COOPERATION
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QUICK CRUISE SUMMARY PROGRAM USER MANUAL

INTRODUCTION

In Nova Scotia, the collection and compilation of forest stand inventory data is often recorded and compiled manually. In order to help facilitate the compilation process, a microcomputer-based software program was developed to process forest stand inventory tallies collected from fixed plot (circular or rectangular) or point sample cruises. Quick Cruise Summary (QCS) runs on an IBM or compatible microcomputer under DOS 3.2+ or OS/2. This manual describes how to use the QCS program. Output from QCS shows total, merchantable, and board foot volumes along with basal areas, diameters, stand heights and densities broken down by hardwoods, softwoods and all species[1]. QCS also computes volume removed and Stand Index[2] for either manual or mechanical commercial thinnings. Stand Index is included for its use in predicting productivity (NSDLF, 1991; NSDNR, 1992) and in determining eligibility for financial assistance under the current Federal-Provincial Forestry Agreement.

FIELD DATA COLLECTION

QCS works with data from two cruising methods: fixed plot cruises, either rectangular or circular; and point sample cruises. For plot cruises, the following data should be collected for QCS input:

- plot size radius, or length and width to the nearest 0.1 m,
- tally of all trees by 2 cm diameter class (at breast height) by product category and species group (hardwood or softwood),
- height of the tree (to the nearest 0.1 metre) of average basal area (BA) at each plot for each product category present,
- number of plots measured,
- stand area to the nearest 0.1 ha, and
- major softwood and hardwood species in the stand.

[1]**Future editions of QCS will include breakdowns by individual species.**
[2]**Stand Index is the ratio of trees to volume (solid cubic metres).**

Canada

Nova Scotia

For point sample cruises, the following should be collected:

- the Basal Area Factor [BAF (metric)] of the prism used,
- a tally of all trees by 2 cm diameter class (at breast height) by product category and species group (hardwood or softwood),
- height of the tree of average BA for each product category to the nearest 0.1 metre at each point sample location,
- number of points sampled,
- stand area to the nearest 0.1 ha, and
- major softwood and hardwood species in the stand.

To facilitate data entry, this information should be collected on the tally sheet provided (back page). Copies of this tally sheet can be generated by the QCS program.

INSTALLATION

To install QCS, copy the contents of the QCS disk into the desired drive and directory on the hard drive. For example, to store QCS in a directory called **CRUISE** on your **C** drive from your **A** floppy drive, type the following at the DOS prompt (press the **ENTER** key after every line)

**CD **
MD CRUISE
CD CRUISE
(put QCS disk into your A floppy drive)
COPY A:*.*

In order for QCS to operate successfully, an ANSI.SYS device driver must be set up in the CONFIG.SYS file. The following line must be inserted into CONFIG.SYS, if it is not already there, **DEVICE=drive:\directory\ANSI.SYS**.

ANSI.SYS is usually located in your DOS directory. For example, if EDLIN is used to edit CONFIG.SYS; and EDLIN.COM and ANSI.SYS are located in the DOS directory of your C drive, proceed as follows (only type the bolded text and press enter after each line):

CD \DOS
EDLIN C:\CONFIG.SYS
End of input file
***I**
1:***DEVICE=C:\DOS\ANSI.SYS**
2:*(press the) **CTL** (key, and) **Z** (at the same time)
***E**

You must now reboot your machine to activate this change.

(press the) **CTL** (key) and **ALT** (key) and **DEL** (key at the same time).

COMPUTER INPUT

QCS is started by typing the letters **QCS** and then pressing the **ENTER** key in the drive:\directory in which the program is stored. The user is then presented with a menu screen. At this point, you have the options to:

(1) Enter data and review results,
(2) Produce a printout of the current input and results, if data has already been entered in the current QCS session,
(3) Generate a hardcopy of the tally sheet, or
(4) Exit the program.

To enter cruise information, press **1** ("Data Entry & Results") and the **ENTER** key. QCS will then generate an input screen, similar to the "header" portion of the first page of the tally sheet (Appendix I). Enter the information in the same order as it appears on the tally sheet. For sections where there is no data, the **ENTER** key is pressed to continue to the next item. Following completion of the data entry in the first screen, you have the option to return and edit the entries. If yes is chosen, the cursor is reset to the first entry. To correct previously entered data, simply enter new data. For data which does not require correction, press the **ENTER** key[3].

