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For Club members only!

Dawn Petschauer, Water Biologist, Public Works/ Sanitation, holds a honeyhead turbot, a species she uses in her research on emerging threats. (She threw this little guy back in the ocean.)

Tracking the New Threats

Steroids and pharmaceuticals are the latest threats to our oceans.

Fish, like this honeyhead turbot, are helping Public Works' Toxicity Unit track them down.

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Public Works

On the Trail of the New



Steroids, pharmaceuticals, pesticides and other pollutants are seeping into our oceans. Dawn Petschauer is the City’s newest and best weapon in tracking these chemicals of emerging concern.

Dawn Petschauer, Water Biologist I, collects specimens aboard the City's *La Mer* monitoring and research vessel.

- Prescription drugs
- Steroids
- Over-the-counter meds
- Personal care products
- Veterinary medicines
- Pesticides

Photos by Angel Gomez, Club Member Services Manager; and courtesy Public Works

Have you ever thought about what happens when you throw old prescription medications down the drain? Or what happens when pharmaceuticals are released from your body? Probably not, but Dawn Petschauer, Water Biologist I, Environmental Monitoring Division, Public Works/Sanitation, does. And the evidence she collects during special studies suggests that these compounds may be potentially harmful to marine life.

These medications include:

- Prescription drugs including hormones (birth-control pills, estrogen replacement drugs, etc.), antidepressants and antibiotics;
- Over-the-counter medications including pain relievers (aspirin, ibuprofen, etc.), cold/flu remedies, and antiseptics (germ-killing liquids);
- Personal care products (toiletries, cosmetics, etc.); and
- Veterinary medicines.

Another strong culprit in emerging threats is modern pesticides. To avoid runoff pollution, pesticides were reformulated. But now, those new pesticides that contain pyrethroid are also a threat. These threats are so new that there are no testing standards. And they

are in such trace amounts that the traditional measure – parts per million – isn't tiny enough. Now it's parts per billion, or even parts per trillion.

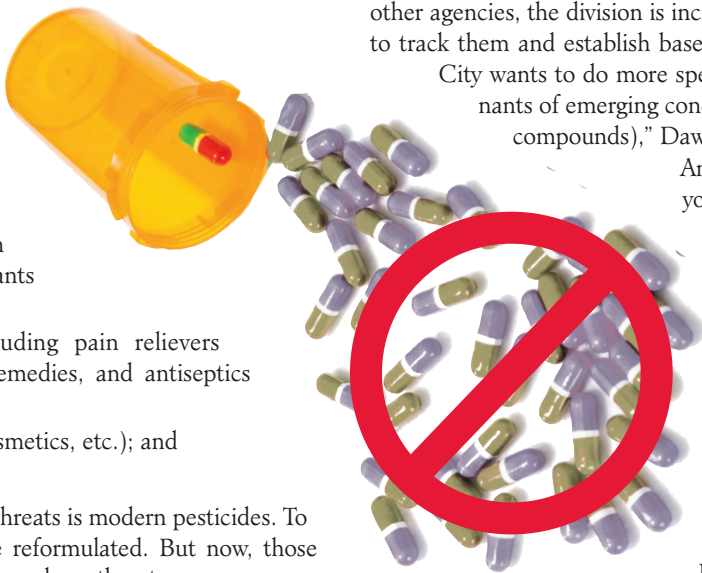
As the City's watchdog group is primarily a monitoring division – to monitor the water as a condition of Hyperion Treatment Plant's permit to operate – most of the work the division does is to monitor for known (traditional) pollutants that can be tracked against known levels of contamination.

But in efforts that are part of specific studies in cooperation with other agencies, the division is increasingly looking at new threats, trying to track them and establish baseline standards of contamination. "The City wants to do more special studies on these CECs (contaminants of emerging concern) and EDCs (endocrine disrupting compounds)," Dawn says.

And the division is involved in convincing you to not pour your unused pharmaceuticals down the drain!

As tracking these new pollutants is fairly recent, it has only just begun to be included in training programs. Dawn Petschauer's Master's degree thesis was on this very subject, and so she is the City's default expert in tracking these pollutants.

Starting on page 26, we'll describe how the Environmental Monitoring Division goes about its work helping to track the new threats. ■



Contaminants



Collecting specimens is part of the Environmental Monitoring Division's monitoring function. This is similar to the type of collection that goes on when tracking the new threats.

