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ALOG User's Manual: A Guide to Using the Spreadsheet-Based Artificial Log Generator

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Contents

Abstract

Computer programs that simulate log sawing can be valuable training tools for sawyers, as well as a means of testing different sawing patterns. Most available simulation programs rely on diagrammed-log databases, which can be very costly and time consuming to develop. Artificial Log Generator (ALOG) is a user-friendly Microsoft® Excel®-based program that accurately generates random, artificial-log data. The program's design is based on information from an analysis of real red oak (*Quercus rubra* L.) logs, which ensures the validity of the data. Information about generated-log features includes length, small- and large-end inside-bark diameters, amount of sweep or crook, and defects. External defect attributes include type, location, length, width, and height. Some internal defect information, including depth, volume, and angle, is also given for the most common defect types. The user can either specify the log's grade and its position in the tree, or have the program randomly draw features from known distributions. Finally, the program incorporates a grading algorithm to check the grade of the generated log. This user's guide provides all the information necessary to install and run ALOG, and to interpret program output.

Keywords: Artificial logs, defect generation, log defects, log generation, red oak, sawing simulation.

Introduction

In today's competitive markets, the forest products industry continues to look for ways to improve mill productivity and profitability. Technological advances in sawmill equipment have led to increased production efficiency and improved product yield. However, most of the decisionmaking in log processing is still performed by equipment operators. The processing decisions they make directly affect product value. Training sawyers and other production workers is essential to a profitable sawmill operation, but an alternative to on site training is becoming increasingly attractive. Computer software can now simulate sawmill processes and provide the necessary training to sawyers.

The Artificial Log Generator (ALOG) program provides realistic hardwood log data in a spreadsheet format for log sawing simulation programs that require accurate and detailed log feature information. One such program is the Log Computer Aided Sawyer Trainer (LogCast), which was developed by researchers in the Department of Industrial and Manufacturing Systems Engineering at the University of Missouri-Columbia, in collaboration with the Southern Research Station of the U.S. Department of Agriculture Forest Service (Forest Service) (Occeña and others 2000). Such sawyer training programs usually draw log information from a database and require modeling shape and defect information from an actual log. A more practical method of getting log data is to generate both the log and defect attributes using a computer program that considers real-log characteristics. Creating a computer-generated log is much faster, easier, and cheaper than physically modeling a real log. Whereas a database, by definition, contains a finite number of logs, log descriptions, or log types, a computer-generated log is always unique; just as every log a sawyer encounters is unique.

Currently, the ALOG program uses only red oak (Quercus rubra L.) log data. Red oak was chosen because of its wide distribution in the Eastern United States and its use in a variety of products—from pallets to furniture. Information from the analysis of external defect and log characteristics, and significant information on the relationship between internal and external defect, were incorporated to ensure the validity of generated logs.

ALOG can generate data based on log grade or position in the tree. Grades are Forest Service standard grades for factory lumber logs (Rast and others 1973), and positions include butt and upper logs. Program output consists of log size and shape attributes, as well as external surface and internal defect attributes. However, internal defect

information in the current version of ALOG is given only for several defect and attribute types. Future versions of ALOG will focus on expanding the internal defect output to include more defect types and attributes.

By following this guide, the user will be able to install ALOG, generate red oak log data based on desired input parameters, interpret program output, and export generated log and defect data. The guide does not include detailed information about methods used to generate data. For a more comprehensive explanation of the program, see Winn and others (2004).

Getting Started

Hardware and Software Requirements

Minimum system requirements include an IBM®-compatible PC with 30MB free disk space and 128MB RAM. The program is not compatible with Macintosh® operating systems. ALOG was developed using Microsoft® Excel® 2002 running under Microsoft® Windows® 2000 and was not tested using other versions. ALOG also requires the user to install two Excel® add-ins for the program to function properly:

- Analysis ToolPak—financial, statistical, and engineering tools installed by default with Excel®
- PopTools—matrix, stochastic process, simulation, and model fitting tools available for free from Commonwealth Scientific and Industrial Research Organisation (CSIRO) Sustainable Ecosystems Web site (www.cse.csiro.au/poptools/)

User Requirements

All user operations are point-and-click, so no prior Excel® experience is necessary to use the ALOG program. In order to install and run the program, a general understanding of how to navigate in the Windows environment is sufficient.

