A Proposal

developed by:

The Landscape and Wildlife Assessment Group (LWAG) and

The Amphibian Research Consortium

to investigate:

Evaluating Sampling Methods for Amphibians

in Type N Systems

submitted to:

Cooperative Monitoring, Evaluation, and Research Committee (CMER)

submitted by:

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US Fish and Wildlife Service, Western Washington Office

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Introduction

Problem Statement and Study Purpose: This study addresses basic needs for amphibian research for the Landscape and Wildlife Assessment Group (LWAG), which is charged with focusing on information gaps that support the Forest and Fish (F^2) agreement, in particular where these affect forest management practices. This study, which addresses sampling methods for amphibians in type N systems, relates to two of five priority wildlife research and monitoring tasks outlined in Schedule L-1 of the Forest and Fish (F^2) report:

(1) G4 - Verification of models that address stream-associated amphibians (SAAs);
(2) G7 - Testing the effectiveness of buffer patches for amphibians in westside type N streams.

Relationship of this study to these tasks is that it addresses the focal sampling method that will be used to examine the validity and effectiveness of proposed buffer prescriptions for type N streams. In particular, this study will determine whether this method can effectively detect target SAAs, and can be use to identify changes in SAA occupancy over time. Without such an analysis, one cannot predict *a priori* whether these methods overestimate or underestimate the effort required. Understanding the efficiency of these methods is important so that researchers and managers can use limited monitoring dollars wisely and sampling protocols can be standardized wherever possible. This study is part of an iterative process leading to G7.

Goals and Objectives: The goal of this project to develop a reliable method of sampling SAAs that can ultimately be used for landscape occupancy trend analysis.

Specifically, this study has two objectives:

1) To determine whether a standard, more comprehensive method of SAA sampling that has the potential to obtain relative abundance data has an significant advantages over a rapid assessment sampling method for presence/non-presence detection of SAAs,
2) To determine criteria that will maximize the return for effort of a presence/non-presence sampling method in Washington state type N landscapes.

Questions and Hypotheses: Standard sampling methods that attempt to assess relative abundance of SAAs in streams suggest that levels of sampling variability are high. Levels may be too high to employ these methods effectively for trend analysis, which will be needed for effectiveness monitoring of type N system buffer prescriptions. Yet, information loss if relative abundance data are excluded is considerable, so it needs determination whether standard sampling methods can provide more key data that a rapid assessment method designed to provide presence/non-presence information. To help determine whether standard sampling methods can provide more key data that a rapid-assessment presence/non-presence method, we ask the question:

1) Do standard sampling methods provide less variable, more accurate (i.e., bias and precision) information than a rapid-assessment method?

We will examine this question by testing the hypothesis that no significant differences exist in the useful information content of data obtained from type N streams sampled with a standard sampling method and a rapid-assessment presence/non-presence method.

A rapid assessment presence/non-presence method developed by Lowell Diller has been applied to streams in California, but its landscape efficiency is based on reasonable guesses. This method needs efficiency evaluation to determine the appropriate criteria for its application; specifically, appropriate criteria for its potential application to type N systems in Washington state. To determine appropriate efficiency criteria for application of the Diller rapid assessment method in Washington state type N systems, we ask the question:

2) Are existing criteria for the Diller rapid assessment methods, as applied in California, appropriate for type N systems in Washington?

We will examine this question by testing the hypothesis that no significant differences in application criteria of the Diller rapid assessment method will exist between California and Washington states.

The study scope focuses on application of the method in westside type N systems because all recognized SAA species in Washington are represented in westside systems. However, with limited modification, we anticipate that the elements developed this study will provide a bases for similar applications in type N systems across the eastslope Cascades as well as more globally within and outside of Washington.

Other Background: The year one pilot study will encompass a suite of type N systems from one westside region, the Willapa Hills, because it is the richest in amphibians in western Washington, and all generic-level taxa found elsewhere are present in the Willapas. Type N system site selection within the region will be based on achieving maximal variability in landscape conditions. The year one study will sample at least 25 type N systems. Data from year one study will be necessary to gauge how many type N systems should be sampled in each westside region for the year two study and how to select those systems. Type N systems to be sampled are from generally high precipitation, forested sites with moderate to high gradients, but otherwise highly variable in their physical and land use characteristics.

