

# Non-herbicidal treatments of JK *s.l.* and Himalayan knotweed on the Queen Charlotte Islands

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- ◆ This is a problem-solving narrative about how one might deal with *Polygonum polystachyum* and JK *s.l.* in analogous situations.
- ◆ It doesn't represent a systematically thought-out approach to a best-case scenario, but it might be helpful to those in similar jurisdictions, etc.
- ◆ The two big issues one always confronts: Metaphyta & Homo sapiens.
- ◆ But let's have a look at the place first...

**SE Alaska**

**The Queen Charlotte Islands**

**British Columbia**



- ◆ Knotweeds and people on QCI:
- ◆ Himalayan Knotweed was first collected on QCI in 1957.
- ◆ JK *s.l.* was first collected in 1998, though clearly it had already been established for some time (40 yrs?).
- ◆ Generally, the local population is supportive of efforts to control both IPs; the ecological uniqueness of the Islands is treasured.
- ◆ Himalayan Knotweed is more plentiful than JK and Islanders tend to see HK as a bigger problem.



- ◆ OK, so bring on the sprayers and clean up the mess...
- ◆ Local attitudes
  - Ecological
  - Food gathering
  - Last bastion
- ◆ Implementing controls in context:
- ◆ Part of a wider effort to control invasive plants under the aegis of the Northwest Invasive Plant Council
- ◆ Options for meeting the challenges posed by the people and the plants: mechanical, light suppression, crazy ideas.

- ◆ Crazy idea#1
- ◆ Capitalize on a habitat characteristic that you observe in local populations of the plant.



















## JK s.l.: Visitor Information Centre Sites



- ◆ Crazy idea#1
- ◆ Capitalize on a habitat characteristic that you observe in local populations of the plant.
- ◆ The majority of the sites for both species on the Queen Charlotte Islands are within 100 metres of the shoreline.
- ◆ Soil types include loam, sand, gravel and coarse rock ("rip-rap").
- ◆ The rhizomes of *JK s.l.* thrive and grow quite large at sites containing coarse, porous substrata like rip-rap.



