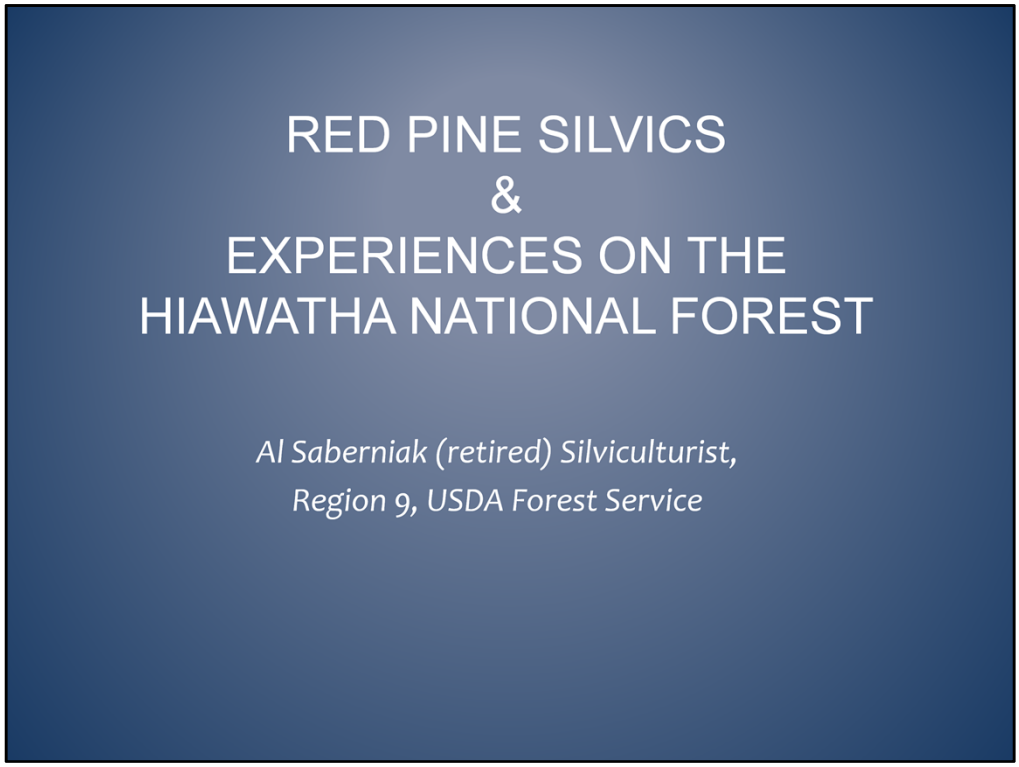


Introduction

Thanks, Jason, and especially thanks to Tim for helping with pictures and the power point. Several weeks ago we had a conference call about the agenda for this meeting and I mentioned that Tim was going to help me with the power point. Dave said to me, "Being retired you probably do not have all of the equipment available that all of the rest of us have." I responded that not only am I lacking some of the equipment but I retired with less than a full slate of computer skills so I really appreciate Tim's help.

Since retirement I have been consulting for private landowners who have a strong interest in turning a profit from forest management, and as a contractor I have been doing inventory for the Forest Service on many of the areas I was formerly responsible for managing. As a result, I have developed and will express some opinions which are mine, not necessarily those of my former employer even though you will still catch me saying "we" when I mean the Forest Service.

In this presentation I will briefly discuss some silvical characteristics and growth potential of RP. I'll then talk about RP management, especially regeneration with a Forest Service emphasis, and I'll finish up telling you where I think we should go

