

Development of the B.C. Vegetation Inventory Training Program

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Abstract.—During the development of the B.C. Vegetation Resources Inventory, it was recognized that success would depend on the ability to implement and actually carry out the design. It was accepted that a training program would be an integral component of the inventory process. A formal process tied to basic principles of committee structure and recognition of work well done has provided a modular, competency-based program. To date, over 80 timber and ecology specialists have been trained and 60 have been certified. The program provides a means of developing and maintaining technical competency, identifying successes and shortcomings of the inventory design process, and serves to promote field-level careers in inventory implementation into the 21st century.

When I first agreed to participate in this conference, and before I had spoken with the two preceding speakers, I thought I would talk about the roles of field people in the design and implementation of a successful inventory. My involvement in the process is as a cruiser, a scaler, and an educator. I suggested in my original abstract that an inventory is a success not when the design is complete, but when it works. An inventory that works *will have* used academics, consultants, and the educational community as well as cruisers and other field practitioners throughout all stages of design, testing, and implementation. The previous speakers provided background to the B.C. Provincial Inventory and described the technical requirements, successes, and failures. Both speakers stressed that credibility has been and is an issue. Dr. Iles pointed out that virtually all difficulties encountered were people-related. If, as I suggest, an inventory is only a success when it works, it should be fairly apparent that cooperation and involvement by all participating groups is necessary. So, instead of pursuing the original topic, I will carry on where the previous speakers left off, and discuss the Provincial Vegetation Inventory training program and our experiences to date with its implementation.

WHY DID WE DO IT

The 1992 report by the Timber Inventory Task Force (TITF) stated:

"Inventory branch has put in very few field inventory plots in the last decade. Many of the experienced staff have moved on. There is a serious need for training, and for the anticipation

of future developments in the Branch. Any new inventory will last a long time. Errors due to lack of training and quality control will occur. There will be a great need to develop career path specialists to direct the work....modify, interpret, recompile, and add to the next data set. It is important that training not just be oriented to Branch procedures, but to general principles and future options" (TITF 1992).

The 1995 Vegetation Inventory Working Group (VIWG) said:

"training of field staff is a serious concern, and should be given a high priority." If...not provided ...could jeopardize the Vegetation inventory....only trained people should be employed..." (VIWG 1995).

This need anticipated during the original Timber Inventory Task Force study and again during the work by the Vegetation Inventory Working Group was confirmed during the various field trials. It became apparent, especially during operational trials, that ad hoc training was not adequate.

A needs analysis was commissioned. The consultant contacted various stakeholders, confirmed training as a priority, and provided an indication of the market size.

WHAT WAS THE PROCESS/ COMMITTEE STRUCTURE

The process was overseen by a steering committee composed of members of the Vegetation Inventory Committee and its working groups.

Course material was developed by subject matter experts (S.M.E.'s) who were selected based on their extensive experience, credibility, and proven track record. The

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subject matter experts were assigned topics that matched the provincial procedures manual, and they developed the curriculum under the guidance of the steering committee and a contract educational consultant.

All curriculum material was field tested during operational trials, and many modifications were made based on the feedback. Instructors were selected and the first course was delivered to the potential instructors by the steering committee and the S.M.E.'s who developed the material and who were ultimately responsible for it. Feedback from that firsthand exposure resulted in further and final modifications.

ASSUMPTIONS GUIDING THE PROGRAM DEVELOPMENT

During the training program development, there were a few assumptions or guiding principles.

It was assumed that the inventory sampling would start slowly, probably province-wide, to fully test the procedures. It was assumed that about 400 samples would be established annually for the first few years and that a crew of two would establish a single cluster sample in 1 day. An average 3-month field season would require about 10 crews or about 20 people to be trained each year for the first couple of years.

It was assumed that everyone collecting provincial data would be trained, certified, and competent. It was also assumed that the training would be free or tied to contracts so that contractors could write off the training expense. It was assumed that training would be a minimal financial burden to the contract community.

