

# Out of Sight, Out of Mind

Discussions of sewage are not generally the topic of polite conversation. With cesspools and pipes that carry human waste to treatment plants usually hidden well out of view, critical matters of sanitation rarely receive the attention they are due.

But in every climate change scenario, the thousands of cesspools and other sewage infrastructure in Hawai'i that lie just feet from the coast are pretty much sure to fail. And the consequences will be disastrous for not only human health, but the health of nearshore ecosystems as well.

In this issue, we look at the mechanisms of that failure, the seeming inability of the state to address it, and an example of how one planning body's discussion of the problem, in deliberating on a permit for a Kona B&B, highlights the hurdles in arriving at a solution.

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# Rising Seas Compromise Coastal Cesspools, Deliver Sewage to Nearshore Ecosystems

Contamination of coastal waters caused by sewage from cesspools and other onsite sewage disposal systems (OSDS) as well as sewage infrastructure will only increase with the rise in sea level over the next few decades.

In fact, it is already occurring, especially at spring and king tides.

Two University of Hawai'i researchers have been studying just how this contamination occurs: Dr. Shellie Habel, a Sea Grant agent with the University of Hawai'i working with the state Department of Land and Natural Resources' Office of Conservation and Coastal Lands, and Dr. Trista McKenzie, a post-doctoral researcher at UH's School of Ocean and Earth Science and Technology.

Both described their recent work at a webinar hosted by the university's Water Resource Research Center and the 'Ike Wai project. Habel has modeled the impact that rising sea levels will have on cesspools in the Honolulu urban core. Although the area is served by the city's Sand Island wastewater treatment plant, the largest in the state, processing an average of 65 million gallons a day of sewage, hundreds of homes and businesses continue to dispose of wastewater by means of cesspools or other OSDS.

(Asked why there remain so many unsewered buildings in Honolulu, Habel said, "Lots of folks in the primary urban core area might not even know what their system is." In addition, digging new laterals – connections between buildings and sewer mains – is difficult in Waikiki especially, given the likelihood of disturbing 'iwi bones, other cultural assets, and buried infrastructure.)

Habel presented a map of OSDS from Kapi'olani Park in the east to the *Continued on Page 8* 



A cesspool in Punalu'u, O'ahu, exposed by coastal erosion.



# **NEW AND NOTEWORTHY**

**Recycling in Good Conscience:** In 2019, Hawai'i exported more than 10 million pounds of plastics for recycling to destinations selected almost always based on cost.

But, as Senate Resolution 12 notes, "endof-life processing for recyclable plastics and waste in many of the countries in which Hawai'i's recyclable waste ultimately arrives are often handled in a manner that cause[s] harm to human health and local environments."

The resolution, which was adopted by the Senate on March 25, urges the Department of Health's Environmental Management Division to "ensure that destinations to which the state's recyclable waste is transported ... abide by the environmental standards" set forth in the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. The convention entered into force in 1992

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#### Directors

Patricia Tummons, President and Treasurer Deborah Chang Teresa Dawson Vice President Secretary Valerie Monson, Director and, as of January 1 of this year, requires trade controls for all mixed plastic waste that is not destined for environmentally sound recycling.

The resolution, introduced by Karl Rhoads, also urges counties to adopt the same practice.

A companion measure in the House was passed out of two committees but had not been voted on by the full chamber by press time.

**Foundational Fight:** The Territory of American Samoa is continuing its fight to keep longline fishing vessels from expanding their grounds 16,817 square nautical miles closer to the islands, despite efforts by the National Marine Fisheries Service and the Western Pacific Fishery Management Council to do just the opposite.

In 2016, based on the council's recommendations regarding ways to help the territory's foundering longline fleet, NMFS opened up most of an area that had been closed to large vessels since 2002.

The territory sued, arguing that the 1900 and 1904 Deeds of Cession protect the cultural fishing rights of the people of American Samoa. The deeds "protect the individual rights of all people dwelling in



# Quote of the Month

"A statute permitting the president in his sole discretion to designate as monuments 'landmarks,' 'structures,' and 'objects' ... has been transformed into a power without any discernible limit to set aside vast and amorphous expanses of terrain above and below the sea."

- U.S. Chief Justice John Roberts



Longliners at Pago Pago, American Samoa.

Tutuila to their lands and other property," and require the United States to recognize "the rights of the chiefs in each village and of all people concerning their property according to their customs."

The U.S. District Court ruled in favor of the territory, but last September, the 9th Circuit Court of Appeals overturned that decision, finding that NMFS's evaluation of the effects the rule would have on traditional 'alia fishers was adequate.

On February 22, the territory filed a petition for a writ of certiorari with the U.S. Supreme Court, asking the court to decide whether the Deeds of Cession, "by which the Territory of American Samoa became part of the United States, establish binding and enforceable obligations on the United States and its agencies."

Approximately 120 years after the deeds were signed, the United States and its agencies "have disavowed their obligations under the Deeds of Cession. This reversal, which was completely unexpected and remains entirely unexplained, strikes at the heart of the relationship between American Samoa and the United States," the petition stated.

It continued that the one-paragraph decision by the 9th Circuit did not "address the objections raised by officials of American Samoa concerning the legal effect of the Deeds of Cession, the potential impact of the revised regulation on Samoan culture, or the NMFS's abandonment of a standard that accounted for these legal and cultural considerations."

The U.S. Department of Justice has until April 28 to reply.

# Are Pacific Marine Monuments Safe Now? Maybe Not, Chief Justice Roberts Suggests

For more than a decade, the Western Pacific Fisheries Management Council has fruitlessly decried the proliferation and expansion of marine national monuments throughout the Pacific, beginning with President Bush's establishment of Hawai'i's Papahanaumokuakea monument in 2006.

But when Donald Trump became president in 2017 and ordered a review of certain monuments established since 1996, the possibility that commercial fishing could return to the Northwestern Hawaiian Islands' Exclusive Economic Zone and to waters surrounding Rose Atoll in American Samoa, the Marianas Trench, and the Pacific Remote Island Areas seemed greater than it had ever been.

