

**Little Balsam Creek Fish Community Assessment**

**Quality Assurance Project Plan**

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**Project Coordinator:** Matt Steiger  
Wisconsin DNR – St. Louis River Area of Concern Program  
1701 N. 4<sup>th</sup> Street  
Superior, WI 54880

**Principal Investigator:** Paul Piszczek

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**Approvals:**

**Date:**

*Matt Steiger*

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\_\_\_\_\_  
Matt Steiger, Project Coordinator

\_\_\_\_\_  
Paul Piszczek, Principal Investigator

\_\_\_\_\_  
Donalea Dinsmore, WDNR Great Lakes Quality Assurance Coordinator

\_\_\_\_\_  
Madeline Magee, OGW Monitoring Coordinator

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## Distribution List

The following individuals and their organizations will receive copies of this approved QAPP and any revisions. This includes people responsible for implementation.

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<b>Name</b>	<b>Organization</b>
Donalea Dinsmore	Wisconsin DNR – Office of Great Waters (OGW)
Madeline Magee	Wisconsin DNR – OGW
Aaron Nelson	Wisconsin DNR – Fisheries Management
Paul Piszczek	Wisconsin DNR – Fisheries Management
Matt Steiger	Wisconsin DNR – OGW Area of Concern Program

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## Executive Summary

This project assesses the fish community, particularly relative to fish passage, in Little Balsam Creek, Douglas County, Wisconsin prior to and after three culvert replacements planned by the St. Louis River Area of Concern (AOC) Program. Project data will be collected, analyzed, and summarized by Superior office personnel of the Department of Natural Resources (DNR) Fisheries Management Bureau using standard fishery survey and analysis methods. Little Balsam Creek is a Class 1 trout stream that supports brook trout, brown trout, and rainbow trout by providing suitable thermal conditions and physical habitats for natural reproduction and propagation of the species. These fishes offer a recreational fishery and possess life history behaviors, particularly seasonal migrations, that necessitate free movement throughout the stream corridor.

The project is the approved Fish Passage Culvert Crossings in Little Balsam Creek – Phase 1 Implementation proposal, and is Project 2 of 6 in DNR’s Office of Great Waters 2017 Area of Concern (AOC) Grant Application, The AOC Remedial Action Plan (RAP) Management Action 9.17 prescribed the replacement or retrofit of at least two perched culverts to facilitate fish and other aquatic organism passage in the AOC. Project data will inform resource managers about the fish community and its response to culvert replacements. The data may also suggest potential outcomes of future road-stream crossing rehabilitation and replacement projects relative to fish passage within and beyond the AOC.

### A. Project Organization

The project is planned and conducted by the DNR’s Superior office Fisheries Management personnel, Paul Piszczek principal investigator, within the Lake Superior Fisheries Management Unit, in consultation with the Project Coordinator Matt Steiger OGW (Figure 1). Superior office personnel include an FTE fisheries biologist, FTE fisheries technician, LTE fisheries biologist, and LTE fisheries technician. The FTE biologist is the Principal Investigator with the Project Coordinator. The FTE biologist and FTE technician are the primary designers and planners of the project, and the FTE technician, LTE biologist, and LTE technician primarily comprise the field survey crew that manages field tasks such as fish collection and data recording and provides logistical planning support. All data are compiled, analyzed, and summarized by whichever staff are available, likely the FTE biologist, FTE technician, or LTE technician. The FTE biologist produces a final summary report and subsequently transmits the report to the Project Coordinator. The principal data users are the FTE biologist and Project Coordinator, although non-project staff can use the report for reference.

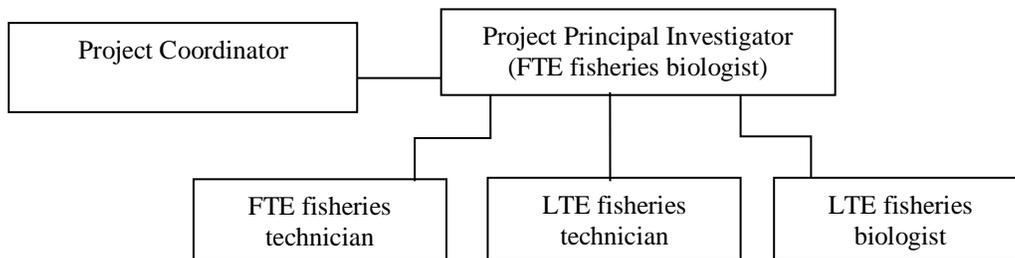


Figure 1. Organizational chart of Little Balsam Creek fish passage assessment project staff.

