Water Use, Monitoring, and Flow Compliance at Run-of-River Hydroelectric Projects in British Columbia

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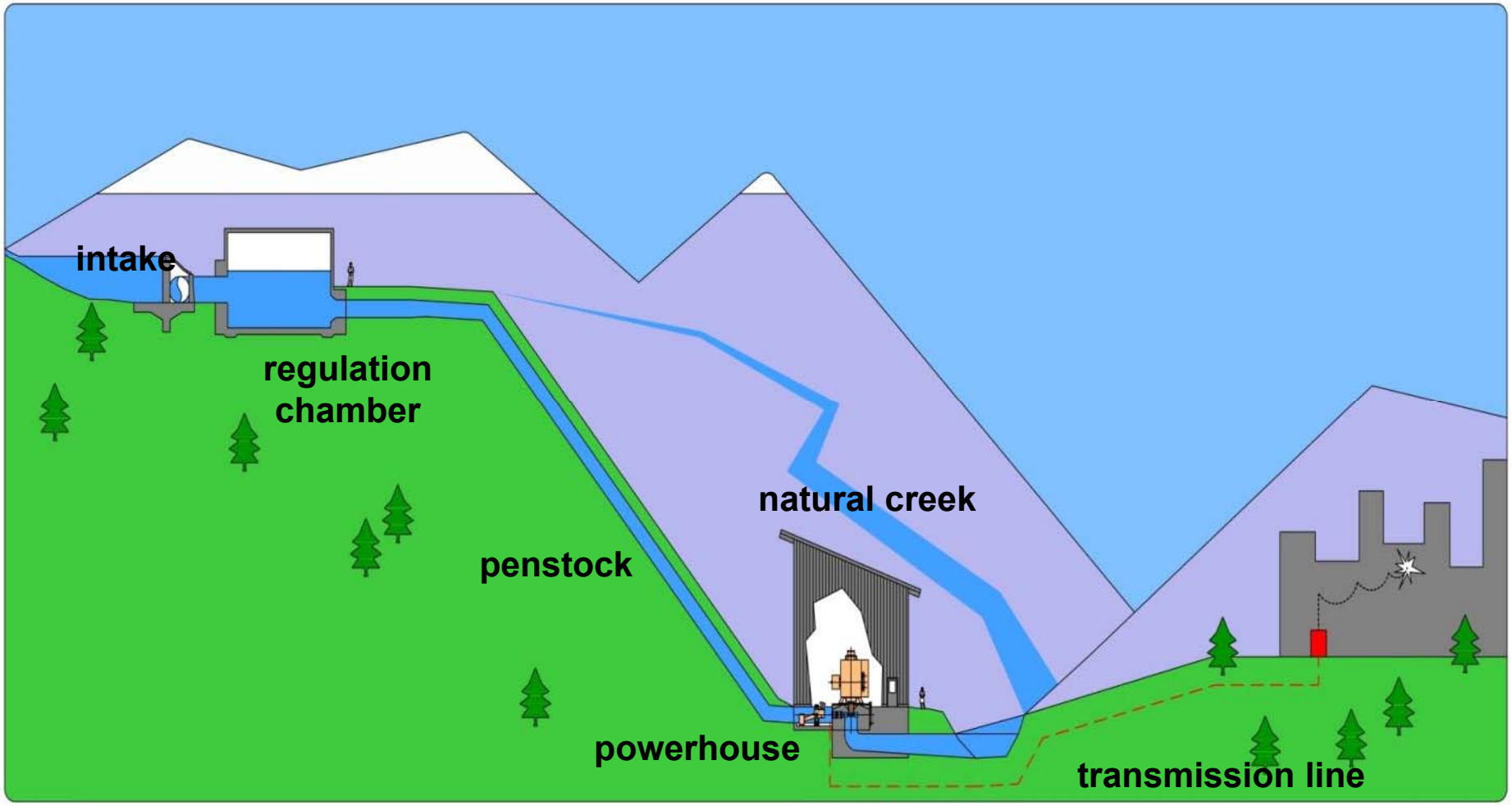
Presentation Outline

1. Introduction and who is Innergex
2. Run-of-River Hydro 101
3. Water Measurement Techniques
4. Operational monitoring and compliance (flow and ‘IFR’)
5. Operational monitoring and compliance (fish and fish habitat)

Who is Innergex Renewable Energy?

- A Canadian company that develops and operates renewable electricity projects (hydro, wind, solar)
- Founded in Quebec in 1990
- Innergex operates facilities in Canada, USA, Chile, France and Iceland
- 21 run-of-river hydro power plants operating in BC
- Sustainability and a special emphasis on local partnerships
- Place high value on First Nation relationships

