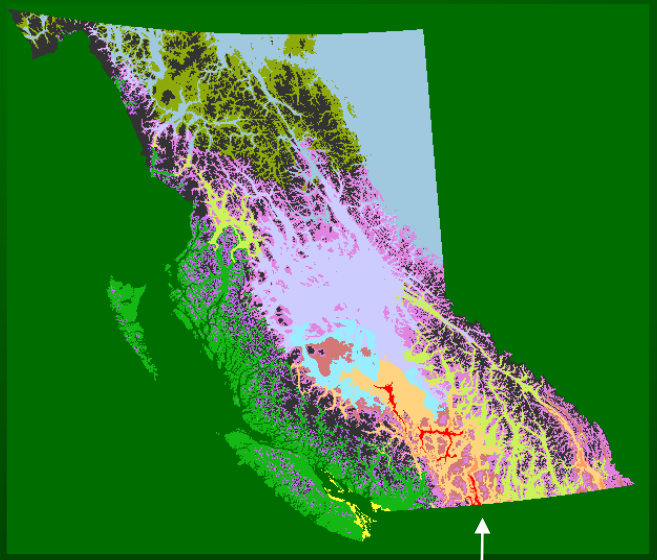
Restoring Ecological Communities at Risk

… *after pipeline construction*

Presented by: ***Lynne Atwood M.Sc. R.P.Bio***

Genoa **ENVIRONMENTAL CONSULTING LTD.**

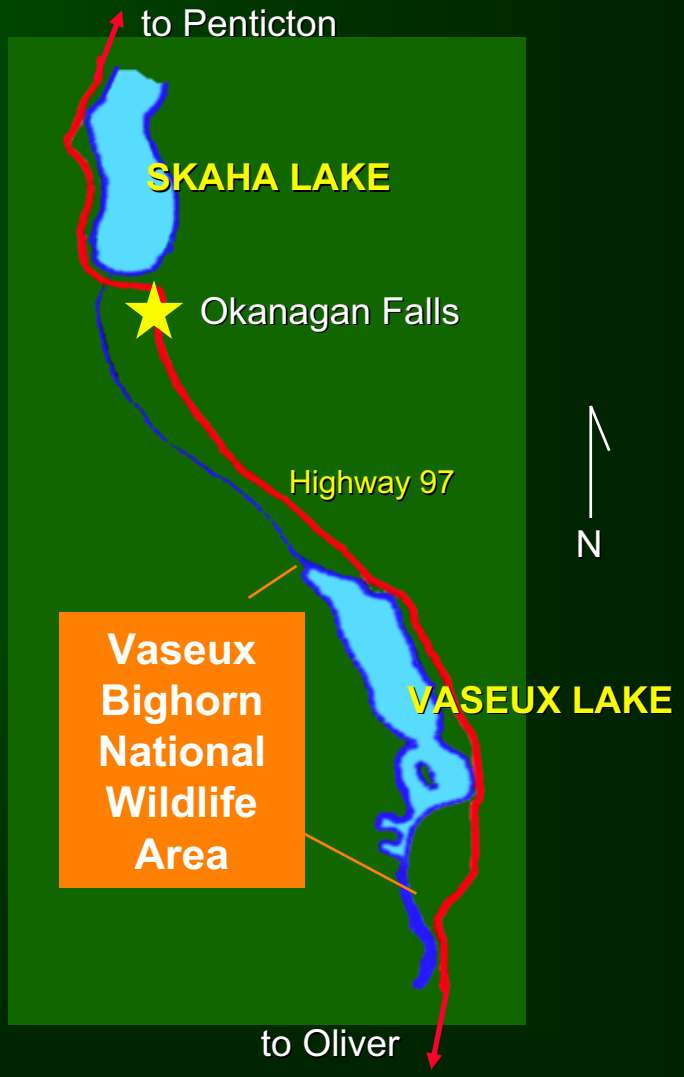
Project Location



Southern Interior Ecoprovince

BGxh1 - Okanagan Very Dry Hot Bunchgrass

PPxh1 - Okanagan Very Dry Hot Ponderosa Pine



Background

- A BC Gas pipeline right-of-way was located in the National Wildlife Reserve (established in the 1950s)
- BC Gas requested permission to install a second pipeline in the right-of-way
- Permission was granted given the area be restored with native species from local sources

