

Reaching Higher

collecting the best natural seed cones efficiently

by

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History of aerial rakes

Helicopter cone collection from natural stands has been going on since the 1970s. The Pacific Forestry Centre experimented with cone rakes named “Rocket Ship,” “Red Baron,” “Silver Triumph” and “Yellow Peril” while Professor Jack Walters at UBC tested “Three-tiered Cone,” “Bedspring” and “Canvas Bag with Teeth.” Okanagan Helicopters tried “Bear Cage” and hovered next to trees while an operator cut cone-laden tops with hand-held hydraulic clippers. Charlie Chilson’s rake broke branches and Fred Fandrich’s scion collector cut tops of plus-trees.

Helicopter pilot Fred Fandrich and design engineer Dr. Helmut Fandrich invented the Fandrich Branch Collector in time for the heavy spruce cone crop in the Fraser Valley in 1979. Dr. Fandrich went on to develop Fandrich Shears, Fandrich Powerrakes, and other rakes.



Choices in aerial collections

The forester can choose to strip branches, sever branches, or cut tops with aerial rakes. Generally he/she will fly over the cone collection area to show the pilot where and what cones to collect to ensure that only the best cones will be picked to give superior growth, greater hardiness, greater resistance to bugs or other desirable characteristics.

The pilot will be told the upper and lower elevation limits of cones required, and asked to pick only the taller, superior trees, or all the heavy cone-laden trees, or trees at specified intervals. If the crop is light he/she may pick every tree with cones in order to supply seed for desperately needed seedlings.

The forester constantly checks sample cones as they are unloaded. If the seed count is too low, or too many cones are bug-infested, he/she may direct the pilot to collect from another area. Likewise, if the seed count is exceptionally high, that particular area can be prioritized and a higher volume collected there.

If the collection is subcontracted on a per-volume quote, one most likely will not get the best cones possible as quantity, rather than quality, becomes the driving force.



Suggestions for increasing seed quality

Superior trees come from superior seeds.



Aerially collected seeds are generally of high quality because the cone-collecting coordinator can choose:

- to collect on the day he/she thinks cones will be at their peak of ripeness, as hundreds of hectolitres of cones can be harvested in a few days.
- to select only superior trees from a broad genetic base with desired tree characteristics.
- to pick only the cones near the top where the best cones usually grow.
- to pick only in heavy crop years when seed yield is larger, seed viability is greater, and costs are lower.
- to select trees that have withstood pine beetle attacks or other infestations in order to create a genetic base for more resistant stands in the future.

