the River Restoration Centre
Working to restore and enhance our rivers

Delivering River Restoration: Recipes for Success

13ᵀᴴ Annual Network Conference

Environment Agency WETLANDS INTERNATIONAL SYKE CIRF

Restoring Europe's Rivers

ACE   AlaskA   ARUP   Cain

Halcrow A CH2M HILL COMPANY   LAND & WATER Services   Penny Anderson Associates Ltd CONSULTANT ECOLOGISTS   ROYAL HASKONING Enhancing Society

rshydro   Salix   WILLOWBANK Erosion & Conservation Services   WLW LTD

A HYDRAULIC AND FISHERIES BASED POST-PROJECT APPRAISAL OF THE INCHEWAN BURN RESTORATION PROJECT, BIRNAM, SCOTLAND

David Gilvear, Colin Bull, Stuart Hugh, Heather Bryson, Lewis Lowe, Ross Paterson, Iain Prescott, Andrew Rossi

Biological and Environmental Sciences
University of Stirling

River Restoration Centre conference
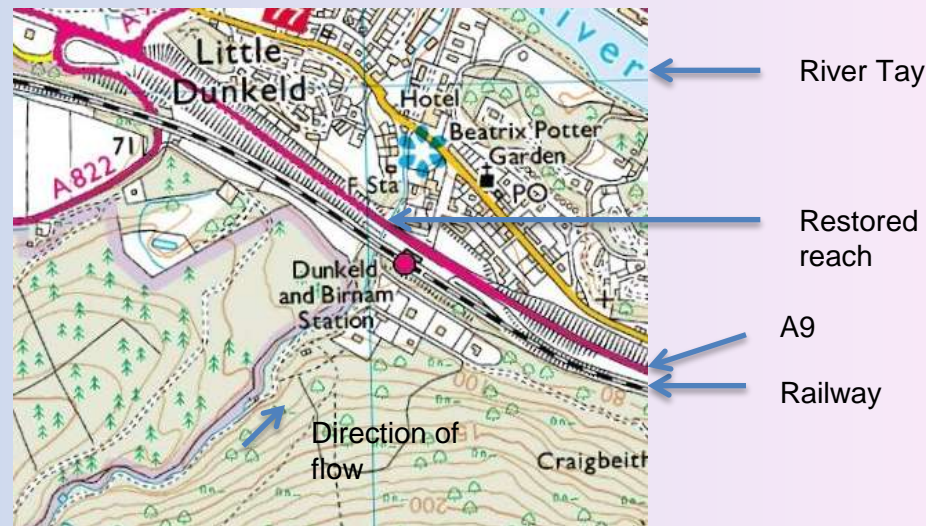April 2010

Introduction

Inchewan Burn encased in gabions during upgrading of A9 Road (1970s).

Dewatered burn and prevented fish passage

Local Ghillie took upon himself to remedy the situation

RRC advised/funding from HEI Fund.

Physical works undertaken in 2008 and improvement of upstream habitat (conifer removal from burn margins)

River Tay

Restored reach

A9

Railway

Direction of flow

INTRODUCTION
RIVER
RESTORATION
WORKS
STAFFING AND
METHODS
FINDINGS
CONCLUSIONS

The river restoration works

Before

During

The river restoration works

After

Downstream

CENTRE FOR
RIVER
ECOSYSTEM
SCIENCE

UNIVERSITY OF
STIRLING

Staffing and Methods

Personnel:

Students (BSc) under tuition of David Gilvear (Fluvial geomorphologist) and Colin Bull (Fisheries biologist)

Hydraulic Habitat Assessment:

5 sites – 3 upstream, restored A9 reach, 1 downstream.

