

RECLAMATION TREE TRANSPLANTING

What do you have to lose??



What are we talking about?

Various sites with transplanted trees including a borrow pit, remote sump, and various MSLs

Great success at a borrow pit where we took trees from soil stockpiles around edges

Some earlier sites go back as far as 2015 but most started 2019 - 2020

Transplanted trees throughout all seasons in 2020 and 2021

Sites will be infill planted as per normal even with transplants on site



How did we start?

- 2019 asked consultants to investigate reclamation sites for tree transplanting opportunities
- Our consultants were great to work with and helped make this happen with suggestions/ideas
- Many of our acquired sites are quite old so have growth around lease edges (within surveyed leases) for donor trees
- Winter 2019 started transplanting trees from lease edges into interior of the sites
- This will be an ongoing project over the next few years to develop an inventory of sites to monitor over time



Borrow Pit Transplant Trial

- Reclaimed North and West slopes (partial rec job)
- Unique in that we transplanted ~40 trees from soil piles onto slopes in NW corner
- Transplanted in Winter 2019
- Trees were taken from topsoil piles on BP edges
- Deciduous and conifers
- 2ft – 15ft tall





What did we learn?

1. Experienced operators help!

- Initial transplanted trees were leaning
- As work progressed the operator gained experience placing trees
- Experience on hole depth and what's too deep or too shallow



2. Using a larger bucket helps

- Allows for more secondary plants around the base of the trees
- Like; raspberries, willows, forbes, mosses, etc.
- Keeps more roots intact and increases survival



3. Trees <1m appear to result in greater survivability

- The bigger the tree, the less chance there is of a successful transplant
 - Getting the root ball into the bucket without damaging roots is difficult on larger trees
 - Ideally you need at least 10 to 12 inches of root ball diameter for every inch of trunk diameter
- Larger trees are tricky to handle and tend to lean after placement
- Plants that sucker can help with infilling of a site vs moving in from edges



4. Access to moisture/placement

- For dryer/higher ground sites trees planted in the wetter low-lying areas of sites tend to do better
- If there is no or little access to water and a dry spring/summer such as 2021 survivability will drop
- Compaction can also inhibit growth so ripping the site well help
- Can place trees a bit lower than surrounding areas to assist with pooling some moisture



5. Saving areas with existing growth

- Where possible saving areas with existing growth/vegetation helps with regeneration
- These are great islands of habitats and sources of suckering plants
- Opportunities to leave existing trees standing and working around them



6. Topsoil piles are excellent sources of trees!

- Topsoil piles are usually sitting on sites for decades in some cases
- Trees would otherwise just be used as woody debris on site
- Topsoil piles can also be used to store/cache trees for later transplanting (keep roots from freezing)
- Can be salvaged prior to spreading out the topsoil



Fall Transplanting

7. Fall transplanting seems to work best

- Late fall trees are going dormant so less of an impact from transplanting
- Keeping size <1m allow for a good root ball to be collected
- This coincides well with Sept – Oct reclamation projects in the green zone
- Literature review supports this seasonal approach



Summer Transplanting

- Trees transplanted in the summer may not do as well as they are actively growing
- May need bigger bucket and smaller trees to disturb less and get an intact root ball
- Careful what else is in the root ball as could cause a grass problem on site!



Winter Transplanting

- Mounded snow may provide some root protection and moisture
- Can pack trees in snow /topsoil piles until ready to transplant to insulate roots
- Frost heave can potentially push some trees out so smaller should be better
- Roots can freeze if left out or not transplanted correctly with well buried roots (above -11°C)
- Spring precipitation can have significant impact on survival



Sometimes it works...

2015



2021



Sometimes it doesn't...

- Still provides structure or coarse woody material on an otherwise flat uniform surface



And sometimes we wait and see.. (Dec 2021 transplants)

- Consultants made choices at the field level as to transplanting based on what was available
- Did not put restrictions on what we would try



Jan – March 2022 Transplants

- 10 additional sites YTD with some more creativity
- Transplanted three “tree islands” at the site, similar to the one in the photo (34 trees in total).



What not to do

- Trees are not far enough in the ground and can be pushed up over the winter
- Shallow holes with clayey soils will not let trees settle in or easy for roots to spread



VS



Too Shallow again

- Frost will most likely heave these transplants out or roots may freeze
- Need to get the hole deep enough!



What's the better transplant?

- Initial goal is to figure out which transplants are most likely to survive
- Literature review indicates:
 - Pine have a more vertical taproot and can do better than spruce in drier sandy soils
 - Deciduous plants usually transplant better than conifers
 - Shrubs normally relocate better than trees so going forward will increase efforts to use



← Co-planting!



Other observations...