Typical Run-of-River Hydro Project



Run-of-River Hydro Intake Facility

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Penstock Construction

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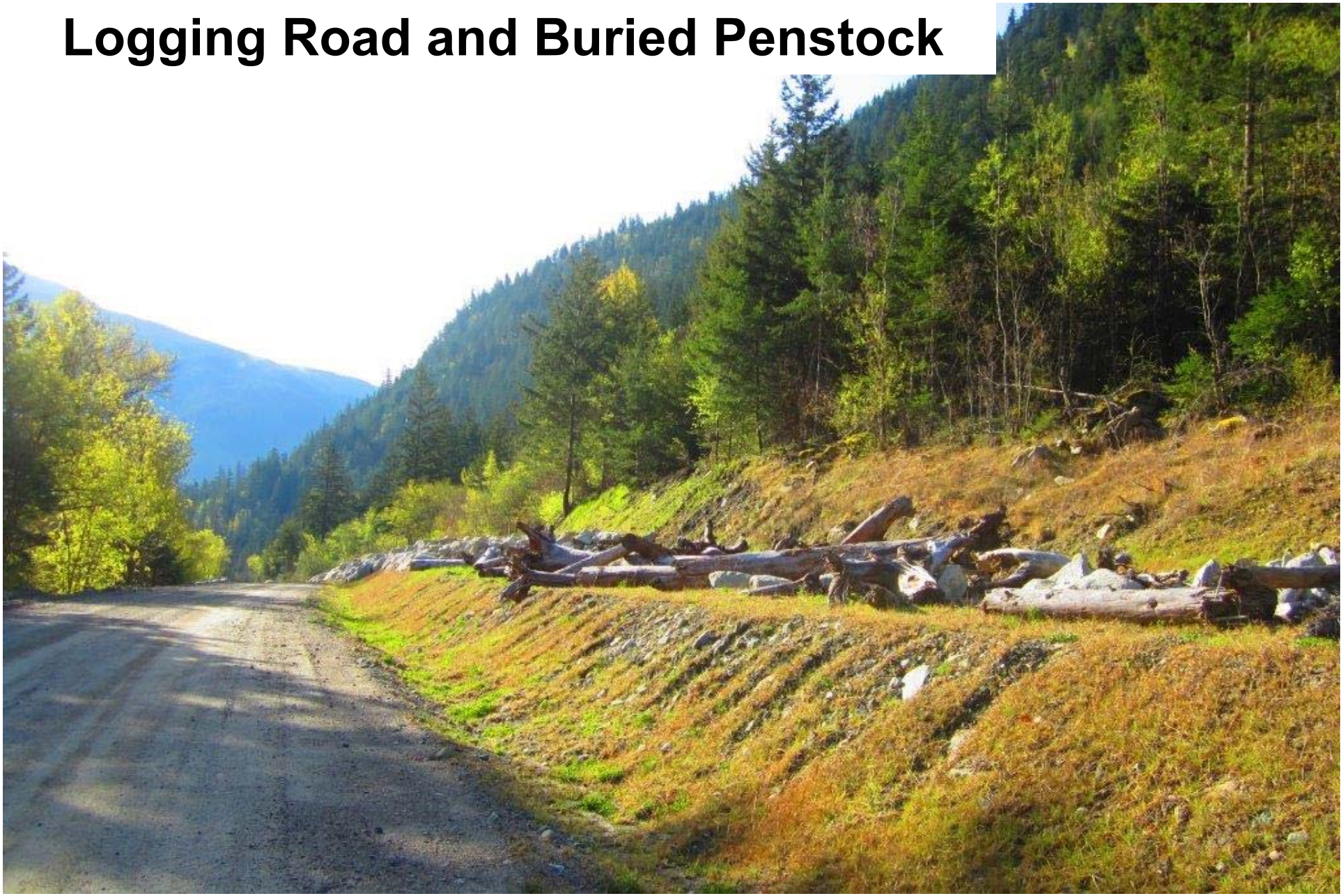
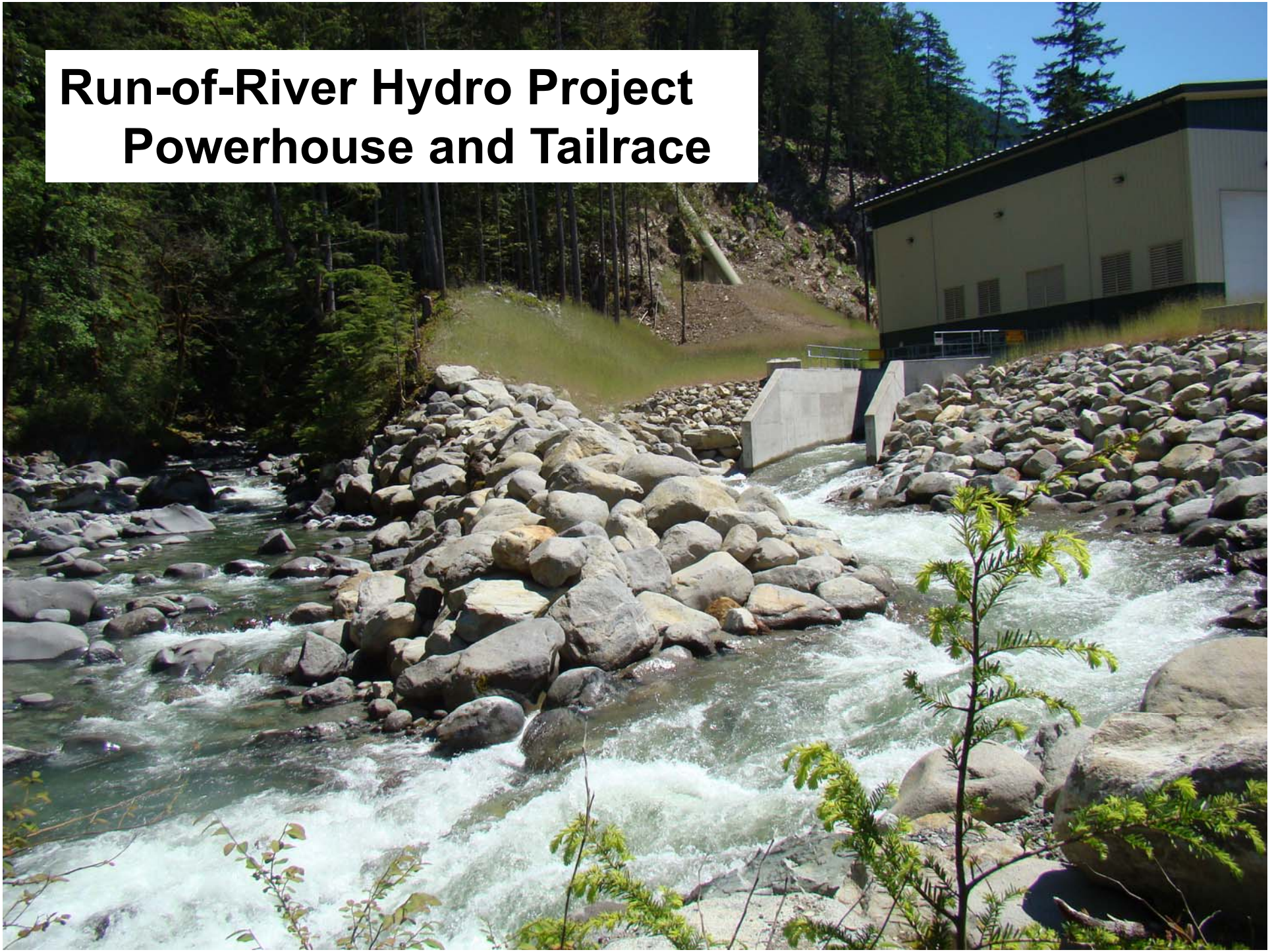
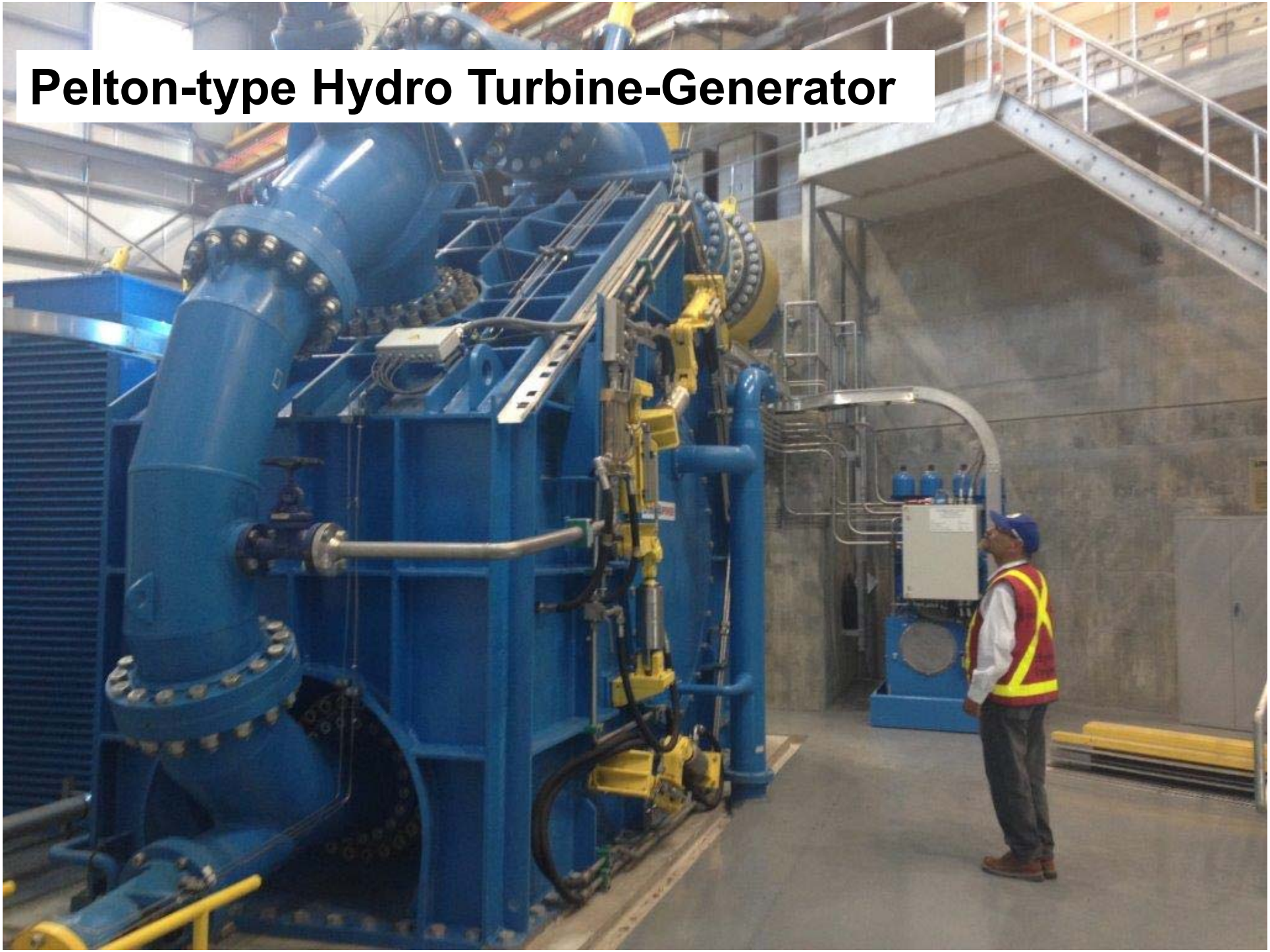
Logging Road and Buried Penstock



