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|  | **Fish and Wildlife Policy**  2nd floor, Provincial Building  213-1 St. W  Cochrane, Alberta  T4C 1A5  Canada  Telephone:403-851-2200  [www.alberta.ca](http://www.alberta.ca) |
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| From: | Dr. Andrew Paul  Provincial Environmental Flow Specialist  Alberta Environment and Parks  Kenton Neufeld  Senior Fisheries Biologist  Alberta Environment and Parks  Rocky Mountain House  kenton.neufeld@gov.ab.ca | Our File Reference: |  |
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| Your File Reference: |  |
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| To: | Dr. Carl Schwarz  StatMathComp Consulting by Schwarz, Inc  625 Bentley Road  Port Moody, BC V3H 3A4 | Date: | 7 January 2019 |
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| Subject: | **Proposal for workshop to describe analytical methods in R for before-after control-impacted watershed experiments** | | |

**Background**

Intensive OHV reclamation activities and reductions in public motorized access have been initiated in Alberta to support native trout recovery. “Intensive” efforts are defined as those improving >50% of highly degraded trout habitat. Extensive restoration is required to deliver measurable changes in fish abundance; others have predicted restoring 20% of a degraded stream was required to achieve a 25% increase in smolt production for coho salmon and 100% of the habitat would need to be restored to be 95% certain of achieving a 25% increase in smolt production. In Alberta, three HUC 10 watersheds targeted for remediation: Rocky Creek, Fall Creek, and Mackenzie Creek. It is the goal of Alberta Environment and Parks to monitor fish populations in these watersheds and detect if the reclamation activities result in a measurable change to the density of immature and adult fish, particularly bull trout. For Rocky Creek, there are three HUC 10 control watersheds; for Mackenzie Creek there are two HUC 10 control watersheds; and, for Fall Creek, there are no control watersheds.

In addition to reclamation activities on these watersheds, landscape-level experiments are being used to evaluate management actions on fish populations throughout the province. Similar to reclamation activities on Rocky, Fall and Mackenzie, the study design of these landscape-level experiments can follow one of several permutations in the spectrum of before-after, control-impacted or multiple treatments. Having a statistically rigorous framework for evaluating these studies will be important both scientifically and to stakeholders.

**Objective**

The objective of the proposed work is to run an 1 day workshop that presents the analytical methods in R to statistically evaluate the unbalanced multiple treatment BACI design s. The workshop would cover:

1. a matched before-after control-impact (mBACI) design for evaluating a single watershed treatment;
2. a pooled mBACI design using a Bayesian hierarchical approach to allow sharing of information across watersheds; and,
3. an approach to deal with treatment responses that change either the magnitude or trend in observed data.

**Deliverables**

There are two deliverables from the proposed works:

1. Provide participants all necessary R code, libraries and supporting programs for the workshop one week prior. It will be the responsibility of workshop participants to have: a) computer with a functioning copy of the latest versions of R and RStudio; and, b) supporting libraries and programs installed.
2. An 1 day workshop that meets the above objectives.

**Budget**

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| **Task** | **Days** | **Cost per day** | **Cost** |
| Workshop preparation | 0 | $1000 | 0 |
| Workshop | 1.0 | $1000 | $1000 |
| Travel |  |  | $1000 but charged at cost |
|  |  | Total (including GST) | $2000 (AB is GST exempt) |

**Timeline**

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| --- | --- |
| **Task** | **Date** |
| Workshop | Prior to 31 March 2019 |