



Nova Pacific Environmental

## NPE Hand Maintenance:

***Sustainable, low impact  
stream channel  
maintenance***



***Stream Channel Choked with  
In-stream Vegetation***



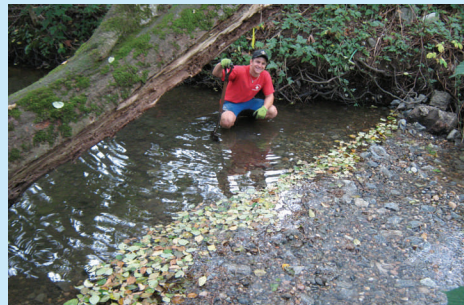
***Stream Channel with  
Flow Capacity Restored  
By NPE Hand Maintenance***

### **NPE Hand Maintenance Protocol**

NPE developed the Hand Maintenance Protocol to create a sustainable, low impact alternative to machine excavation. NPE's crews use hand tools to manually remove in-stream and riparian invasive species such as Himalayan blackberry, Policeman's helmet, reed canary grass and Japanese knotweed as well as all blockages impeding flow (garbage, debris, beaver dams, etc.) Watercourse drainage and habitat values are significantly improved and regular follow-ups allow hand maintenance teams to sustain these flow and habitat features.

Once the stream channel and riparian zone have been cleared of invasive species, native shrubs, saplings and/or whips are planted along the stream bank to help shade out invasive species, reducing the long term maintenance effort and improving the overall health of the stream.

If needed, in-stream habitat enhancements such as rock weirs, LWD installations, and fish spawning platforms can be constructed by our skilled hand maintenance crews.



***Building a rock weir***

### **NPE's Experience with Hand Maintenance**

*Having developed and implemented these procedures over the past eight years, NPE has unique expertise and capability in manually maintaining stream flows and habitats.*



Nova Pacific Environmental

**rock weir**

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## Why Hand Maintenance?

**NPE's Hand Maintenance provides municipalities with sustainable, optimal flood protection, while enhancing fish habitat and water quality**



**Stream Channel Before Hand Maintenance**



**Same Channel After Hand Maintenance**

## Benefits of Hand Maintenance

- provides municipalities with sustainable, optimal flood protection
- creates more regularly enhanced fish habitat and better water quality
- eliminates constraints of the short in-stream work window
- eliminates the need for fish salvage
- reduces direct impacts on fish, fish habitat and the riparian area
- allows native in-stream and riparian communities to stabilize and mature
- provides increased cover and food sources for fish and wildlife
- applicable to a significant percentage of watercourses
- provides a cost-competitive, low impact alternative to machine maintenance
- is favourably viewed by Provincial and Federal Agencies (MNRO and DFO)



**Planting willow whips**



**Creek-side plantings**

## Versus Machine Maintenance

- constrained by in-stream work window
- destroys fish and wildlife habitat
- destroys native riparian vegetation and cover
- eliminates in-stream vegetation and cover
- promotes growth of invasive plants
- yields only cyclical improvements in both flow capacity and fish habitat qualities.



**High Impact Machine Maintenance**

## NPE Hand Maintenance - Short and Long Term Objectives

**Short Term:** Reduce the need for maintenance, yielding an overall cost reduction.

**Long Term:** Permanently restore the stream ecosystem to a functional, self-sustaining condition.