United States
Department of
Agriculture

Forest Service

**Southern Forest
Experiment Station**

New Orleans,
Louisiana

General Technical Report
SO-48
September, 1983

Computation of Southern Pine Site Index Using a TI-59 Calculator

Richard W. Guldin and Robert M. Farrar, Jr.

SUMMARY

A program is described that permits computation of site index in the field using a Texas Instruments model TI-59 programmable, hand-held, battery-powered calculator. Based on a series of equations developed by R.M. Farrar, Jr., for the site index curves in USDA Miscellaneous Publication 50, the program can accommodate any index base age, tree age, and height within wide limits for the four principal southern pine species: loblolly (*Pinus taeda* L.), longleaf (*P. palustris* Mill.), shortleaf (*P. enchinata* Mill.) and slash pine (*P. elliottii* Engelm.). Small errors in estimating average stand age or height cause large errors in estimating site index, especially for young stands. The program is used to explore the sensitivity of site index estimates to age and height errors.

Computation of Southern Pine Site Index Using a TI-59 Calculator

Richard W. Guldin and Robert M. Farrar, Jr.

INTRODUCTION

Forest management is influenced by the productivity of the tract supporting the timber. Site index — the expected average height of the dominant and codominant stems in a stand at a reference base age — is a measure of the productive capacity of the land for a given species. Traditional methods of computing site index require lengthy calculations back at the office. To determine approximate site index of southern pine stands in the field, foresters have often relied upon ocular interpolation of the curves for index base age 50 presented in Miscellaneous Publication 50 (USDA Forest Service 1976). But ocular interpretation of site index differences for young stands is very difficult and translation to other index base ages is also difficult with the curves.

This report contains a listing of the program for a Texas Instruments model TI-59 calculator[1] that allows foresters to compute site index quickly and accurately in the field. The program also enables foresters to translate indexes to different base ages, to compare expected heights at different ages on the same site, and to compare site indexes implied by differing heights of trees the same age. Finally, a sensitivity analysis of site index estimates is reported that illustrates the inaccuracy resulting from small errors in determining stand age and stand height.

PROGRAM BACKGROUND

Farrar (1973) expressed the site index curves in Miscellaneous Publication 50 as equations having the form:

$$\begin{aligned}\mathrm{Log(SI)} = \mathrm{Log(ATH)} &+ b_1\left[\frac{1}{\mathrm{IBA}} - \frac{1}{\mathrm{ATA}}\right] \\ &+ b_2\left[\left(\frac{1}{\mathrm{IBA}}\right)^2 - \left(\frac{1}{\mathrm{ATA}}\right)^2\right] \\ &+ b_3\left[\left(\frac{1}{\mathrm{IBA}}\right)^3 - \left(\frac{1}{\mathrm{ATA}}\right)^3\right] \\ &+ b_4\left[\left(\frac{1}{\mathrm{IBA}}\right)^4 - \left(\frac{1}{\mathrm{ATA}}\right)^4\right]\end{aligned}$$

where Log = logarithm, base 10
SI = site index
ATH = average total height of the dominant and co-dominant trees in a stand
IBA = site index base age
ATA = average total age-from-seed of the dominant and co-dominant trees in the stand

Farrar (1975) later developed a FORTRAN program to calculate site index (or height) arrays from inputs of index base age, average tree age and average height (or site index).

The calculator program presented here (appendix, Program Listing) uses coefficients Farrar (1975) developed to describe site index curves in Miscellaneous Publication 50. Thus, the same limitations regarding age, site index, and average height apply (table 1).

The User Instructions contain five basic steps (appendix). The first step initializes the program's parameters and prepares the calculator for one of the next four steps, each a different program option.

Step 1: Program Initialization

During initialization, the calculator memory is partitioned between storage for program steps and for constants and the program is entered into calculator memory. If the memory is not partitioned properly, the program cannot be loaded. Program

[1]The use of trade, firm, or corporation names in this report is for the information and convenience of the reader. Such use does not constitute official endorsement or approval of the product or firm by the USDA to the exclusion of others which may be suitable.

