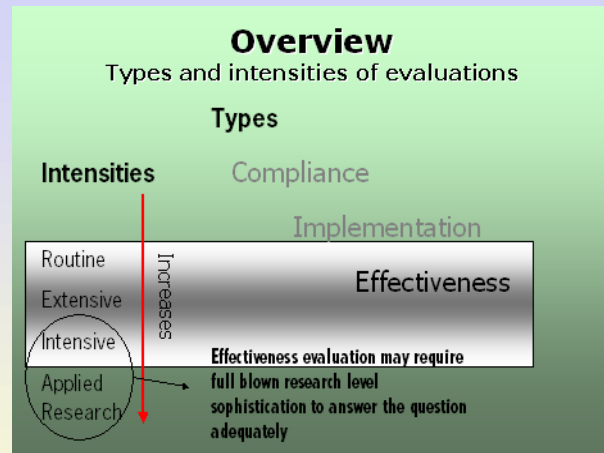


A Primer on Monitoring and Evaluation Approaches



FRPA Resource Evaluation Program

Ministry of Forests

Ministry of
Water, Land &
Air Protection



THE UNIVERSITY OF BRITISH COLUMBIA

A One-day Introductory Workshop - 2005

Prepared under contract by Symmetree Consulting Group Ltd.

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Section A

Workshop Goal

- To provide an understanding of the range of monitoring and evaluation options
- To focus attention on Effectiveness Evaluations, and what it takes to make an EFFECTIVE one



The goal for this session is to provide a full understanding of the range of monitoring and evaluation options. The focus will be on Effectiveness Evaluations.

The workshop will allow for discussion and participant input. This is not a project management workshop. It is not meant to walk someone through all the steps on setting up an EE program, instead it is meant to provide a thought framework from which a monitoring strategy can be based. A second workshop aimed at creating the groundwork for a specific Question/evaluation strategy is an option.

Notes:

Agenda

- Course Introduction
- Why monitor or evaluate?
- The range of evaluation options
- Indicators – choosing good ones
- Case studies
- Review

Agenda continued

- Case studies
 - Weyerhaeuser Forest Strategy
 - Washington State Habitat Restoration
 - Thinning and wildfire severity
 - Stand level biodiversity and Riparian Assessments in BC
- Creating your own evaluation

Notes:

OVERVIEW:

Effectiveness Evaluations – A primer for making them truly effective

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ABSTRACT

This document describes the workshop flow and contents using examples from the presentation materials. The one-day workshop has been created to provide background and useful steps in designing true Effectiveness Evaluations, and differentiating them from other types of evaluations or monitoring. The workshop focuses on a process to develop effective indicators. Case studies are used to highlight successful approaches.

The workshop is made up of modules that cover the following.

- ❑ Why monitor or evaluate? The initial module provides an introduction on why we monitor or evaluate and how important framing the initial question is. That is what is it we want to know? The question drives the approach.
- ❑ The monitoring continuum. This module covers how the various types of monitoring: Compliance, Implementation, Effectiveness and Validation are related to one another forming a continuum.
- ❑ Designing good indicators. This is a key component of any truly EFFECTIVE monitoring or evaluation program. The critical factors in choosing good indicators are covered with examples.
- ❑ Case studies of Effectiveness Evaluations that include:
 - Weyerhaeuser Forest Strategy
 - Fuel treatments on wildfire severity
 - Habitat restoration – a full scale effectiveness evaluation program
 - Routine evaluations for Stand Level Biodiversity and Proper Riparian Function in BC

Keywords: Effectiveness Evaluation, Monitoring, Indicators, Case studies, Workshop
BACKGROUND

The workshop is a joint initiative of the BC Ministry of Forests, Forest Practices Branch (MOF), Ministry of Lands, Water & Air Protection (MWLAP) and the Centre of Applied Conservation Research, University of British Columbia (UBC). With the advent of the Forest and Range Practices Act (FRPA) and regulations there will be a greater emphasis on outcomes and results versus procedure and policy. The new reliance on results brings with it an obligation for assessment and evaluation, and the ability to use the subsequent data to learn and adapt procedures or policy.

To address this challenge, a joint steering committee was established (organizations mentioned above) consisting of: Peter Bradford, MoF, Frank Barber, MoF, Richard Thompson, MWLAP, Laurie Kremsater, UBC, Shawn Morford, FORREX, Craig Sutherland, MoF, Wayne Martin MoF, and Eric Lofroth, MWLAP. The steering committee was tasked with organizing a process to facilitate active participation in understanding and implementing Effectiveness Evaluations. The process is ongoing. This paper outlines a training session ‘Effectiveness Evaluations – A primer for making them truly effective’ one part of the process of making evaluations effective and part of the new forest stewardship model.

WHY MONITOR/EVALUATE – MODULE 2

Monitoring or evaluations are based on the desire to know the answer to a question. When a practice or treatment is chosen there is a need to determine first if it was done correctly (Implementation Evaluation), and secondly, if it achieved the objective that it was designed for (Effectiveness Evaluation). The workshop promotes the need to spend time up front clearly defining the question you are interested in answering. This step is essential in focusing future actions.

The workshop uses the example question “Are WTPs (Wildlife Tree Patches) working?” This question promotes discussion on linking data, analysis and the question at hand. Often a monitoring program will be rich in data, but poor in answers. Care must be taken when collecting information that it has a role in answering the specific question. There are five key aspects in the exploration process presented.

1. What is the ultimate goal? – Often referred to as the monitoring starting point or the impetus for the monitoring.
2. What is the underlying concern? - Monitoring endpoint?
3. What are the key issues or barriers for addressing the monitoring endpoint?
4. How easy or difficult is it to get to the ultimate monitoring endpoint?
5. Other constraints?

The module then explores each of these five points in relationship to maintaining stand level biodiversity with respect to the maintenance of WTPs.

EVALUATION CONTINUUM – MODULE 3

Evaluation can take many forms and intensities. This module highlights the range of evaluation approaches and nomenclature. The four types of evaluations presented are:

- Compliance - Does it meet the legal requirements?
- Implementation - Did you do what was intended?

- Effectiveness – Are the desired outcomes being met?
- Validation – Is our hypothesis correct?

These are further subdivided into monitoring intensities. The levels are:

- Routine – relatively simple using yes/no questions
- Extensive – more detail is used, for example categories are used such as good, fair and poor.
- Intensive – is more detailed yet and requires quantitative data collection.
- Applied research – is where a controlled replicated experimental design is used.

Each of the four types of evaluation are explored with respect to intensity to show the continuum of type and intensity as they relate to a varying array of questions.

DESIGNING GOOD INDICATORS FOR EFFECTIVENESS EVALUATIONS MODULE 4

Choice of indicators is a key element in creating “Effective” effectiveness evaluations. Where there are many options, choosing the right indicator can be confusing. This module provides a structured protocol for assessing indicators and ensuring that those chosen will answer the question that has been posed.

The choice of indicators is presented within the Monitoring/Evaluation Framework. The framework is as follows:

1. Clearly define the question (s) / objective (s)
2. Build indicators
3. Design the data collection approach
4. Plan the monitoring program
5. Implement
6. Check results against performance criteria
7. Make recommendations – i.e., feedback to management.

It is stressed that the process of monitoring and learning is ongoing. New answers may promote new questions and with that, new indicators. To ensure this process is effective requires a concerted effort in quality assurance at all steps and attention to detail with respect to information management.

Building Indicators

Four steps are presented: choosing or building the indicator to answer the question; test the initial indicator- specifically assess are they representative, reliable and feasible; replace adjust or add more indicators – retest; design performance criteria and indices.

The module describes what constitutes an indicator; that is something we can measure.

It is known that we can measure many things. A key to choosing the right indicator is looking deeper into the question to see what the underlying social concern is. For example; when asking the question, “Are my vegetation management treatments effective?”, we ask, “effective for what?” The actual question that derives the choice of indicator is; “Are my vegetation

management investments worthwhile?” This statement provides a monitoring endpoint from which to choose indicators. The key transition to the “actual question” is the underlying concern based on a true societal value or benefit. By itself effective vegetation management treatments pose no clear benefit to society. However, worthwhile investments clearly do. This question prompts further exploration of what makes an investment worthwhile (Noon, 2003)

This leads to the discussion on key issues, such as complex endpoints, types of indicators – function, structure or species based. Some practical considerations for indicator development are reviewed such as, are you comparing alternatives, are there accepted targets or thresholds in the literature, what is the time scale and area to be assessed by the indicator. A choice from equally representative and reliable indicators will come down to a question of practicality and cost.

Steps – an example using vegetation management is used, the following steps are described:

1. Choose initial indicators – e.g., brainstorming.
2. Test to see if they are representative, reliable and feasible. Specifically:
 - Representative – Does the indicator address the scope of the question? How well does it cover the key aspects of the monitoring endpoint? How well does it show differences between geographic units (if required)? How well does it show trends over time (if required)?
 - Reliable – Does the indicator directly affect the monitoring endpoint? Is the link well founded in science? Is it responsive to the actions we are concerned about – e.g., treatments, management practices? Is the response persistent? Can it be measured in a scientifically credible manner? Will the results have acceptable variability?
 - Feasible – Is the indicator practical? Are the data readily available? If not can the data be obtained at a reasonable cost and time frame?

IF THE INDICATOR FAILS ONE OR MORE TESTS - the following is recommended: either drop the indicator and replace with another, adjust the indicator to better address the question or objective, or add additional indicators to more thoroughly address the question or objective.

Once indicators are chosen one needs to determine when to change management practices based on that indicator? Performance criteria can help provide context for indicators by creating categories of ‘goodness’ or ‘badness’. These categories can then be used to provide feedback to managers. Examples are provided.

CASE STUDIES – MODULE 5

A suite of case studies has been created to allow participants to observe how various groups have approached effectiveness evaluations. The case studies chosen cover a range of detail and completeness. Some have results; others are in the earlier stages. All case studies are presented using the 7 step Monitoring / Evaluation framework described above.

Four examples have been chosen to highlight what goes into making an ‘effective’ effectiveness evaluation. The four case studies are:

Weyerhaeuser BC Coast Forest Strategy

(http://www.forestry.ubc.ca/conservation/forest_strategy/)

The Coast Forest Strategy uses stand level variable retention and landscape zoning, to maintain biological diversity and ecological processes on Weyerhaeuser Coastal Timberlands. To assess

whether the approach is indeed meeting its goals an aggressive monitoring and adaptive management program was implemented. The module covers the process as it relates to the 7 steps. The Forest Strategy case study allows participants to see the level of commitment and detail that is required when a full-scale adaptive management program is put into place.

Effect of Fuels Treatment on Wildlife Severity

(<http://www.cnr.colostate.edu/frws/research/westfire/FinalReport.pdf>)

An evaluation of fuels treatment on wildlife severity was undertaken by Philip Omi and Erik Martinson (2002) from Colorado State University. Their study looked at areas where fuel treatments had occurred with subsequent wildfires. The final report is found on the web (address above). The report outlines the steps taken, from identifying the question to the results and recommendations. It is an instructive example on how to put together a doable evaluation that can provide results in a timely fashion.

Monitoring and Evaluation Strategies for Habitat Restoration and Acquisition, Washington State Salmon Recovery Funding Board (2003)

(http://www.iac.wa.gov/Documents/SRFB/Monitoring/SRFB_Monitoring_Strategy.pdf)

The Washington State Salmon Recovery Funding Board as a follow-up from recommendations stemming from an Assessment of Monitoring Methods and Benefits for Salmon Recovery Funding Board Projects and Activities a full scale monitoring strategy was created. At this time 9 protocols were created for a range of issues relating to habitat restoration (found at, <http://www.iac.wa.gov/srfb/docs.htm>) including: Fish Passage Projects, Instream Habitat Projects, Riparian Plantings, Livestock Exclusions, Constrained Channels, Channel Connectivity, Spawning Gravel, Instream Diversions, and Habitat Protection. Each of these protocols contains a fully described set of steps to provide for an 'effective' evaluation. An example protocol is used to show the level of detail that the protocol requires. For additional information and specifics, the participant's are directed to the above web address.

Routine Evaluations for Stand Level Biodiversity and Proper Riparian Functioning in BC.