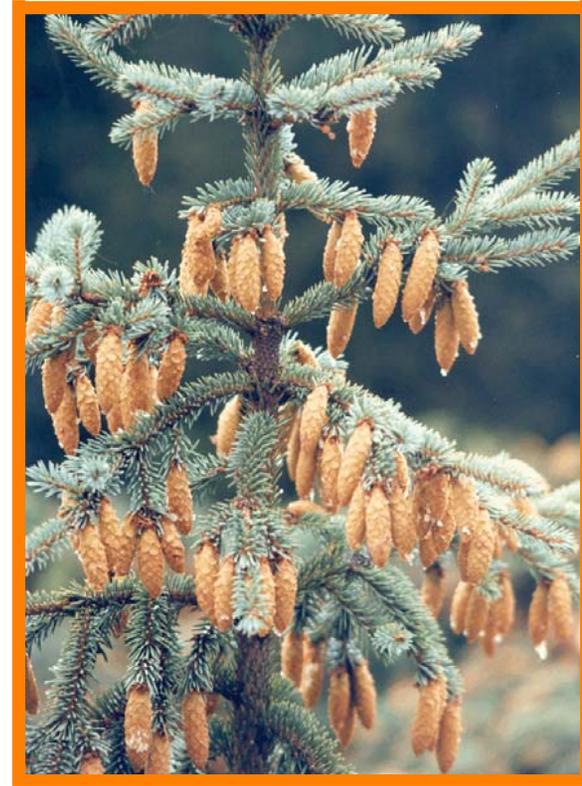
Suggestions for faster collections

- Cone collecting is fastest where trees have fairly narrow crowns, tops have a heavy cone crop, cones are of good quality, cones are not opening (so every tree can be picked), and most trees in a patch have good crops. The biggest hindrance to a good cone yield is cones that are turning brown and therefore unusable.
- A good pilot experienced with external load flying is the key to getting cones to the ground quickly.
- Before starting a collection, locate key stands of heavy cone crop, check seed counts, determine the maturity of the cones and find suitable unloading and refuelling sites. This preplanning results in a smoother operation and higher production per hour.
- Select unloading sites below the stand being raked because flying upward with the basket empty is easier than with it full.
- Whenever possible, transport a rake to the collecting site by truck or trailer. Aerial ferrying of rakes reduces helicopter airspeed to about 80-90 mph (130-145 km/h).
- Fly paths that minimize distances between trees. Generally, fly out empty and rake trees on the way back so that the longest flight is with an empty basket.
- A ground crew of two is best but one person can clean a rake.
- Self-dumping rakes can dump tops directly into trucks or trailers for transport to better sacking sites.
- Generally, dumping sites should be less than two kilometres from trees, although the species and abundance of cones influence the cost/benefit ratio.

The supply of Fandrich aerial rakes has never been a problem. Even during the heavy cone crop year of 1993 when all 49 Fandrich cone rakes were working, every request for a machine was met on time. Reserving a rake is part of a good collection plan.

Availability of helicopters can be a problem, though. During hot dry summers helicopter companies may need to give priority to fighting forest fires and may not have a machine available for picking cones.

Suggestions for high germination rates



The mechanical act of aerial harvesting does not in itself increase the germination rate, but aerial harvesting allows the conscientious forester to collect only the best cones available, at the right time, from superior trees. The result is that often he/she gets more seeds per bushel, better quality seed, and higher germination rates.

Most often, cones collected aurally yield more seeds per bushel with higher germination rates than cones collected from the ground. Cornell (1985) reports the yield from 1226 bushels of white fir cones collected aurally in the Stanislaus National Forest in California was 2.4 times higher than is usually obtained from seed collected manually. The germination rate for the aerial collection was 60%, well above the average, and the cost of seed was just over \$36 per pound compared with \$69 per pound for past collections (Durham, 1985). [For references see the Fandrich website www.coneharvesters.com.]

Suggestions for greater genetic variation

Fandrigh aerial cone rakes have been used with helicopters for a quarter of a century to collect the best cones from a broad genetic base. The cones picked from the tops of trees have high germination rates as they can be monitored and collected at peak ripeness.



Helicopters can fly quickly over a large area to gather cones from greatly diverse natural stands. Pilots may be requested to gather cones randomly or with specific characteristics for future benefits.

For example, the forester may want to collect cones from lodgepole pine trees that have withstood the onslaught of the pine beetle infestation. There are many advantages to collecting seeds from these resistant trees to be used as a base for reforestation once the epidemic is over. For whatever reasons, these hardy trees may be one genetic step closer to withstanding future infestations. Cones from these trees will be most easily available using aerial rakes.

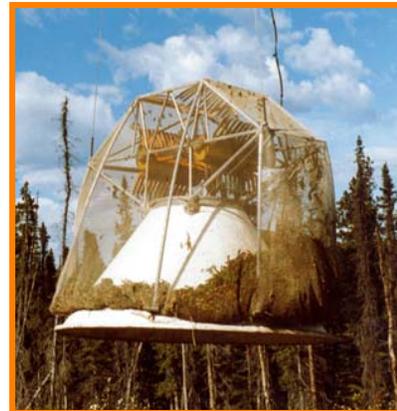
Types of Fandrigh aerial rakes



Fandrigh branch collector
helicopter lift cuts branches
of true fir and cedar



**Fandrigh manual-unload
shear**
cuts cone-laden tops
of all species



Fandrigh powerrake
strips cones from branches of
spruce, larch, and Douglas fir



**Fandrigh self-dumping
shear**
cuts cone-laden tops
of all species



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