[3]**Except for the "POINT SAMPLE", "STRIP CRUISE" AND "CIRCULAR PLOT" sections. Their values must be reentered despite being unchanged.**

Following completion of the first screen, you are asked whether you want to enter tree tallies. If you answer yes, the program presents the second input screen. This screen resembles the second page of the tally sheet (Appendix I). Enter the number of trees for each 2 cm diameter class by product category and species group. When the bottom of the diameter tally entry section is reached, the cursor moves to the top of the same screen to permit entry of tree height by product category. Heights are entered[4] in metres to the nearest tenth (e.g. 12.4 m). After entry of heights is completed, you are given the option to enter trees tallied above the 40 cm diameter class.

DATA SUMMARY PRESENTATION

Following the entry of tree tallies and heights, the first of four summary screens appears (Appendix I). The first summary screen provides softwood stand values by product category as follows:

- Diameter: average diameter in cm,
- Stems: average density expressed in trees/hectare,
- Basal Area: average density expressed in square metres per hectare (m^2/ha),
- Height: average height in metres,
- Volume[5]: average volume expressed in solid cubic metres.

The column headed UNMRCH represents the sum of the volume of all unmerchantable trees and the tops and stumps (inside bark; excluding branches) of all merchantable trees. The column headed MERCH is the addition of the columns headed PULPWD and SAWLOG, while the column headed TOTAL is the addition of the columns headed UNMRCH and MERCH. STAND VOLUME is determined by multiplying volume/ha by the stand area. Two figures are shown in the row labeled STAND INDEX. Under the MERCHANTABLE column, the stand index is computed by dividing the number of merchantable trees by the merchantable volume in cubic metres (a predictor of manual productivity in a commercial thinning). Under the TOTAL column, stand index is computed by dividing the total number of trees by the merchantable volume in cubic metres (a predictor of mechanical productivity in a commercial thinning). Stand Index is included for its use in predicting productivity and determining eligibility for financial assistance. SPACING is calculated from tree frequency. Appendix II lists the calculation methods for these attributes.

To proceed to subsequent summary screens press **ENTER**. The second summary screen (Appendix I) displays the same statistics for hardwood, while the third summary screen displays the sum of the softwood and hardwood values. The program then gives the user the option to explore the possibility of performing a commercial thinning or shelterwood on the stand in question. If the "Define Management" option is selected (**1**), the program asks for:

- Distance between Access Trails: to the nearest 0.1m,
- Trail Width: to the nearest 0.1m,
- Percentage Basal Area Removal: within leave-strips, and
- Method of Treatment: manual or mechanical.

The program then estimates total basal area, spacing, stems and volume removed and left-standing following the treatment. Volume removed is also shown including and excluding trails.

[4]A height for each product category tallied must be entered or volume calculations will be in error.

[5]Inside bark bole volumes are computed using Honers (1967) standard volume tables. The coefficients used to calculate volume are based on the major species entered in screen 1.

All information produced, can be printed by selecting the "Hardcopy Input/Results" option (**2**) at the Main Menu[6]. Alternatively, you may edit the data currently in memory by selecting the "Data Entry & Results" option (**1**) from the "Main Menu" and then the "Edit Existing Values" option (**2**). The most recently entered stand information remains current in the summary screens until new data is entered or the QCS program is quit.

To obtain a copy of QCS, send a formatted diskette and your return address to:

N.S. Dept. of Natural Resources
Forest Research Section,
P.O. Box 68,
Truro, N.S.
B2N 5B8
Attn: "Quick Cruise Summary"

SUMMARY

Quick Cruise Summary (QCS) is an IBM compatible microcomputer program for compiling forest inventory data collected from circular and rectangular plots or point sample cruises. Metric stand values per hectare computed by product category are: DIAMETER, STEMS, BASAL AREA, HEIGHT, and VOLUME. These values are summarized by hardwood, softwood and all species. For proposed commercial thinnings or shelterwoods, QCS also calculates Stand Index and removed and residual, basal area, number of stems, and volume.

WAIVER

The Nova Scotia Department of Natural Resources makes no warranties, expressed or implied, and shall not be liable for direct or indirect damages arising from the use of the QCS software program.