(<http://www.for.gov.bc.ca/hfp/frep/index.html>)

The objective of the Ministry of Forests Evaluation Program is to determine if forest and range policies and practices in British Columbia are achieving government's objectives for FRPA resource values, with a priority on environmental parameters and consideration for social and economic parameters, where appropriate. This will be accomplished by:

- Evaluating the status or trends of resource and ecosystem values and determining causal factors;
- Determining whether resource values are being managed in a sustainable manner through proven or alternative forest practices; and
- Recommending options for changes to forest and range policies, practices and legislation, where required.

Presently, three sets of values have pilot-level projects underway to test the chosen indicators. Two of these pilot projects, Stand Level Biodiversity and Proper Riparian Functioning, are included in this module to highlight the steps taken along the 7-step pathway. It is instructive to note that these pilot projects will be reassessed after the field season (assessing for whether their indicators are Representative, Reliable and Feasible). Province-wide monitoring will follow based on the results of assessments.

References:

British Columbia Ministry of Forests, FRPA Resource Evaluation Program Website

<http://www.for.gov.bc.ca/hfp/frep/index.html>

Noon, B.R. 2003. Conceptual issues in monitoring ecological resources. IN: D.E. Busch, J.C. Trexler (eds). Monitoring ecosystems: interdisciplinary approaches for evaluating ecoregional initiatives. Pp. 27-71. Island Press.

Omi, P and E. Martinson. 2002. Effect of fuels treatment on wildfire severity, final report. Submitted to the Joint Fires Science Program Governing Board. Western Forest Fire Research Center Colorado State University.

(<http://www.cnr.colostate.edu/frws/research/westfire/FinalReport.pdf>)

Taylor Associates Inc, Cascadia Consulting Group, R2 Resource Consultants. 2003. Monitoring and evaluation strategies for habitat restoration and acquisition. Washington State Salmon Recovery Funding Board.

http://www.iac.wa.gov/Documents/SRFB/Monitoring/SRFB_Final_Report_Complete-June-2003.pdf

Washington Salmon Recovery Funding Board. 2003. Monitoring and evaluation strategy for habitat restoration and acquisition projects. Draft 5/23/2003

http://www.iac.wa.gov/Documents/SRFB/Monitoring/SRFB_Monitoring_Strategy.pdf

Weyerhaeuser BC Coastal Forest Strategy

(http://www.forestry.ubc.ca/conservation/forest_strategy/)

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Section B

Why Monitor / Evaluate?



Monitoring overview Where to start

How about at the beginning?

You need to fully explore your management question or objective.

↘

So monitoring / evaluation provides what it was designed for.



Often we want to dive right in and start collecting data. We have a notion about the type of information we need and we think if we can just get some data on it the answer to our question, or solution to our issue will magically rise to the surface. The dilemma often encountered is that you don't get the data you really need, or, you collect too much unnecessary data so that the monitoring becomes unnecessarily complex and expensive.

Exploring the monitoring question / objective

Why spend the time up front?

- Potentially save time and money
- Useful results more quickly

Example - What do I want to know or what is my concern?

↓

- Are our WTPs working?



Is our question simple or complex?

Notes:

Exploring the monitoring question / objective

Are our WTPs working?

Gee - We collected all this data and we still aren't sure if they are working?



Sample 254 WTPs for:

1. Snags by species and size class
2. Live trees by species and diameter class
3. Nesting or denning activity
4. % blowdown
5. % cover of shrubs and herbs
6. Incidence of forest health agents

Notes:

Exploring the monitoring question / objective



What did we ask for?

I don't remember but I think we got it

Notes:

Exploring the monitoring question / objective

Are our WTPs working? – questions to explore...

1. **What is the ultimate goal –**
Monitoring Starting Point?
2. **What is the underlying concern? –**
Monitoring Endpoint?
3. **What are the key issues or barriers**
for addressing the monitoring endpoint?
4. **How easy or difficult** is it to get to the
ultimate monitoring endpoint?
5. **Other Constraints?**



A good reference on this subject is found in *Monitoring Ecosystems: Interdisciplinary Approaches for Evaluating Ecoregional Initiatives* Edited by David E Busch and Joel C. Trexler, specifically in Chapter 2 *Principles of Ecosystem Monitoring Design* by Barry Noon.

The Ultimate Goal may be vague – benefits unclear

Example: Ultimate Goal or Monitoring Starting Point

- **To Ensure WTP's are working to maintain Ecological Integrity.**

Underlying Concerns? - Must credibly link these concepts with what society values.

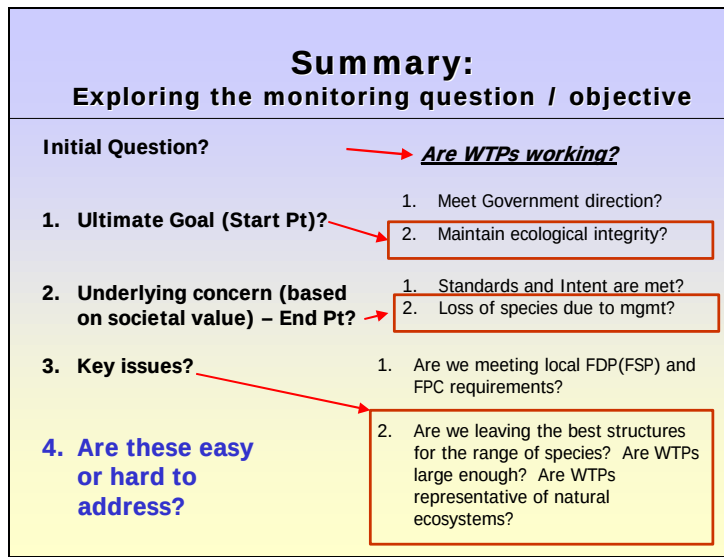
becomes the Monitoring Endpoint

Example:

- **Is there a loss of species due to management with WTPs?**

BUT – may still be tough to directly assess this

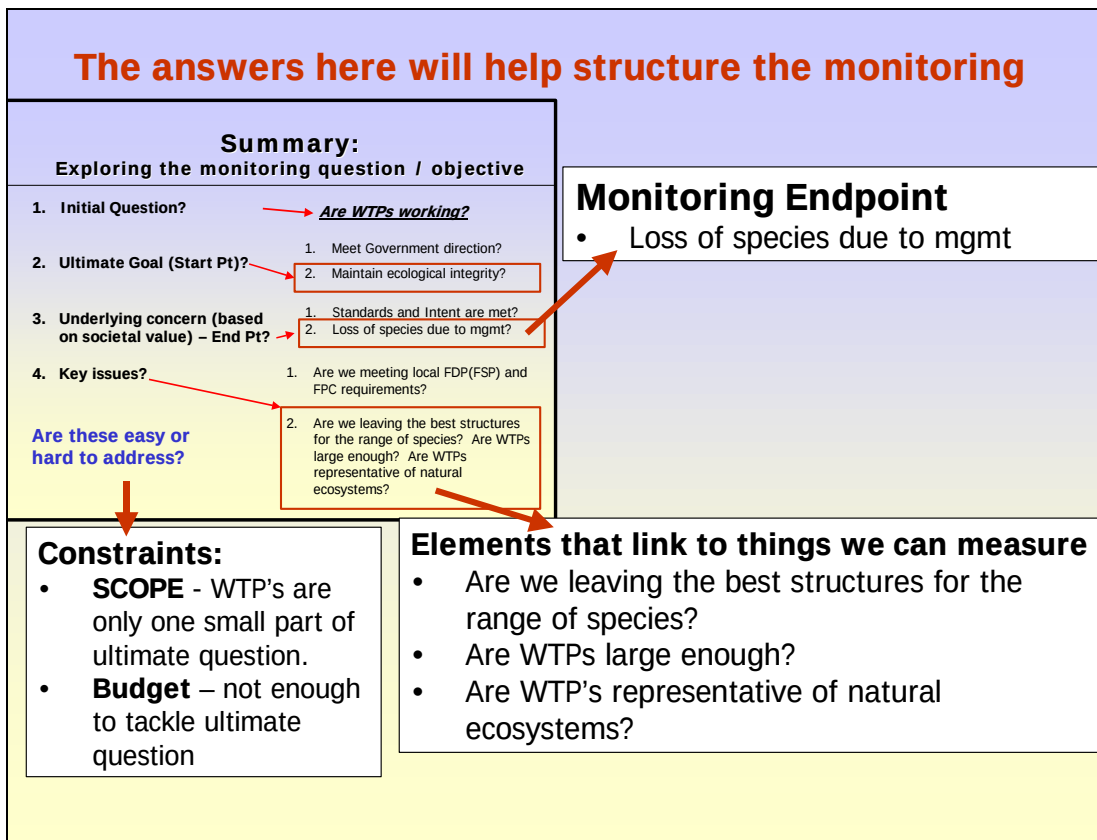
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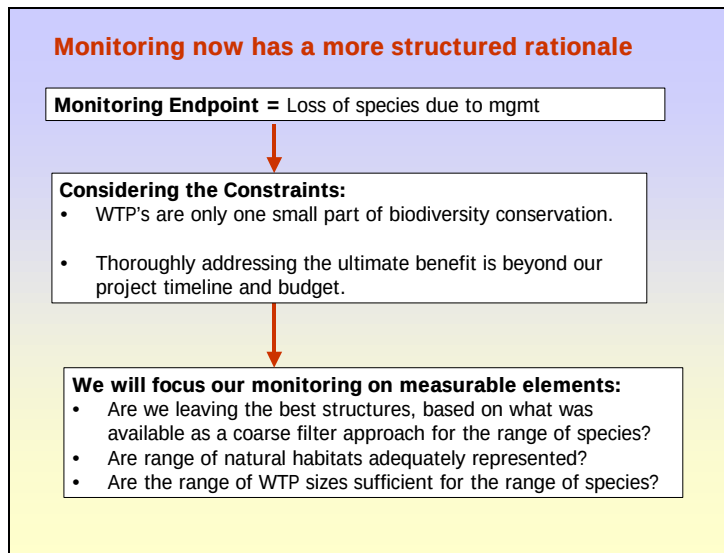
This summary shows how the initial question “Are WTPs working?” could have taken an entirely different direction. If our ultimate goal had dealt more with compliance issues (meeting government direction) monitoring would take on an entirely different focus.

Notice that once you start exploring your initial question, by looking for key issues and underlying concerns the challenges focus and scope for your monitoring becomes clearer.

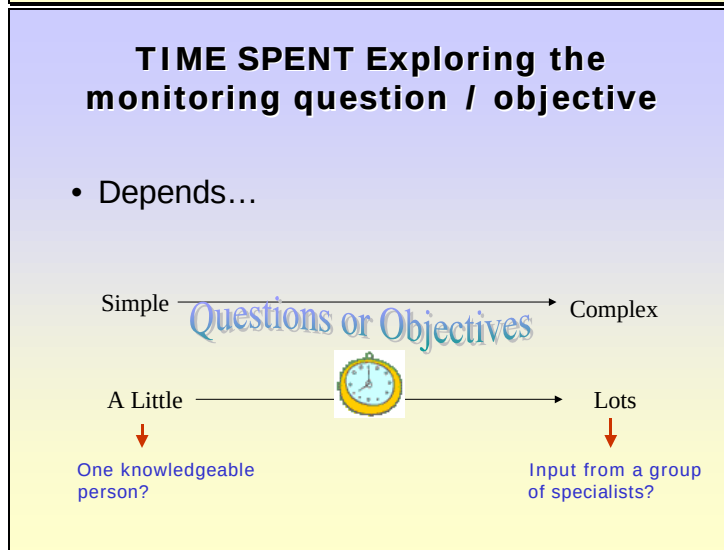
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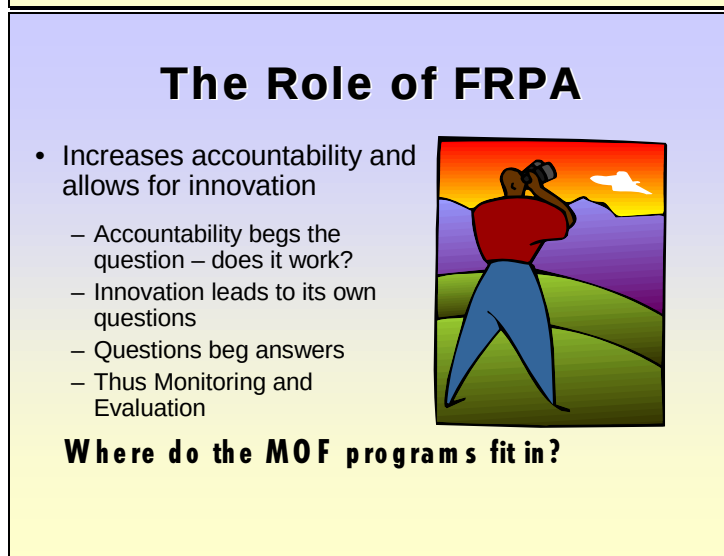
Notes:



Notes:



Time spent in the question exploration stage is worthwhile. It will vary from a little to lots and may involve one knowledgeable person or a whole team of folks (if the question is complex).