Richard W. Guldin is Principal Economist, Southern Forest Experiment Station, Forest Service — USDA, at New Orleans, LA. Robert M. Farrar, Jr. is Principal Mensurationist, Southern Forest Experiment Station, Forest Service — USDA, Monticello, AR, in cooperation with the Department of Forestry and the Arkansas Agricultural Experiment Station, University of Arkansas at Monticello.

Table 1.——*Limits for species equations*[1]

	Loblolly	Longleaf	Shortleaf	Slash
Age limits (years)	10–80	15–100	10–100	10–60
SI limits, base age 50 (feet)	60–120	40–120	40–100	60–100

[1]From Farrar (1975, table 1).

execution begins with the constants for the desired species being retrieved from storage and positioned in the general equation subroutine. The program moves automatically to step 2 after completing initialization.

Step 2: Site Index Calculation

This step, the subroutine labeled E inside the program, automatically calculates the average total age and average total height of the stand at the sampling point from the ages and heights of individual trees. The calculator display prompts the user for data using a numerical code. When the display contains 1111111111, the next datum needed is the site index base age; 2222222222, the tree age; 3333333333, the tree height. Ages and heights for a minimum of 10 dominant and codominant trees should be measured and entered. The display flashes the number of trees already entered before prompting the user for the next age. A zero is entered for tree age after the data for all trees at a sampling point are entered, causing the program to prepare for index calculation. The program asks for the index base age, then computes average age, average height and site index of the stand. The average age and average height flash in the display and site index is displayed. If the calculator is attached to a PC-100 printer, the results are also printed.

From Step 2, the user can branch to any of the next three steps by entering the appropriate letter (A,B, or C). If the calculation of site index is desired at another sample location in the stand, press "RUN/STOP" and the program will recycle and prepare for the first tree age at the next sample location. Previously calculated site indexes, average ages or average heights are not stored in calculator memory. For a different species, go back to step 1.4.

Step 3: Height Projection

This step, the subroutine labeled A inside the program, calculates an expected height for each age specified by the user, given site index and index base age, the inverse of step 2. Step 3 can also be used to convert from one index base age to another. For example, a particular stand of longleaf pine may have a site index of 70, base age 25. At age 50, the dominant and codominant trees would have an average height of 110 feet. Because age 50 can also be considered an index base age, the height at this age becomes the site index — 110 feet.

When the program displays 4444444444, enter site index. After entering the age for which height is desired, the program calculates expected height. Press "RUN/STOP" to recycle for another age. All the variables entered are also printed if a PC-100 printer is attached.

Step 4: Height Vector

This step, the subroutine labeled B inside the program, calculates a vector of expected average heights of dominant and codominant trees for a vector of average stand ages. The user specifies site index, base age, and the increment between ages when heights are desired. The program prompts 5555555555 for the age increment in years. The program begins at age 10 (15 for longleaf) and continues computing heights for each age until the upper age limit is reached (table 1). When the upper age limit is reached, 9876543210 is displayed. Both the age and height vectors are printed if a PC-100 printer is attached.

Step 5: Site Index Vector

The site index vector, the subroutine labeled C inside the program, is similar to the height vector. The user specifies the stand age, index base age, height increment and the maximum height desired. The program calculates the site index associated with each height, beginning at 10 feet, for the specified average stand age. The program prints 999 for output if site index is less than 10 feet or greater than 170 feet. The end of the vector is marked by 987654321. The height and site index vectors are both printed if a PC-100 printer is attached.

Using the Program

Foresters should thoroughly familiarize themselves with the program before using it in the field the first time. The following 10 operations should be performed.

1. Keystroke the program (appendix) into the machine after properly partitioning the memory.
2. Write 2 sets of cards for the program.
3. Clear the memory.

4. Reload the recorded program.
5. Run a complete listing (2ND LIST and INV 2ND LIST) of the recorded and reloaded program.
6. Verify keystroke accuracy against Program Listing (appendix).
7. Correct any mistakes.
8. Rewrite both sets of cards, if necessary.
9. Run the test problems (appendix) to verify that the program is working properly.
10. Use a data set you have previously analyzed and compare the program's results with your prior results.