After reviewing more than two dozen monuments, then-Interior Secretary Ryan Zinke concluded in a 2017 report that of the Pacific marine monuments, only the Rose Atoll monument and the expansion area around the Pacific Remote Islands monument should be amended or the boundaries revised to comply with the Antiquities Act, "while also allowing the regional fishery management council to make fishery-management decisions."

Zinke noted that despite an apparent lack of adherence to the purpose of the Antiquities Act, "some monuments reflect a long public debate process and are largely settled and strongly supported by the local community."

More recently, Trump issued executive orders seeking ways to make the U.S. fishing industry more competitive and to reduce regulations to promote economic recovery. These orders also opened the door to changing the Pacific monuments' boundaries and/or fishing restrictions.

To the council and its executive director Kitty Simonds, the best way to achieve the executive orders' goals, as they related to the U.S. fishing industry in the Western Pacific, was to lift the fishing restrictions in the Pacific marine national monuments.

In the end, though, despite Zinke's recommendations and Wespac's multiple pleas to remove the fishing bans in all four Pacific marine monuments, Trump took no action on them before leaving office. He did, however, lift the commercial fishing ban in the Northeast Canyons and Seamounts Marine National Monument in the Atlantic.

# 'How Far We Have Come'

With Joe Biden now president, it remains to be seen whether the new administration will roll back any of the marine monuments' existing protections. Instead, on his first day in office, Biden signed an executive order that requires the Secretary of the Interior to review Trump's amendments to the boundaries of and conditions for the Bears Ears National Monument, the Grand Staircase-Escalante National Monument, and the Northeast Canyons and Seamounts Marine National Monument, "to deter-



The Laysan albatross known as Wisdom, pictured here on Midway Atoll with one of her chicks, is the world's oldest known banded wild bird. The Pacific Islands Fisheries Science Center has reported that, when they were still allowed to fish there, Hawai'i longliners caught significantly more albatross inside the Papahanaumokuakea Marine National Monument expansion area than outside.

mine whether restoration of the monument boundaries and conditions that existed as of January 20, 2017, would be appropriate."

But a statement made last month by U.S. Supreme Court chief justice John Roberts in a case regarding the Northeast Canyons and Seamounts monument raises the possibility that national monument boundaries and restrictions may still be vulnerable to manipulation via a court challenge.

On March 22, the high court unanimously agreed to not hear an appeal by the Massachusetts Lobstermen's Association and other fishing industry groups of a D.C. district court decision to uphold the establishment of the 3.14million-acre marine national monument five years ago.

In his statement on the groups' petition for a writ of certiorari, Roberts explained that the Antiquities Act "originated as a response to widespread defacement of Pueblo ruins in the American Southwest" by pottery diggers. The Act provided a "mechanism for the 'preservation of prehistoric antiquities in the United States," he wrote. In addition to objects of historic interest, the act was meant to protect those of scientific interest, as well.

Roberts pointed out that under the act, the areas a president may protect as part of national monuments must "be confined to the smallest area compatible with the proper care and management of the objects to be protected."

"Somewhere along the line, however, this restriction has ceased to pose any meaningful restraint," Roberts wrote. "A statute permitting the president in his sole discretion to designate as monuments 'landmarks,' 'structures,' and 'objects' ... has been transformed into a power without any discernible limit to set aside vast and amorphous expanses of terrain above and below the sea.

"The Northeast Canyons and Seamounts Marine National Monument at issue in this case demonstrates how far we have come from indigenous pottery," he wrote.

Since 1920, the Supreme Court has consistently sided with past presidents in challenges to very large monuments, for example, the 808,000-acre Grand Canyon National Monument, and those that protect marine waters, submerged lands, ecosystems, and wildlife.

Even so, Roberts wrote, "We have never considered how a monument of these proportions—3.2 million acres of submerged land—can be justified under the Antiquities Act. And while we have suggested that an 'ecosystem' and 'submerged lands' can, under some circumstances, be protected under the Act, see Alaska v. United States, 545 U. S. 75, 103 (2005), we have not explained how the Act's corresponding 'smallest area compatible' limitation interacts with the protection of such an imprecisely demarcated concept as an ecosystem. The scope of the objects that can be designated under the Act, and how to measure the area necessary for their

# Feds Seek Input From Fishery Councils On Climate Crisis, Conservation Goals

"We know in many places of the country, our fisheries are being affected by climate change," Sam Rauch, NOAA's deputy assistant administrator for regulatory programs told the Western Pacific Fishery Management Council (Wespac) last month.

Fish stocks are moving from traditional fishing grounds; maybe new stocks move in, maybe not, he continued, adding that ocean acidification can affect shellfish communities.

"Dealing with these difficult issues is not something you can do in a vacuum," he said.

Recognizing that, President Joe Biden on January 27 signed executive order 14008, "Tackling the Climate Crisis at Home and Abroad." The order calls on the Secretary of the Interior, in consultation with the heads of various departments and agencies, to submit a report to the newly created National Climate Task Force this month recommending steps "to achieve the goal of conserving at least 30 percent of our lands and waters by 2030."

Those steps would be taken, "working with state, local, tribal, and territorial governments, agricultural and forest landowners, fishermen, and other key stakeholders," the order states.

The order also tasked the National Oceanic and Atmospheric Administration with collecting input from "fishermen, regional ocean councils, fishery management councils, scientists, and other stakeholders on how to make fisheries and protected resources more resilient to climate change, including changes in management and conservation measures, and improvements in science, monitoring, and cooperative research."

On March 3, NOAA published an item in the *Federal Registers*eeking public comment on this directive. Responses had to be received by April 2.

With regard to the "30 X 30" goal,

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proper care and management, may warrant consideration—especially given the myriad restrictions on public use this purely discretionary designation can serve to justify."

Roberts noted that the petitioners in the Northeast Canyons case failed to suggest what the act's "smallest area" clause means or provide any standard that might guide the court's review. Still, he continued, "We may be presented with other and better opportunities to consider this issue without the artificial constraint of the pleadings in this case."

He suggested that those opportunities include five active cases involving the Cascade-Siskiyou National Monument expansion and its effects on commercial logging, as well as challenges to Trump's changes to the Northeast Canyons and Seamounts, Grand Staircase–Escalante, and Bears Ears national monuments.