FRPA allows for innovation in forest practices by inclusion into Forest Stewardship Plans. It is the role of the District Manager to either approve or reject suggested innovative approaches based on the level of assurance they have that the procedure will meet the overriding objectives for the area.

Section C

Evaluation and Monitoring Approaches



Terminology and the Continuum

Monitoring /evaluations – what do you want to know and why?

Did we treat the whole area?

Did the treatment control the vegetation?

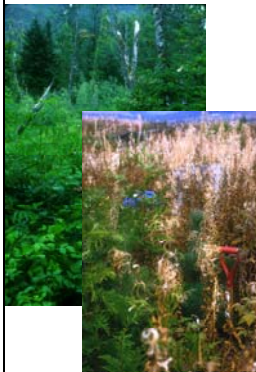
Did more trees survive and are they bigger?



The first question you need to ask when starting and working on a monitoring/evaluation project is: What is it that you want to know?

The type of monitoring and intensity should match the question and the available budget.

Evaluation overview Where to start



What is the ultimate goal?
Or put another way
What question are we trying to answer?
(Monitoring Starting Point)

What is the underlying concern?
Why do we care? (Monitoring Endpoint)

Is the question easy or hard to answer?

The answers to the above questions will help put you on the evaluation continuum.

Notes:

Types of Evaluations

Compliance	Does it meet the legal requirements?
Implementation	Did you do what was intended?
Effectiveness	Are the desired outcomes being met?
Validation	Is our hypothesis correct?

These are described in the document Evaluation Concepts and Terminology – (Forest Practices Board, FRPA Resource Evaluation Program FREP, January 2004)

Monitoring Intensities

Intensities used – depends on the question

Routine – relatively simple yes/no lists – provides red flags

Extensive – more detail, e.g., categories used G,M,P (can produce red flags)

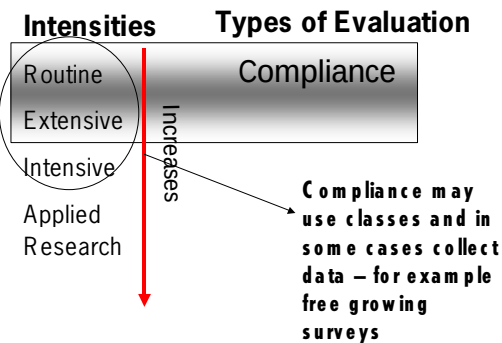
Intensive – quantitative data collection – some form of analysis needed

Applied Research – treatment, control, replication approach

Notes:

Overview

Types and intensities of evaluations

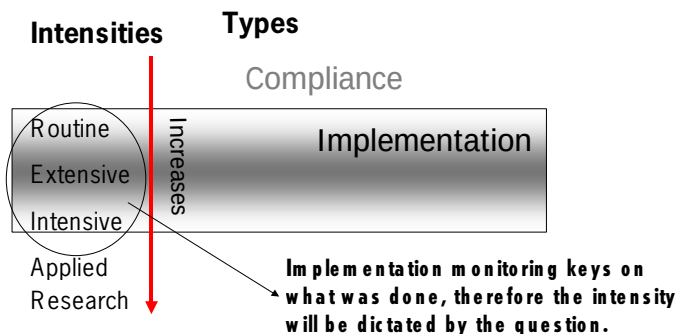


For compliance the intensity used depends upon the standard being assessed.

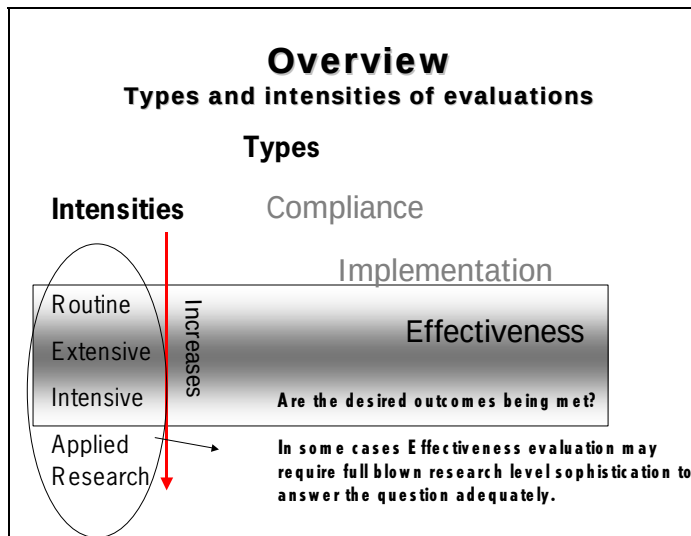
Notes:

Overview

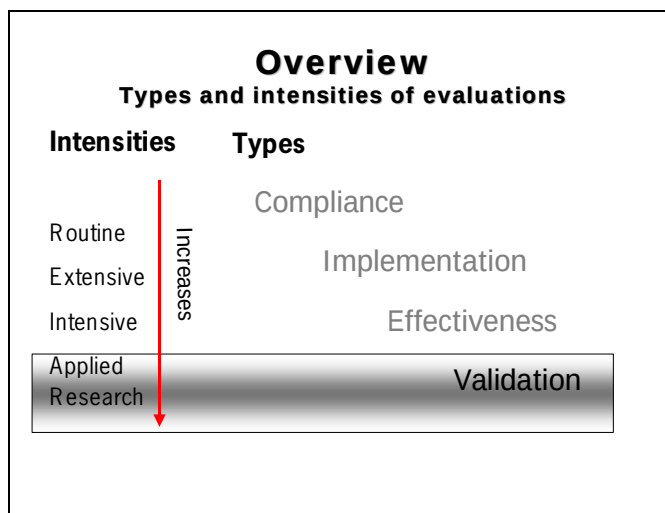
Types and intensities of evaluations



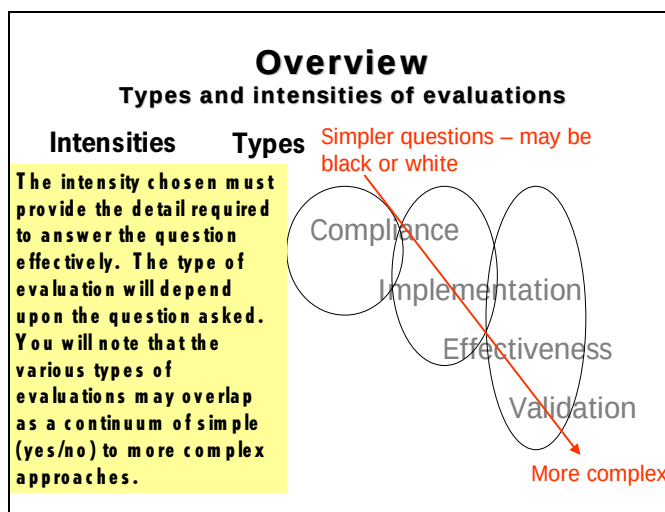
Implementation monitoring/evaluation assesses whether you have done what you said you would do.



Effectiveness evaluation is trying to get at the question of ‘Are the desired outcomes being met?’ In most forest management scenarios this is a somewhat complex task.



For Validation monitoring or testing of hypothesis evaluation, a formalized well thought out set of procedures and protocols is required.

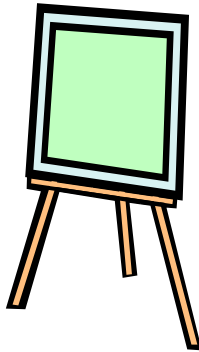


As the questions get more complex more time and effort is needed up front to frame the questions in ways that will provide useful answers and to create indicators that are representative, reliable and feasible.

Monitoring / Evaluation

Participant examples

Question / approach



Provide examples of monitoring and evaluations that you have been involved-in or know-of.

Section D

Designing Good Indicators For Effectiveness Evaluations



The Monitoring /Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

REMEMBER:

- *This process is ongoing and will continually be updated and improved.*
- *Success will require Good Quality Assurance and Information Management Programs..*

Remember – this is a journey, not a destination. Monitoring usually is ongoing.

Notes:

Effectiveness Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
 2. **Build indicators**
 3. Design Data Collection Approach
 4. Plan Monitoring Program
 5. Implement
 6. Check Results against Performance Criteria
 7. Choose
1. Build initial indicators
 2. Test initial indicators – representative, reliable, feasible?
 3. Replace, adjust or add more indicators – Retest
 4. Design performance criteria and indices

Notes:

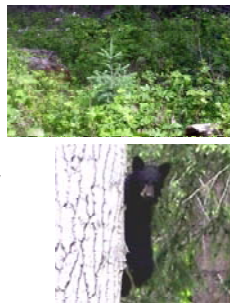
Monitoring and Indicators

Monitoring = Finding out how well we are doing?

An Indicator = Is something we can measure.

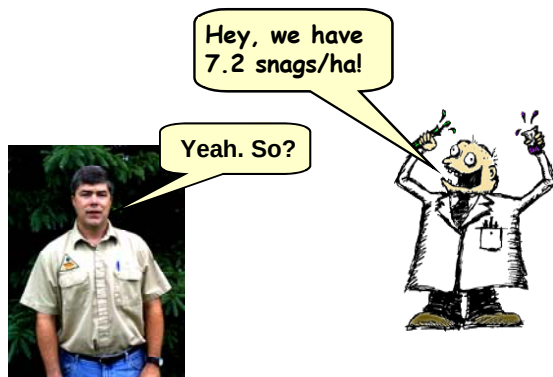
TO SEEK ANSWERS TO INITIAL QUESTIONS (or goals stated as questions:

1. Are our vegetation management treatments effective?
2. Are we sustaining ecosystem integrity throughout forest tenure?



Notes:

Remember – it pays to explore your question first



Notes:

Explore the question first

1. What is the underlying concern – based on societal value?

- Are my vegetation management treatments effective?



- What do we mean by effective – for what?

Monitoring Endpoint

- I really want to know if my veg management investments are worthwhile.

Tying this question to worthwhile investments clearly takes this beyond an academic question of whether or not we are just killing brush. The key here is we linked the initial question to a societal value or benefit.

We still need to answer the “What to measure question” but we will get into that in a moment.

Notes:

Explore the question first

2. What are the key issues to address the monitoring endpoint?

- Are my vegetation management investments worthwhile?



- How does that tie to measurables?

- Dollars spent vs hectares treated
- Ht growth, health and vigor of crop trees
- Amount and ht of competing vegetation

Now the potential measurables become clearer when tied to a clear endpoint.

Notes:

SO -What is an indicator?

1. Measurables that represents the key features of the monitoring endpoint.
2. Links to one or several measures of attributes, characteristics or properties.
3. Represents or indicates a “state” or “condition”.



Notes:

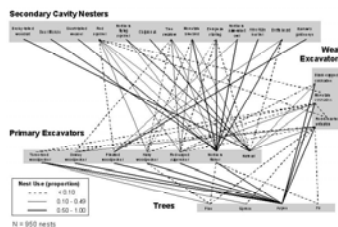
Some Endpoints are Complex

Monitoring Endpoint:

- Is there a loss of species due to our management practices?



Difficult to find simple measurables that are directly linked to the question.



SO – we need to ensure the indirect linkages are carefully considered

This is the reason we need indicators

There is no direct one measure of vegetation management effectiveness and there certainly isn't one thing we can measure to check to see if ecosystem integrity is being sustained – like checking someone's blood pressure.

Notes:

Types of Indicators

Several Choices for Ecological Systems

- Function-based
- Structure-based
- Species-based

(Lindenmayer et al. 2000)



CHOICE - Depends upon the question, practicality and cost

For ecological systems – Lindenmayer et al. (2000) identified three types of indicators.

Notes:

Indicator Development

Some practical considerations:

1. Are you comparing alternatives? (...compared to alternate practices A, B and C)
2. Are there an accepted targets or thresholds? (...and/or target X)
3. What is the SCOPE:
 - What is the time scale for measurements (...through the rotation) and reasonable measurement intervals.
 - What is the Spatial scale (...across the landscape) – potential survey design criteria and sample size(s)



SCOPE – is really important for determining monitoring feasibility. Answering these questions regarding time and spatial scales and monitoring intervals and design criteria may help narrow down the choice of indicators.

