Pollution worries abound in frac sand waste streams

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In Wisconsin, frac-sand mines in Trempealeau, Buffalo and Barron counties are creating unstable piles of sand waste and illicit wastewater runoff.

In Minnesota, state health officials are studying two chemicals widely used in frac-sand processing as contaminants of "emerging concern."

Four years into a mining boom that is reshaping parts of the rural countryside, mining companies and government regulators are coming to grips with the reality that the new industry involves much more than scooping sand out of the ground and hauling it away.

The states’ burgeoning frac-sand industry, they have found, creates waste streams they are scrambling to understand and control.

From pyramids of discarded sand to sludge that accumulates in filtering devices, the mines create tons of waste byproducts that must be managed until they can be plowed back into the ground as part of reclamation plans designed to protect the environment and preserve the rural landscape.

“The industry just came on too fast,” said Ruth King, a stormwater specialist with the Wisconsin Department of Natural Resources. “I wish we could turn back the clock a couple of years and start over.”

In a rash of continuing violations that started last year, heavy rains have combined with sand-processing water to overflow holding ponds on several mining sites. The breaches have dumped sandy sediment into public waters, where it can suffocate fish eggs, kill aquatic plants and rob fish of habitat they need to reproduce.

“It really does impact the fisheries side of it,” said Roberta Walls, another Wisconsin DNR water specialist.

Rich Budinger, president of the Wisconsin Industrial Sand Association, an industry trade group, said sediment pollution is indeed a threat to natural areas. The entrance of new, inexperienced sand companies and heavy rains have made conditions more challenging, he said. But, he noted, the state requires frac-sand companies to obtain stormwater permits, which should be sufficient to prevent lasting environmental damage. Any habitual violator should not expect to stay in business, he said.
“It shouldn’t be an ongoing issue,” Budinger said. “This doesn’t represent the industry as a whole.”

20 violations

Heading into this spring, the Wisconsin DNR had cited 15 frac-sand mines for alleged violations of water regulations, including two that advanced to the Wisconsin Department of Justice for possible legal sanctions. Since then, Walls has written at least four new violation notices and King is handling another.

“It’s very challenging,” Walls said. “I really don’t see the state being able to provide the staffing levels that the workload demands.”

Most large frac-sand mines, she said, are properly sized and engineered, with zero discharge to neighboring streams and wetlands. Problems have cropped up at smaller sites where man-made holding ponds are barely large enough to contain water used for processing sand — much less heavy spring rains, melting snow and water that drains from wet stockpiles.

The Great Northern Sand processing site near New Auburn, Wis., is a case in point. Last November, the site spilled sediment-filled wastewater into Beaver Creek, which leads to an important wildlife sanctuary in Barron County, according to state records.

Jim Drost, a former U.S. Bureau of Mines engineer and an expert in industrial sand, said he was angered by the spill because he and others had warned that the site would produce sediment pollution.

Drost grew up in the area and fears that silt from a cluster of surrounding frac-sand operations will wipe out local habitat for such rare creatures as the Karner blue butterfly and Butler’s garter snake.

“We’ll have a dead swamp in 10 years,” he said.

Great Northern worked hard to prevent another breach, King said, adding pond capacity and taking other steps. But the plant had two more spills in April, according to a document she provided.

Now the operation has given up on plans to be self-contained and will receive a permit that allows for discharge of clear water, an approach other mines are taking.

One of the biggest operations to run afoul of its zero-discharge plan is Preferred Sands of Blair, Wis. Kevin Lien, director of land management for Trempealeau County, said water from the mine repeatedly overflowed this spring into an intermittent stream that runs into Larkin Valley Creek and on to the Trempealeau River.

“It’s constantly in use and being filled with sediment,” Lien said of the stream.

In a statement to the Star Tribune, Pennsylvania-based Preferred Sands said it has worked closely with the DNR to resolve “complex inherited environmental issues.” The company, which also operates a frac-sand mine in Woodbury, said the Blair facility is not discharging any process water off its site.

