**Alberta Conservation Association**
**2009/10 Project Summary Report**

**Project Name:** *Stream Crossings and Arctic Grayling Conservation in the Athabasca River Basin*

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**Partnerships**

Alberta Sustainable Resource Development
University of Alberta

**Key Findings**

- Conductivity (>300 µS/cm) significantly increased Arctic Grayling electrofishing catch rates, but did not influence angling catches.
- Angling was the most efficient method for sampling Arctic Grayling, but we suggest using both electrofishing and angling to sample all grayling size classes.
- Artic Grayling should be sampled later in the summer to improve the probability of capture.
- In general, mark-recapture and three-pass depletion methods resulted in similar Arctic Grayling population estimates.
- Of the stream crossing structures, only culverts appeared to influence Arctic Grayling distributions. However, the majority of grayling were found at non-hanging culverts.
- At a sub-basin scale, we found no significant relationship between road densities (km/km$^2$) and Arctic Grayling abundance; however, populations in the Athabasca sub-watershed may already be too fragmented to detect changes in abundance.

**Introduction**

In Alberta, Arctic Grayling (ARGR) populations have declined severely in the past 50 years, and improperly installed culvert crossings may be a major contributing factor (Alberta Sustainable Resource Development (ASRD) 2005). Despite being listed provincially as *Sensitive* (ASRD 2001), Alberta lacks a standardized sampling method for ARGR. The purpose of our project was to determine effective monitoring protocols for Arctic Grayling in wadeable streams by assessing the field efficiency of several sampling methods, how temporal and stream characteristics effect

ARGR catch rates, and comparing grayling population estimates using mark-recapture and three-pass removal methods for small (≤110 mm) and large ARGR (>110 mm). Furthermore, we assessed the effects of stream crossing structures on ARGR abundances above and below watercourse crossing structures, and on a larger sub-basin scale.

**Methods**

From May 12 – 27, 2009, we conducted egg kick surveys at 20 sites in 13 sub-basins of the Athabasca River drainage. Potential spawning sites were identified as riffle-run transitions in second- to fourth-order streams, with water depths of 0.15 – 0.5 m, water velocities of 0.35 – 0.55 m/s, and gravel/cobble substrate (Huet 1959, Stewart et al. 1982, J. O'Neil pers. comm.). We assessed potential spawning habitats by disturbing the substrate for one minute in a 1-$m^2$ sample plot upstream of a kick-net at three to nine locations within the riffle-run transition area. Three transition areas were sampled such that a total of 18 1-$m^2$ plots per site were sampled.

During the 2008 and 2009 field seasons, we electrofished a total of 84 sites and angled 33 sites in 18 watershed sub-basins for ARGR. A subset of nine sites were resampled for the mark-recapture and three-pass removal study. We collected biological information (fork length, species identification) and habitat data (stream width, temperature, water chemistry) at each site. After measurement, we returned fish to their respective stream sections. We conducted stream crossing inventories on sampled sites, following inventory protocols outlined in McCleary et al. (2006).

**Results**

Angling using dry flies was the most efficient method for capturing ARGR. Using a three-person crew, angling captured 2.33 fish/h, while electrofishing detected 1.13 fish/h, and kick surveys an average of 1 egg/h.

Of stream habitat data parameters investigated, only conductivity (>300 µS/cm) significantly influenced ARGR electrofishing catch rates. Angling and electrofishing typically captured fewer ARGR in early summer (May 15 – July 15) than late summer (July 16 – August 31). Fish caught by angling were larger, on average (111 mm), than those captured by electrofishing. However, electrofishing allowed us to capture young-of-the-year ARGR. We found that ARGR population estimates were similar using three-pass depletion and mark-recapture methods.

In our comparison of ARGR abundance above and below bridges (n = 12) and culverts (n = 7), we found that angling catch rates did not differ significantly above and below either structure. Electrofishing catch rates were not significantly different above and below bridges, but we captured 85% more ARGR above culverts (Figure 1). However, we only detected grayling at culverts with little or no hang height (≤0.04 m). At the sub-basin scale, increasing road densities did not significantly influence ARGR abundances (Figure 1).