SENSITIVITY ANALYSIS

Users must bear in mind the age limitations inherent in Miscellaneous Publication 50 (USDA Forest Service 1976). The ages specified for loblolly, shortleaf, and slash pine are ring counts to pith from cores taken at dbh, plus 3 years. For longleaf pine, age is ring count to pith from cores taken at dbh, plus 7 years. All of the data came from naturally regenerated, second-growth stands. Consequently, the ages are all estimated *age-from-seed.* Users should calculate the ages of their trees the same way.

Using the program for plantations can create problems. In the first place, the height growth patterns depicted by the site index curves for natural stands may not match the patterns in plantations, especially plantations on old field or prepared sites. Assuming that the curves are suitable, there is still another problem. When a plantation is established, the 1-0 (bare-rooted) seedlings planted are already 1 year old from seed. Thus, when a plantation is 25 years old, the trees are actually 26 years from seed. Common practice presumes that the average height of dominant and codominant trees in a plantation 25 growing seasons after planting is the site index with an index base age of 25 years. But this presumption creates a one year height growth error in this program. The height of a stand planted 25 years previously is the site index only if the index base age is 26 or the seedlings planted were grown in containers and were less than 6 months old when planted. Thus, the presumption that average plantation height equals site index is only correct for plantations 24 years after establishment with 1-0 (bare-root) seedlings.

Serious errors are created when evaluating site quality based on young, fast-growing stands if the year's difference in age-from-seed versus age-from-establishment is ignored. For example, suppose the average height of dominant and codominant trees in a loblolly pine plantation 11 years from seed (10 years after establishment) is 36 feet. Site index, base age 50 for 11 years and height 36 feet is 80. But if the age is mistakenly entered as 10, based on the age since establishment, site index for a height of 36 feet is 96. The error of one year induces a 20 percent error in site index (fig. 1). If these overestimates of

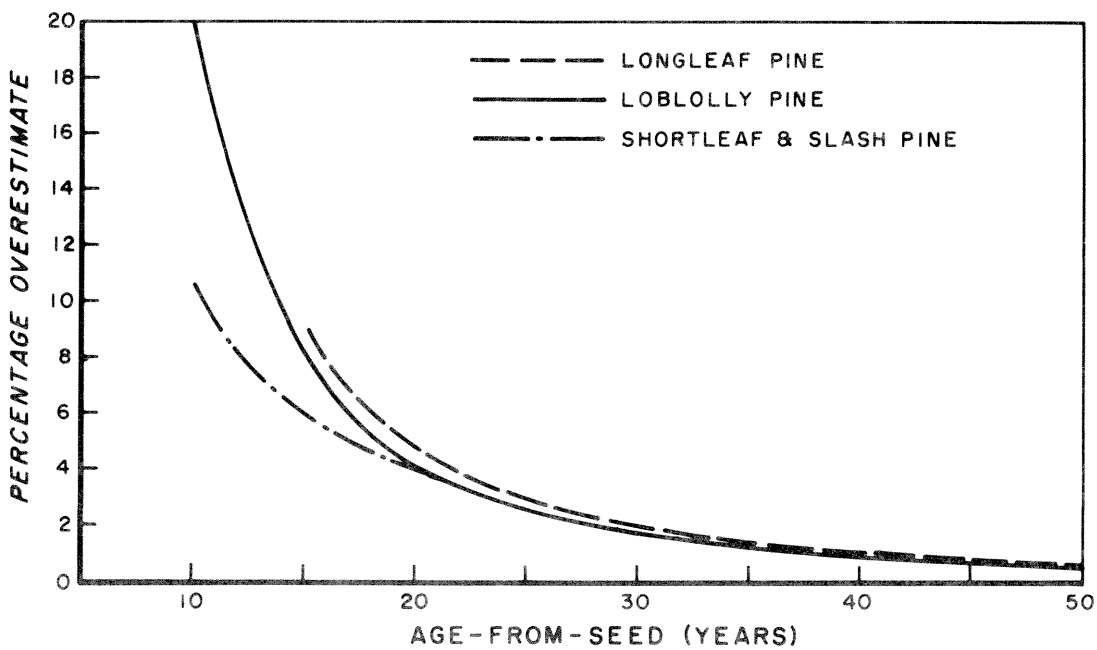

Figure 1.—*Site index percentage overestimate resulting from a one-year aging error, $SI_{50} = 80$ for each species.*

