Synthetic rope and logging

Second cooperators meeting yields some solutions

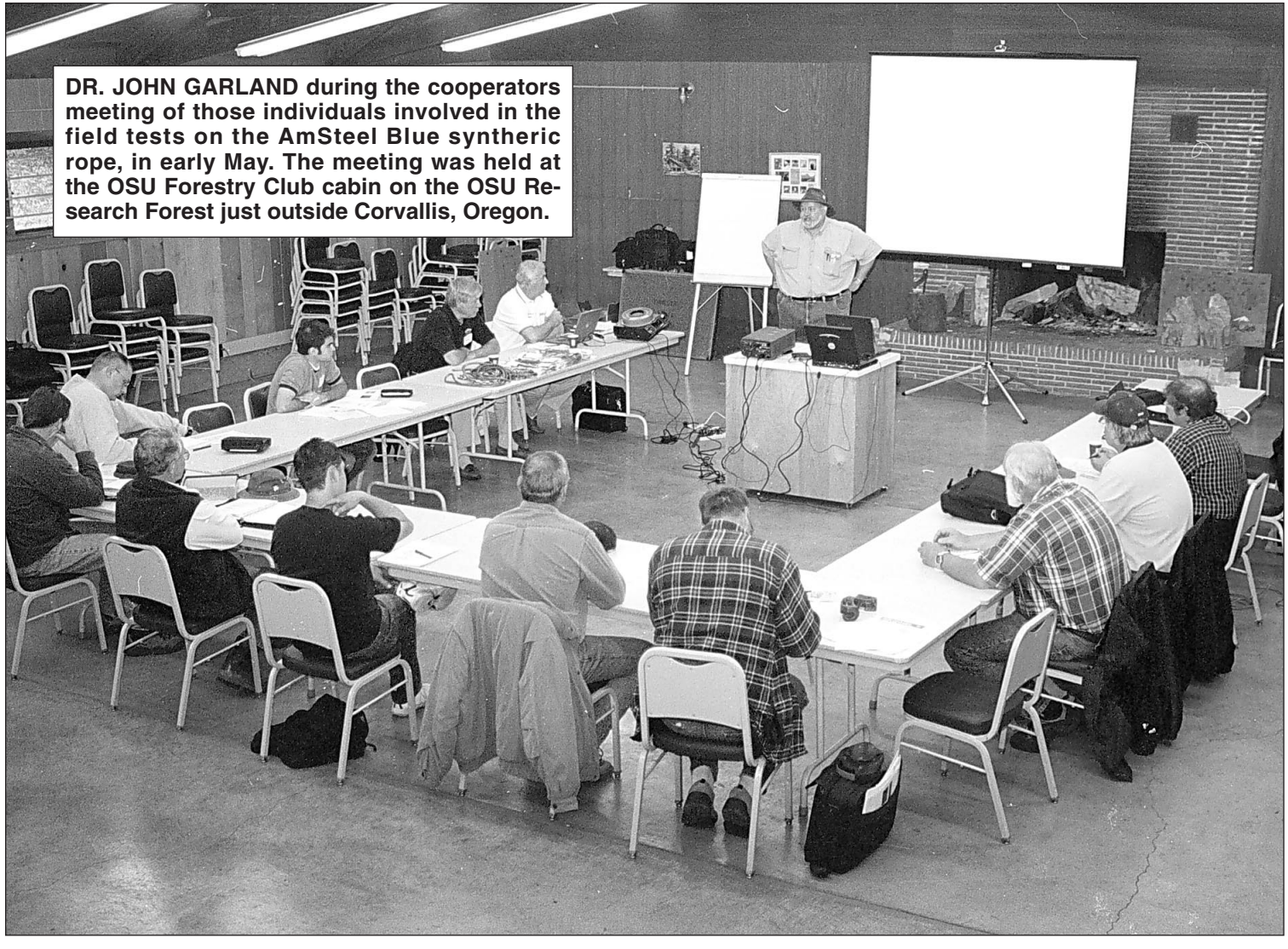
CORVALLIS, OREGON

By Mike Crouse

Each of the past two years, loggers who were involved with the ongoing Oregon State University field testing of Samson Rope Technologies Am-Steel Blue, and Am-Steel Blue II synthetic rope come together to a "cooperators" meeting to share their experiences, and share what works and doesn't work with the product.