100 measurements of velocity and depth along centre line; also depth and velocity at 3 cross-sections leading to over 700 measurements in total; Top ten boulder sizes in each reach at top, middle and bottom.
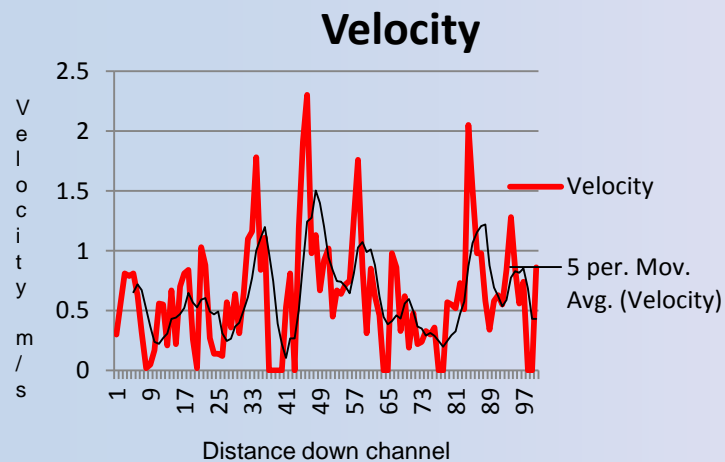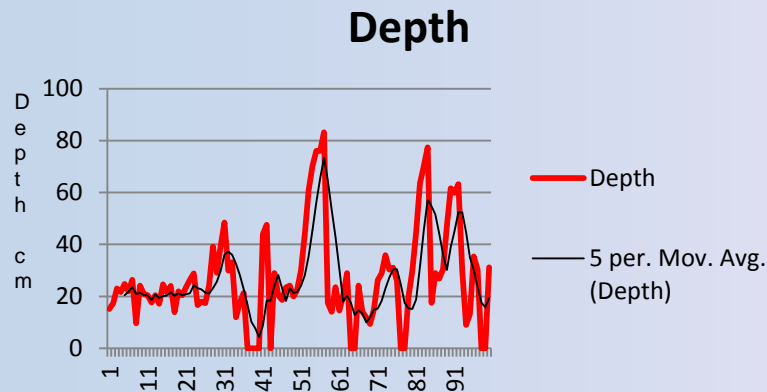
Fisheries assessment:

4 sites – 2 upstream (n=2), restored A9 reach (n=2), 1 downstream(n=2)

Electracatch backpack, 250 V PDC. Operated by fully trained SFCC team leader; 5 minute timed sampling selecting for optimal salmonid habitats available. Species present, number and size recorded.