This study is a necessary precursor to all TFW projects that involve model validation or trend analysis for amphibians in type N systems.

Proposed Methods

We propose to compare two methods of sampling SAAs in type N streams in a study that will extend, at a minimum, over two years. A first-year pilot study will concentrate on:

1) comparing the information content of the standard method with the rapid assessment method because the rapid assessment method is less costly and its information content may not differ significantly, and
2) defining species-specific baseline criteria for application of the rapid assessment method in Washington state.

Pilot study data will help determine precisely how or where the sampling design should be expanded or reduced, and how extensive that design should be made. The second year of study

will also address between-year variation. Regardless of results, the year one study can stand alone in the event year two funding is not obtainable. Whether a third year of data is required will depend on the results of year two.

Environmental Variables: To address whether no significant differences exist in the amphibian information content of type N streams sampled with a standard method and a rapid assessment method, we will measure or record several variables that relate to amphibian occupation of these systems. These will include:

(1) target amphibian encountered,
(2) life stage (as egg, larvae, metamorph, juvenile, or adult) of target amphibian encountered,
(3) location of first detection of the target amphibian encountered in each sampled reach, and
(4) numbers of target amphibian encountered in sampled reach (for standard method only).
(5) location of the second and subsequent detections of the target amphibian encountered (only within the 30 m of the first detection for the rapid assessment method).

Some of these variables, namely life stage and number of amphibians, are also being recorded in a study of seeps and related aquatic habitats proposed to CMER. However, the context in which these variables are used here differs substantially.

Coarse-level habitat data will also be collected from sampled reaches to help determine whether variation in the aforementioned variables may be related to habitat differences. The coarse-level habitat variables to be measured or recorded will include:

1) aspect,
2) gradient,
3) unit stream power,
4) mean annual flow,
5) birth year of stand, and
6) elevation.

Variables chosen were based on measurable information having substantial likelihood of affecting variation in aforementioned amphibian variables.

Study Design: The year-one study will address sampling at least 25 type N systems in one of westside regions, the Willapa Hills. Selection within region will be randomized from a pool of potential sites, 80% on the actively managed lands and 20% on lands without active management. Sites on lands without active management will be used as reference baselines.

Sampling will use two methods:

1) the unpublished Diller light-touch rapid-assessment landscape method developed for landscape-scale presence/non-presence assessment, and
2) a modification of the widely used stream-scour method of Bury and Corn (1991)

The light touch method requires sampling a fixed reach length focusing on the presumptively best habitat. Sampling will continue for another 30 m to determine whether additional detections occur. After sampling with this method, the same reaches will be sampled within the following three-week interval with a version of the Bury and Corn (1991) method. Specifically, 30 3-m bands will be sampled within the same reach lengths. Placement is will again be biased towards the presumptively

best habitat based on existing life history data for the collective suite of target SAAs. Time constraints in year one will prevent sampling all streams with the modified Bury and Corn method, but at least 12 type N systems sampled with the rapid-assessment method will also be sampled with this method.

In addition, one of the cooperators, the Forest Service's Forestry Sciences Lab, will be testing a third visual method that requires no physical rearrangement of the substrate on at least the 12 type N systems sampled with both the aforementioned mentioned methods. Streams sampled with all three methods will be sampled with the visual method first, the rapid-assessment method second, and the modified Bury and Corn method last.

Field forms will be used to facilitate scoring of the aforementioned data on initial and subsequent surveys. Year one results will guide the sampling scheme for the subsequent year(s).

Data Analysis: Data analysis will use elements from both Statview™ and Systat™, depending on descriptive elements or tests required. Some aspects are general, and encompass variable classes independent of analysis. Continuous variables will be examined using frequency distributions to identify patterns of kurtosis, modality, and skewedness. These will determine whether alterative non-parametric tests should be selected. For comparisons in which variables have a parametric description, variance homoscedascity will be examined. Non-homogeneous variances may also force selection of a non-parametric alternative.