As you can see – often with a long list of complex indicators – these considerations may require considerable expertise to help you address them.

Indicators – which ones do we use?

- everything imaginable in the entire universe?



If you aren't doing the work,
or spending the dollars

So yes – go way out there – use whatever you want – as long as you aren't worried about the difficulty, time frames or cost!

Notes?:

First - Develop some initial indicators

1. Represents the key features of the monitoring endpoint.
2. Includes one or several measures of attributes, characteristics or properties.
3. represents or indicate a “state” or “condition”.

Potential Indicators:

- Meet free-growing?
- Ht of crop trees?
- Color of crop trees?
- Amount of veg?
- Height of veg?
- Hectares treated & dollars spent?

Monitoring Endpoint - Are my veg mgmt investments worthwhile?



Notes:

Choosing Indicators

Test each indicator to ensure they are:

1. Representative
2. Reliable
3. Feasible



(Based on The Wellbeing of Nations by Robert Prescott-Allen, 2001)

THESE ARE THE ATTRIBUTES OF A GOOD INDICATOR (Based on The Wellbeing of Nations by Robert Prescott-Allen, 2001) – Robert worked to develop thousands of indicators to compare the sustainability (wellness or quality of life and environment) amount the world’s nations.

Notes

Testing Indicators

Characteristics of a good one

1. Representative

2. Reliable
3. Feasible

Does the indicator address the scope of the question?

- How well does it cover the key aspects of the monitoring endpoint?
- How well does it show differences between geographic units (if required)
- How well does it show trends over time (if required)?

Notes:

Examples:

Testing Indicators

Characteristics of a good one

1. Representative

2. Reliable

3. Feasible

Does the indicator directly reflect the monitoring endpoint?

- Is the link well-founded in science?
- Is it responsive to the actions we are concerned about – treatments, management practice etc. - is the response persistent?
- Can it be measured in a standardized scientifically credible manner?
- Will the results have acceptable variability?

Next – we must ask if the indicator we are using is based on good science – has it been verified in the literature as being a good indicator of what we are seeking?

Notes:

Testing Indicators

Characteristics of a good one

1. Representative

2. Reliable

3. Feasible

Is the indicator practical?

- Is the data readily available? IF NOT:
 - Can the data be obtained at an acceptable cost?
 - Can the data be obtained in a reasonable time frame?

This is especially important for complex questions like the biodiversity question – answering it well will take many indicators over a long period of time which will be very costly.

Notes:

Choosing Indicators

1. FIRST BRAINSTORM POTENTIAL INDICATORS
2. MUST RIGOROUSLY TEST PROPOSED INDICATORS:



- Representative?
- Reliable?
- Feasible?

If NOT

A. Drop and Replace with another indicator.

B. Adjust the indicator to better address the question / objective.

C. Add more indicator(s) to better address the question / objective.

We must FIRST brainstorm as many indicators as we can think of – use specialist help if necessary.

Notes:

Testing Indicators

MONITORING ENDPOINT: Are my vegetation management investments worthwhile?

Proposed Indicator:

- Reduction in % cover of vegetation after treatment



Representative	Reliable	Feasible	Actions
X	✓	✓	
Scope- poor Does NOT cover all aspects of question Also – <u>persistence</u> of treatment over time?? <u>Geographic differences?</u>	•Well founded •Responsive •Could be Credible with OK variation	Cost effective Relatively easily sampled	Possibly: <ul style="list-style-type: none"> Adjust add more indicators replace

WHAT OTHER INDICATORS SHOULD WE LOOK AT?

DOES ONE OF THEM BETTER ADDRESS THE QUESTION AND CAN IT BE USED ON ITS OWN? OR – DO WE JUST NEED TO ADD MORE INDICATORS TO BETTER COVER ALL ASPECTS OF THE QUESTION?

IF WE STILL NEED THIS ORIGINAL INDICATOR – DOES IT NEED TO BE ADJUSTED?

How will we Use Indicators?

They will be used for:

- Comparing effects of different management actions or external stresses.
- Assessing conditions against targets/ thresholds.
- Assessing changes or trends in conditions.

BUT – How will we know when to change our management practices?



From Chapter 5 of Learning to Sustain Biological Diversity – Learning occurs in two ways – through making comparisons and by understanding mechanisms.

Notes:

Performance Criteria

Allow us to:

1. Rate our performance so we better know when to take action.
2. Better make comparisons over time or between geographic units.

Example:	% increase in tree height growth 5 years post treatment (relative to control)	
200%+	-	Good (Best - desirable)
100%	-	Acceptable (just meets objective)
50%	-	Marginal (transitional)
20%	-	Poor (undesirable)
0%	-	Bad (unacceptable - failure)

From Robert Prescott-Allen's "Wellbeing of Nations" (2001).

KEY = This requires an understanding of what is desirable or even acceptable (or unacceptable)

Notes:

Performance Criteria

Sometimes we must make assumptions because:



- Critical thresholds are unclear because they are non-linear, and/or integrate with other factors.
- "Optimum or desirable" is not clear in a dynamic ecosystem.
- Poorly understood mechanisms and interactions affect performance.
- Time lags for response are unknown.

If an assumption is made

- **Consider research and monitoring to validate it.**

Notes:

Validating Assumptions



Notes:

Performance Criteria for multiple indicators

How do we rate performance when:

- Multiple indicators are measured in different ways with different units.



Need to convert performance to a score

- Using a common scoring system

We may need a common currency to combine indicators into index score – if a number of different indicators are needed to answer a question – especially if those indicators are measured in very different ways.

Notes:

Performance Criteria for multiple indicators

Converting to a common score:

Example: % increase in tree height growth years post treatment (relative to control)

		Score
200 %	- Good (Best -Desirable)	100
100 %	- Acceptable (just meets objective)	80
50 %	- Marginal (transitional)	60
20 %	- Poor (undesirable)	40
0 %	- Bad (unacceptable - failure)	0

Then combine scores into a performance index

To simplify the results a performance index could be created. The one above takes into account the additional growth and provides a Score over the range of potential outcomes. For this example, the measure of success could be set at greater than 50% of the trees have scores of 60 or greater, anything less would be considered unacceptable.

Notes:

Performance Index for Questions or Objectives with Multiple Indicators

PROBLEM – The indicators may relate to one another in different ways?

- Sometimes good or acceptable performance in all indicators is required to address question or objective.
- Better performance with one indicator may compensate for poorer performance in others.
- Some indicators may be more important than the others.

Notes:

Performance Index for Questions or Objectives with Multiple Indicators

PROBLEM – The indicators may relate to one another in different ways?

1. **Sometimes good or acceptable performance in all indicators is required.**

Rating = that of the worse performing indicator

2. Better performance with one indicator may compensate for poorer performance in others.
3. Some indicators may be more important than the others.

In some cases the worst performer directly reflects performance. This is the case when we monitor water quality by looking at levels of pollutants in streams. It wouldn't make sense to average the levels all the way across all contaminants, when one pollutant (say lead or mercury) is very high. The rating should be undesirable or unacceptable based on the worst performer (lead or mercury).
Notes:

Performance Index for Questions or Objectives with Multiple Indicators

PROBLEM – The indicators may relate to one another in different ways?

1. Sometimes all indicators are equally important.

2. **Better performance with one indicator may compensate for poorer performance in others.**

Rating MAY be an average of the indicators.

- Performance criteria must be directly proportional.

3. Some indicators may be more important than the others.

You have to be careful with averaging. The only way to do this successfully is to carefully apply the performance criteria so that good performance indeed compensates for bad performance on a direct proportional basis.

Notes:

Performance Index for Questions or Objectives with Multiple Indicators

PROBLEM – The indicators may relate to one another in different ways?

1. Sometimes all indicators are equally important.

2. Better performance with one indicator may compensate for poorer performance in others.

3. **Some indicators may be more important than the others.**

Some indicators may be weighted against the others.

- For complex questions
- Must weight them carefully

Notes:

Providing Feedback to Management

REMEMBER – Performance Indices are artificial representations of reality

ALWAYS – Review your individual scores and assumptions before providing feedback.



A careful examination of the results is generally required before informed feedback. It is important when informing decision-makers to point out assumptions and outstanding questions. Often weighting of performance scores and even the value of the score itself require considerable assumption and inference.

Notes:

Providing Feedback to Management

CONSIDER:

Trends over time

- How are things going compared to a baseline?
- Are we improving or not?
- What's getting baddest fastest? – or better quickest?

Alternate practices

- What's the best option or suite of options?
- consider both operational or experimental comparisons

Context

- What is the context for these trends or comparisons?
- Uncontrollable outside influences?



Notes:

Effectiveness Evaluation Framework Recap for Indicators

1. Clearly Define Question(s) / Objective(s)

2. Build indicators

3. Design Data Collection Approach

4. Plan Monitoring

5. Implement

6. Check Results

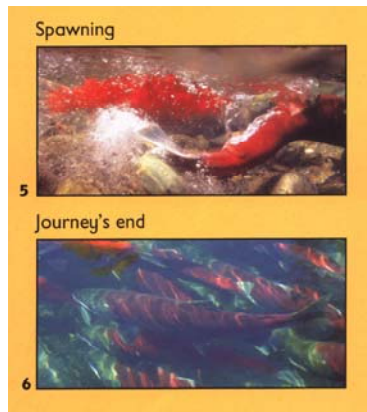
7. Choose Metrics

1. Build initial indicators
2. Test initial indicators – representative, reliable, feasible?
3. Replace, adjust or add more indicators – Retest
4. Design performance criteria and indices

Summary / Recap

Section E1

Washington Salmon Recovery Program Habitat Restoration Monitoring approach case study



What you will take away from this presentation

- How the Washington Salmon Recovery Team linked the goals with questions to be answered
- The level of detail for data collection and analysis recommended up front
- Cost of such a project

This project is large with a significant up front commitment to standardization and use of well thought out and designed protocols. This module will show how the planning team linked goals of the projects with the questions that were to be answered. Results are not yet available (2005) as the evaluation monitoring started in late 2004. However, this example highlights the level of detail that lends itself to scientific scrutiny and the associated costs.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

How does the Washington State Riparian example fit the monitoring/evaluation framework? What can we learn from this example?

This framework is provided to assess the completeness of an EE monitoring approach.

The intent is to learn from those who have gone before.

Notes:

Washington Salmon Recovery Funding Board Example

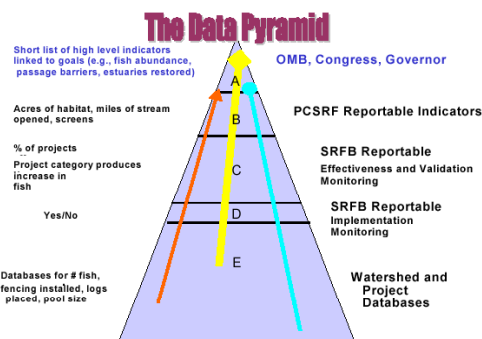


Figure 2. The Effectiveness Monitoring Data Pyramid
From
http://ia.c.wa.gov/Documents/SRFB/Monitoring/SRFB_Monitoring_Strategy

The strength of this diagram is how it shows the feedback steps through managers up to decision makers (e.g., Congress and the Governor). You will note that the pyramid has a wide base of data gathering and analysis through report creation the information is distilled into information that can be used at the top where direction is provided.

Leaning point. The key is that all steps are identified up front. There are fewer surprises this way.

Washington Salmon Recovery Funding Board Example



<http://www.iac.wa.gov/srfb/docs.htm>

This slide shows the WEB location of the program. As can be seen by the various bullets on the slide there is considerable detail, of which only a small portion will be covered to show the steps taken in their EE approach. If interested the web location is given on the slide and is:

<http://www.iac.wa.gov/srfb/docs.htm>.
Monitoring related documents are located under Effectiveness Monitoring and Other Monitoring Documents.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

Clearly Define Question(s) / Objective(s)

Habitat Restoration – case study

- Problem analysis identified need for effectiveness evaluation (June 2003)
- Step 1 – articulate the goal(s) that link most closely to the issue and underlying concerns.
 - Rehabilitate riparian areas
- Step 2 – Identify objectives/criteria
 - Result is a suite of detailed field protocols

The questions were created as a result of a detailed problem analysis that showed a lack of coordinated feedback from monitoring the effectiveness of various projects. The Steps taken were to identify the goals that were tied to underlying issues and concerns (I.e., issues around habitat alteration and loss for fish). The objectives were refined in a detailed suite of field protocols that outline specifically what is desired for a range of variables.