CENTRE FOR
RIVER
ECOSYSTEM
SCIENCE

UNIVERSITY OF
STIRLING

Hydraulic habitat assessment

Depth

Velocity

Distance down channel

INTRODUCTION
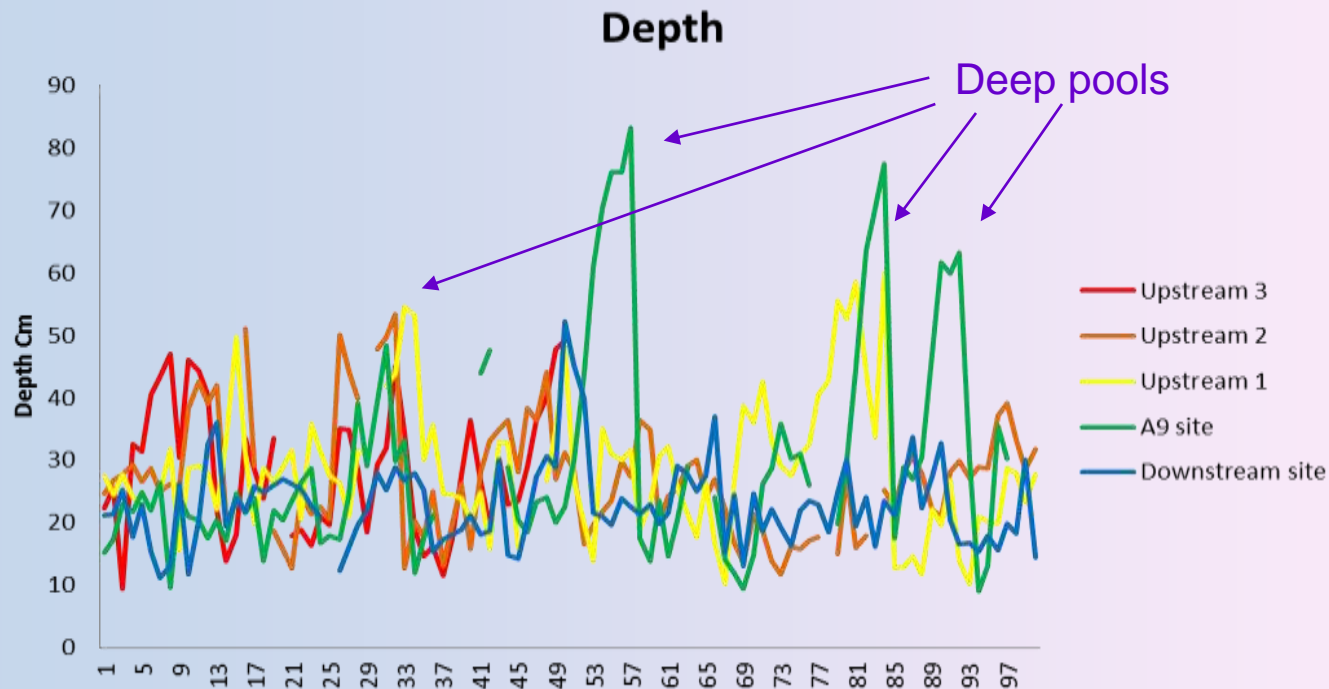THE RESTORATION
WORKS
STAFFING AND
METHODS
FINDINGS
CONCLUSIONS

Restored reach

• Depths at low flow - 0-80cm