To assess differences in information content between standard, rapid-assessment methods, and visual methods, those variables for which data exist from both methods will be descriptively compared. Chi-square analysis will be used to compare detection levels for target species. Additionally, power analysis will be used to determine the level of confidence that exists in abilities to detect differences of a fixed magnitude for the standard method. An inability to detect a difference of some magnitude will be justification to reject the standard method as adding significantly to the information content of the data collected. Study cooperators will collectively determine the magnitude of difference that should be detectable based on management and practical application criteria.

To determine the general efficiency of the rapid-assessment method and visual methods, frequency distributions of distance to first detections will be used to identify a preliminary asymptote. This asymptote will be used to refine sampling for the year two study design. If an asymptote is not obtained, this will indicate that additional sampling may be required. Data from the lands without active management will be used to determine whether the distance to first detection curve is likely to vary significantly from that generated for actively managed lands. For those coarse-level habitat variables with sufficient range and for which units are reasonably evenly distributed across that range, a two-level comparison of distances to first detections analysis to determine whether habitat-specific differences in detection patterns occur. Distances to first detection will be compared to relative abundance data from the standard method to determine whether distances might be used as a reasonable surrogate for relative abundance. Similar relationships will be explored for distances to the second detection (within the additional 30 m reach sampled), if enough of the latter are available. Distances to second detections will also be examined for habitat-specific differences. Subsequent year data will allow similar comparisons within other regions and between regions. Other comparisons may be possible depending on patterns that may appear in the data.

Data will be entered into Excel in a time- and location-based format for both easy retrieval and manipulation prior to parsing files used in various statistical analyses. Excel is also especially useful

for graphical representations needed for some statistical analyses as well as development of figures for the final report and peer-reviewed publication. Arcview may be required for mapping and depiction of some spatial elements.

Technical Approach: Study Implementation: Tasks for study implementation are listed in order of completion.

1-15 July 2000	Refinement of field protocol, coordination with co-operators, and hiring technicians
16-31 July 2000	Field planning: Assembly of equipment, field form refinement, arranging field lodging, and technician training
1-25 Aug 2000	Fieldwork addressing initial surveys
26 Aug-30 Sept 2000	Initial survey data review, preliminary analysis, and progress report development
1 Oct 2000	First progress report submittal
26 Aug-31 Oct 2000	Second and subsequent surveys where needed
15 Oct-15 Dec 2000	Data review, complete analysis, and second progress report development.
16 Dec 2000	Second progress report submittal
16 Dec 2000-15 Feb 2001	Development of draft report
16 Feb 2001	Draft report submittal and define considerations for year two fieldwork
16 Mar-15 Apr 2001	Internal review
16 Mar-15 Apr 2001	Year two proposal development
16 Apr-15 May 2001	External review
16 Apr-15 May 2001	Final report development
16 May-15 Jun 2001	Final report submittal and year two proposal submittal
16 Jun-15 Aug 2001	LWAG assessment for peer-reviewed publication

If assessment deems sufficiency of data for peer-reviewed publication, development of manuscript for peer review; if assessment deems data insufficient, delay development until after year two data collection

	Initiate fieldwork for year two
	Submit manuscript to peer-reviewed journal if sufficiency allowed development

Details for year-two will become available with development of the year two proposal.

Deliverables

Progress Reports: Progress Reports will be developed in a memorandum format, and will be deliver in both electronic and hard copy forms. Enough hard copies of progress reports will be made to deliver one to each cooperator, LWAG member, and other interested parties. Progress reports will typically not contain illustrations. However, should illustrations be used, they will be graphical figures developed in Excel.

Draft Reports: Draft Reports will be developed in the CMER Technical Report Guidelines format, and will be delivered in both electronic and hard copy forms. However, hard copy draft reports will not be bound. Enough hard copies of draft reports will be made to deliver one to each cooperator, LWAG member, and other interested parties.

