

Fertilization at the Time of Planting With RTI Teabag Fertilizer

Presented By:
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Who is RTI?

- Have been in business since 1993 getting our start with fertilizer teabags with over 275 million sold to date
- Production facilities located in Salinas, CA



Who is RTI?

- In 2006 expanded to production of its biological *Xtreme Gardening* line, which includes Mychorrhizae and nitrogen fixing bacteria
- Xtreme Gardeners have been using these products to produce world record setting vegetables



What can RTI do for You?



Pli 410 1+0 - Beginning of second growing season – IDF mw2 – Barriere, BC

Fertilized with RTI Continuum

Impressive, but have you ever wondered what happens to these trees after the first growing season? At RTI we know. As you proceed through the presentation you'll find out too.

The Seedling

Sx 412a 1+0 –
Primed and Ready
for Action!

But at this point it
is really nothing
more than
potential.



RTI Teabag Fertilizer
products are here to
help you get the
most out of that
potential.

The Objective of the Seedling

Site Occupancy

Somebody is going to capture the site resources (both below and above ground) It's either going to be the seedling or the competing vegetation. There is no time to waste establishing after planting. The sooner the seedling captures the site and its resources, the better its growth potential.

Sx 412a 1+0 - Third growing season – ICH vk1 – Blue River, BC

Fertilized with RTI Bio-pak and punching its way through the competing vegetation



How Does a Seedling Capture a Site?

Fine roots — supply the moisture and nutrients. The more extensive the network, the better it can supply the tree to expand its foliar biomass.

Foliage — the engine that drives growth. The bigger the engine, the greater the growth.

What the Seedling Needs

- ✓ Light

- ✓ Soil Moisture

- ✓ Suitable Environment

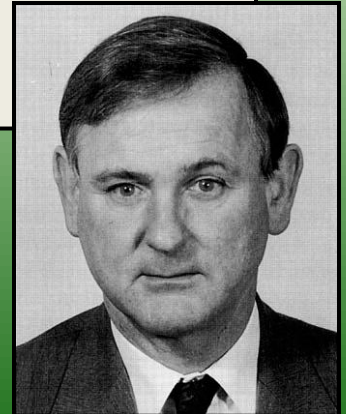
- ✓ And.....

PROPER NUTRITION

Timing Is Everything!

In the beginning of a seedlings life, nutrient accumulation is very rapid as it develops its foliage and fine roots. In consequence, nutritional problems are most likely to develop in the early years while the green crown is being developed. Therefore, it is this stage when the concentration of nutrients is likely to be the critical factor controlling the rate of crown development and responses to a wide range of fertilizer nutrients can be expected. It is also at this time when judicious fertilizer application can most influence the development of the stand, perhaps saving many years of rotation length.

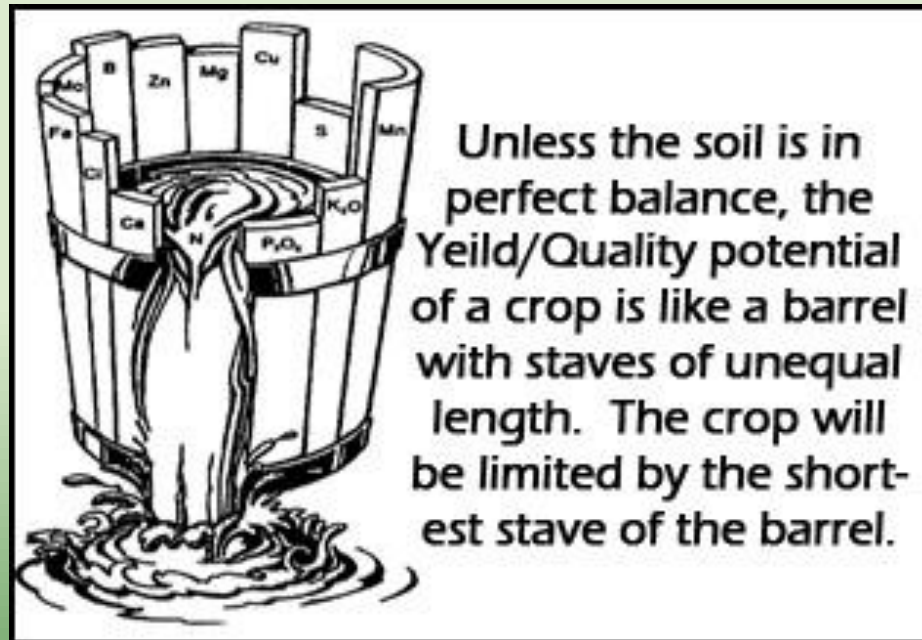
Hugh Miller, Department of Forestry, University of Aberdeen, retired



Forest Fertilization: Some Guiding Concepts (Forestry, Vol. 54, No.2, 1981)

The influence of stand development on nutrient demand, growth, and allocation (Plant and Soil 168-169:225-232, 1995)

One limiting nutrient can hinder the growth potential of a tree



Resources available to the seedling at the time of planting to access the site



Other than what the seedling has stored in its foliage and roots, all it has immediately accessible for nutrients is the remaining soil in the plug.

**Thus, once planted, the seedling has
to get its roots out to access site
resources**



**But it takes time
and energy!**

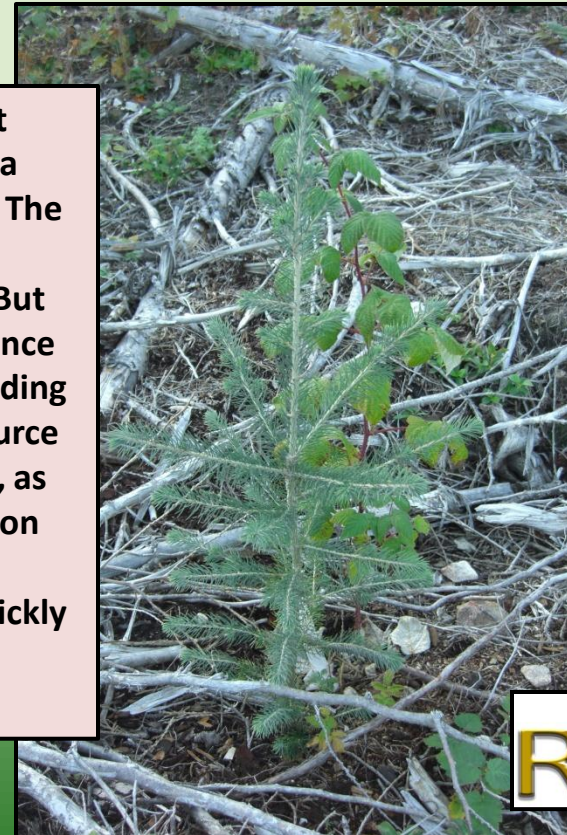
Adequate But Not Enough To Release the Seedlings Full Potential

Typical Sx Control – ICH mw3

Sx Fertilized with GSFP -pak



Note: This is not what would be considered a nutrient limiting site. The tree on the left is still working to access it. But look at what a difference can be made by providing a seedling an easy source of balanced nutrition, as exhibited by the tree on the right. The teabag helps the seedling quickly transition from the nursery to the site.



Current Years Growth Foliage Sample

Control

Gilbert Smith -pak



The Objective of the Teabag

To supply the seedling with **an easy source of balanced nutrition** which will aid in the establishment of fine roots and foliage. This will in turn allow the seedling to capture the site faster and maximize its growth potential.



The Teabag is the bridge for the seedling from the nursery to establishing on site.



What Does it Do?

Three Vital Components

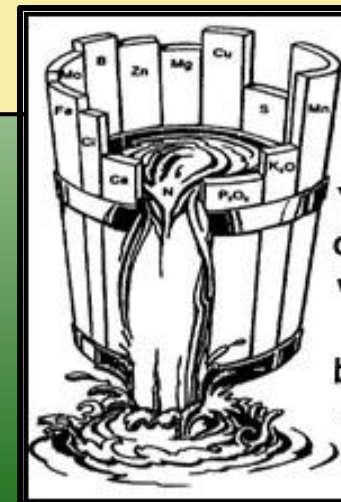
1. **Balanced Nutrition**
2. **Controlled Release Characteristics**
3. **Location**



Balanced Nutrition

- Trees need more than just N – P – K Plants actually need up to 16 different elements.
- RTI Teabags provide balanced nutrition including S and B two of BC's most limiting
- RTI teabags provide nutrients in a format that seedlings can immediately utilize

Did you know that some nutrients actually have to go through a conversion process by soil organisms to be made available to the plant? Thus, an element can be present in the soil but still unavailable to the seedling. RTI teabag fertilizer nutrients are in a form immediately available to the seedling.



Release Characteristics

RTI Teabags release nutrients

- **at a rate and amount that trees can utilize**

Trees are not grass. Quick releasing fertilizers designed for the farm release too quickly to be compatible for trees and will leach away before the seedling can even capture them.

- **at temperatures when roots are growing**

If the soil is too cold for roots to grow, the fertilizer stays put until conditions are right.

