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Dam Break

Scale of disaster leaves community reeling

By Becky Johnson • Staff Writer

A dam broke on an irrigation pond at Balsam Mountain Preserve in Jackson County two weeks ago unleashing hundreds of tons of mud downstream.

A sediment plume extended from the Balsam Mountains all the way to Fontana Lake 30 miles away for days following the disaster. The mud slurry killed all the fish and most other aquatic life in Sugar Loaf and Scotts creeks, according to biologists from state and federal agencies who assessed the aftermath of the ecological catastrophe. Impacts to the Tuckasegee River — home to the endangered elktoe mussel — are still being assessed, but are considered serious.

The earthen dam was built a year ago by Balsam Mountain Preserve, a 4,500-acre development in Jackson County, to create an irrigation pond for its golf course. The disaster came as a shock to many given Balsam Mountain Preserve's status as an eco-development, a model even among hard-to-please environmentalists.

No one was injured in the initial wave of mud and water, but damage was plentiful. The yards of downstream neighbors were buried in mud and creek banks were sheared off.

The causes for the dam failure are still under investigation. In the meantime, state officials are questioning whether Balsam Mountain Preserve had obtained the proper permits.

The cost of clean-up

The dam break could prove a costly disaster for Balsam Mountain Preserve, thanks to a mounting list of clean-up requirements and potential fines.

Regulatory agencies want sediment strained from the river and deposits of mud dredged out. Once a determination is made as to how many tons of dirt washed into the river, the company will be required to remove an equal amount, they said.

"They will need to do a mass balance equation. Everything that went in has to be taken out," said Kevin Barnett with the Division of Water Quality.

Engineers are calculating the volume of earth in the dam that was washed downstream, as well as the creek banks sheared off by the torrent of water as it moved down the waterways.

"We need to have a complete accounting of every handful of dirt that has been sent down the river," said Mark Cantrell with the U.S. Fish and Wildlife Agency.

Doug Hoffman, vice president of Balsam Mountain Preserve, said the company's plan is to leave the creeks better than they were before the disaster. They plan to take more sediment than went in.

Along with sediment removal comes stream bank restoration, Hoffman said. Sugarloaf Creek, the stream immediately below the dam, was so badly eroded that it calls for total channel reconstruction.

Once all that's done, Balsam Mountain Preserve will have to embark on species reintroduction to restore aquatic life. Also on the list of expenses: appeasing downstream neighbors whose yards were covered in mud.

As for fines, Balsam Mountain Preserve could be facing as much as \$400,000 if agencies assess the maximum that law allows, although the maximum assessment on all the various violations probably isn't likely. Some of the violations include:

- \$500 per day that the dam was in existence without a dam safety permit, if it is deemed that the dam met the threshold for requiring a permit
- \$25,000 per day that the disaster results in a violation of state water quality standards.
- \$25,000 per day that the disaster results in a violation of Balsam Mountain Preserve's environmental impact permit.
- County erosion violations. (add more here)

Hoffman said Balsam Mountain Preserve is “cognizant” of the astronomical price tag they could be looking at for clean-up and related costs, but money is not an object.

“To tell you the truth, although it is obviously in the back of our mind, we understand it is the right thing to do,” Hoffman said. “Every week we will sit down and say, ‘Do we have to stop doing other things to make sure this gets done?’ This is the priority.”

Eco-consequences

Scotts Creek, a major creek flowing through Jackson County, was described as everything from “chocolate pudding” to a “mud slurry” in both color and texture in the days following the disaster. All that mud had devastating consequences on the aquatic habitat.

“I would imagine this sort of incident would not only clog the gills and smother most fish and bugs, but will further compromise the ability of any fish who do survive because it will impact their food sources,” said Mark Cantrell with the U.S. Fish and Wildlife Service.

Kevin Barnett with the state Division of Water Quality said any fish in Scotts Creek were either smothered by mud or blown downstream.

“They are either dead or washed out of the system,” Barnett said. Same goes for bugs.

“All the aquatic insects would have been flushed out or been buried in the sediment and died due to the lack of oxygen,” Barnett said.