- Placing cluster of trees and single trees on same site, is there a difference in survivability
- Assume cluster is better with intergrowing roots and protection from wind
- Trees experience a degree of shock after being transplanted—but on these sites the “what comes next” is out of our hands (i.e. rain, temperature extremes, etc.)
- Stock/species available for transplant can be limited
- Donor soil conditions should be similar to the transplant site (i.e. peaty wet area to a sandy subsoil or clay = bad)



There is no downside to the transplanting

- Transplanted trees can be resilient, even if leaning
- Costs are minimal as all the equipment is on site and one hour of equipment time can get many trees
- Worst case it adds micro sites & coarse woody material to a site
- In some cases, trees will be knocked down anyways if they are in a cut/fill area on lease so why not transplant them
- There really is no downside here! (although you do need to think about potential helicopter landings)



Questions to be answered further as we go along...

- Can tree transplanting speed up reclamation timelines?
 - Probably not, but it will add ecological value to the site
- What ecological benefits are brought to a site?
 - Secondary species, micro sites, vertical structure, and animal habitat
- What is the impact of the growing medium where the trees were taken from and put into (i.e. topsoil pile vs sandy subsoil or clay)?
 - We know trees in sandy soils may not transplant well as the root ball can lose material/mass during handling
- What density of transplanting is needed to make an impact on site progression?



Tree Density?

- Average of 28 trees/site
- Wide variance between 5 – 100 trees/site

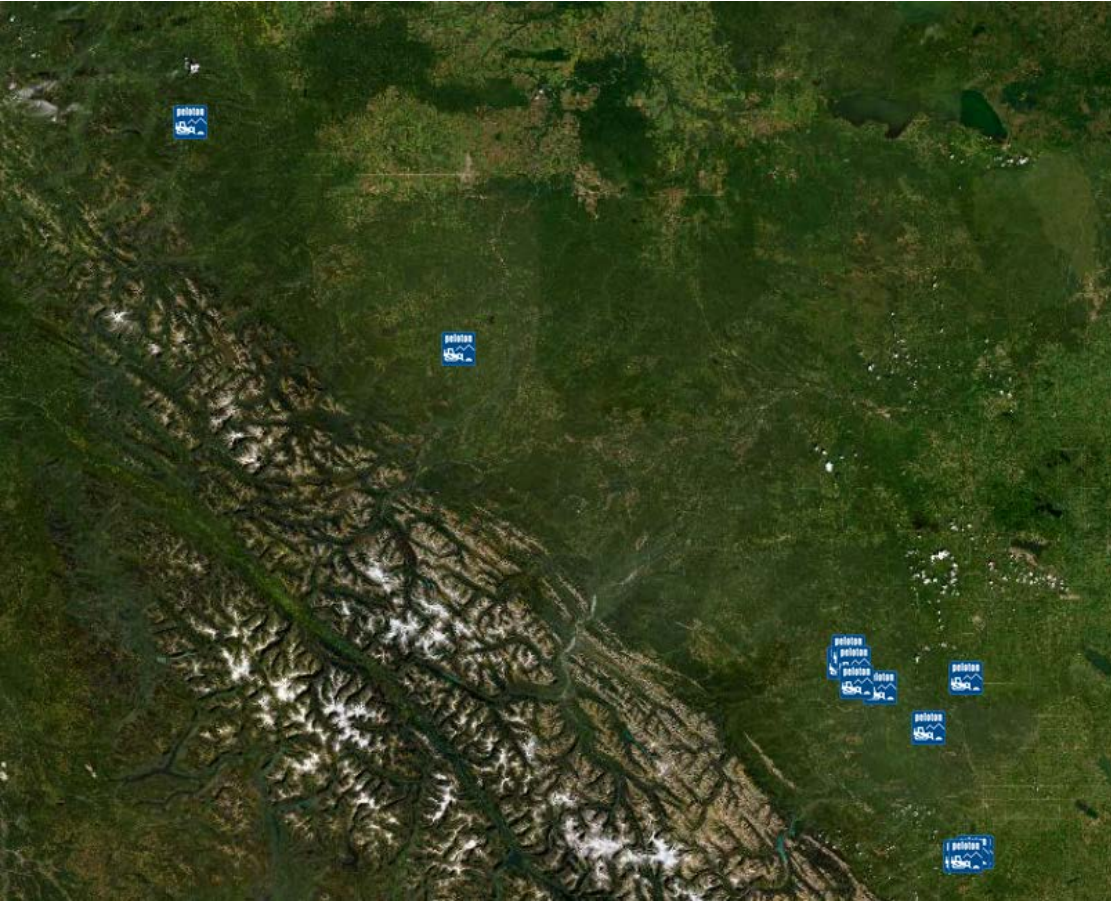


Consultant humor... Tree Stonehenge



Tracking the work

- Part of the go forward plan is to track this work so we can identify best practices
- In Siteview we can track transplanting dates (seasonality), equipment operator, consulting company, types of trees and survival rate
- We can pull a report of all the transplanted sites to monitor them year over year
- Since 2019 we have transplanted ~600 trees over 39 sites