## 'Glimmer of Hope'

University of Hawai'i professor Alison Rieser, an expert on ocean and coastal law, said she believes Roberts would have granted the petition. "He just couldn't get three other justices to vote for review, and for good reason. ... The petitioners didn't plead sufficient facts or present a case on why the monument is not the smallest area compatible. That would have been hard to do since there is probably lots of evidence in the record that the White House worked with scientists and proponents to reduce it to the smallest area," she said, referring to a July 2020 article published in *Frontiers in Marine Science*, which details the scientific basis for the monument designation and its boundaries.

The Natural Resources Defense Council, the Conservation Law Foundation, the Center for Biological Diversity, and R. Zack Klyver pointed out in their brief opposing the petition that "Congress has had over four decades to correct any mistake it saw [with the designation of monuments under the Antiquities Act], and it can still do so at any time. Indeed, petitioners note that Congress has-more than once-taken action to limit the president's Antiquities Act authority in response to perceived overreach. But Congress has never imposed similar limitations on the president's authority to designate monuments in the ocean."

the Council Coordinating Committee, composed of all of the heads of the nation's regional fishery management councils, sent a letter to the secretaries of the Department of the Interior and the Department of Commerce, arguing that that goal has already been met.

"[W]e submit that the MSA [Magnuson-Stevens Act] and its implementation through the RFMC [regional fishery management council] process, as a measure of progress, already conserves and protects more that 30 percent of marine fishery resources and habitats. The MSA not only works well but is the gold standard worldwide for sustainable fishery conservation programs," the committee wrote.

"Should any additional needs for conservation of marine fishery resources be identified as part of the process of implementing this EO, they should be authorized only through the robust, open public process established by the MSA," it continued.

Rauch noted that the order does not define "conserving" and that he expects *Continued on next page* 

Rieser, who joined in an amicus brief in the D.C. Circuit Case on the issue of whether the Antiquities Act applies to the EEZ, said that Roberts' statement may tempt some litigants to somehow challenge the Pacific marine monuments in court.

At the Wespac meeting last month, council member John Gourley said Robert's statement gives a "glimmer of hope" to those who have wanted to see fishery activities in the monument waters return to regulation under the Magnuson-Stevens Act (MSA). The MSA tasks the fishery councils with providing management recommendations to the National Marine Fisheries Service.

Gourley read parts of the statement aloud, adding, "It really hits home some of the long conversations we've had over the years."

None of the other council members had any comment on it, but later in the meeting, the council renewed its efforts to lift monument fishing restrictions, albeit just in the Pacific Remote Islands Marine National Monument. The council voted unanimously to send a letter to the Biden administration asking him to do so.

### Wespac from Page 4

the Department of the Interior will at some point provide guidance on what it means and how much of the land and water is currently conserved.

Council chair Archie Soliai suggested that more than 50 percent of the country's waters were already conserved in the marine national monuments, which total nearly 760 million acres. Those in the Pacific account for all but 3.1 million acres of that.

Council member John Gourley expressed his concern about how that term will ultimately be defined. "I know there's a lot of people who want no take. ... I think that would defeat the purpose of conservation actually," he said.

Council member Ed Watamura noted that the state's similar initiative, Holomua: Marine 30 X 30, does not seek to simply protect 30 percent of marine waters in the Main Hawaiian Islands from all forms of fishing. Rather, it calls for 30 percent of nearshore waters in the Main Hawaiian Islands to be included in some kind marine management area (MMA).

Currently, only 6 percent of those waters are included in one of the state's various types of marine management areas (i.e., marine life conservation district, community-based fishing area, or fish replenishment area).

"Each MMA has its own set of rules which may include fishing regulations, such as restrictions on gear type, size and catch limits, or take of particular species. Rules may also limit or prohibit other activities, such as ocean-based tours, anchoring, vessel transit, and other recreational, commercial, or extractive activities," states the Department of Land and Natural Resources website on the program.

With regard to the national initiative, Gourley asked, "If the 30 X 30 is to be done on a regional basis ... perhaps we can ask to rescind some of the monuments so we can meet the goal of the legislation?" He added, "Of course, I'm being silly."

"You can always ask the question because why should the little dots on the map" — the Pacific Islands — "carry the burden?" Simonds replied.

She said the executive directors for all of the fishery councils are "looking at the entire U.S. picture and reviewing reports put out by different agencies about MPAs and closures. The enviros are going to be calling for no fishing. ... We shouldn't close fishing to everybody. We're working on something so that at our May meeting, we'll probably have a lot to share."

She also noted that the council's Scientific and Statistical Committee (SSC) had established a working group to develop recommendations in response to the executive or-

der. The group's members include Ray Hilborn, Don Kobayashi, Frank Camacho, Erik Franklin, Milani Chaloupka, and Jim Lynch.

Simonds added that her office had submitted draft comment letters to Wespac's executive committee, but that none were ready for review by the full council. "What we are describing are all of our ecosystem work beginning in the '90s with the coral reef ecosystem plan. ... After the council's discussion, we have to add a few other facts," she said, adding that her office will send out a second letter "depending on what the SSC working group comes up with."

Perhaps based on Gourley's joke about removing some of the Pacific marine national monuments, the council later voted to have the National Marine Fisheries Service ask the Biden administration to remove the fishing restrictions in the Pacific Remote Islands monument. It was not on the agenda as an action item.

At 314 million acres, it is the second largest marine national monument. Papahanaumokuakea in the Northwestern Hawaiian Islands is the largest.

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# Measures To Protect Oceanic Whitetip Sharks

The Western and Central Pacific stock of the oceanic whitetip shark, federally listed as threatened, is considered to be overfished and experiencing overfishing. Last month Wespac voted to recommend that the Hawai'i longline fleet eliminate the use of wire leaders, which are intended to weigh branch lines down to keep gear from flying back and injuring crew members.



"Farreid glass sponges are visible in the foreground of this fairly high-density sponge community found at about 2,360 meters (7,740 feet) depth. Corals were also present, but in lower abundance. Iridogorgia and bamboo coral are in the background," state's NOAA's website on the Pacific Remote Islands Marine National Monument. Credit: NOAA Office of Ocean Exploration and Research, 2017 Laulima O Ka Moana.

By getting rid of the wire leaders, it's expected that incidentally hooked sharks will be able to bite through the monofilament fishing lines and swim free with less trailing gear, which will increase their likelihood of survival.