Installation

Downloading from the Internet—ALOG can be downloaded at the following Web site: www.srs4702.forprod.vt.edu. If Internet access is unavailable, contact Matthew F. Winn, USDA Forest Service, Southern Research Station, Blacksburg, VA 24060 [(540) 231–8815].

Installing from a CD–ROM—Copy the file named ALOG.xls from the CD–ROM to the computer's hard drive.

Installing PopTools add-in—PopTools can be downloaded at the following Web address: www.cse.csiro.au/poptools/. Follow the installation instructions on the PopTools Web site.

Configuring Excel®—To function properly, Excel® must be reconfigured prior to using ALOG. Use the File-Open option within Excel® to open the file named ALOG.xls. Depending on your computer's security settings, you may receive a warning that the file contains macros. If so, click Enable Macros. The macros are safe and must be enabled before using ALOG. Next, select Tools-Add-Ins. Confirm that Analysis ToolPak and PopTools are checked. If the Analysis ToolPak is not available, run Microsoft® Office® setup and install it. Click OK. Select Tools-Options and click on the Calculation tab. Verify that the calculations are set to Manual. Click OK. The program is now ready to use.

Overview

ALOG is a Microsoft® Excel® workbook of 28 worksheets, 3 of which are user viewable. The remaining 25 are used for calculations only and are hidden. When first opened, the program displays the Main worksheet (fig. 1). Here the user specifies input parameters and generates log data. When the program has completed the necessary calculations, the Main worksheet displays log and defect data. The user can then verify the grade of a generated log, if desired, and also export results.

The Main worksheet (fig. 1) displays a link to another worksheet—Key to Defect Types (fig. 2)—which asks the user to choose an appropriate Defect code. The display provides Defect types corresponding to the selected codes, as well as a detailed description of each type.

To view the generated log and defects, click on View Log, see "G" (fig. 1). A third worksheet, titled Graded Log (fig. 3), will appear, displaying a view of the generated log's surface ("unrolled") along with the program-determined grading face.

Main Worksheet

The Main worksheet (fig. 1) is displayed by default when ALOG is opened. From here the user specifies input parameters, generates log and defect data, and grades the generated log. This also links the user to the Key to Defect Types and Graded Log worksheets.