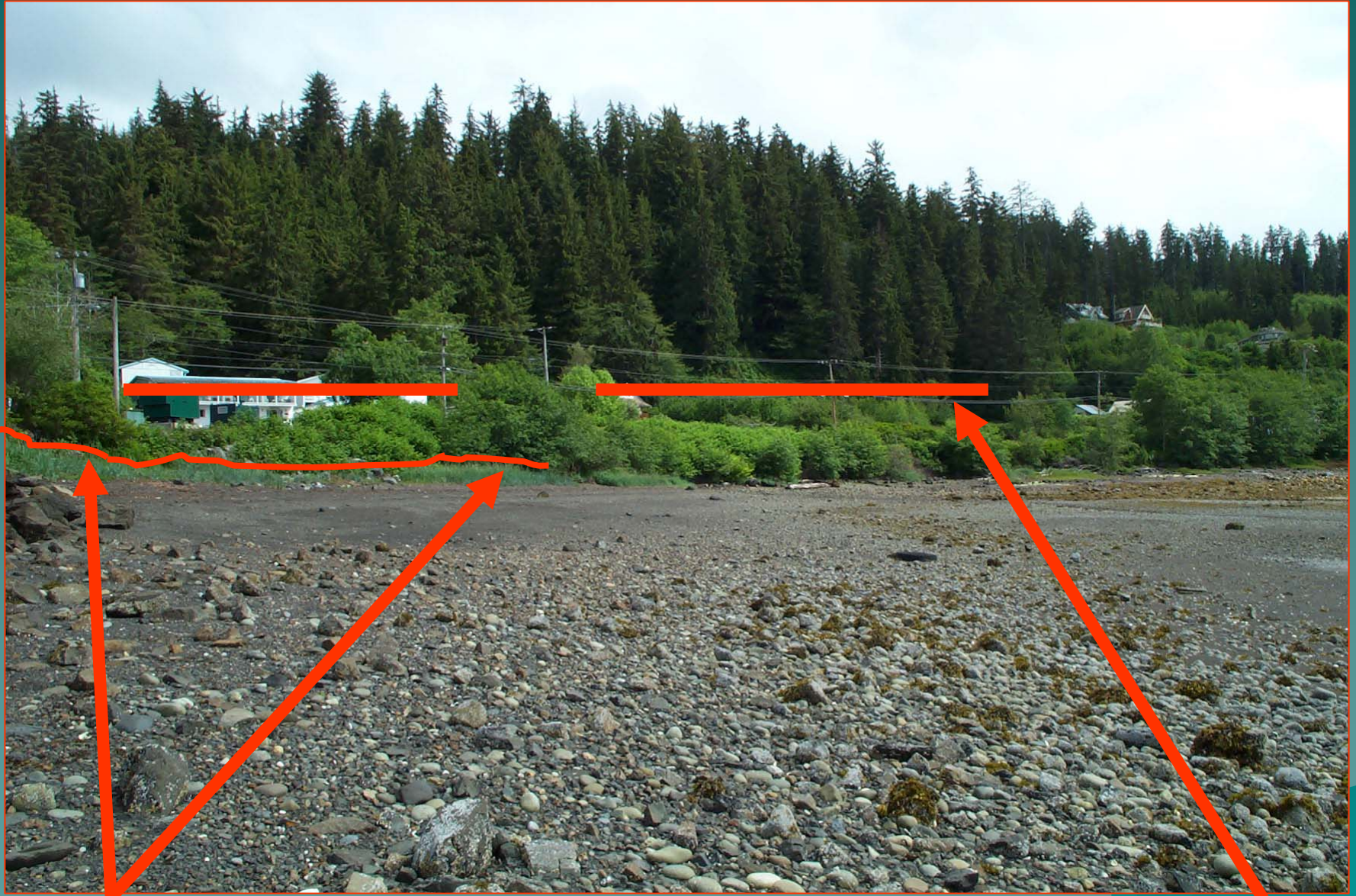




# Observations on habitat

- ◆ Close proximity to human settlement is frequent, but some sites are remote.
- ◆ Sites are all associated with disturbance, natural or human.
- ◆ On sites found adjacent to salt water, plants do not penetrate into the *Leymus mollis* zone and a distinct line of demarcation can be observed between the Knotweeds and halophytic plants (e.g., *Leymus mollis*, *Honckenya peploides*, *Cakile edentula*).
- ◆ Even where tidal action would not structurally affect the growth of the Knotweeds, these species do not thrive in saline soil conditions.

## JK s.l.: Visitor Information Centre Sites



Line of demarcation between *Leymus mollis* and *JK s.l.*

Horizontal extent of *JK s.l.* under orange bars.










## ◆ Site trial

- ◆ Key questions:
  - ◆ Would treatment with seawater have a rapid, deadly effect on rhizomes, the leaves and the stems?
  - ◆ What longer term effects would seawater have on the soil and regrowth of both invasive and native plants?
- 



## Beginning of seawater treatment of *JK s.l.* at VIC site



Almost immediately after beginning to water, wilting of the leaves is apparent.



*JK s.l.* at VIC treatment sites after 5 hours of seawater spray





*JK s.l.* at VIC treatment sites after 5 hours of seawater spray





*JK s.l.* at VIC treatment sites after 5 hours of seawater spray









*JK s.l. 1 day after treatment*





*JK s.l. 1 day after treatment*





*JK s.l. 1 day after treatment*





*JK s.l. 2 days after treatment*





*JK s.l. 3 days after treatment*





*JK s.l. 3 days after treatment*







**The Royal Canadian Data Logger: digital measurement**











- ◆ Observations suggest that *JK s.l.* cannot tolerate saline soil conditions. It was hoped that by creating saline conditions on the site, the rhizomes might be desiccated.
- ◆ Some effect on the biomass of the rhizomes can be inferred from the density and cross-sectional area of stem regrowth and from observed attrition of bundles in the following season.
- ◆ The salt spray appears to have had three important effects.
  - (1) leaves were desiccated and nearly all abscised within 10 days of first spraying
  - (2) adventitious roots, which are numerous on healthy shoots in control area, were brown and desiccated in areas treated with seawater.
  - (3) Fluid reservoirs in lower stem chambers disappeared.



*JK s.l. 2 weeks after treatment*



Re-growth of leaves after 2 weeks. Stems appear photosynthetic.



*JK s.l. 2 weeks after treatment*





*JK s.l. 2 weeks after treatment, new treatment finished*



Re-treatment shows same effect, suggesting that continual spray would eventually eradicate plants



*JK s.l. 2 weeks after treatment, new treatment finished*





*JK s.l. 2 days after new treatment finished*



Compare the condition of this stand with the adjacent stand on the next slide



*JK s.l. before removal on Hwy 33*





# Evaluation

- ◆ As a defoliant, salt water is very effective in dry conditions.
- ◆ Precipitation within 48 hours of spraying adversely affects treatment. This limits effective treatments to periods of favourable weather conditions.
- ◆ Our primitive means of delivering the seawater (spraying with a hose, even with a higher pressure pump as was done later) is labour intensive.
- ◆ An automatic delivery system will probably provide sufficient salt water to the soil to provoke a systematic desiccation of the plant and rhizome.
- ◆ Automatic systems have a greater potential to economically eradicate the plant from shoreline sites where the infrastructure (e.g., power) is available.
- ◆ Our trials for this species were done under what were arguably the least favourable soil conditions, rip-rap with embedded organic detritus on sand and gravel.
- ◆ Results differ significantly from *Polygonum polystachyum*, where the potential for success is even higher (see below).