The recommendation supports an initiative announced by the Hawai'i Longline Association (HLA) to end the use of wire leaders, a move that the Pew Charitable Trusts, the Ocean Foundation, and Earthjustice support.

The council also recommended that Pacific Islands Regional Office of NMFS, as well as its own staff, provide support to the HLA's efforts to train captains and crew on proper shark handling and gear

"The biggest gains will be in the international arena," HLA's executive director Eric Kingma told the council's SSC, noting that the U.S. fishery's take of the sharks accounts for only a small percentage of what's taken in the Western and Central Pacific.

The council voted to ask the State Department and NMFS to seek to increase the observer coverage rate in foreign fleets in the region to 10 percent, up from the 5 percent required by the Western and Central Pacific Fisheries Commission, and to require the use of electronic monitoring. HLA, Pew, and the Ocean Foundation had recommended the observer coverage rate be increased to 20 percent.

The council had also asked the department to "advance the reduction of wire leader usage and the use of circle hooks in the international longline fisheries as important steps to reduce fishing mortality," and to promote binding, international handling measures.

# Thousands of Cesspools Harm Reefs, But Fixing Them Will Cost Billions

Cewage is killing the reefs of Hawai'i.

Sure, other factors are at play. There's overfishing, especially of herbivores. Physical damage from hurricanes. Chemicals in runoff from former plantation fields and lawns, oils from highways and leaking underground tanks and pipes. And, not least, warmthere is the least enforcement of fishing regulations.)

During a webinar last December on sewage impacts in Hawai'i, Element Environmental's Daniel Amato noted that Hawai'i reefs evolved in a low-nutrient system. The state's tens of thousands of cesspools are sending raw sewage straight "from your toilet

"Probably the biggest problem in terms of the connection between land and our reefs and our ocean's health lies in onsite sewage disposal systems." — Greg Asner

ing ocean temperatures that can result in bleached corals. All contribute to the harm.

The Hawai'i Department of Health has estimated that there are around 88,000 cesspools statewide, releasing some 55 million gallons a day (mgd) of untreated sewage to the environment.

If nothing is done to curb the flow of nutrients carried into nearshore waters by means of submarine groundwater flows, Hawai'i's coastal ecosystems as we know them now are pretty well doomed.

They already have been seriously compromised. Last year, Greg Asner and colleagues published a report that found the major factor accounting for a 10-year decline of 45 percent in adult fish biomass along the west coast of Hawai'i island was nitrogen coming from landbased sewage disposal.

"Probably the biggest problem in terms of the connection between land and our reefs and our ocean's health lies in onsite sewage disposal systems," Asner said last month at a two-day virtual Sustainability Summit sponsored by the County of Hawai'i. In west Hawai'i island, most sewage disposal is through cesspools, accounting for some 680 million gallons of wastewater released to nearshore waters in 2017. (Not that sewage is the biggest factor in all locations surveyed. The steepest declines in fish biomass were seen in South Kona, Asner said, in areas where

into a hole in your yard. ... When you add even small amounts of nutrients [to the ocean], it can really change the reef dynamics. ... The reef is covered in these alien seaweeds that fish don't like eating."

Cesspools that serve single-family homes, apartment buildings, churches, schools, and businesses are not the only contributor. They are just one class - albeit the largest one - of what are termed onsite sewage disposal systems (OSDS). Other types of OSDS include septic tanks and aerobic systems that discharge to a seepage pit and systems that employ trenches and soil treatment. The total number of OSDS statewide is put at around 110,000.

Municipal wastewater plants that inject treated sewage into deep holes in

more complicated.

# Financial Reckoning

For years, the state has attempted to figure out how best to convert cesspools basically, brick- or concrete-walled pits that receive untreated sewage - to other systems that remove or reduce nutrients before releasing the effluent to the environment.

In 2015, in recognition of the problem, the Legislature attempted to encourage homeowners with cesspools near drinking water sources, streams, or coasts to hook up to municipal sewer systems or replace them more effective individual wastewater systems by allowing tax credits of up to \$10,000 to offset the costs of upgrades, with a total of \$5 million a year in tax credits available. In 2018, just 41 taxpayers claimed credits, while in the previous two years, the total was 47. The tax credit program expired at the end of last year, with the tax credits for 2018 and 2017 totaling less than half a million dollars. (The Department of Taxation has released no figures for the tax credit program for 2019 or 2020.)

In 2017, the Legislature mandated that all cesspools would have to be eliminated by 2050 - with certain exceptions (including small lot size, steep terrain, or "accessibility issues").

That same year, the Department of Health (DOH) noted that replacing each cesspool with an improved treatment method could cost \$20,000 or more, with the total cost (in 2017 dollars) of \$1.75 billion to replace all 88,000 cesspools. That breaks down to \$54.7

"The reef is covered in these alien seaweeds that fish don't like eating." — Daniel Amato

the ground (such as those in Lahaina, Kihei, and Kahului, Maui) also contribute to the load. To address the inputs from centralized wastewater treatment plants that use injection wells will be challenging and expensive. But the very fact that they are centralized simplifies things.

When it comes to addressing the inputs from tens of thousands of individual cesspools, the problem is far million per year, if construction costs were averaged over the entire period from 2018 through 2049, it noted.

In 2018, the Legislature authorized the DOH to establish a Cesspool Conversion Working Group to develop a plan for attaining the goal of eliminating all cesspools by mid-century. "Making sure people understand why cesspools are a problem is a big challenge," the

Continued on next page

## Sewage from Page 6

working groups' Michael Mezzacapo said at the December webinar.

In a report just released in February, "Cesspool Conversion Finance Research Summary Report," the average cost is now pegged at \$23,000 per cesspool, for a total cost of more than \$2 billion.

This would represent a financial hardship for households with annual incomes below \$126,000, the report found. "Historically, affordability for water and wastewater service has been benchmarked as a percentage of median household income," it notes, with the U.S. Environmental Protection Agency setting affordability for these services at a rate of less than 2 percent of household income.

"Approximately 97 percent of all residents with cesspools have an income less than \$126,000 and thus would be financially burdened by the cost to convert," the report states. "If a \$10,000 rebate were provided to each household, approximately 85 percent would be financially burdened."