## **Problem Definition/Background:**

Fisheries data in Little Balsam Creek are lacking to adequately characterize the fish community's ability to migrate throughout the corridor relative to the three perched culverts at County Highway B, Severson Road, and Patzau-Foxboro Road. The perched culverts are considered to either restrict or prohibit fish passage throughout the creek and are therefore planned to be replaced in 2018 and 2019. The existing culverts are metal, round conduits, two of which are corrugated, to be replaced by corrugated metal, bottomless arch conduits. The culverts are perched at their outlets, which can effectually block fish migration and therefore diminish the population's size and viability by reducing spawning success.

The approved Fish Passage Culvert Crossings in Little Balsam Creek - Phase 1 Implementation proposal, which is Project 2 of 6 in the Department's Office of Great Waters 2017 AOC Grant Application fulfills the St. Louis River AOC Remedial Action Plan (RAP) Management Action 9.17, which provides for replacement or retrofit of at least two perched culverts to facilitate fish passage and other aquatic organism passage in the AOC. RAP Management Action 9.17 identified road-stream crossings as likely barriers to fish passage in Wisconsin sections of the AOC (MPCA, 2013 updated 2015-<http://dnr.wi.gov/topic/greatlakes/st.louis.html>).

## **Project Objectives and Data Quality**

The project goal is to describe the Little Balsam Creek fish community at two road-stream crossings (culverts) before and after their replacements and to document improvement in fish passage following replacement of road-stream crossings. Specific objectives are to:

- Estimate fish population size;
- Document fish population size structure; and
- Assess fish passage.
- Document fish passage improvement following the stream crossing project

Standard fish collection surveys will be conducted at discrete stations upstream and downstream from the two culverts in late-summer/early-fall under normal stream flow conditions for that time of year. Individual fish will be marked with a fin clip, to differentiate their collection locations (e.g., upstream or downstream from the culvert). All "downstream" stations receive the same type of fin clip and all "upstream" stations receive the same type of fin clip. Specific data consists of species, numbers of individuals, lengths of individuals, initial collection location, and fin clip type (e.g., upper caudal), all of which will be collected by DNR Fisheries personnel who have from several months to many years of training and experience designing and implementing fishery surveys, operating electrofishing equipment, identifying fish, and compiling and summarizing data. Several data quality objectives are described, below.

**Precision and Accuracy:** Precision and accuracy are not applicable to the collection of fish, due to the lack of opportunity for survey duplication and replication in Little Balsam Creek (i.e., no reference site for electrofishing). However, accuracy of the population size (i.e., number of individuals by species and length) is maximized by using a multiple-pass depletion-removal method, rather than a catch-per-effort method (often a single pass). Following capture, all fishes will be identified either through the knowledge of the specific fish handler or by the collective knowledge of the field personnel. If necessary, however, fish will be vouchered and returned to the laboratory for identification. Any voucher will include project

name, stream name, survey date, and survey location. Total fish numbers will be double-counted prior to release and individual fish will be double-measured if miscommunications occur between the fish handler(s) and data recorders. For the fish passage assessment, accuracy relates specifically to the fin clip type (e.g., top lobe of tail) and survey location, both of which are expected to be 100% accurate; the repetitive act of clipping a fin and the independence of fish survey locations eliminates any potential confusion.

Representativeness: Backpack electrofishing equipment, multiple-pass depletion estimates, and mark-recapture surveys (including fin clipping) are the most widely used and accepted fish survey techniques for wadable stream fishery assessments, particularly for producing representative data across survey stations and pre- and post-culvert replacement timeframes. Fish surveys at each station represent the respective fish communities, and the marking surveys (i.e., first of two surveys for mark-recapture) will represent the extant fish communities upstream and downstream from each culvert prior to and after replacement. The recapture surveys will be conducted following a timeframe that represents the timeframe of which any fish movement could be expected.

Comparability: Backpack electrofishing equipment, multiple-pass depletion estimates, and mark-recapture surveys (including fin clipping) are the most widely used and accepted fish survey techniques for wadable stream fishery assessments, particularly for producing comparable data across survey stations and pre- and post-culvert replacement timeframes.

Sensitivity: Backpack electrofishing equipment, multiple-pass depletion estimates, and mark-recapture surveys (including fin clipping) are the most widely used and accepted fish survey techniques for wadable stream fishery assessments, particularly for ensuring the data are sufficiently sensitive to comparisons among survey locations and determining the extent to which fish can move relative to obstructions such as perched culverts.