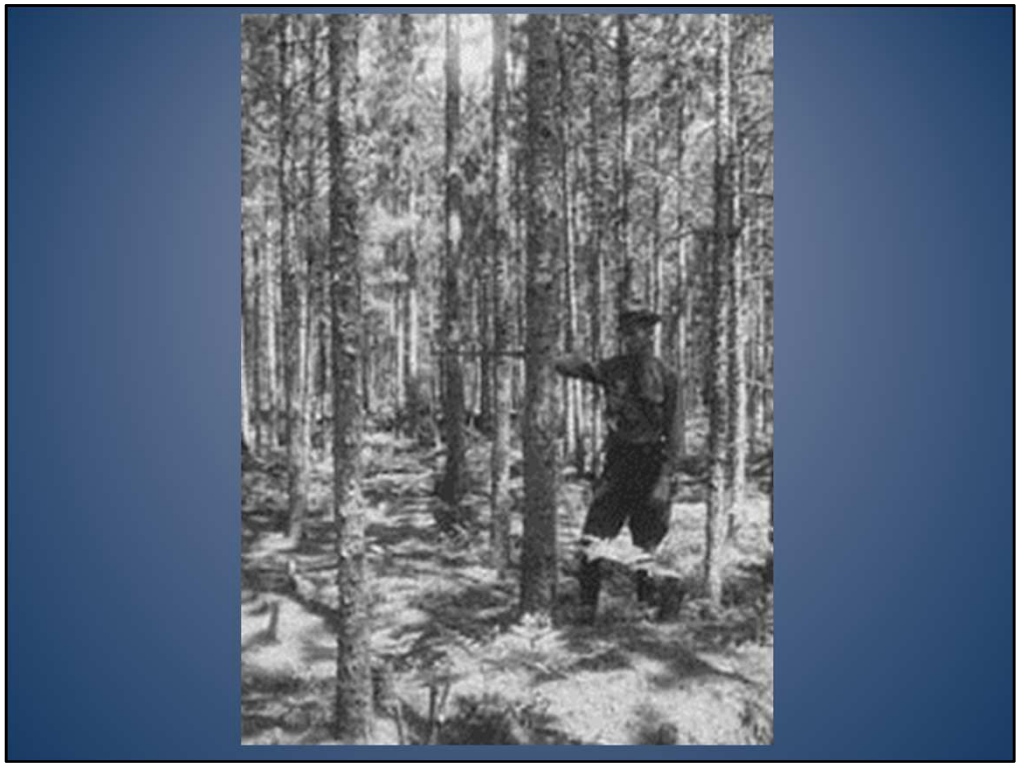
with RP.
I'm going to hit on only some of the more important Silvical Characteristics of RP, especially those that impact the things I'll be talking about.

RP is shade intolerant – less shade intolerant than JP, but much more intolerant than WP or RM.

Once established if proper density and free to grow status is maintained, it is fast growing.

Natural stands of regeneration can exceed 10,000 stems/ac.

Many plantations have been established at very high densities.



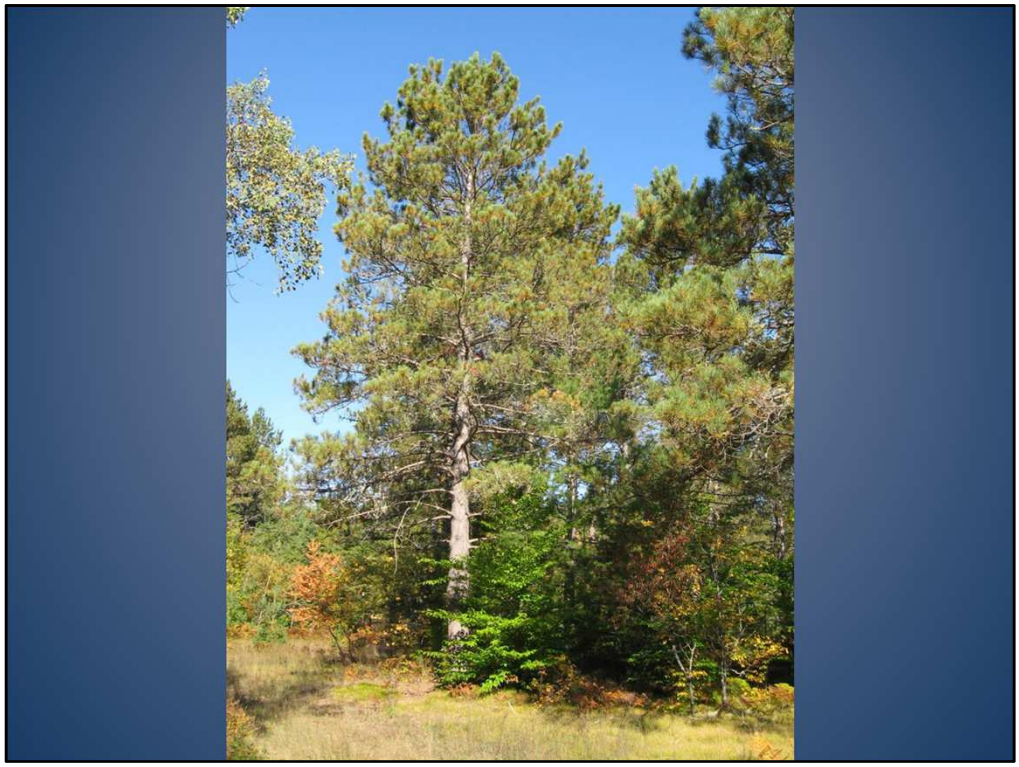
RP does not tend to naturally reduce stem numbers like JP or Aspen will – but it will grow in very dense stands.