Issue Exploration - specifically

- Are the projects funded as habitat restoration, sponsored under the Salmon Recovery Fund, providing the desired outcomes?
- A 169 page report* assessing monitoring methods and benefits found a lack of effectiveness evaluation and recommended that these be undertaken.

* Assessment of Monitoring Methods and Benefits for Salmon Recovery Funding (SRF) Board Projects and Activities, 2003. Prepared for Interagency Committee for Outdoor Recreation Salmon Recovery Funding Board, Olympia Washington by Talyor Associates Inc., Cascadia Consulting Group, R2 Resource Consultants.

The big question is as described above – Are the funded projects providing the desired outcomes? This is much easier to write or say than to determine. The background report indicated a lack of monitoring to provide effectiveness feedback. Specific recommendations were provided on the methodology and information needs.

Washington Salmon Recovery Goal

The broad *goal* is to:

To better understand the effectiveness of salmon habitat restoration projects on their benefits to salmonids and their associated habitats.

Note that the goal is rather general and is not directly measurable – it sets the stage for the more detailed objectives, criteria and assessment methodologies and analysis.

The big GOAL of the project was to get a more complete understanding of how well the restoration projects benefited salmon and their habitats. This broad goal helps then set more specific objectives and criteria from which to assess success.

Washington Salmon Recovery Goal

A more specific goal relating to planting in the riparian zone*:

Monitoring Goal – Determine whether riparian plantings are effective in restoring riparian vegetation, stream bank stability and reducing sedimentation

Questions to be answered

Have at least 50% of the riparian plantings survived for at least 10 years?

Have the riparian shading and riparian vegetative structure been improved by year 10?

Has erosion and stream sedimentation been significantly reduced by year 10?

* Taken from Monitoring Effectiveness of Riparian Planting Projects MC3 – Washington Salmon Recovery Funding Board Dec 2003

Because of the complexity of the topic, specific goals were identified by topic area. This is the specific monitoring goal for planting in the Riparian Zone. The monitoring goal was then translated into specific questions that when answered help determine if indeed the goal has been met.

Learning points – the importance of identifying and fine tuning goals. Linking the questions to those goals so that answers help determine if the goal has been met.

Steps in the process

Clearly Define Question(s) / Objective(s)

Are the questions and objectives clear and well defined?

✓ Yes

- Goals and objectives were clearly defined and delineated in over a range of categories

This example has shown a clearly and transparent set of objectives and related questions that pertain the objectives / goals. This is a good example of linking the issue with steps to measure/quantify and assess for success. For more examples look at the Protocols for Monitoring Effectiveness under Other Monitoring Documents at <http://www.iac.wa.gov/srfb/docs.htm>

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

For a copy of their monitoring strategy go to http://www.iac.wa.gov/Documents/SRFB/Monitoring/SRFB_Monitoring_Strategy.pdf

The next steps, after coming up with questions that relate to the objectives is to build indicators and design the data collection so that sufficient data are collected, but not to such an extent that it is unworkable. Remember indicators need to be Representative, Reliable, and Feasible. The Washing State group went thought a process to create indicators that met those criteria.

Protocols were created for consistent data collection and analysis (includes indicators)

- Monitoring and Evaluation Strategy (DRAFT)
- MC-1 Fish Passage Projects (FINAL)
- MC-2 Instream Habitat Projects (FINAL)
- MC-3 Riparian Plantings (FINAL)
- MC-4 Livestock Exclusions (FINAL)
- MC-5 Constrained Channels (FINAL)
- MC-6 Channel Connectivity (FINAL)
- MC-7 Spawning Gravel (FINAL)
- MC-8 Instream Diversions (FINAL)
- MC-10 Habitat Protection (FINAL)
- IMW-1 Plan for Establishment of Intensively Monit

PROTOCOL FOR MONITORING EFFECTIVENESS OF RIPARIAN PLANTING PROJECTS

MC-3

Washington Salmon Recovery Funding Board
April 2004



Prepared by
Bruce A. Crawford
Project Manager

They did this by creating a number of protocols that were created to provide detailed instructions on what to measure, and what it means when evaluated. For each type of project a detailed protocol for data collection (indicators) and analysis was created. These are available on the web at <http://www.iac.wa.gov/srfb/docs.htm>

Leaning points – good document control, all dated and kept up to date are key. Well designed protocols take the guesswork out of the evaluation process.

Protocols were created for consistent data collection and analysis, they include

7

NULL HYPOTHESIS

- Planting of vegetation in the riparian corridor has had no effect upon:
- Increasing the amount of shading or
 - Increasing the complexity of canopy layers of streamside riparian cover.
 - Reducing the proportion of actively eroding streambanks

OBJECTIVES

BEFORE PROJECT (YEAR 0)

- Determine the proportion of the three layers of riparian vegetation present within the project impact and control areas.
- Determine the proportion of shading within the project impact and control areas.
- Determine the proportion of actively eroding stream banks within the project impact and control areas.

AFTER PROJECT (YEARS 1, 3, 5, AND 10)

- Determine the overall survival of the species of riparian vegetation planted.
- Determine the proportion of the three layers of riparian vegetation present within the project impact and control areas.
- Determine the proportion of shading within the project impact and control areas.
- Determine the proportion of actively eroding stream banks within the project impact and control areas.

RESPONSE INDICATORS

Level 1 – Number of trees and shrubs planted The number of trees and shrubs planted at the time of the project. This level 1 indicator tracks how many plantings actually survived over time as a measure of project effectiveness.

Riparian plantings variable	Description
Indicator explanation	The number of actively eroding streambanks in the control area.
Indicator	The area affected with active erosion in the riparian corridor.

Level 2 – Streambank Vegetation Using EMAP protocols (Pusek et al. 1996b), the percent shading is calculated using a densitometer and the riparian species diversity underlying ground cover and canopy can be determined in a consistent manner. One would expect the percent shading and the species diversity to change over time as the plantings grow. The proportion of actively eroding streambanks is an indicator of sedimentation and erosion into the stream. If riparian plantings are effective in creating riparian cover, then bank erosion should decline.



*Pay now or later –
upfront work will
pay off over time*

Each of the protocols followed a strict framework for presentation, thus providing a structured approach that did not let parts slip through the cracks. For any EE program, following steps such as these will help ensure the data collection is linked and suited to the analysis phases. It will take time up front, but it is similar to the oil filter analogy, pay me now or pay me later. If you do not have a well-structured process, money and time will be wasted and the project may not provide useful results.

Washington Salmon Recovery Monitoring Example

Data design and comparison approach

What are we comparing with?

Use of the Null hypothesis

Planting of vegetation in the riparian corridor has had not effect upon:

- Increasing the amount of shading
- Increasing the complexity of canopy layers of streamside riparian cover
- Reducing the proportion of actively eroding streambanks

To determine if the treatments were in fact achieving what they were meant to achieve they were compared against NULL hypotheses – that is the treatment did nothing towards achieving its goal. To determine this specific measures were identified to compare.

Notes:

Washington Salmon Recovery Monitoring Example

Where to begin?

They chose to use the BACI approach = Before and After Control Impact approach – this requires comparisons to a similar untreated area used as a control

Choose the measures pretreatment that will be used to compare results, for example:

- Percentage cover by vegetation layers
- Proportion of the stream-reach shaded
- Actively eroding stream bank

Analysis approach is selected **before** not after monitoring plan is created. For some comparisons a BACI design was chosen. This approach samples the control and Impact simultaneously at both locations at designated times before and after the Impact has occurred. This type of design is required when external factors (e.g., rainfall and species composition) affect the riparian areas at the control sites.

Learning point: Match the sampling design to the statistical analysis to be used. This is a critical step often overlooked when setting up monitoring programs.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Choose Management Action and Provide Feedback

These parts were described in a RFP that outlined two years of monitoring and all required activities. The RFP suggested the term would be extended to 10 years based on funding.

The monitoring program then needs to be formulated: the amount of time it will take, who is to do the monitoring, analysis and reporting (note: the amount of money available will affect the approach taken).

For this example the process was put out for tender with two years of secure funding and plans to extend it to 10 years (funding dependent). In many cases evaluation beyond 10 years will be needed to truly determine efficacy in some of our complex biological and geomorphological interactions (I.e., Conifer rooting effects on long term bank stability over a range of stream sizes and climatic conditions).

Learning point – a long-term commitment is needed for some more complex monitoring efforts.

Washington Salmon Recovery Monitoring Example – direction provided for feedback

TESTING FOR SIGNIFICANCE

One can choose to test the following data collected for each of the indicators for number of riparian plantings, canopy cover, understorey, ground cover, and canopy.

Table 6. Example - Data table for hypothetical presence of riparian

	Year 0	Year 1	Year 2
Plant 1	0	100	100
Plant 2	0	100	100
Plant 3	0	100	100
Plant 4	0	100	100
Plant 5	0	100	100
Plant 6	0	100	100
Plant 7	0	100	100
Plant 8	0	100	100
Plant 9	0	100	100
Plant 10	0	100	100
Plant 11	0	100	100
Plant 12	0	100	100
Plant 13	0	100	100
Plant 14	0	100	100
Plant 15	0	100	100
Plant 16	0	100	100
Plant 17	0	100	100
Plant 18	0	100	100
Plant 19	0	100	100
Plant 20	0	100	100

DECISION CRITERIA

Effective if at least 50% of the riparian plantings in the project area survived in Year 10.

Effective if a change of 20% or more is detected by Year 10 at the riparian 10 test for measures of the above-ground canopy density and the above-ground density of the above-ground canopy.

Effective if the canopy density is at least 50% of the riparian plantings in the project area.

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3. Design Data

4. Plan Monito

5. Implement

6. Check Results against Performance Criteria

7. Make recommendations (feedback to management)

The protocol also provides a methodology to assess the results against specific performance criteria – that is - did it make the grade? The success points or ‘lines in the sand’ are drawn early-on to provide clear measurables upon which to assess results. This may difficult in some areas where there is no clear answer for what worked and what didn’t. In those cases more research on basic thresholds may be required to help create the desired outcome range or target.

Leaning point – Identify performance criteria up front. In some cases additional research may be needed to provide clearer criteria.

Washington Salmon Recovery Monitoring Example

Cost to implement effectiveness evaluation of Restored Riparian Habitat
– Contract was let for \$350,000 US per year for 2 years (\$700,000 US)

This type of monitoring and project is not cheap. The cost of monitoring alone was tendered at \$700,000 US for two years. That did not include the substantial work that went into the creation of the Problem Analysis document and the detailed Protocols created for the project. This also only identifies funding for two years, as mentioned often results will not be clear until much later, 10 years plus. Thus to do this type of monitoring a commitment is needed and often needs partnerships.

Section E 2

Effect on Fuels Treatment On Wildfire Severity* A retrospective Effectiveness Evaluation

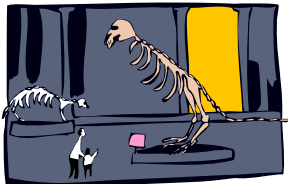


***Principal investigators Philip Omi and Erik Martinson Colorado State University – based on their final report to the Joint Fire Science Program Governing Board found online at**

<http://www.cnr.colostate.edu/frws/research/westfire/FinalReport.pdf>

What you will take away from this presentation

- How effectiveness evaluations can be set up to address an issue using a retrospective approach
- How well this study followed the steps for Effective Effectiveness Evaluation.



Not all effectiveness evaluations can take the form of an experiment where a control and treatment are set up to determine treatment effects. Often a study will look backwards to evaluate whether a treatment has been effective. This study shows in detail how to set up a retrospective effectiveness evaluation.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

*How does the retrospective Fuel Treatment example fit the monitoring/evaluation framework?
What can we learn from this example?*

Intro – We begin each of the Case Studies with the framework and the pertinent section highlighted, we will then go over the approach taken and then ask whether the step was dealt with well or less than optimally.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

Did they have a clearly defined question and or objectives?

Steps in the process

Clearly Define Question(s) / Objective(s)

Rationale - \$796,000,000 for fuel treatment is allocated in fiscal 2001 and 2002 by the USFS



- Question is – are fuel treatments effective at reducing wildfire severity?
- What information is available?
 - Not much it turns out
- A goal and 4 objectives were created
 - The goal was to add to the limited database on fuel treatment efficacy
 - Main objective was to compare wildfire severity between areas with different pre-fire treatments and untreated controls.