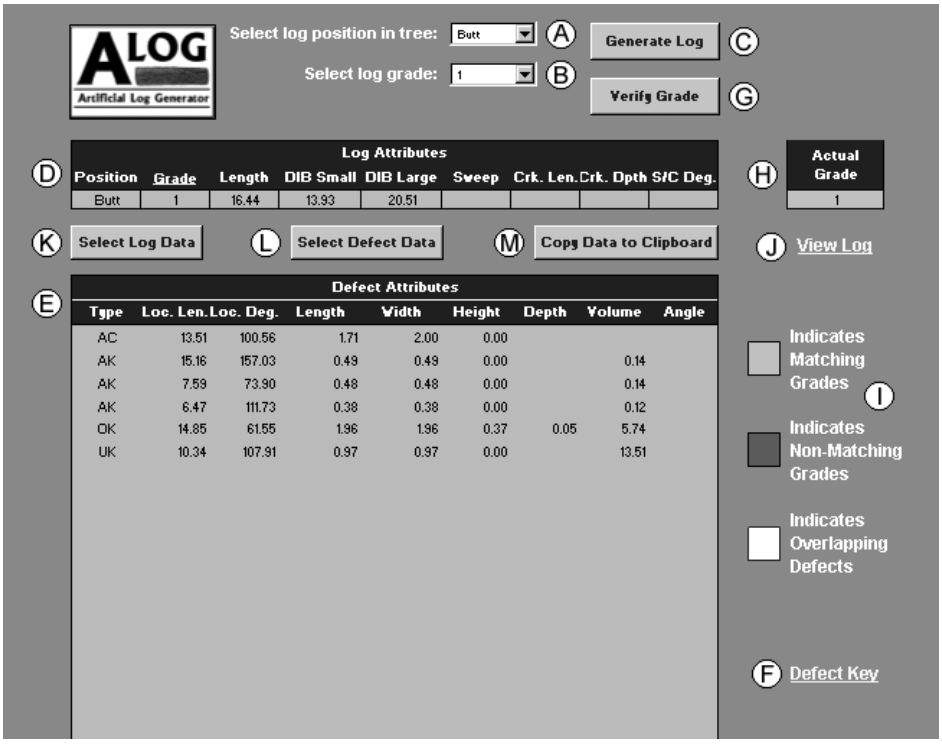
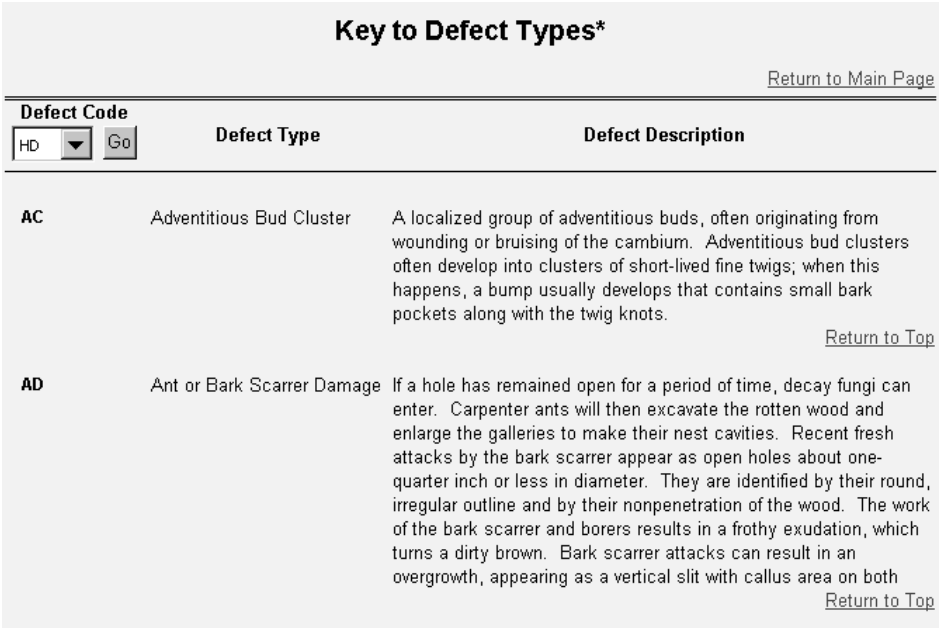


Figure 1—ALOG's Main worksheet. Note: White circles with letters are for explanation purposes only and do not appear on the Main Worksheet.



Key to Defect Types*

Return to Main Page

Defect Code (HD, Go)	Defect Type	Defect Description
AC	Adventitious Bud Cluster	A localized group of adventitious buds, often originating from wounding or bruising of the cambium. Adventitious bud clusters often develop into clusters of short-lived fine twigs; when this happens, a bump usually develops that contains small bark pockets along with the twig knots. Return to Top
AD	Ant or Bark Scarrer Damage	If a hole has remained open for a period of time, decay fungi can enter. Carpenter ants will then excavate the rotten wood and enlarge the galleries to make their nest cavities. Recent fresh attacks by the bark scarrer appear as open holes about one-quarter inch or less in diameter. They are identified by their round, irregular outline and by their nonpenetration of the wood. The work of the bark scarrer and borers results in a frothy exudation, which turns a dirty brown. Bark scarrer attacks can result in an overgrowth, appearing as a vertical slit with callus area on both Return to Top

Figure 2—ALOG's Key to Defect Types worksheet containing Defect Codes, Defect Type, and Defect Description.