It was also assumed that the material would be in the public domain, available to colleges and universities, and that an instructional accreditation process would be developed to facilitate the eventual transfer of instructional responsibility to the educational community.

PRINCIPLES OF THE DEVELOPED TRAINING PROGRAM

All of the original assumptions survived the development stage, and a few more were added to the final product.

The concept that everyone collecting provincial data will be competent and certified through an evaluation process was re-emphasized. Competency is based on a demonstrated mastery of the Vegetation Inventory procedures and principles, not on previous experience, professional title, or membership in any professional organization.

The basis for training is the Provincial procedures manual, and any change to the procedures will be reflected in the

training. Experience arising from training will be used for assessing future procedural modifications.

The procedures and the resulting training program are based on principles rather than rules, and the training will encourage participants to approach sampling problems laterally rather than in our traditional vertical manner.

The curriculum is Provincial and common to the entire province. The procedures will not change by region, but the applications will vary with the significant changes in climate, topography, vegetation, and forest health encountered from region to region. Local experts in soils, ecology, and forest health will supplement the instructional staff in each Forest Service region.

The course is modular and is normally delivered as a package. If modules are to be taken individually, they must be accompanied by an inventory overview and discussion of inventory and sampling procedures. Module material may not be de-coupled from the principles. Training is separated into two streams, one for timber and one for ecology. Individuals must receive "cross training" in the other's specialty before certification. Certification will follow the successful completion of all modules, field mentoring, and audited experience.

THE FINISHED PRODUCT

The training program is normally a 13-day *full program* made up of eight modules. The final 2 days are for evaluation and are a combination of written, oral, and field skills demonstrations. Four of the modules are common and must be taken by all participants; the remaining modules are specific to either the timber or ecology stream participants.

Modules

1. Overview of the Veg Inv	timber and ecology
2. Field orientation and navigation	timber and ecology
3. Principles of sampling and plot est.	timber and ecology
4. Inventory cruising	timber
5. Call grading and net factoring	timber
6. Plants, soils, and old growth	ecology
7. Forage measurements	ecology
8. Coarse woody debris	timber and ecology

Each module or course is accompanied by an introductory video, and the course materials are an extensive package of instructor guides, reference material, overheads, slides, participant guides, and example oral questions.

Challenge Program

Individuals are able to "challenge" the program pre-requisites or in some cases may actually challenge the individual modules or an entire stream.

Successful challengers to the pre-requisites participate in the full 13-day program, while module and stream challengers receive a 1-day theoretical overview, a 1-day integrated practice session, and then join the full participants for the final 2-day evaluation process.

The challenge program is based on a prior learning assessment (P.L.A.) process. The program assesses learning gained through experience, uses a simple portfolio approach, and relies on certified individuals "signing off" specified competencies.

The intention of using a prior learning evaluation is to recognize learning gained through experience, minimize occupational barriers and training duplication, focus on results rather than process, and contribute to self esteem by recognizing experiential learning.

DELIVERING THE TRAINING PROGRAM

Since the program was first delivered in 1996, there have been 8 training sessions, and 48 timber specialists and 19 ecology specialists have been certified.

The courses normally have between 15 and 20 people in them, usually more in timber than in ecology. The courses are delivered across the province and are coordinated through an outside agency.

During the first year, the instructor to staff ratio was very high. Initial courses ran with five instructors. Most recently, courses have been conducted with a lead instructor to coordinate and teach the challenge participants and another two instructors to teach the timber and ecology streams.

The course is usually delivered with the first three modules as common with both timber and ecology participants together. The streams are then split for discipline-specific instruction and brought together again for work as an integrated team.

Early courses were all full participation with no challengers present. The most recent courses have had more challengers than full participants.