Hawai'i County has more than 48,000 cesspools, more than any other county in the state. It also has a higher percentage of households – 71 percent – that are not connected to centralized wastewater treatment plants. More than 9,000 of the cesspools are in areas where drinking water sources are vulnerable to contamination; almost 16,000 are in areas where they may impact sensitive waters, including coastal environments, including some of the most popular beaches and surf spots in Kona and Hilo.

And it also has "the greatest affordability challenges," the report notes, with a high percentage of the households now served by cesspools being unable to afford conversion costs without experiencing financial hardships.

Kaua'i County has just over 12,000 cesspools, with 54 percent of all households on the island unconnected to sewage treatment plants. Again, 95 percent of those households would experience financial hardship if required to upgrade to an approved wastewater disposal system.

Just 22 percent of Maui County households use cesspools (around 14,000 in total), but the financial challenges of paying for upgrades would hit them hard as well. On Moloka'i, 100 percent of the households relying now on cesspools would be unable to pay for them without undue hardship; on Maui island, that figure is 98 percent. (The report did not include figures for the island of Lana'i.)

The City and County of Honolulu has the lowest percentage of households served by cesspools—just 3 percent. Still, there are nearly 11,000 cesspools. Honolulu households have a higher income on average compared to other counties, yet many of those households now on cesspools would nonetheless face hardship if required to upgrade.

Now that the \$10,000 tax credit is off the table, it is not clear what financial assistance will be available to homeowners served by cesspools.

There may, however, be new sewage treatment options that cost less than the estimated average of \$23,000 per household. The study notes that some alternative sewage treatment technologies can cost as little as \$9,000. Mezzacapo said the cesspool working group is evaluating waterless options, small-scale treatment facilities and "all of the available technologies" and their respective costs.

Amato added that there has been a lot of energy and money spent, including by the Bill and Melinda Gates Foundation, to reinvent the residential toilet. "Some have literally no waste; they make clean water; they don't put wastewater into the ground; the solids can be used as fertilizer ... I think that we should keep an eye on these technologies as they become more and more available," Amato said.

This year Senate Bill 369 and a companion, House Bill 112, were introduced, establishing a "time of transfer wastewater inspection program" within the Department of Health. Anytime a residential property unconnected to a sewer system would be sold, a DOH inspector would determine whether the wastewater system required upgrades. If the system failed inspection, it would need to be replaced or repaired within one year, either by the seller or buyer.

The House measured died without a hearing. The Senate committees on

Agriculture and the Environment and Ways and Means held hearings in February. Testifying in favor of the measure was the Department of Health, which noted that both the U.S. Environmental Protection Agency and the National Oceanic and Atmospheric Administration have advised that the state needs to develop an individual wastewater system inspection program if Hawai'i 's coastal nonpoint pollution control program is to be approved. If not, the DOH warned, the state could lose \$1.1 million in federal funds. "This measure would be a starting point for developing an inspection program that is needed to satisfy federal requirements and it would also decrease the number of failing systems, thereby having a beneficial impact on water quality," the department stated in its written testimony.

A number of nonprofits and individuals also testified in support. The only opposition was from the Hawai'i Association of Realtors.

Ken Hiraki, the association's director of government affairs, said his group "supports the goal of protecting Hawai'i's drinking water, streams, ground water, and ocean resources. However, it could be years or a property owner may never sell their property. As such, point of sale requirements are not a practical solution to address the issue of individual wastewater system repair."

The Senate passed out the bill and forwarded it to the House for consideration. House leadership referred it to four committees; no hearing had been held on it by press time. The bill is unlikely to pass this year.

In addition to finding ways to get homeowners to convert their cesspools, Mezzacapo said it's also important to get different levels of government to work in concert to prevent sewage discharges into the ocean.

Suppose someone wants to create a subdivision and have a high density of septic systems adjacent to the coast, in an area that the DOH has concerns about. "Is that the best thing to do? That takes planning between the two entities" — the county and the DOH — "and it takes outreach to homeowners," he said. — *Patricia Tummons, with additional reporting from Teresa Dawson* 

#### Cesspools from Page 1

airport in the west, with each known OSDS color-coded red, yellow, or green as to whether it was already flooded at the ground surface, partially submerged in groundwater, or whether it was presumed to meet Department of Health guidelines, with at least 15 feet of unsaturated soil between the surface and the water table, based on current sea levels and the assumed elevation of groundwater head.

Nearly all – 86 percent – of the identified systems are already compromised (yellow), with a few already completely inundated (red). Only those furthest mauka were presumed to be compliant with DOH guidelines.

With sea level rise and eroding coasts, even more cesspools and other OSDS will fail, Habel said. To model this, Habel overlaid rising sea level scenarios – of 32, 60, 98, 122, and 152 centimeters, representing reasonable predictions of increasing sea levels from 2030 up to the end of the century – on the OSDS maps.

By century's end, the map was dominated by red symbols.

# Arbitrary Setbacks

Outside the urban core of Honolulu, coastal erosion and sea level rise are already exposing cesspools on beaches next to homes that are themselves being threatened by encroaching seas.

Habel gave an example of a house in Pupukea, on O'ahu's North Shore, where oceanfront homes have often resorted to extreme measures – sand burritos or illegal and often jerry-rigged defenses – in an effort to halt erosion. In December, the house was relocated to an area further from the shore on the same lot, the kind of shoreline retreat that generally is praised by planners. In connection with the move, the cesspool that had served the house was closed, replaced by a septic system with a leach field, which requires a minimum 50-foot setback from the coast.

"But there are two problems with relying on a 50-foot setback," Habel noted. "One is evident here: as the distance between the [onsite sewage disposal system] and shoreline decreases with erosion, systems can end up very near to the shoreline or directly on the shoreline, on the public beach."

"The second issue is the distance used to measure the setback when authorizing an OSDS. It isn't measured from the actual shoreline but from the tax-mapkey boundary," a boundary that rarely reflects actual shorelines in areas where erosion has occurred, as in Pupukea.

"For major changes, counties require shoreline surveys to be made, but authorization for installation of OSDS might not follow that same requirement," she said.