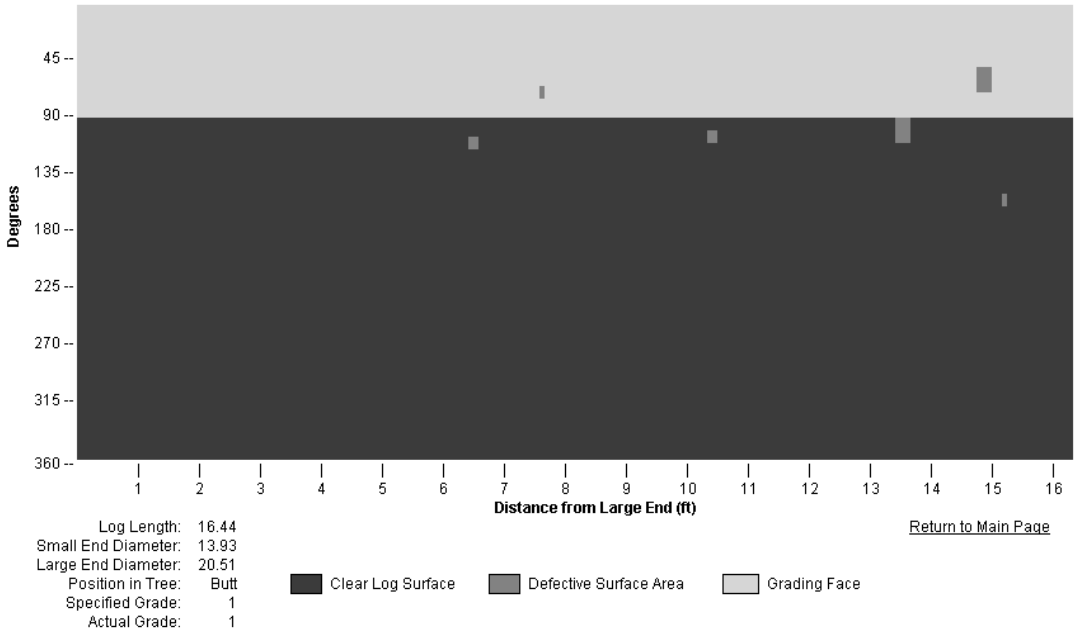


Figure 3—ALOG's Graded Log worksheet showing an unrolled view of a sample log, its defects, and the grading face.

Select Log Position

To select the generated log position in the tree, click on one of the two options listed in the drop-down menu, see "A" (fig. 1). Select either position (butt or upper) or, instead, allow the program to randomly assign log position. Upper logs are any above the butt log.

Select Log Grade

Click one of three options on the Select Log Grade drop-down menu, see "B" (fig. 1). Available log grades 1, 2, and 3—in order of decreasing quality—are based on Forest Service standard grades for hardwood factory lumber logs (table 1) (Rast and others 1973). The drop-down menu also provides the option of having the program randomly generate log grade.

Table 1—Forest Service standard grades for hardwood factory lumber logs

	Log grades							
Grading factors	F1			F2				F3
Position in tree	Butts only	Butts and uppers		Butts and uppers				Butts and uppers
Scaling diameter (inches)	13–15[a]	16–19	20+	11+[b]	12+			8+
Length without trim (feet)	10+			10+	8–9	10–11	12+	8+
Required clearcuttings[c] of each three best faces[d]								
Minimum length, (feet)	7	5	3	3	3	3	3	2
Maximum number	2	2	2	2	2	2	3	No limit
Minimum proportion of log length required in clearcutting	5/6	5/6	5/6	2/3	3/4	2/3	2/3	½
Maximum sweep and crook allowance								
For logs with < ¼ of end in sound defects (percent)	15%			30%				50%
For logs with > ¼ of end in sound defects (percent)	10%			20%				35%
Maximum scaling deduction (percent)	40%[e]			50%[f]				50%
End defect [see Rast and others (1973), page18]								

[a] Ash and basswood butts can be 12 inches if they otherwise meet requirements for small F1s.
[b] Ten-inch logs of all species can be F2 if they otherwise meet requirements for small F1s.
[c] A clearcutting is a portion of a face, extending the width of the face, that is free of defects.
[d] A face is ¼ of the surface of the log as divided lengthwise.
[e] Otherwise F1 logs with 41 to 60 percent deductions can be F2.
[f] Otherwise F2 logs with 51 to 60 percent deductions can be F3.
Source: Rast and others (1973).

Generate Log Data

After specifying input parameters, the user can generate log and defect data by clicking on Generate Log, see "C" (fig. 1). The program will scroll through various worksheets while performing calculations and should take only a few seconds to produce results. Log and defect attributes for the generated log will then be displayed on the Main worksheet.