Restoration Objectives

- Re-establish the pre-construction plant communities
- Retain the genetic integrity of the native species
- Control the spread of noxious weeds

Restoration Plan ...*components*

- Native seed collection
- Native plant salvage
- Native plant propagation
- Pre and post construction weed control

Project Approach

- Pre-construction surveys divided the Wildlife Area into 7 geographic zones based on plant community type
- Restoration prescriptions were devised for each geographic area (GA)
- Broadleaf seeding areas were delineated within each GA

Balsamorhiza sagittata

Seed Collection

- ~ 360 Kg of seed were collected from the local antelope-brush *(Purshia tridentata)* shrub-steppe and ponderosa pine *(Pinus ponderosa)* parkland plant communities

  - 39%* bunchgrass seed (5 Species)
  - 46% shrub seed (13 shrub species)
  - 14% herb seed (19 broad-leaf herb species)

* Percentage of total seed weight

Bunchgrass Seeding

- **5 hydroseed mixes were developed from collected seed**
  - **species combinations and proportions were based on the surrounding plant community**

- **Mixes Contained Grass Seed Only**
  - **combinations of 5 native and 1 domestic grass**
    - Bluebunch wheatgrass *(Pseudoroegneria spicata)*
    - Sand dropseed *(Sporobolus cryptandrus)*
    - Needle and thread grass *(Hesperostipa comata)*
    - Red three-awn *(Aristida longiseta)*
    - June grass (*Koeleria macrantha)*
    - Annual ryegrass *(Lolium multiflorum)*

Broadcast Seeding
.. *Broadleaf Herbs*

Two species germinated in > 75% of areas seeded

- Yarrow (*Achillea millefolium*) (94% of areas)
- Brown-eyed Susan (*Gaillardia aristata*) (88% of areas)

An additional 2 species germinated in about 50% of seeded areas

- Wooly plantain (*Plantago patagonica*) (49% of areas)
- Long-leafed daisy (*Erigeron corymbosus*) (51% of areas)

15 species germinated in < 49% of seeded areas

- 2 species germinated in 25% to 48% of seeded areas
- 7 species between 11% and 24%
- 6 species in < 10% of areas

Broadcast Seeding ... *Shrubs*

5 shrubs were broadcast seeded, after two years germinants of 4 species were found

- Pasture sage *(Artemisia frigida)* (94% of seeded areas)
- Rabbitbrush *(Chrysothamnus nauseosus)* (34%)
- Red currant *(Ribes cereum)* (8%)
- Saskatoon (*Amelanchier alnifolia)* (1%)

Whole Plant Salvage

- 7600 plants
  - 86% Bunchgrass
  - 7% Perennial Herbs
  - 7% Shrubs
- 5,600 Litres of Microbiotic Crust
  - e.g. *Tortula ruralis* & *Cladonia* spp.
- 112 m^2 of Clubmoss
  - *Selaginella densa*

Survival of Salvaged Plants

- Shrubs average survival 77%
  - Best species: red currant, sumac *(Rhus glabra),* mock orange *(Philadelphus lewisii) – all 100%*
- Broadleaf herbs (61%)
  - Best species: northern wormwood (Artemisia campestris) and snow buckwheat (Eriogonum niveum)
- Bunchgrass (76%)

Survival of Microbiotic Crust

After 2 years .. Plots inoculated with crust species averaged 92% higher cover of crust species than plots that were not inoculated.

