Koa Field Day – Koa stand management
February 5, 2009
The Nature Conservancy – Hawai‘i Kona Hema preserve

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Hawai‘i Renewable Resources (forestry and weed control so far) extension videos:
www.youtube.com on the “HawaiiRREA” channel

Koa stand management

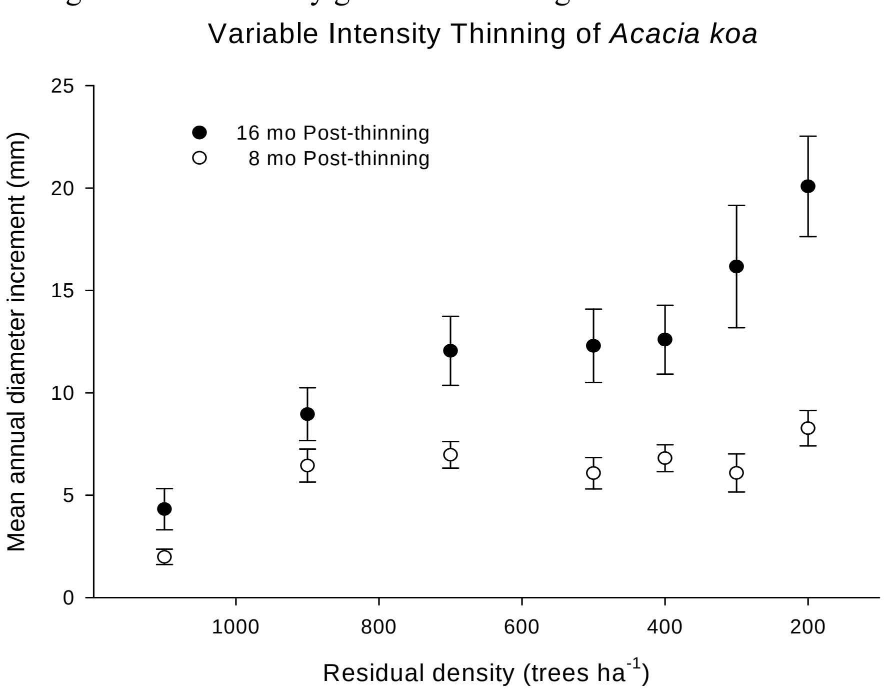
- Koa regenerates naturally after logging from buried seed in the soil (unless the forest is grazed!).
- The resulting natural stands are extremely dense, with many thousands of trees per acre. Since the trees can only grow larger by outcompeting other trees, individual trees in the stands grow slowly, even if the stand as a whole is growing well.
- How many koa trees of a merchantable size can a site support?
- Does thinning help “release” selected crop trees from competition so that they grow faster?
- Is thinning economically efficient?
- When should thinning be done?
- Does fertilization help koa?
- Does grass compete with koa?

Koa Sites (all natural, single-age stands, naturally regenerated after logging, at about 5500 ft elev.)

Location	*Rainfall (in)*	*Soil Type*	*Age at measurement*	*Trees/acre*	*Basal area ft^2/acre*
Honomalino	40	Thin ash over ʻaʻā lava	25	1,377	105
Umikoa	80	Deep ash	9	2,768	140
Keauhou	70	Ash over ʻaʻā lava	24	397	109
Laupāhoehoe	100	Deep ash	34	142	152
Kokeʻe	80	Weathered clay	24	476	157

Results

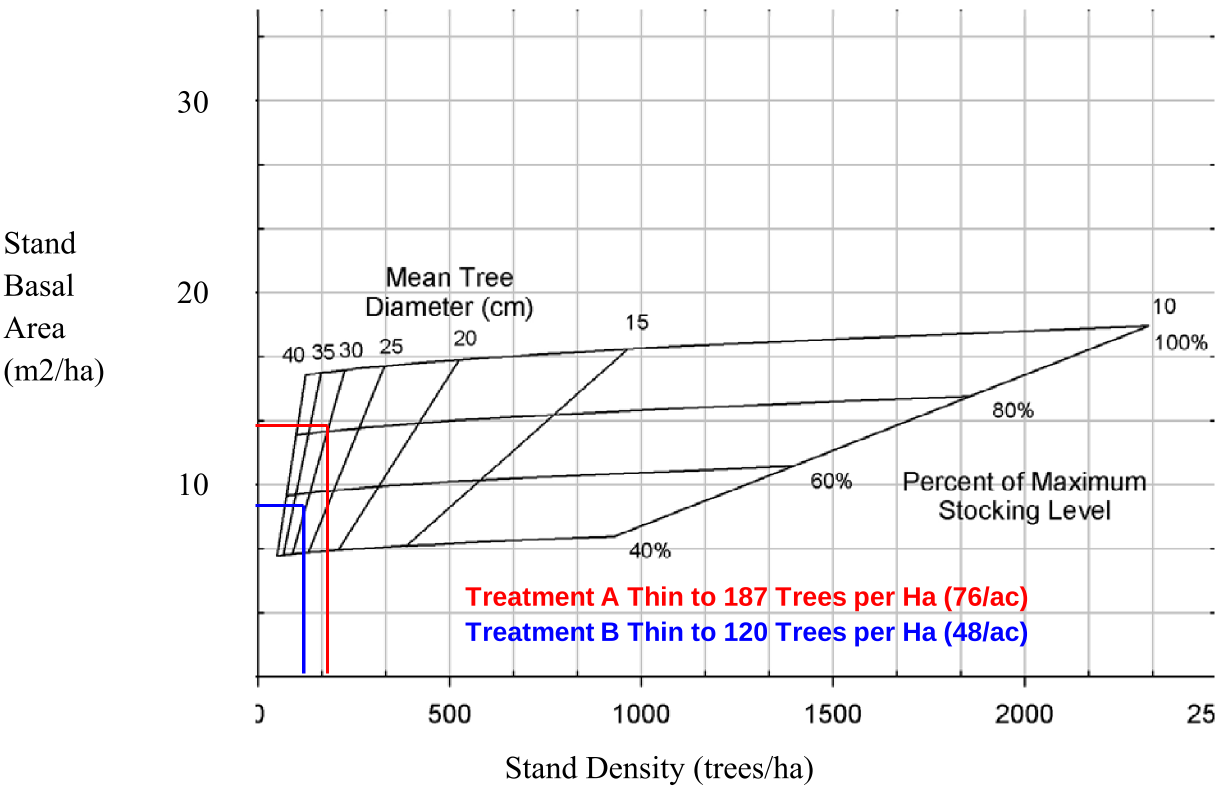
Honomalino: Individual trees in a 25-year-old stand were selected and thinned to different densities (each tree was in the center of a different radius plot). Results: the more space trees were given the faster they grew. Control of grass under the koa trees had no effect.