Log attributes—Generated log attributes include log position, grade, length, small- and large-end inside-bark diameters, sweep, crook length, crook depth, and radial orientation of sweep or crook, see "D" (fig. 1). Log grade and position will be the same as the user specified unless the random option was selected. Log length is given in feet and includes a random trim allowance. Both small- and large-end diameters are given in inches and represent the average diameters measured through the center of the cross section of the log, terminating at the cambium. Sweep is measured in inches as the maximum deviation from straightness along the length of the log. Similar to sweep, crook is defined as an abrupt deviation from straightness along the length of the log. Crook length is given in feet, measured from the small end of the log and includes the length of log affected. Crook depth is the maximum deviation in inches from the straight portion of the log. Finally, the radial location of sweep or crook (S/C Deg.) is the angular orientation of the defect relative to an arbitrary 0° reference point on the log ends.

Defect attributes—External defect attributes included in ALOG output consist of defect type, surface location, length, width, and height, see "E" (fig. 1). Note that the program supports only surface defects, not end defects. An explanation of each defect type code can be found in the Key to Defect Types worksheet. A hyperlink to the defect key is available in the lower right section of the Main worksheet, see "F" (fig. 1).

ALOG uses two parameters to locate an external defect: location length and location degree. Location length is the distance from the large end of the log to the center of the defect. Location degree is the angular orientation around the log from an arbitrary reference point to the center of the defect. The program uses three parameters to describe the size and shape of the external defect: length, width, and height. All are measured in inches. Defect length is measured along the length of the log and defect width is measured perpendicular to defect length. Defect height is the maximum perpendicular distance from the defect to the normal (defect free) log surface.

Internal defect information is also available for several defect types and attributes. Internal defect attributes include depth, volume, and angle. Depth is the maximum distance in inches that the defect extends below the cambium perpendicular to the log surface. Defect volume is the total space occupied by the defect inside the log and is measured in cubic inches. Angle is the orientation of the defect relative to the pith and is measured in degrees.

Due to the numerous random variables used in generating external defect parameters, occasional defect overlapping will occur. When this happens, the violating defects will be highlighted yellow in the Defect Attributes section. Where defect types overlap, the user can regenerate the log in order to avoid unrealistic external defect placement.

Grade the Generated Log

Using random variables in log and defect generation may result in a mismatch of the actual grade of the generated log with the grade specified in the input. After generating a log, click Verify Grade, see "G" (fig. 1) to determine the actual grade. A number representing the generated log's actual grade will appear in the Actual Grade box, see "H" (fig. 1). If the log does not meet the minimum requirements for a grade 3 log, it will be denoted as below grade (BG). If the actual grade matches the grade specified, the box will be highlighted green; if not, it will be red, see "I" (fig. 1). In either case, the log generated is still a reasonable sample; it just has a grade different than that specified. If the specified and actual grades differ, the user can update the grade in the Log Attributes table by clicking on Grade, see "B" (fig. 1). Before exporting log data from the program, the user should enter or verify the log grade.

When log grading is complete, click on View Log, see "J" (fig. 1) to view a rudimentary representation of the generated log and its defects. Additional information is presented under the Graded Log worksheet section.

Export Log and Defect Data

Exporting to Excel®—Click on Select Log Data, see "K" (fig. 1), then on Copy Data to Clipboard, see "M" (fig. 1). Open the Excel® worksheet where you want to store the data. Select the area where you want to place the data and select Paste under Edit in the main menu. Repeat this process to export defect data by clicking on Select Defect Data button, see "L" (fig. 1).

Exporting to a text file—Often it is useful to export data in a format that is easily readable by other programs. To export the data to a tab-delimited or fixed-width text file, click on the appropriate button (for log or defect data). Select the Export Range to File option under the PopTools menu. Follow on-screen directions to save the selection to a text file.

Key to Defect Types

From the Main worksheet, click on Defect Key, see "F" (fig. 1) to access the Key to Defect Types worksheet (fig. 2). This worksheet contains the defect codes, the type of defect, and a brief description of each type. A listing of all defects generated by ALOG is also shown in appendix B. To view a specific defect type, select a defect code from the pulldown menu in the upper left section of the worksheet and click Go. Click Return to Top below each defect description to return to the top of the worksheet. To return to the Main worksheet, click on the link in the upper right corner of the page (fig. 2). Defect descriptions are taken from Bulgrin (circa 1960), Carpenter and others (1989), and Rast (1982).