• Water Velocities - 0.15-2.5 ms^{-1}
• Step-pool morphology

Hydraulic habitat assessment

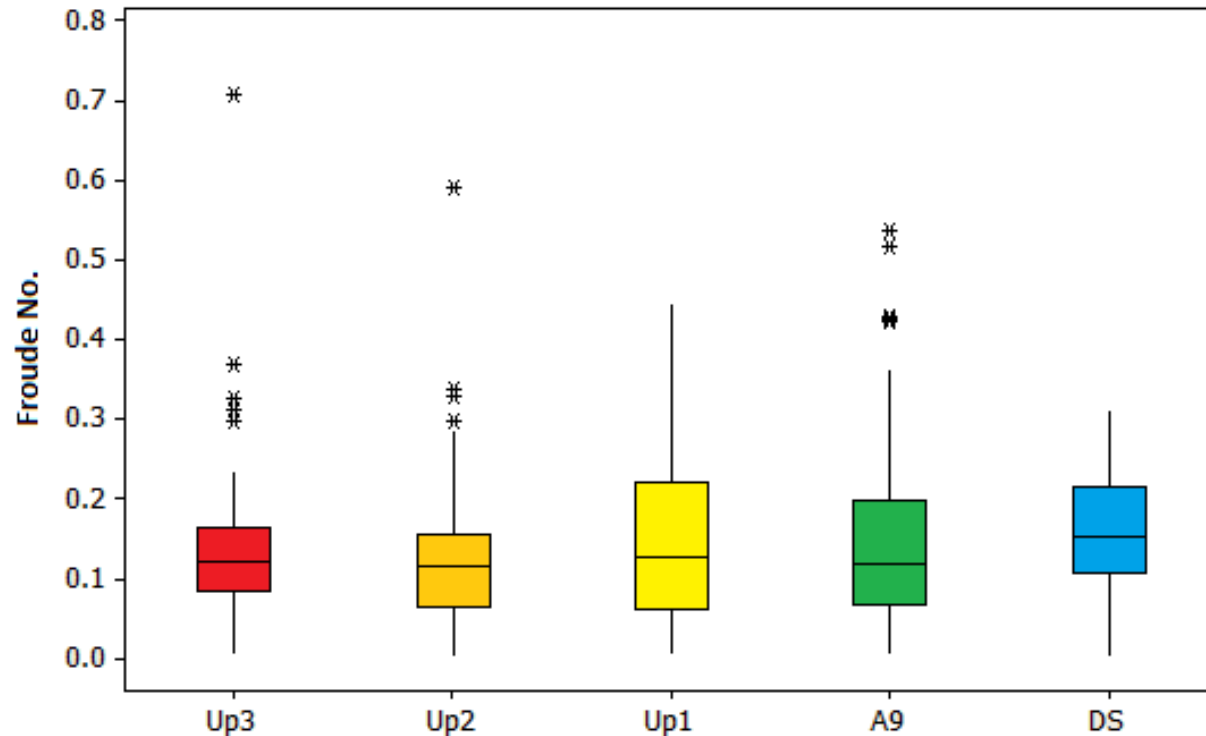INTRODUCTION
THE RESTORATION
WORKS
STAFFING AND
METHODS
FINDINGS
CONCLUSIONS

Hydraulic habitat assessment
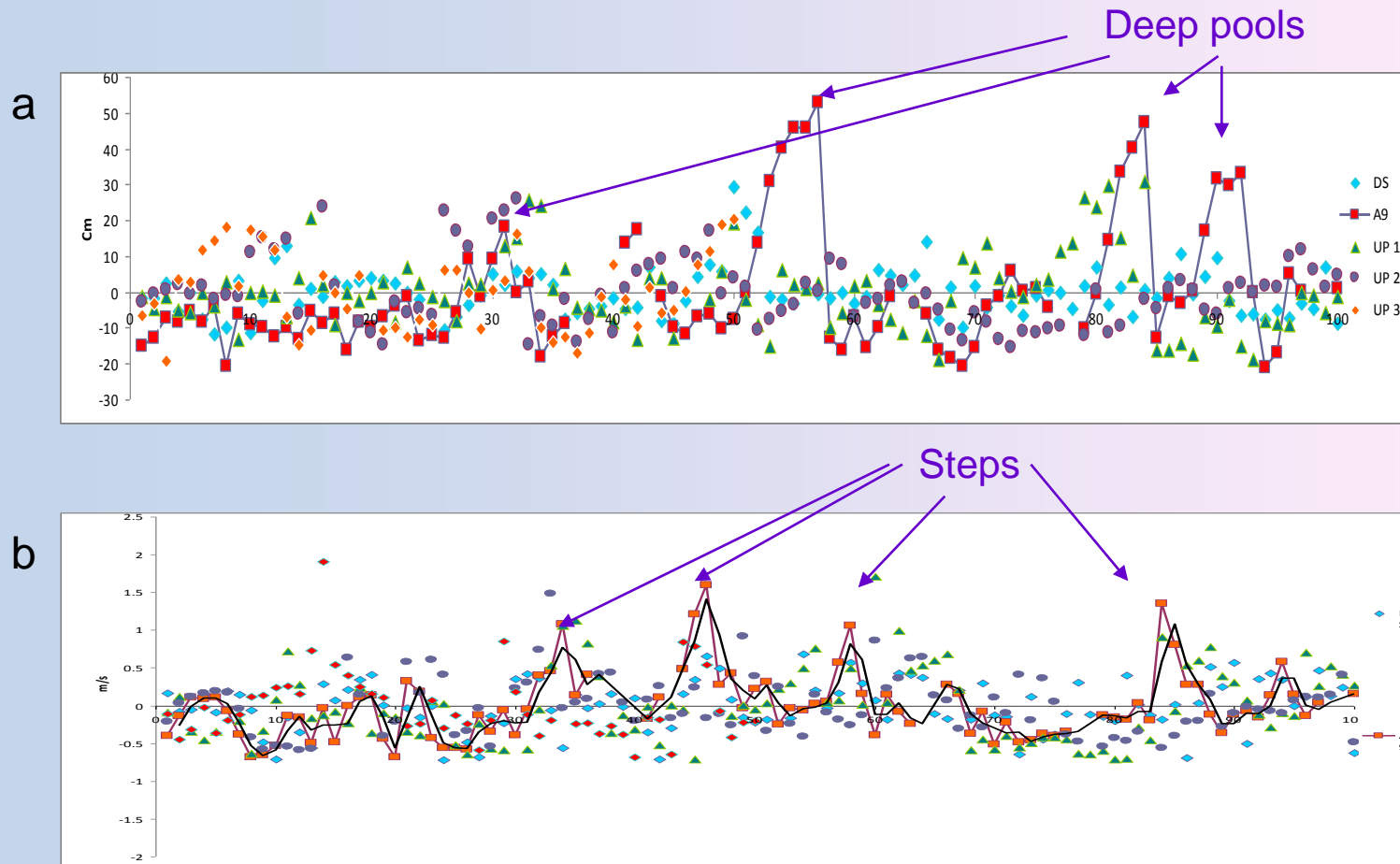
Residuals around average depth (a) and velocity (b)