THE *ALIVE!* INTERVIEW

Restrain the Drain

On Tuesday, Feb. 1, Club CEO John Hawkins and *Alive!* editor John Burnes interviewed Stan Asato, Water Biologist III and supervisor of the Toxicity Unit, and Dawn Petschauer, Water Biologist I and City expert on emerging threats to ocean water. The interview took place near the unit's labs at Hyperion Treatment Plant.

ALIVE!: First, thanks for showing us around on the boat, and then in the lab. Tell us about the toxicity division. What's your purpose, and how do you do what you do?

STAN ASATO: The toxicity testing unit determines the toxicity of the effluent of the city's different treatment plans.

Effluent is...

STAN: Treated wastewater or treated sewage. The state issues a permit for the treatment plants to discharge effluent into the ocean. And before plants [like Hyperion] can discharge it, they have to make sure that it's not toxic. That's our primary duty – to make sure that the treatment plants meet the standards that the state has put on the City treatment plants.

How do you go about testing that?

STAN: We do it through what is called toxicity tests. You have two different types of toxicity tests. You have acute toxicity test, where you measure whether or not the animal can survive in the effluent for a certain amount of time. And then there's chronic toxicity testing, which looks at whether and animal can grow, develop normally, or reproduce successfully.

How many people are working in toxicity?

STAN: There's seven staff – five water biologists, one technician and then there's me. I'm the supervisor and supervisor makes seven.

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From left: Dawn Petschauer, Water Biologist I, and Stan Asato, Water Biologist III and Supervisor, explain their methods to Club CEO John Hawkins.

Public Works

Tracking the New Threats

As part of special research projects, the Environmental Monitoring Division tracks the new threats. Here's how:



Doing the Research

Most of the daily activities of the Environmental Monitoring Division involve monitoring the ocean for known contaminants. But from time to time, they are called on to assist in special research projects to track the new pollutants. Here are summaries of two recent research projects; more special studies on emerging threats are scheduled for 2011.

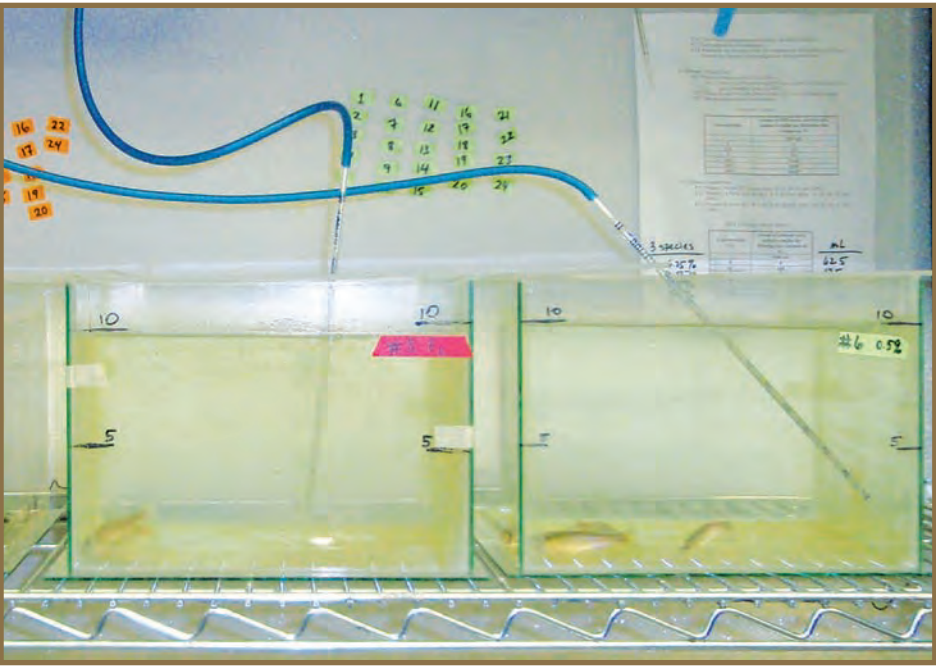
Ballona Estuary Sediment Evaluation

This special study aimed to determine the compound that was causing the heightened toxicity in the sediments in the Ballona Creek as it neared the ocean in Playa del Rey. The study found that the culprit were pyrethroid, a common constituent of pesticides.