This year's meeting was held at the Oregon State Forestry Club Cabin on the OSU Research Forest just outside Corvallis, Oregon in early May, with about 20 participants involved, most of whom had used the AmSteel synthetic line the over that span of time.

AMSTEEL-BLUE is manufactured by Samson Rope Technologies out of Ferndale, Washington (www.samsonrope.com). Certainly, there are other synthetic ropes on the market, however Samson Rope stepped up in the research and provided a lot of their own time, energy, and materials to this project.



DR. JOHN GARLAND during the cooperators meeting of those individuals involved in the field tests on the AmSteel Blue syntheric rope, in early May. The meeting was held at the OSU Forestry Club cabin on the OSU Research Forest just outside Corvallis, Oregon.

First, the rope itself is ultra high molecular weight polyethylene (UHMWPE) fiber rope. The polyethylene fibers are combined to yarns and the yarns are combined into strands that are formed into various rope constructions including twisted, plaited, and braided. AMSTEEL-BLUE is a 12-strand braided rope. This synthetic rope has a higher breaking strength to weight ratio than steel, by a factor of 9 to 10. Other favorable characteristics include high flexibility, low stretch (other than the newly formed eye-splice), and a specific gravity less than one (floats), and can be easily spliced. Coatings can be applied to increase resistance to abrasion, prevent contamination, and increase ease of splicing used ropes.

The synthetic is generally the same material commonly used for fuel containers.

Weight difference

The most obvious plus of synthetic rope is the differ-

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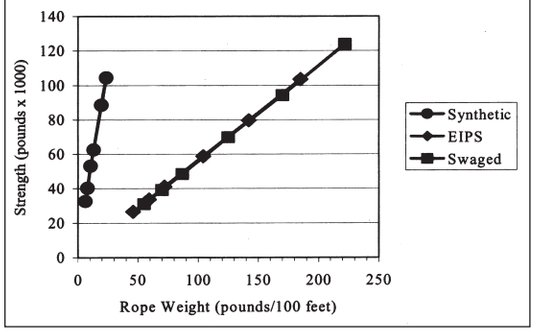
ence in weight. For a given diameter, steel wire rope is 7.5 (extra improved plow steel, EIPS) to 9 (swaged) times as heavy as a comparable length of AMSTEEL-BLUE rope (See Fig. 1). The synthetic rope is also flexible and does not produce "jiggers" (sharp, broken wires within a strand) as handling hazards common to wire rope. The cost is about four to six times that of wire rope in the specially produced quantities now available. The offshore drilling (anchoring) marine towing industries use similar synthetic ropes in applications parallel to logging.

The breaking strength of AMSTEEL vs. steel products is significantly higher than in previous synthetics as well (See Fig. 2 on Page 25). Comparisons between published breaking strengths for some common logging wire rope grades and constructions (EIPS and swaged) and those published for AMSTEEL-BLUE. At medium rope sizes (0.5-0.625 inch diameter), synthetic strength exceeds both EIPS and swaged wire ropes. At larger diameters, the synthetic advantage diminishes to about equal EIPS strength at a 1-inch diameter. Rope elongation is also shown for AMSTEEL-BLUE under loads in Table 1. These elongation values are an increase of 0.3 feet per 100 feet of rope length at loadings shown (an absolute percentage difference of 0.3 percent more than steel constructed ropes).

Figure One. Nominal breaking strength as a functino of rope weight for rope diameters 0.5-1.0 inches.



Other testing and other products

Oregon State University's Dr. John Garland opened the meeting with reviewing test results from other areas on similar synthetic rope products, including field trials in Canada by FERIC (Forest Engineering Research Institute of Canada), as well as other trials in Austria, New Zealand, and in both Minnesota and Colorado. The applications were similar to those being tested at Oregon State, although conditions varied with locale. The synthetic line was also used in New Zealand on self-releasing chokers as well.