LITERATURE CITED

Honer, T.G. 1967. *Standard volume tables and merchantable conversion factors for the commercial tree species of central and eastern Canada.* Canada Dept. of Forestry and Rural Development, Forestry Branch, Information Report FMR-X-5. 153 pp.

NSDLF, 1988. *Forestry Field Handbook.* Forest Research Section, Nova Scotia Dept. of Lands and Forests. 29 pp.

NSDLF, 1991. *Worker productivity in merchantable thinning operations - Part II.* Forest Research Section, Nova Scotia Dept. of Lands and Forests. For. Res. Rept. No. 28, 8 pp.

NSDNR, 1992. *The productivity of four single-grip harvesters in commercial thinnings.* Forest Research Section, Nova Scotia Dept. of Natural Resources. For. Res. Rept. No. 39, 16 pp.

[6]**The laserjet printouts contain an identification number that is automatically generated on top of the softwood and softwood + hardwood pages.**

Appendix I
Sample Output

QUICK CRUISE SUMMARY (c) 1992	Nova Scotia Department of Natural Resources
CRUISER	Campbell/Smith
	YY MM DD
DATE	92 08 27
SUBDIVISION	01
PLAN NUMBER	0127
MANAGEMENT UNIT	05
STAND NUMBER	012

Major Softwood Species	Major Hardwood Species	
Red Spruce	Yellow Birch	
TOTAL STAND AREA		2.0 ha
POINT SAMPLE	NUMBER	14
	FACTOR (m)	3.0
STRIP CRUISE	WIDTH (m)	
	LENGTH (m)	
CIRCULAR PLOT	NUMBER	
	RADIUS (0.1m)	

OVERSIZE STEMS - (Greater than 40 cm) - Specify diameter

DIAM	UNMERCHANTABLE		PULPWOOD		SAWLOG		SAMPLE	HEIGHTS (*0.1m)		
	SOFTWOOD	HARDWOOD	SOFTWOOD	HARDWOOD	SOFTWOOD	HARDWOOD		UNM	PWD	SLG
46	0	0	0	0	0	1	21	.0	.0	.0
50	0	0	0	0	1	0	22	.0	.0	.0
56	0	0	0	0	0	1	23	.0	.0	.0
							24			
							25			
							26			
							27			
							28			
							29			
							30			

DIAM	UNMERCHANTABLE		PULPWOOD		SAWLOG		SAMPLE	HEIGHTS (*0.1m)		
	SOFTWOOD	HARDWOOD	SOFTWOOD	HARDWOOD	SOFTWOOD	HARDWOOD		UNM	PWD	SLG
02	0	0	0	0	0	0	01	5.0	15.2	17.5
04	0	0	0	0	0	0	02	4.2	13.2	15.2
06	0	0	0	0	0	0	03	3.6	11.5	14.0
08	2	0	0	0	0	0	04	.0	13.2	16.5
10	0	0	9	1	0	0	05	.0	13.0	16.7
12	0	0	10	1	0	0	06	.0	13.0	17.0
14	0	0	12	4	0	0	07	.0	8.7	15.9
16	0	0	11	3	0	0	08	.0	15.5	18.2
18	1	0	16	2	0	0	09	.0	15.2	19.0
20	0	0	7	0	10	0	10	.0	.0	.0
22	1	0	2	2	6	1	11	.0	.0	.0
24	0	0	4	2	10	1	12	.0	.0	.0
26	0	0	6	1	6	0	13	.0	.0	.0
28	0	0	2	4	9	2	14	.0	.0	.0
30	0	0	2	2	4	1	15	.0	.0	.0
32	0	0	1	3	3	0	16	.0	.0	.0
34	0	0	0	1	2	0	17	.0	.0	.0
36	0	0	0	0	0	0	18	.0	.0	.0
38	0	0	0	1	0	1	19	.0	.0	.0
40	0	0	0	0	0	0	20	.0	.0	.0

QUICK CRUISE SUMMARY - PER HECTARE VALUES		SOFTWOOD				
STAND AREA 2.00 (ha)		AVERAGE PRODUCT VALUES				
		UNMERCHANTABLE	PULPWOOD	SAWLOG	MERCHANTABLE	TOTAL
DIAMETER	(cm)	10.55	15.21	24.76	17.43	17.01
NUMBER OF STEMS		98	967	227	1194	1292
BASAL AREA	(m^2)	.86	17.57	10.93	28.50	29.36
HEIGHT	(m)	4.27	13.17	16.67	14.40	14.32
VOLUME	(m^3)	25.43	102.62	78.48	181.10	206.53
STAND VOLUME	(m^3)	50.86	205.24	156.96 fbm=30303.46	362.19	413.05
STAND INDEX					6.59	7.13
AVERAGE SPACING	(m)				2.89	2.78