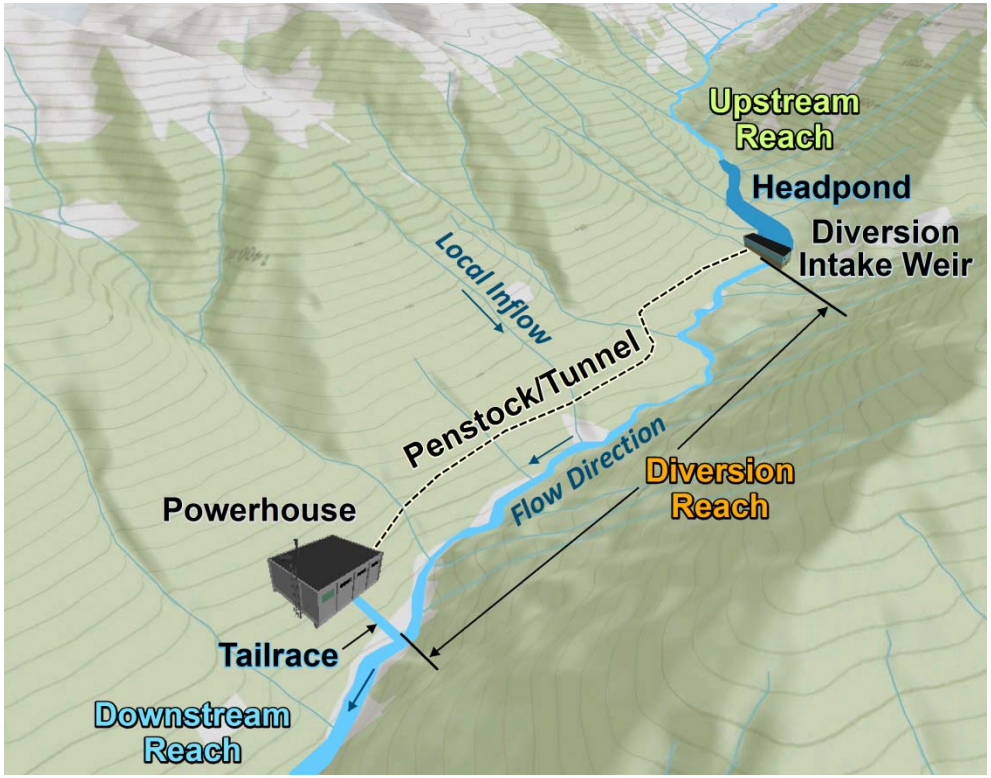
Run-of-River Hydro Project
Powerhouse and Tailrace

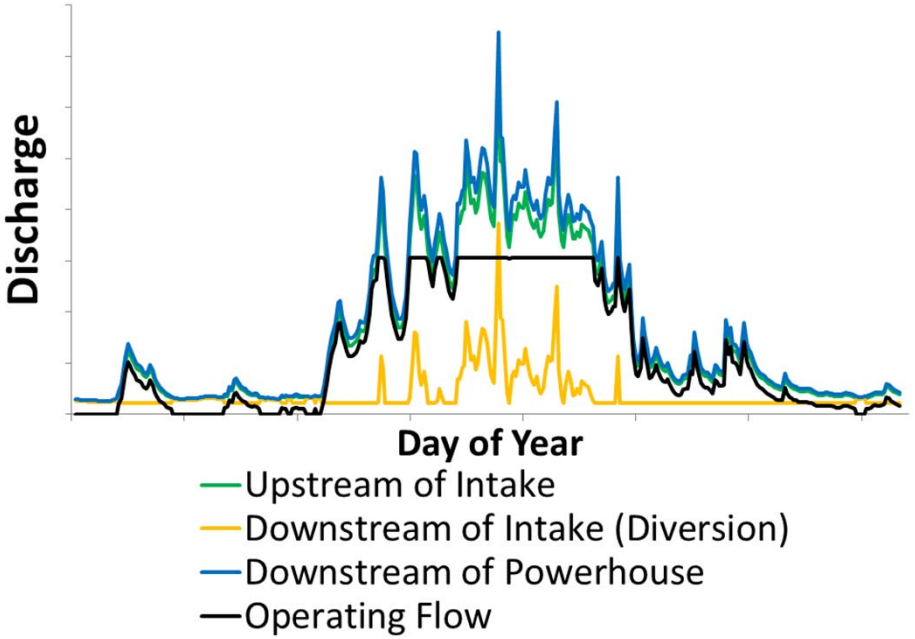


Pelton-type Hydro Turbine-Generator



Run-Of-River Hydrology





Conditional Water Licence

- Issued under the BC *Water Sustainability Act*
- Strictly governs water use for hydroelectricity production
- Maximum diversion (m^3/s)
- Minimum instream flow (IFR) (m^3/s)
- Ramping rates
- Monitoring requirements
  - Typically 5 years; fish and fish habitat water quality, inverts, ducks, re-veg.