On the average it takes 8 years for RP to reach breast height.

It is very important to keep in mind that JP out grows RP for the first 20 years.

During establishment JP is a SERIOUS competitor.

On better sites it is easily out competed in early growth by poor quality hardwoods or aspen



Understocked stands and open grown trees easily reach 24 inches DBH in 60 to 70 years

RP tends to be wind firm; however, if dense stands are over thinned, snow and ice easily bend the boles.

It takes 2 growing seasons for cones to develop. The first year they are quite small.

They mature the following September.

Seed falls in late September to early November depending on location.

Larger trees are ground fire resistant however allowing fuel ladders to develop is a recipe for disaster and stand replacement fire.

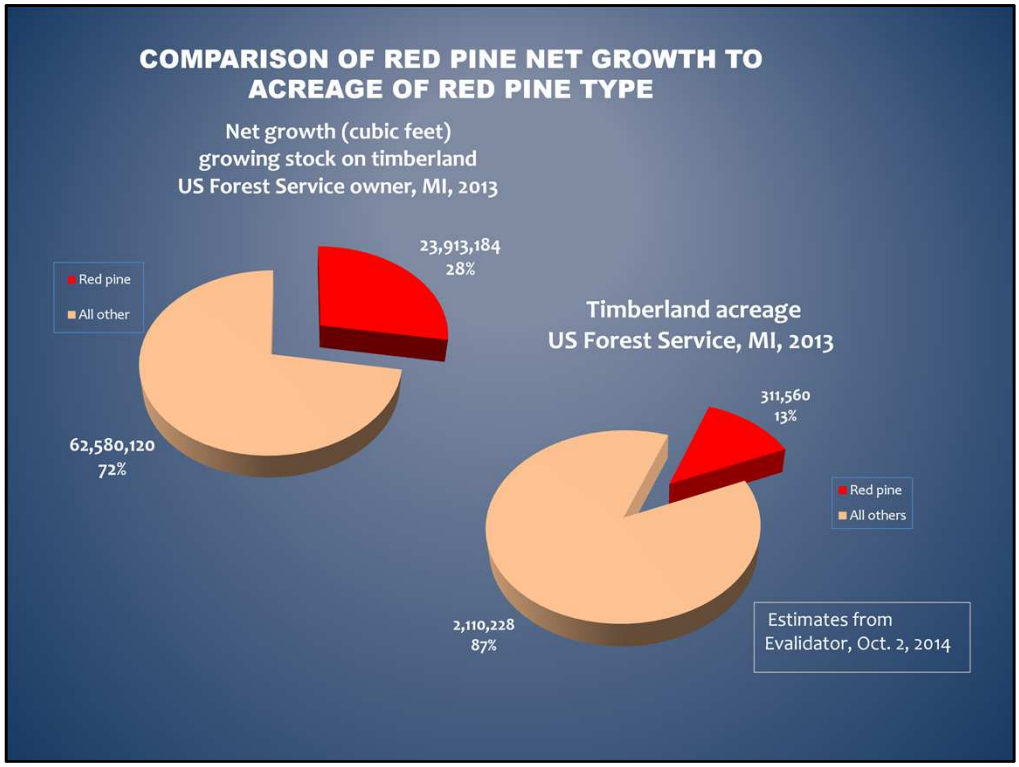
Natural and human caused fire played an important role in the pre European lake states forests, especially the RP type.

RP is capable of living to 300 years but 200-225 years is a more consistent final age.

RP Productivity is high. As already mentioned RP is relatively fast growing. Some virgin stands were measured at over 40MBF / ac.

I have seen CCC plantations in which a volume estimate using a quick plot exceeded 60 cds. / ac.

Plantations easily grow 1 to 1.5 cd/ac/year with some better sites exceeding 2cd/ac/yr.