- **for at least two growing seasons**



Teabag Location



At the roots where it can be easily accessed

**Why is capturing the site
and maximizing a trees
growth potential
important?**

#1 - Brush Competition – The Big Battle For Site Occupancy



**If the seedling can't easily obtain site
resources.....**



Unfortunately there are others who can

**And we all know what happens to
trees left too long in the brush**



However, given adequate resources....



Note: The leader for this tree was determined in the previous growing season. The laterals were determined two growing seasons ago. If during those time periods the seedling was short of resources, how could it produce a vigorous bud and keep up with the brush it faces today? There is no room for lag time on a site like this.

Sx 412a 1+0 end of 4th growing season

Site Planted “as is” due to terrain – No Brushing

ESSF wc2 – near Vavenby, BC – Area Stocked



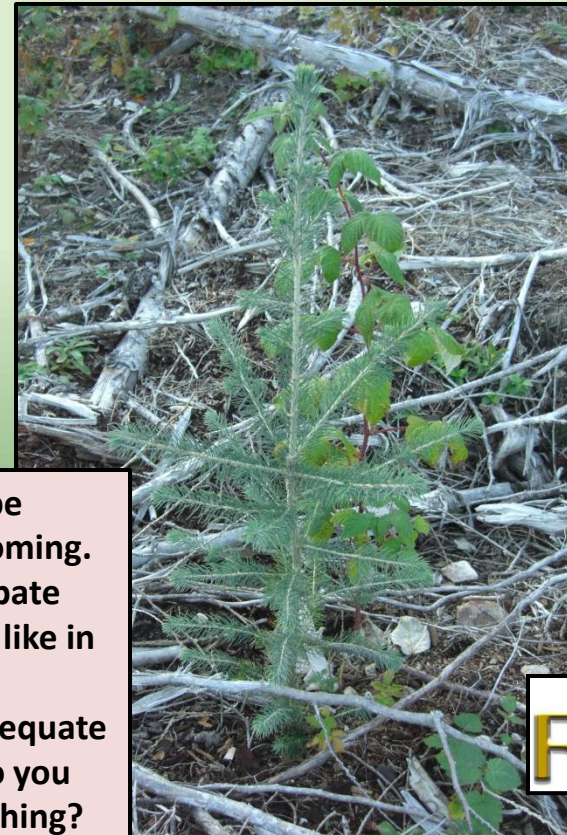
Sample Tree

Therefore, which one do you think will be the better performer in two years?

Typical Sx Control – ICH mw3



Sx Fertilized with GSFP -pak



Not much brush may be present now, but its coming. Its important to anticipate what the site will look like in two years time when considering what is adequate growth. How much do you want to spend on brushing?

Can you afford to leave anything to chance?

Cost of Teabag fertilization/ha - \$250

Cost of Manual Brushing once/ha - \$400 - \$800

**Cost of a fill plant due to NSR status - \$1.00/tree
+ the potential follow –up brushing**

Consensus is that an RTI teabag fertilizer application at the time of planting can make the difference to get trees past the brush



2 – Volume Production



412A 1+0 Fdi – Year 5 – RTI Bio-pak, ICH wk1 – Blue River, BC

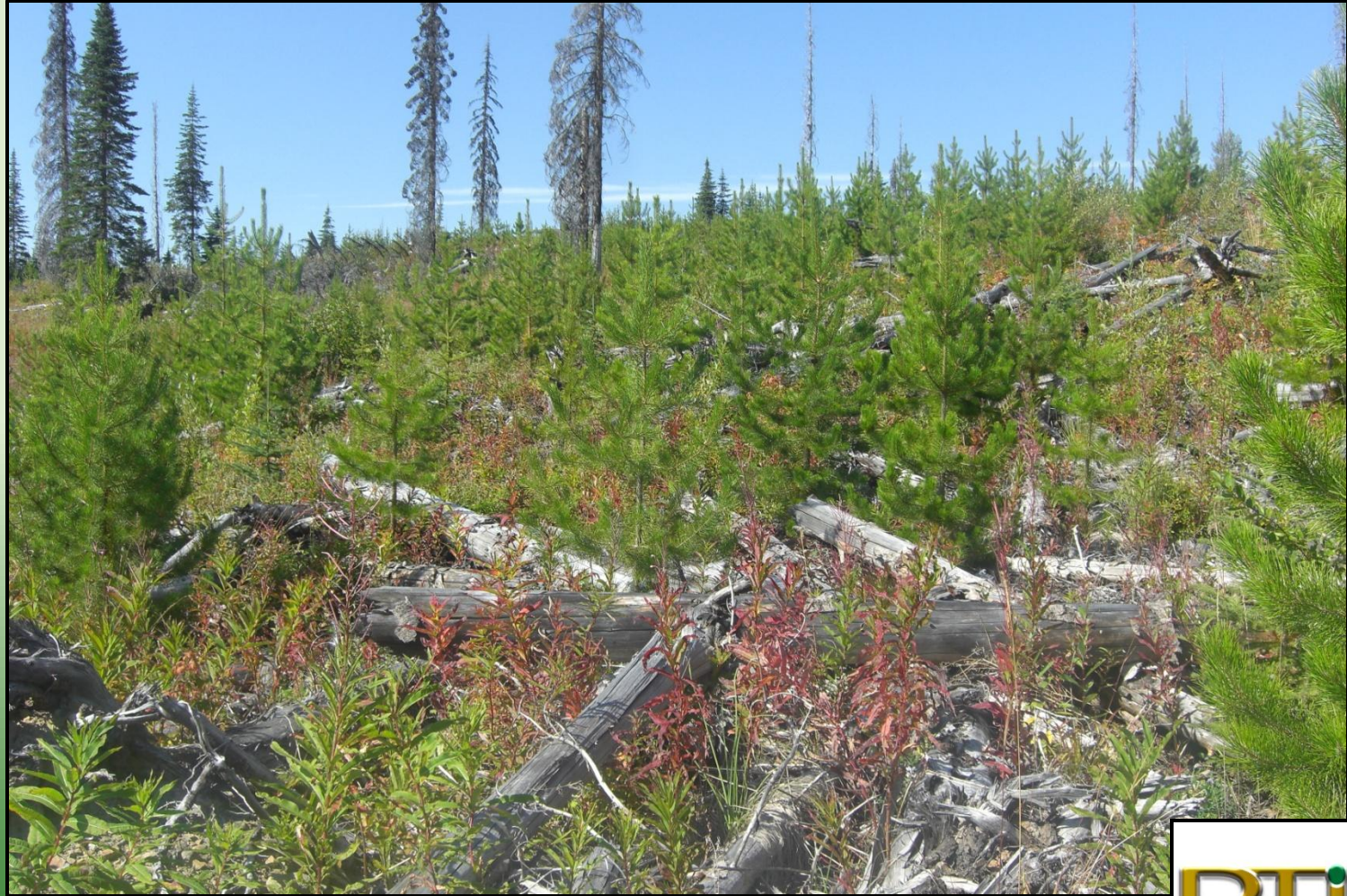
RTI Is Currently Monitoring Three Trial Sites

McLure Fire – Continuem Blend

Oyster River – Silva-pak

Lemieux Creek – Bio-pak

Scott Lake (Barriere, BC) – Lodgepole Pine – Year 7 McLure Fire -MS dm 2



Scott Lake (McLure Fire)

Site History

- Burned hot by McLure Fire 2003
- Site Prepped. by knockdown Spring 2005
- Planted Spring 2005 with Pli PSB 410 1+0



Oyster River (Campbell River, BC) – Douglas – fir – Year 13 – CWH xm1



Oyster River

Site History

- Winter Harvested 1998/1999
- Planted – As – IS 1999 with Fdc PSB 410 1+0

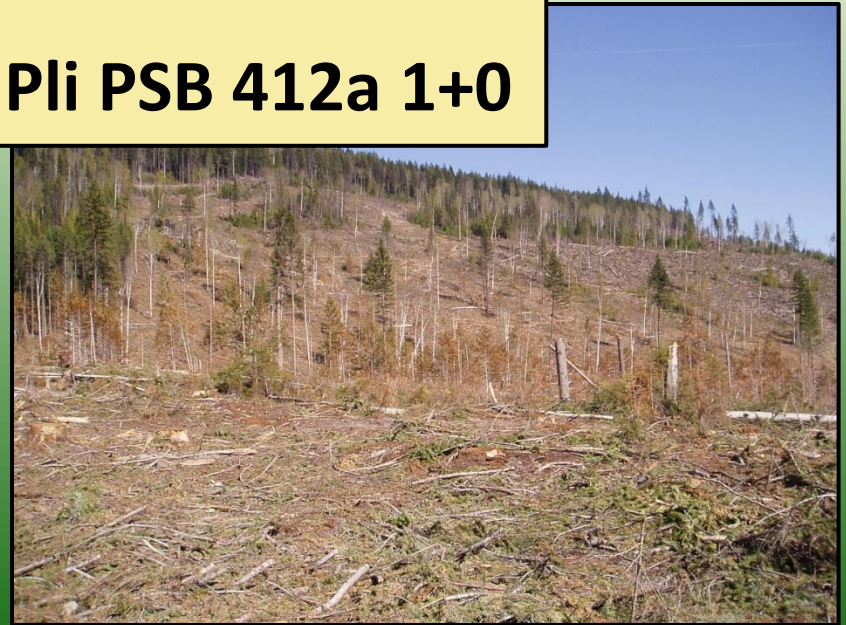
Lemieux Creek (Clearwater, BC) – Lodgepole Pine – Year 9 - IDF mw2