Water Biologists from the Sanitation's Environmental Monitoring Division collect samples during last year's Ballona Sediment test, which found traces of pesticides at the bottom of Ballona Creek.



The New Contaminants *Alive! Feature*



Endocrine-Disrupting Compound Test

This study exposed lab-raised adult fathead minnows to two different strengths of treated wastewater (effluent) that is discharged from the Hyperion Treatment Plant outfall into the ocean (effluent). The purpose was to see if these effluents could affect the genes of the fish. The fish were also exposed to estradiol, a natural estrogen. This study was done in cooperation with the Southern California Coastal Water Research Project (SCCWRP) and the JWPCP (Joint Waters Pollution Control Plant).

Dawn Petschauer (bottom) conducts research during the Toxicity Unit's study on Endocrine-Disrupting Compounds.



Tracking the New Threats, continued page 28

“We saw...high levels of female reproductive hormones, specifically in male fish”

THE *ALIVE!* INTERVIEW

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Emerging Threats

So that's what you do most of the time here in the Environmental Monitoring Division. But let's talk about the work that you're doing with emerging threats. When did the City start looking at new threats to the ocean?

DAWN: Well, legacy compounds such as DDT and PCBs, which were more or less some of the first endocrine disruption compounds, have been monitored by the City for some time now under the [treatment plant] permit. The newer threats, I believe, started with my Master's research, where with the help of the City of Los Angeles, I looked at the potential impacts of environmental steroids, both natural and synthetic, on the physiology of flatfishes.

While you were at Cal State Long Beach.

DAWN: Yes. And from there [the Toxicity Unit has] facilitated other research incorporating these newer contaminants, including sediment toxicity testing. We participated in a regional sediment study in '07, and we continue to monitor sediment toxicity in the Ballona Wetlands annually. We are also participating in the NOAA [National Oceanic and Atmospheric Administration] mussel watch program this year.

It's natural that the City would have a young person on this because this is what they're teaching in schools now. Is that right?

STAN: I think it is. I think Dawn has studied the emerging ones, that's why there's a concern because those are the relatively new ones. There are also the legacy ones that she's mentioned. We've always known about DDT and PCBs. What they're finding out [now] is when they started reducing those numbers, other compounds replaced them. For example, DDT was the most common pesticide. But, because DDT was banned one of the alternatives is pyrethroids. Now they are finding that pyrethroids are very common in a lot of areas.

DAWN: It's just now they are able to detect them. Analytical methodologies have limited us in the past because these emerging contaminants are found in the environment in such trace amounts, like parts per billion or parts per trillion, much lower than the amounts that we were finding some of the older legacy compounds. Now that we have the means to detect them, we're trying to understand if they are "new" or if we just weren't able to detect them before.

Is it safe to assume, then, that because you are finding these things at much smaller levels – per billion or per trillion, that they would then be that much more powerful and strong? Because they're having really bad effects at much, much lower levels?

DAWN: I don't know if we could say that each one of the constituents that we're finding are having severe impacts, but, I think, they're definitely under consideration for concern. But yes, the amounts that are being found in the environment are small...You find smaller amounts, but yes the potencies of some of these newer compounds are thought to be pretty high.

So they can be potent.

DAWN: In very, very small quantities? Yes.

Does the federal government have standards that you're supposed to be looking for with these emerging threats?

STAN: It's so new that the government is trying to set up limits and standardized procedures for investigating these emerging compounds.

But they're not even sure what the end result problem is going to be. It may or may not be serious?

STAN: Yes.

DAWN: Yes.

STAN: That's where academia and then the public are going to have to become involved to see if there is a problem. And then the government will know where to set some of these limits.

DAWN: Because there's no standardized methodology right now, we don't have a way to implement a feasible procedure into our current monitoring program. What they're trying to do with some of the newer technology like microarrays is look at the genetic level instead of the traditional focus which has been on the phenotypical level, which refers to changes in eye color or sex, for example. [With the newer technology], they can run a tissue sample of, say, a fish, and the microarray can analyze say 16,000 genes at once to look for genetic impacts that may or may not result in changes in an individual's phenotype per se, but may still result in physiological effects.

How long might it take for all of the standard operating procedures to settle out?

DAWN: It's really in its infancy.



If you had to compare yourself to other monitoring units throughout the country or the world, are you leading the way, in the middle or behind the trend?

