

Environment



Hawai'i
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Plane Truth

After more than a year of aerial surveys of the Big Island's most protected natural areas, the results are in: native rain forests are losing ground to an invading army of exotic plants. A write-up of the work done by the team of researchers and scientists associated with the Carnegie Airborne Observatory published last month reveals just how extensive the losses are and how imminent the threat is to what remains of some of the best native forest in the state.

Amid the bleak findings is a ray of hope: If the people in charge of managing the native forests and watersheds respond quickly to problems identified by the aerial surveys, Hawai'i has a fighting chance of defending what remains.

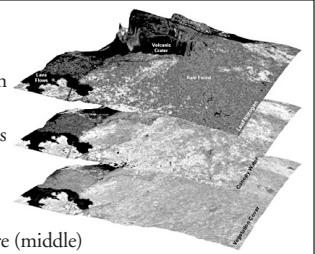
A New Regime: Invaders Alter Shape, Functionality of Native Rain Forests

Hawai'i's forests are under siege. The dry forests have long been held up as the poster child for endangered native landscapes, but a recent study suggests the islands' wetter rain forests face imminent peril as well.

The study's principal author, Gregory Asner, said in an interview that the aerial research he and his team have done carries a clear and urgent message for anyone involved in managing Hawai'i's mauka lands: "We should do a full-court press now, or get out of the business."

What Asner and his team have done is describe in heart-breaking detail the way in

The Carnegie Airborne Observatory can develop map overlays like this one, showing leaf nitrogen content (top), canopy moisture (middle) and vegetation cover (lowest) in a forest tract.



COURTESY: GREGORY ASNER

which invasive plants are restructuring native rain forests. As Julie Denslow, a botanist who has studied invasive plants for decades, says, the study doesn't really sur-

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'Rare Earth' Metals May Hold Promise Of Deterring Sharks from Fishing Lines

While sharks play important roles in the world's marine ecosystems, there are times when we'd like them to just go away. In the case of the longline fishery, sharks can annihilate or scare away a fisherman's catch, damage fishing gear, and lead to waste, especially when sharks themselves get hooked. The Hawai'i longline fleet alone catches about 19 sharks for every thousand hooks thrown into the water.

To avoid shark depredation and bycatch, the fishing industry and scientists have investigated possible chemical, magnetic, and electrical deterrents. Recently they discovered that certain types of metals can repel sharks, even when food is involved.

At the Western Pacific Fishery Management Council's Scientific and Statistical Committee meeting last month, John

Wang, a scientist with the National Oceanic and Atmospheric Administration, presented the results of his study of electropositive metal effects on shark feeding behavior conducted last year in waters off O'ahu's North Shore.

In cooperation with the shark-viewing tour company Hawaiian Shark Adventures, Wang and NOAA's Yonat Swimmer sunk wooden 'opelu-baited poles, two at a time, into waters where Galapagos, sandbar, and tiger sharks were swimming. From the safety of a shark viewing cage, they watched how the sharks reacted. In each trial, one of the poles was held adjacent to a control metal (lead), while the other was held near a metal from the Lanthanide series of elements, also known as rare earth metals.

What they found surprised them, Wang

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Hawai'i

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NEW AND NOTEWORTHY

PHOTO: PIFSC



A New High and Low: First, the good news: In 2007, 14 endangered Hawaiian monk seal pups were born in the Main Hawaiian Islands, the highest number on record.

The bad news is that the monk seal population in the Northwest Hawaiian Islands, where a vast majority of the seals live, continues to decline and now includes fewer than 1,000 individuals. What's more, the fact that juvenile seals there are not surviving to adulthood bodes poorly for future reproduction.

According to a recent population assessment by the Pacific Islands Fisheries Science Center's monk seal recovery team, the monk seal population at the six main colonies in the NWHI has been decreasing by about 4.1 percent a year since 1998. Last year, populations at all of the sites except Midway decreased.

In its report, the team admits that last year's counts are not entirely accurate. At Laysan, Pearl and Hermes Reef, Midway, and Kure, "we probably identified nearly all the seals but had a few new individuals show up towards the end of the season," they wrote. "At [French Frigate Shoals] and Lisianski, we clearly didn't identify all the seals, the latter due to the field season being cut short due to a medical emergency."

Even so, the team estimates that 784 non-pups and 151 pups were counted at the six sites, for a total of 935 monk seals, nearly 80 percent of which are adults and pups. About 15 percent are juveniles and less than ten percent are sub-adults. In the mid- to late-1980s, juveniles and sub-adults made up about 40 percent of the NWHI monk seal population.

A February report by the PIFSC states that high mortality of immature seals "appears to have led to the shift in age composition, particularly at French Frigate Shoals, where shark predation continues unabated."

The report continues that, at FFS, 16 seals were known to have been bitten by sharks last year, seven of which were nursing or weaned pups. Four of those pups died or disappeared, two were severely amputated and have a low chance of long-term survival, and the last pup escaped with minor injuries.

Pulling Out: Faced with the possibility of getting into more trouble, the Hawai'i Institute of Marine Biology has withdrawn its request for a contested case hearing over last summer's decision by the Board of Land and Natural Resources to fine coral scientist Greta Aeby for violating conditions of her Northwestern Hawaiian Islands Marine Refuge permit.

According to a recent press release by KAHEA: The Hawaiian-Environmental Alliance, the hearings officer appointed to the case ruled on February 21 that KAHEA had standing to participate and that the scope of the hearing "should be enlarged to investigate the full range of potentially illegal activities that occurred on the 2006 research expedition."

Although KAHEA had hoped to address alleged outstanding violations during the hearing, program director Marti Townsend says she supports HIBM's decision.

"We don't want to go through a contested case unnecessarily, but I hope this sends a message to researchers and [Papahānūmokuākea Marine National Monument] co-managers that the ways things were happening aren't good enough," she said.

A New NAR? The state Department of Land and Natural Resources's Natural Area Reserve System Commission is proposing to designate 1,311 acres of native, leeward O'ahu forest (currently known as the Poamoho Public Hunting Area) as a new Natural Area Reserve (NAR).

The proposed reserve lies between a U.S. Army training area owned by Kamehameha Schools and the U. S. Fish and Wildlife Service's new O'ahu Forest National Wildlife Refuge. Because the entire area has been leased to the Army until 2029, a draft proposal for the reserve notes that the military may conduct training in the proposed Poamoho NAR during weekends and holidays with prior notice to the general public. Those training activities "are typically limited to single file, small unit maneuvers along ridgelines," and do not include the use of live fire or explosives, the proposal states.

A public hearing on the proposal is scheduled for 6 p.m., April 30 in the first-floor board room of the Kalanimoku Building at 1151 Punchbowl Street in Honolulu. For more information, call Emma Yuen, Division of Forestry and Wildlife planner, at (808) 587-4170.

A Clarification: Last month's article on the 'āha kiole advisory committee erroneously quoted William Aila as stating that the committee had held meetings in Ko'olauoko. According to Ko'olauoko Hawaiian Civic Club president Mahealani Cypher, no such meetings had been held.