In the case of the Pupukea house, the distance of the new septic tank from the shore was 69 feet, as measured from the TMK boundary. However, as aerial photos clearly show, the actual distance is much less than the 50-foot setback, Habel said.

"When you look at how erosion is predicted to affect an area, both the leachfield and septic tank, as well as the relocated house itself, will be directly affected by erosion with as little as half a foot to one foot of sea level rise," she said.



Triangles show likely condition of OSDS in the Honolulu urban core with a 5-foot rise in sea level.

## Confirmation

"It's one thing to run models and simulate these issues... but it's another to actually confirm it," Habel said as she introduced McKenzie.

To determine the ways in which rising sea levels compromise sewage infrastructure, McKenzie looked at how groundwater flows shift in response to seawater. There are two ways in which rising seas can lead to sewage contamination of coastal areas, McKenzie explained: the direct way, with inundated cesspools or fractured sewer lines releasing contaminants as the water table rises.

Then there's the indirect means, with the flooding of storm drains that flow to the coast. "This pathway becomes a vector for wastewater transport when OSDS are in the vicinity or compromised sewer lines," they explained.

To confirm direct and indirect transport of contaminants, McKenzie sampled water in two low-lying areas of Honolulu, Waikiki and Mapunapuna, at spring, high, mid-, and low tides, with spring tides used as a proxy for conditions under higher sea levels.

Waikiki was marshland until the Ala Wai canal was dug. There, the suspected contamination in the Ala Wai canal is direct, coming from cesspools that are compromised as sea levels rise. Here McKenzie took samples at two sites along the Ala Wai and one near the small-boat harbor.

At Mapunapuna, near the Honolulu airport, the area regularly floods at high tides and in heavy rains as seawater rushes in through manholes, an example of the indirect means of contamination. Here, the samples were taken from water rising in three storm drains and again at a nearby coastal site.

To detect the extent of groundwater in the samples, McKenzie tested them for radon (a naturally occurring element in groundwater but not seawater), nutrients (signs of fertilizers and sewage), and other chemicals (including caffeine and pharmaceuticals).

As expected, storm drains in Mapunapuna quickly overflowed with seawater at spring tides, carrying into the streets contaminants from compromised sewage infrastructure – "which is not great," McKenzie said.

Samples from the Ala Wai also showed

## Cesspools from Page 8

tidally influenced changes in groundwater and pharmaceutical signals, confirming that as sea levels rise, contamination from wastewater will be an increasing issue.

Among the disturbing findings were the high levels of unregulated contaminants, called contaminants of emerging concern (CECs), in the sampled water.

More than 94 percent of the samples had at least one CEC, with caffeine and carbamazepine, an anticonvulsant drug, the most frequently detected, McKenzie said. Again, the presence of CECs and the fluctuation in their concentrations with the tides "provides concrete evidence of tidally influenced inundation of wastewater infrastructure," they added.

At Waikiki, CEC scores increased with rising tides, showing increased infiltration of groundwater. The opposite occurred at Mapunapuna, where seawater intrusion through the storm drain network, which already has contaminated water in it, leads to dilution of the sewage effluent.

"CECs are really interesting," McKenzie said, providing "a lot of potential to use in research." Yet, they added, "even in trace quantities, they're demonstrated to have negative impacts on the ecosystem."

The risk quotients for CECs are calculated based on the extent to which they exceed the Predicted No-Effect Concentration, or PNEC, and anything greater than a risk quotient above I poses a high risk for the ecosystem.

Sixty-two percent of the samples had risk quotients exceeding 1 for carbamazepine and caffeine. Samples taken at the Ala Wai and in both coastal sampling areas showed no presence of fluoroquinolones (antibiotics, including Cipro), which, McKenzie explained, degrade quickly in the presence of sunlight. At two of the storm drain sites in Mapunapuna, however, the fluoroquinolone risk quotients were 21 and 26.

McKenzie wrote up the results of the study in an article published in *Limnology* and Oceanography Letters, co-authored with Habel and Henrietta Dulai ("Sealevel rise drives wastewater leakage to coastal waters and storm drains"). In recognition of the high quality of the research, McKenzie was awarded the L&O Letters Early Career Publication Honor. — Patricia Tummons

# Planning Commission Confronts Challenges of Cesspool Conversion

Which has the greater value? Keeping a private swimming pool, to be used by a handful of guests at an exclusive Kona bed-and-breakfast that sits practically on the shore?

Or converting a cesspool that receives the sewage generated by those guests into a septic system that would provide at least some treatment of the waste before it enters the ocean?

The question arose last month as the Hawai'i County Leeward Planning Commission considered what upgrades should be placed as conditions on a permit to allow homeowner Arthur H. Arejian, a high-powered real estate broker in Southern California, to rent out four of the five bedrooms in the 2,000-square-foot house fronting Kahalu'u Bay to as many as 10 guests a night.

The public would surely benefit more from the cesspool, but removing the pool to allow installation of a septic system – well, "that's a big ask" of the homeowner, said Arejian's agent, John Papin.

It's not even certain that removing the pool that lies between the house and Kona's Ali'i Drive would be possible, given required setbacks and leach fields.

Commission chair Michael Vitousek recognized the problems that shoreline cesspools pose to water quality. "For a cesspool on a lot at the shore, the time for the sewage to reach the ocean is basically zero," he said. As part of \$150,000 in upgrades to the house planned in connection with the B&B, "maybe now is the time to request this. It would at least slow the leach of cesspool material into the ocean."

According to the application, the house sits on a 14,530-square-foot lot, with the house itself just outside a 20-foot setback from the shoreline, last certified some 36 years ago. That lot size of roughly a third of an acre, however, refers to the property line set when the lot was first subdivided decades ago by then-landowner Bishop Estate. For decades, much of that theoretical property has been submerged. At the time shoreline certifications were made in 1979 and again in 1985, the ocean had claimed more than half of the lot. Aerial photos today show the house sitting atop unvegetated rocks.

Were a shoreline survey to be done today, it is unlikely to show any distance at all between house and sea.