Lemieux Creek

Site History

- Skid Harvested Winter/Spring 2002
- Stumped Fall 2002
- Planted Spring 2003 with Pli PSB 412a 1+0



Results



**Fdi 412A 1+0 Fdi
Year 8
RTI Bio-pak**



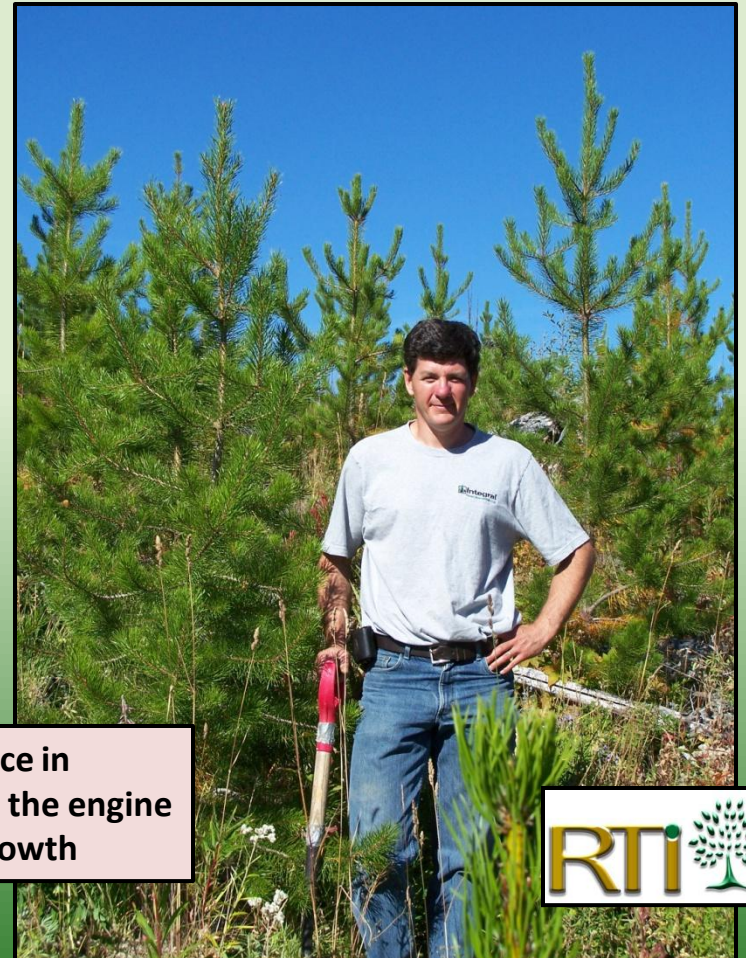
Scott Lake (McLure Fire)