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Quote of the Month

*"Data collected [by the FWS on albatross populations] has been basically ...
pissed against the wall."*

— *Paul Dalzell, senior staff scientist,
Western Pacific Fishery
Management Council*

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said, noting that the sharks exhibited very distinct aversion behaviors around the electropositive Lanthanide-metal poles. At the meeting, Wang showed video footage taken from inside a viewing cage of sharks swimming up to and eating the bait from the control poles, while sharks that approached the poles near the Lanthanide metal jerked their heads away from the bait at the last second or avoided the pole altogether. These aversion responses, which included sudden and abrupt changes in a shark's head or body motion, increased when the sharks approached the electropositive poles, he said.

Even so, the metals did not always keep the sharks from taking a bite from the 'opelu. In 77 trials, sharks took their first bites of bait from the control poles 75 percent of the time, Wang said.

Wang's and Swimmer's results are consistent with discoveries made by SharkDefense, LLC, in the Bahamas. According to a December 2006 report by SharkDefense's Michael Herrmann and Eric Stroud and consulting marine biologist Patrick Rice, when approached with acrylic poles tipped with certain Lanthanide metals, "sleeping" lemon and nurse sharks would wake and react violently.

"The strength of avoidance behavior appeared to roughly correlate to the position of the metal in the Lanthanide series, with elements 57-64 showing more reactivity than elements 75-71," the report states.

The report continues that calcium and strontium, which are highly electropositive metals, are potent, but last only one to two hours in seawater.

"An alternative to high priced pure Lanthanide metals are alloys of early-Lanthanide metals, particularly Neodymium-Praseodymium alloy, which offer benefits of high electropositivity, machinability, and somewhat stronger corrosion resistance than the pure Lanthanide metal component in seawater," the report states.

In response to questions from the committee, Wang stated that Stroud's preliminary work on pelagic target species suggests that these metals won't affect them. As for his own future studies, Wang said he hopes to investigate the reaction of sharks in different behavioral states to the metals, the effectiveness of combinations of metals, and habituation tests, among other things. He adds that he has not been able to find any information on the toxicity of the metals.

SSC member Dan Pohlemus pointed out that the issue of corrosion also needs to be

dealt with, since Wang stated that the corrosion rate for the Lanthanide metals tested is two grams per hour.



Council Staff Opposes Petition To List Loggerheads Turtles As Endangered Species

For the past several years, the conservation community and the Hawai'i longline fishing industry have battled over regulations intended to protect threatened and endangered sea turtles from being caught or killed by longline fishing gear. In 2000, the fishery was shut down, but reopened in 2004 under new regulations that have reduced turtle bycatch significantly.

Even so, the battles continue. Last year, the Hawai'i Longline Association proposed raising some of the caps imposed by the National Marine Fisheries Service on fishing effort and turtle catches. Also, the law firm Earthjustice, on behalf of the Turtle Island Restoration Network and the Center for Biological Diversity, filed a petition with NMFS and the U.S. Fish and Wildlife Service to reclassify the North Pacific population of the loggerhead sea turtle (*Caretta caretta*) from the status of threatened to endangered and designate as critical habitat all state and federal waters and Exclusive Economic Zones used by the turtles for foraging off Hawai'i and the U.S. West Coast.

Not surprisingly, the Western Pacific Fishery Management Council opposes the reclassification.

"Whilst loggerhead populations are depressed ... the status of endangered is unwarranted," Paul Dalzell, the council's chief scientist, said at the Scientific and Statistical Committee meeting.

The petitioners argue that current trends suggest the North Pacific loggerheads will probably be "quasi-extinct" (defined as 50 adult females) within about 50 years. Dalzell noted, however, that according to the National Oceanic and Atmospheric Administration's most recent five-year review of the loggerhead population, it is not in a "steady monotone decline."

The Hawai'i swordfishing fleet is allowed to catch 17 loggerheads before it is shut down for the rest of the year. Given that, Dalzell said, "I'm really now beginning to have serious doubts on the impacts of longlining on loggerheads," and noted that a recent turtle workshop on longlining in the North Pacific revealed that logger-

heads are being caught there at a rate that is 100 times what it is in Hawai'i.

Trying to save loggerheads by focusing only on the fishery here is "like trying to wage a war on drugs and focusing on El Salvador," he said.

By all accounts, Baja California and Japan are the critical loggerhead habitats, Baja being where they forage and Japan where they nest.

"The coastal fishery bycatch issue [as opposed to pelagic fishery bycatch] is the number one hot button issue," Dalzell said. According to research by Japan's Takashi Ishihara, which was presented at the workshop, many thousands of loggerheads are being caught in pound nets – cages with an opening at one end that leads to several chambers.

Ishihara estimates that there are 750 large and 11,400 smaller pound nets around Japan. At a single pound net in Miyama, Ishihara found that 96 percent of the loggerheads caught died and 16 were killed in just one day. Dalzell multiplied the estimated monthly loggerhead catches from a Japanese pound net by the number of large pound nets around Japan and suggested that the nets could capture roughly 70,000 and kill 20,000 loggerheads a year.

While he admitted that those numbers aren't accurate, since not all large pound nets are located near nesting areas, Dalzell pointed out that these nets are also used in Taiwan and China.

"This and those coastal fisheries in Baja are what's hammering the loggerhead," Dalzell said.

An October 2007 article on small-scale fisheries bycatch in Baja California, published in PLoS ONE, estimates that a minimum of 299 loggerhead turtles were killed by the local gillnet fishery in 2005 and the bottom-set longline fishery killed at least 680. The study, by Hoyt Peckham, David Maldonado Diaz, Andreas Walli, Georgita Ruiz, Larry Crowder, and Wallace Nichols, states that total loggerhead mortality in the area is probably much higher than 1,000 because they used minimum factors (hooks, fishing days, etc.) in their calculations, and because they estimated bycatch for only two of 12 or more fleets that fish in or near loggerhead high-use areas.

Despite the obvious impacts of fishing on loggerheads, Dalzell said concentrating on nesting areas will do more for the turtles than fishing restrictions or regulations.

An article by Rebecca Lewison of San Diego State University and Crowder of Duke University published last year in *Conservation Biology*, however, suggests that

fishing regulations are indeed necessary, but should not be limited to longlining.

Their article, titled "Putting Longline Bycatch of Sea Turtles into Perspective," states that while bycatch rates from individual vessels are low, "the amount of gear deployed by longline vessels suggests that cumulative bycatch of turtles from older age classes is substantial. Current estimates suggest that even if pelagic longlines are not the largest single source of fisheries-related mortality, longline bycatch is high enough to warrant management actions in all fleets that encounter sea turtles. Nevertheless, preliminary data also suggest that bycatch from gillnets and trawl fisheries is equally high or higher than longline bycatch with far higher mortality rates. Until gillnet and trawl fisheries are subject to the same level of scrutiny given to pelagic longlines, our understanding of the overall impact of fisheries bycatch on vulnerable sea turtle populations will be incomplete."

Crowder and his co-authors of the October 2007 article on Baja bycatch also seem to side with the petitioners in regard to the status of the North Pacific loggerhead population. The article states that censuses of North Pacific loggerheads nesting in Japan "indicate as much as a 90 percent decrease in nesting females within the past three generations to fewer than 1,000 per year, qualifying the population for critically endangered status."

Groups Seek Federal Listing For Black-Footed Albatross

On October 1, 2004, Earthjustice, again on behalf of the Turtle Island Restoration Network and the Center for Biological Diversity, submitted a petition to the U.S. Fish and Wildlife Service requesting that the black-footed albatross (*Phoebastria nigripes*) be listed as a threatened or endangered species and that critical habitat for the bird be designated. The petition stated that commercial fisheries in the North Pacific were inadvertently killing from one to five percent of the global population of the albatross and that the restrictions that had been imposed on the Hawai'i-based longline fleet were inadequate because they allowed fishing in albatross foraging areas.

