he failed steel pens used at Cooke Aquaculture’s Atlantic salmon farm on Cypress Island in Washington State have been completely removed, but the black mark against the company in particular and on salmon aquaculture at large could linger long after the farm has been rehabilitated. “Yes it was a serious event not just for us but for the industry,” Cooke Aquaculture’s vice president of communications Nell Halse told Aquaculture North America (ANA). “The last escape in Washington was in the 1990s, So it is a bad situation and we know we’ll have to rebuild trust.”

As of October 4 Cooke has accounted for 200,927 fish, including 145,851 fish recovered from the damaged structure, and 49,892 fish recovered through the company’s fish buy-back program, with significant help from several Coast Salish tribal communities. Cooke has made financial offers to Coast Salish tribes in excess of $1.5 million for their recovery assistance efforts.

‘Key indicators of the business are pointing in the right direction,’ says BCSFA

BC Salmon Farmers Association (BCSFA) Executive Director Jeremy Dunn painted a bright picture of British Columbia’s farmed salmon industry, saying 2017 overall has been a “fantastic year” and conditions will likely remain favorable in 2018. “Our members have no problem selling every fish that they raise and it’s been that way for a few years now. Seafood has always been a volatile market but the global trend seems to point to demand remaining strong for the foreseeable future,” Dunn tells Aquaculture North America (ANA).

British Columbia’s farmed salmon industry contributed $1.5 billion towards the province’s economy between 2013 and 2016 and created 1,600 jobs, according to an independent economic analysis of the province’s salmon aquaculture industry. The increase of 37 percent over the past three years in its value to the province shows the industry is reaping the benefits from unprecedented investment in technology and practices that increase the overall performance of BC salmon farms.
Trending now: Aquaponics continued from cover

Center at UWSP, Hartleb says the rise of larger-scale commercial aquaponics operations speaks volumes about the industry’s evolution.

“Prior to that, aquaponics was limited to people who were doing small- or medium-scale to feed their family and friends, almost like a second job so they could sell their produce and fish on the weekend,” says Hartleb. “We’re just seeing in the past two years, real commercial businesses that employ dozens of people and are producing thousands of heads of greens per day and hundreds of thousands of fish per year.”

Ken Armstrong is deeply involved in the industry in his role as treasurer of the Aquaponics Association, and as owner and founder of California’s Ouroboros Farms. Ouroboros Farms has grown steadily alongside the industry, evolving into an operation with three 20,000-gallon tanks growing greens and fish. Its clients include local consumers and a Michelin three-star restaurant in San Francisco.

“Part of what’s driving that growth is that, with any new industry or paradigm, there are those who jump in head first,” says Armstrong. “Particularly here in California as the drought got worse, it drove people to question the farming methodologies that are being used.”

California has always been a center of food movements; the drive for organic foods started there, says Armstrong. “Particularly here in California as the drought got worse, it drove people to question the farming methodologies that are being used.”

The growing industry still faces its share of challenges, however. Brad Todd, greenhouse manager for Lucky Clay’s Farm in North Carolina, says the amount of technical knowledge needed to operate the systems effectively is daunting. Finding qualified employees for existing operations is also a challenge, he says.

The knowledge required “goes from how to diagnose streptococcus in fish, all the way to diagnosing streptococcus in fish, all the way to diagnosing streptococcus in fish,” says Armstrong. “Aquaponics fits that niche perfectly because of its ability to provide really high quality nutritious, fresh food, closer to urban centers where these highly perishable items get to market quicker.”

“Consumers are demanding transparency in their food supply,” says Armstrong. “Aquaponics is a method of production that gives the consumer more control of where, when, and how their food is grown.”

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— Dr Chris Hartleb, University of Wisconsin–Stevens Point

Record low for fish-in/fish-out ratio

The salmonid sector has been criticized for its use of fishmeal and fish oil, but in 2015 the sector produced more fish protein than it consumed, according to the IFFO.

“For every 1kg of wild fish consumed by the aquaculture industry as feed, a total of 4.55kg of farmed fish was produced in 2015,” said the organization.

It expects the 2017 figure to be even higher “as aquafeed volume has continued to increase against a background of finite fishmeal and fish oil supply.”

IFFO is the international trade organization that represents and promotes the marine ingredients industry.

Plant nutrient analysis, and everything in between,” says Todd. “It takes a large knowledge base to do an efficient productive system.”

Edenworks CEO and co-founder Jason Green echoes those concerns. “There is not a huge talent pool globally for technologists and operators in aquaponics; it is a very specialized field. Having both the technology and engineering side and also having operational expertise is a barrier to entry, he says.

Another challenge is the need to educate the public about aquaponics, including correcting misconceptions about it and distinguishing it from hydroponics. “I’ve had people tell me that it was unethical to sell fish that were swimming around in water with algae in it,” Todd says.

He hopes the industry’s growth will lead to a greater knowledge about aquaponics as a sustainable food production system.