End connectors research

One of the more eagerly anticipated presentations was from graduate research assistant Joel Hartter, and the results of the re-

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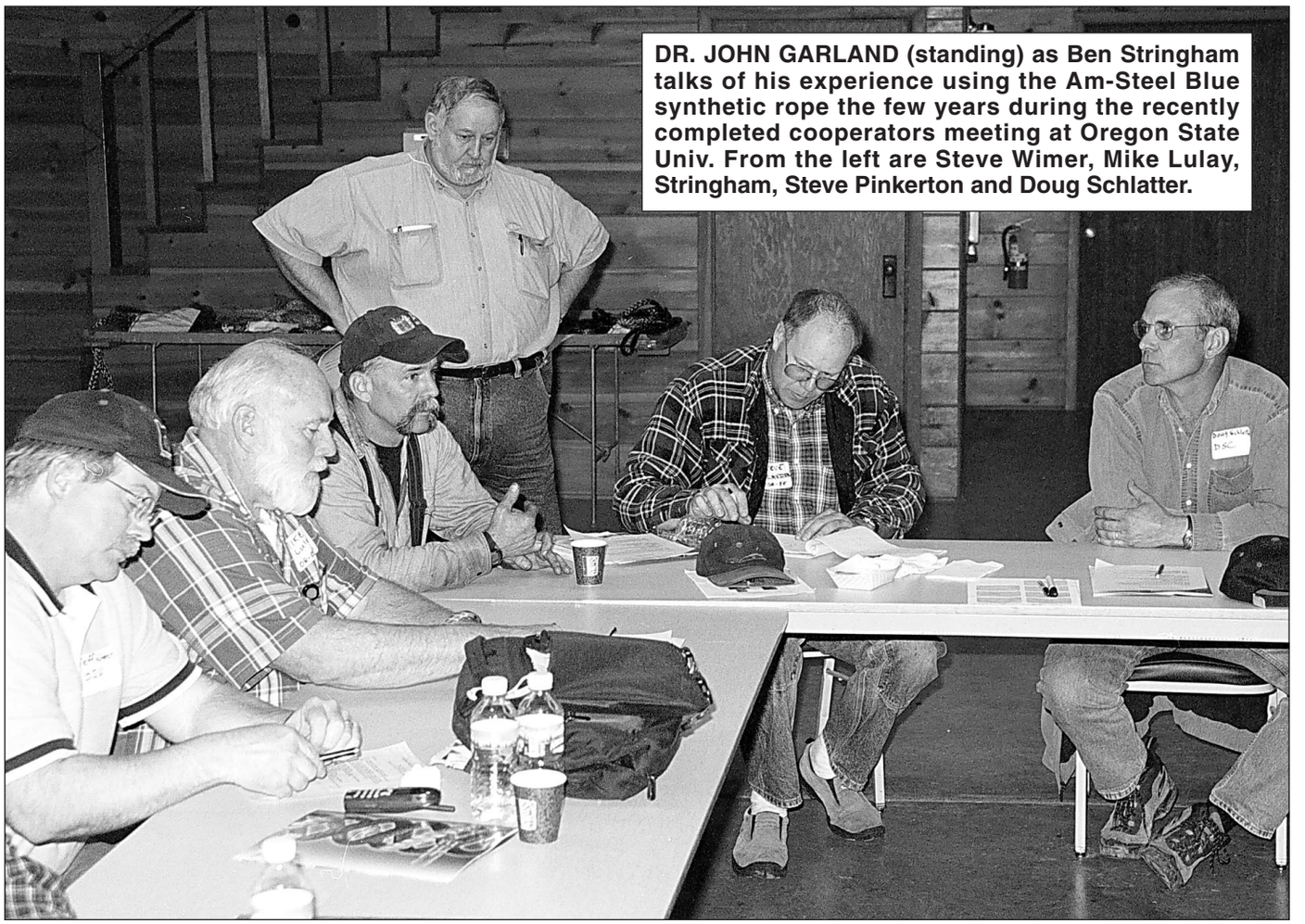
VARIIOUS pices of working Am-Steel Blue and some Am-Steel Blue II on display for all to examine at the cooperators meeting.



DR. JOHN GARLAND (standing) as Ben Stringham talks of his experience using the Am-Steel Blue synthetic rope the few years during the recently completed cooperators meeting at Oregon State Univ. From the left are Steve Wimer, Mike Lulay, Stringham, Steve Pinkerton and Doug Schlatter.

Synthetic rope

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search he's been involved with on synthetic rope end connectors for harvesting applications.

There are some obstacles by the very nature of synthetic rope's characteristics that have made end connectors a challenge. With the AmSteel Blue, it has a low coefficient of friction (about 0.08), low heat resistance (max. working temperature is 158 deg. F), and does not bond well to other materials.