At the time the petition was submitted, the FWS was busy trying to comply by 2005 with a court-approved settlement regarding listing rules and informed the groups that it had insufficient resources to initiate the process of reviewing the petition.

Three years later, on October 9, 2007, the

FWS announced it was finally initiating the 90-day period during which the public can submit data, comments, and information to be considered by the FWS in its review of the petition. In its *Federal Register* announcement, the FWS stated that the petition provided "credible scientific information that incidental mortality in commercial longline fisheries may threaten the existence of the black-footed albatross."

At the SSC meeting, however, Dalzell argued that the population information kept by the FWS is so poor, "there isn't the data available to make a decision."

Information is kept in cardboard boxes and the banding system for black-footed and Laysan albatrosses is not well designed, he said, adding, "Data collected for population assessments and demographic measurements has been basically, if you forgive the expression, pissed against the wall."

Dalzell said that the information presented in the petition is years out of date and claimed that the population is stable and has been so for a decade, with about 60,000 nesting pairs a year.

As far as bycatch by the Hawai'i longline industry, that has been reduced ten-fold – from an estimate of between 1,000 and 2,000 birds a year in the 1990s and 2000, to the present estimate of "ones and tens" a year,



A black-footed albatross and chick.

PHOTO: USGS

Dalzell said. Since 2002, between 16 and 89 black-footed albatrosses interacted with the Hawai'i longline fleet each year.

"There seems to be no correlation between black-footed albatross populations and longline growth," Dalzell said, adding that most of the population is in the Northwest Hawaiian Islands, which "are as protected as you can get."

Despite similar comments submitted to the FWS by the council in 2005, the agency concluded in its October announcement, "Although mitigation measures have reduced mortality of black-footed albatrosses in some (U.S.-based) fisheries, the information in the petition indicates that fishery-related threats to the species throughout its range are ongoing." — **Teresa Dawson**

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Strange Accounting System Shows Inflated Vacancy-Related Loss at DLNR

When positions are authorized and funds appropriated for them by the Legislature, state departments can realize savings when the positions are vacant. But when other employees have to carry the extra workload of the vacancies, the savings can be eroded through overtime and other costs. The high vacancy rates at the Department of Land and Natural Resources have led some people to question if the desire to achieve savings may be working at cross-purposes with the need to have warm bodies in place to do the department's work.

In late January, in response to a request for information from Senator Clayton Hee, the department prepared a list of vacant positions along with an estimate of savings resulting from them. The grand total of actual savings was placed at roughly \$250,000. *Environment Hawai'i* was provided with the same data given to Hee, as well as an updated data set reflecting the department's position at the end of February.

Comparing the two sets of figures resulted in a shock: in roughly five weeks, the department's savings attributable to vacancies plummeted nearly three-quarters of a million dollars. Instead of having a net savings result from the empty positions, the department at the end of February was reporting a vacancy-associated loss of nearly half a million dollars.

But was the loss real? Our analysis suggests the department didn't really lose anything. Instead, the difference between the January and February figures resulted from flawed bookkeeping, and, what's more, probably neither figure was accurate or even meaningful.

Eroding Economies

To understand how the department calculates its vacancy-associated costs or savings, consider, for example, the figures for the department's Division of Conservation and Resources Enforcement. By January 25 of this fiscal year, the division reported having achieved a savings of \$400,177.50 from not having filled 22 vacancies. Offsetting this, however, was a bill for \$410,727.37 in overtime costs, another \$59,149.96 in temporary assignment "and other payroll adjustment," and vacation pay of \$49,904.73. (According to the department, when employees retire, they receive a payout for their accrued vacation days, and this has to come out of the overall budget for salaries.)

Excluding the vacation payout, which would presumably have been made with or without the vacancies, DOCARE reported it had actually spent \$469,877.33 on salaries to do the work that, had the vacant spots been filled, would have cost it \$400,177.50.

In some cases, vacancy savings are redirected, and this is reflected as a cost against the vacancy savings. The Historic Preservation Division, for example, took \$100,000 from funds that were originally to pay employees and used part of it instead as a state match for a federal grant for "heritage communities, a Main Street-type program" for 'Ewa Villages, according to DLNR administrator Laura Thielen. Another part was "to help us with our data base, . . . so we can better track the flow of information between islands and the central office."

Redirecting vacancy savings, Thielen said, requires that the department go through the state process for approval. "In some cases, shifts can be approved within the department," she said. "At other times, we have to go through Budget and Finance, and in some cases we need approval by the governor and notice to the Legislature."

Garbage In, Garbage Out?

The spreadsheets provided to *Environment Hawai'i* supposedly reflected estimated savings accrued from vacancies at the end of January (January 25) and at the end of February (February 29).

The earlier compilation of data indicated that for the current fiscal year, the department had accumulated \$248,079.43 in savings from the vacant positions. The later compilation gave a total that was nearly three-quarters of a million dollars less: instead of a showing net savings amounting to a quarter million, the vacancies had actually cost the department \$485,854.32.

How could the department lose this much money in a matter of weeks? What did these figures mean?

We looked at the figures more closely in an effort to identify where the losses occurred. That's when a certain strangeness to the figures began to emerge.

First, according to the spreadsheets, the gross savings achieved from vacancies (before any adjustments for overtime or temporary duty and the like) actually *decreased* in the one-month period in some divisions. This would seem to be a logical impossibility:

since the gross savings reflect a total accumulated from the start of the fiscal year to the time reflected on the spreadsheet, there does not seem to be any way for it to diminish from one month to the next; a dollar unspent in August remains a dollar unspent in December and will still be a dollar unspent on June 30, when the state fiscal year ends.

It is equally implausible that the expenses associated with vacant positions would remain unchanged from one month to the next. Unless suddenly every position was filled and there were no more payouts in overtime or temporary assignments to make up for the lost work, cumulative expenses associated with covering vacancies would presumably be expected to rise from one month to the next. Yet for every one of the 17 DLNR financial accounts that make up its budget, expenses neither increased nor diminished. For example, at the Bureau of Conveyances, expenses associated with vacant positions amounted to \$258,551.13 for the portion of the fiscal year ending January 25. A month later, expenses associated with vacancies were unchanged, down to the penny. For both months, the vacancy-related expenses for the entire department stood at \$1,959,504.19.

Paper Losses

So if new hires soared in February, and vacancy-related expenses held remarkably, unbelievably steady, how can one explain the apparent fact that the department's vacancy-associated savings plunged nearly three-quarters of a million dollars over the course of the month?

In fact, the losses are fictional. That's the only conclusion one can reach.

How did this happen?

The department had not provided any explanation by press time, but we've come up with our own. Reviewing the spreadsheets, it appears that once a vacancy is filled, it is removed from the ledger listing vacancies. And savings associated with the unfilled position, accumulating since the first of the fiscal year, are also deleted when the position description is removed.