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Stream Discharge Measurement – Manual Method

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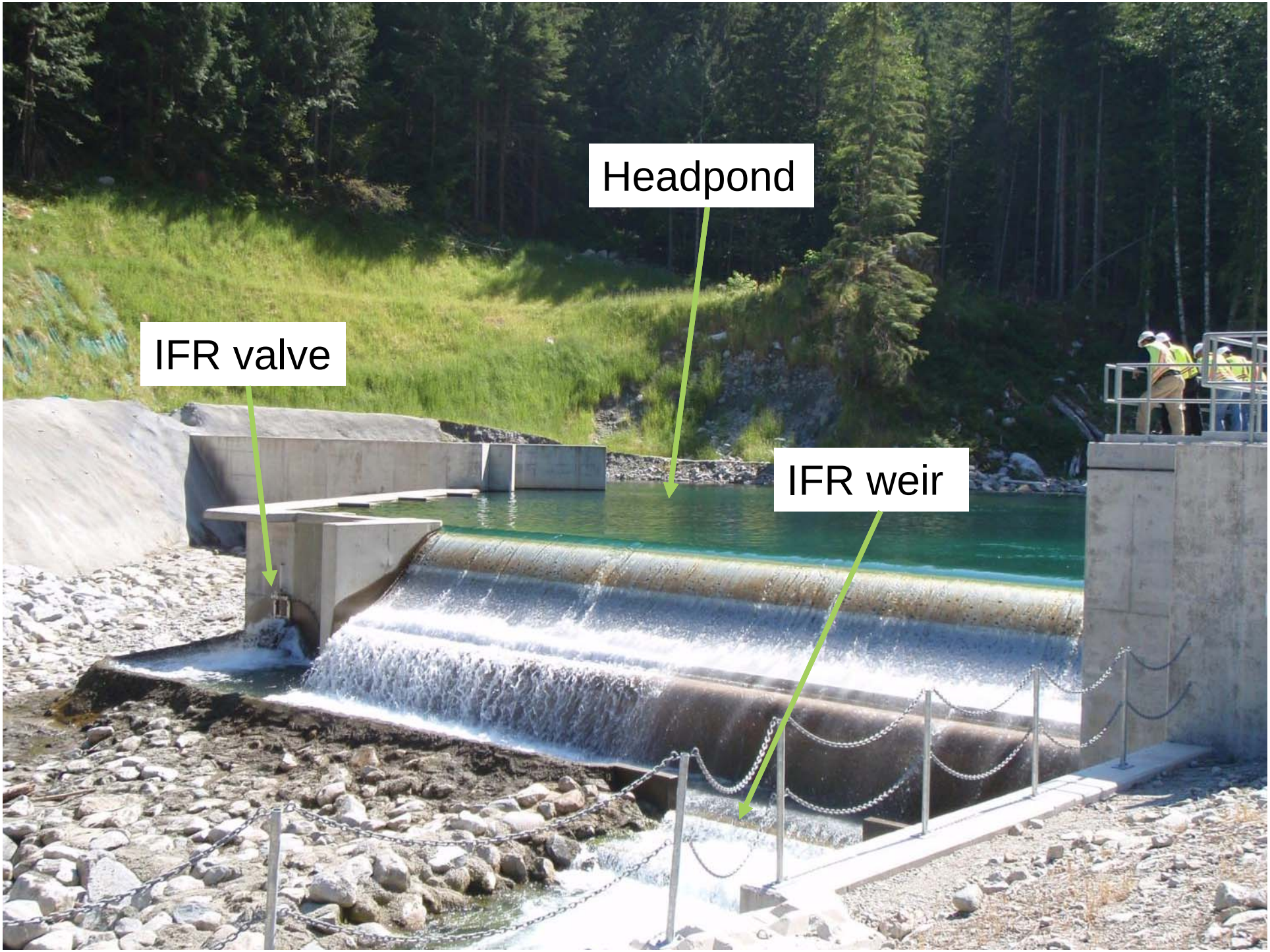
Hydrometric Gauge Installation

Hydrometric Gauge Installation


Headpond
IFR valve
IFR weir

Instream Flow Requirement (IFR)