site index are used as arguments in some stand volume and growth predictors to estimate present and future volumes, they obviously cause overestimates of both volumes and growth. The problem becomes most acute when young, fast-growing stands are on the verge of merchantability and when the log-rule being used, such as the Doyle Rule, penalizes small stems. Under these conditions, overestimating site index by 10 to 20 percent can lead to overestimating future growth and yield by 33 to 50 percent over 20 to 30 year rotations (Feduccia et.al. 1979). Economic evaluations of investments in possible intermediate treatments founded on such overestimates of site index will conclude that higher rates-of-return will be earned than will actually occur. Consequently, landowners may over-invest in stand treatments and inefficiently allocate scarce management funds.

Foresters should take care when comparing their own plantations with published yield tables or with growth and yield models that vary with site index. They should determine whether the published information was constructed using age-from-seed or age-from-establishment and which age is implied in the site index base age. Then, this program can be used to properly enter the published plantation yield tables or utilize published equations for comparison.

In the authors' experiences, field foresters using clinometers tend to overestimate tree heights by 2 to 10 percent compared to actual heights measured with a tape after felling. It is often difficult to actually see the true tree top because closed crown canopies or intervening branches near the top of the tree can obstruct the measurer's vision. Consequently, heights taller than those actually existing are often recorded. However, in contrast to the misspecification of age, height errors are not compounded. Site index is only raised by the same percentage as the percent height error.

The nature of the errors flows directly from the form of the estimating equation. Because ages are used in the exponent of the equation, the equation is much more sensitive to aging errors than height estimation errors. But, overestimating actual heights compounds the problem of determining site index for plantations when the year that seedlings spend in the nursery is ignored.

Sound data collection procedures should eliminate the age and height estimation errors. If accurate data are used, this program will provide site indexes and height growth projections far superior to results from ocular interpolation of curves without having to retreat to the office for computations.

LITERATURE CITED

Farrar, R.M., Jr. Southern pine site index equations. J. For. 71:696–697; 1973.

Farrar, R.M., Jr. Southern pine site-index computing program. Res. Note SO-197. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station; 1975. 7 p.

Feduccia, D.P., Dell, T.R., Mann, W.F., Jr., Campbell, T.E., and Polmer, B.F. Yields of unthinned loblolly pine plantations on cutover sites in the west gulf region. Research Paper SO-148. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station; 1979. 88 p.

USDA Forest Service. Volume, yield, and stand tables for second-growth southern pines. Misc. Publ. 50. Washington, DC: U.S. Department of Agriculture, Forest Service; 1929 (rev. 1976). 202 p.