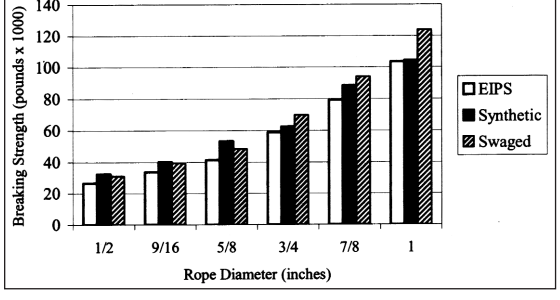
The rope's manufacturer, Samson, recommends splices only, and tests consistently demonstrate the rope loses very little of its strength from that modification.

A number of splices have worked well, in terms of joining two pieces together (long splice), making an eye by feeding the rope back onto itself (eye splice), whoopee slings, that feed back through the rope itself, which allows for length adjustment, and Y-Splices.

Knots or compressing the synthetic rope greatly reduces both its strength and resilience, and epoxy proved disappointing as well.

What has proven to work best is creating an eye splice that looks over an end connector. That maintains the strength of the rope while allowing a terminator. Some original designs of this are not quite ready for public use as yet, but are expected in the near future.

FIGURE 2. Ultimate breaking strengths of common diameter ropes used in logging applications: comparison of steel wire rope with AMSTEEL-BLUE (UHMWPE) synthetic rope.



Hartter noted that seven of the 14 end connectors which were tested were suitable for commercial use. He made particular emphasis that knots on the synthetic rope should not be used (sacrifices strength, and because of the lack of abrasion, ultimately will slip and fail).

The central point to keep in mind in working with the synthetic rope is when they encounter any surface, that the surface be smooth, and if the rope is looped over that surface that it be smooth, rounded, and without sharp edges. With that and a good eye splice, you're able to maintain the ropes strength, and form a connection with (as in the case with synthetic wrappers) lengths of chain.

A new development

Samson developed a second Am-Steel product called Am-Steel Blue II. "It's two ropes," said Samson representative Dave Strauss, "made to resist the wear." This was in response to the wear they were seeing in the log truck wrappers. The outside blue layer covers the interior yellow core. "When the core is visible, its time to retire," Strauss reiterated "it's a double braid... with this product its core dependent in terms of the load."

The product to date has been used primarily with truck wrappers.