QUICK CRUISE SUMMARY - PER HECTARE VALUES		HARDWOOD				
STAND AREA 2.00 (ha)		AVERAGE PRODUCT VALUES				
		UNMERCHANTABLE	PULPWOOD	SAWLOG	MERCHANTABLE	TOTAL
DIAMETER	(cm)	.00	19.05	33.04	20.69	20.69
NUMBER OF STEMS		0	203	20	223	223
BASAL AREA	(m^2)	.00	5.79	1.71	7.50	7.50
HEIGHT	(m)	4.27	13.17	16.67	14.40	14.32
VOLUME	(m^3)	3.48	32.84	11.41	44.25	47.73
STAND VOLUME	(m^3)	6.95	65.68	22.82 fbm=4471.52	88.50	95.45
STAND INDEX					5.04	5.04
AVERAGE SPACING	(m)				6.70	6.70

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QUICK CRUISE SUMMARY - PER HECTARE VALUES SOFTWOOD + HARDWOOD

STAND AREA 2.00 (ha)	AVERAGE PRODUCT VALUES				
	UNMERCHANTABLE	PULPWOOD	SAWLOG	MERCHANTABLE	TOTAL
DIAMETER (cm)	10.55	15.94	25.53	17.99	17.60
NUMBER OF STEMS	98	1170	247	1417	1515
BASAL AREA (m^2)	.86	23.36	12.64	36.00	36.86
HEIGHT (m)	4.27	13.17	16.67	14.40	14.32
VOLUME (m^3)	28.90	135.46	89.89	225.35	254.25
STAND VOLUME (m^3)	57.81	270.91	179.78 fbm=34774.98	450.70	508.50
STAND INDEX				6.29	6.72
AVERAGE SPACING (m)				2.66	2.57

ESTIMATES OF PRE AND POST STAND VALUES for Shelterwood and Commercial Thinning

Distance Between Access Trails	15.00 m	Trail Width	3.00 m
Percentage Basal Area Removal	40. %	Method of Treatment	MANUAL

E-S-T-I-M-A-T-E-S

STAND INDEX	BASAL AREA		SPACING		NUMBER STEMS		VOLUME	
6.29	REMOVED	REMAINS	PRE	POST	REMOVED	REMAINS	REMOVED	REMAINS
PER HECTARE =	19.17	17.69	2.57	4.02	895	619	132.21	122.04
FOR STAND =					1790	1238	264.42	244.08
FROM TRAILS							101.70	
FROM LEAVE STRIPS							162.72	

Appendix II
Definitions

Frequency:

Total Frequency (TF): the number of trees per hectare greater than 1 cm diameter at breast height (DBHob).

Sawlog Frequency (SF): the number of sawlog quality trees per hectare greater than 17 cm DBHob.

Pulpwood Frequency (PF): The number of pulpwood quality trees per hectare greater than 9 cm DBHob (excluding sawlog trees).

Merchantable Frequency (MF) in trees/ha:

$$MF = PF+SF$$

Unmerchantable Frequency (UF) in trees/ha:

$$UF = TF-MF$$

Basal Area:

Total Basal Area (TBA): the cross-sectional area, 1.3 metres above ground, of trees greater than 1 cm DBHob, expressed in metres squared per hectare (m^2/ha).

Sawlog Basal Area (SBA): The cross-sectional area,1.3 metres above ground, of all sawlog quality trees greater than 17 cm DBHob, expressed in m^2/ha.

Pulpwood Basal Area (PBA): The cross-sectional area, 1.3 metres above ground, of all pulp-wood quality trees greater than 9 cm DBHob (excluding sawlog trees), expressed in m^2/ha.