For example, suppose the Division of Forestry and Wildlife began the year with a vacant clerical position paying \$1,911 a month. Each month that position remained vacant, the nominal savings in unpaid payroll would be \$1,911 (\$22,932 if the position went vacant the entire year). If, on October 1, someone was hired and began working that job, the savings for the year would still be \$5,733 (three times the monthly salary), assuming the clerical worker remained on the job. Yet, the way that the DLNR spreadsheets have been pre-

Positions Unfilled, Funds Unspent at DLNR

Stand in the halls of the Kalanimoku Building in downtown Honolulu long enough, and you're bound to overhear staffers with the Department of Land and Natural Resources complain over the lack of money or personnel that prevents them from carrying out the many tasks they're charged with.

A look at the budget figures given to the 2008 Legislature bears them out.

Although the department's approved operating budget for fiscal year 2006-2007 came to \$92.247 million, the department's expenditures for that period fell short of the mark, by 3 percent (\$2.56 million), according to the so-called "Variance Report" prepared by the state Department of Budget and Finance. The report reflects each state department's expenditures at the end of the first three months of each fiscal year.

When it comes to personnel, the discrepancy is even greater. According to the Variance Report, as of September 30, 18 percent, or 140, of the 775.5 authorized permanent staff positions in the DLNR were vacant. As in years past, the DLNR's vacancy rate is far above the rates seen in other state departments. On average, across all departments, the vacancy rate stood at 6 percent, with 2,666 unfilled positions out of more than 45,000.

Viewed in another light, the vacant posts at the DLNR represent more than 5 percent of vacancies statewide – this despite the fact that the department's operating budget accounts for less than 1 percent of the overall state budget.

Since then, the DLNR's position count has of course changed, but many chairs continue to remain unoccupied. DLNR administrator

Laura Thielen insists, however, that the department is working aggressively to fill them.

"The vacancies are not intentional," she said. "We have been talking with managers about this since I started, about six, seven months ago. We want to fill these positions. The managers want to fill these positions. We're not intentionally keeping positions vacant to achieve savings.

Clerical positions account for a large number of the vacancies, Thielen said. "It's extremely frustrating not to be able to find people to fill these positions. The Department of Human Resources Development is trying to help by aggressively recruiting clerical workers. As the pace of Hawai'i's economic growth slows, we may find that the state is a more attractive employment option, and may be a bit more successful" in recruiting for these posts, she told *Environment Hawai'i* in an interview responding to a written list of questions.

Within the department itself, the vacancy rates among divisions fluctuate widely. "The vacancies tend to be concentrated in three divisions," Thielen said, naming the divisions of State Parks, Boating and Ocean Recreation, and Forestry and Wildlife.

In the case of State Parks, which as of late January had 41 empty spots (28 permanent, 13 temporary), most of the vacancies are paid for out of the State Parks special fund, Thielen said. "During the economic downturn of the 1990s, the Legislature shifted general-funded positions to become special-funded. Now we're at the point where the ceiling on special funds expenditures, which includes these positions, is far higher than the revenue stream that State Parks generates. So we cannot

afford to fill some of these positions." (Thirty-one of the 41 vacancies are paid for out of the parks special fund.)

Thielen acknowledged that the parks special fund had been raided in recent years, and said that the Legislature is poised to make another raid on the fund this year. "We're trying to point out to the Legislature—help us out by not raiding our fund, give us more general fund positions, and support us when we take steps to increase revenue streams. We're also pointing out to the Legislature that if they cut these positions, they won't save any money."

As far as the vacancies in the Division of Boating and Ocean Recreation (DOBOR) are concerned, she noted that most of them are difficult-to-fill clerical posts, "and when we do get folks, they take advantage of promotional opportunities within the department and move up to higher-level jobs." (All of the DOBOR personnel are paid from the boating special fund. As of late January, 19 permanent positions were empty.)

Thielen attributed DOFAW vacancies (37 as of late January) to "a combination of reasons. They're our biggest division, so they have the biggest movement" of personnel. Once more, she cited problems in hiring clerical positions. Another factor, she said, is that "DOFAW is an interesting division. The management philosophy there is they want to have a lot of responsibility and accountability at the local level. They've taken some steps by redescribing or recreating new position series through civil service procedures. Take someone like a laborer. Instead of having them listed as a general laborer, you put them in as a forester, so they're held responsible for independent duties.... But this process takes time. In my opinion, DOFAW is one of the better-managed, better-run divisions."

The Division of Conservation and Resource Enforcement was not on Thielen's

Savings from page 5

pared, the savings associated with vacancies vanish the moment the post is filled and the position is erased from the register of vacancies.

This faulty accounting is the reason – the only reason – why the net vacancy savings shown for February are so different from (and smaller than) those in the January spreadsheet. With the department having had so many new hires in that period, the savings that would have appeared on the spreadsheet in the event the posts remained

vacant suddenly disappeared.

In other words, the three-quarters of a million dollar loss in vacancy-related savings that turns up at the end of February is a completely meaningless number.

To have a truly accurate figure for vacancy-associated savings, one would have to look at the vacancy figures in each of the 17 accounts for each of the preceding months in the fiscal year. Then you would need to multiply each vacancy by the number of months it existed and add up the total. This is the only way to approximate true vacancy savings.

By erasing the savings associated with vacancies that are filled during a given fiscal year, the department has wildly and inexplicably overestimated the cost of vacancies.

Whether anyone at the Capitol has figured out the department's screwball accounting is an open question. Calls to Senator Hee's office were not returned by press time. *Environment Hawai'i* asked the DLNR for an explanation of the accounting procedures used to arrive at these supposed "savings," but no response had been received by press time.

— P.T.

top-three list for vacancy problems. However, in recent years, it has had trouble filling its positions. Asked about that, Thielen attributed many of DOCARE's vacancies to the fact they were for positions authorized by last year's Legislature, "and in creating new positions, we have to go through a series of paper-work steps – create the job, get approval to fill it, and only then can we hire." A further confounding factor that slows down the hiring process for DOCARE enforcement officers is the fact that minimum qualifications for most positions include law-enforcement training and for all officers an extensive background check. A recent recruitment drive for more senior-level officers, Thielen said, ended after "we didn't find anybody who met the minimum qualifications... or, in some cases, in their background, they had incidents which disqualified them from law enforcement." Despite the problems in recruitment and the fact that for three clerical positions vacant since 2005 there has been no appropriation made for two years, the department is requesting in this year's supplemental budget an additional 15 positions (11 officers, four clerks).

Another issue that arises on examination of the DOCARE spreadsheet are five vacant enforcement-officer positions paid for by the boating special fund. "I think these are the five positions created a couple of years ago under

a legislative budget proviso to provide cruise ship security at small boat harbors in Maui and Kona," Thielen said. "DOBOR was going to be doing that security, but as the time neared, the decision was made by the prior chairman [Peter Young] to have it temporarily assigned to DOCARE..."

"When the auditor did an audit of DOCARE, the division was criticized for mission creep. One criticism was that the focus on things like cruise ship security was not appropriate. So the department began taking steps to revert the security to DOBOR, since this was always supposed to be a temporary measure.

"DOBOR has picked up security duties in Maui and is phasing in in Kona. But because the [Department of Budget and Finance] has these positions listed under DOCARE, we're asking the Legislature in our supplemental budget request to transfer these lines back to DOBOR."

The actual work involved does not require enforcement officers, Thielen said, but will be done by planners to be hired by DOBOR. "They're not doing security. They're doing administration of cruise-ship security," she said. "They'll manage schedules, tendering, working with the Coast Guard, and handle contracts with private security companies." If security is elevated

above the current level, DOCARE would be involved, but even so, Thielen said, "day-to-day involvement would be significantly less than it is now."