Graded Log Worksheet

A simple, unrolled view of the generated log is available on the Graded Log worksheet (fig. 3), which is accessible by clicking on View Log on the Main worksheet, see "J" (fig. 1). The image displays the log length, in feet, along the x-axis and the distance around the circumference of the log on the y-axis, expressed in degrees from an arbitrary reference point. Surface defects are represented by red rectangles and are based on the defect length and width generated by the program. If a defect overlaps the arbitrary circumferential reference mark (0°), a portion of the defect will be displayed on the top of the unrolled log; the remaining will be displayed on the bottom. Defects that are not considered grading defects (light bark distortions,

open sound seams, open bird peck, sound wounds, and flanges) will not be used in determining log grade and are not shown on the log image.

The grading face chosen by the program is displayed on the log and represents the second-worst face, according to the Forest Service standard log grading rules. Note that there may be more than one equivalent grading face, but the program only displays the first one when moving from the top to the bottom of the screen. For a more detailed explanation of the Forest Service log grading rules, see Rast and others (1973). Other information available on the Graded Log worksheet includes the log length, small- and large-end diameters, log position in the tree, the grade specified by the user, and the actual grade of the log. To return to the Main worksheet from the Graded Log worksheet, click Return to Main Page (lower right area of the screen).

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Appendix A

Troubleshooting Guide for Diagnosing and Fixing Problems Encountered When Using ALOG

Problem	Solution
Defect data section on the Main worksheet is always empty after generating logs or cells in the log and defect data sections are filled with "#VALUE!".	Select the Add-Ins option under Tools in the main menu. Verify that the checkboxes next to the Analysis ToolPak and PopTools are selected. If the Analysis ToolPak is not available, run the Microsoft® Office® setup again and install it. If the PopTools add-in is not available, download it from the Internet at www.cse.csiro.au/poptools/ and follow the installation instructions on the Web site.
The program takes an excessive amount of time to generate and grade logs or the program stops responding.	Select Options under Tools in the main menu and click on the Calculation tab. Verify that the calculations are set to Manual.
When the Generate Log button is clicked, a window appears stating that macros are disabled.	Restart the ALOG program. If a window appears warning that the file contains macros, click the Enable Macros button.
Not all defects that are listed in the defect attributes section are shown on the log image.	The following defects are not considered grading defects by the program: light bark distortions, open sound seams, open bird peck, sound wounds, and flanges. Therefore, they are generated by the program but not used in calculating log grade. They also do not show up on the log image.

Appendix B

Defect Codes, Associated Defect Types, and Descriptions of Log Defects Generated in ALOG

Defect code	Defect type	Defect description[a]
AC	Adventitious bud cluster	A localized group of adventitious buds, often originating from wounding or bruising of the cambium. Adventitious bud clusters often develop into clusters of short-lived fine twigs; when this happens, a bump usually develops that contains small bark pockets along with the twig knots.
AD	Ant or bark scarrer damage	If a hole has remained open for a period of time, decay fungi can enter. Carpenter ants will then excavate the rotten wood and enlarge the galleries to make their nest cavities. Recent fresh attacks by the bark scarrer appear as open holes about one-quarter inch or less in diameter. They are identified by their round, irregular outline and by their nonpenetration of the wood. The work of the bark scarrer and borers results in a frothy exudation, which turns a dirty brown. Bark scarrer attacks can result in an overgrowth, appearing as a vertical slit with callus area on both sides.
AK	Individual adventitious bud	Subnormal buds found at points along the stem. They arise from latent or dormant buds in the leaf axils of the young stem and persist for an indefinite number of years within the cortical-cambial zone. These buds can be activated at any time during the life of the tree in response to various stimuli, leading to the development of an epicormic branch.
B	Bump	A protuberance on the tree or log surface that is overgrown with bark. It may be abrupt with steep surfaces, or it may be a smooth undulation that tapers gradually in all directions to the normal contour of the log. The majority of bumps cover projecting sound or rotten limb stubs, a cluster of adventitious buds, or a concentration of ingrown bark over a scar.
BS	Butt scar	Generally a triangular-shaped break in the bark or wood at the butt end of the first log caused by fire, logging, or other means.
Bu	Bulge	A general enlargement of the stem of a tree or log—a barreling effect—often without an evident cause such as a knot or callus formation. It may be near a branch stub, rotten knot, knothole, wound, or other point of entry for fungi that can cause rot. It usually suggests a cull section, the extent of the rot indicated by the farthest limits of the deformation.
CBPk	Closed bird peck	Occluded holes caused by bird attacks that are filled with callus tissue. Holes can appear singularly, linearly, or in groups. Damage usually extends into the wood in the form of bark flecks, callus pockets, and stain spots.