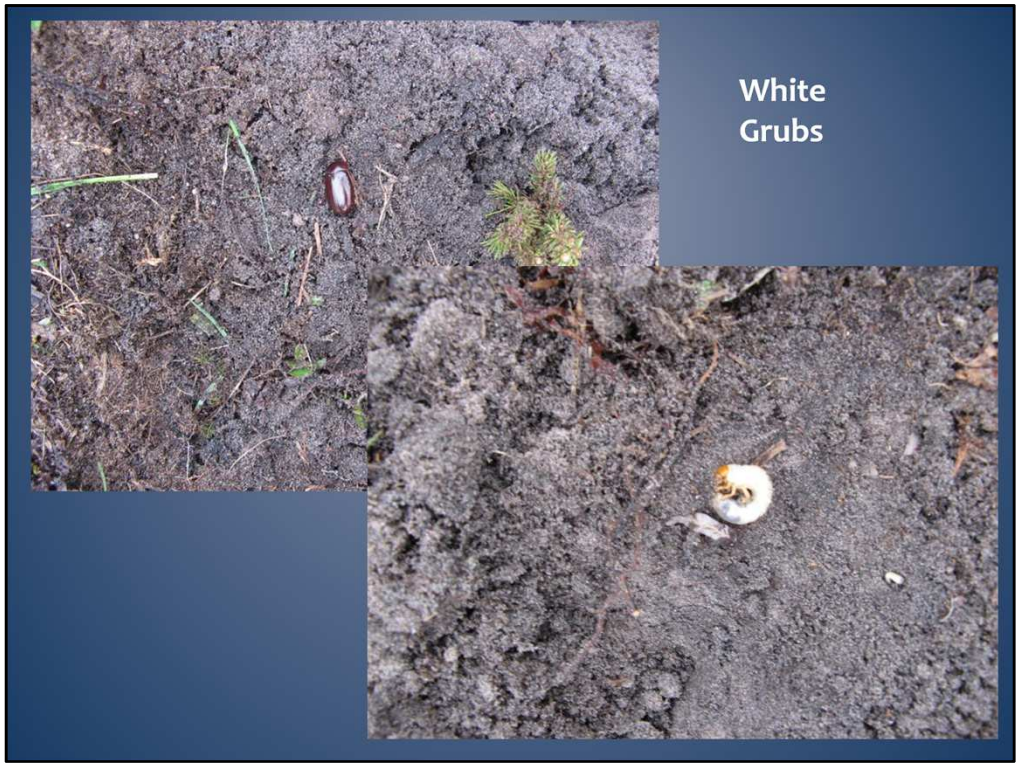


On the Michigan national forests RP growth makes up 27.6% of TOTAL volume growth on the NF yet constitutes only 12.9% of the total acreage.

While I don't advocate plantation management everywhere on the landscape, I am not ashamed to fully support and recommend current levels of land allocation to red pine. We can produce a lot of cords and boards on relatively small acreages allowing less intensive management elsewhere.

RP acreages are down substantially from pre European settlement. It is estimated that about 7 million acres of RP existed within the lake states, whereas we are now at about 1 million acres.

Any discussion of a species is incomplete without mentioning pests. Since Bob and Roger are on the agenda, I am only going to mention a few that have been thorns in my side during my career.



White grubs play havoc in planting sites especially into sod fields.

Scleroderris is capable of undoing successful regeneration work.

Sirococcus and Diplodia are serious shoot blights capable of completely taking out an understory age class, and when present, either of these blights prevent 2 story or multi age stand management.

I fear that these diseases are being overlooked by many people who advocate variable density thinning with the intention of regenerating gaps to RP. I also would like to mention that the term VDT is a misnomer since thinning is an intermediate treatment and should have no regeneration objectives.

Root rots can become problematic especially after thinning using heavy equipment which caused compaction or bole damage. (Heterobasidium annosis root rot)

I'll mention some about the RP cone beetle a little later.

A number of nonnative insects and or diseases warrant being watched for potential problems in the future. (Sirex woodwasp, mountain pine beetle, European strain of Scleroderris and unfortunately the list probably goes on)

Management of RP is a lot of fun – I like working with it.

RP is climax only on the driest sites like Pinus-Vaccinium. In the central UP these are mostly Rubicon soils.

However it grows very well on much better sites as long as competing vegetation is controlled. Many acres of higher site class were planted by the CCCs, and in recent years on old abandoned farm fields.

These were sites which at one time had a strong conifer component mixed with low quality hardwoods (red maple, birch and beech).

They were clearcut and burned, many of them multiple times. Habitat classification on these sites will be in the Quercus – Acer and some even into the Tsuga classification.

In the central UP these are Kalkaska soils. These are very productive sites but will require effort to keep RP on them. When the Hiawatha developed their site classification system in the 90s, our ecologists and soil scientists separated these higher quality sites occupied by plantation into a distinct ELT, realizing how productive they are by holding them back successionally into less than climax vegetation, especially RP. In 2005-06 when the Hiawatha did their forest plan revision, we said it was desirable to keep these sites in RP because of the high productivity.

Once you know what site you are dealing with and have decided on RP management, you need to think about regeneration.

Thousands of acres were planted on the National Forests by the CCCs in the late 30s and 40s. Most of these sites were burned over, often stump and sod fields, and were usually furrowed and planted to about 1200 trees per acre.

Fill in planting was often done on successive years to ensure full stocking. Planting was done in both fall and spring. It is these plantations that have been the bread and butter of the pine industry for the past 30 years.