A Historic Problem

The Historic Preservation Division has been under fire in recent years, with charges of incompetence, inefficiency, and mismanagement being just a few of the accusations leveled against the agency. Recently, Thielen appointed a committee to look for a new administrator to replace Melanie Chinen, who resigned late last year.

According to the Variance Report, as of September 30, 2007, 12 of the 13 permanent, full-time positions in Historic Preservation were filled. Notes accompanying the report, however, stated that five positions "were being actively recruited" as of that date.

According to the spreadsheet information provided to *Environment Hawai'i*, as of January 25, 2008, the division had nine vacancies. Of those, six were reported to have been vacant as of September 30, 2007 (five of them empty since 2006).

Environment Hawai'i asked how the Variance Report, with its one listed vacancy, could be reconciled with the spreadsheet.

As of press time, no response had been received. —**Patricia Tummons**

Forest from page 1

prise anyone who has conducted research on the ground, but it "dramatically confirms impressions from the ground that invasive exotic species are changing the structure of Hawaiian forests in a major way."

Authors of the study included Asner and Robin Martin, both of the Carnegie Institution of Washington, based at Stanford University, Stanford's Peter Vitousek, and Flint Hughes of the U.S. Forest Service's Institute of Pacific Islands Forestry, based in Hilo.¹ Using an array of sophisticated instruments, the team conducted aerial surveys of over a million acres of forested lands at elevations ranging from the coast to the tree line. All the areas surveyed were in one or another category calling for protective management, such as state-owned Natural Area Reserves or federal National Park Service lands.

High-Flying High Tech

One of the most remarkable things about

the research is the technology it uses. Over the last decade, Asner has worked to develop a means of studying forests using remote sensing technology, including satellites and planes. Satellites provide too little detail, however, and even high-resolution digital photographs from overflights don't provide enough information to be able to identify vegetation at the level of its species composition.

But by combining a high-powered laser system (Light Detection and Ranging, or LiDAR) with souped-up spectrometers, Asner has overcome both those drawbacks. A small plane outfitted with the instruments as well as a precise Global Positioning System is used as the research platform. From an altitude of 15,000 feet, the High-Fidelity imaging spectrometers (HiFIS) are able to capture and analyze light reflected from some 100,000 laser beams a second that are directed at the forest canopy. Part of the light in each beam is bounced back to the spectrometers each time it hits a leaf or a branch, but what isn't reflected continues down to the next layer of the forest, stopping only when it reaches the underlying terrain.

The result is a set of data from which one can reconstruct a three-dimensional image of the forest. The information gleaned from the lasers details the physical shape of the canopy and understory, as well as the terrain itself. By analyzing the reflected light, the spectrometers provide detailed information on the chemical makeup of vegetation at every level of the forest. Matching that profile against the unique chemical signatures of common native and invasive plants, the researchers are able to come up with maps that show precisely where Hawai'i forests are succumbing to the invaders.

After a year of work, the researchers honed in on 10 forested areas, ranging in size from 125 to 250 acres, representing five "pairs" of native-dominated and nearby alien-dominated forest. The invaded areas were analyzed for the presence of five invasive species: albizia (*Falcata moluccana*), tropical ash (*Fraxinus uhdei*), kahili ginger (*Hedygium gardnerianum*), faya tree (*Morella faya*), and strawberry guava (*Psidium cattleianum*).

Theme and Variations

What they found was that the five invading

¹ "Invasive plants transform the three-dimensional structure of rain forests," *Proceedings of the National Academy of Science*, March 3, 2008.

Five Foes of the Hawaiian Rain Forests

The invasive plants called out for special attention in the Carnegie Airborne Observatory surveys are among the most destructive of all forest invaders in Hawai'i. What follows is a short thumbnail sketch of each of them:

PHOTO: FOREST AND KIM STARR



Kahili ginger in flower.

Kahili Ginger, *Hedychium gardnerianum*
Native to the Himalayas, no one knows when this plant was introduced to Hawai'i, but with showy, fragrant flower stalks up to eight feet tall, presumably it was brought here as an ornamental. It thrives in wet habitats between sea level and 5,000 feet, forming dense mats that crowd out other species. It spreads both by seed and by rhizomes. The wilt-causing bacterium *Ralstonia solanacearum* may be able to hold its growth in check, but more work needs to be done in developing a dispersal method.

Tropical Ash, *Fraxinus uhdei*

This shade-tolerant tree from Mexico was widely planted in Hawai'i as a potential source of lumber. Reaching heights of 90 or more

feet, it forms canopies that shade out most understory species. Tropical ash colonizes disturbed areas in forests with its wind-dispersed seeds and prevents the re-establishment of native plants. Currently, only chemical herbicide treatment has been effective in controlling its spread.

Faya Tree, *Morella faya*

Faya, native to the Azores, Madeira, and Canary islands, was introduced to Hawai'i at the beginning of the 19th century, probably as an ornamental. In the 1920s and 1930s, faya was planted by the Territory of Hawai'i for watershed reclamation until its invasive qualities were recognized. A nitrogen fixer, faya adapts to a wide range of habitats. It quickly forms dense canopies, choking out natives. A type of fruit rot already found in Hawai'i, *Botrytis cinerea*, may be able to suppress the spread of faya. The wounded-tree method, cutting off the bark at the base and applying an herbicide, is another control method being used.

Strawberry Guava, *Psidium cattleianum*

Introduced in the early 1800s for its edible fruit, strawberry guava, native to Brazil, soon escaped cultivation. It reproduces quickly, with its dispersal aided by wild pigs and birds that eat the fruit. Strawberry guava is found

across a wide elevational range. The U.S. Forest Service has petitioned the state Department of Agriculture for permission to release a promising biological control agent, *Tectococcus ovatus*, against strawberry guava. *Tectococcus*, a small insect that creates leaf galls, is expected to spread gradually on the plant and reach damaging levels within a few years.

Albizia, *Falcata moluccana* and *Albizia chinensis*

Native to tropical Asia, albizia was introduced to reforest barren lands by botanist Joseph Rock in 1917. Spread by seed and fast growing, albizia thrives in nutrient-poor conditions. It can attain heights of 150 feet, with a crown extending half an acre or more. The roots supporting the tree fan out to cover an area just as large. Albizia is very susceptible to hormone type herbicides and reportedly susceptible to being killed by root damage from heavy equipment. The potential for biological control has not been evaluated, but finding any biocontrol organism to target albizia without damaging native trees is going to be difficult, since so many native tree species are also leguminous. — **Tara E. McCarthy**

Tara McCarthy is a graduate student in the Audubon Expedition Institute of Lesley University in Cambridge, Mass. She spent part of her spring break working with Environment Hawai'i.

species wrought substantial changes in the physical makeup of the forest in four different ways.

Forests invaded by the tropical ash and faya trees had much denser high canopies than those found in the typical native forest, dominated by 'ohi'a (*Metrosideros polymorpha*), the study notes. No more than 4 percent of incoming light was able to penetrate the canopies of mature tropical ash or faya tree, the study found, whereas in adjacent native forests, up to 13 percent of light penetrated the canopy. The mid-story species present in typical native forests, consisting of tree ferns and native shrubs, were all but absent in the invaded forests, while ground-covering ferns and native seedlings, present in the native forests, were detected far less frequently in the invaded areas.