Pipan pointed out this "additional wrinkle" in obtaining approvals for a septic system. "To design and actually install a septic system there is going to be a little tricky, given the space constraints," he said. "If we plan to put in a septic system, this is going to instigate another round of Special Management Area permitting. The Planning Department will likely look at that certified shoreline from the 1980s and request that it be updated. A new shoreline may be closer to the dwelling and could put the backside of the dwelling within the 40-foot mandatory shoreline setback. And then we'd be in the position where state law prohibits us from putting in a septic system because it's too close to

Continued on next page



An aerial view of Arthur Arejian's house fronting Kahalu'u Bay in Kona.

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the shoreline. So what do we do in that situation? We would have to a) prepare an environmental assessment and b) seek a shoreline setback variance.... So it's not that we're averse to doing this. It's a good idea. It's just that there are complicating factors, namely the shoreline setback."

Bryan Lindsey, the architect designing the improvements to the house, told the commission, "There is no area, obviously, on the ocean side for installing anything." On the Ali'i Drive side of the property, "there's not much room... The feasibility doesn't look great."

Alex Roy, the Planning Department staffer who presented the department's recommendation for approval to the commission, noted that the cantilevered lanai of the house was already up against the 20-foot setback in 1985. "A 40-foot setback," what is now required, "would bring us somewhere just under the house structure, possibly even further," he said.

Anyway, "by converting from a cesspool to more of a drainfield structure, there seems to be some confusion that getting rid of the cesspool and putting in a new drainfield system would somehow alleviate material going into the water. That's not the case. It still would be leaching in, just in a much broader area," he said.

Extending the sewer service "is the best way to deal with septic issues," he said. But the county's sewer line, connecting to the Kealakehe wastewater treatment plant, ends some 1,200 feet to the north along Ali'i Drive. The line connecting to the private Keauhou sewage treatment plant is about the same distance to the south.

Deputy planning director April Surprenant was asked about the county's plans to extend the public sewer to this area. "We are considering some things in the next round of the general plan," she said, but "we're not ready to reveal that or discuss all of that quite yet. But those are part of the considerations going into our long-range plans as a whole. For now all we can go by is the direction and codes, laws, and rules as provided by the Department of Health." The state requires all cesspools, including the 49,000 in Hawai'i County, to be eliminated by 2050.

Roy spoke against the idea of requiring

Arejian to upgrade the home's cesspool. "To put the burden on the applicant, when they have very little room, may lead to future problems that would take a lot more engineering to resolve," Roy said. "There's just not the space to do something. If they have to deconstruct the house to put a septic system under it, the impacts from that process alone could be more detrimental."

"You're pretty much banking on the possibility of connecting to one of the two sewers, north or south, in the future," commissioner Nancy Carr Smith said.

"Not necessarily," Pipan replied. "Like I said, we're not opposed to converting to a septic system. The trick is, not having complete knowledge of where the certified shoreline lies right now would make that incredibly difficult, if even possible. A condition could be written such that if sufficient space, after a certified shoreline survey is conducted, is available to accommodate a septic system, then it would be installed given a timeline...

"Obviously a sewer system is ideal. There are dozens and dozens of homes along this stretch of Ali'i Drive that have no improved wastewater system. Many of those homes are million dollar homes. It makes sense for the county to have an improvement district, a contribution from each owner. These things are probably beyond scope of this permit, but I think there could be some condition that should an improvement district be established, the applicant would contribute his fair share to extend the sewer to his property." Carr Smith then asked if Pipan and his client had considered using the pool area for a septic system.

"We haven't spoken to an engineer," Pipan said. This is going to be a much bigger impact on the Special Management Area, decommissioning the cesspool, digging up the driveway in the parking area. We would have to rely on Mr. Arejian to see if he were amenable to losing the pool. I don't know, that's a pretty big ask. We can defer to him." Arejian, who was present on the Zoom screen, did not weigh in on this question.

Commissioner Mark Van Pernis objected to the idea of not requiring immediate upgrades of the cesspool, noting that Arejian could be expected to have income of \$20,000 to \$30,000 a month, so "he should be able to handle the cost." In response to concerns about the cesspool, Papin suggested that the permit include a condition requiring installation of an upgraded system only if it were determined to be feasible. "I would not like to put the applicant in a tough situation by agreeing to upgrade the system but have him not be able to do so due to the shoreline," Papin said.

Commission chair Vitousek elaborated on the matter offeasibility. It would not include asking the homeowner to tear down anything, he said. Rather, feasibility would include using just the area "outside of the space of the existing home and improvements," and pursuing "variances of setbacks if needed to allow the conversion."

As approved by the commission, the permit requires Arejian to make a fairshare contribution to a sewer district "if and when one is formed" near his property. In the meantime, he is to upgrade to a septic system within five years, "if determined feasible within the space provided." — P.T.

# **Kona Cesspools**

Along most of Ali'i Drive in Kona, cesspools release human waste to the sea with no treatment. But that's just a small part of the 6,500 cesspools in the area that discharge 4 million gallons of wastewater to the ocean each day. That includes 1,200 pounds of nitrogen and 600 pounds of phosphorus, to say nothing of the pathogens and pharmaceuticals found in human waste. (Figures come from a 2017 report by the Department of Health, identifying priority areas for cesspool conversion.)



Yellow dots show cesspools in the Kona area. Blue dots represent drinking-water wells.

# BOARD TALK

# Fate of Endangered Forest Birds Hinges On Landscape-Scale Mosquito Control

"It is a very dire situation. We have some strategies, and we're pursuing them as fast as possible on parallel tracks, but it's a lot of fingers crossed right now," Department of Land and Natural Resources director Suzanne Case told her fellow members of the Board of Land and Natural Resources last month.

At the board's March 25 meeting, the DLNR's Division of Forestry and Wildlife briefed the board on its plan to rescue between 20 and 30 critically endangered kiwikiu (Maui parrotbill) from their shrinking habitat and ensconce them at three mainland facilities until they can be released in a location safe from avian malaria-carrying mosquitoes.

Models have predicted that the west and east populations of the tiny honeycreepers will be functionally extinct in 2021 and 2026, respectively, according to state forest bird biologist Lainie Barry. A population is considered functionally extinct once it shrinks to 10 breeding pairs.

The bird's population was relatively stable between 1980 and 2001, with 400 to 500 individuals, but has plummeted since then. At last count, in 2017, there were an estimated 157 kiwikiu left in the wild. Barry said there is a concern that that trend has continued and there are now fewer than 157 left.