Final Reports: Final Reports will be developed in the CMER Technical Report Guidelines format, and will be delivered in both electronic and hard copy forms. All final report copies will bound in appropriate long-lasting format. One hundred hard copies of final reports will be made. Each cooperator and LWAG member will receive one copy. Half of remaining copies will be retained by each of DNR and the project coordinators to be deliverable upon request to other interested parties. Copies of the final report will also be made available on the CMER web page.

Peer-review Submittal: Delivery of a peer-reviewed submittal in year one will depend on whether LWAG judges the year one data sufficient to develop a submittal. If that is the case, the submittal will be developed in the format of the journal that LWAG deems appropriate for submittal. Authorship will include all contributing cooperators. Once submittal is accepted and published, reprints of the publication will be available for dissemination.

Raw Data Repository: Raw data from this will work will be available to other investigator from the appendix of the final report. Electronic forms of the raw data will be obtainable from DNR or WDFW. Any data that qualifies as effectiveness monitoring with be sent to the Effectiveness Monitoring Database of the NW Indian Commission.

Management Structure, Personnel, Resources, and Qualifications

Key Personnel: **Project Coordinator**: Marc P. Hayes, PhD, Washington Department of Fish and Wildlife (WDFW), Habitat Program. Dr. Hayes will be responsible for coordinating the study, oversight of the study on the ground, and development of progress, draft, and final reports. Dr. Hayes will be also responsible for development of peer-reviewed submittals, whenever LWAG judges the data to be sufficient for peer-reviewed publication.

Project Co-coordinator: Timothy Quinn, PhD, Washington Department of Fish and Wildlife, Habitat Program. Dr. Quinn will be responsible for helping to coordinate the study, and assist with fieldwork and development of progress, draft, and final reports. Dr. Quinn will also be responsible for assisting with development any peer-reviewed submittals.

Resumes: Resumes for key personnel are attached (to the end of this proposal).

Other Resources Required: Equipment: Digital thermometers, clinometers, compasses, flagging, GPS units, headlamps, miner's lamps, Pesola spring scales, plastic 15-cm rulers, rangefinders, ziplock bags will be required to complete the fieldwork. Cell phones and field radios will be needed to ensure the safety of field personnel.

Scientific technicians: Four experienced scientific technicians will be hired to help complete the fieldwork. Two of these technicians will have had significant field experience with amphibians and will serve as field crew leaders.

Training: Dr. Hayes and Mr. Larry Jones, a Forest Service cooperator (see below), will provide training for field technicians in field protocol. Specifically, training will address measurement and recording of variables in the field; identification, handling, and measurement of amphibians; mapping and recording procedures; use of GPS units, and computer data entry.

Cooperators: Larry Jones, PNW Research Station, will assist in selection of the five unmanaged control sites, training field technicians, and will sample a subset of sites using the visual method with his field technicians.

Jim MacCracken, PhD, Longview Fibre Company, will provide access to 12 type N field locations from the Willapa Hills and and one field technician who will assist field crews from 1 September 2000 onwards. Dr. MacCracken will also participate in review and analysis of year one data, development of the year two study, and help troubleshoot sampling and analysis issues.

Lowell Diller, Simpson Timber Company, the originator of the rapid-assessment method used in this study with serve as an advisor and advise and assist in analysis of year one data and on the direction of year two design.

Phil Peterson, Simpson Timber Company, will assist with design elements of the year one study. Mr. Petersen will also participate in review and analysis of the year one data, development of the year two study, and help troubleshoot sampling and analysis issues.

Ken Risenhoover, PhD, Port Blakeley Tree Farms, will assist with design elements of the year one study. Dr. Risenhoover will also participate in review and analysis of the year one data, development of the year two study, and help troubleshoot sampling and analysis issues.

Doug Runde, PhD, The Weyerhaeuser Company, will provide access to 19 type N field location from the Willapa Hills region. Dr. Runde will also participate in review and analysis of the year one data, development of the year two study, and help troubleshoot sampling and analysis issues.

We will seek an intra-agency cooperator with expertise with Arcview to assist with spatial analysis.