Early in my career we were doing the “clean up work,” planting areas the CCCs didn’t get to.
I would like to say we were as successful as the CCCs but we were not.

In the 60s and 70s we were machine planting. Failing to control sod, white grubs, and competition caused low survival rates.

The Forest Service has continued to plant RP mostly on cut over CCC origin jack pine plantations, as well as trying to convert some poor site aspen back to pine forests.

The traditional Rx in the last 30 years has been to roller chop slash and bracke for individual hand planting spots at about 750 trees per acre.

Picture: Planting Bräcke spots.

We were held accountable for success at 80% or better of full stocking, but still there were lots of years we were not able to achieve these objectives.

Planting in the sweet spot

I have been involved with and have observed a number projects directly seeding RP onto prepared sites.

These have had mixed success, but most of these seeding treatments were followed by stand planting to successfully regenerate to RP.

When I was in school, conventional forester training was that RP is an erratic seeder making natural regeneration by either shelterwood or seed tree harvest inconsistent. Early in my career I took an interest in seed production in RP because I wanted to be using shelterwood or seed tree harvests to avoid high cost regeneration by planting.

During that same period of time I was doing a lot of sale administration, as well as silvicultural work, and I kept seeing more than adequate 1 year old cones on harvested trees so I figured that “next year” are the year to do my site prep and get lots of natural regeneration. Well the next season would come and there were few if any mature seed bearing cones left on trees which just the fall before had lots of first year cones. During this time I had prescribed and executed several RP shelterwoods, none of which were successful.

I was perplexed until someone introduced me to the RP cone beetle.

This guy, if you understand his life cycle, can be beat! He spends the winter on the ground sleeping in these broken-off shoot tips.

In spring she flies to the top of RP trees and lays her eggs in the base of one year old cones.

The critters hatch and feed on the cones causing them to fall off of the tree.

The beetles are very successful at getting most if not all of the cones. And the life cycle goes on causing RP seed production to be successful only when cone beetle populations crash.

The good news is that we can help those populations crash locally if we interrupt the beetles life cycle by Rx burning in the late fall or early spring while the beetles are on the ground.

After doing several Rx burns to kill cone beetles, I have observed that you often get a second successive RP cone crop after the fire.

One such site was the Billy Bob timber sale which had been a RP/JP CCC origin banded plantation with about 4 to 6 rows of RP and 8 to 10 rows of JP. When I discovered the site, the JP had been removed and for some reason the regeneration work had fallen through the cracks, had not been prescribed, and nothing had been done. The RP strips had not been thinned and were growing well. The former JP strips were full of untreated about 4 year old slash with scattered regeneration of cherry, and aspen.

The following May we did a Rx burn, under burning the RP and burning the JP slash. As usual for Rx burns, the weather was not exactly as predicted and we had a hotter fire than I wanted, but we did meet our objectives except we had about 1% mortality in the RP strips.

That summer we mechanically site prepared the soil to about 60% mineral soil exposure. That fall I put out seed traps which consisted of nothing more than a shallow wooden box with half inch hardware cloth across the top to keep out squirrels and mice.

I placed the traps directly under the RP and across the clearcut JP strips. I was shocked later as I observed the seed collections through the fall as we had dozens of RP seeds per square foot across the stand.

Other RP stands which had not been Rx burned that year had few if any seed producing cones. These observed results have been consistent over about 5 years and several thousand acres of Rx burning under RP overstory.

The following spring I was ecstatic when I observed thousands of newly germinating RP seedlings per acre. It was shortly after this that I got involved in forest plan revision and was chained to a desk in Escanaba, followed by 3 years in the regional office in Milwaukee, and I did not get to keep an eye on the progression of my prescription.

Then in about 2012, after retirement, I landed a contract with the FS doing inventory in stands which adjoined the Billy Bob project. Needless to say I spent some time wondering about the Billy Bob project area. I discovered the regeneration infested by siroccus from the overstory of RP. The site also needed release and precommercial thinning.

The RP strips were removed in 2013, and this is what the area looks like today with about 1,000 RP seedlings per acre.

Just a few quick summary points of my observations about RP shelterwoods may be appropriate.

My first attempts were to retain about 40% crown closure. I think that is way more cover and seed source than you need.

As few as ten trees per acre probably would be adequate if you have a good seed source.

(Ten trees per acre are probably more like a seed tree regeneration system.)

Having more trees to remove during the overstory removal just increases damage to your regenerating stand.

Mechanical site preparation is important as burning does not give the best seed bed.

Periodic surveys are important to meet your management objectives.

