places and rounded to 2 for storing each tree. After putting W.S.V. on a per hectare basis, appropriate reductions are made for stump and top to get merchantable gross volumes at close and intermediate utilizations. Again, calculation is to 3 decimals and rounding to 2 for summing. Further reductions are made for decay only and decay, waste, and breakage. These are also to 3 decimals, rounded to 2. Summing is done under 45 headings of diameter limit, merch. and cull specifications until the whole sample has been processed. On completion, these 45 fields are rounded to 1 decimal place for output and publication.

The method of selecting W.S.V./C.I. constants and factors is being changed. Table number will now consist of 3 digits, two for the species code (01-16) and one for the series number. The latter is ascertained by reference to a table (see appendix 6) in core storage, and depends on whether the species is mature or immature and in which of the 12 zones it occurs. The application of D.W.B. factors is more complicated because there is more than a simple age break between immature and mature to consider and also factors may be local or zonal. However, it is planned to dispense with control cards and make the rule that unit factors will always be used in preference to zonal if they exist. For every unit there will be a table of "age groups and series numbers" on disk (see appendix 15). This allows 4 series to be used - say younger immature, older immature, mature and over mature; generally speaking, only the first three will be used. Age classes for degrees of maturity vary by species and appropriate figures are therefore recorded in the age break fields. If unit information is available, then the 2 digit series number found in the

"Precision in calculating and summing volumes, basal areas etc. will be greater than stated. However, there is no

table is preceded by the two figure species code to make a unique 4 digit table number. This is accessed on disk and the required D.W.B. factors (see appendix 8) are brought into core. If unit information is not available, then arrays (see appendices 11 and 12) in core storage are used to derive the correct table number. Four examples of how the system works (with 1, 2, 3 and 4 series) may be seen on the two pages marked appendix 13.

Basal area in square metres per hectare is calculated for each tree to 4 decimal places, rounded to 3, summed, and finally rounded to 2 before printing. Formula for basal area is:

D.B.H. squared x per hectare factor x 0.00007854

Each species and the whole sample has the basal area presented at 6 diameter limits. Stems per hectare is simply the P.H.F. applicable to each tree, summed. The accumulation is to 2 decimal places (unrounded, of course) because we have P.H.F.'s to that precision (e.g. 1.25 and 6.25). Before presentation at the 6 diameter limits, the values are rounded to 1 decimal place. Average diameters will continue to be derived by calculating the diameter of a tree of average basal area rather than by the erroneous method of summing diameters and striking an average. Formula used will be:

$$\text{Average D.B.H. per hectare in centimetres to 1 decimal} = \sqrt{\frac{\frac{\text{SUM OF BASAL AREA 'per hectare}}{\text{SUM OF STEMS}}}{0.00007854}}$$

Results will be rounded to 1 decimal place. As in the case of basal areas and stem counts, average diameters will be presented for each

species and the whole sample at 6 diameter limits (7.5 cm. +, 12.5 cm. +, 17.5 cm. +, 22.5 cm. +, 27.5 cm. +, and 32.5 cm. +).

The preceding 6 metric diameter limits which have been selected are roughly equal to those which were used under the Imperial system. The following table shows how closely related they are.

Old D.B.H. Limit in inches	Equivalent of old limit in centimetres to one decimal	New D.B.H. Limit in centimetres
3.1+	7.9+	7.5+
5.1+	13.0+	12.5+
7.1+	18.0+	17.5+
9.1+	23.1+	22.5+
11.1+	28.2+	27.5+
13.1+	33.3+	32.5

It will be seen that new limits range from 0.4-0.8 cm. below the old ones.

For more details on allocation of type group, element, age class, height class, stocking class, site, etc., please see Section 6 - Output Records, and refer to the appropriate fields of the type B record. There one will also find a description of how varying per hectare factors are applied to old samples; rules for deciding diameter level for type group and site (17.5 cm. +, 12.5 cm. + or 7.5 cm. +) are also given there. page 34)

12. Produce Individual Tree listings (see appendix 23) for each sample computed. This will usually run to two sheets because it contains all the information (other than volumes) that has been computed. Previously, each species had been divided into residual trees and "others". Now, it

is proposed to have each species by tree class. This will take more room but such items as "dead potential" trees will stand out on their own rather than being lost in with suspect, dead useless and veterans.

13. Produce Individual Sample Volume statements (see appendix 25) for each sample computed. These contain basic information, stratum and 15 presentations of volume in cubic metres per hectare by species and total. There is one sheet for each sample.

For the record, these decisions have been made concerning white bark pine.

a) Element If sample leads in Pa, then maturity rules relating to Pl and deciduous apply, i.e.
   Age classes 1-4 = 1 (I)
   Age classes 5-9 = 2 (M)

b) Cull Factors Continue to use those derived for Pw and apply them by the same maturity rules, ie
   Age classes 1-6 = immature
   Age classes 7-9 = Mature

c) Site Tables Pa will use Pw tables.