



Summary: Research Programs

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I'd like to address four different areas. I think any research program that is based on managing, that tries to teach us more about managing a tree species, ought to include at least these four dimensions. And what I'd like to do is go through each of these very briefly and just to summarize what we learned in this area, in this conference.

Now the first one is the basic biology and ecology of the target species, and here I think the big message came from Tom Conkle's talk, where he documented what I think we generally knew but hadn't really seen in black and white before, that there is a great deal of heterozygosity in these different populations, and we saw this manifested several different times; perhaps Don Gardener's fungi demonstrated that also. In addition, Robin Harrington's talk about natural disturbances and their effect on koa was quite interesting in part because it told us that we may not understand as much about the disturbances themselves, as well as the responses we see. Those of you who didn't take a good look at the poster outside by Paul Scocroft and his colleagues should, because it summarizes a great deal of useful information about basic koa ecology, in looking at reforestation.

The second category is management, and again I think Tom Conkle indicated that we should be reforesting with seed that is native to a particular area and Jim Silva and Jean Conrad, I think, backed this up with the high degree of height-specificity that they saw in their data. We spent a fair amount of time on genetics, and this was quite interesting, but it's also interesting that at one end of the time spectrum we have the seedlings that Dr. Sun is following, and Dr. Brewbaker's hybrids that he's following. They take a while to grow; the tissue-culture techniques that Dr. Nagai discussed are very powerful, but she cannot use mature material and so, I think, we're still not able to take proven winners and [reproduce] them using tissue culture. But obviously this is a very promising technique and one that should be pursued.

One of the major management areas that we talked

about (and this impinges a bit on the third area, how koa, the target species, interacts with other species) is the area of competition and weed control. Sally Rice said that koa seedlings will come up through kikuyu grass, but I think those seedlings may be the only ones in all of Hawai'i to do that, because Gene Conrad's study was very heavily compromised by kikuyu grass. Nick Dudley spent a fair amount of time talking about mulching versus herbicides. Jim Fownes and Kevin Grace, in both the talk and in the poster, demonstrated that grazing is really most helpful in weed control and that some aspects are more beneficial than others. Mike Robinson suggested that perhaps koa could be used to shade out gorse, but then Jim Fownes also showed us that there's a lot of mortality among what Sally calls the "teenage" trees. So here's an area where I think that it would be very useful to have a model to look at the advantage of shading out gorse or other species on one hand versus the cost of planting and maintaining a densely stocked stand on the other.

The two studies on nutrient relationships were very interesting, both from a management viewpoint and from a basic ecology viewpoint. Holly Pearson showed that nitrogen fixation probably is most important before age 12, and Jim Silva suggested that the effects of fertilization have really ended by age 16, and this suggests that perhaps we ought to be looking at these nitrogen-phosphorus relationships more closely, perhaps to tailor management recommendations for particular sites.

Now in the third category, competition or interaction with other species, Don Gardner's discussion on the types of fungi was very interesting, as was the question of how dieback exists as a disturbance, how it affects habitat for other species, which I think would be a very important area to follow up on here. The poster by Susan Miyasaka and her colleagues called our attention to the symbiotic relationship between koa and mycorrhizae; that perhaps again could be exploited. Now this third area, how koa interacts with other species, I think is a very important one, and I think that the research community has given it short shrift. Mr. Bosworth



pointed out in his presentation yesterday that we really don't have the luxury of considering any of these species by themselves. And if you go back to the 1986 koa symposium, Ron Walker commented on the striking correlation between the distribution of koa and native bird habitats. Now, if you go up to Hakalau and talk to people there, you find out that branch cavities are essential for 'ākepa. We heard about branch cavities and how you get around having branch cavities. Here again, a model demonstrating the trade-offs between pruning and not pruning would be very appropriate and might be very helpful in helping us decide how we might manage a given stand for different kinds of products in different areas. By the same token, the birds at Hakalau, the endangered species, are found more at one end than another; is this related to foliage nutrients? Does this affect the kinds of insects that are feeding on the tree and then are fed on by the birds? Mike Robinson showed us pictures of these corridors of koa trees that they hope will help to re-establish, to move the koa forest down. Who is going out to those corridors of koa trees and looking at whether or not they work for birds, whether they work better for exotic mammals? This is the research opportunity that we ought to be exploiting, that looks at how the koa forest interacts with other species. I think that we just have to face the fact that what we're doing in koa forest is very likely to affect the survival of endangered species. I can understand Bill Cower's concern about the tracking of endangered species, but I think we have to be pro-active in understanding these ecological relationships and then addressing the difficult policies that may be associated with it, because if we don't do it, someone else will, and I think it's more likely to be to our advantage to hit this kind of problem head on.

Now, we also learned very little about the fourth area: how a managed forest fits into a larger landscape. Here we're talking not just about a physical landscape, but we're also talking about a sociological landscape and an economic landscape. Here, I think, there's a lot of opportunity and not much research. There's not very much money out there for evaluating traditional forest management strategies, but people are interested in seeing resource managers interacting with sociologists, with economists, in trying to develop not necessarily answers but strategies to coming up with answers to these difficult kinds of problems. And I think that Bill Libby's observations about the current differences between

Hawai'i and New Zealand in meshing the forestry and conservation needs on forest lands really merits much more careful consideration by the forest community.