Evaluation and Certification

As indicated earlier, certification is required to collect Provincial Inventory data. During the final 2 days of the training program the participant is required to take a

written and oral examination and then demonstrate competency on all procedures.

Certification is currently issued module by module. Certified participants are eligible to work on Provincial Inventory projects where they will be "mentored" for 2 to 4 days and audited on a schedule based on audit results.

Mentoring

Mentoring of the participants after their training session is an integral part of the learning process. Competence is required, and it is recognized that competence is achieved through experience. A mentor who is experienced and respected provides guidance to the learner during the early stages of the operational sampling. Each graduate will be mentored 2 to 4 days depending on need and opportunity. The mentors provide confidential support, serve as role models, and provide nonjudgmental instruction and guidance.

Audit Program

The audit program was developed using a process similar to that of the original inventory. An independent contractor was hired to facilitate the process. The contractor formed a working group of experienced and respected field practitioners to develop the audit objectives, strategies, and procedures. Those procedures were put into draft form by the Forest Service and were reviewed by the working group, instructors, and regional staff before they were finalized.

The audit is used for contract control and inventory validation, and it serves as a training tool by providing early feedback to the sampling team. Audits are performed by trained and competent people. Each sampler is audited on a schedule that declines with success. The audit results are the final assessment of competency and may be used to recommend further mentoring, additional training, or the removal of certification.

HOW HAVE WE DONE WITH OPERATIONAL SAMPLING

The recommendations of the Vegetation Inventory Working Group were:

"The ministry of Forests should conduct this entire Inventory" and "These proposed Vegetation Inventory procedures should not be forced on groups who have historical data processes adequate to their own procedures for resource management" (VIWG 1995).

A loss of funding has required the Forest Service to develop partnerships with "corporate inventories" to collect the Provincial Inventory samples.

There have been about 11 field projects since 1966. Some of the projects have been Forest Service initiated, coordinated, and supervised, but most are funded "corporate inventories" with a mixture of full VRI samples and "timber only" samples. The majority of the plots are "timber emphasis plots," but all plots must use Provincial Vegetation Inventory procedures and standards.

Currently, there are about 250 full VRI samples and about 1,500 timber only samples established in B.C. Data editing, database entry, and compilation are moving fairly slowly, especially for the full VRI sample data.

Most projects are carried out by licensees who are subcontracting the project supervision, project management, and field sampling. Typically, crews are two or three people with a timber specialist, an ecology specialist, and an assistant trainee. All but the trainee are certified and are on a mentoring and audit schedule.

WHAT WORKED FOR US

Developing principles or guidelines and sticking to them has worked.

It works to emphasize principles throughout training, mentoring, and auditing. Field people are learning to use common sense and to pay attention to the objective rather than simply follow rules.

Demanding that competency be demonstrated has worked. It has emphasized the commitment to accuracy and is sending a clear message that those who are certified have earned it, are proud of it, and intend to maintain the standards.

Using experienced, respected, and qualified people willing to work as subject matter experts, instructors, and mentors has resulted in a product that works in the field. Material developed and advice given by experienced and respected people is not challenged frivolously and tends to remain stable.

It worked when committees were able to meet often, work as a team, and not have alternate agendas.

The educational consultants worked well by being non-intrusive in technical matters and by providing 24-hour support for busy volunteer subject matter experts.

Assigning tasks appropriate to skills, attaching names to the final product, and giving written credit where it is due works.

It worked well for us to field test every proposed procedure several times and in varying conditions before accepting it as a procedure.

Following a formal process involving many is often painful until all parties have had their say and until everyone recognizes that the process is technical and not political. Eventually when only "workers" remain and everyone else has gone away happy and unthreatened, the work can be done. It works and the product will be supported.

Introducing the concept of "challenging" through demonstrated learning has stressed the idea that competency must be demonstrated and is not a matter of experience, position, or professional standing. It has been a slow process, but the forest workers, rich on experience and short on academics, are beginning to recognize that documenting learning for educational credit may be worth the trouble and effort.