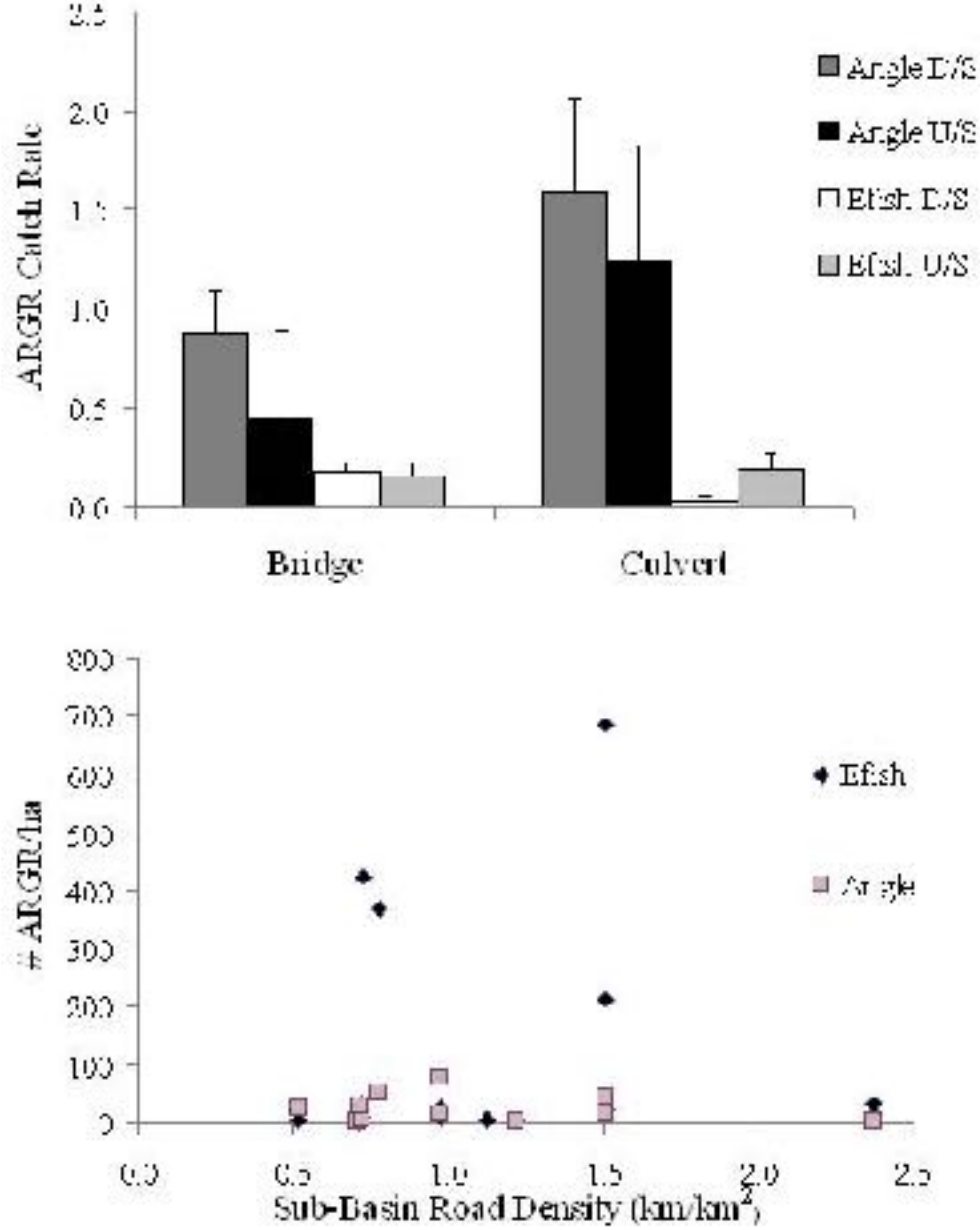


Figure 1. a) Comparison of mean (± standard error, SE) catch rates of Arctic Grayling (ARGR) upstream (U/S) and downstream (D/S) of bridge and culvert crossings using angling (#ARGR/angler hour) and electrofishing (#ARGR/100s) gear. b) Comparison of ARGR abundances in Athabasca River sub-basins with different road densities.

**Conclusions**

Angling was the most efficient method for sampling ARGR in wadeable streams, but we suggest using both electrofishing and angling to sample all ARGR size classes. We suggest sampling ARGR later in the summer to improve the probability of capture. Three-pass depletion and mark-recapture ARGR population estimates rarely differed; we suggest using mark-recapture methods because they are typically less labour intensive.

Of the stream crossing structures, only culverts appeared to influence ARGR distributions. However, the majority of grayling were found at non-hanging culverts. At a sub-basin scale, we found no significant relationship between road densities (km/km$^2$) and ARGR abundance;

however, populations in the Athabasca sub-watershed may already be too fragmented to detect changes in abundance.

**Communications**

- Presentation to the Northern Light Fly Tyers. February 17, 2010.
- Presentation to the Alberta Flyfishers Club. February 1, 2010.

**Literature Cited**


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Photo Captions

Field staff, Troy Furukawa (ACA) and Sierra Sullivan (University of Alberta), conducting Arctic Grayling egg kick surveys. (Photo: Laura MacPherson)

Typical stream habitat sampled for Arctic Grayling. Wolf Creek is pictured. (Photo: Laura MacPherson)

Main stem of Pinto Creek, excellent Arctic Grayling habitat. (Photo: Laura MacPherson)