Recipes for Restoration

Context of Climate and Landscape in Western Canada

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SER
SOCIETY FOR
ECOLOGICAL
RESTORATION

Restoration Analogies

www.grashe.com/seattle_painting_restoration.html

www.eliteautomotiverepairs.com

Recipes

Restoration Best Practice Concepts
(adapted from SER 2016)

1. Natural reference ecosystem and an understanding of succession and natural variation are the basis

2. Goals and objectives are developed only after a site description

3. Reliable achievement of success means assisting natural recovery by <u>supplementing only where impaired</u>

4. Seeks the highest and best-effort progression toward full recovery of the ecosystem

5. Draws on all relevant knowledge for successful outcomes

6. Underpinned by early, genuine, and active engagement with all stakeholders for successful outcomes
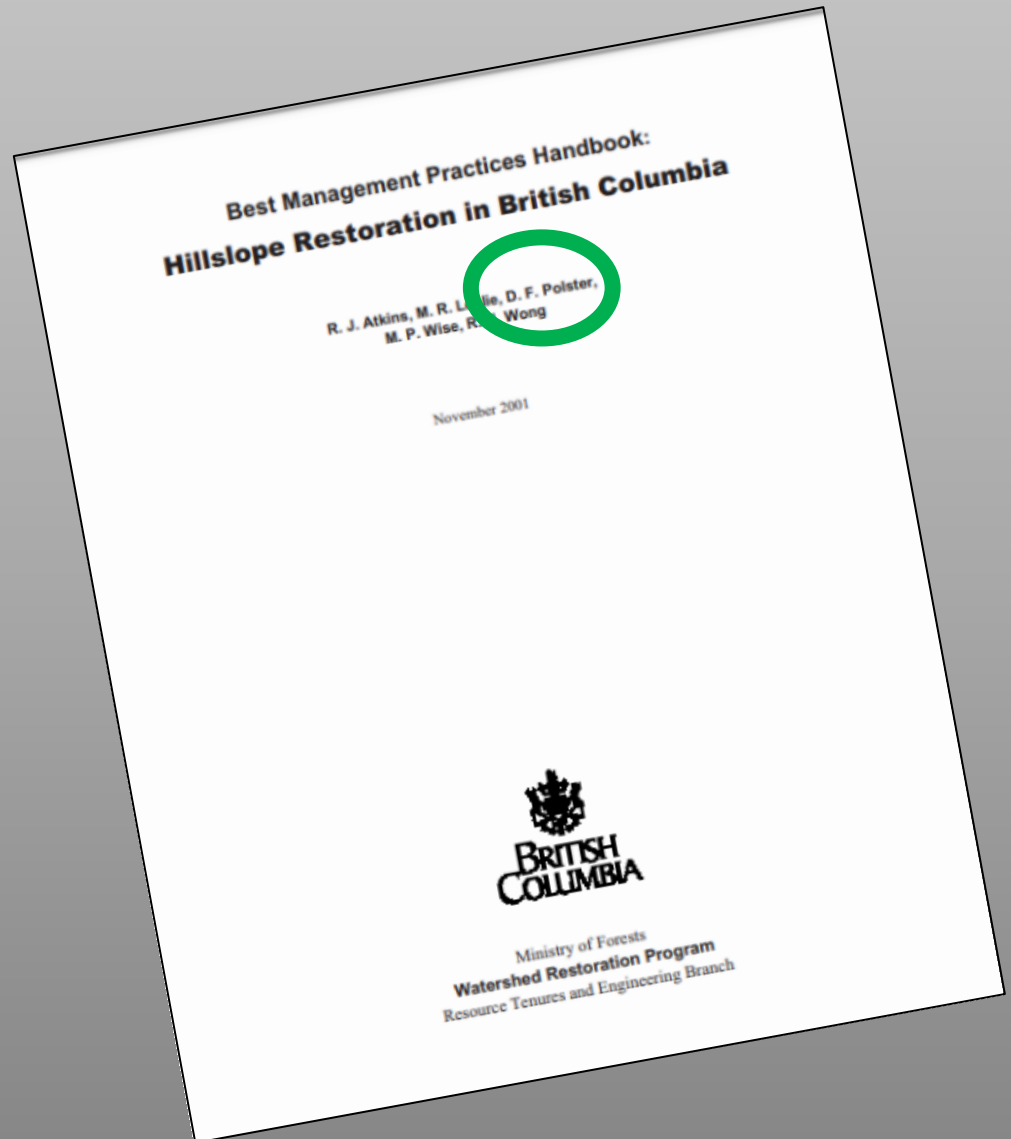
Hydro-seeding

Hydro-seeding

Excellent resources exist.