Completeness: All proposed surveys are expected to be completed in the prescribed timeframes. The project can be deemed complete, however, if all prescribed surveys at County Highway B (i.e., pre-replacement upstream and downstream, and post-replacement upstream and downstream) are conducted, as the data from these surveys can reflect the fish community and fish passage at other culverts within the project (i.e., Patzau-Foxboro Road). Standard survey station lengths (e.g., 100 meters) are expected to yield sufficient numbers of fish to compute population estimates and to mark for the passage assessment, then subsequently recapture. If numbers of fish are deemed insufficient at the time of each survey, the survey station length will be extended until at least 30 individual salmonids are captured, as discussed in Sampling Method Requirements, below.

## **Project/Task Description and Schedule**

Electrofishing surveys will be the primary task for this project and conducted using standard backpack electrofishing gear for depletion-removal population estimates and a mark-recapture passage assessment. The surveys will consist of capture, identification, enumeration, measurement, and release of individual fish during each independent survey (i.e., sampling event), then recapture in a subsequent independent survey within three to six days after the initial survey. A fin clip, which is a standard and widely used fish marking technique, will be used to identify individual fish and determine the extent to which fish passed through the crossings. The surveys will be conducted in August or September 2018, prior to culvert replacement, to maximize the capture efficiency of individual fish. Fish are most easily seen and captured during low stream flow, and fish will have had much of the summer season to grow to more catchable size (e.g., one to two inches). Post-culvert replacement surveys will be conducted at similar times.

Specifically, culverts will be replaced in 2018 and 2019, with the post-replacement surveys being conducted in 2020. As needed, block nets will be installed to minimize fish immigration or emigration during the survey. The data collection, processing, and reporting schedule is summarized as follows:

- Summer 2018 (culvert pre-replacement): Fish surveys at upstream and downstream stations at two road stream crossings (County Highway B; Patzau-Foxboro Road);
- Fall/Winter/Spring 2018-2019: Input, analyze, and compile data in MS Excel worksheets;
- Summer 2020 (culvert post-replacement): Repeat fish surveys from Summer 2018;
- Fall/Winter/Spring 2020-2021: Input, analyze, and compile 2020 data as was done for 2018 data and; compare 2018 and 2020 data; write final report (May 2021).