Lodging: Lodging will be required for field crews during sampling intervals near different field locations so daily shuttling from a point distant from home is not required. Cost of lodging is covered under the simultaneously submitted seep proposal.

Other comparable projects: Dr. Hayes, the project leader, has engaged in at least 30 comparable projects in the Pacific Northwest over the past 10 years. Among the most recent are six projects that address various aspects of Oregon spotted frog (*Rana pretiosa*) ecology at Conboy Lake National Wildlife Refuge (Klickitat County, Washington) and throughout its historic range that ranged in amount from $5,000 to $35,000. Most funding for these projects, some of which are ongoing were through the Oregon and Washington state offices of the Fish and Wildlife Service, and the Ridgefield National Wildlife Refuge Complex (RNWRC), the respective contacts for which are Ms. Laura Todd

(Oregon State Office, Portland), Dr. Karolee Owens (Washington State Office, Lacey), and Mr. Joseph D. Engler (RNWRC, Ridgefield, WA).

Assumptions, Deviations, and Exceptions

Projects involving fieldwork always carry some risk. The greatest risks involve unpredictability of animals under unexpected circumstances. In context of this study, extreme drought conditions could result substantial change in detection patterns that could substantial change detection curves, especially in the rapid-assessment method. Conversely, extremely wet conditions during the typically low flow season could result in circumstances that may make some type N systems sufficiently difficult to sample that analyses and comparisons would be limited. Either of these limitations would result in fieldwork to complete proposed analyses and comparisons requiring more time. In effect, this would extend the pilot project into the 2001 field season and a more comprehensive analysis into 2002.

Lesser risks may influence individual type N systems. Both natural (e.g., landflows) and human-induced (e.g., some fires) phenomena could alter such systems in a way that would make them inaccessible or unusable in the design matrix proposed. In the event of such occurrences, a set of at least 10 alternative type N systems will be available to replace the altered ones.

Application of the these methods to type N systems in Washington, and especially in the Willapa Hills region may force unanticipated modifications to sample effectively on a landscape scale. For example, the Diller rapid assessment methods recommends using a 1000-m reach for landscape level detection of *Ascaphus*. A 1000-m length of reach may not be available for many, if not most, of the type N systems across the Willapa Hills region. In that case, a shorter length may have to be selected to effect adequate landscape coverage. Sufficient modification may prevent comparison of this method with its previous application elsewhere, and in effect, may require development of an entirely region-specific rapid assessment method.

Examination of type N systems in the Willapa Hills that have been harvested recently (in the last 5 years) indicated that slash entirely shielding the stream channel will prevent sampling using the aforementioned methods. Removing the slash shield will alter the steam microenvironment, so a different landscape-scale method will be required to include such units in a landscape assessment that has some level of comparability across all type N units.

Other Information

The project coordinator, Dr. Hayes, with 25 years of field experience with amphibians and the last ten in the Pacific Northwest, has both regional and global reputations in conservation and management of amphibians, and brings an ideal experience background to the coordination and management of this project.

Cost Proposal

General Information:

Total Budget	**$**	**107318.20**
Labor	$	79,224.20
Overhead (20.8%; CMER funding request only)	$	5,824.00
Direct Materials, Facilities, and Equipment	$	7,580.00
Travel	$	14,690.00
In-kind contributions	**$**	**71,726.40**
Labor	$	58,606.40
Direct Materials, Facilities, and Equipment	$	4,220.00
Travel	$	8,900.00
Total requested from CMER	**$**	**35,591.80**
Labor	$	20,617.80
Overhead (20.8%)	$	5,824.00
Direct Materials, Facilities, and Equipment	$	3,360.00
Travel	$	5,790.00
Direct Labor:	**$**	**20,617.80**
Training: Two Scientific Technicians IIIA (2 days @ $10.60/hr x 8 hr/day x 4)	$	339.20
Two Scientific Technicians IIIH (2 days @ $19.99/hr x 8 hr/day x 4)	$	639.68
Fieldwork: Two Scientific Technicians IIIA (30 days @ $10.60/hr x 8 hr/day x 2)	$	5,088.00
Two Scientific Technicians IIIH (30 days @ $19.99/hr x 8 hr/day x 2)	$	9,595.20
Data entry: One Scientific Technician IIIH (30 days @ $10.60/hr x 2 hr/day)	$	1,166.00
One Scientific Technician IIIH (30 days @ $19.99/hr x 2 hr/day)	$	2,189.90
Analysis: One Scientific Technician IIIH (10 days @ $19.99/hr x 8 hr/day)	$	1,599.20
Overhead – General and Administrative Expenses: (WDFW = 20.8%)	$	5,824.00
Direct Materials:	**$**	**1,470.00**
Miscellaneous (copying, phone charges, rite-in-the-rain paper)	$	450.00
Printing and binding (draft report and 100 copies of final)	$	1,000.00
Ziplock bags (200 units @ $3.50/25 units)	$	28.00
Specific Testing: Not applicable		
Facilities and Special Equipment:	**$**	**1,890.00**
Lodging: (Budget covered under seep proposal)		
Equipment		
Digital field thermometers (4 @ $25.00 each)	$	100.00
Miner's lamps with chargers (2 @ $275.00 each)	$	550.00
Pesola spring scales (2 sets of 3 @ $40.00 each)	$	240.00
Rainsuits (4 @ $250.00)	$	1,000.00
Travel Expenses:	**$**	**5,790.00**
Mileage (150 miles x 30 days x 0.31/mi x 2 field crews)	$	2,790.00
Vehicle ($500/month x 3 months x 2 vehicles [one per field crew])	$	3,000.00
Estimated Cooperator Contributions (Cash or In-Kind Services):	**$**	**72,226.40**
Forest Service, Forestry Sciences Laboratory	$	**12,000.00**
Labor	$	10,000.00
Travel	$	2,000.00

Longview Fibre	$	**16,324.00**

Labor	$	14,424.00
Travel	$	1,900.00
Port Blakeley	$	**3,500.00**
Labor	$	2,500.00
Travel	$	500.00
Estimated Cooperator Contributions (Cash or In-Kind Services): (continued)		
Simpson Timber Company	$	**5,500.00**
Labor	$	4,500.00
Travel	$	1,000.00
Washington Department of Fish and Wildlife	$	**18,902.40**
Labor	$	16,682.40
Training: One Research Scientist I (2 days @ $29.88/hr x 8/hr)	$	478.08
Fieldwork:		
One Research Scientist I (12 days @ $29.88/hr x 8/hr)	$	2,868.48
One Chief Scientist (8 days @ $36.17/hr x 8/hr)	$	2,314.88
Data entry: One Research Scientist I (2 days @ $29.88/hr x 8/hr)	$	478.08
Analysis:		
One Chief Scientist (4 days @ $36.17/hr x 8/hr)	$	1,157.44
One Research Scientist I (16 days @ $29.88/hr x 8/hr)	$	3,824.64
Draft and Final Report Development		
One Research Scientist I (16 days @ $29.88/hr x 8/hr)	$	3,824.64
One Chief Scientist (6 days @ $36.17/hr x 8/hr)	$	1,736.16
Travel		
Vehicle ($500/month x 3 months [Research and Chief Scientist])	$	1,500.00
Equipment		
Infrared thermometers (3 @ $240.00 each)	$	720.00
The Weyerhaeuser Company	$	**10,000.00**
Labor	$	8,500.00
Travel	$	1,500.00
US Fish and Wildlife Service	$	**6,000.00**
Labor	$	2,000.00
Travel	$	500.00
Equipment (GPS units)	$	3,500.00
Subcontracted Services:	**$**	**960.00**
Analysis: Statistical Consultation (2 days @ $60.00/hr x 8 hr)	$	960.00

Profit/Risk (only for contracted proposals): A risk element has been incorporated into mileage, but not elsewhere. See assumptions, deviations, and exceptions section for other risk issues.

Literature Cited

Bury, R.B., and P.S. Corn. 1991. Sampling methods for amphibians in streams in the Pacific Northwest. USDA Forest Service, General Technical Report, PNW-GTR-275. 29 pp.