Year 7



Control

Note the difference in foliage biomass – the engine that drives the growth



Fertilized with Continuem



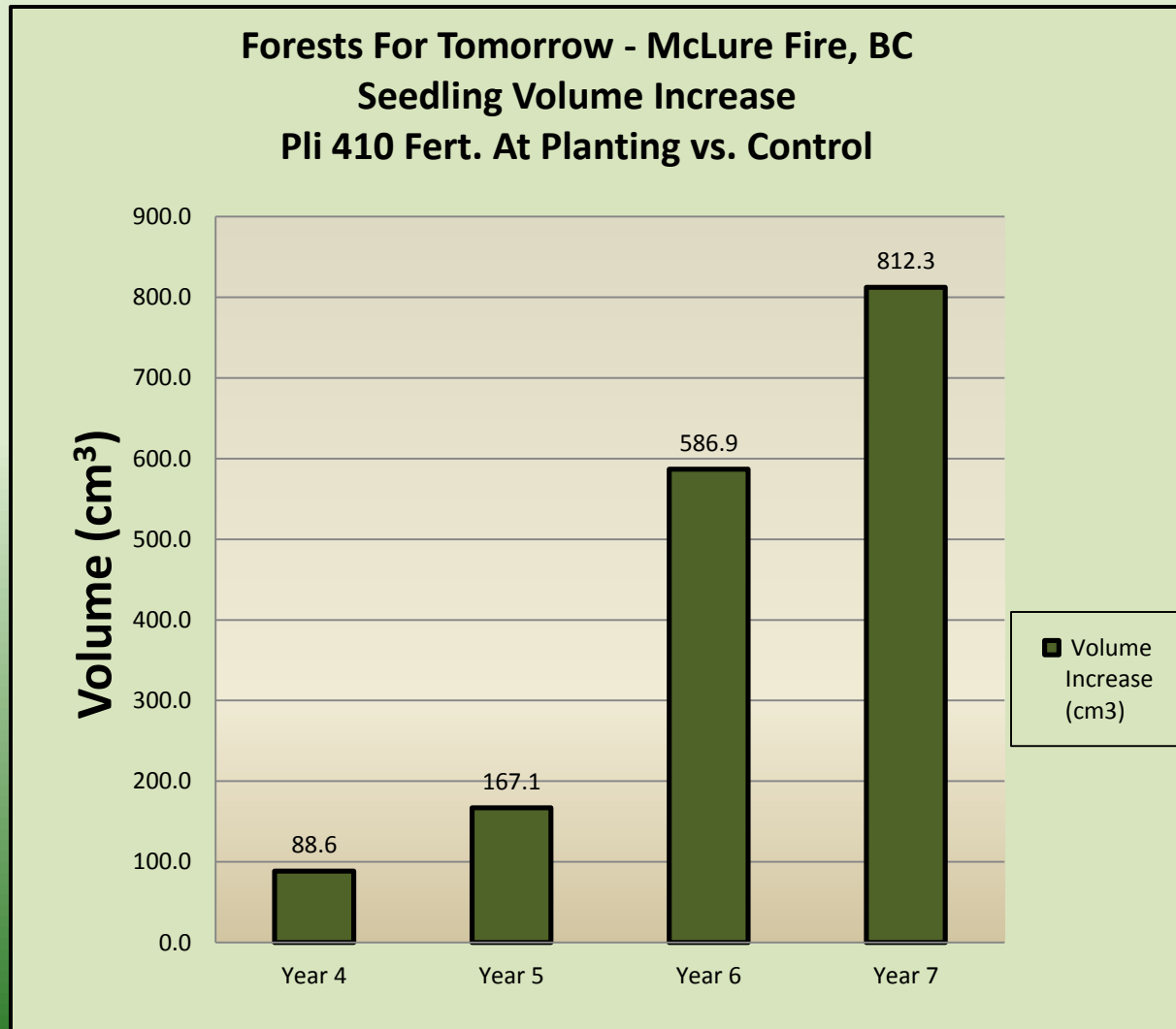
McLure Fire – Year 5

Control



Continuem

McLure Fire



84% Volume Increase/Tree Year 7 and the spread has been increasing over time

So far a Type II Response is Being Exhibited



Oyster River

Control

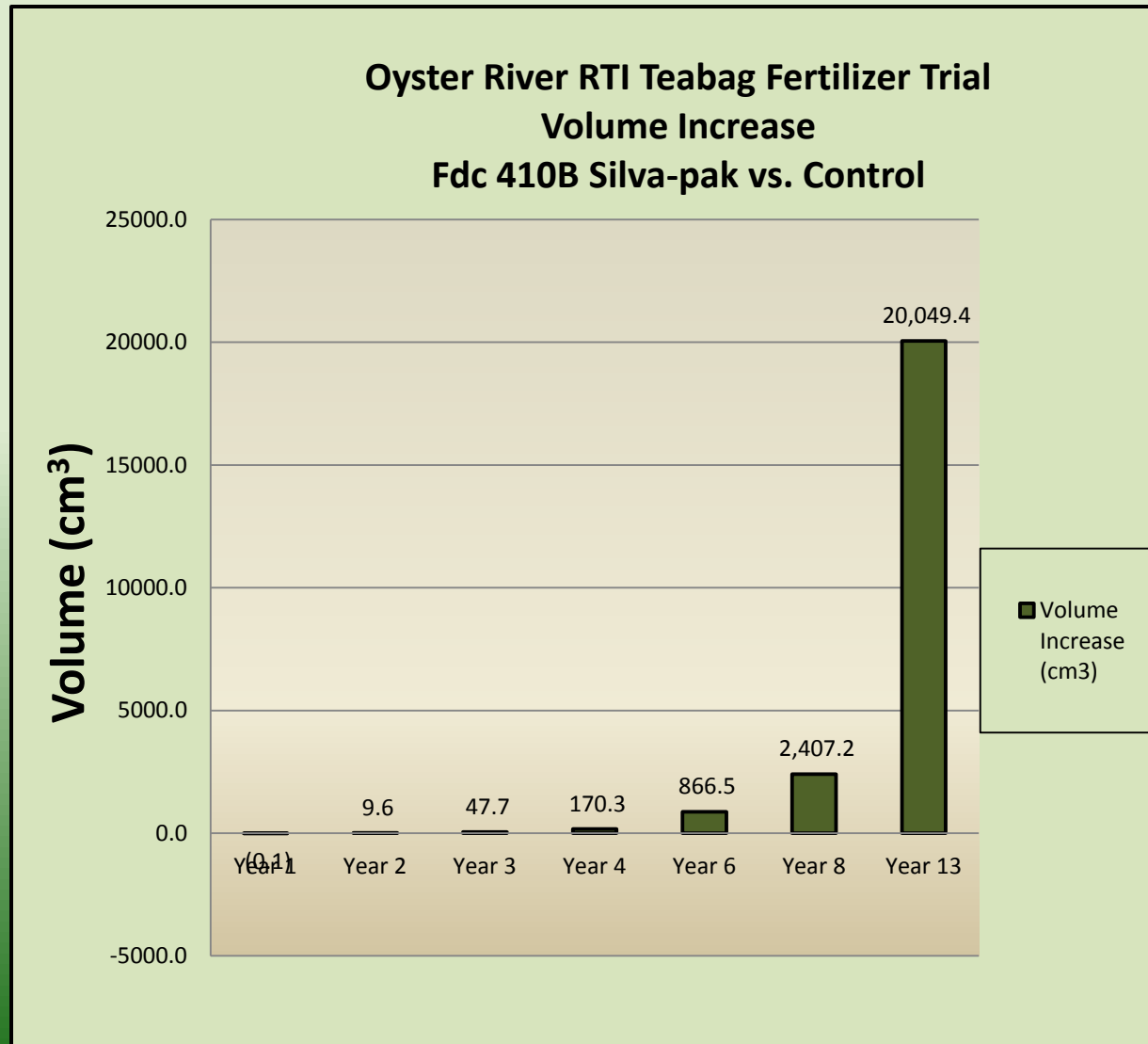


Year 13

**Fertilized with
RTI Silva - pak**



Oyster River



71% Volume Increase/Tree Year 13 and the spread has been increasing over time

So far a Type II Response is Being Exhibited



Lemieux Creek

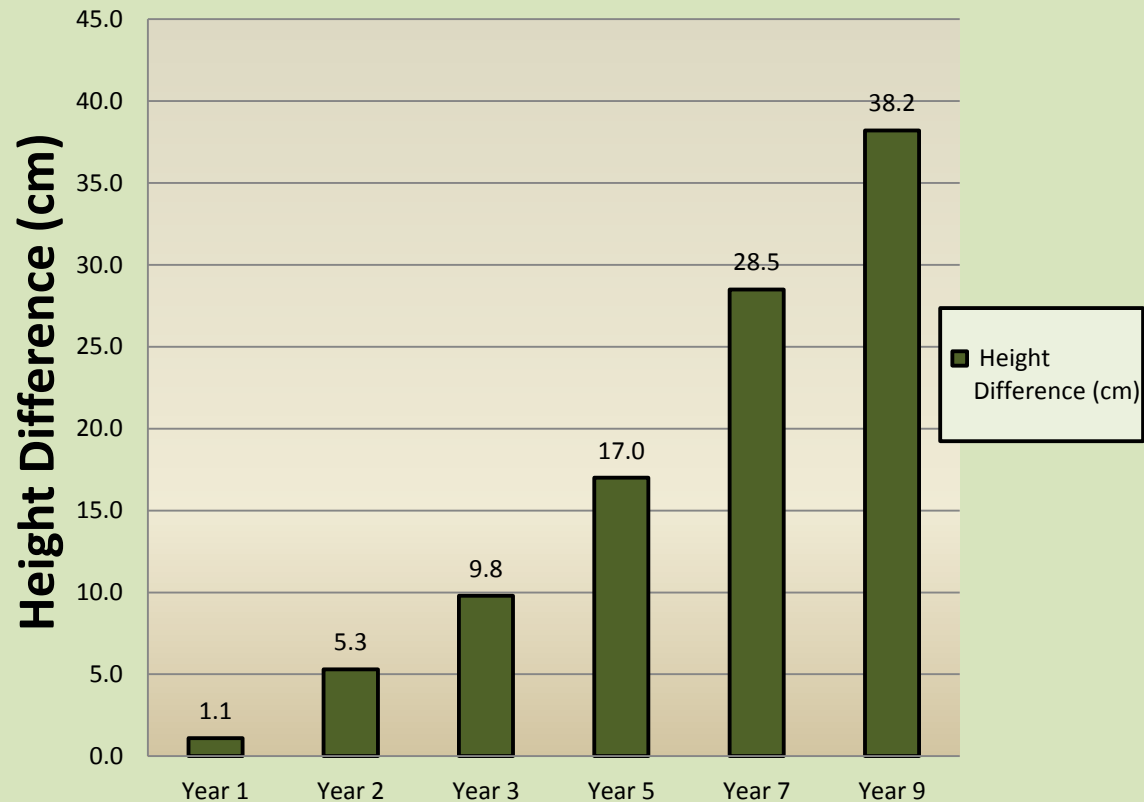
**Fertilized with
RTI Bio - pak**

Control



Lemieux Creek - Height

Lemieux Creek RTI Teabag Fertilizer Trial
Lemieux Creek Seedling Height Difference
Pli 412 Fert. At Planting vs. Control - Bio - pak