Hydraulic habitat assessment

INTRODUCTION
THE RESTORATION
WORKS
STAFFING AND
METHODS
FINDINGS
CONCLUSIONS

Froude No – integrates velocity and depth and measure of flow type

Hydraulic habitat assessment

INTRODUCTION
THE RESTORATION
WORKS
STAFFING AND
METHODS
FINDINGS
CONCLUSIONS
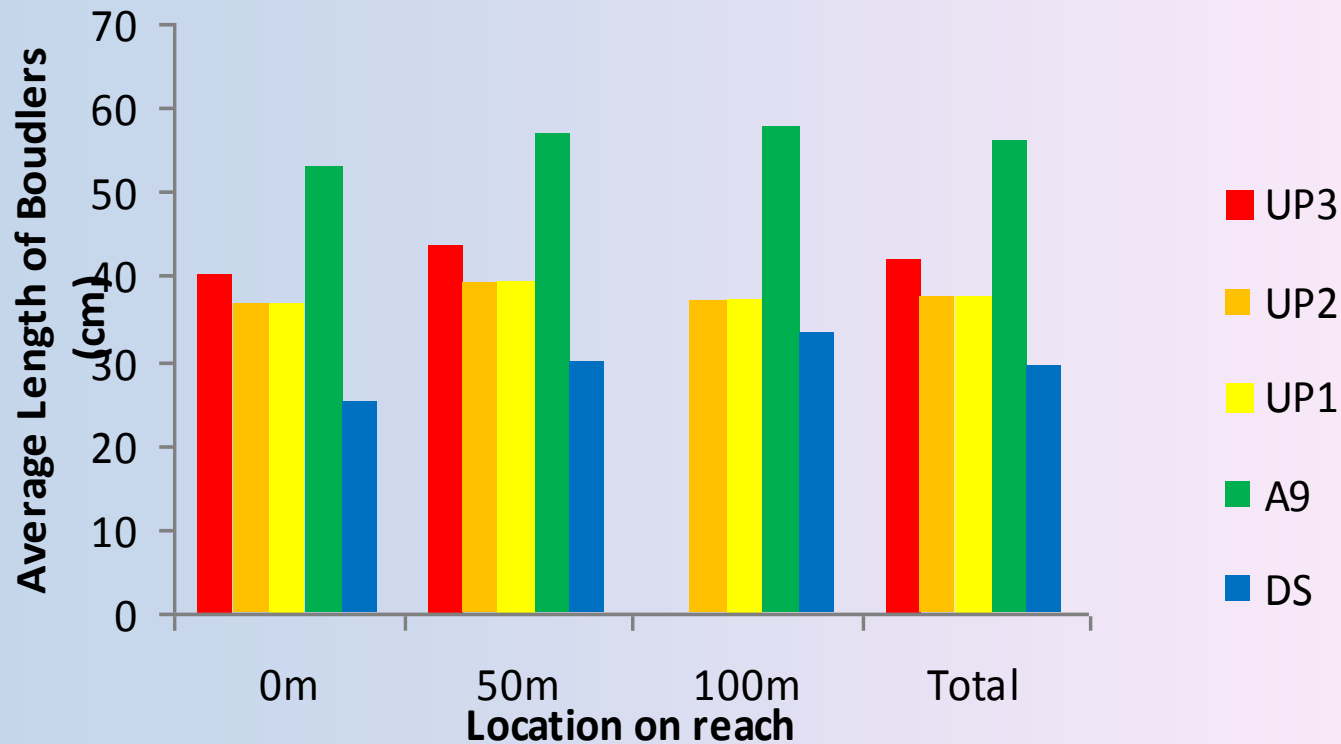
Findings

Fisheries assessment

	Trout	Salmon	Eel	Stoneloach
upstream sites above waterfall	27	0	1	0
upstream sites below waterfall	38	1	3	0
sites within restored section	16	54	0	0
sites downstream	36	42	3	1

Direction of flow

- 4 species encountered (trout, salmon, eel, stoneloach
- Trout found at all sites
- Eels present upstream from restored section
- Juvenile salmon present in the short restored section and downstream in similar numbers.
- Masonry-culvert beneath railway line possible impairment to migratory fish
- The presence of natural waterfall provides impairment to migratory salmonids

