The company swallows a competitor

In which … a combining of companies and inventory data calls for some quick adjustments …

All the other serious Vice-Presidents from the other serious companies were acquiring land, so of course there came a time when OH's company felt it had to do the same. The opportunity for a takeover presented itself, and the decision was made quite independently of the state of the target's forest (some would say quite independently of logic). Of course the smaller company had an inventory which was used in the negotiations, but only for rough answers and it was subject to correction to set the final sale value.

A few days after the basic sale conditions were signed, the Biometrics group was called in to discuss the situation. The final price was based on the timber value (to be appraised "later") and "later" was now coming up very quickly. "How long will it take to do an evaluation of this land base", asked the manager in charge of cleaning up the details. "Well", said OH, "it's a bit like designing a rocket engine. It takes as long as you have. What is the time frame". "Twelve days, starting Monday", replied the manager.

The Nun nearly fainted, and The Kid was struck dumb. "No problem", said OH – after taking a deep breath. "That means that we should be done in about 9 days to leave room for surprises, revisions and problems. Luckily the weather is good enough to allow us full access to the area, which certainly makes life simpler. This will require some helicopter time, so we will start phoning right now to reserve some flying hours.

The first thing we will do is to get our young cruiser Jackson up in a chopper with a Global Positioning System to make sure there are no large errors such as unrecorded burns, grossly misidentified species or areas not updated from harvest or heavy thinnings [1]. We will get a more experience cruiser to assist with those calls, because some of the logging and terrain judgments might be of great interest. A small number of plots will not catch

[1] Even a young cruiser can recognize a burn or a horribly estimated volume.

many of these problems. When we know that the timber description is basically sound for the *entire* area then we are down to differences in practices between company methods or changes due to growth. While those aerial checks are being done we will get crews on the ground to put in plots. As soon as we have plot data we will do the compilations, in order to cut down the time between the end of the field work and the final report. I assume that the GIS people have transferred any data and can work tonight in order to produce maps and plot locations. The field crews and data compilers should be ready to go tomorrow".

"What is the purpose of this inventory", The Kid asked [2]. "The only question is the timber value", said the manager, "land value is handled in a different way. The purchase agreement is specifically geared to this number, and we must have it in a hurry." "Will this be audited ?", asked OH. The manager confirmed that the sellers would want to have some verification of the value. A few more questions were asked, such as :

~ Was the former inventory available on a database/GIS ? (yes)
~ Was it up to date ? (no)
~ How many of our crews were immediately available ? (3)
~ Did the growth potential matter ? (he was not sure)
~ Did the previous inventory give a stand value ? (yes)
~ Was logging cost essential - in other words, did we want the net value after logging, or for standing timber value ? (just standing value)
~ Was the only requirement the standing value ? (yes!) [3]

"All right", said OH, "let's just assume that I have already done the work. The answer is that the value is 1.04 times the rough cost used for the acquisition. Are we done now ?" The manager thought about this a moment, then confirmed that this one number was all he needed. OH got this in writing the next day. Asking for it in writing also had a wonderful affect on concentrating the manager's thought process.

There were several other questions that the manager could not really answer. The group was dismissed to form a plan, with the essentials to be decided by that afternoon.

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[2] OH had worked hard to make him focus on this "what is the question" approach to sampling problems, and The Kid was beginning to learn.

[3] The manager was a bit miffed that this question was being asked repeatedly. OH had learned from harsh experience that the really pivotal questions had to be asked many times and verified several ways. He knew perfectly well that once this question was answered, another *would* be asked – but if the management *swore* that this would not be done then perhaps the next questions might be asked more quietly and politely, and with time and budget attached.

"First", said The Nun, "I think we have to sort out sample size – what sampling error is required ?". "On the contrary", said OH, "there is no such requirement – there is only a time requirement. We will do what we can in the time available. We have 9 days and 3 crews. That determines sample size". This offended The Nun's recollection of her sample size lectures, but she could think of no rational argument to advance.

She tried again to be helpful. "With 10 plots per day, that gives us about 270 plots, which should give a reasonable estimate of the overall volume". "Wrong", said OH. "The volume does not matter, it's the value we are looking for, and *more specifically* it is the value of the stands compared to the value that is already assigned by the previous inventory. If that ratio is fairly consistent it will quickly give us a good answer, and a consistent ratio will also minimize any bias from our selection of stands, since there will be some stands that we cannot visit for some reason." The Kid suggested to The Nun that she would probably recall this from her statistics class as a classic "Ratio Estimator", which she found comforting.