But not everyone is using these resources.

Best Management Practices Handbook:
Hillslope Restoration in British Columbia

R. J. Atkins, M. R. Leslie, D. F. Polster, M. P. Wise, R. Wong

November 2001

BRITISH COLUMBIA

Ministry of Forests
Watershed Restoration Program
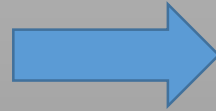Resource Tenures and Engineering Branch

Hydro-seeding Wrecks

Hydro-seeding Wrecks

Ideally, perennials establish under cover crop

Often the infill desired just doesn't happen

Hydro-seeding Wrecks

Roadside Seed-mix Standards (B.C.)
(adapted from Ministry of Transportation & Industry, & FLNRORD)

Coastal BC	Interior BC
Fall Rye	**Fall Rye**
Annual Rye	Perennial Rye
Perennial Rye	Intermediate Wheat
Intermediate Wheat	Slender Wheat
Creeping Red Fescue	Crested Wheat
Hard Fescue	Creeping Red Fescue
Timothy	Sheep Fescue
Orchard Grass	Orchard Grass
Smooth Bromegrass	Canada Bluegrass
Redtop	White Clover
Alsike Clover	Alfalfa
White Clover	
Red Clover	
Birdsfoot Trefoil	
Alfalfa	

Cover Crops

Cover Crops (green manure)

Companion Crops

Nurse Crops (facilitation)

Annual Cover Crops (Companion Crops)

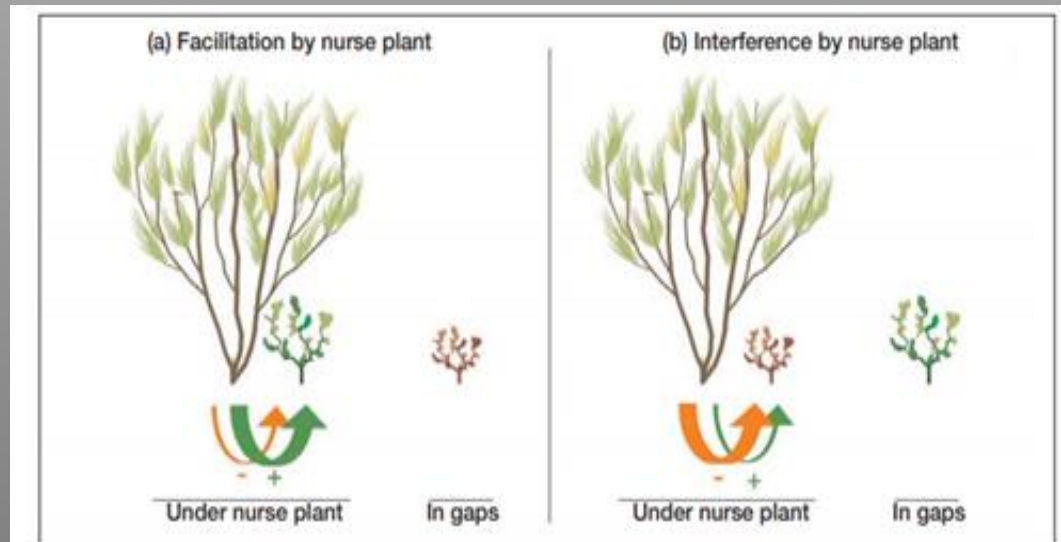Barley (*Hordeum vulgare*)

Oats (*Avena sativa*)

Fall Rye (*Secale cereale*)

Nurse Crops

Gomez-Aparicio, L. 2009. J. Ecology. 97: 1202-1214.

- Facilitation rare in nature, usually shrubs or small trees "facilitate" herbs, cacti, and woody plants, with tradeoffs.

- Early-emerging herbs "inhibit" late emerging herbs (competition).

- Abiotic structures (rocks, coarse woody debris) better "safe sites"

Padilla & Pugnaire 2006. Frontiers in Ecology and Environment. 4: 196-202.