"In sum," the authors write about the submontane and montane forests invaded by ash and faya tree, "these tall, high-leaf-volume invaders create a biologically impoverished environment beneath their

canopies."

They found a second pattern of invasion on the eastern flank of Kilauea volcano, where kahili ginger has become a problem. Compared with native forests, those invaded by the ginger had three times as much volume in the understory, but native plant volume in the mid-canopy area was two thirds of what it was in the native forest. The ginger forms "an impenetrable layer of rhizomes, which is likely the cause of the losses" in mid- and ground-level native species, the scientists write. In addition, they note that other research has already shown that the ginger reduces the nutrient concentrations in trees and depresses the regrowth of native canopy species.

The invasion of lowland forest in the Puna area by albizia represented yet a third type of invasion. Here, they write, even though the trees reach heights of 100 feet or more, the canopies are more open, allowing up to 21 percent of incoming sunlight to pass through. This, in turn, allows strawberry guava to form dense stands in the

midcanopy layer, which in turn shut out almost all light to the ground. "Our airborne measurements showed that this combination of invaders change the 3D volume of the forest by +55%, -66%, and -29% at upper, middle, and lower canopy levels, respectively," they write.

The results of Asner's team "strongly suggested" that the secondary invasion of guava makes it all but impossible for native regeneration in the understory level. In those rare instances where albizia was present without strawberry guava, "we found both native and non-native understory plants growing in high densities and abundances."

The last type of invasion is that of strawberry guava alone. In more than 200 acres, strawberry guava was found to have reached the upper canopy, with mature 'ohi'a trees "protruding very sparsely ... through the alien canopy."

Both airborne and on-the-ground surveys showed that the strawberry guava invasions allowed only 5 percent of incoming light to get into the understory. "In this

scenario, the invasive tree grows within a native canopy, closing at the midlevel position, and precluding the establishment and regeneration of other species."

Management Implications

Asner finds the results alarming. "Big island reserves are clearly endangered," he said. "Good grief! It ought to be on the top of everybody's list in Washington," he added. At some point, a threshold will be crossed when forest function is permanently impaired by changes in three-dimensional structure, he said—and forests in Hawai'i are approaching it at a precipitous clip.

Denslow, recently retired from the Forest Service's Institute of Pacific Islands Studies, agrees. "Alterations in forest structure cascade into impacts on ecosystem processes," she says. "Seedling establishment, species composition, and resources available to bird and insect communities will be affected as a consequence."

The work of Asner and his colleagues "is one of the first illustrations of the impacts of invasive species on native, intact tropical forest at a large scale," she says. "It highlights the vulnerability of even protected areas and otherwise healthy forests to invasive species, and the need for aggressive management to maintain conservation values."

One of the great values of the technology, in Asner's view, is that it can point managers in the direction of problems that, if caught early enough, can head off larger consequences. "Every time we fly over a place, we could change the management plan," based on what is learned, Asner said. "This would be an adaptive management strategy, if the state adapted to what we see."

Rhonda Loh, natural resources manager for Hawai'i Volcanoes National Park, was enthusiastic about the implications of Asner's work. "This underscores the need for landscape-scale management, using biocontrol," she said in a phone interview. "But just as important, it provides a technique for early detection. That's where we see a lot of promise. In areas where we have only a few small individuals [of invasive plants], we now have a technique that allows us to find them without having to walk every square foot."

Loh identified yet another benefit: "It gives us a better understanding of how invasives affect basic ecosystem properties, such as movement of water and nitrogen through the system. So it can give us an idea of how well some of our native canopy species respond after the removal of ginger."

Paul Conry, head of the Department of Land and Natural Resources' Division of

Land Board Authorizes Further Air Surveys

Last December, the state Board of Land and Natural Resources authorized a \$70,000 contract with the Carnegie Institution to use the Carnegie Airborne Observatory to develop detailed maps of three additional Big Island forest areas: the 2,600-acre Wao Kele o Puna forest, the Kapapala Canoe Management Area, and the Ka'u Forest Reserve.

Most of the funding for this project will come from the Wao Kele o Puna management fund of Department of Land and Natural Resources' Division of Forestry and Wildlife. DOFAW is in the process of adding Wao Kele o Puna to its forest reserve system. In the report submitted to the board proposing the project, DOFAW states that the area's dense vegetation and many lava cracks, tree molds, and open lava tubes make it difficult to collect baseline data using traditional on-the-ground survey methods.

"CAO is an excellent option for surveying [Wao Kele o Puna] for forest types, invasive species locations, understory vegetation, identifying possible hazards, and locating threatened and endangered species... in a manner that is safer, more cost effective, and more accurate than possible by traditional forest survey methods," the report states.

Using the Kapapala Canoe Management Area, DOFAW plans to compare

the cost effectiveness of the CAO system with traditional survey methods. The division has secured a \$37,000 grant from the Forest Service for this work, which will cover 800 of the area's 1,200 acres.

The survey planned for the Ka'u Forest Reserve is intended to accomplish several goals. Because the reserve supports the highest density of three endangered birds and is also a priority site for the reintroduction of the endangered 'alala into the wild, DOFAW plans to use the CAO to identify understory vegetation.

"In specific, we are interested in knowing if the CAO can identify understory vegetation in 8,000 acres that have already been surveyed using traditional forest survey methods. If so, we will not only verify existing critical habitat, but also document change in that habitat that has occurred over time. Conducting this trial on a portion of this Reserve is consistent with DOFAW's long term goal of mapping and monitoring the range and health of koa forests, as well as increasing critical habitat for Hawai'i's most endangered birds. The amount of dieback, possibly due to koa wilt, will also be identified. Furthermore, Ka'u's proximity to KCMA allows the most efficient use of limited resources," the report states.

— T.D.

Forestry and Wildlife, which oversees management of most of the areas surveyed in the study, had not seen the article. In a phone interview, he told *Environment Hawai'i* he wanted to have similar surveys of Hawai'i's forests done statewide. "One of the things we are trying to pursue, both nationally and locally, is to see this technology be adopted more for general survey and inventory uses," he said. "We're working with the Forest Service to see if we can get funding to have a forest inventory analysis done in Hawai'i, one of three states where this hasn't been done, so it will be possible to get this quality of information" for the entire state, he said.

Asked whether the specific information in the article would be translated into action anytime soon, Conry suggested it would be

used in developing management plans. "This fits into our watershed partnerships and their management programs, the NARS [Natural Area Reserve Systems] management plans... We've got the partnerships that can now begin to take this information."

"Where you've got it, we should use it. Where we don't have it, we should see if we can get the resources to provide better coverage."

In the meantime, Asner's group has already begun working with DOFAW to help plan fencing in the Laupahoe Natural Area Reserve. By controlling the movement of pigs, the state hopes to reduce the spread of strawberry guava in the area.

— Patricia Tummons

Working at 15,000 Feet, Greg Asner Is Still Firmly Rooted on Hawaiian Soil

Clearly, Greg Asner would rather not talk about his 15 minutes of fame.

"It's very embarrassing," he says of his having been named by *Popular Science* magazine last October as one of its "brilliant 10" scientists and researchers of 2007.

"It just came out of the blue," Asner said in a recent interview, "but if it draws attention to the problems we're addressing, I guess that's okay."

And these days, what's causing Asner to lose sleep are the many threats he sees to the survival of Hawai'i's native forests.