Survival surveys are crucial in the first several years after stand regeneration to ensure proper densities are established and maintained. The Forest service requires a minimum of 2 regeneration surveys after treatment. It is important to take action as soon as a problem is detected. For example, if stocking is not quite up to your expectations this allows you to fill in plant before you lose your site preparation. The Forest Service requires stand certification of its reforestation efforts at 5 years after treatment.

These regeneration surveys often detect release needs and initiate follow up treatment to keep trees in a free to grow condition.

Pre and post treatment surveys are essential to monitor stand conditions and ensure stand objectives are being met.

I've already mentioned that JP and poor quality HDWDs easily outgrow RP in early years.

Release on better sites is essential to keep trees free to grow. Herbicides are a wonderful tool if they are available to you.

I spent most of my career with that tool unavailable because of public issues and concerns.

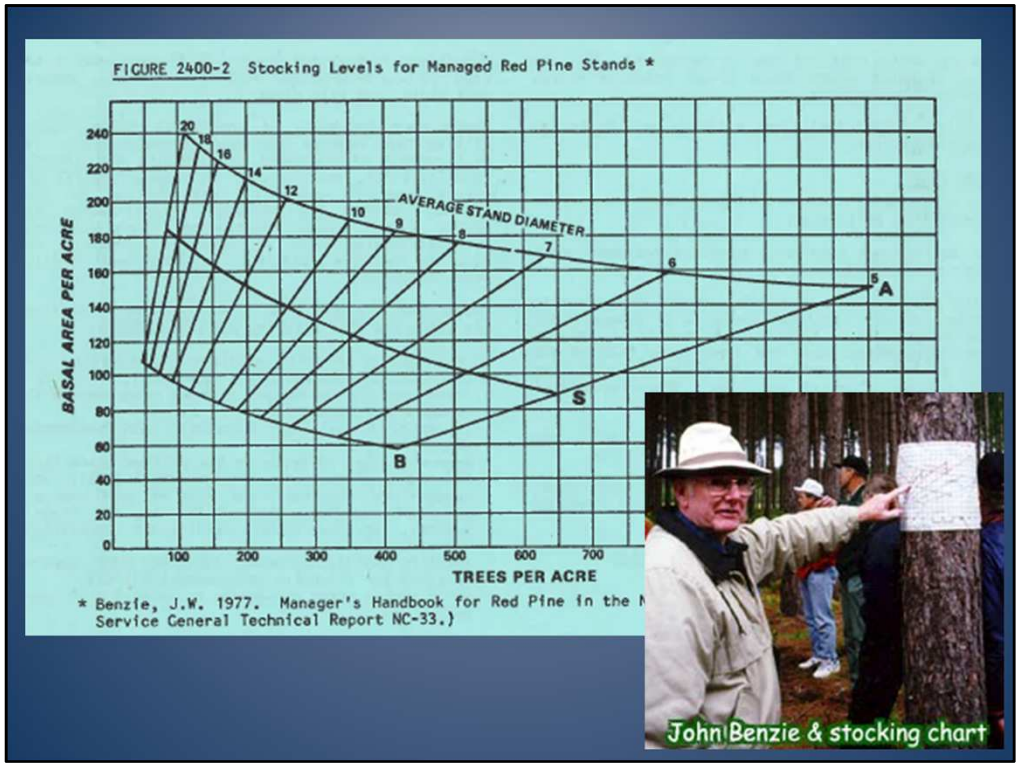
As a replacement, we used hand tools, lots of prison and contract labor to individually release planted trees.

This was usually done by prescribing a free to grow radius around trees to be released.

An important down side to mechanical release is that it will do nothing to protect against sod which is a serious competitor.

Pruning is a useful tool to help control tree form and increase clear wood. Down through the years pruning has been low priority task for the Forest Service relegated it to YCC, YACC, and prison crew labor.

The exception to this is for disease control projects which in today's economy is the most likely use for pruning. We have undertaken a number of projects to reduce the spread and presence of shoot blight especially Sirrococcus.