Appendix

Program Listing

```
000  43 RCL
001  30  30
002  91 R/S
003  76 LBL
004  16 A'
005  43 RCL
006  16  16
007  42 STO
008  10  10
009  43 RCL
010  17  17
011  42 STO
012  11  11
013  43 RCL
014  18  18
015  42 STO
016  12  12
017  43 RCL
018  19  19
019  42 STO
020  13  13
021  86 STF
022  01  01
023  15  E
024  76 LBL
025  17 B'
026  43 RCL
027  20  20
028  42 STO
029  10  10
030  43 RCL
031  21  21
032  42 STO
033  11  11
034  43 RCL
035  22  22
036  42 STO
037  12  12
038  43 RCL
039  23  23
040  42 STO
041  13  13
042  86 STF
043  02  02
044  15  E
045  76 LBL
046  18 C'
047  43 RCL
048  24  24
049  42 STO
050  10  10
051  43 RCL
052  25  25
053  42 STO
054  11  11
055  43 RCL
056  26  26
057  42 STO
058  12  12
059  43 RCL
060  27  27
061  42 STO
062  13  13
063  86 STF
064  03  03
065  15  E
066  76 LBL
067  19 D'
068  43 RCL
069  28  28
070  42 STO
071  10  10
072  43 RCL
073  29  29
074  42 STO
075  11  11
076  43 RCL
077  21  21
078  42 STO
079  12  12
080  42 STO
081  13  13
082  86 STF
083  04  04
084  76 LBL
085  15  E
086  58 FIX
087  00  00
088  00  0
089  36 PGM
090  01  01
091  71 SBR
092  25 CLR
093  76 LBL
094  90 LST
095  43 RCL
096  32  32
097  91 R/S
098  32 X:T
099  43 RCL
100  38  38
101  67  EQ
102  14  D
103  43 RCL
104  33  33
105  91 R/S
106  78 Σ+
107  71 SBR
108  66 PAU
109  61 GTO
110  90 LST
111  76 LBL
112  14  D
113  43 RCL
114  31  31
115  91 R/S
116  98 ADV
117  99 PRT
118  35 1/X
119  42 STO
120  08  08
121  79  x̄
122  32 X:T
123  71 SBR
124  66 PAU
125  35 1/X
126  42 STO
127  09  09
128  79  x̄
129  71 SBR
130  66 PAU
131  65  ×
132  71 SBR
133  10 E'
134  95  =
135  99 PRT
136  91 R/S
137  15  E
138  76 LBL
139  11  A
140  43 RCL
141  34  34
142  91 R/S
143  98 ADV
144  99 PRT
145  42 STO
146  07  07
147  43 RCL
148  31  31
149  91 R/S
150  99 PRT
151  35 1/X
152  42 STO
153  09  09
154  43 RCL
155  32  32
156  91 R/S
157  76 LBL
158  89  π
159  98 ADV
160  99 PRT
161  35 1/X
162  42 STO
163  08  08
164  43 RCL
165  07  07
166  65  ×
167  71 SBR
168  10 E'
169  95  =
170  99 PRT
171  91 R/S
172  43 RCL
173  32  32
174  91 R/S
175  61 GTO
176  89  π
177  76 LBL
178  12  B
179  43 RCL
180  34  34
181  91 R/S
182  98 ADV
183  99 PRT
184  42 STO
185  07  07
186  43 RCL
187  31  31
188  91 R/S
189  99 PRT
190  35 1/X
191  42 STO
192  09  09
193  43 RCL
194  35  35
195  91 R/S
196  99 PRT
197  42 STO
198  14  14
199  01  1
200  00  0
201  42 STO
202  15  15
203  22 INV
204  87 IFF
205  02  02
206  88 DMS
207  05  5
208  44 SUM
209  15  15
210  76 LBL
211  88 DMS
212  43 RCL
213  15  15
214  98 ADV
215  71 SBR
216  66 PAU
217  35 1/X
218  42 STO
219  08  08
220  43 RCL
221  07  07
222  65  ×
223  71 SBR
224  10 E'
225  95  =
226  71 SBR
227  66 PAU
228  43 RCL
229  14  14
230  44 SUM
231  15  15
232  43 RCL
233  15  15
234  32 X:T
235  87 IFF
236  04  04
237  70 RAD
238  87 IFF
239  01  01
240  60 DEG
241  01  1
242  00  0
243  00  0
244  77  GE
245  88 DMS
246  43 RCL
247  30  30
248  99 PRT
249  91 R/S
250  76 LBL
251  70 RAD
252  06  6
253  00  0
254  77  GE