STAN: We're a monitoring group, so we're supposed to monitor what the City discharges. But when these [emerging] compounds come up

we have to be involved in it. There's an agency called the Southern California Coastal Water Research Project [SCCWRP]. They're a joint powers agreement agency that the City helps support that does a lot of the initial investigations. We work with them. And we try to work with them to develop protocols. Groups like that are doing more of the leading. They were set up specifically to address those kinds of concerns. We're probably somewhere in the middle.

But, you're part of that team.

DAWN: Yes.

Culprits and Effects

In layman's terms what are the concerns that you're seeing out today?

DAWN: In my research and other', we saw high levels of female reproductive hormones, specifically in male fish. And in some cases that led to things such as finding ovarian tissue in male testes; in production of vitellogenin, which is an egg yolk protein that shouldn't be in a male fish at all. So what we call feminizing effects is more or less what we were seeing, or what other research showed.

Outside of that, just in general, any sort of bioaccumulation of one or more pollutants can cause problems, especially if you see it in a recreational or commercially used fish, something that we would eat.

Where are these coming from? What is the public doing that's causing that to happen?

DAWN: There are a variety of sources and pathways. Anything that's a large-volume discharger that receives wastewater [like the Hyperion Treatment Plant] has the potential to be discharging them in the oceans. You can also get it from storm water, urban runoff. The storm water interacts with medicated feeds that can later get into river streams and other systems. They will later discharge into oceans. But, what's becoming more important now is

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Public Works

Tracking the New Threats – continued from page 27

Lab Work

Fish needed for studies on emerging threats are either caught at sea, or lab-reared and purchased by the City for research purposes. Lab work, therefore, is critical to tracking the emerging threats. Here are a number of the labs used to track these new contaminants; the labs are used for normal everyday monitoring, too.



Dawn holds a master culture of water fleas, which are lab-reared and maintained for subsequent toxicity tests pursuant to the City's NPDES permitted monitoring program.



Dawn Petschauer performs a chronic toxicity test on a species of water flea for Public Works' Tillman freshwater reclamation plant in Van Nuys.

“No drugs down the drain’ is very crucial. It should be all of our individual missions to make sure, to be aware.”



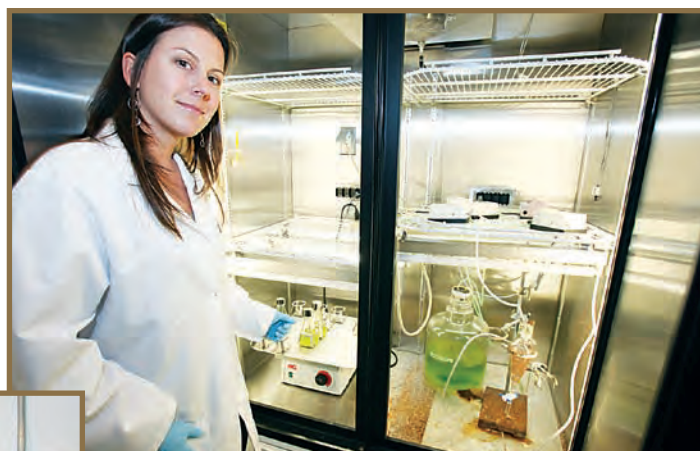
Dawn and Club CEO John Hawkins tour one of the five environmental chambers used to perform the chronic and acute toxicity tests.



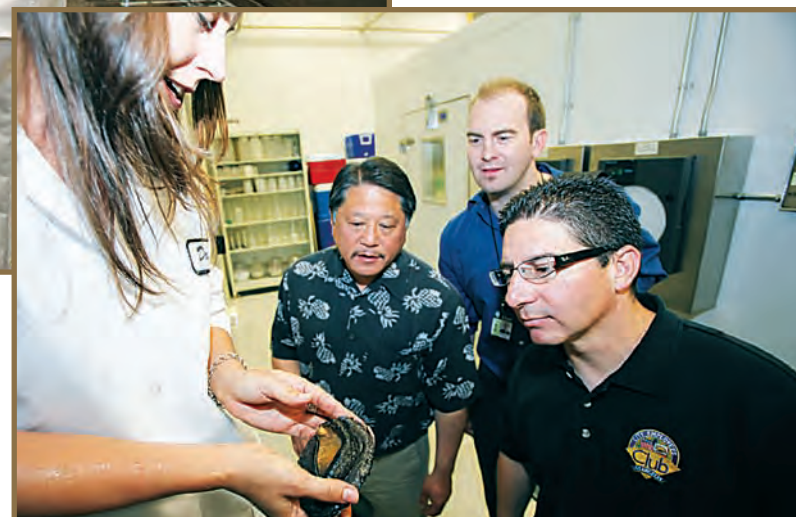
Water quality measurements (e.g. salinity, pH, dissolved oxygen) are performed using probes throughout the duration of the toxicity tests.