The questions were a direct result of numerous severe wildfires that occurred in the United States. The assumption is: fire suppression and forest management practices have led to larger than natural fuel buildups resulting in more damaging and severe forest fires. Funding was provided to reduce fuel loads as a means to reduce fire severity and associated damage. Thus the question is simple: Are fuel treatments effective at reducing wildfire severity?

Learning point – the question in this case relates to funding allocated to a treatment that has not been proven to be effective. Use ‘issues’ to help direct effectiveness evaluation emphasis (dollars).

Steps in the process

Clearly Define Question(s) / Objective(s)

Are the questions and objectives clear and well defined?

✓ Yes – and along with the objectives hypotheses were provided.

- Fuel treatments do not reduce wildfire severity and
- Fuel treatments do not reduce wildfire intensity

Two hypotheses resulted from the question, these turn the question around, if these hypotheses are found to be true, the treatments are ineffective and another approach needs to be looked into.

Learning point – turn the question into hypotheses that can be tested.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

For a copy of their monitoring strategy go to
<http://www.cnr.colostate.edu/fires/research/westfire/FinalReport.pdf>

The next steps are to build indicators and design data collection.

Effect of Fuels Treatment on Wildfire Severity

Build indicators

For this the research team used (from the literature)

Fire severity – a post fire assessment that incorporates crown and soil measures

Fire intensity – physical parameter related to flame length



Often the literature may have studies similar to the one you are embarking on. A good first step is to do a literature review to determine if there are indicators and approaches that may be useful for your situation.

Learning point – use the literature to help identify indicators and or methodologies before starting your sampling strategy.

Effect of Fuels Treatment on Wildfire Severity

Design Data Collection Approach

26 potential study sites were identified, 4 were chosen



The report that summarizes this evaluation provides a detailed explanation of how potential study sites were identified and ultimately selected. This part of any effectiveness evaluation is important and is often impacted by costs, making it a critical step. Full disclosure of the steps taken allow for clearer interpretation of results.

Learning point – Study site selection should be done carefully with clearly described selection criteria.

Effect of Fuels Treatment on Wildfire Severity

Design Data Collection Approach

Data were collected using protocols from the literature

- 0: No damage – all tree crowns unscorched.
- 1: Spotty damage – partial scorch on at least 1 tree, but some trees unscorched.
- 2: Moderate damage – partial scorch on all tree crowns, but few trees completely scorched.
- 3: Heavy damage – nearly all tree crowns completely scorched, but few crowns consumed.
- 4: Extreme damage – nearly all tree crowns consumed.

The downward heat pulse was estimated with ground char ratings in 4 30-cm x 60-cm subplots located at 90° angles and 17.85 m from each plot center. Ground char was rated as follows (after Ryan and Noste 1985):

- 0: Unburned - no evidence of surface fire.
- 1: Light - some small twigs or leaves remain.
- 2: Moderate - all twigs, leaves, and standing grasses consumed, mineral soil charred.
- 3: Deep - mineral soil altered in color or texture.

Data collection protocols may either be created from scratch, modified from those used elsewhere or taken directly from similar studies. For this study protocols were available from the literature. This can be an advantage as the methods have been tested previously and have undergone peer review to look for potential pitfalls.

Learning point – use protocols that are in place if they are suited to your task. The wheel need not be reinvented for each study.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

Once the goals, objectives and questions have been set it is time to plan the monitoring program.

The Monitoring/Evaluation Framework

Plan Monitoring Program

Implement

Table 4. Weather conditions on days in which sample plots burned by the H. Meadow fire (weather data taken from the National Weather Service).

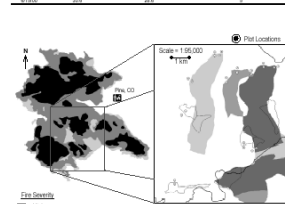


Figure 5. Severity of the H. Meadow fire, fuel treatment units within our study area, and our plot locations. Severity map and other spatial information provided by the Pine-San Isabel National Forest. Severity categories are not necessarily comparable to those depicted in Figure 3 and 4.

Four sites were chosen, reasons were provided for those not used.

Plots were located and measured, data were collected and analyzed.

The report goes into detail on how the effectiveness evaluation was implemented including why sites were chosen or not.

Learning point – keep all assumptions up front and in the open it will provide more strength to any conclusions made and allow others to learn from your approach.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

The final steps.

Effect of Fuels Treatment on Wildfire Severity

Check Results against Performance Criteria

Use of the Null hypothesis

Was the severity and intensity unchanged by treatment?

Results

Wildfire severity – All measured indicators of wildfire severity were **significantly lower** in treated stands except for one site.

For this study they used the Null Hypothesis to test whether treatment effects were significant.

Learning point – provide the analysis procedure up front it will save time and reduce angst in the long run.

Effect of Fuels Treatment on Wildfire Severity

Make recommendations (feedback to management)



Conclusions

Fuel treatments moderate extreme fire behavior within treated areas... Still unanswered questions revolve around necessary treatment intensities and duration of treatment effects.

Suggest use as a buffer to allow for suppression in areas where fire threatens societal values.

Photo from
http://www.pfc.forestry.ca/entomology/mpb/management/silviculture/mature_e.html

Conclusions were provided. Management suggestions were made. This study provides the guidance that decision makers can then use when allocating scarce resources.

Learning point – the Effectiveness Evaluation does not in itself change or modify practices, it is created to help inform management and managers on treatment options.

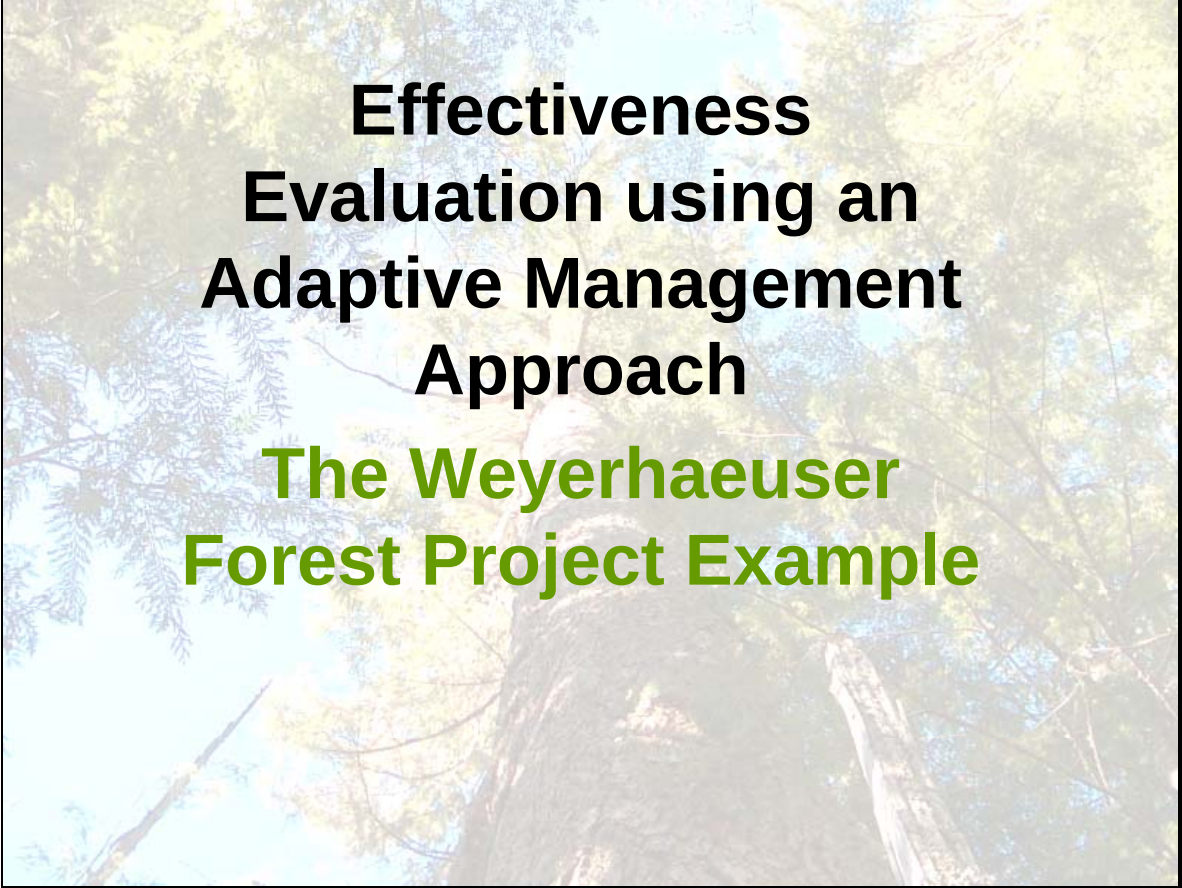
Effect of Fuels Treatment on Wildfire Severity

Is this a good example of Effective EE?

- ✓ Yes this example follows the steps laid out and provides clear answers to the questions.
- ✓ You will note that the questions beg more answers but that is often the results of EE.

This is a good example of Effective Effectiveness Evaluation using a retrospective approach.

Section E 3



Effectiveness Evaluation using an Adaptive Management Approach

The Weyerhaeuser Forest Project Example

The Weyerhaeuser Example

Thanks

Thanks go to Glen Dunsworth, Bill Beese, Nick Smith (Weyerhaeuser), Fred Bunnell and Laurie Kremsater (UBC) for use of their study design, results and presentation materials.

What you will take away from this presentation

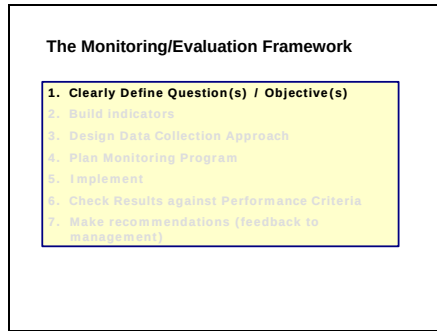
- How a company created an effectiveness evaluation program to provide feedback on a new innovative approach to harvesting within their tenures.
- How objectives and indicators were chosen and refined to address specific questions.
- How the process is meant to provide feedback to practitioners

The Monitoring/Evaluation Framework

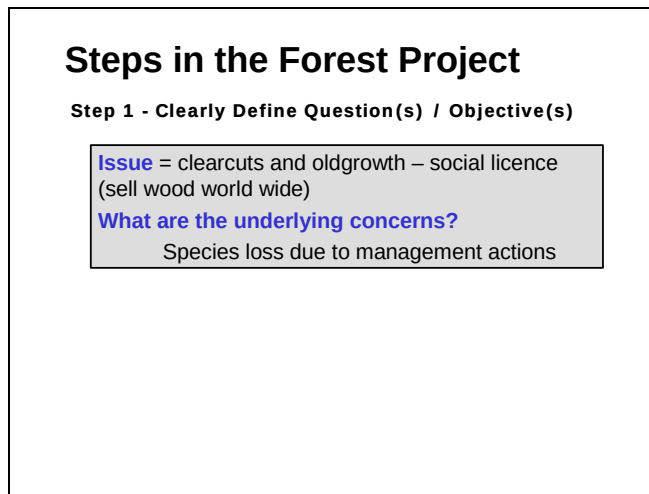
1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

How does the Weyerhaeuser example fit the monitoring/evaluation framework, what can we learn from this example

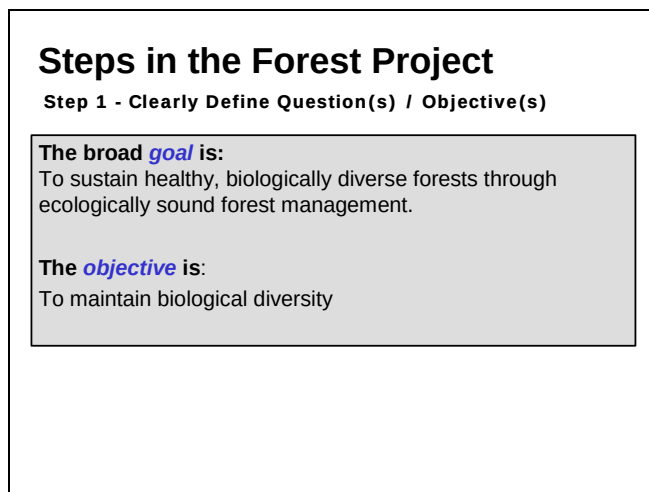
Intro – We begin each of the Case Studies with the framework and the pertinent section highlighted, we will then go over the approach taken and then ask whether the step was dealt with well or less than optimally.