Husband Road site, before treatment.





Husband Rd. site after treatment.





## Husband Rd. site after 3 treatments





Husband Rd. site in March 2006 showing seawater and light suppression treatments side-by-side.





Husband Rd. site in March 2006, saltwater treatment area highlighted in orange



Light suppression area in drab green.



Untreated control site for *Polygonum polystachyum* in March 2006





# Site during late April 2006





# Untreated *Polygonum polystachyum* on Hwy. 16





# Treatment of *Polygonum polystachyum* on Hwy. 16





Treatment finished for the day





Treatment finished





Treated *Polygonum polystachyum* on Hwy. 16 after 5 hours





Treated *Polygonum polystachyum* on Hwy. 16 after 5 hours





Treated *Polygonum polystachyum* on Hwy. 16 after 5 days





# Seawater treatment of *Polygonum polystachyum*

- ◆ Range and site observations on *JK s.l.* apply to this species as well, though *P. polystachyum* appears to prefer even less saline habitats than *P. cuspidatum*.
- ◆ The control method used was generally the same, but two factors may have influenced the result to some extent:
  - There was more variation in the soil conditions at sites with this species.
  - Purchase of a high-pressure pump allowed us to deliver more seawater to the sites in each watering.
- ◆ Treatments suggested that this species is more vulnerable to seawater treatment than *JK s.l.*



## ◆ Summary

- ◆ The habitat characteristics of these species, both in their native range and where they have been introduced, suggests that they will not tolerate saline soils at the same concentrations as halophytes like *Leymus mollis* (Dune wildrye).
- ◆ Our trials set out to determine if artificially salinizing the habitat of sites containing these IPs might be a useful tool in controlling them.
- ◆ Trials indicated that this is a very promising technique, particularly for *Polygonum polystachyum* (Himalayan knotweed).
- ◆ For *JK s.l.* seawater spray causes leaf desiccation and abscission, but the stems and rhizomes remain living and, apparently, photosynthetically active at the concentrations we produced. Sprinkling on a weekly cycle in optimal weather conditions will continuously defoliate a treatment area. Using an automatic sprinkler system, this would arguably be an economical method of treatment.
- ◆ For soil types with less drainage potential and more moisture retention characteristics than our trial sites, the level of success would likely be much higher.
- ◆ It is likely that applying seawater in continuous drip irrigation would salinize the soil beyond the tolerance of these species.
- ◆ For *Polygonum polystachyum* our results were better than expected. Desiccation was noted immediately and the death of 90% of above-ground stems followed within several days. After the third treatment very little activity was noted and little regrowth has occurred at the site up to the present.
- ◆ The current plan is to continue to treat the site, now including the control area, and attempt eradicate *Polygonum polystachyum* from the site.
- ◆ Ecological effects on the sites appear to be limited to a temporary transition to grasses and more salt tolerant plants from the previous *Polygonum* monoculture.



◆ Thanks for listening!

◆ Triffids beware!