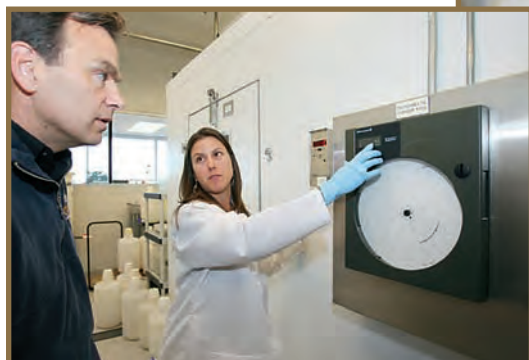
ABOVE: Some of the testing equipment used to perform the toxicity tests.



ABOVE: An incubation chamber used to grow their green algae stock, used to feed lab-reared water fleas.



Toxicity Supervisor Stan Asato watches as Dawn Petschauer explains to Club staff Angel Gomez and Brent Urban how to distinguish the sex of one of their invertebrate test species, *Haliotis rufescens*, the red abalone.



LEFT: Temperature recording charts monitor the temperature of the individual chambers to ensure EPA guideline compliance.



BELOW: Dawn Petschauer and Club CEO John Hawkins showcase one of their lab-maintained red abalone.



Dawn Petschauer explains to Club CEO John Hawkins how they measure the cell density of a freshwater unicellular green algae.

Getting Past the Filters

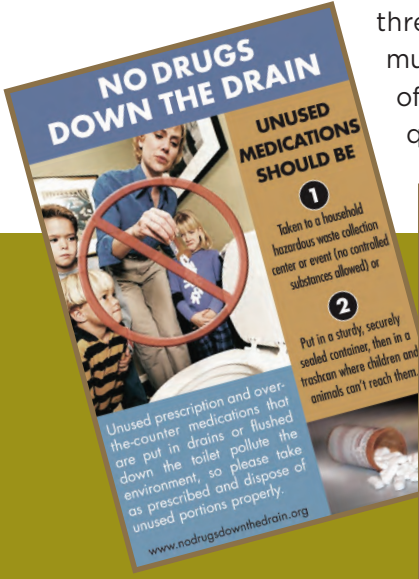
These round scrubbers are the last main filtration for the effluent (treated wastewater) before it is discharged to the ocean five miles offshore. They were designed for — filtering traditional pollutants measured at parts per million —however, they were not designed to filter out these newer chemicals of emerging concern, detected at levels as low as parts per billion or some at parts per trillion.



Public Awareness

Finally, Sanitation’s Environmental Monitoring Division helps spread the word about the dangers of improper disposal of medicines and personal care products.

The campaign, titled “No Drugs Down the Drain,” educates consumers as to the proper disposal of those elements that are considered emerging threats. The Website contains much information, including a list of locations where materials in question can be disposed of.



For more information, go here:
www.nodrugsdowndrain.org

THE ALIVE! INTERVIEW – continued from page 27

domestic application – household sewers and septs, recreational activities. All of those indirectly or directly discharge in the ocean.

What would some examples be?

DAWN: Natural steroid hormones; synthetic hormones like ones that are found in birth control pills; pharmaceuticals; and personal care products.

The pills we take?

DAWN: Anything: The soaps that you wear, that you wash off in the sink – we see them, too.

STAN: Even ibuprofen is detected in some samples.

DAWN: They’re finding caffeine.

STAN: Naproxen.

DAWN: Lipitor is a huge problem now. Triclosan, which is an antifungal agent in antibacterial soaps, is a known endocrine disruptor.

Really?

DAWN: Yes. There’s lots of it. We don’t have any sort of way of modulating or quantifying all of our household usage because we don’t know. But it goes directly in. And correct me here, but wastewater treatment facilities weren’t intended to remove items like that. Our facility wasn’t meant or intended to get rid of them. We’re looking at other ways of trying to remove them and stay ahead of the game.