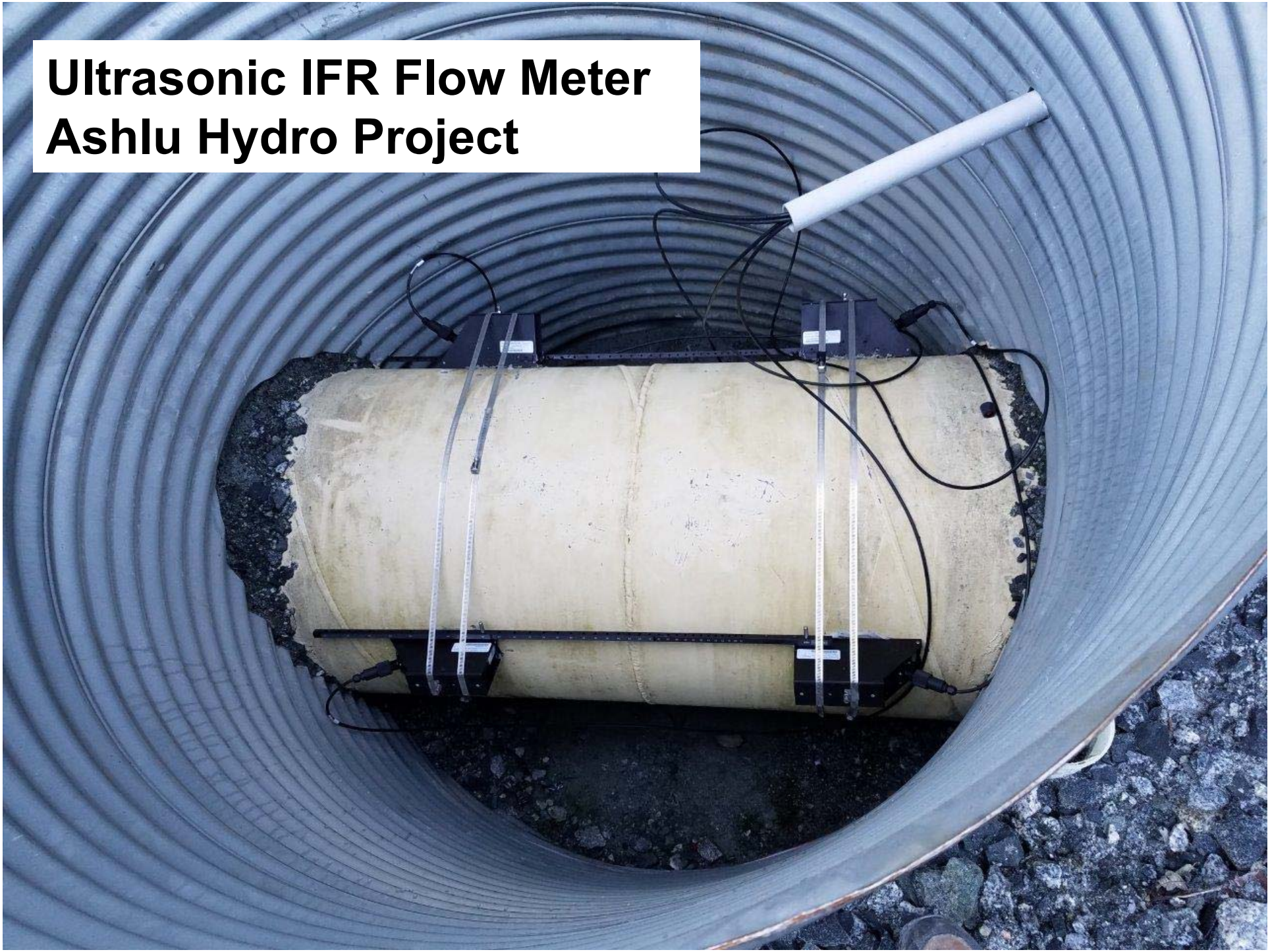
Measurement Weir

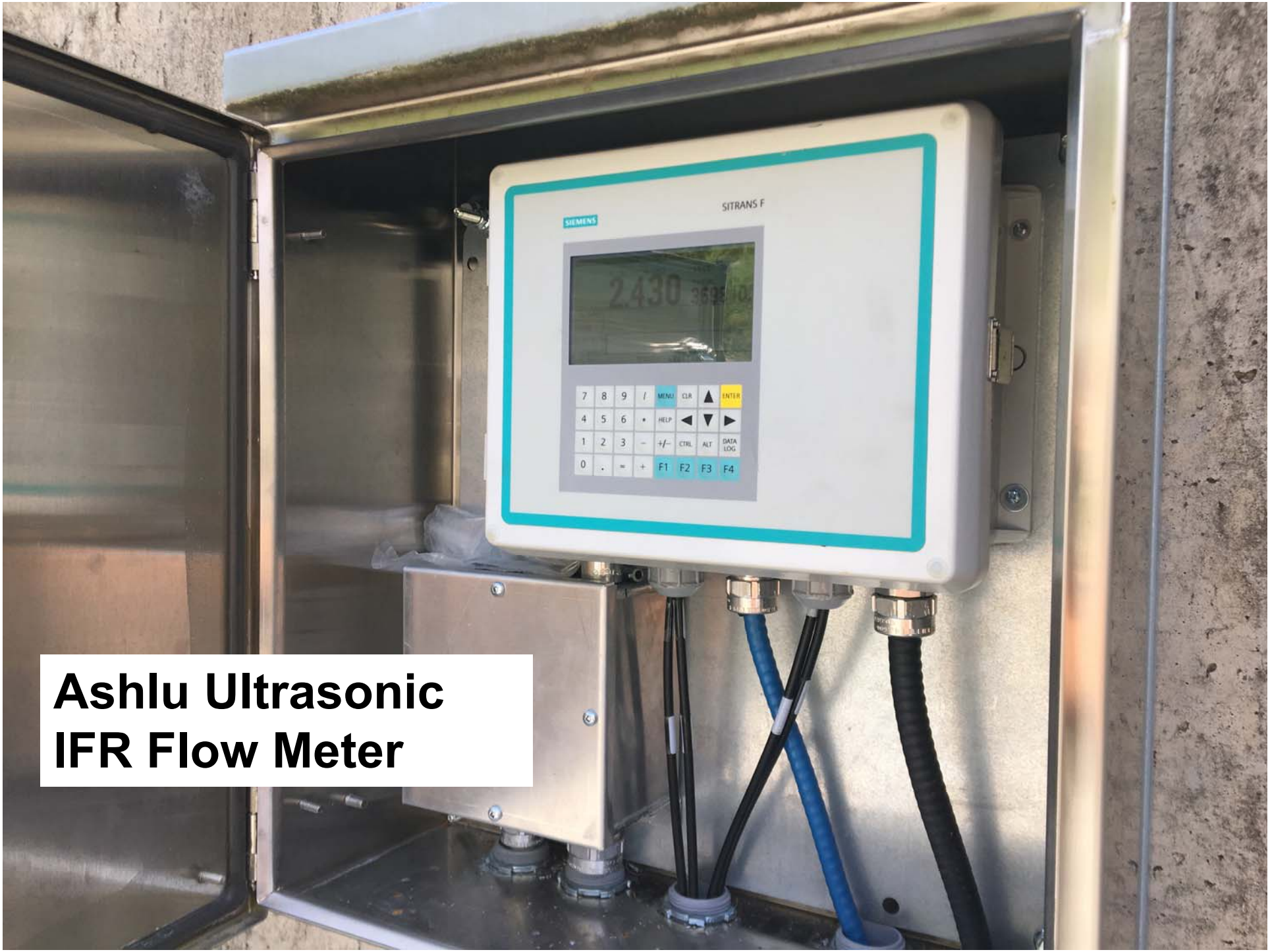
IFR Measurement Weir

Manual Discharge Calibration

IFR Valve - Ashlu Creek Hydro Project

Ultrasonic IFR Flow Meter
Ashlu Hydro Project





Ashlu Ultrasonic IFR Flow Meter

Fish Monitoring Results at Innergex Hydro Sites in BC

- Completed 5-year monitoring at 10+ of BC hydro projects