General		1
Siteheader		
Site Components		
Surface Locations		
DLS		
NTS		
Location Contact Informat		
Wells		
E H & S		
Assessments		
Reclamation Certificate Inform		
Tree Planting		
Operations		

General		1
Tree Planting Date	...	10/5/2021
Tree Type	...	Transplanted
Number of Trees Planted		50
Comment		30 spruce 15 willow 2 birch 1 aspen 1 green alder ... 1 jack pine

General		1
Siteheader		
Site Components		
Surface Locations		
DLS		
NTS		
Location Contact Informat		
Wells		
E H & S		
Assessments		
Reclamation Certificate Inform		
Tree Planting		
Operations		

General		1
Tree Planting Date	...	2/7/2019
Tree Type	...	Transplanted
Number of Trees Planted		40
Comment		Various types of trees both coniferous Pine and Deciduous Alders

Next step to try?

Could you transplant a site to reclamation standards?

- Excavator at \$200/hr at 15 minutes/tree (or a day's worth of time ~\$2,000 - \$3,000)
- Potential to transplant enough stems for \$3,000 - \$5,000 to reach rec criteria density
- To plant a site with nursery stock you have the tree planting crew, consulting time, plus nursery costs ~\$5,000 - \$10,000/site
- Option to bring in an actual tree spade to properly transplant trees vs excavator
 - Tree spades increase the likelihood of a clean, efficient extracting, transporting and transplanting process, which contributes to a higher survival rate for transplanted trees
 - Tree spades can be much slower than an excavator
- Obvious problem #1 would be finding enough donor trees to make this even a starter proposition



Regulatory requirements

- Gathering transplanting materials from completely within the disposition does not require approval.
- Collecting of transplant materials off disposition requires approval.
- Regulated under *Forest Genetic Resources Management and Conservation Standards* (FGRMS).
- Need to complete FGRMS 10A and submit it to the appropriate Forest Area office.
- For small amounts (like transplanting a few trees) there is no need to register the material prior to moving it provided FGRMS 19.1 and 19.2 are met.

Protected A (when completed) Appendix 10A FGRMS
Alberta Agriculture and Forestry Forest Area Date of Application yyyy-mm-dd

Applicant/Requesting Agency

Mailing Address City or Town Province Postal Code

Phone Extension Email Address

Requested Start Date yyyy-mm-dd Estimated Completion Date yyyy-mm-dd

Purpose of Collection

1. To add multiple species, use the buttons provided or attach list to email using excel file with the following columns for items 3, 4 and 5: Target species, Material type, Amounts expected, and Harvest method.

2. Collection Location (provide seed zone and attach maps of the collection area(s), add lat. and long. in decimal degree format where applicable.)

Seed Zone

Latitude (use decimal degree format to six decimal places)

Longitude (use decimal degree format to six decimal places)

3. Target Species (attach list)*

4. Material Type and Amounts Expected (attach list)*

5. Harvest Method (attach list)*

6. Will Collected Materials be Used for Reforestation or Reclamation on Alberta Public Land?

Yes No Other

Specify

Add Location Remove Location

7. Retention of Seed

For Stream 1 seed lots, Alberta may, at the time of registration, retain up to 30,000 viable seeds or 5% of the initial total seed lot, whichever is less. In the absence of seed viability test data Alberta may retain up to 60,000 seeds or 10% of the initial total seed lot, whichever is less. Alberta will notify the owner of any withdrawals. Amounts greater than this will require written consent of the owner (Standard 17.1.1). For all other public land seed or vegetative material collections not intended for reforestation, reclamation or tree improvement in Alberta, the owner may be required to provide 10% of harvested seeds or vegetative material to Alberta. (Standard 17.1.4)

Department Use Only

8. Other Permission(s) and/or Notifications Required - Area Office

Road Access Yes No Not Required

Land Use TFA Yes No Not Required

Disposition Permission Yes No Not Required

Other (specify)

FGRMS:

19.0 Deployment of Unregistered Material (for limited use only)

19.1 *Wild* transplants and *propagules* from within 5 km and 100 m elevation of the target planting site, or from within 20 km of the planting site and in the same *seed zone*, may be deployed without *registration*. These transplants and *propagules* may not be multiplied or serially propagated.

19.2 Where *deployment* will be without nursery production and will be completed within nine months of the collection date, a maximum of 5,000 *propagules*, cumulative over years, from a single *genotype* may be deployed without *registration*.

Borrow Pit 8
2015 - 2021



And on the ground...



BP 0
2016 -2021







BP 7
2018 -2021



BP 5
2019 - 2021



BP 19
2018 - 2021



BP 01-01
2017 - 2021



BP SMC 19
2018 - 2021