"In addition, we need to minimize the waste of precious time moving between stands. We should therefore put in clusters of plots within stands. We might get 3 stands done per day, but let's plan on 2. That gives us (9*3*2) = 54 stands to visit to establish a ratio. We will maximize the efficiency by having a few temporary people doing count plots which will give us good species percentages [4]. The experienced cruisers will do all the defect calculations and log grading."

"How many plots in a stand", asked The Nun. "As many as we can get with the available time", replied OH. "The cluster gives one number, and that will be compared to the previous inventory estimate of that stand value". "Won't that complicate the Sampling Error calculation ?", she foolishly asked. "Vi, how many times do I have to tell you ? Nobody cares about the Sampling Error. It matters little or nothing. Any calculated Sampling Error (or a guess, for that matter), will be sufficient. We are not buying a Sampling Error, we are buying a forest. The standard equations are more than adequate for this situation. The important thing here is the answer, and getting it in time."

"What stands should we check ?", asked The Kid. OH was clearly worried about this. "If we can get the GIS people to do it quickly, we will use a sorted list of stand values per acre and choose systematically from that. We will choose stands proportional to their total value. When we choose very large stands, we will break them up and actually sample parts of them so we do not have too large an area to work on. This systematic sample will not only get us an answer, but will give us some data to see if

[4] There was not much training needed for that simple part of the process, although they did need to be careful and get accurate tree counts. *Simple - but important*.

there is a trend in measured and estimated stand value". Lem understood the virtues of a sorted list, and little more needed to be said.

"If we cannot get any help from the GIS people, we will just take a grid sample across the maps. This will also select stands proportional to their area, and will be slightly less efficient, but adequate", OH concluded. "In the end, we will compute a ratio correction (or a regression) between the old value estimates and our own measured value".

"If we have extra time, can we put in a few more observations ?", Lem asked. "A good point, and we will arrange that", agreed OH. "We will set an initial sample size we know we can complete, and then take random samples during the rest of the time available. There is certainly no bias involved with such a process." A warning glace at The Nun was enough for her to drop any remarks about variance complications when combining systematic and random plots.

"The old inventory is not up-to-date, and the other company probably used different standards, taper functions, and all kinds of other details", suggest Vi, who was eager to suggest an issue. "Not a problem", OH replied. "All we need is a value that is *proportional* to our measurements. The change in standards is not likely to make much difference. It will only change the ratio between our value and the initial estimates. After we do our field work, the average correction ratio will adjust for *all* these procedural differences at once."

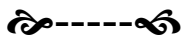
"Should we stratify the existing stands in some way ?" asked The Kid. "I don't know", replied OH. "The ratio might be quite similar for all stands, so stratification is not obviously needed. Since the requirement is standing value it seems clear that we better have a cross-section of the stands checked, just to give the financial people some confidence. Let's use a high-value and a low-value strata, with fewer measurements in the low value strata. In addition, we might want a third strata for the areas planned for logging within the next 5 to 10 years. Let's make sure there was no surprise reason this company was sold because of immediate harvest issues, including constraints that we might inherit."

"How will we handle the auditing ?", asked The Kid. "Simple enough", said OH. "We will ask the seller to either put some people on our crews to verify the work, or we will ask them to visit the same plots and attach a value to the measured trees. They can check some tree counts if they wish, but there is little to go wrong there. Since we have already flagged in the route and marked the trees, this should be very efficient for them (or for their auditor/contractors). When we are all done, we compare our value to theirs. Regardless of individual tree differences we should have an overall number we can agree on. We will have a direct estimate of the

difference between their opinion and ours on a sample we can verify is correctly chosen.

"One thing we will have to do is to agree upon an approach with the seller - and quickly. If our differences are only about computation, we can do it both ways, or decide on that later when we have the data. Let's just make sure we all agree on field procedures when possible. We will also measure some site indexes, just in case the growth rates get considered in the value determination. When we cannot agree, let the other crew do it their own way, but let's do things the same way whenever possible."

The probability is good that we will all agree. They could even use different methods, if they choose, and the chances are we will still be close enough to close this deal with no problems. Neither side wants to screw up the process over just a few dollars."



The deal was, indeed, done. There were lots of differences on calling individual log values, but the overall answer was quite close.

Too much money was paid, but not because of the inventory values. Everybody was happy except the shareholders who had to pay off the cost of an overpriced acquisition by an upwardly mobile Vice-President.

Note to readers … the next chapter is about check cruising issues.

Franklin : Have you ever thought, headmaster, that your standards might perhaps be a little out of date ?

Headmaster : Of course they're out of date. Standards are always out of date. That is what makes them standards.

Alan Bennett
Forty Years On (1969) act 2

"In God we trust; all others must bring data."

W. Edwards Deming

Consistency is the paste jewel that only cheap men cherish.

William Allen White