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This shows the initial steps taken by the Forest Project team, note it begins with Issue identification then turns around the issue to make a positive statement on goals from that emerges objectives (criteria) and from there indicators.



This shows the initial steps taken by the Forest Project team, note it begins with Issue identification then turns around the issue to make a positive statement on goals from that emerges objectives (criteria) and from there indicators.

Fitting into the framework

1. Clearly Define Question(s) / Objective(s)

2. Build indicators

3. Design

4. Plan

5. Impl

6. Chec

7. Make

management)

1. How well were the questions and objectives defined?
2. Is there enough detail in these questions/objectives to begin a monitoring program?

✓ *The questions were clear and to some extent the objective is well defined, however more detail is needed to create an effective evaluation procedure*

The issue of clearly defined questions and objectives is looked at here. We ask the question are the objectives/criteria well defined (do they relate to the overall goal)? Are the differences between Goals and Objectives clear – Goals are at broader conceptual scale, Objectives/Criteria are more specific and have the ability to be measured. Thirdly, is there enough detail in the questions/objectives/criteria to set up a monitoring program? Likely not yet more detail is needed.

Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)

2. Build indicators

3. Design Data Collection Approach

4. Plan Monitoring Program

5. Implement

6. Check Results against Performance Criteria

7. Make recommendations (feedback to management)

Intro – the next step was to build indicators and design the data collection approach.

Choosing indicators

A group of scientists and managers worked together to identify what questions they needed answers to.

From the questions indicators were chosen – refining this process took two years of field assessment and analysis to find ones that worked

Learning from their example should provide efficiencies for others

Core group – 4 scientists – what do we really want to know

Key epiphany – if we collect this data – do we know what to do with it?

Indicator Selection – Indicators were chosen to:

- Measure impacts of policies & issues – eg. VR
- Identify priorities & problems
- Provide early warning information
- Anticipate future conditions & trends
- Assess current conditions or trends
 - Compare places or situations
 - In relation to targets & goals

Note, numerous indicators were chosen to answer a range of questions.

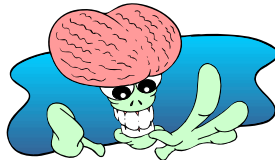
Tips they used in choosing indicators

- Sensitive to stresses on the ecological system
 - Related to BC forest management
 - Predict changes that can be averted by management actions
- Acceptable variability
- Reflect known or suspected cause-effect relations
 - Responsive to stresses in a predictable way

When indicators are chosen they need to be relevant and be something that is affected by the treatment or management action taken. If they are excessively variable often treatment effects will be hidden within the inherent variability and thus not a useful indicator. The literature should be used to identify suspected or known cause and effect relationships (e.g., more predators results in prey control). Predictable responses should be hypothesized such as when predators are removed, prey levels increase based on food availability. The devil is in the detail on how to use the indicators effectively and efficiently.

Tips they used in choosing indicators

- Focused, clear, specific and measure key information
- Practical to measure (methodology, ID)
- Cost-effective to measure
- Agreed-upon by sponsor, team & stakeholders



Choosing indicators is a critical step and needs lots of brainpower to get useful ones.

Objective : maintain biological diversity

Indicators – three levels:



Representation (Coarse Filter)

lesser known species and functions



Structure (Medium Filter)

*heterogeneity of **habitat***



Species (Fine Filter)

*productive **populations***

This slide describes the three levels of evaluation that were seen necessary to address the objective of maintaining biological diversity. The actual indicators flow from these three levels (filters).

For Each Indicator

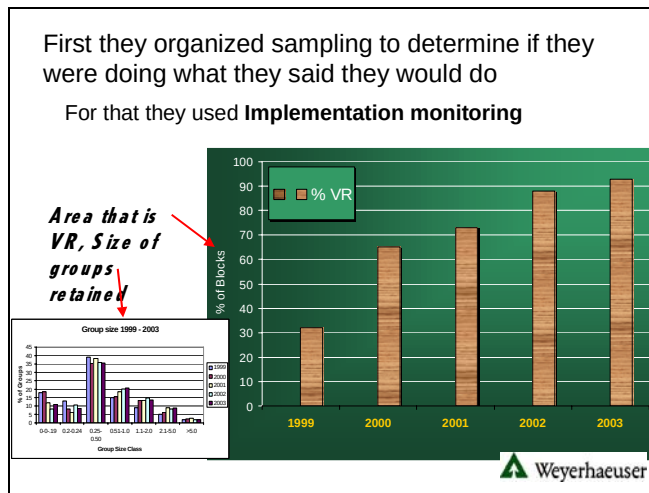
- Why?- rationale
- What?- to monitor
- How to monitor? – monitoring protocols and data management
- What to do with the results?- feedback to management

Steps taken for each indicator.

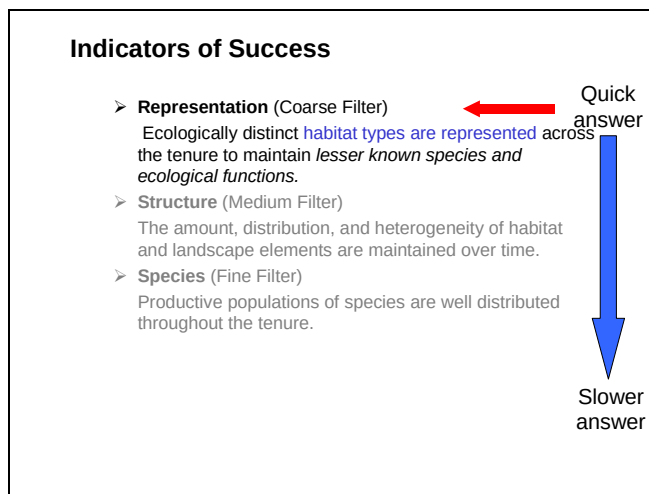
How does it fit with the Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
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7. Make recommendations (feedback to management)

Notes:



For true effectiveness monitoring to be valid, one must be sure that what is stated as being done is being done, thus implementation monitoring is a key part of the process.



This section goes through the tough steps taken to identify indicators by filter level. Indicators have different strengths, some are easy to measure providing quick answers others are difficult to measure but may be needed to answer the underlying question.

Representation: what to monitor?

- **Amount** in reserves or lightly managed
- Ecosystem **types** in reserves
 - Is any ecosystem low?
- Landscape structures and context
 - Patch size and patch distribution of reserves
 - Forest interior

So to determine what to monitor requires more thinking and asking what will we do with data once we have it?

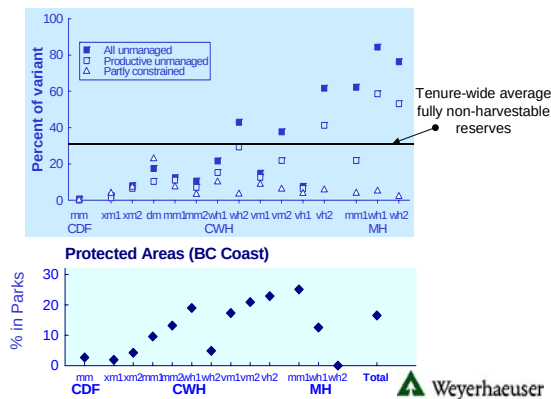
Ecological Representation:

- How much do you have?
- Is it all rock and ice or good balance?
- Is it just bits and pieces? In one spot or well distributed?
- Are all those larger patches thin or do we have interior?



Again what will you do with data once you have it? This is a key part of choosing the information you gather.

Variant Representation- Constrained Land Quick to do and report out on



This represents quick feedback when data are available – from this decisions can be made on whether to modify practices or not. Prior to getting the information a target or range should be identified and some action options provided to help interpret the data.

How does it fit with the Monitoring/Evaluation Framework

- Develop VR practices to mitigate the low levels of reserved forest in CDF, CWHxm1/2, and CWHvh1.
- Use partially constrained areas to improve ecological representation.
- Use VR retention patches adjacent to reserve areas
- Develop an old-growth conservation and restoration strategy

6. Check Results against Performance Criteria

7. Make recommendations (feedback to management)

The yellow box represents management actions to address the findings of the coarse level filter effectiveness evaluation. This addresses point seven and effectively closes the loop for this part of the evaluation.

Indicators of Success

- **Representation** (Coarse Filter)
Ecologically distinct habitat types are represented across the tenure to maintain *lesser known species and ecological functions*.
- **Structure** (Medium Filter) ←
The amount, distribution, and heterogeneity of **habitat and landscape elements** are maintained over time.
- **Species** (Fine Filter)
Productive populations of species are well distributed throughout the tenure.

OPTIONAL – VERY DETAILED AND MAY NOT BE NEEDED AS PART OF THE WORKSHOP – PROVIDED AS ADDITIONAL INFORMATION. We have added both the next two levels and they can be left in and discussed or left out depending upon time and the desire of the group to go through this example.

Structure: Rationale – why measure structure?

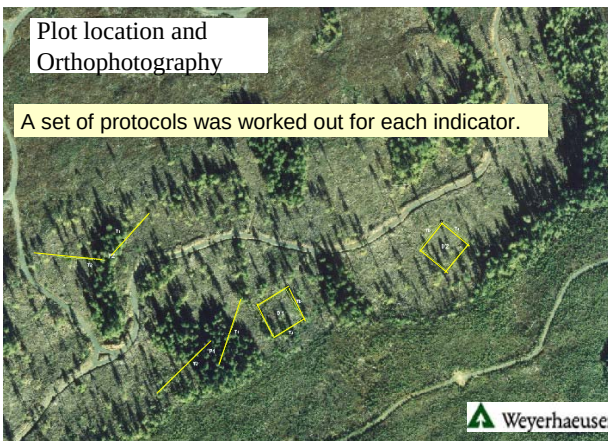
- Most direct indicator of practices
- Key ecological attributes related to large literature for vertebrates on our tenure



Structure is relatively easy to measure and there is information from the literature on certain components, so targets or comparisons can be made.

Plot location and Orthophotography

A set of protocols was worked out for each indicator.



It is important to document all monitoring protocols. This is a time consuming process and one that needs significant up front attention. Along with sampling protocols, data management protocols are also needed and must be adhered to.

Structure: what to monitor

- **Key attributes** (*large live trees, snags, CWD, canopy cover, shrub cover, and ground cover layers*)
- **Interpretive measures** (*vertical structure, horizontal structure*)
- **Processes** (*decay, growth*)
- **Landscape summary variables** (*edge, road/crossing density, patch size/age*)



The key here was to utilize information that was available from previous studies, that is use key structures from the literature (e.g., Jack Ward Thomas's Blue Mountain work). The information that was to be collected needed to fit into models to query outcomes.

How does it fit with the Monitoring/Evaluation Framework

Data indicate low levels of large snags

- ✓ shift emphasis on ecological anchors or increase patch sizes (e.g. tall snags).

6. Check Results against Performance Criteria

7. Choose Management Action and Provide Feedback

Note that while there is a perceived low level of large snags, compared with a target, this does not directly relate to population abundance or maintenance.

Indicators of Success

- **Representation** (Coarse Filter)
Ecologically distinct habitat types are represented across the tenure to maintain *lesser known species and ecological functions*.
- **Structure** (Medium Filter)
The amount, distribution, and heterogeneity of habitat and landscape elements are maintained over time.
- **Species** (Fine Filter) ←
Productive *populations of species* are well distributed throughout the tenure.

OPTIONAL – DETAILED AND MAY NOT BE NECESSARY TO GO OVER. The third level of indicator is the species level.

Species - rationale

- A check on first 2 indicators
- Genetics key to maintaining biodiversity
 - Species are the only self-replicating packages of genes.
- Long-term persistence of species key to forest project success
 - Public sees sustenance of species as the ultimate measure of success or failure.



Species were chosen to monitor for the reasons indicated above. However choosing and monitoring them is not an easy task.

Species: what to monitor

- **Principle:**
 - Species related to VR principles
 - forest influence and life-boating
 - Need a range of species
 - slow to fast dispersers
 - slow to fast reproductive rates
 - small home ranges to wide-ranging
 - variety of habitats

When choosing species to assess they wanted to cover the broad range of ecological tolerances and habitats. They used these principles in choosing species to monitor.