(continued)

Appendix B

Defect Codes, Associated Defect Types, and Descriptions of Log Defects Generated in ALOG

Defect code	Defect type	Defect description[a]
CL	Closed lesion	A relatively localized, spindle-shaped necrotic canker consisting primarily of bark and cambium. A lesion starts as a small area of dead bark resulting from a wound caused by cambium-mining insects, mechanical wounding, fungal diseases, or gnawing of the bark by red squirrels. A spot of gum then appears, and gum continues to ooze through the bark down the trunk, where it hardens and darkens.
DK	Dead knot	Remnant of a branch consisting of all or a part of the stub. The knot consists of dead tissue but shows no presence of decay and may be as hard as the surrounding wood.
DKC	Dead knot without callous growth	Remnant of a branch consisting of all or a part of the stub. The knot consists of dead tissue but shows no presence of decay and is covered or surrounded either partially or wholly with callous growth.
Fla	Flange	Triangular, buttress- or wing-like formations projecting from the base of the butt log. Exaggerated projections of the normal stump flare sometimes extend 7 or 8 feet and seem to be related to wetness and softness of site. Flanges occur outside the milling frustrum of the log but have no relation to blemishes in the underlying wood. Flanges are not considered grading defects in factory lumber logs.
GBS	Overgrown bark seam	A seam that has healed to the point where a patch of bark is partially or wholly enclosed in the wood.
GD	Grub damage	A scar in the bark resulting from grub work. Usually a sharp pucker consisting of a pitted core, not over 1/4 inch in diameter, surrounded by callous tissue and distorted bark over an area 3/4 inch to 2 inches in diameter. In severe cases a round "plaster" of callous tissue as large as 3 inches in diameter may occur.
GSS	Overgrown sound seam	Longitudinal radial separation of the fibers in a log overgrown with callous tissue and showing no signs of decay. They are usually caused by wind, frost, or lightening.
GSU	Overgrown unsound seam	Longitudinal radial separation of the fibers in a log overgrown with callous tissue but has decay beneath and possibly to the sides of the callous. They are usually caused by wind, frost, or lightening.
HD	Heavy bark distortion	An indicator of an overgrown knot identified by the characteristic pattern of concentric circles encompassing the defect indicator. Bark distortions differ from "overgrown knots" in that there is no height associated with the indicator.

(continued)

Appendix B

Defect Codes, Associated Defect Types, and Descriptions of Log Defects Generated in ALOG