255  88 DMS
256  43 RCL
257  30  30
258  99 PRT
259  91 R/S
260  76 LBL
261  60 DEG
262  08  8
263  00  0
264  77  GE
265  88 DMS
266  43 RCL
267  30  30
268  99 PRT
269  91 R/S
270  76 LBL
271  10 E'
272  53  (
273  01  1
274  00  0
275  45 Y^x
276  53  (
277  53  (
278  43 RCL
279  10  10
280  65  ×
281  53  (
282  43 RCL
283  08  08
284  75  -
285  43 RCL
286  09  09
287  54  )
288  54  )
289  85  +
290  53  (
291  43 RCL
292  11  11
293  65  ×
294  53  (
295  43 RCL
296  08  08
297  33 X²
298  75  -
299  43 RCL
300  09  09
301  33 X²
302  54  )
303  54  )
304  85  +
305  53  (
306  43 RCL
307  12  12
308  65  ×
309  53  (
310  43 RCL
311  08  08
312  45 Y^x
313  03  3
314  75  -
315  43 RCL
316  09  09
317  45 Y^x
318  03  3
319  54  )
320  54  )
321  85  +
322  53  (
323  43 RCL
324  13  13
325  65  ×
326  53  (
327  43 RCL
328  08  08
329  45 Y^x
330  04  4
331  75  -
332  43 RCL
333  09  09
334  45 Y^x
335  04  4
336  54  )
337  54  )
338  54  )
339  54  )
340  92 RTN
341  76 LBL
342  13  C
343  43 RCL
344  31  31
345  91 R/S
346  98 ADV
347  99 PRT
348  35 1/X
349  42 STO
350  08  08
351  43 RCL
352  32  32
353  91 R/S
354  99 PRT
355  35 1/X
356  42 STO
357  09  09
358  43 RCL
359  36  36
360  91 R/S
361  99 PRT
362  42 STO
363  14  14
364  43 RCL
365  37  37
366  91 R/S
367  99 PRT
368  42 STO
369  00  00
370  01  1
371  00  0
372  42 STO
373  15  15
374  76 LBL
375  59 INT
376  43 RCL
377  15  15
378  98 ADV
379  71 SBR
380  66 PAU
381  65  ×
382  71 SBR
383  10 E'
384  95  =
385  32 X:T
386  01  1
387  00  0
388  77  GE
389  80 GRD
390  01  1
391  07  7
392  00  0
393  32 X:T
394  77  GE
395  80 GRD
396  71 SBR
397  66 PAU
398  76 LBL
399  50 I×I
400  43 RCL
401  14  14
402  44 SUM
403  15  15
404  43 RCL
405  00  00
406  32 X:T
407  43 RCL
408  15  15
409  77  GE
410  91 R/S
411  61 GTO
412  59 INT
413  76 LBL
414  80 GRD
415  43 RCL
416  39  39
417  71 SBR
418  66 PAU
419  61 GTO
420  50 I×I
421  76 LBL
422  66 PAU
423  99 PRT
424  66 PAU
425  66 PAU
426  66 PAU
427  66 PAU
428  66 PAU
429  66 PAU
430  66 PAU
431  92 RTN
432  76 LBL
433  91 R/S
434  43 RCL
435  30  30
436  99 PRT
437  91 R/S
```

```
                0.   00
                0.   01
                0.   02
                0.   03
                0.   04
                0.   05
                0.   06
                0.   07
                0.   08
                0.   09
                0.   10
                0.   11
                0.   12
                0.   13
                0.   14
                0.   15
       -2.41737   16
      -273.824    17
        4227.7    18
      -19758.5    19
      -11.8701    20
                0.   21
       1263.79    22
      -12409.5    23
    -11.104909    24
    -83.244961    25
      2239.678    26
    -11260.453    27
      -8.80405    28
       22.7952    29
  9876543210.     30
  1111111111.     31
  2222222222.     32
  3333333333.     33
  4444444444.     34
  5555555555.     35
  6666666666.     36
  7777777777.     37
                0.   38
  9999999999.     39
```