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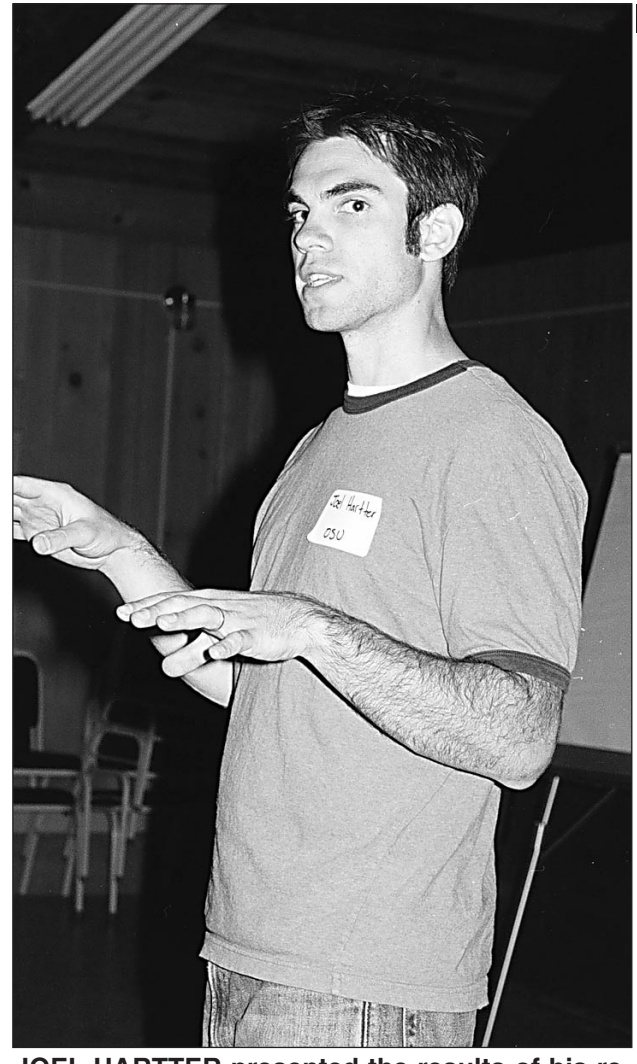
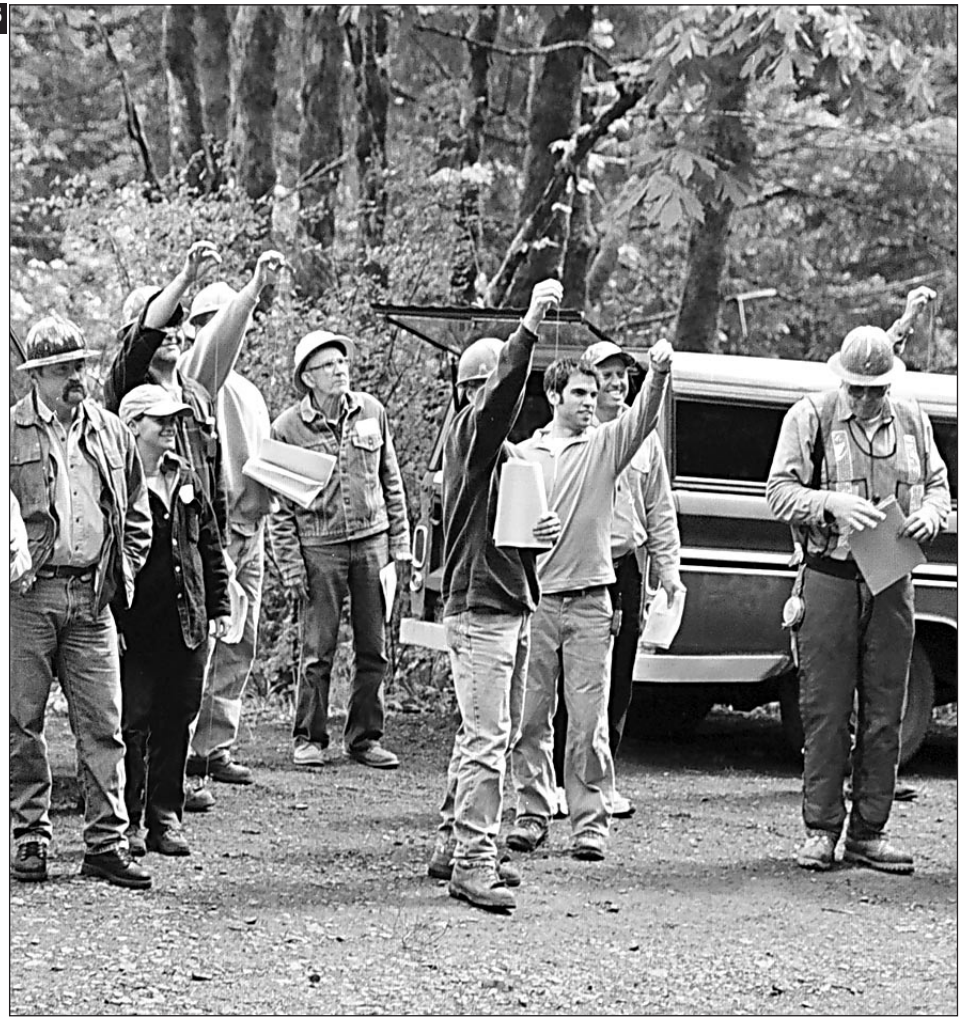


JOEL HARTTER presented the results of his research on synthetic rope end connectors during the cooperator's meeting. Hartter is a graduate assistant.



MEASURING DEFLECTOIN with a plumb bob are a number of those participating in the Division 7 Forest Activities Code Rigging Demonstations at Oregon State's McDonald Forest the day following the cooperator's meeting. During this demonstration, they also had a number of working and static displays set up using the Am-Steel Blue synthetic rope, which Oregon State has been researching for forest applications the past several years.