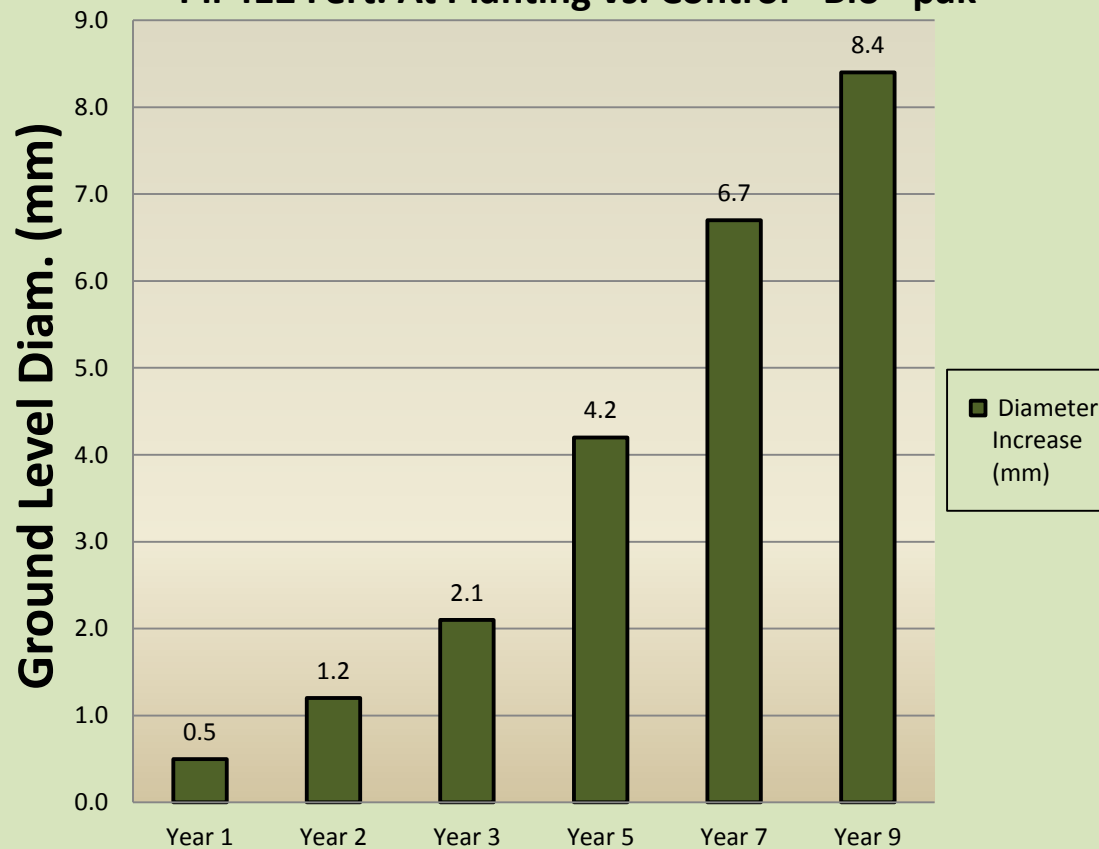
15% Height
Increase/Tree

Time to FG the
same for
Treatment and
control



Lemieux Creek - GLD

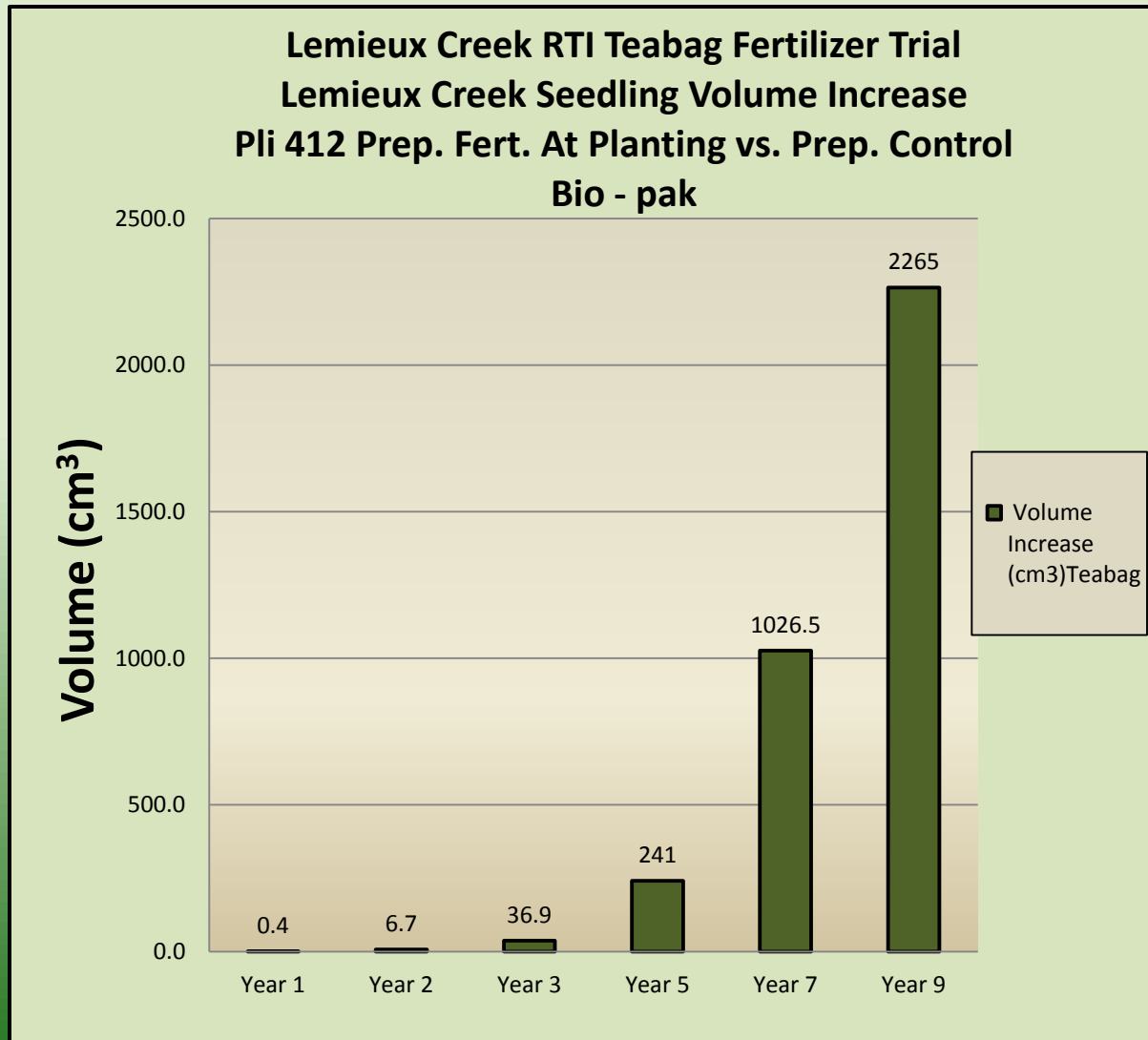
Lemieux Creek RTI Teabag Fertilizer Trial
Lemieux Creek Seedling Ground Level Diameter
Increase
Pli 412 Fert. At Planting vs. Control - Bio - pak



11% GLD
Increase/Tree



Lemieux Creek - Volume



42% Volume Increase/Tree Year 9 and the spread continues to increase over time

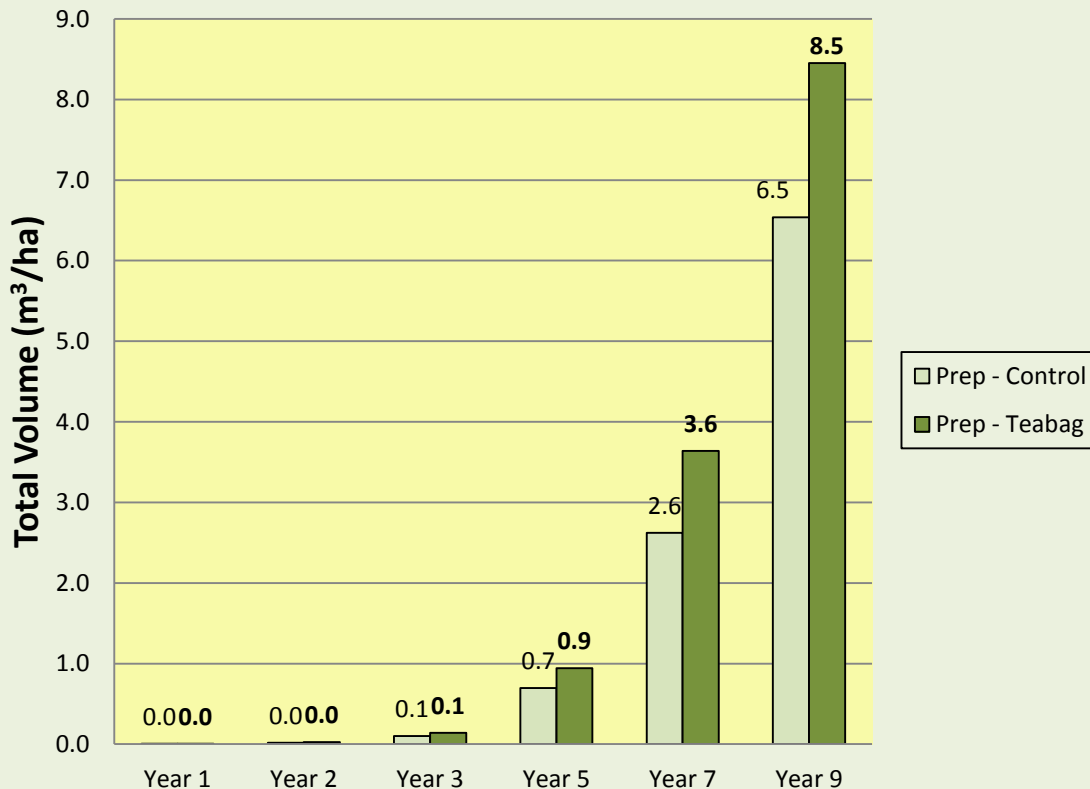
So far a Type II Response is Being Exhibited



Lemieux Creek

Volume Differences Over Time Between Treatments

Seedling Mortality Accounted For - (1450sph at planting)