Merchantable Basal Area (MBA) in m^2/ha:

$$MBA = PBA+SBA$$

Unmerchantable Basal Area (UBA) in m^2/ha:

$$UBA = TBA-MBA$$

Diameter:

Total Diameter (TD) in cm:

$$TD = \sqrt{\frac{TBA}{TF \times 0.00007854}}$$

Pulpwood Diameter (PD) in cm:

$$PD = \sqrt{\frac{PBA}{PF \times 0.00007854}}$$

Sawlog Diameter (SD) in cm:

$$SD = \sqrt{\frac{SBA}{SF \times 0.00007854}}$$

Merchantable Diameter (MD) in cm:

$$MD = \sqrt{\frac{MBA}{MF \times 0.00007854}}$$

Unmerchantable Diameter (UD) in cm:

$$UD = \sqrt{\frac{UBA}{UF \times 0.00007854}}$$

Volume:

Total Volume (TV):The volume inside bark of all trees, including the stump and top, 1 cm DBHob and greater, as determined from Honer's (1967) volume equations, expressed in solid cubic metres per hectare (m^3/ha).

Sawlog Volume (SV): The volume inside bark of all sawlog quality trees greater than 17 cm DBHob as determined from Honer's volume equations, expressed in m^3/ha and board feet (fbm) per stand. Sawlog volume is based on the New Brunswick Log Rule. Stumps (15 cm height) and tops (portion of the bole less than 10 cm diameter inside bark (Dib) are excluded.

Pulpwood Volume (PV): The volume inside bark of all pulpwood quality trees greater than 9 cm DBHob (excluding sawlog trees) as determined from Honer's volume equations, expressed in m^3/ha. The merchantable bole excludes the stump (15 cm height) and top (portion of the bole less than 7.6 cm diameter inside bark (Dib).

Merchantable Volume (MV) in m^3/ha:

$$MV = PV + SV$$

Unmerchantable Volume (UV) in m^3/ha:

$$UV = TV - MV$$

Height:

Pulpwood Height (PH): Average of the sampled pulpwood tree heights expressed in metres.

Sawlog Height (SH): Average of the sampled sawlog tree heights expressed in metres.

Unmerchantable Height (UH): Average of the sampled unmerchantable tree heights expressed in metres.

Total Height (TH) in metres:

$$\frac{(PHxPBA)+(SHxSBA)+(UHxUBA)}{TBA}$$

Merchantable Height (MH) in metres:

$$\frac{(PHxPBA)+(SHxSBA)}{MBA}$$

Spacing:

Average Spacing (AS) in metres:

$$AS = \sqrt{\frac{10{,}000}{TF}}$$

Stand Index:

For **Manual Commercial Thinnings (SI_{man})**:

$$SI_{man} = \frac{MF}{MV}$$

For **Mechanical Commercial Thinnings (SI_{mec})**

$$SI_{mec} = \frac{TF}{MV}$$

Tally /sheet

QUICK CRUISE SUMMARY (c) 1992

Nova Scotia Department of Natural Resources

CRUISER	
DATE	Y Y M M D D
SUBDIVISION	
PLAN NUMBER	
MANAGEMENT UNIT	
STAND NUMBER	

Major Softwood Species	Major Hardwood Species
TOTAL STAND AREA	ha

POINT SAMPLE	NUMBER	
	FACTOR (m)	
STRIP CRUISE	WIDTH (m)	
	LENGTH (m)	
CIRCULAR PLOT	NUMBER	
	RADIUS (0.1m)	

OVERSIZE STEMS - (Greater than 40 cm) - Specify diameter

DIAM	UNMERCHANTABLE		PULPWOOD		SAWLOG		SAMPLE	HEIGHTS (*0.1m)		
	SOFTWOOD	HARDWOOD	SOFTWOOD	HARDWOOD	SOFTWOOD	HARDWOOD		UNM	PWD	SLG
							21			
							22			
							23			
							24			
							25			
							26			
							27			
							28			
							29			
							30			

DIAM	UNMERCHANTABLE		PULPWOOD		SAWLOG		SAMPLE	HEIGHTS (*0. 1m)		
	SOFTWOOD	HARDWOOD	SOFTWOOD	HARDWOOD	SOFTWOOD	HARDWOOD		UNM	PWD	SLG
02							01			
04							02			
06							03			
08							04			
10							05			
12							06			
14							07			
16							08			
18							09			
20							10			
22							11			
24							12			
26							13			
28							14			
30							15			
32							16			
34							17			
36							18			
38							19			
40							20			