Synthetic rope

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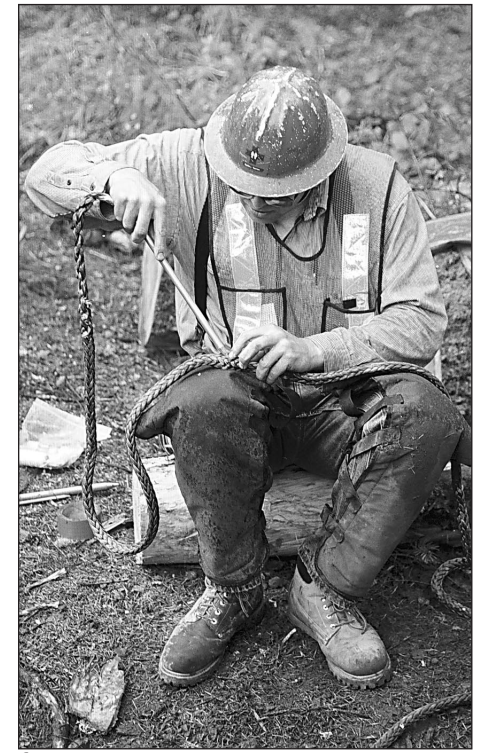
Other logging applications

A few things to keep in mind with AmSteel Blue, and likely with other similar makes of synthetic rope. First off, while it has strength similar to that seen in steel rope, the crew using this material has to be aware of how they treat it, in particular as it concerns sharp edges and rough surfaces. For instance, you'll want to make sure the stumps you tie to aren't going to snag or perforate the rope. Similarly, any surface the rope runs over should be smooth, and without sharp edges that can cut the strands.

The rope has excellent spooling characteristics, laying down on the spool very well, without the problems one can encounter with steel wire diving between loops and being difficult to retrieve. One plus several have alluded to, is the ability to get more line on the spool, which has some obvious benefits.

Some other applications:

• **Haywire:** one crew used about 2,000-ft. of 3/8ths inch AmSteel Blue, in three sections. "We wondered how we'd string them together, and used a short strap with a buried eye on each end, and connected." They hadn't found any problems with pulling it through the brush, and between the weight and its flexibility, it is much easier to deal with. Again, you have to be aware of running over sharp surfaces.



few

• **Drop line on a Boman skycar:** The crew runs 9/16ths. "We tied it with a knot and about eight wraps, then painted orange on the next 50-ft. so they had plenty of no-

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tice they were nearing the end. Those guys knew as soon as the line hits the ground, they need to be pulling line out because it will back spool." That occurred because they'd run very light turns at first. The emphasis is that you have to tension the spool. The benefit beyond the drop line being both light and flexible is the additional line that could be spooled. 'They were pulling out 300-ft. laterally." In conclusion, "Overall the crew really liked the material. They take care of it once they learn how to use it."

• Static line, guy lines, support lines, and jack lines for intermediate supports: First, if you're notching a tree, those notches must be clean, and not pinch the rope (which sacrifices rope strength). Also, when you wrap a stump, you cannot bind the synthetic cable because that compromises the line, and how the weight is distributed on the line.

• Intermediate support packs: several operators assembled all the intermediate support components on a single board, or pack, which enabled them to haul all they needed to rig a tree in a single trip. "It saves our bacon" said one contractor who's use the AmSteel the past year plus.

In the final analysis, synthetic rope is available from a number of vendors, many of which have similar characteristics to the AmSteel Blue and AmSteel Blue II products, although virtually all the research and testing both in the lab and in the field was with Samson's AmSteel.

And while the synthetic rope is not the answer to all situations all the time, it provides a number of obvious and sometimes not so obvious advantages (such as no jiggers from wear). It does require that the crew using it pays attention to how it's being used, particularly in its exposure to heat and sharp edges.

As the material finds its way into day-to-day use with logging crews, other innovations will inevitably come to light as is the norm. At present, it is three to fives times the cost of wire rope, but in the right circumstance many have found that a small price to pay for the weight, flexibility, strength and convenience, particularly when it comes with improved productivity and improved safety.

CLASSROOM in the open at the Division 7 Forest Activities Code Rigging Demonstations at Oregon State's McDonald Forest the day following the cooperator's meeting. Nearly 50 were in attendance for the day-long session.

WORKING TO TIGHTEN a "woopie sling" of Am-Steel Blue synthetic rope is one of the crew members with the help of Steve Pilkerton.