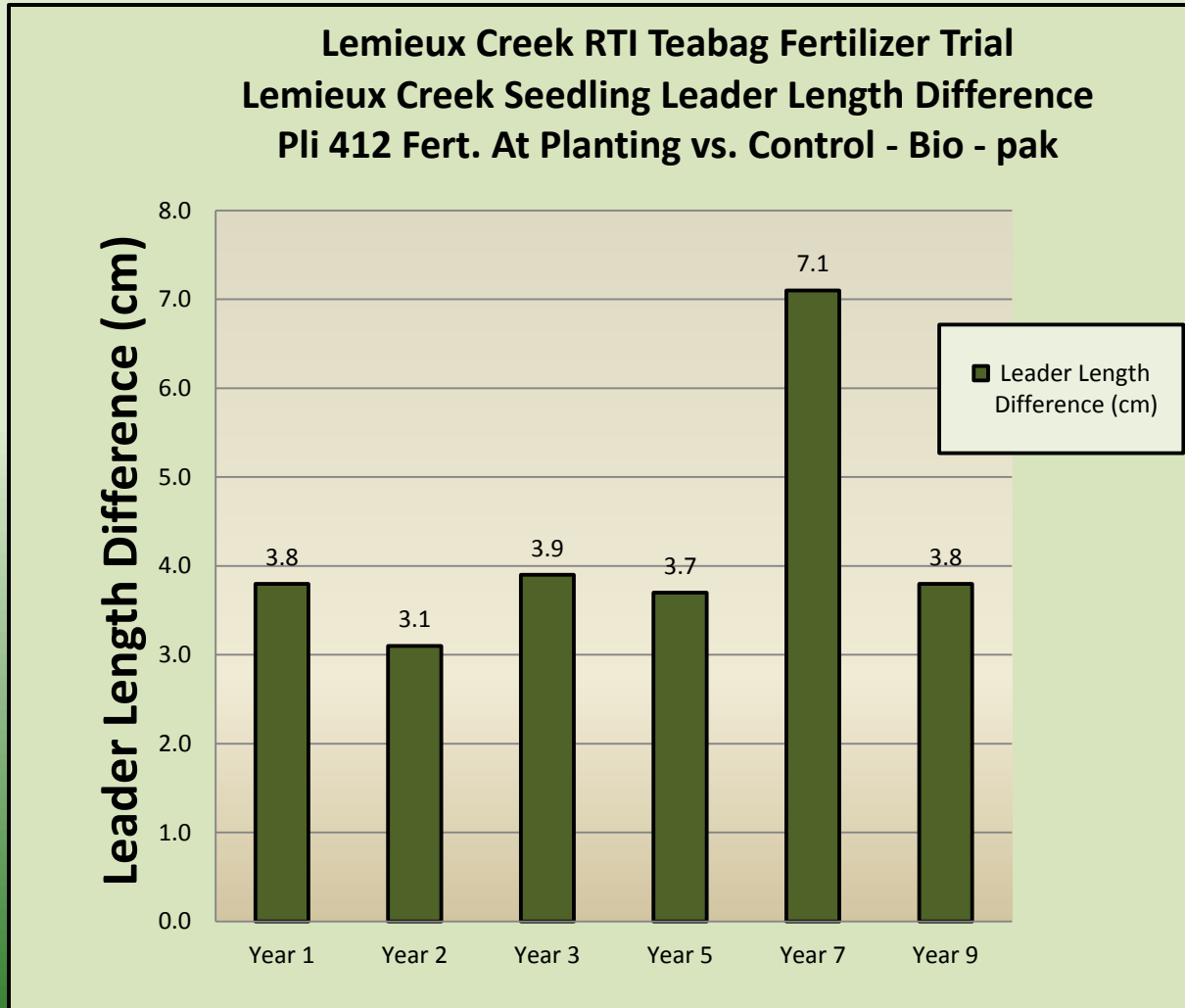


•31% more Volume/ha at Year 9 vs. Site Prep. Control

Due to being impacted by competing Aspen to a larger extent, the fertilized treatment had approx. 100 sph fewer tress/ha than the control. Despite this setback however there is still substantially more volume.



Lemieux Creek – Leader Length



8% Leader length
Increase/Tree

Note: The area was brushed in year 5 to take care of the Aspen competition. Look how the fertilized trees were able to respond in a greater way to the treatment than the control.



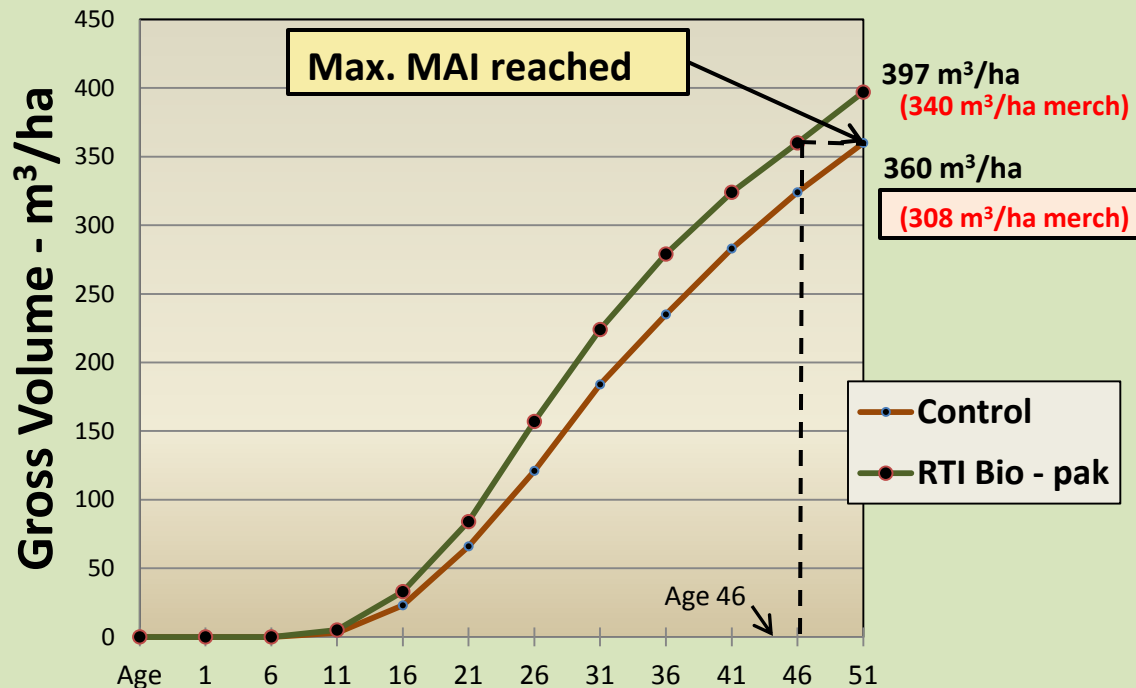
Which tree would you expect to respond better to future silviculture treatments?



Lemieux Creek

Long Term Results

Lemieux Creek RTI Teabag Fertilizer Trial
TIPSY Forecast Gross Volumes
Pli 412a Prep. Fert. vs. Prep. Control



Biological Rotation Length
5 yrs or 10% shorter
or
potential to gain an
additional **32m³/ha** merch
and **capture additional**
CO₂ at age 46

For the rest of the stands
life, everything is
accelerated by 5 yrs
with the RTI Bio-pak

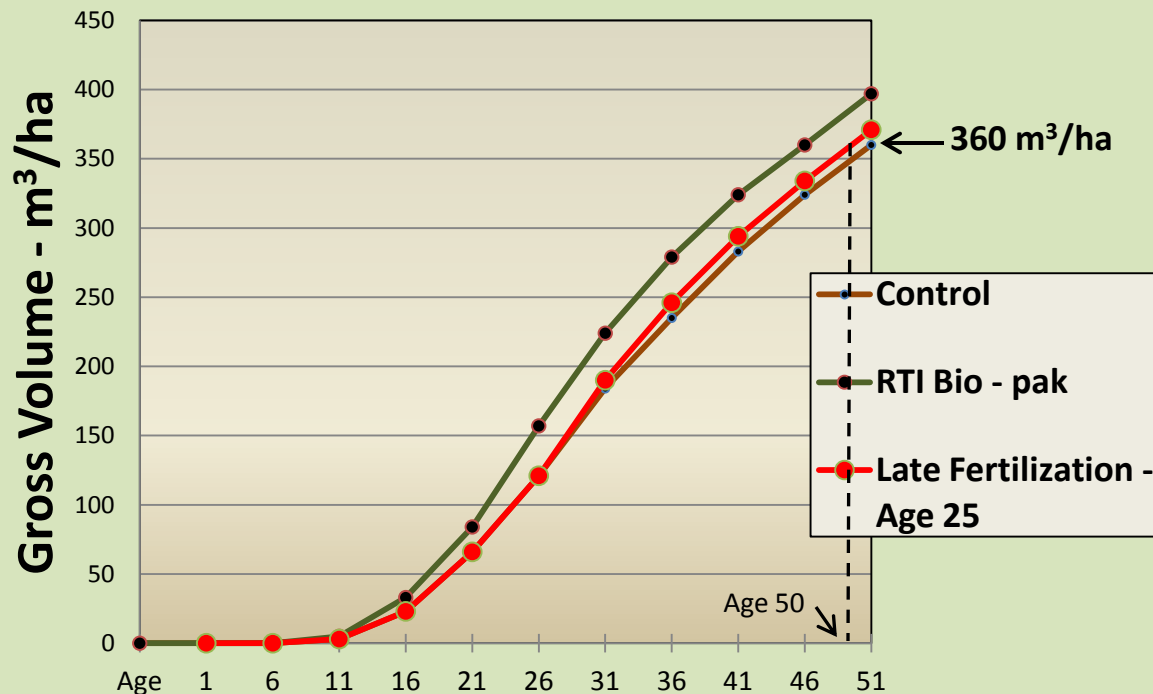
Note: These results are considered to be very conservative and an example of the trees returning to the growth curve when they reach max. MAI for the site. (Type 1 response) If there is in fact a Type 2 response, gains will be much larger .