So, I'd like to dwell briefly on this last area, because I don't know how many of us appreciate the fact, but I think that it's extremely important for foresters to be pro-active in these kinds of areas. We cannot sit around and wait for people in other disciplines to move in, because public sentiment, for instance, in something like the spotted owl rests first with something like wildlife habitat and not with managed forest. Even though we're certainly meeting society's needs, we are still perceived as creating the problems, as being timber beasts. So, if Hawai'i is going to move ahead with koa forest management, then the forest industry, together with state and federal agencies, has to work more actively—starting now—with wildlife and other interests in line right from the very beginning.

I think this is a tremendous opportunity, partly because we have a very active and vibrant community of evolutionary ecologists and wildlife biologists here with us, and I think there are plenty of good economists, sociologists, both here and on the Mainland, that we can bring into these studies.

I congratulate the researchers who presented such an informative session, and I ask the research community in general, including myself, to try to look critically at broader issues. I also ask the Hawai'i Forest Industry Association and interested and concerned individuals to actively seek out opportunities to bring together researchers and managers from these different disciplines to articulate and address the problems that are looming larger and larger on the horizon.

Comments

Mike Robinson: I don't know exactly how we do it, other than spending more money on it, but I know what I'd like to see done. As a forester who has practiced in many different parts of the world, including here in Hawai'i, and written plans for management of koa and other timber land, I'm very frustrated by the lack of research we have here. I know on the Mainland it's a very envious situation, where there is 40 years of research to back up your decision-making. There's charts, there's biologists that can communicate very clearly to you how many snags per acre to leave, whether they're hard snags, soft snags, what kind of bird you're going to protect by leaving that snag, what diameters of logs to



leave on the ground for small critter habitat; we don't know any of that stuff over here. I've tried to piece some of that stuff together, but you talk to the experts and they don't know, and that's the question that comes up. So part of our role on this side of the table is to create a future, so I would hope as quickly as possible we give the land managers the tools they require to make those good decisions. That's going to require a lot of research, but the kind of research that answers those really tough questions quickly. I hope we put our research dollars into exactly those questions that resolve the biggest issues. How can we address the sustainability issues, the environment, the economy, the sociocultural needs of our community? How can we resolve those interfaces where they come together? How can we cut koa and protect the endangered species? Or how can we create endangered species habitat which in theory would do away with the endangered-species issue because we've got 10,000 more acres of koa forest out there? And how can we pay for that . . . maybe through some sort of sustainable harvesting? I think it can be done, but we don't have all the answers, so everyone's being very conservative about how they approach the issue.

Stevie Whalen: I want to draw from some of my experience with the sugar industry, and one of the positive things has been their financial commitment to research. Industries here in Hawai'i are isolated from federal funds, and we don't have a lot of research dollars coming into the state. This is a time when national research dollars are diminishing because of various social programs that are taking up a bigger part of the budget. It's important to look to making the financial commitment to meet it, taking that risk, but accepting the responsibility of directing the research and getting the type of work that they felt needed to be done for the industry to move ahead. That's the advantage of funding your own activities, and those in the private sector recognize that. Other industries put 2 percent of their gross income into research, and until the agricultural industry, which forestry is a part of, makes that commitment, we're not going to move ahead at any faster rate than you do under the use of public funds, which takes a longer process. The sugar industry used their funds to leverage public funds when they got into economic difficulty. The public sector now requires the private sector to match everything. Until the industry comes to the table

to develop research, it's going to be a slow process. I feel we now have the opportunity and the attention, so the industry has to look at some kind of assessment process to come up with the funding to get the research done.

Michael Buck

We're so glad that Kathy Ewel has come to Hawai'i. We hope that she finishes her Kosrae work quickly so she can spend more time here. I think that level of analysis tells you there's some new kids on the block. I think it's criminal that in this state, the eleventh largest forest in the whole U.S. and America's only tropical forest, we don't have a forestry school or forest management classes. When I compare other state forests, our state management agency gets less support, because it's just not there right now. We are actually paying the resource agency, with the help of HFIA, to put on a course at UH Hilo. The students want it, and students would love to come here. We'd love to have an internship program working with the university to get people into the forest. I really hope that out of this initiative we can hire people and people can come and do vocational training, internships as well as higher education. The issue of koa at the landscape level is very important and the roles of public and private lands within that context needs to be discussed and refined for koa to be part of a stable forest industry here.

Cynthia Salley: How many private landowners are there here at this symposium who either have potential forest or native forest they are managing right now? . . . (show of hands) . . . fifteen. On behalf of all of us, I want to thank you all, because basically this whole symposium has been put on for our benefit. I guess indirectly what I'm saying is that there is a whole component that is missing here, and that's private landowners. And perhaps as we get into some of our discussions later on maybe we'll realize why they're not here. In order to carry on everything that we've been talking about, the research, the stewardship, you're really talking about the private landowner, because Mike Buck has already told us that the state can't do it. We're all that's left.

Kathy Ewel: I think there's one partial solution that's available to us and that is, from a newcomer's standpoint, I think there's a certain amount of parochial-ness in the way we approach research in Hawai'i. I think we



ought to draw more heavily on our colleagues on the Mainland. Holly Pearson is from California, she's a graduate student, she's not from Hawai'i, but her research is very appropriate to Hawai'i. I think we can call on funds and talent available on the Mainland to address research problems that we consider to be im-

portant that we can help guide. We don't need to worry so much about finding the money here. There is a broader range of talent available to whom we can communicate our concerns and call for help. It can't do anything but benefit us.