(a) Facilitation by nurse plant — Under nurse plant — In gaps

(b) Interference by nurse plant — Under nurse plant — In gaps

Nurse Crops in Dry Environments

Perry, L.G., Cronin, S.A., Paschke, M.W. 2009. Plant Ecology. 204: 247-259.

- Cover crops more often fail to suppress weeds, and succeed in suppressing desired perennials.
- Cover crop competition strong enough to suppress annual weeds, also suppresses desired perennials.

Espeland, K., Perkins, L.B. 2013. Ecological Restoration. 31: 69-78

- Oat cover crop on North Dakota coal mine = neutral effect on perennial grass establishment.
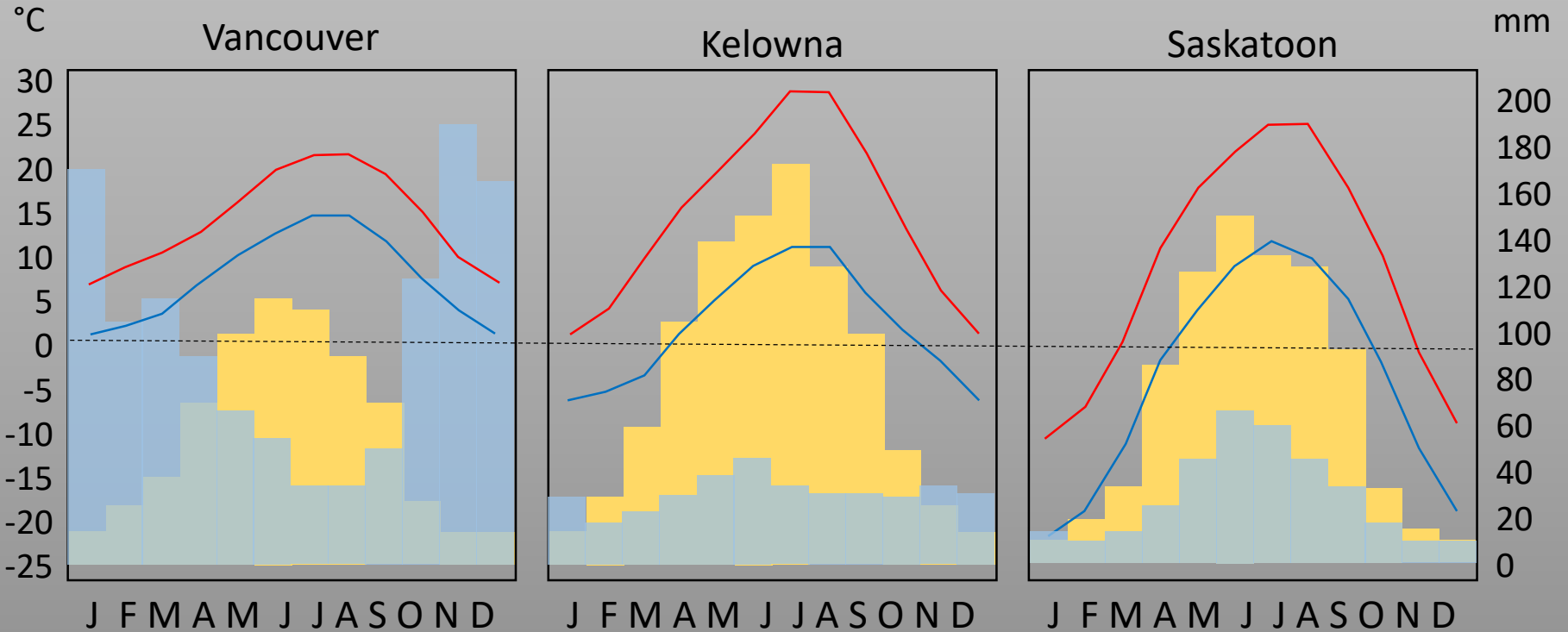
Environmental Gradients