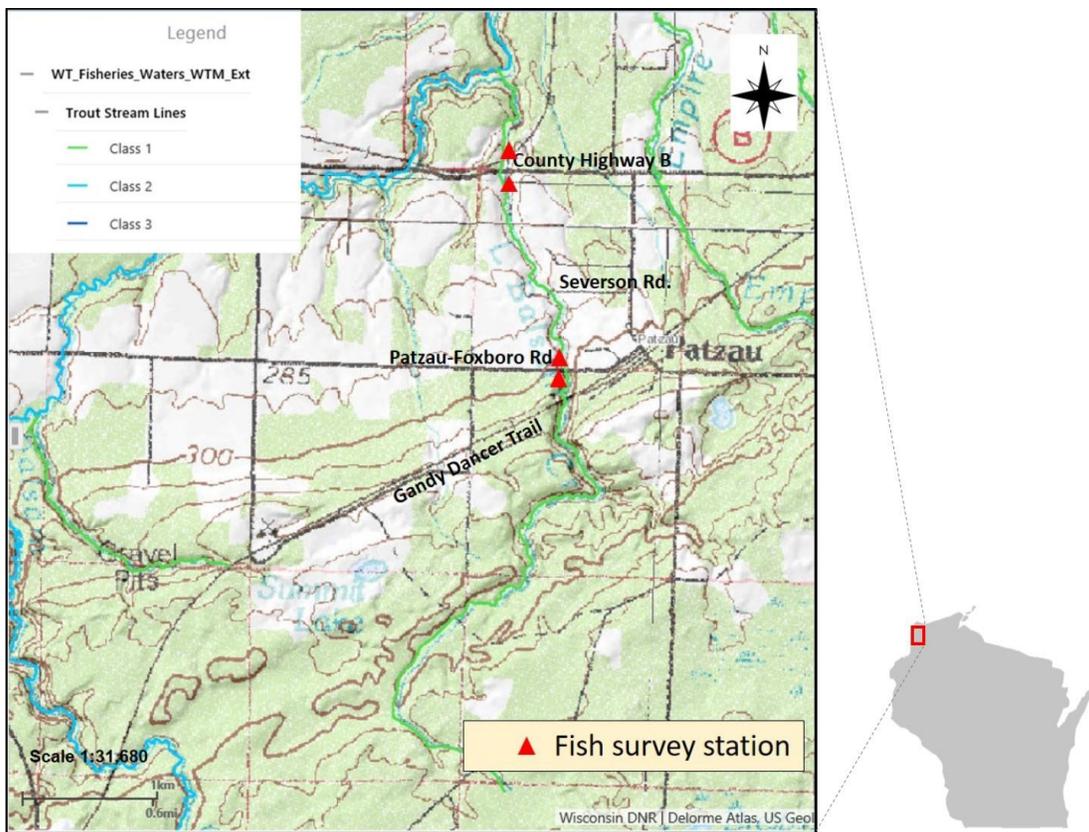


Figure 2. Little Balsam Creek fish community assessment project location, Douglas County, Wisconsin.

Stream Crossing	Lat	Long
County Highway B	46.489859	-92.227896
Patzau-Foxboro Road	46.503663	-92.234826

## **Personnel, Special Training Requirements or Certifications**

Personnel consist solely of DNR Fisheries staff from the Superior office, all of which have from several months to many years of training and experience designing and implementing fishery surveys, operating electrofishing equipment, identifying fish, and compiling and summarizing data. All personnel have received electrofishing safety training, a statewide DNR prerequisite for fish surveys using electrofishing.

## **Documentation and Records**

All project-related documents, from correspondence to data to reports will be stored in various electronic file formats (e.g., .doc, .xlsx, .pdf) in the DNR Superior office electronic file folders. Any paper copies will also be retained in the Superior office paper files. Fish surveys will be documented on standard DNR field data sheets, which include a metadata section, general survey conditions section, open space for comments, and the fish records table. The raw field data sheets will be retained indefinitely in the Superior office paper files in a folder specific to this assessment project. All data will be input to MS Excel worksheets, analyzed using various tools within the software, and electronically stored in the DNR Superior office electronic file folders. The final report will be prepared in MS Word and distributed to individuals on the distribution list, previously noted in this QAPP. The report and its drafts will also be stored in the DNR Superior office electronic file folders.

## B. Measurement/Data Acquisition

### **Sample Process Design (Experimental Design)**

A significant storm event produced flood-stage river flows from June 15-17, 2018, which damaged or destroyed numerous road-stream crossings in Douglas County and the Town of Summit, including County Highway B and Patzau-Foxboro Road. Fish passage in Little Balsam Creek will continue to be an AOC priority, and as such, the fish passage assessments will continue as initially planned.

Sixteen discrete surveys will be conducted at each road-stream crossing to be replaced:

Survey Timeframe	Survey Location	Survey Station	Survey Type	Number of Surveys
Pre-replacement	County Highway B	Downstream	Mark	1
			Recapture	1
		Upstream	Mark	1
			Recapture	1
	Patzau-Foxboro Road	Downstream	Mark	1
			Recapture	1
		Upstream	Mark	1
			Recapture	1
Post-replacement	County Highway B	Downstream	Mark	1
			Recapture	1
		Upstream	Mark	1
			Recapture	1
	Patzau-Foxboro Road	Downstream	Mark	1
			Recapture	1
		Upstream	Mark	1
			Recapture	1

### **Sampling Method Requirements**

Fish will be surveyed at the problem culverts at County Highway B and Patzau-Foxboro Road prior to and after their replacements. Replacements will occur in 2018 and 2019. Specifically, discrete survey stations will be established immediately downstream and immediately upstream from each culvert. For example, the downstream station will end at the culvert outlet and the upstream station will begin at the culvert inlet. Block nets will be installed as necessary to minimize fish escapement from the station. Surveys will be conducted during August and September 2018 and September 2020 under normal seasonal stream flow conditions for that time of the year and relative to the culvert replacement schedule.

Survey station length is established using standard stream protocol (35x Mean Stream Width) and the same stations are used for pre and post surveys. All surveys will be conducted with one or two pulsed DC backpack electrofishing units, depending on water conditions and staff availability, owned by DNR Fisheries. Survey equipment and supplies will include dip nets, buckets, measuring boards, clipboards, and field data sheets, also owned by DNR Fisheries. Electrofishing will consist of at least two consecutive electrofishing passes (exclusive of interim periods to process fish from each pass) within each discrete sampling station. This methodology will provide data for computing population estimates at each survey station after Zippin (1958) and assessing fish passage similar to work by Cahoon et al. (2007). For the fish passage assessment, if insufficient numbers of fish are captured within the station after three passes, additional stream lengths will be surveyed immediately upstream from the upstream station and

immediately downstream from the downstream station to capture additional fish until at least 30 total salmonids are captured. These fish will be processed and retained independently from those collected from the discrete station.