S-Curve

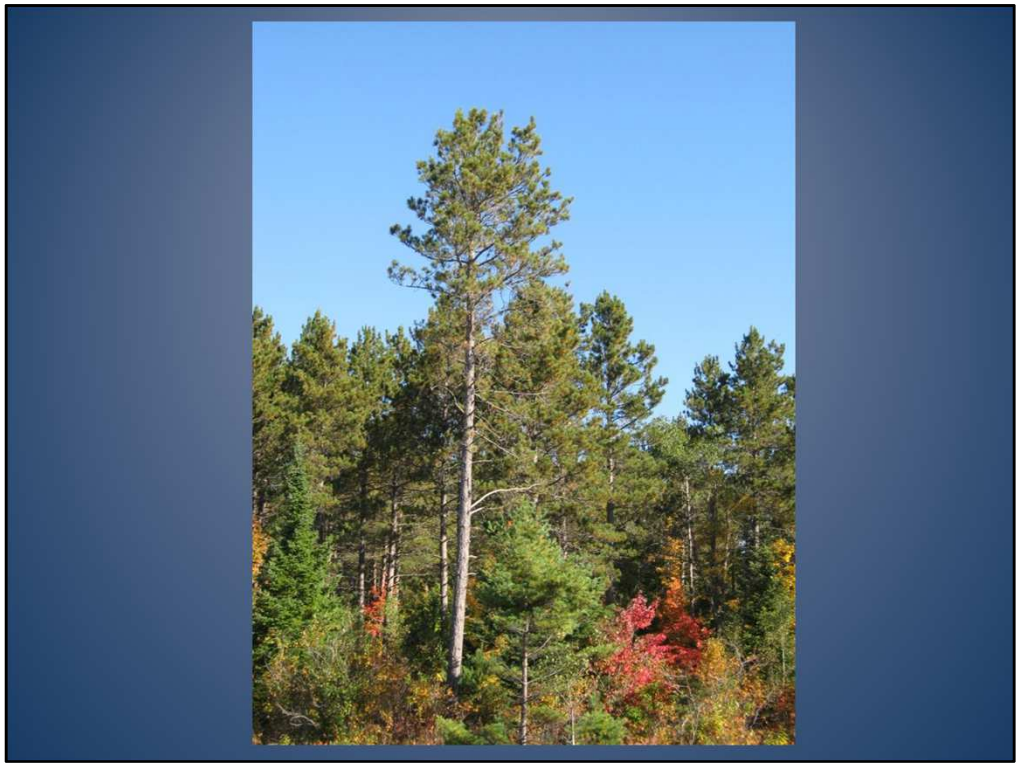
I've already mentioned that RP will survive and grow in very dense stands. Densities well in excess of 200 sq. ft. BA are not uncommon in either natural stands or planted stands which have not been thinned. Stand density control sets tree form, and the first 30 to 40 years are very important. (Dense stands yield long straight clear boles - lower densities create limby logs with lots of taper.) John Benzie's stocking chart shown in the RP managers HB shows an A and a B curve. The B curve represents minimum stocking to occupy the site with open grown trees. The A curve represents a recommended upper limit for managed stands.

When the Hiawatha developed its 1986 forest management plan, we discussed RP quality sawlog management with John and he developed the S curve for us. Our objective was to thin slightly below the S curve and let the stands regrow to above the S curve before another thinning operation. Maintaining about one third of the tree height in live crown assures the trees are free to grow. I'd like to restate that it is important to know your objective and markets and manage RP stands to yield best returns. (If you have a great pole market you better be above the S curve. If your markets are strictly pulpwood, tree quality doesn't make too much difference, so just keep the site fully occupied with free to grow trees.

Just a few quick comments about fire management within RP. Fire was part of the natural system in which RP naturally lived and thrived. Its thick bark is designed for protecting the cambium from being destroyed by ground fires. I have even seen fire crawl up the bole of RP burning the “fuzzes” off of the bark with no long term impact to the tree.

RP does not usually get the attention that JP gets when it comes to crown and stand replacement fires. However, as I’ve already mentioned, fuel ladder build up in RP stands is a quick way to turn a light ground fire into a stand replacement fire. My suggestion is to keep the stands tight and the encroaching vegetation starved for sunlight.

In my opinion unless we are going to put fire back into RP systems with all of the ramifications that come with it, such as char on boles causing timber industry concerns, and the potential of escape fires, etc. the whole idea of VDT and regenerating uneven-aged stands of RP is seriously questionable.