Involving regional experts during training programs has provided credibility and local expertise.

Basing the instruction modules on a sound, principle-based, procedures manual has provided teaching boundaries and solid reference material.

Sticking to the idea that competency is not acquired through courses but must be developed through supervised practice is reinforcing the commitment to develop inventory professionals.

Competency-based evaluations and the requirement that Forest Service staff complete the same training and certification as everyone else send the appropriate message about commitment to standards.

It worked to use acknowledged experts (vs. specialists) to develop the audit objectives and strategies. It has provided an excellent starting point and will serve as principles and reference for the Forest Service.

Supporting the inclusion of ecological data supports integration and is a good idea. It gives "social" credibility to the program. Technical success will not be the only measure of inventory success. Credibility is an issue and society will demand the collection of information other than tree data.

Making procedures and training material available to educational institutions is a sure way to ensure provincial use of good, conceptually sound, material.

WHERE HAVE WE HAD PROBLEMS—SUGGESTIONS

Problems arise if you include, in the technical process, people not qualified to be there. It is appropriate to develop and test sampling procedures based on agency or individual concerns. It is a mistake to indulge the

operational collection of data without the sponsoring agency demonstrating needs and participating in testing and operational use. Try the following:

Include people who "have a need"—sideline them from the technical input—it is not a consensus process; have them work as steering committees and liaison committees.

Include field collection procedures only if the sponsors have field tested them (extensively) themselves; have sponsors teach the procedures before asking others to teach them.

Moving to an operation level without first developing and testing data acquisition, database, and reporting tools creates problems:

If possible, don't go operational until the entire process is in place, and tested—start small—field crews quickly learn which data are real and which are speculative.

It is a mistake to not completely involve those who will eventually implement the inventory:

Spend time during the design phase and definitely during testing to explain the objectives and process to regional or field supervisors.

Problems will arise if agencies "in charge" exercise control through authority and generation of rules and when "being in charge" is the objective:

Only those qualified to be in charge should be; train those in charge, encourage an understanding of principle, discourage the proliferation of rules and vertical thinking, encourage initiative, and reward success.

The people charged with responsibility must have authority and must be willing and able to use their judgment about principles and objectives; they must be informed, trained, and committed.

An inappropriate field load will kill an inventory project:

Develop procedures for all data requirements; field test and perfect the procedures; remove excessive requirements; put some on the shelf for later use; recognize that inventory is a sample, not a site description; have data collection appropriate to conditions, time, and training; have the owners of the data collect the data—it may require you to declare ownership.

It is a mistake to not have an effective communication process to immediately answer field concerns:

Provide a means for field supervisors to have their problems and concerns addressed and solved immediately; someone with authority must be available to SOLVE problems—not defer or pass them along; that person then should have the responsibility to take the change or issue to the procedure level and to the training program.

Problems can be anticipated and technical changes can be handled appropriately if an independent overview technical steering committee is in place:

Maintain an independent group of experts to provide technical advice and keep individual technical issues in perspective.

It is a good idea to view the inventory design as a set of tools to be used or not used as required. It is a mistake to require all of the tools to be used at all times, and it is a mistake to put broken tools back in the toolbox:

Train and educate field supervisors so that they will have the judgment and the authority to select the appropriate tools for use; do not allow bureaucrats to impose mandatory field procedures based on their inability to develop flexible edit and compilation routines; test and fix the procedures for any particular component before putting it away for future use.

For many reasons, mostly economic, the slow controlled start of the Vegetation Inventory did not happen. The training plan anticipated a slow start with inventory samples being established, in fairly large sampling units, controlled by the Forest Service. It was anticipated that secure funding would allow projects to be identified enough in advance that contractors could advance bid and participate in training before the project start time.

Problems arose when funding shifted to the corporate side, and it was necessary to pursue the Provincial Vegetation Inventory in partnership with licensees. Licensees were required to use the VRI procedures for their corporate inventories.