Asner, a staff scientist with the Department of Global Ecology at the Carnegie Institution for Science, at Stanford University, and his team of about 10 scientists and technicians, conduct research around the globe. In mid-March, they flew to Kruger National Park in South Africa for several weeks as part of a multi-year study. In the past, the team has looked at ecological issues in the southwestern United States, the Amazon, and elsewhere.

Yet Hawai'i remains a special focus. After receiving a degree in aerospace engineering, Asner came to Hawai'i in the early 1990s. Here, he found work as a field technician with The Nature Conservancy, where he was introduced to the challenges of managing natural resources in the face of limited personnel and funds, on the one hand, and aggressive invaders, on the other.

After his stint with TNC, Asner returned to school, receiving graduate degrees in ecology and biogeochemistry from the University of Colorado. For the last decade, he has been developing ways to streamline the process of gathering detailed information about natural resources on a large scale. The culmination of those efforts is the Carnegie Airborne Observatory, Asner's brainchild.

The observatory consists essentially of two instruments – one a Light Detection and Ranging (LiDAR) system that captures light reflected from up to 100,000 laser beams per second and which generates information on the physical characteristics of the landscape (forest canopy height, topography); the second is a high-powered spectrometer, analyzed by Robin Martin, Asner's wife and team member, which can measure the reflected light and generate information on the chemical properties of whatever the light hits. By comparing the known chemical profiles of plants with the chemical signatures read by

the spectrometer, it's possible to identify what plants are in the forest below, and where they are – down to a single tree.

Asner and his team mount the observatory in a small twin-engine plane, with a viewing hole cut into its floor. Flying at a height of up to 15,000 feet, for the last year, they've been mapping Hawai'i's forests, focusing on the Big Island, but with a few excursions to Kaua'i thrown in for good measure.

The observatory is the evolutionary result of many years of tweaking technology that most often was developed with altogether different applications in mind. "We started with cameras, and then began using the hyperspectral imaging and LiDAR combination in 2007," Asner says. "The second-generation Carnegie Airborne Observatory is going to be in the works soon."

"The whole process is based on increasing levels of technological mayhem," Asner says, describing the madness behind his methods. "Hardware is hard, but ecology is even harder. Driving everything is ecology."

Sustainability

"What is the sustainability of Hawai'i's protected areas – against invasive species, land use changes, and climate change? How sustainable are these reserves?" he continued. "What is the efficacy of the work that is being done to protect them?"

Using the airborne observatory, Asner and his team are able in hours to generate answers to questions that it would take months or years to resolve with traditional ground-based surveys. The observatory can map 20 acres per second, at a resolution of 1 meter. With Asner's maps, land managers can obtain near real-time information on what areas are vulnerable to invasion, where invasions are occurring, and where native forests are still intact.

Not that airborne surveys will replace old-fashioned field work. "We still need field measurements," Asner says. "Even now, we spend more time in the forest than above it."

"But measuring some things on the ground is tough. Tree height, for example. That's hard to do on the ground, but from the air, it's a piece of cake."

Also, it's not yet possible to identify every species of weed from the air.

"The signatures of some species can vary," Asner said. "Waiwi" – strawberry guava – "has a constant signature and is easy to map."

"Rubus, on the other hand" – blackberry –



Greg Asner

"has a variable signature, really variable. I think of it as sneaky. It can spread all over before it shows up in remote sensing. *Morella faya* is easy to spot, but *Miconia* is stealthy – until it gets to be a real problem."

For these reasons and more, Asner said, "we're careful not to oversell" the potential of airborne observing. "We're still working on the science, in addition to management-related studies."

It's difficult work, with clouds playing havoc with scheduled surveys (the observatory needs clear skies). Conditions in the unpressurized aircraft require everyone aboard to wear oxygen masks. But Asner and the observatory are here for the long haul. The president of the Carnegie Institution has signed an agreement with the U.S. Forest Service, allowing the observatory to have office and lab space at the Hilo headquarters of the service's Institute of Pacific Islands Forestry.

The observatory is collaborating with the state to map additional forest reserve areas on the Big Island. Recently, Asner and his team began working with Forest Service and Army staff at Pohakuloa Training Area as part of a Department of Defense restoration ecology project. "We're trying to increase the extent and diversity of dry forest" in the Pohakuloa and Pu'u Wa'awa'a areas of the Big Island, Asner says. "We decided we could figure out where to do restoration work with the airborne observatory – mapping the woody plants, the fire fuel, topography."

Although Asner's work is still in its early stages, one thing has already become clear from his surveys: "The best forests we still see are surrounded by 'a'a flows. As Rick Warshauer says, 'a'a is the friend of the forest."

—P.T.

WHATEVER HAPPENED TO...

The Food Irradiator at Honolulu Airport

When Michael Kohn announced his intention to build a facility at Honolulu International Airport to irradiate fruit for export markets, his plans called for it to be up and running by February 2006.

More than two years later, the license Kohn needs to operate that facility, which he calls Pa'ina in Hawai'i, is still held up in administrative appeals before the Nuclear Regulatory Commission's Atomic Safety and Licensing Board.

Last month, Kohn was hopeful that the NRC would short-circuit the appeals process by overturning the most recent decision by the Atomic Safety and Licensing Board. But without discussion, on March 17 the NRC postponed any action that would dismiss or overturn ASLB review of the case. Instead, it issued a ruling on questions that the ASLB had forwarded to the commission, seeking its guidance on questions related to safety that seemed, to the ASLB, to be unaddressed in the NRC regulations.

In a 25-page order, the NRC basically threw the ball back into the safety board's court, finding that nothing in the NRC regulations precluded the board from taking up issues relating to safety concerns over the proposed siting of the facility.

"I think it's a favorable outcome," said David Henkin, representing irradiator opponents Concerned Citizens of Honolulu. "I'd like to think the board will see the NRC guidance as I do, as a green light, in unusual situations, to look at the safety and environmental consequences" when an irradiator is proposed for a site such as the Honolulu airport.

A Brief Recap

After Kohn applied for the license in 2005, the NRC initially decided it could grant it without preparing an environmental assessment. That determination was successfully challenged, however, by an ad hoc group, Concerned Citizens of Honolulu. In December 2006, the NRC released a draft environmental assessment for the irradiator, which Kohn proposes to build on state-owned land lying between Lagoon Drive, on the ocean side of the airport, and an airport runway. Concerned Citizens then contested the sufficiency of the EA and a supporting report, which was supposed to analyze the effect of a natural disaster, such as a tsunami, and airline crashes at the site. Last June, the NRC released an

appendix to the draft EA, which was to address the impacts of a terrorist attack on the irradiator.

Last August, NRC staff issued the final environmental assessment and finding of no significant impact (FONSI).

Yet another challenge was made by Concerned Citizens, represented by Earthjustice attorney Henkin. The EA and the supplemental reports, Henkin argued, did not really take a hard look at environmental impacts, it failed to consider alternative sites and technologies, and the agency should have prepared a full environmental impact statement.

Contentious Decision

Last December, the Atomic Safety and Licensing Board, which handles administrative appeals of NRC staff decisions, determined that the first and second of these contentions merited further consideration, while it held off any decision on the third one. By upholding the contentions, the ASLB paved the way for further disclosure and argument on the points raised.