User Instructions

Step	Procedure	ENTER	Press	Display
1.0	INITIALIZE THE PROGRAM PARAMETERS			
1.1	Partition the calculator.	6	2ND OP 17	479.59
1.2	Load the program, reading card sides 1 to 4.	side #	INV 2ND WRITE	side #
1.3	Begin execution.		RST R/S	9876543210.
1.4	Select the species desired: A′ = loblolly; B′ = longleaf; C′ = shortleaf; and D′ = slash		2ND (letter)	2222222222.
2.0	SITE INDEX CALCULATION[a]			
2.1	Enter the present tree age (PTA).	PTA	R/S	3333333333.
2.2	Enter the present tree height (HT).	HT	R/S	2222222222.
2.3	Do steps 2.1 and 2.2 for all n sample trees.			
2.4	After entering the last sample tree height, enter 0 for the next PTA.	0	R/S	1111111111.
2.5	Enter the index base age (IBA) desired.	IBA	R/S	Site Index
2.6	To prepare the program for calculating site index at a new sample location. If a new species is desired, go to step 1.4		R/S	2222222222.
3.0	HEIGHT PROJECTION		A	4444444444.
3.1	Enter site index (SI).	SI	R/S	1111111111.
3.2	Enter index base age (IBA).	IBA	R/S	2222222222.
3.3	Enter the stand age (SA).	SA	R/S	Expected HT
3.4	Recycle the program for the next stand age.		R/S	2222222222.
4.0	HEIGHT VECTOR		B	4444444444.
4.1	Enter site index (SI).	SI	R/S	1111111111.
4.2	Enter index base age (IBA).	IBA	R/S	5555555555.
4.3	Enter age increment (AI). The program continues until upper age limits are reached.	AI	R/S	Ages & Heights
				9876543210.
5.0	SITE INDEX VECTOR		C	1111111111.
5.1	Enter index base age (IBA)	IBA	R/S	2222222222.
5.2	Enter the average tree age (ATA)	ATA	R/S	6666666666.
5.3	Enter height increment (HTI).	HTI	R/S	7777777777.
5.4	Enter maximum height (HTMAX). The program continues to HTMAX. If an SI outside the range $10<SI<170$ is computed, the program prints 9999999999. The end is marked 987654321.	HTMAX	R/S	Heights and Site Indexes
				987654321.

[a]To get to step 2.0 without going through step 1, press E from anywhere in the program.

Program Test Problems

Step	Action	Printer tape	Calculator display
1.0	Initialize the program		
1.1	Partition the calculator		479.59
1.2	Load the program by reading cards		1,2,3,4
1.3	Begin execution		9876543210.
1.4	Select loblolly pine (A′)		2222222222.
2.0	Calculate site index using the data (E)		
2.1	PTA — 16,15,18,17,16,17,15,16,16,17		3333333333.
2.2	HT — 47,42,51,47,43,48,43,45,44,49	1, 2, ...	1,2, ..., 10. &
2.3	Repeat 2.1 and 2.2 for all 10 trees	...., 10	2222222222.
2.4	Enter 0 for PTA after HT = 49		1111111111.
2.5	Enter IBA = 25	25	
	Display flashes the average age.	16	16
	Display flashes the average height:	46	46
	Display stops flashing, SI appears:	68	68
3.0	Calculate expected stand heights (A)		4444444444.
3.1	Enter SI = 80	80	1111111111.
3.2	Enter IBA = 25	25	2222222222.
3.3	Enter SA = 18	18	
	Expected height is displayed	60	60
3.4	Recycle for next SA: R/S		2222222222.
3.3	Enter SA = 27	27	
	Expected height is displayed	85	85
4.0	Calculate a height vector (B)		4444444444.
4.1	Enter SI = 70	70	1111111111.
4.2	Enter IBA = 30	30	5555555555.
4.3	Enter AI = 10	10	
	The display flashes	PTA = 10 20 30 40 50 60 70 80	
	and printer prints:	HT = 23 50 70 84 93 100 104 108	
	The end marker appears:	9876543210.	9876543210.
5.0	Calculate an SI vector (C)		1111111111.
5.1	Enter IBA = 50	50	2222222222.
5.2	Enter ATA = 67	67	6666666666.
5.3	Enter HTI = 20	20	7777777777.
5.4	Enter HTMAX = 200	200	
	The display flashes	HT = 10 30 50 70 90 110 130 150 170 190	
	and printer prints:	SI = 999 27 45 63 81 100 118 136 154 999	
	The end marker appears:	9876543210.	9876543210.

Guldin, Richard W., and Farrar, Robert M. Jr. Computation of southern pine site index using a TI-59 calculator, U.S. Department of Agriculture Forest Service, General Technical Report SO-48. South. For. Exp. Stn. New Orleans, La. 8 p. 1983.

A program is described that permits computation of site index in the field using a Texas Instruments model TI-59 programmable, hand-held, battery-powered calculator. Based on a series of equations developed by R.M. Farrar, Jr., for the site index curves in USDA Miscellaneous Publication 50, the program can accomodate any index base age, tree age, and height within wide limits for four principal southern pine species.

Keywords: Growth, timber management, loblolly pine, longleaf pine, shortleaf pine, slash pine, computer program, plantation, dendrochronology.