- Central focus of studies was fish and fish habitat
- Predictions during EA were for reduction in fish habitat in the 'diversion reach' at many sites (and reduction in fish abundance)

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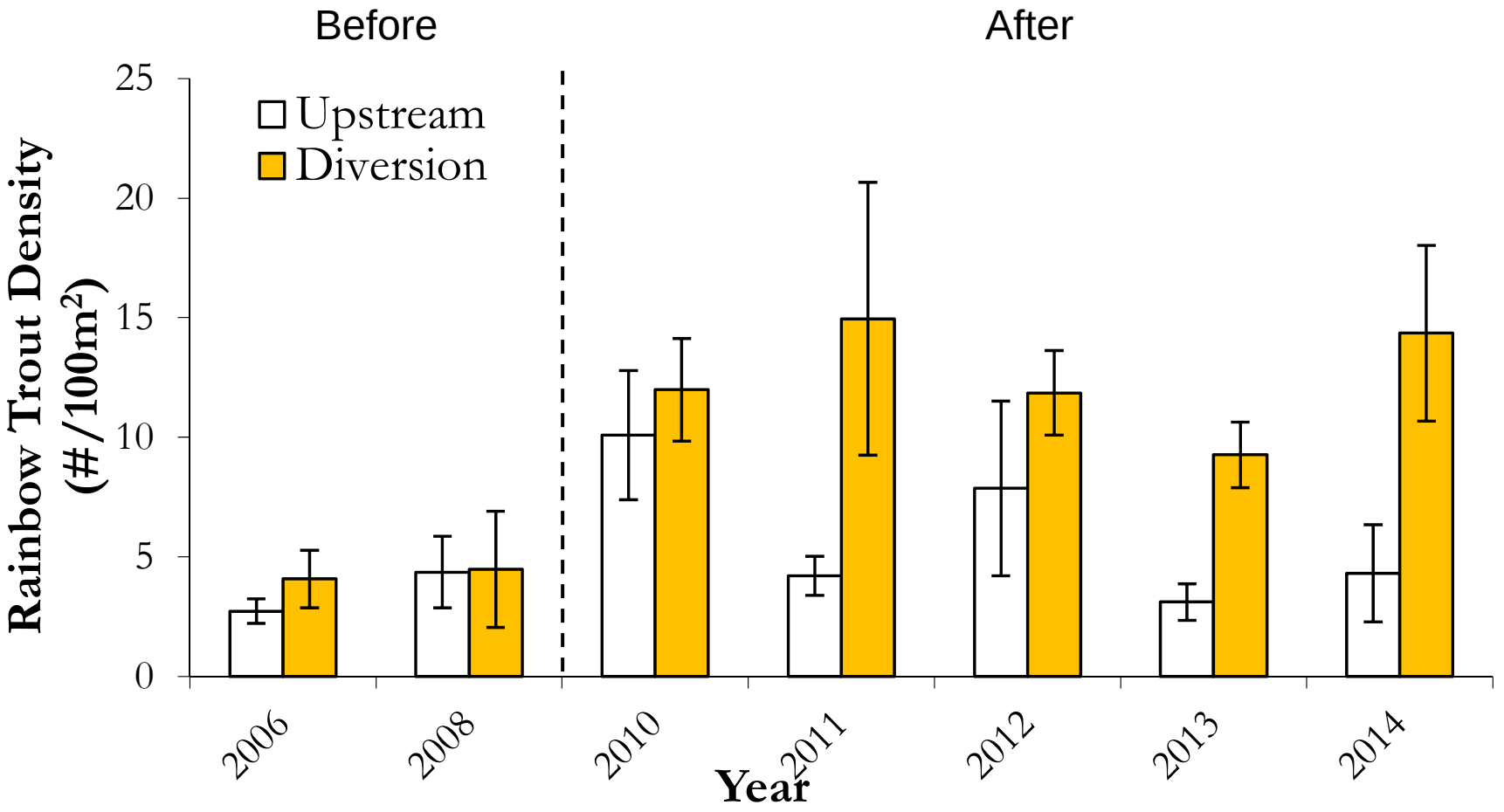
5-Years of Monitoring Douglas Creek Rainbow Trout