Propagation of Native Plants

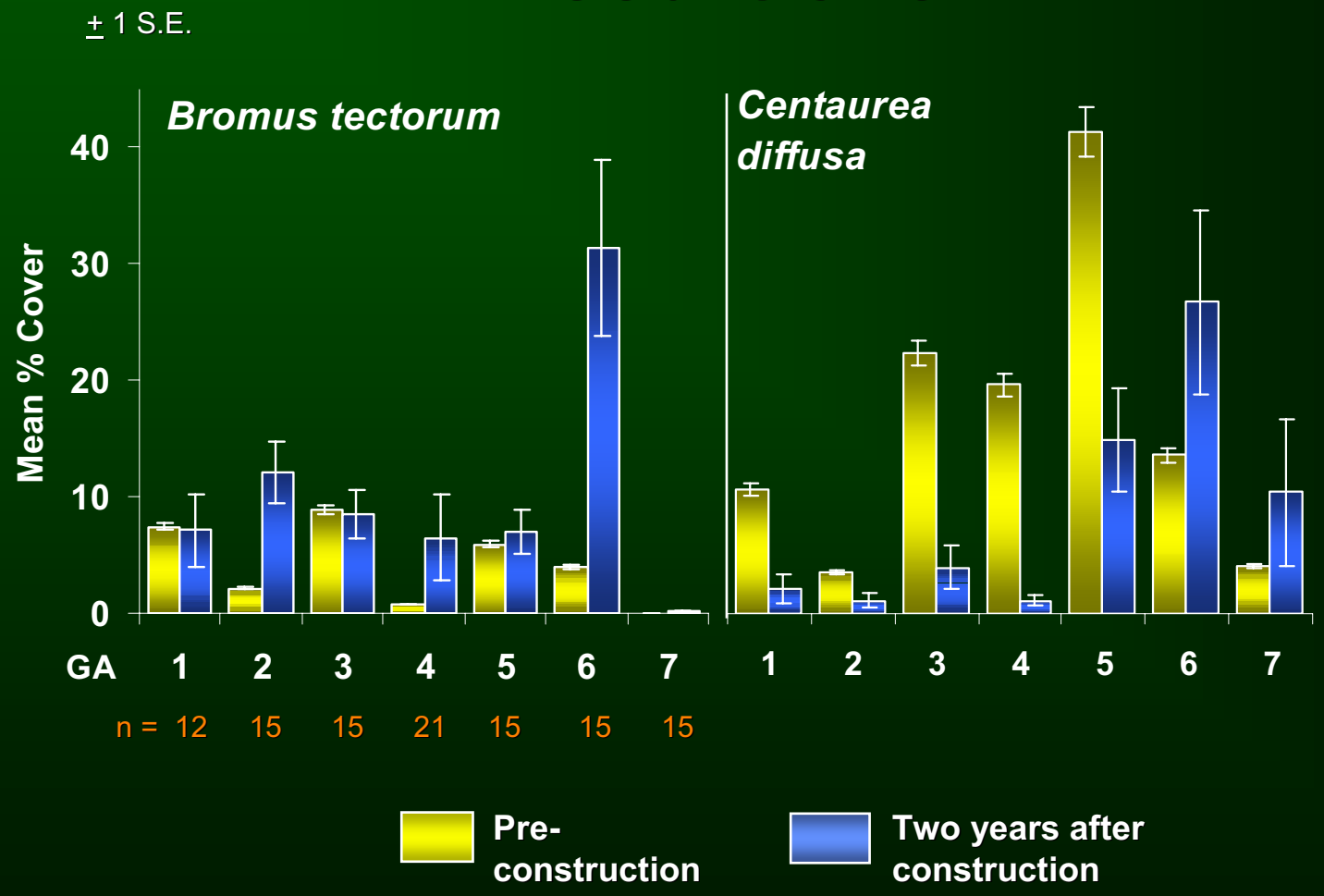
- Salvaged bunchgrasses were divided into tillers and grown into plantable plugs
- Antelope-brush was grown from seed
- Woods rose was propagated from cuttings

All nursery-produced stock was replanted on the disturbed right-of-way through the Wildlife Area

Pre and Post Construction Weed Control

- A rigorous manual weed control program for diffuse knapweed (*Centaurea diffusa*) was carried out before construction
- All project vehicles and equipment were monitored and only allowed on site if weed free
- Chemical control of diffuse knapweed and sulphur cinquefoil was conducted after restoration

Pre and Post Construction Weed Cover



Lessons Learned ..

- Microclimate conditions effect establishment rates
- In semi-arid regions, timing plant salvage operations is critical and
  - plant salvage operations should target bunchgrass and shrubs
  - only salvage perennial herbs with seed that is difficult to collect or germinate
- Microbiotic crust can be established to disturbed soils
  - it is a seed storage site, adding native and non-native annuals to the restored area.
  - Treat the microbiotic crust for weeds before re-applying
- Cheatgrass was the most problematic weed affecting establishment of seeded native bunchgrasses
- Relying on locally collected native plant material is costly and seed collection and propagation should start at least two years before restoration

5 years after restoration

Microbiotic crust and native bunchgrasses restored to pipeline right-of-way


Bluebunch wheatgrass and
Brown-eyed Susan restored to

Acknowledgements

Funding and Support

- Terasen Gas Inc

Special thanks to:

- Westland Resource Group Inc
- Tom Duralia