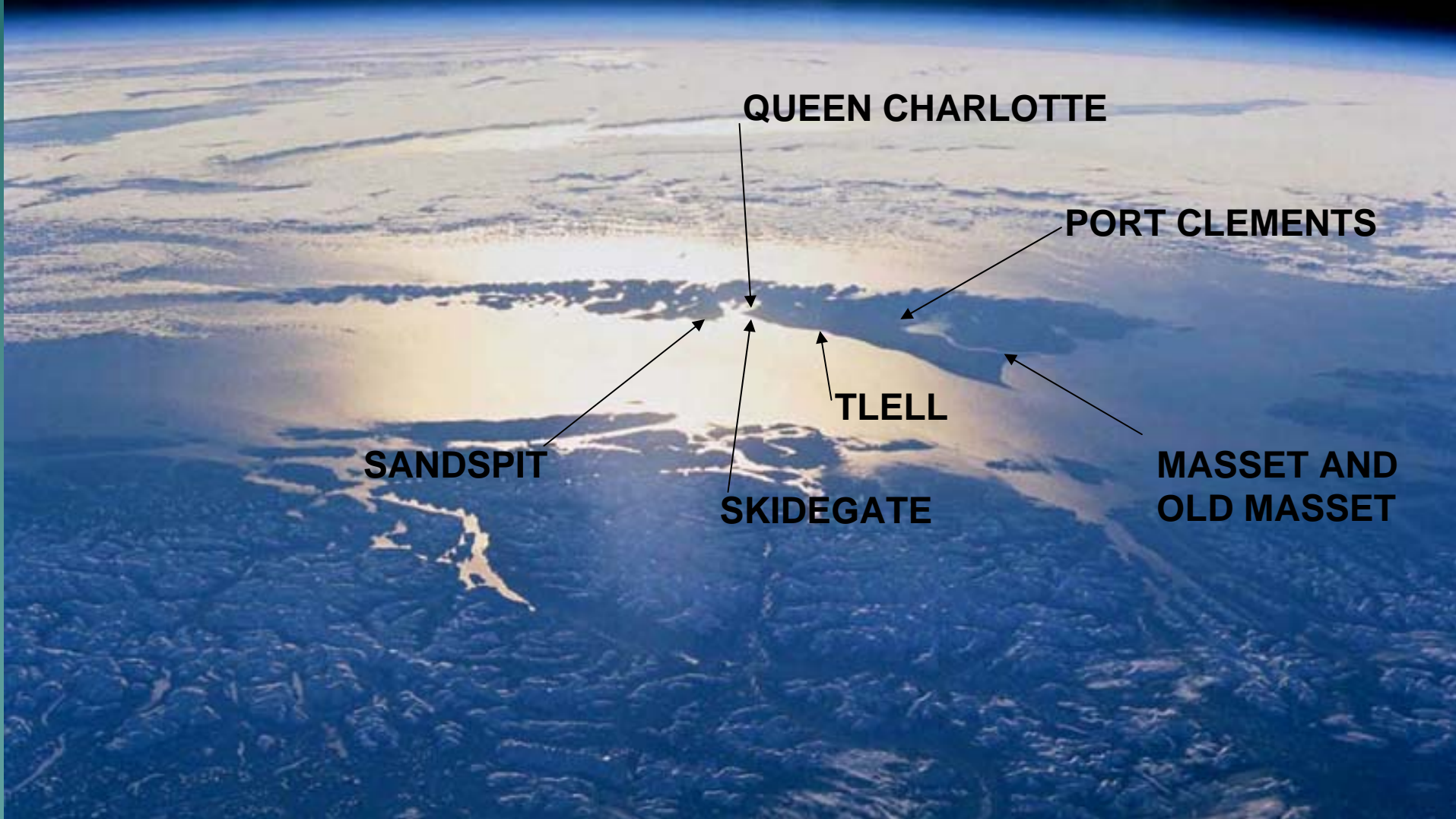


# Light Suppression Technique

- ◆ This technique has been tried elsewhere for control, with mixed results.
- ◆ Combined with replanting of competitive native species, we are attempting to adapt this method to control Knotweeds in the longer term.
- ◆ Phase 1 involves suppressing light available to the plants and thus progressively reducing the underground biomass by applying a layer of cardboard, carpet or other suitable material and then 2 layers of black plastic followed by a layer of sawdust over the site.
- ◆ Phase 2 involves intensive maintenance of the sites, repairing any breaks in the plastic and cutting back any emergent stems.
- ◆ Phase 3 involves introducing suitable native shrubs and deciduous trees that will out-compete the IPs.
- ◆ Phase 4 involves monitoring and maintenance.
- ◆ The following photos illustrate Phases 1 & 2 of the process.
- ◆ Stem cutting was combined with the other methods to reduce the vigour of larger rhizomes.



# The Place:



**QUEEN CHARLOTTE**

**PORT CLEMENTS**

**SANDSPIT**

**TLELL**

**SKIDEGATE**

**MASSET AND  
OLD MASSET**



## *JK s.l.* rhizome bundle at stem insertion



In the photo, this bundle had been out of the ground for more than a month, yet growth persists; more than 2 years later it is still alive.



Winter remnants of *JK s.l.* at Weyerhaeuser site





## Emergent Spring growth of *JK s.l.* at Weyerhaeuser site



Site after preparation and with emergent Spring growth.



# Emergent Spring growth of *JK s.l.* at Weyerhaeuser site





# Growth of *JK s.l.* at Weyerhaeuser site 2 weeks later





# Re-growth of *JK s.l.* at Weyerhaeuser site 2 weeks later





# Weyerhaeuser site at end of the season (October 2005)







Site still active in 2<sup>nd</sup> season









Preparing site for Phase 3: Introduction of native vegetation.



Winter remnants of *JK s.l.* at Sunset Trail site





# Emergent Spring growth of *JK s.l.* at Sunset Trail site







Phase 3 under way, Salmonberry and other spp. established at site