Species: what to monitor

- **Vascular plants** (*canopy closure, down wood, forest interior, exotics*)
- **Lichens** (*hanging lichens and lobaria species*)
- **Bryophytes** (*on various woody substrates*)
- **Fungi** (*mycorrhizae*)
- **Invertebrates** (*gastropods, carabid beetles*)
- **Vertebrates** (*birds, amphibians, small mammals*)

When assessing what to monitor, Weyerhaeuser initially chose more species than it could handle – they realized early on that they needed to be more selective. These are the various categories that they chose from.

Species: what to monitor

Section	Comparison/target/etc.	Hab. elements	Stand structures	Microclimate	Bryophytes	Epiphytic lichens	Introduced plants	Gastropods	Carabid beetles	Salamanders	Songbirds	Squirrels	Et ceteras
1.1	VR type												
1.2	VR retention level												
2.1	Patch size												
2.2	Edge												
2.3	Patch type												
2.4	Stand objectives												
3.1	Clearcuts												
3.2	FPC												
3.3	Uneven-aged man't												
3.4	Eco-forests												
4.1	VR implementation over time												
4.2	VR succession												
5.1	External targets												
5.2	"Nature" targets												
5.3	Species' requirements												
6	Non-harvestable sites												
7	Explanatory mechanisms												

This matrix was used to identify opportunities for monitoring. There is a complete discussion, by species, on why they were chosen or not in the document: Learning to Sustain Biological Diversity on Weyerhaeuser's coastal tenures by Fred Bunnell, Glen Dunsworth, David Huggard and Laurie Kremsater, July 2003.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

Lessons Learned

What did we learn?

Lessons Learned

- Take time up front to create workable indicators – use knowledgeable people
- Expect some revisions to indicators as information is collected – assess periodically
- Not everything can and should be measured, choose carefully
- Plan for long term funding but expect that it might dry up – I.e., have contingency plans (priorization matrices)

Notes:

Lessons Learned

- Vague management goals & objectives, made it difficult to select indicators
- Only a few indicators measured, focus of study narrow, resulted in oversimplified understanding of interactions
- Rationale/methods for selecting indicators not stated, difficult to interpret data

Notes:

Lessons Learned

- Need to have a connection between the results of monitoring and decision-making
 - Critical indicator values that would trigger a policy response were not identified up front
 - Comparisons not made (to other practices, targets, species requirements, etc)
- No attempt to understand cause-effect in the first iteration.

Notes:

Lessons Learned

- Planning an EE study means selecting appropriate design to answer the questions
- Project team needs an expert, but
- Whole team can understand basic design considerations
- Project coordinator needs to know enough to check that the full range of design issues considered

Notes:

Lessons Learned

- What design(s) will answer our key questions with reliable, relevant results?
 - Can practices be compared?
 - Can trends be detected?
 - Causal inferences?
 - Can results be generalized?

Notes:

Effectiveness Evaluation Approaches

Non-experimental studies

- retrospective studies
- observational studies, impact assessments
- analytical surveys

Notes:

Effectiveness Evaluation Approaches used

Experimental studies

- Sample design issues
 - Populations / strata
 - Treatments
 - Spatial Controls
 - Pretreatments
- Analyses**
- Null models
 - Regression types
 - Bayesian Statistics

Notes:



Section E – 4

Proper Functioning Condition Riparian value assessment for FRPA



A product of FRPA Resource Evaluation Program, in concert with WALP and UBC

What you will take away from this presentation

- What goes into designing an effectiveness evaluation for Riparian Function.
- An example of the use of indicators that are:
 - Representative
 - Reliable
 - Feasible

This case study highlights an approach that has evolved over a period of 5 or more years and is based on numerous expert input workshops and in the field fine-tuning.

Notes:

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

REMEMBER:

- *This process is ongoing and will continually be updated and improved.*
- *Success will require Good Quality Assurance and Information Management Programs.*

The framework:

Notes:

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

Steps in the process

Clearly Define Question(s) / Objective(s)

Are the riparian features within the range of proper functioning condition?

E.g.,

Benthic invertebrates

Bank and channel stability

Fish habitat features



Notes:

Notes

Steps in the process

Clearly Define Question(s) / Objective(s)

Are the questions and objectives clear and well defined?

- ✓ Yes – if we understand what goes into proper riparian function. This is a matter of expert opinion and is an area of ongoing input and understanding.

Riparian Function – build indicators

1. Build initial indicators – done by committee over a number of years – field tested and refined
2. Test initial indicators – representative, reliable, feasible? – the indicators have been tested and modified to meet the three criteria – more later
3. Replace, adjust or add more indicators – ongoing
4. Design performance criteria and indices – done and in place – OK, moderately at risk, at risk...

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

Riparian – Proper Functioning Condition

Design Data Collection Approach

Designed initially as an intensive or detailed assessment it was modified to be used as a routine assessment (extensive) to identify issues quickly and efficiently



Originally the data collection was quite detailed requiring data analysis. The approach was revised to allow a quick field assessment-using yes no answers to a list of questions. Data are collected to help answer the questions, but no analysis is performed.

Notes:

Riparian – Proper Functioning Condition

Indicators were chosen to assess:

- Stream morphology
- Stream biology
- Fish habitat



The indicators were chosen to cover the range of proper functioning condition. It is from summarizing all questions that an estimate of proper functioning condition can be provided.

Notes:

The Monitoring/Evaluation Framework

Plan Monitoring Program
Implement



10 blocks per District selected randomly from a population of 100 randomly selected blocks – 3 pilot districts in 2004 – hands on training in each.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. **Plan Monitoring Program**
5. **Implement**
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. **Check Results against Performance Criteria**
7. **Make recommendations (feedback to management)**

Riparian – Proper Functioning Condition

Check Results against Performance Criteria

Reference values are provided as found from the literature and professional opinion

Results

Each reach is evaluated and ranked based on the answers to a list of specific questions related to proper functioning condition.

The final tally of questions answered NO provide insight into the condition of the reach. Follow-up is needed to determine the cause if found to be non functioning.

Riparian – Proper Functioning Condition

Make Recommendations – I.e., feedback to management

Conclusions

The project will provide ratings by reach with initial indications as to cause. If significant issues are raised this will be taken into account for future policy or legislative direction.

Notes:

Riparian – Proper Functioning Condition

Is this a good example of Effective EE?

? Too early to tell. However, the pilot approach is a good way to fine tune indicators and analysis methods.

Pilot helps fine-tune the process. A good approach.

Section E 5

Protocol for Stand Level Biodiversity Monitoring



A product of the FRPA Resource Evaluation Program

What you will take away from this presentation

- Initial steps in implementing an effectiveness evaluation program.



The first step in setting up an effectiveness evaluation for Stand Level Biodiversity.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

REMEMBER:

- *This process is ongoing and will continually be updated and improved.*
- *Success will require Good Quality Assurance and Information Management Programs.*

The steps above will be used to assess the program at this time.

The Monitoring/Evaluation Framework

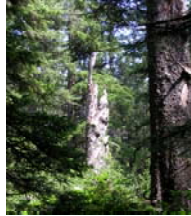
1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

What question or questions are being asked?

Steps in the process

Clearly Define Question(s) / Objective(s)

- Is the structural retention, Wildlife trees and CWD left associated with cutblocks adequate to maintain habitat for dependent species at the site and across the landscape now and into the future?



The question posed is quite broad and difficult to assess, with limited budgets a more workable question is needed.

Steps in the process

Clearly Define Question(s) / Objective(s)

- Is the structural retention, Wildlife trees and CWD left associated with cutblocks adequate to maintain habitat for dependent species at the site and across the landscape now and into the future?

Are the questions and objectives clear and well defined?

? This question is highly ambitious and is very open ended which will make data collection, analysis and reporting difficult.

You would need to determine not only if the content of the WTP's were sufficient but also the range of sizes and patterns associated with them were appropriate to meet the full range of dependent species across all the different natural disturbance types in the province.

Steps in the process

Clearly Define Question(s) / Objective(s)

Instead a more directed question can be asked, that relates directly to the intent of the WTP program.

Are Wildlife Tree Patches providing the range of habitat for those species dependent on wildlife trees? Specifically:

- ☐ A diversity of tree species (conifers and deciduous) in various successional stages;
- ☐ Multiple canopy layers;
- ☐ Standing dead trees of varying sizes and stages of decay;
- ☐ Large live trees (often with defects as these make good future wildlife trees); and
- ☐ Coarse woody debris for foraging substrate and shelter

This question comes from the original literature on creation of WTPs. It provides specific measurables from which to gauge whether the intent is being met.

Steps in the process

Clearly Define Question(s) / Objective(s)

Are Wildlife Tree Patches providing the range of habitat for those species dependent on wildlife trees?

Are the questions and objectives clear and well defined? Using the modified question

✓ Yes – the modified question builds upon the characteristics used by species dependent upon wildlife trees and relates to the initial objectives for WTP creation.

The question as phrased does not provide direct effectiveness, instead it more relates to implementation and did we leave what we said we would. Therefore the first step towards an effectiveness evaluation is often Implementation monitoring to set up future evaluations.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

The next steps

Stand Level Biodiversity – build indicators

1. Build initial indicators – done by committee
2. Test initial indicators – representative, reliable, feasible? – pilot project to test for the three factors
3. Replace, adjust or add more indicators – to be done – then retest
4. Design performance criteria and indices – to be done



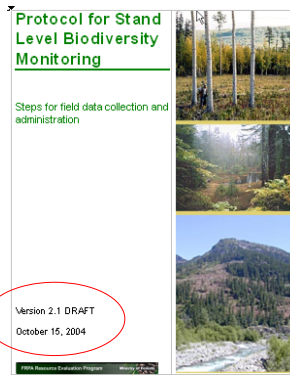
The initial indicators were created by a committee to be tested through pilot projects. They have been reviewed and are in the process of being revised.

At this time there are no specific performance criteria or indices, they are being worked on.

Stand Level Biodiversity

Design Data Collection Approach

- A protocol for block selection and data collection has been created
- An important feature is noting the date and version



Data collection protocols are in place and being updated through Pilot project feedback.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Make recommendations (feedback to management)

The program is evolving.

The Monitoring/Evaluation Framework

Plan Monitoring Program
Implement



10 blocks per District
selected randomly from
a population of 100
randomly selected
blocks.

Pilot districts used the protocol to collect data. Workshops to discuss the results are planned to provide feedback for the process.

The Monitoring/Evaluation Framework

1. Clearly Define Question(s) / Objective(s)
2. Build indicators
3. Design Data Collection Approach
4. Plan Monitoring Program
5. Implement
6. Check Results against Performance Criteria
7. Choose Management Action and Provide Feedback

The next steps.

Stand Level Biodiversity

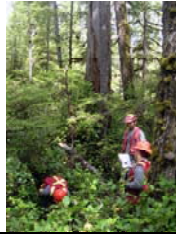
Check Results against Performance Criteria

The plan is to compare data with Baseline sites.

- To answer the question – Were there significant differences in abundance of features in WTPs as compared to their availability in unharvested baseline sites?

Results

Not yet available.



The approach is in its early stages and undergoing refinement at this time.

Stand Level Biodiversity

Make Recommendations, i.e. feedback to management

Conclusions

Not yet available

- Note this assessment is **IMPLEMENTATION monitoring** at this time.
- Since - We have an "implementation question":

Are Wildlife Tree Patches providing the range of habitat for those species dependent on wildlife trees?

This assessment is an example of Implementation monitoring.

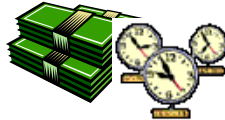
Stand Level Biodiversity

Make Recommendations, I.e. feedback to management

- It can lead to **Effectiveness Evaluation** once evaluation criteria can be agreed upon based on the original ultimate question.

Is the structural retention, Wildlife trees and CWD left associated with cutblocks adequate to maintain habitat for dependent species at the site and across the landscape now and into the future?

AND, once you have time and money available to do this.



It is important for effectiveness monitoring that we know implementation is being done right – so in effect implementation monitoring should be the first step in effectiveness monitoring.

Effectiveness Evaluations – If you have a question that you think EE would help solve, maybe a follow-up Workshop to take it to the next level is for you.

Contact Frank Barber at Frank.Barber@gems6.gov.bc.ca or

Bryce Bancroft at bbancroft@symmetree.ca

to set up a follow-up session.