Following capture after each electrofishing pass, all fish will be identified to species. Due to the known low relative salmonid abundances at each crossing, all salmonids such as rainbow trout and brook trout will be measured to the nearest 0.1 inch, recorded, and counted. Contrastingly, only 25 individuals from each non-game species captured will be measured to the nearest 0.1 inches, recorded, and counted. All non-measured individuals will be counted and recorded. All salmonids and up to 100 non-game species individuals will be given a fin clip as a temporary mark during the initial surveys to distinguish fish from the upstream station and downstream station when recaptured in the recapture survey. The temporary fin clip will be a small piece of fin from the top or bottom lobe of the tail, sufficiently large to be identified in follow-up surveys. In the event of any time constraints during the fish surveys, only up to 100, two-inch and longer individuals of non-game species will be given a fin clip. Following processing, all fish will be retained instream in a sealed flow-through mesh fabric bag until all electrofishing runs in both stations are completed. Fish from both the downstream and upstream stations will then be released to the stream in the downstream station.

Excluding fin clipping but including examination for fin clips, the survey procedure will be repeated at each station three to six calendar days after the initial surveys, which will provide data necessary to assess fish passage prior to culvert replacement. This range of time will accommodate any scheduling and logistical complications due to weather and stream flow conditions. Cahoon et al. (2007) used a 48-hour period between initial capture and recapture sampling to track movement of fish marked with visible implant elastomer tags within a closed section of stream that was created by installation of block nets. Belford and Gould (1989) monitored trout passage through a culvert over a five-day period by marking fish with either a fin clip or T-bar Floy® anchor tag; the study used electrofishing and an instream wear to recapture tagged fish. Solcz (2007) tracked passage of Yellowstone cutthroat trout over the course of several months using PIT tags and arrays to detect movement through culverts.

The entire procedure, including fin clipping, will be repeated after both culverts have been replaced during the comparable field season (i.e., September 2020). Any fin clips from previous surveys are expected to have regenerated by 2020.

## ***Data Management***

All data will be stored, managed, analyzed, and reported electronically using networked desktop computers. The data will be transcribed directly from field data sheets to the DNR Fisheries Management Database, a cache available only to DNR Fisheries personnel through its computer network and centrally managed by DNR Fisheries Information Technology personnel. Prior to and after input to the database, the data will be reviewed for errors and outliers. Any errors will be reconciled through consultation between and among field and/or data entry personnel. Outliers and irreconcilable errors will be omitted from the analysis. A data summary will be shared with the Principal Investigator after the data are collected and compiled.

For analysis, the data will be retrieved from the database and used to calculate population estimates and fish passage efficiency for each of the pre- and post-replacement stream conditions. Fish passage efficiency will be expressed as the number and proportion of fish of each species with fin clips from the upstream station that return to the upstream after the interim period between the mark and recapture surveys (e.g., four days). However, fish with fin clips from the downstream station will also be used as a

secondary measure of successful fish passage. The data will be appropriate for either parametric methods such as t tests and ANOVA or non-parametric methods such as Chi-square, with significance detection at 0.05 alpha. Tests for data normality will first be conducted to determine which test to use. Analyses will be conducted by treatment (pre- and post-replacement) and by fish species.

## **C. Assessment/Oversight**

### ***Assessments and Response Actions***

Formal assessments are not planned for the project. The Principal Investigator and field personnel (at most, three staff) will constantly remain in close communication with one another prior to, during, and after each survey. The Principal Investigator will periodically assist the field personnel. The field personnel will immediately report to the Principal Investigator any complications and inefficiencies with the surveys, staffing arrangements, etc., and modifications will be made accordingly. Any requisite modifications will be made to ensure population estimates can be computed and fish passage could be assessed according to this QAPP. In the unlikely event that survey data are insufficient, alternative methods to assess fish passage will be proposed to the Project Coordinator via electronic mail.

### ***Reports to Management***

A fish passage assessment report will be drafted by the Principal Investigator and/or DNR Fisheries personnel involved with the surveys. Following review and approval by the Principal Investigator, the Principal Investigator will transmit the report to the Project Coordinator via electronic email. The Project Coordinator will provide comments and suggestions, as necessary. Any revisions to the report will be made and/or approved by the Project Investigator prior to transmittal of the final report to the Project Coordinator. The final report will illustrate the performance of the culvert replacements relative to the providing fish passage at County Highway B and Patzau-Foxboro Road. Further, the report will provide methodology for future fish passage assessments within or beyond the AOC.