In October 2019, hoping to establish a new population on the island, the state translocated seven birds from the Hanawi Natural Area Reserve (NAR) and seven captive birds to the Nakula NAR. While they thrived initially, most of them quickly succumbed to avian malaria.

The Nakula NAR was believed to be safe from the disease, but since the release, additional surveys indicate there had been a drastic increase in mosquitos. During the 2019 release, there could have been a seasonal spike in the population – either that, or the high infiltration is the new normal at Nakula, Barry said.

In any case, the kiwikiu are highly vulnerable in their current habitat. Research has shown that the "mosquito zone" moves seasonally, Barry said, adding that changes in precipitation patterns are "creating a climate more amenable to mosquitoes and avian malaria transmission. ... The problem is getting steadily worse every year and we are running out of time."

Over the last few decades, kiwikiu have moved further upslope. "We're only finding them at the highest distributions now. ... If we get these 'king tides' of mosquito influxes upslope, it doesn't take much to infiltrate the kiwikiu habitat," she said.

A working group in 2020 found that the most important thing to do to prevent the species' extinction was to safeguard a portion of the population in captivity until a safe relocation site can be found. Right now, that doesn't exist on Maui, she said.

In the past, the San Diego Zoo has housed populations of the species, but it had limited success in captive breeding and now has no capacity for a new batch of kiwikiu, Barry said. The zoo already has its hands full caring for and rearing critically endangered 'alala (Hawaiian crow) and Kaua'i 'akikiki and 'akeke'e (both honeycreepers).

Removing 30 kiwikiu will mean the

birds will go extinct in the wild sooner than estimated, by about three years, she said. "But at the same time, it would give us something we don't have: a safe population that will be protected from avian malaira. ... We feel it would be worth the risk," she continued.

The National Aviary in Pennsylvania, the Smithsonian Conservation Biology Institute in Virginia, and the Tracy Aviary in Utah have all committed to taking the birds on. Right now, they have a combined capacity for 20 individuals. "We feel 20 individuals is not enough. We want to get at least 30 — 15 breeding pairs," she said.

The plan will be to capture the birds, hold them for a very short time in Hawai'i, then transport them to the mainland zoos as quickly as possible, she said.

In the meantime, the state is exploring the possibility of eventually translocating the birds to Hawai'i island, which she said may have more disease-free habitat than Maui. "We don't know yet if this is a viable option," she said, noting that potential impacts the kiwikiu might have on Hawai'i island birds, and vice versa, need to be evaluated.

Another project critical to the longterm viability of the species is the development of landscape-scale mosquito control.

Without landscape-scale mosquito control, Barry said, "we are going to lose *Continued to page 12* 



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not just the kiwikiu, but many other Hawaiian bird species."

Efforts are already underway to introduce male *Culex* mosquitoes that host a strain of the naturally occurring Wolbhchia bacteria that is different than the one found in Hawai'i. According to Barry, mating male and female mosquitoes must have matching strains of Wolbachia bacteria to produce viable eggs. If male Hawaiian mosquitoes with a unique strain can be reintroduced, they'll mate with wild females and will suppress the population, she said.

"This is being used around the world to target human diseases and it is being used on the U.S. mainland. We completed the transfer of Hawai'i mosquitoes to the mainland," she said.

She expects the DLNR will obtain a permit this year from the Hawai'i Department of Agriculture to import them back into Hawai'i. It will also apply for an emergency permit from the Environmental Protection Agency to do a pilot release.

She said if the state can get that emergency permit, a pilot release can happen next year. After further EPA approval of a biopesticide registration, a landscape-scale release could occur in 2024, according to her timeline.

## Birds in a Bucket

"Your timeline for projected extinction and things that need to happen ... It's too tight," board member Kaiwi Yoon said.

Barry said the functional extinction predictions are just based on models. "We do believe we have time before then. There are still birds in the wild. We know that. We feel like we need to act as soon as possible to get enough birds into captivity to establish a big enough population in captivity we can use to save enough species in the wild," she said.

Yoon asked about the other bird species that are facing the same fate as the kiwikiu. "It's not just the kiwikiu. There's a bunch of birds in this bucket," Yoon said.

Barry explained that the 'akikiki and 'akeke'e are in danger because they are found in a relatively low-elevation plateau on Kaua'i. "If we get that



Kiwikiu are estimated to become functionally extinct in the wild in a few years. The state hopes to capture about 30 of them to be the source of a new, possibly translocated population in the future.

inundation of mosquitoes, they have nowhere to go," she said. She also said Maui's critically endangered 'akohekohe (Crested honeycreeper) is also a species of concern.

There are 40 'akikiki and about 7 'akeke'e in captivity. "We're looking for other options for 'akeke'e, including potential translocation [to other islands]. ... Holding a captive population is not the solution," she said. She added that the captive 'akikiki aren't breeding well, either.

Board member Jimmy Gomes asked how the mainland facilities will create an environment that the island birds can get acclimated to.

Barry said they can create controlled climates, but that providing access to the native Hawaiian foods the birds would get in the wild will be limited. "They'll do what they can," she said.

Board member Sam Gon asked how the 'akohekohe would do in captivity.

Barry replied that it doesn't do well. "Even transporting the bird is risky. It's not a viable alternative. We are definitely concerned about that species, as well. ... For that species we're looking at landscape-level mosquito control as the thing that turns that population around," she said.

"The landscape mosquito control is likely to be the big answer for all our forest birds," Gon said.

Board member Chris Yuen said there are no guarantees that the proposed plan will work, but the only alternative is to let the kiwikiu go extinct.

To ensure there is high-elevation habitat available that Hawaiian forest birds can migrate to as temperatures warm, Barry said, in addition to the slow natural forest line movement that will likely occur, the state is planting vegetation above the tree line at several locations around the state "to get a head start."

Yoon asked what funding the state had for these initiatives.

DOFAW administrator Dave Smith said the work depends heavily on federal funds. "This is not just our issue. It's a federal endangered species issue, as well," he said.

There are "a whole bunch of irons in the fire" to protect the birds, he said. "We hope we can cobble together the money and people can understand the dire situation they're in."

Case noted that the National Park Service is also very engaged in the effort.

"It's really going to be a team effort to try to pull this off," Smith said.