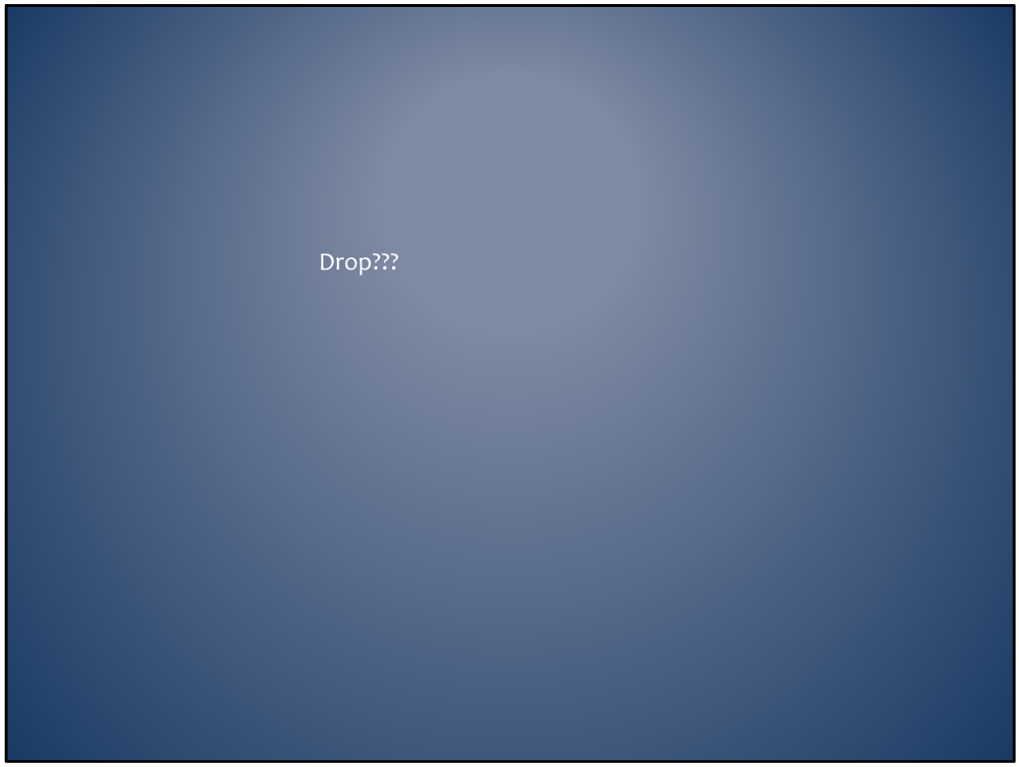
Finally, I've been asked to answer the question "What about climate change and how should our management for RP be adjusted?" Some have suggested that in a global warming scenario RP is a loser because we are on the southern edge if its range. At this point in time, I differ with that opinion for 2 reasons.

First, many of the pine forests of the 1800s are known to have had their origin in the 1600s when some evidence suggests that the earth was warmer and dryer than current conditions.

Secondly, and perhaps more importantly, RP is a fast grower and we could actually complete a rotation of 30 to 40 years before any potential, major catastrophic events predicted by climate change take place.

The likely scenario of a species being edged out from climate change is the weakest link in its life cycle and for RP and many species that is regeneration. In 50 to 100 years if global warming is a reality, there may be an impact on RP's ability to regenerate and compete.

At this point in time I believe that RP is a safe bet over the next projected rotation and my advice is PLANT MORE! - Let’s get it back up to the 7 million acres it once occupied here in the lake states.



Drop this section if running short on time) I wanted to talk a little about the CCC era plantations but did not know if time would allow me to. Consequently this is out of sequence from the rest of my discussion. The CCCs left us with a number of odd plantation configurations that serve as a training tool for us but also have an interesting reason for their origin. RP was often mixed with JP. Sometimes this was done by randomly intermixing the two species, sometimes every other row was RP/JP all the way up to several to many rows of each species creating a banded plantation. I was told indirectly by a CCC era forester that they knew they should not be mixing the two species, but they did not have enough RP seed and as a result enough planting stock to plant solid RP plantations as they wished. Their thought was to get the areas planted and back into production. Then, as the stands matured to regenerate entire blocks naturally back to RP similar to what I described on the Billy Bob project area. I personally have eliminated as many of these banded plantations as I have been able to because I think they are a visual blight on the landscape. A number of others on the Hiawatha have been treated in different ways. Most have had the JP harvested. Some JP strips have been regenerated to JP with the idea of regenerating the entire area at the second rotation of the JP. Other JP strips have been planted to RP perpetuating the banded plantation but also playing Russian roulette with siroccus and diplodia. Some JP strips have been used to establish a shelterwood and have been underplanted to WP. I am sure I have not seen all of the attempts of managing the CCC plantations, but I am thankful for the

good work and fantastic RP stands that our predecessors left us with.

RED PINE

Dominant Species:

red pine	aspen
eastern white pine	black oak
jack pine	northern red oak
red maple	eastern hemlock
black cherry	

Abiotic factors:

- **Low nutrients and moisture**
- **Sandy glacial deposits, thin soils over bedrock**

Disturbances:

- **Severe stand-replacing and mild surface fires**
- **Droughts**
- **Insects and wind**

MNFI Natural Communities:
Dry northern forest
Dry-mesic northern forest

Courtesy of Stephen Handle, NIACS