Findings

Fisheries assessment

upstream sites: above waterfall

sites in restored section

upstream sites: below waterfall

downstream sites
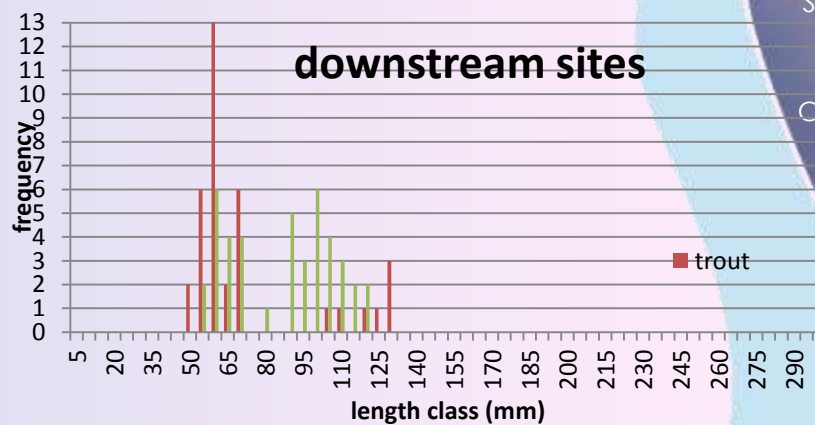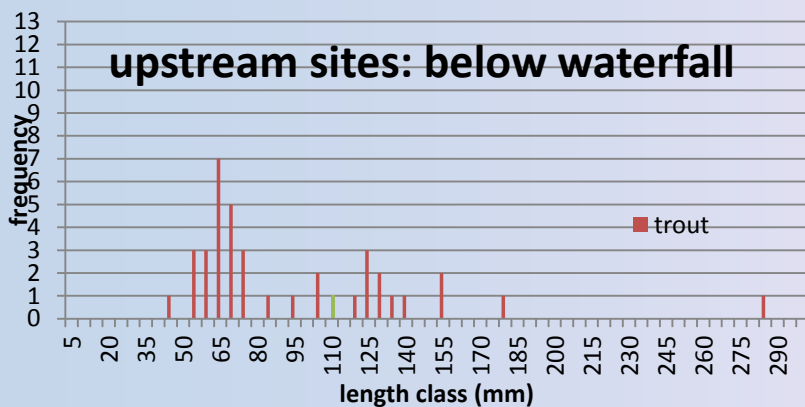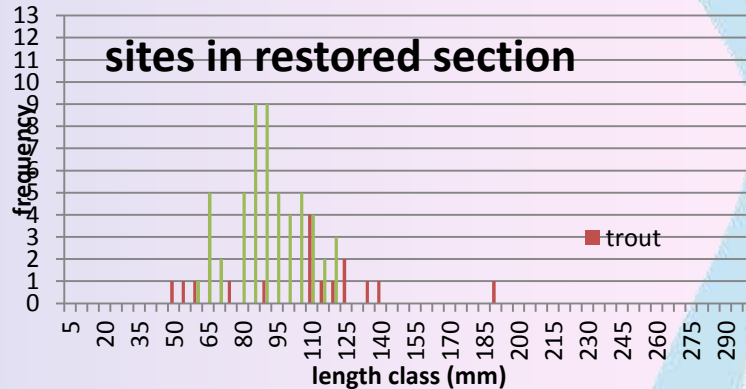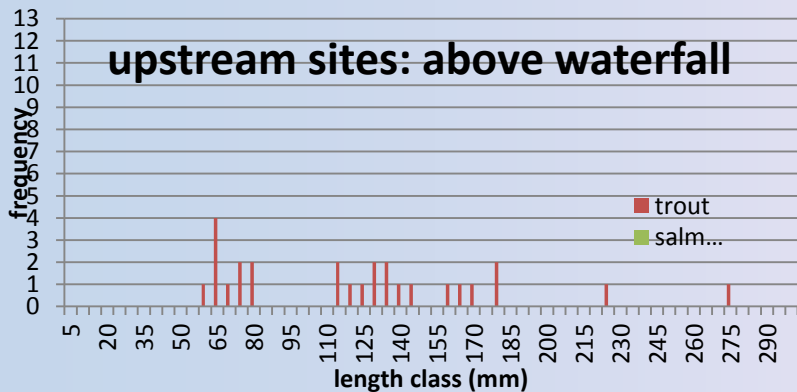
Conclusions

- Successfully restored hydraulic habitat

- Salmonids colonising restored reach

- Salmon passage upstream impaired

- Post-project appraisal critical

- Need for adaptive management

- Need for application of fish passage porosity tool for waterfall/railway culvert and possible "works" (e.g. boulder placement/baffles)

- Value of "citizen" (student) science in post-project appraisal

CENTRE FOR RIVER ECOSYSTEM SCIENCE

UNIVERSITY OF STIRLING

INTRODUCTION
THE RESTORATION WORKS
STAFFING AND METHODS
FINDINGS
CONCLUSIONS