Lemieux Creek

Fertilizing at Planting Vs. Fertilizing Later On

Lemieux Creek RTI Teabag Fertilizer Trial
TIPSY Forecast Gross Volumes
Pli 412a Prep. Fert. vs. Prep. Control



Rotation Length **1 yr** (vs. 5yrs for RTI Bio -pak) or **2% Shorter** or potential to gain an additional **10m³/ha merch** (vs. 32m³/ha merch for RTI Bio-pak)



Lemieux Creek

FAP vs. Fertilizing at Age 25

Cost \$250/ha vs. \$400/ha

Harvest at Age 46 vs. Age 50

Return On Investment – 7.49% vs. 2.88%

Less environmental impact – 15kg/ha vs. 435 - 550kg/ha

Much smaller carbon footprint

Logistics are negligible

Trees at planting are always physiologically ready

#3 - Defense



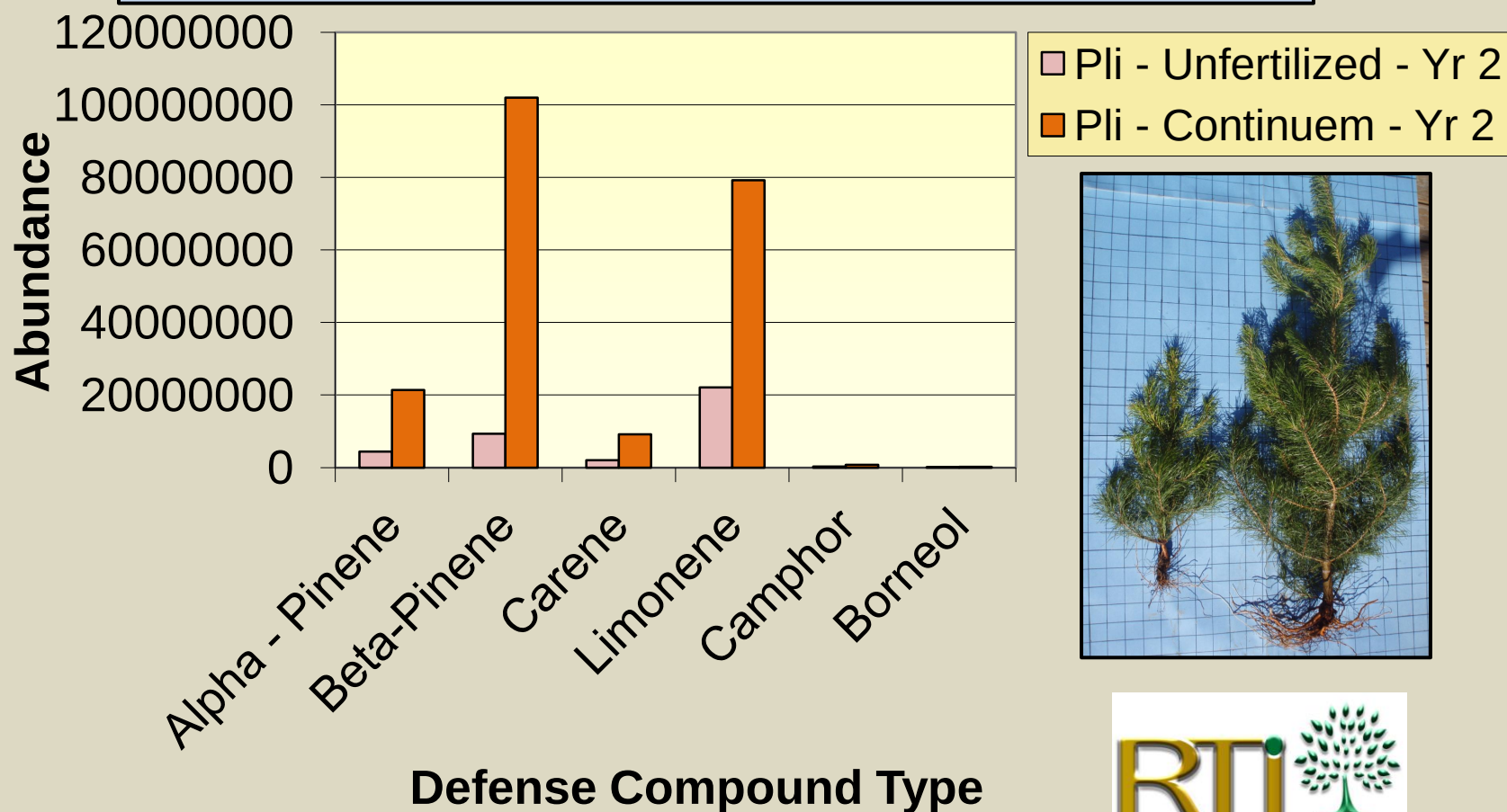
**Pli fertilized with
Continuem at the time
of planting**

A more vigourous tree with the right nutrients can more effectively defend it self. Even if browsing does occur, it can much more easily recover. This seedling was planted in the McLure Fire and browsed by voles after planting. Seven years later this same seedling is now Free Growing.

Scott Lake (McLure Fire)

Continuem vs. Unfertilized Pli

It is easy to see from this chart that fertilizing with Continuem changes the seedling



Browse Protection



This Fdi tree was planted on a site that had been previously devoured by voles. These seedlings were fertilized with Continuum. The voles may have clipped a few lower laterals but they didn't dare touch the stem.



#4 - Douglas - fir



PSB 412a 1+0 – Year 3 – IDF dk2 – Monte, Lake , BC - Continuem

Fdi – Fertilized at Planting



Typical 1st Year Fdi



Fdi Fertilized with RTI Gilbert Smith -pak

If there was ever a tree foresters struggle with to establish, it has been Fdi. However, fertilizing at the time of planting with RTI Continuem or Gilbert Smith – pak eliminates the planting shock.



What the Potential Can Lead To



Fdi 412a 1+0

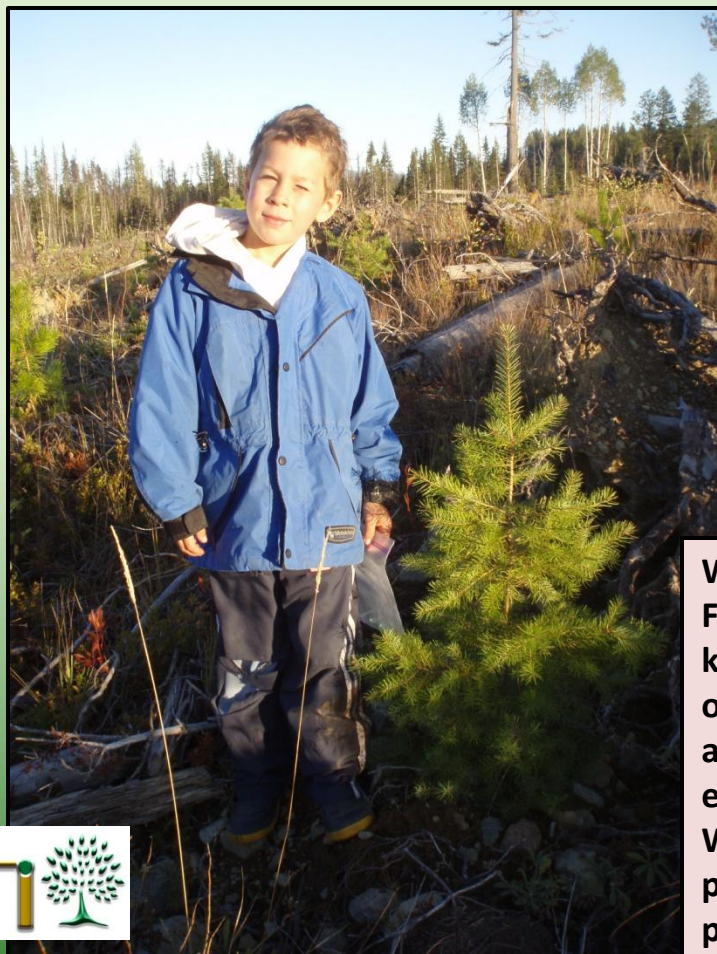
Year 7

3.4m tall

**Fertilized with
Gilbert Smith-pak**



Fertilized Fdi vs. Pli



Whoever heard of
Fdi consistently
keeping up and
outperforming Pli
at the time of
establishment?
With RTI fertilizer
products, now its
possible.



Fertilized Fdi – RTI Continuem Blend– Year 2

Unfertilized Pli – Year 2

Why fight the bush?