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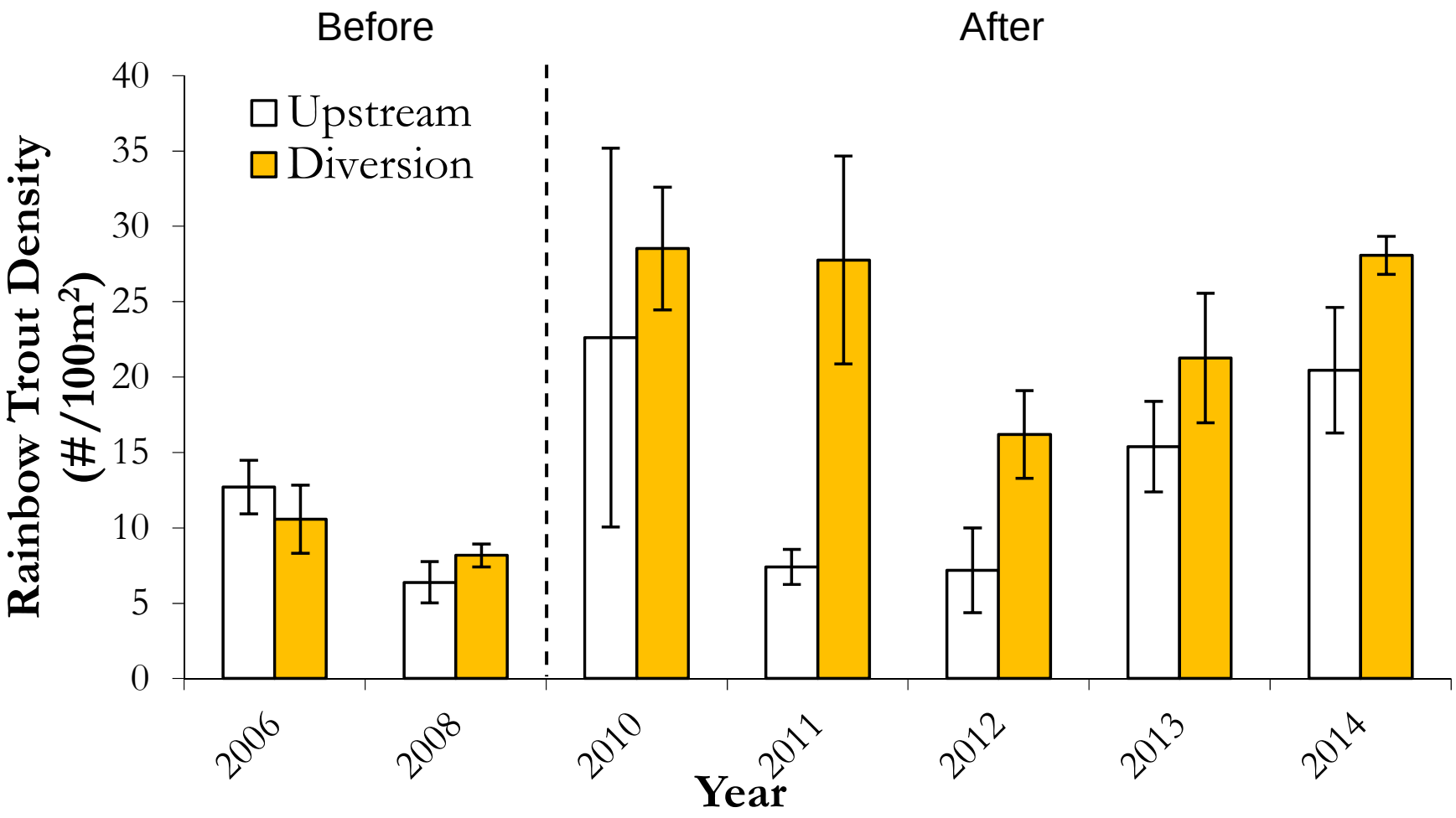
5-Years of Monitoring Fire Creek Rainbow Trout



Fish Monitoring Results at Innergex Hydro Sites in BC

- Predictions during EA were for reduction in fish habitat in the 'diversion reach' at many of our sites (and reduced fish abund.)
- 5 year monitoring studies found the contrary – *increased abundance*
- Potential driving factor?
  - Very steep, cold mountain rivers, difficult habitat conditions
  - Lower river flows → calmer conditions → higher fry survival

Questions?