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Two projects focused on increasing food security in remote communities in Canada are gaining traction. One of them is a collaborative project between the Moose Cree First Nation and Canadian Aquaculture Systems Inc.

In the two-and-a-half years since the Moose Cree First Nation in Northern Ontario received funding for a feasibility study in 2015, they have determined that an aquaponics operation would be the most effective option. “We’re now at the detail and design phase – educating the community about aquaculture and aquaponics, laying out the plan for the building, having drawings done, and basically moving the project forward,” says Moose Cree Director of Economic Development, Stan Kapashesit. “If all goes well, we’re hoping to put a shovel in the ground next building season.”

Collaboration with Canadian Aquaculture Systems has boosted the project. Company president Daniel Stechey says the project will not only benefit the local community through increased food security, but will provide opportunities by incorporating educational elements to engage the youth.

“It’s not just First Nations or remote communities,” says Stechey. “There are communities all over the world where food security is an issue and they’d like to have more control over what they produce.”

The next key challenge, he says, is to get it right so that the project can be replicated in other communities.

In Quebec, a similar effort is underway. A company called Écosystèmes Alimentaires Urbains (ÉAU) developed the first vertical aquaponics farm in Montreal. When that urban farm began attracting the attention of local communities, the company shifted its focus from urban farming to working with communities to build projects around their needs.

“For a project to have a clear impact on food security, on socio-political issues and empowerment, it has to be tailored to a community,” says ÉAU co-founder and CEO Olivier Demers-Dubé.

ÉAU is currently working on 10 projects in the province in partnership with various aboriginal communities, food cooperatives, non-profits and businesses. Demers-Dubé believes aquaponics will become a key food production method and that the projects ÉAU helps establish will inspire the development of similar ones.

“At the rate the world’s population is growing, 1.3 billion people will need food by 2050 and the livestock that we produce right now will not be enough, for obvious reasons,” says Demers-Dubé. “Aquaponics is not necessarily the only answer, but it will make a difference.”

— Matt Jones
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Aquaponics as an interactive learning tool

Texas Autism Center engages through aquaponics system

The Bright Mosaic Autism Center in Denton, Texas uses an aquaponics farm as an interactive learning tool to help engage the children they work with.

Founder Christopher Brown says that he developed the idea after a traditional garden failed to hold the children’s attention. Now the center has a large “aquaponics tower” and several smaller aquaponics systems on site, which is more engaging because it is more visually interesting and the children can see the results more quickly.

“We grow microgreens in that tower mostly, which only take about nine days from when you plant the seeds to harvesting,” says Brown. “The kids are getting to see the fruits of their labor almost immediately. Their attention span is a week or two, anything beyond that they’re going to lose interest.”

Most of the food produced by the system is used to feed the behavioural therapists who work with the center and the surplus is given to parents. Brown says he hopes over time the system might also help expand the palates of some of the pickier eaters who attend the center.

Aquaponics transformative for Denver community

Struggling American families in an historic Denver neighborhood have found a haven in the Dahlia Campus Greenhouse, a 5,400-sq-ft aquaponics facility.

Located in what used to be the United States’ largest African-American-owned mall that went bankrupt, the farm has been credited by beneficiaries for transforming the neighborhood from a food desert to a food oasis.

The farm features two state-of-the-art raceway fish tanks at 2,800 gallons each, holding catfish and tilapia. Expected output of fish is 5,000 lbs annually.

The fish tanks have their own integrated filtration system with automatic filter backwashing. The tanks also circulate water via air pumps, which simultaneously provide oxygen, thus reducing the overall energy and equipment footprint.

The greens being grown include several varieties of kale, salad and leaf lettuces, cooking greens, collards, basil and chard, culinary herbs and microgreens. Annual output for greens is expected to be about 25,000 lbs.

“There was a great deal of community input regarding the types of fish and plants they wanted to grow,” said the Dahlia Campus for Well-Being, which runs the facility. Members of the community, from children to adults, help with tasks such as planting seedlings that will later be replanted in the aquaponics farm and sorting lettuce for food boxes they take home.

Farm manager Jenna Smith runs the farm in collaboration with Veterans to Farmers, which provides farm support and training to veterans. The farm was recently featured on PBS NewsHour as an innovative community-based model for healthy food, wellness and support programs.
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**Dairy farmer sees future in aquaponics**

Tilapia and lettuce produce supply the local market

**BY TOM WALKER**

W hen Mary and Nate Calkins were looking to diversify their Lake Orchard Farm in Sheboygan, Wisconsin, they chose to invest in aquaponics.

“We have always run a progressive and diversified farm,” Nate Calkins says of their sixth-generation Wisconsin dairy operation, located about 60 miles north of Milwaukee along the shores of Lake Michigan. “It was a quick article about aquaponics and was just riveting by the possibilities.”