Defect code	Defect type	Defect description[a]
KCl	Knot cluster	Two or more knots or branches growing in a more or less inseparable group and usually elevated above the normal surface.
LD	Light bark distortion	An indicator of an overgrown knot identified by the characteristic pattern of concentric circles encompassing the defect indicator. Light distortions show only a slight amount of curvature in the surrounding bark plates, and the bark pattern shows only slight variance from normal. Since the internal knots associated with light bark distortions are usually buried deep within the log, it is not considered a grading defect in factory-grade logs. Bark distortions differ from "overgrown knots" in that there is no height associated with the indicator.
MD	Medium bark distortion	An indicator of an overgrown knot identified by the characteristic pattern of concentric circles encompassing the defect indicator. Medium distortions show signs of the concentric circles, but the circles are broken in several areas by the normal bark pattern starting to reform. Bark distortions differ from "overgrown knots" in that there is no height associated with the indicator.
MH	Medium hole	Unoccluded openings in the bark, 3/16 to 1/2 inch in diameter, which sometimes penetrate into the wood beneath. They include entrance and emergence holes of wood-boring insects, increment-borer and tap holes, and openings made by sapsuckers.
OBPk	Open bird peck	Unoccluded openings in the bark caused by bird attacks. Generally, the holes show no signs of callus tissue formation. Open bird peck is an indication of a recent attack and usually doesn't affect the underlying wood. Open bird peck is not considered a grading defect in factory lumber logs.
OK	Overgrown knot	A knot that has been completely overgrown but is clearly outlined by circular or other configurations in the bark. Overgrown knots differ from bark distortions in that there is an obvious height attribute of the defect when compared to the normal log surface.
OKC	Overgrown knot without callous growth	A knot that has been completely overgrown but is clearly outlined by circular or other configurations in the bark. The knot is covered or surrounded either partially or wholly with callous growth.
OKCl	Overgrown knot cluster	Two or more overgrown knots growing in a more or less inseparable group.

(continued)

Appendix B

Defect Codes, Associated Defect Types, and Descriptions of Log Defects Generated in ALOG

Defect code	Defect type	Defect description[a]
Op	Operational defect	Cracks, splits, brooming, splinter pull, "barber chair," holes, etc., that result from felling, skidding, or loading.
Oss	Open sound seam	Longitudinal radial separation of the fibers in a log with no evidence of callous tissue or decay. They are usually caused by wind, frost, or lightening. Open sound seams are not considered a grading defect in factory lumber logs.
R	Rot	Advanced decay, not identifiable with a knot or branch.
RK	Rotten knot	A knot where advanced decay is present and extends beyond the area of the limb stub.
RKC	Rotten knot without callous growth	A rotten knot covered or surrounded either partially or wholly with callous growth. Advanced decay is present and extends beyond the area of the limb stub.
SK	Sound knot	Remnant of a branch consisting of all or a part of the stub. The knot shows no indication of decay and is as hard as the surrounding wood.
SKC	Sound knot without callous growth	Sound knot covered or surrounded either partially or wholly with callous growth. The knot shows no indication of decay and is as hard as the surrounding wood.
SW	Sound wound	Damage to the stem due to natural causes such as a limb falling against another tree or from logging. The wood underneath is sound and callous overgrowth may be open or closed or any degree of coverage of the wound. Sound wounds are not considered a grading defect in factory lumber logs.
UK	Unsound knot	Remnant of a branch consisting of all or a part of the stub. The knot shows presence of decay and is not as hard as the surrounding wood. The amount of decay is normally confined to the limb stub.
UKC	Unsound knot without callous growth	Unsound knot covered or surrounded either partially or wholly with callous growth. The knot shows presence of decay and is not as hard as the surrounding wood. The amount of decay is normally confined to the limb stub.

[a] Defect descriptions taken from Carpenter and others (1989), Rast, (1982), Bulgrin (circa 1960).

Winn, Matthew F.; Araman, Philip A.; Wynne, Randolph H. 2005. ALOG user's manual: A guide to using the spreadsheet-based Artificial Log Generator. Gen. Tech. Rep. SRS-79. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 13 p.

Computer programs that simulate log sawing can be valuable training tools for sawyers, as well as a means of testing different sawing patterns. Most available simulation programs rely on diagrammed-log databases, which can be very costly and time consuming to develop. Artificial Log Generator (ALOG) is a user-friendly Microsoft® Excel®-based program that accurately generates random, artificial-log data. The program's design is based on information from an analysis of real red oak (*Quercus rubra* L.) logs, which ensures the validity of the data. Information about generated-log features includes length, small- and large-end inside-bark diameters, amount of sweep or crook, and defects. External defect attributes include type, location, length, width, and height. Some internal defect information, including depth, volume, and angle, is also given for the most common defect types. The user can either specify the log's grade and its position in the tree, or have the program randomly draw features from known distributions. Finally, the program incorporates a grading algorithm to check the grade of the generated log. This user's guide provides all the information necessary to install and run ALOG, and to interpret program output.

Keywords: Artificial logs, defect generation, log defects, log generation, red oak, sawing simulation.

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