STAN: Exactly.

And these compounds aren’t breaking down first?

DAWN: Not technically, and that’s another problem. When [some of them] go into our bodies, for us to get rid of them and not store them in our fat, our body metabolizes them or changes them. Sometimes the byproduct of what’s coming out is far worse than the actual parent compound.

Because the body is processing it so it can eliminate it.

DAWN: Exactly.

Is there a big glaring thing – something specific – that we’re putting out there right now that stands out like a sore thumb?

DAWN: Well just because it’s out there doesn’t necessarily mean that it’s having the highest impact. Without really knowing what all the potencies are, I don’t think I

can answer that. But anything that we’re finding out there in increased frequency warrants investigation, certainly.

Hormones were a big concern. They generated a lot of public awareness, and we certainly found problems with them. But they’re turning out that they may or may not be such a concern now, just because our treatment facility seems like it does a pretty decent job of getting rid of them. So it may not be a concern necessarily for us.

Storm water and urban runoffs can be a different story. Pesticides right now are the primary concern.

Pesticides more than hormones?

DAWN: Yes, at this point because of the potency, because of the inability for us to monitor it.



From left: Dawn Petschauer, Stan Asato and John Hawkins.

STAN: A lot of times the pesticides don’t go through the treatment plant. That’s the runoff she’s talking about. They get washed down the street or washed into a creek. They never go through the treatment plan unless the person takes it and actually physically puts it in their toilet to dispose of it. But if it’s sprayed on your plants and then it washes off the plants, it washes down the street, it never gets treated at all.

We don’t do storm water testing. But we do look at some of the areas that the storm water will end up in, like Ballona Creek. It appears that Ballona Creek has quite a bit of pesticides in the sediment.

Are there natural toxins that are ending up in the wastewater treatment stream? The stuff that’s entering into the ocean – does it scare you?

DAWN: Well, that we’re aware of it is a positive way to look at it. Back with legacy compounds, most people had no idea what they were, and there was unlimited dumping. The fact that we’re taking a fast-forward approach and actually addressing the concerns and trying to utilize ways of modifying it makes me feel better about it.

STAN: And this, too – The [Hyperion Treatment] Plant has gone from primary treatment to partial secondary to full secondary [treatment]. There’s been a great improvement in Santa Monica Bay around the discharge area. Now that they’ve gotten rid of the bad stuff, they’re able to see some of the little changes that are going on.

You’ve taken care of a lot of the big things and now you’re starting to be able to focus more of your time and effort and energy into some of the smaller ones.

STAN: Yes.

In 10 years, you’re going to have a multitude of things you’re going to be able to identify that you weren’t today. It never ends.

STAN: It never ends. But the whole goal is monitoring—we’re constantly monitoring to make sure that things wither are getting better and are not going to get worse as it did in the past.

What You Can Do

What can people do?

DAWN: Public awareness is crucial. I think domestic applications are going to be the next major concern because there’s no way of investigating or understanding what people are using.

Parabens are another compound that’s been a big problem. You find them in lotions and detergents. And they’re a chemical concern. If you just turn over any sort of product you’re buying and get a better idea of what you’re actually putting in the environment and what you’re putting on yourself realistically and your children, then everyone can do their own individual proactive decisions to help in the long run.

Do you have any little tips?

DAWN: Parabens are big. Biodegradables are obviously a huge good. “No drugs down the drain” is very crucial. It should be all of our individual missions to make sure, to be aware. Read the information that’s out there.

I think the next step is to get some sort of feasible collection or take-back service. If we could take the medications back that people don’t want, we’d be able to eliminate some of the stuff [that gets into the ocean].

When I was kid, I thought the storm drain – I’m not even going to tell you.

STAN: Oh, go ahead.

DAWN: Come on.

I thought it was like a trashcan.

DAWN: Everyone does.

STAN: It’s very common.

I remember just driving by and throwing stuff in. And now I think: Did I know where it was going? And I would go to the beach and swim!

STAN: Yes.

Yes. But I don’t want people to think that the ocean is in really bad shape and everything is dying I’ve actually seen things get much better. Things are getting better because of modern technology, and because of people starting to care. People are amazed how fast the recovery is. The recovery has been incredible.

Well, thank you both very much!

DAWN: You’re welcome.

STAN: Yes, you’re welcome. ■