Vancouver Kelowna Saskatoon
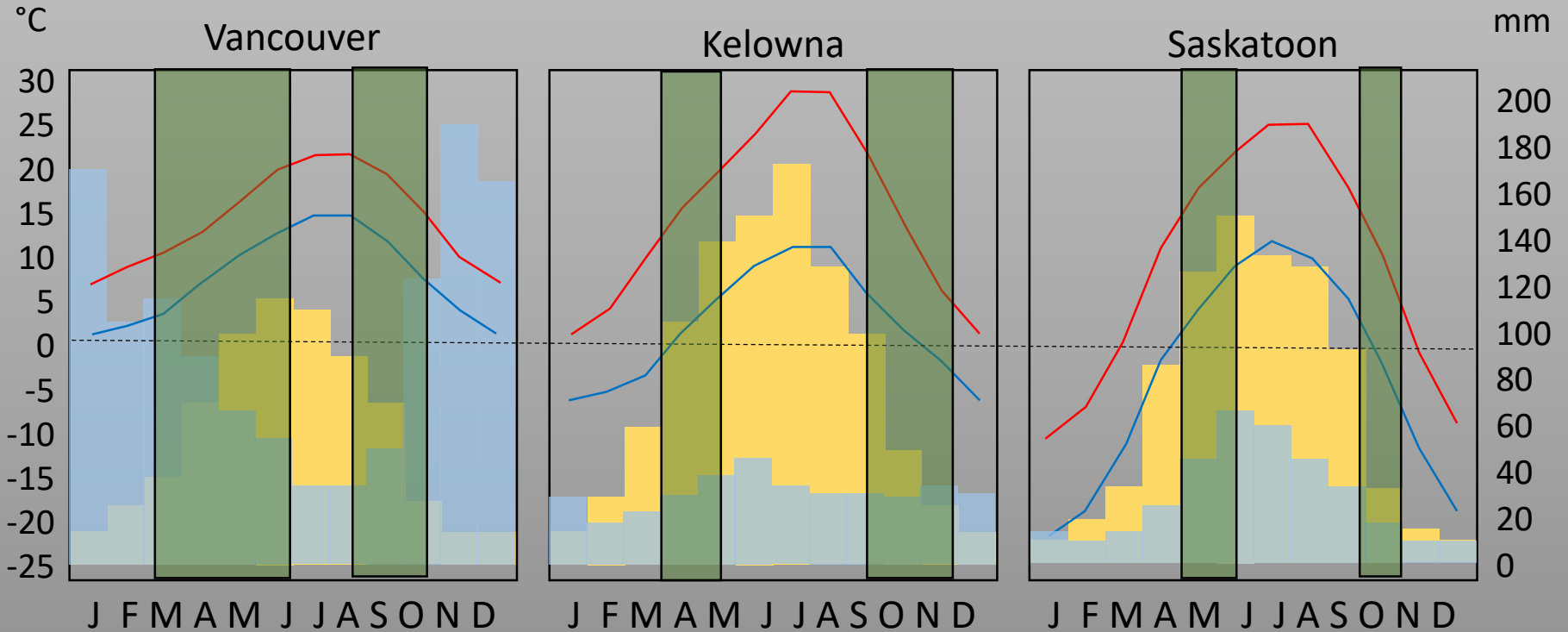
Environmental Gradients

°C — Vancouver, Kelowna, Saskatoon — mm

Vancouver
Steep Slopes
Young Parent Material
Coarse Textured

Kelowna
Steep Slopes
Young Parent Material
Coarse Textured

Saskatoon
Gently Undulating Slopes
Old Parent Material
Fine Textured

Seeding Windows

Vancouver
Spring seed perennials
Fall seed "winter cover crop"

Kelowna
Spring seed perennials (risky)
Fall seed perennials (dormant)
Fall seed "winter cover crop"

Saskatoon
Spring seed perennials
Fall seed perennials (dormant)

Successional outcomes – Goals & objectives

Vancouver

Kelowna

Saskatoon

Use natural references

Supplement where impaired

Questions/Recommendations

1. In the dry interior of BC, should revegetation expertise be coming from the wet coast or the dry great plains?
   a) Similar to coast: steep slopes, coarse soils, winter wet
   b) Similar to great plains: prolonged drought, grassland end-point

2. In the dry interior of BC, what is the relative benefit of seeding a perennial mix? with:
   a) Better site preparation to provide a good seedbed
   b) Annual "fall rye" cover crop as a "nurse" crop for winter erosion
   c) Placement of physical amendments (mulch, rock, CWD) for safe sites

3. Hydro-seeding can cost 10 to 100X that of broadcast seeding, and cost of one failed hydro-seeding operation could pay for 10 to 100 broadcast seeding operations. How are risks of failures assessed and managed?
   a) Better to "make it green" fast for client satisfaction and contract closure?
   b) Better to repeat broadcast seeding for 10 years in different seasons to obtain a mix of establishment dates and infill?