Data by Dr. Patrick Baker, USDA Forest Service and The Nature Conservancy of Hawaii. Do not reproduce without permission.

Papa: The koa in the Papa tract is much less dense than the koa in the Honomalino tract. Early 2008 a ten-acre site was thinned to either 76 trees/acre (treatment A, 12 foot radius) or 48 trees/acre (treatment B, 15 foot radius) based on Baker and Scowcroft stocking charts and Baker's results of thinning in Honomalino (above). 32 "control" trees were left unthinned to compare with 32 thinned trees. Half the experimental trees were fertilized with triple super phosphate at a rate of 681 lbs P/acre. As of November 2008, there were no differences between thinned and unthinned trees nor between fertilized and unfertilized plots.

Papa stocking chart



Umikoa: We selected 64 crop trees based on growth and stem form. Note crop trees have longer clear boles than average tree in stand.

	DBH (in)	Height (ft)	Length of clear bole (ft)
Crop trees	4.9	27	14.5
Average tree in stand	4.1	24	10.5

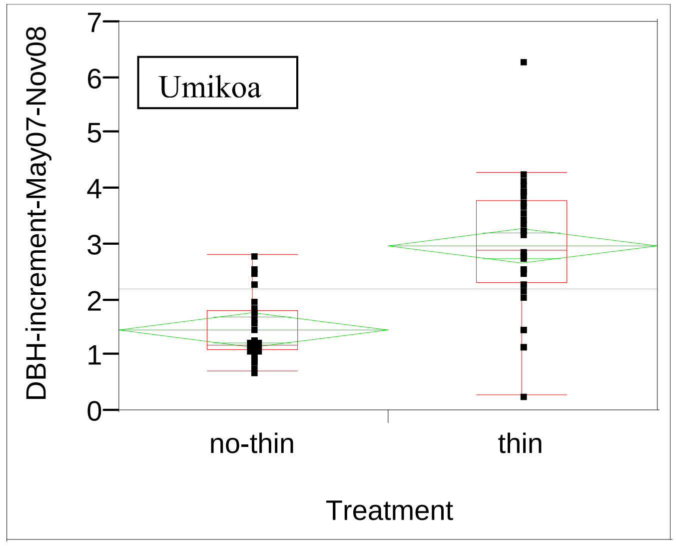
March 2007 we thinned all trees within 16 ft. radius of crop tree leaving 160 crop trees/acre
Basal area of 140 ft^2/acre will allow 160 trees/acre to grow to average 13 in. diameter
Then time for a second thinning. Commercial?

June 2007 we fertilized selected trees with 9.3 lbs treble super phosphate (0-46-0) per crop tree (equivalent to about 600 lbs TSP/acre). November 2008 we re-applied P fertilizer and sprayed grass and understory weeds with imazapyr (Arsenal-Powerline©) herbicide.

Umikoa results at 18 months

	DBH increment (in/18 mo)
Thinned	1.2
Unthinned	0.6

No effect yet of fertilization.



Keauhou: We selected individual crop trees in a 28-year-old stand and released them by thinning all trees whose crowns touched the crop trees. We fertilized with 681 lb P/acre of triple-super-phosphate and controlled grass under the crop trees with fluazifop-P-butyl (Fusilade©) grass-specific herbicide. We found that the *combination* of fertilization and thinning doubled the diameter growth of crop trees, but thinning alone wasn't statistically significant.

		Forest floor treatment	
	Control	**Grass control**	**Grass control plus fertilizer**
		-----DBH growth, in/yr-----	
Control	0.19a	0.24ab	0.29bc
Thinned	0.27ab	0.35bc	0.42c

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