## **D. Data Validation and Usability**

### ***Data Review, Verification, and Validation Methods***

All data will be reviewed by the field personnel at the time of transcription from the field data sheets to input to the DNR Fisheries Management Database. Errors discovered at that time will either be reconciled with the Principal Investigator and field personnel or omitted from the analysis. Potential errors will likely be limited to illegible handwritten data on the data sheets or incorrect species-length couplets. For example, a recorded 10-inch long longnose dace would be reconciled as either a 10-inch rainbow trout or brook trout, or a 1.0-inch longnose dace; longnose dace do not attain 10 inches. Irreconcilable data will be excluded from the data set and the analysis. Any data collected through deviations from the prescribed sampling plan will be reconciled via consensus between the Principal Investigator and field personnel. Without consensus, the datum will be excluded from the data set and the analysis.

### ***Reconciliation with Data Quality Objectives***

The data will be compiled after the conclusion of all surveys and subsequently reviewed to determine overall usability relative to each data quality objective, as follows:

Precision and Accuracy: All surveys will be reviewed relative to the numbers of passes used in each survey. Only surveys with at least two passes will be used for quantitative analysis between culverts and among surveys. For fish identification, only those species positively identified will be included in the data set. Any species not positively identified, either in the field or laboratory via voucher, will be excluded. The Principal Investigator will consult the field personnel to identify any inconsistencies in the data that could have resulted from miscommunications between the fish handler(s) and data recorder. Any irreconcilable data will be excluded from the data set.

Representativeness: The Principal Investigator will review all surveys to determine whether they were conducted with backpack electrofishing equipment, multiple-pass depletion estimates, and mark-recapture surveys (including fin clipping). Further, the Principal Investigator will consult field personnel to determine the timeframe of the surveys, particularly the time between the individual marking surveys and recapture surveys. Any survey couplets found to exceed the prescribed three to six-day timeframe will be considered usable only if stream conditions are deemed relatively consistent with those during the marking survey. The timeframes for all surveys relative to pre- and post-replacement are obvious, and therefore do not require review.

Comparability: The Principal Investigator will review all surveys to determine whether they were conducted with backpack electrofishing equipment, multiple-pass depletion estimates, and mark-recapture surveys (including fin clipping). The Principal Investigator does not anticipate any deviations from this, since no other survey is appropriate and applicable.

Sensitivity: The Principal Investigator will review all surveys to determine whether they were conducted with backpack electrofishing equipment, multiple-pass depletion estimates, and mark-recapture surveys (including fin clipping). The Principal Investigator does not anticipate any deviations from this, since no other survey is appropriate and applicable.

Completeness: The Principal Investigator will review the surveys to determine whether all 16 prescribed surveys were conducted, specifically the surveys at County Highway B. Any marking survey that does not include a companion recapture survey will be excluded from the fish passage assessment. A population estimate for the marking survey will be computed in those instances, however. Any survey that was not conducted in its full station length (e.g., 100 meters) will be excluded from population estimates. However, mark-recapture fish passage efficiency will be computed and included in the overall fish passage assessment.

Final assessment of the data for pre and post surveys will be compared to determine if a significant difference in passability is observed. Trout species are the focal point of the passage assessment and non-game species observed may be pooled or assessed by species if there is sufficient data.

## **References**

- Belford, D.A. and W.R. Gould. 1989. An Evaluation of Trout Passage through Six Highway Culverts in Montana. *North American Journal of Fisheries Management*, 9:4, 437-445
- Cahoon, J. E., T.E. McMahon, O.R. Stein, D. Burford, and M. Blank. 2007. Warmwater Species Fish Passage in Eastern Montana Culverts – Final report FHWA/MT-07-009-8182, prepared for Montana Department of Transportation. Montana State University, Bozeman, MT Helena, MT. 70 pp.

- Solcz, A.A. 2007. Assessment of Culvert Passage of Yellowstone Cutthroat Trout in a Yellowstone River Spawning Tributary Using a Passive Integrated Transponder System. M.S. Thesis, Montana State University, Bozeman, Montana. 63 pp.
- Zippin, C. 1958. The removal method of population estimation. *Journal of Wildlife Management*, 22, 82-90.