Murky wash water

The Midwest’s sand mining boom was triggered by oil and gas companies that use the silica grains in a drilling process called “hydro fracturing” — and they set exacting standards for the sand they buy. To meet those specifications, sand mines in western Wisconsin have had to remove more clay and undersized sand than they projected, several regulators said. The separation process is driving greater water usage and creating larger stockpiles of spent material, Lien and others said.

“This is pretty fussy sand,” said Tom Woletz, Wisconsin DNR’s leading frac-sand expert until he retired last month.

As sand is filtered, the so-called “fines” are washed away from usable frac sand. Mining companies then treat the murky wash water with chemicals, called flocculants, that cause suspended particles to sink so the water can be reused. The clarified water is used to wash more sand, while the wet, sluffy fines are piled as waste material that is eventually plowed back into the ground where sand was excavated.
A well-managed frac-sand site keeps the piles stabilized, sometimes by mixing in top soils, Walls said.

But at the Preferred Sands site in Blair, the waste piles have twice absorbed enough water to turn lava-like and spill from high elevations onto neighboring property, trashing the interior of a house, flowing into a garage on another property and fouling a wetland.

“It’s been a nightmare for us,” said Dick Eberly, a neighbor whose property was tainted by both spills.

Preferred Sands said it will take additional steps in coming months to improve compliance with regulations. “Preferred Sands is fully committed to protecting the environment in the communities in which we operate,” it said in a prepared statement.

Lien said one problem is that some mines have followed a minimum design standard and sized their holding ponds to accommodate the area’s biggest rain event in the past 10 years. In Trempealeau County, Lien and others set a tougher standard, keyed to 100-year rainfall events — but even that hasn’t prevented overflow problems, he said.

“It all looks good on paper when they come in for their permit,” Lien said. “Now we have erosion problem after erosion problem.”

‘Emerging concern’

In addition to problems with runoff and waste piles, state officials and some frac-sand companies are wary about the widespread use of a chemical called polyacrylamide to clarify sand-processing water. Polyacrylamide contains residual amounts of acrylamide, a neurotoxin linked to cancer and infertility.

So far, no one has detected acrylamide in aquifers or soil around industrial sand mining sites, and in Wisconsin’s Chippewa County, a rare acrylamide monitoring program in an area with lots of frac-sand activity has not sounded any warnings.

But small amounts of acrylamide have been shown to accumulate in mining waste water, and the chemical is widely considered to be present in stockpiles of discarded fines.

Mining reclamation plans call for those heaps to be buried back in the ground in unprecedented volumes — some of it at mines where digging goes well below the water table.

“There hasn’t been a lot of study about what happens to these chemicals when they get into the subsurface,” said Virginia Yingling, a hydrogeologist with the Minnesota Department of Health. “We are trying to find out if it’s a problem.”

Budinger said frac-sand companies in Wisconsin adhere to an approved products list for flocculants and other water additives. He said responsible operators continually are managing water quality and quantity with the environment in mind.

Using polyacrylamide to clarify wastewater allows mining companies to reuse the water, conserving valuable groundwater. And published studies demonstrate that polyacrylamide can degrade safely when stored above ground.

Even so, polyacrylamide and polydadmac, another widely used sand-processing flocculant, were recently added to the Health Department’s list of “chemicals of emerging concern” and will be screened for potential health risks.

The Minnesota Pollution Control Agency has its own study group on flocculants and might reassess existing permits that allow polyacrylamide use depending on findings.

Mike Caron, director of land use for Minnesota-based Tiller Corp., said the company’s frac-sand division has intentionally avoided polyacrylamide because of the unknowns. The company uses a starch-based flocculant sold by HaloSource Inc. of Bothell, Wash.

Several sand mining operations around the country have switched to greener technologies, said Frank Kneib, a HaloSource product manager.
Tiller operates a frac-sand mine near Grantsburg, Wis., and still is resolving a spill of dirty water that reached the St. Croix River last year. The U.S. Army Corps of Engineers treated it as a violation of the federal Clean Water Act and the Wisconsin Department of Justice is considering possible sanctions.

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