In challenging the sufficiency of the environmental assessment, Henkin said that the NRC staff did not address Concerned Citizens' detailed and voluminous objections on the draft. As the ASLB describes it, the group contends "that the staff's actions amount to an omission of any meaningful consideration of the intervenor's comments and, in turn, preclude the type of informed decision-making required by NEPA [National Environmental Policy Act]."

The ASLB agreed with the Concerned Citizens that the NRC staff had failed to address 12 of the 25 points they raised about the EA's sufficiency. As to the other 13, the ASLB found that "each is sufficiently addressed."

Here's a synopsis of some of the points raised by Concerned Citizens and upheld by the ASLB:

Transportation: Concerned Citizens claimed the EA did not adequately consider the possibility of transportation accidents involving the shipment of the cobalt-60 sources to and from Hawai'i. The staff responded by claiming it did not have to consider them, since such impacts are addressed in a generic environmental impact statement (GEIS) dealing with the transport of radioactive materials.

The ASLB disagreed: "Having introduced

transportation impacts in the draft and final EA, the staff cannot now fence off the subject from challenge," the ASLB found. "Because the applicant's proposed facility cannot operate without regular shipments of Co-60 sources, the transportation of the radioactive sources shipped to and from the facility, along with transportation accidents that are an inevitable fact of life, appear to be connected and intertwined actions whose potential impacts may need to be examined in the final EA... The staff's reliance on a GEIS... is too little and too late to defeat the contention."

Effect on Foods: The EA did not address, but should have done so, the impacts of eating irradiated foods on human health. In raising this objection, Concerned Citizens referred to recent studies that showed irradiated fats could promote the growth of cancers.


The ASLB found that indeed, such a potential impact would be "closely intertwined with, and connected to, the use of the proposed irradiator," and allowed further argument on the point. In opposition, NRC staff observed that other federal agencies, including the Food and Drug Administration and the U.S. Department of Agriculture, have determined food types that may be safely irradiated, and argued that any such discussion was outside the jurisdiction of the NRC. "In the context of the staff's compliance with the mandates of NEPA, however, the fact that other federal agencies have regulatory authority over the safety of irradiated foods does not automatically excuse the staff from considering in the final EA the health effects associated with irradiating the tropical fruits... at the proposed facility," the ASLB wrote, agreeing to allow a full briefing on this question.

This determination drew a swift response from Russell Stein, vice president of Gray*Star, which manufactures the irradiator. On January 4, Stein wrote the NRC directly: "We are stunned," Stein wrote. And while "we disagree with all of the decisions of the ASLB in this order, we are stunned that the ASLB ruled that the EA should potentially include the review of the safety of the irradiation of food," he said. "This is clearly outside of the purview of the NRC."

"We believe that the ASLB has grossly erred," he wrote, and "Gray*Star respectfully asks that the commission itself take up a review of this case." The ASLB order "will incur major costs and even greater delays... Without a commission review, this process will continue indefinitely. In the meantime, most likely, the irradiator will not be installed. Pa'ina Hawaii and the agricultural sector of Hawai'i are suffering and will continue to suffer irreparable harm."

Henkin, who was not copied on Stein's



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letter, eventually received a copy from NRC staff. On January 14, he wrote the NRC, expressing Concerned Citizens' opposition to Grey*Star's request. Henkin noted that Gray*Star was not even a party to the proceedings, and, as such, "may not make a request for review of the board's order." In addition, he wrote, the request "invites precisely the piecemeal interference in ongoing license board proceedings the commission has long disfavored." The order "neither denied nor granted Pa'ina's application for a materials license. Rather, it merely admitted two environmental contentions, leaving for later determination whether the final environmental assessment satisfies the NRC staff's legal obligations."

Under NRC rules, the commission has 40 days to initiate its own review of any order of the ASLB. They extended that in February to March, and on March 4, the commission secretary announced that she was extending until April 1, 2008, the time within which the commission could initiate its review of the ASLB order.

Terrorist Attacks: One of the glaring omissions in the EA, Concerned Citizens alleged, was the failure to analyze potential terrorist acts targeting the irradiator. At the time of the ASLB decision, a case that raised this point was pending before the NRC, concerning the Diablo Canyon nuclear power plant's storage of spent fuel. In the December order, the ASLB announced it was withholding a ruling on this point until "we have the benefit of the commission's guidance from its treatment" of the Diablo Canyon case.

The NRC order was issued on January 15, finding that an EA has a two-fold function: informing both the public and the decision-maker of the possible environmental impacts

of a project. Still, the NRC allowed sensitive information of the sort that could be withheld under the Freedom of Information Act to be withheld from publication in the EA. On the other hand, the NRC did require the staff to list the documents it relied on in making its environmental analysis and provide also, for each withheld document, the reasons why a FOIA exemption is claimed. Such a compilation is described as a *Vaughn* list, named after a federal court case that established the precedent.

Last month, the ASLB issued its order on the argument by Concerned Citizens that the environmental assessment failed to address the threat of terrorism. It is now requiring only that the NRC staff prepare a *Vaughn* index, describing the privileged documents it relied upon in preparing the EA, and release of the documents that are not exempt from disclosure.

The Paths Not Taken

The environmental assessment, Concerned Citizens claimed, did not "rigorously explore and objectively evaluate" any alternative sites or technologies other than the one being proposed by Pa'ina Hawaii. The ASLB upheld this point, agreeing that fuller discussion of alternatives would need to be made.

Concerned Citizens say, in effect, "that for the purposes of complying with NEPA, an adequate environmental assessment must provide a rigorous and objective evaluation of the relative environmental costs and benefits of the methyl bromide gas and heat treatment technologies in relation to the proposed Co-60 irradiator as well as consider the alternative technology of an electron beam irradiator," the ASLB wrote in summarizing this contention. "Thus, the contention claims that the staff's actions amount to an omission both of any rigorous and objective evaluation of the relative costs and benefits of the two alternative technologies briefly mentioned by the staff and of any consideration of the electron

beam irradiator alternative." The ASLB agreed that this omission merits further briefing.

As to the failure to consider alternative sites, Concerned Citizens, "relying on its expert's declarations ... states that (1) sites located away from the lagoon at the airport would eliminate threats from tsunami run-up and hurricane storm surges; (2) sites on solid ground, rather than unconsolidated fill, would eliminate liquefaction during earthquakes; and (3) sites away from the airport runway would reduce the threat of airplane crashes."

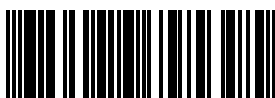
NRC staff opposed the argument, saying it is not "required to consider remote and speculative alternatives."

But the ASLB agreed with Concerned Citizens, finding that "the merits of the legal issue contention can only be addressed after the contention is admitted. Finally, and more importantly, where, as here, the burden of compliance with NEPA falls on the staff, the obligation to examine alternative sites falls upon the staff and not the intervenor."

The Human Environment

The last argument that the Concerned Citizens raised was that the irradiator may harm the human environment, a possibility that triggers the need to prepare a full environmental impact statement. But given that the two arguments as to the insufficiency of the EA and the failure to consider alternatives were admitted for further review, the ASLB wrote, this argument was premature. "[S]hould we find that the final EA is adequate, we will then be in a position to determine whether the proposed irradiator might cause significant degradation of some human environmental factor, and thus require the staff to prepare an EIS. On the other hand, should we find that the final EA is inadequate, the EA will need to be supplemented or amended before it can be determined whether an EIS is required."

— *Patricia Tummons*



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