Fdi – Year 7 – Fertilized with Gilbert Smith – pak - IDF mw2 – Lemieux Creek

#5 - Moisture Deficits



Lava Canyon Fire – Chilcotin Plateau

Hydration - pak



Control – Year 1

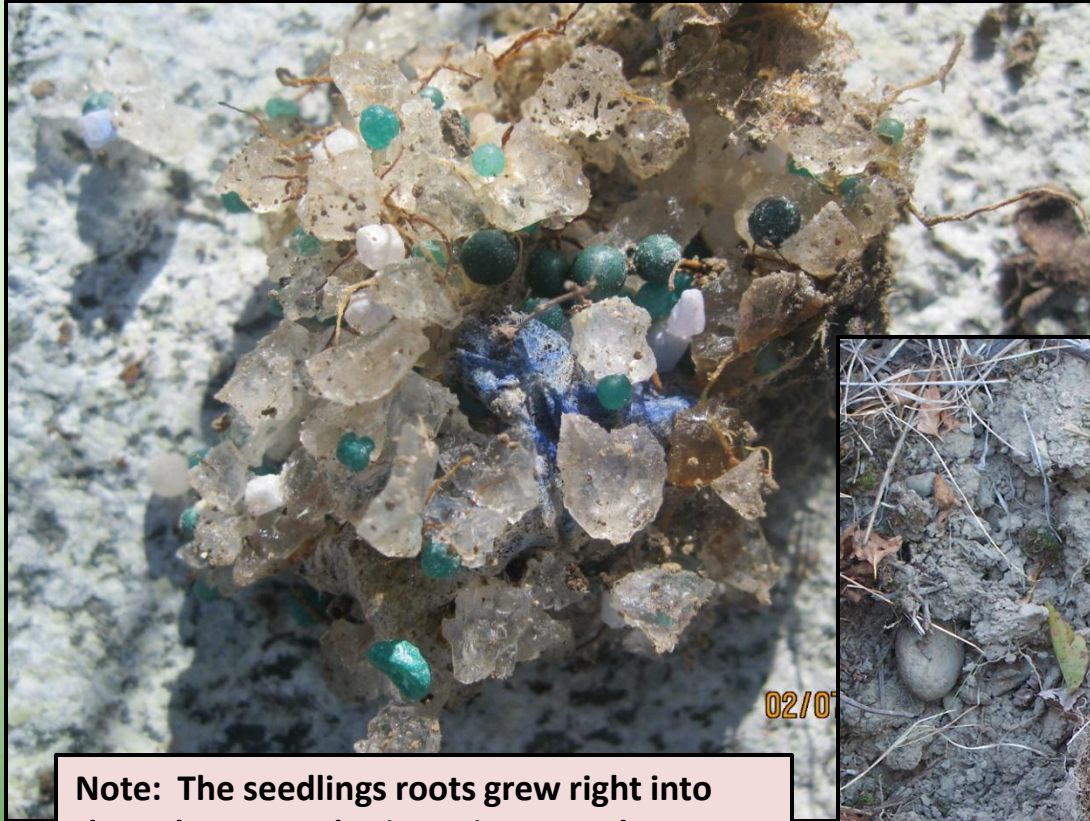


Hydration-pak – Year 1

RTI Hydration-paks contain a moisture retaining polymer to assist seedlings establish in times of moisture stress.



Hydration-pak



Note: The seedlings roots grew right into the polymer to obtain moisture and nutrients. At the end of two growing seasons there is nothing left but a mass of fine roots where the teabag used to be. The seedling has used the resources to fan its root system into the surrounding soil and is doing well despite the drought conditions.

#6 - Rehabilitation



We have the product to help you re-establish the tough spots.



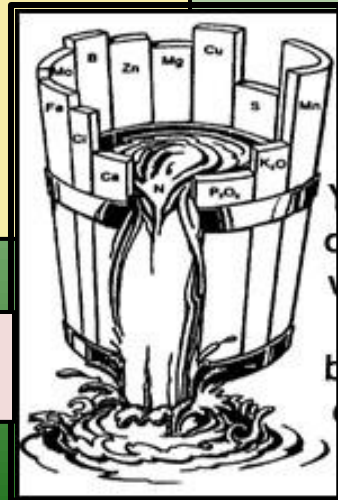
You've tried fertilization at planting in the past but it didn't work

VERY IMPORTANT

Fertilization at the time of planting is
part of a silviculture regime

NOT the entire regime

Don't forget the barrel except exchange the nutrients on the staves for site limiting factors such as soil temperature.



Have you Taken Care of the Microsite?



You can plant on the top of the mound or the bottom of the hole. Which tree is obtaining the greatest benefit from the fertilizer? Know your site and select the best microsites accordingly.



Microsite



You can plant behind the stump or in the adjacent brush. Where will the tree obtain the greatest benefit from the fertilizer?

Protect your tree!

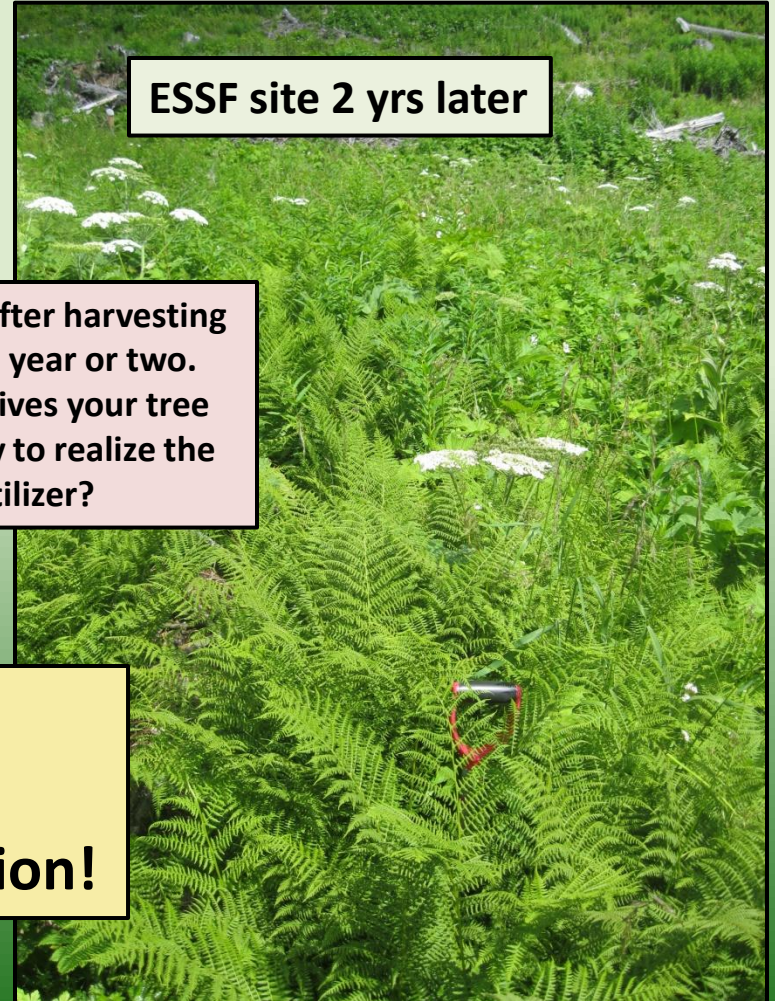


Have you managed for brush?



ESSF site after harvest

You can plant right after harvesting or you can wait for a year or two. Which time period gives your tree the best opportunity to realize the benefit from the fertilizer?



ESSF site 2 yrs later

The best brush management is free

Planting Timing and Microsite Selection!

Stock Type and Nursery



**Is your stock
type right
for the site?**

**Has the
nursery
performed
well?**

**Fertilizer will not rescue
substandard trees on a tough site**

Teabag Placement



Remember, if the soil is too cold for roots to grow, it is too cold for the fertilizer to release. Very important to remember when using in colder environments.

The teabag can't do its job in the wrong location.

Too deep or too far away is ineffective



Which product or blend are you using?

Make sure that you are using the right blend for your application



Each of these blends has been developed to meet a specific need and are based on feedback from our research and our clients. We work with our clients to get the most out of the product and amend as necessary.

**Bio –paks
Booster – paks
Silva – paks
Continuem
Hydration-paks
Forest-paks
Chilcotin
Gilbert Smith - paks**

NOT ALL FERTILIZERS ARE CREATED EQUAL!

Fertilizers can vary in terms of the quality of their components and release mechanisms.

NOTE: Fertilizers can be amended over time

We work closely with our clients to improve blends over time and are always on the lookout for better technology



It's About More Than Just Nutrient Abundance

Is your fertilizer balanced or just a big shot of N?

The label looks balanced but does it release balanced?

Do the components release nutrients the seedlings can actually use?

Is the release mechanism designed for tree seedlings or agronomics?

Did you know that nutrient ratios are just as important as abundance?

That's why we ensure our fertilizers are balanced. You've tried fertilizer before and the treated trees are growing slower by year 5? Seedlings with nutrient imbalances (too much nitrogen) can actually have their growth set back over time and this may be part of your problem.

At RTI we understand these concepts and will not sacrifice product quality for a short term response. We are in it for the long haul.



Planter Safety

- All of RTI's source materials are analyzed for Heavy Metals and are well within safe limits
- RTI Teabags were part of a Planter Health Study reported on by FERIC and partly funded by Worksafe BC and the Western Silviculture Contractors Association
- With proper, common sense precautions, such as proper hygiene and wearing proper gloves, our products are very safe to handle



Pricing

**RTI is a registered vendor with the
BC Purchasing Commission**

**Contact Darius Bucher (integralfm@telus.net or 250-835-2072)
for specific pricing information**



Take Home Messages

Fertilizing at the time of planting with RTI's fertilizer teabags has the potential to accelerate the growth curve, if not put the trees on a totally different curve, perhaps saving many years of rotation length.

The greatest physiological benefit of fertilizing at the time of planting with RTI fertilizer teabags is an increase in volume (roots, foliage, stem) which also in turn helps a seedling overcome site limiting factors such as pests and brush competition.

Fertilizing when the tree is establishing provides greater benefit physiologically, economically, and environmentally than fertilizing later in the rotation.
You have no time to waste.



Given the impact that fertilization at the time of planting can have on a seedlings' development, how important is product quality to you?



It takes a lot to establish a quality seedling.

Is this the place to cut corners given the potential benefits?

Thank You