Sampling unit sizes decreased, the number of samples increased, more people had to be trained, training objectives were different for corporate samples, and training could not be tied to specific projects. Contractors could not afford to send participants without secured contracts, project finalization often did not provide lead time to develop a course, skilled instructors were few and committed, and available contractors were not qualified for the training as designed.

It is proving difficult and expensive to develop qualified instructors when courses are seasonal and compete with other projects. There are not enough projects to warrant training a large group of instructors, and a small instructor group limits training flexibility.

We moved ahead of our ability to train, certify, monitor, and support the product. If the training is mandatory, it is the limiting factor.

Compromising on principles is not a solution:

Success requires that all the pieces work; don't impose field requirements that your training people can't handle.

Competency-based programs require a certain skill level for entry; experience, credentials, or influence is not a substitute; stick to the pre-requisites—in the long run it will be respected and will provide necessary credibility.

As Dr. Iles indicated earlier in "one of those.... modern inventories....the potential for disaster was enormous....however, we seem to have pulled it off (the design, that is—the *execution* is still very much up in the air.)"

The design is working and the procedures, with a few exceptions, are working. The methods that "had drifted off track" or were "wrong headed" have been largely banished. Participants of the training program have embraced the principles taught and seem willing to continue to do so. Field crews seem to understand a valid sample, they are wary of bias, they appreciate simple and sound collection methods, and they work hard at accuracy.

The inventory design, procedures, and the training program are a success, and the director of inventory is listening and seems willing to make changes as required.

If the de Morga's can step away and provide room for people who are capable and able to deal with the details, perhaps the implementation will succeed as well.

There is a need to define ownership of the inventory process so that the ecology sample size can be reduced and the one or two untested procedures can be fixed to avoid damaging the credibility of the majority of tested procedures.

The tedious and difficult behind-the-scene details need to be taken up by those concerned with doing the work rather than being in charge, and the process of communication with regions, districts, and industry must be restarted and expanded. A full record of the VIWG and

training process; the submissions, discussions of technical issues, and decisions on those issues; and the recommendations for implementation should be prepared and used to clarify the intent, purpose, and limitations of the inventory design. The training program needs to be modified to address current realities. There is a need to de-couple the training from projects, and reduce the costs by providing individual module delivery during the off season and by developing alternate forms of delivery. The challenge program should be simplified and should provide short "upgrade" courses to facilitate program entry or, in some cases, to expedite the challenge process and reduce the demand for full training programs, and the details of certification and re-certification should be left to an educational institution or certifying association.

The real challenge to me, as an educator, is to move professionally prepared technical material into the colleges and universities. As our populations have grown and as our workforce requirements have changed, it has become socially necessary to enter the workforce as late as possible. School is a great place to keep people out of the work environment.

Few would argue that our time spent in school is time spent learning. We now spend 16 to 18 years earning credentials to gain an entry-level position in the workforce. Bachelor degrees are now required where high school diplomas were once adequate.

Unfortunately, the people with the bachelor's degrees and the universities don't know it. The graduate expectations don't match entry-level needs. Employers don't provide extensive on-the-job training, and the universities don't teach the technical material that would provide the skills for those entry-level positions. Our entry-level graduates do not expect to work their way up. They certainly do not expect to have careers as cruisers or as dirt foresters. In most cases, they do not have the technical skills even if they wished to do so.

The success of inventories and other field-based processes depends on professional field people. There must be careers for cruisers, field ecologists, and dirt foresters. Some continuity and stability in the field workforce is required. Over the long run, we will certainly not succeed by providing project-specific training programs. The skills, and to some degree the procedures, will have to be developed and learned during our ever increasing school time.

Technical material that is rooted in principle, that is prepared by competent experienced people, and that is field tested and found to work must find its place in our post-secondary curriculum.

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