Aquaponics ticked a number of boxes for the Calkins. Fish and vegetables made a good business case to balance the more volatile dairy market. He could convert a building housing a milking parlor to house the fish. They would be producing local food, which would contribute to food security and sustainability, and the working environment was very positive. “There is something about walking into an 80°F greenhouse in February (when Wisconsin temperatures are well below freezing) and seeing all the lush plants,” says Calkins. “Our employees sure like it.”

Calkins is a structural engineer by training and was able to construct the 4,000-sq-foot greenhouse by himself. “It came on a truck and I was able to follow the instructions,” he quips. But the couple went with a custom fish and plant rearing system from Nelson and Pade Inc in Wisconsin.

“I wanted a ‘Cadillac’ system,” says Calkins. “I know someone who has a make-shift aquaponics system in their garage that they have cobbled together with tubs and I bet they actually grow more vegetables outside during the summer.”

Nelson and Pade installed a 6-500 Clear Flow Aquaponic System from the 5/8-inch fingerlings are four weeks old when they arrive from Americulture, a supplier of Nile tilapia fry and fingerlings based in New Mexico. They take 12 to 16 months to reach market weight. “We are really happy with the quality of the fry that we get from Americulture, we only lose about one-half a percent,” says Calkins. An average weekly harvest is 50 to 60 fish weighing around 2 to 2.5 lbs.

Rangen is the feed of choice. Calkins is happy with the insect and fishmeal protein base. “I have used other feed in the past but I don’t like corn-based products,” Calkins comments. “I’ve never seen a fish jump out of the water and take a bite of corn.”

“The on-farm well taps into a limestone aquifer with a pH of around 7.8. ‘When we put the fish in, they bring the water down to around 7.1, which is ideal for growing tilapia,’ Calkins explains.

The operation has 3,000 gallons of fish-rearing water and a total of 15,000 gallons of recirculating water.

**SPECIES OF CHOICE**

Tilapia was the species of choice. “We were looking at the quality of fish to grow the greens,” Calkins explains. “Perch is a popular native species here in Wisconsin that we could grow for the local market, but they are a slower growing fish that don’t provide the same level of nutrients to support the greens.”

“We actually harvest based on nutrient load that will be available for the plants. Some weeks I may harvest as few as four fish, or none at all,” says Calkins. He looks for the nitrate level to be between 150 and 160 ppm. “Right now it’s at 120 ppm, so I will need to build it back up.”

“Our biggest expense is fish feed, but it’s still cheaper than plant fertilizer,” he adds.

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**EDUCATING THE PUBLIC**

The aquaponics greens and tilapia were not an easy sell when Lake Orchard started production three years ago. “We opened our doors and had people in for tours to show them our operation. Even though aquaponics is an ancient system, people didn’t know about it and were scared of...
Calkins says, “We talked about how our farm environment is different from Asia. Tilapia can have a bad reputation in America, but it’s not the fish’s fault, it’s how they were raised.”

The greenhouse can produce 60,000 heads of lettuce greens a year. The majority is sold in bulk with some retail packs. Calkins estimates about 60 percent of the production goes to wholesale and 40 percent goes to retail. Seedlings are transferred to 1 1/4-inch spacing in the floating polystyrene rafts that measure 8’ x 80’. At 12 weeks they are moved to 4-inch spacing, and after another 12 weeks to 8-inch spacing. “Moving them twice is a bit more labor-intensive, but it allows us to use the space much more efficiently than if we had them in 8-inch space all the time,” he says.

The media beds hold recycled glass that nurtures rooted plants like tomatoes, beans and kohlrabi. Calkins says he can get 500 to 600 lbs of tomatoes in addition to the lettuce.

The entire production is heated with propane from December though to March. “When it’s sunny the heaters don’t run, when it’s cloudy they run constantly,” he says. At night, heat from the metal halide lights helps moderate the air temperature. He estimates that on average, propane costs $1,000 per month. “It’s very expensive,” says Calkins, so he is investigating using solar power. “I’m hoping to take the operations completely off-the-grid by next summer,” he says.

The WateReuse Association, a trade organization advocating water reuse, has awarded an aquaponics farm backed by Pentair and Urban Organics the “2017 Agriculture Project of the Year” for its water- and energy-saving features.

The aquaponics farm, located in Saint Paul, Minnesota, is different from most aquaponics systems in that it is designed to be a decoupled system, meaning the fish production system can be operated separately from the plant production system.

This allows Urban Organics to raise fish species in cold water with low nutrient levels, alongside plant species in warm water with high nutrient levels by capturing, treating, concentrating and reusing the waste nutrients from the fish using Pentair’s advanced water filtration technology.

By reusing the water repeatedly, the system utilizes less than 10 percent of the water that would be required for conventional farming. Energy use, meanwhile, is minimized by up to 40 percent using energy-efficient pumps and LED lighting.

The 87,000-square-foot indoor aquaponics farm is expected to be at full capacity in early 2018. It is expected to produce 275,000 pounds of fish and 475,000 pounds of organic produce annually.