Cantrell said the impacts have extended for miles and miles downstream. Topping Cantrell’s concerns are a colony of endangered elktoe mussels that live in the Tuckasegee River near the mouth of Scotts Creek. Sediment pouring out of Scotts Creek into the Tuckasegee landed right on the colony, Cantrell said.

Cantrell and other biologists went snorkeling in the Tuckasegee several days after the disaster to assess the damage, but the water was still too sediment-laden to make any reliable observations.

“My nose was scraping the bottom of the river to try to see the bottom,” Cantrell said. “We were not able to be able to determine how badly it has accumulated in the Appalachian elktoe habitat.”

So much mud went into the water that it exceeded the transport capacity, Cantrell said. In other words, the water couldn’t carry it all and sediment got deposited in mounds along the way. A week after the disaster, clumps of sediment were continuing to lift up and be carried downstream. The severe drought made things even worse, with the abnormally low water levels even less able to absorb the volume of sediment.

In hindsight, a quicker response could have been deployed to catch the sediment with special equipment and devices, Barnett said.

“We are working on a protocol on how to address these things more quickly and more efficiently. At least from my standpoint I have a better understanding of what it takes to get things moving,” Barnett said.

Permit questions

Balsam Mountain Preserve failed to get a permit for its dam from the state, despite bumping against the threshold for doing so.

A permit is required from the state dam safety unit if the dam meets one of two litmus tests. A dam needs a permit if it is taller than 15 feet and holds back the equivalency of 10 acre-feet of water — defined as a 10 acre pond one foot deep, or one acre pond 10 feet deep, or any variation thereof. A dam also needs a permit if its failure poses a potential hazard downstream.

The dam was definitely taller than 15 feet. And according to Mac Fowler, a dam safety engineer with the state, it appears to have held more than 10 acres feet of water.

Balsam Mountain Preserve officials disagreed.

“It didn’t have 10 acre-feet of water in it,” said Doug Hoffman, vice president of Balsam Mountain Preserve.

A land surveyor is in the process of calculating the exact volume of water held back by the dam before a final verdict is made.

But Fowler would also argue the dam met the other litmus test for a permit: a potential downstream hazard. Again, Hoffman claimed otherwise. The fact that the

dam did fail but no one was hurt and no structures damaged proves it wasn't a hazard.

Even if the dam didn't quite meet the state's threshold, Fowler said they should have checked in anyway.

"They should have sent us notification to get our concurrence that it was smaller," Fowler said.

If the company had submitted its plans, Fowler would have told them that the design was not adequate for the size dam they were proposing.

Complicating matters, the dam was not constructed as it was originally designed.

"The dam was actually constructed larger than what was designed by the engineer," said Fowler. "There was a disconnect somewhere between what was originally planned and what was actually constructed."

Dam design

Mac Fowler, a state dam safety inspector, said there was a flaw in the design, namely involving a pipe that allowed water to pass from the pond under the dam and into the creek below.

A corrugated metal pipe was buried at the base of the earth dam to let water pass through from the pond. Earth is packed tightly around the pipe, but there is still a hairline crack between the dirt and the pipe. Water can seep through this crack, eroding the dirt around the pipe in the process, Fowler said. Eventually, it causes the dam's collapse. Fowler said he thinks that's what happened. To solve the problem, the pipe should have been concrete, not corrugated metal, and should have had special fill material around the pipe.

Doug Hoffman, vice president of Balsam Mountain Preserve, disagreed with Fowler's assessment of the dam failure. Hoffman said the pipe had a seep collar on it to stop erosion around intake. Fowler said a seep collar isn't always enough. So what did cause the failure?

Hoffman suspects natural forces beyond the company's control were at play in the dam failure. Perhaps there was an underground spring or a seeping rock vein that eroded the dam from below. Geotechnical surveys and soil borings are currently under way to determine any outside factors, Hoffman said.

Eco-development

Since its inception, Balsam Mountain Preserve has served as a model for ecologically sensitive development. The development set aside more than half of its 4,500 acres for permanent protection under a conservation easement. The development employs three full-time naturalists to monitor the environment and has an on-site nature center. Rare and endangered plants are relocated when threatened by the footprint of a house or road. Homeowners can't even cut a tree limb without permission.

"A lot of folks have said 'Well geez, if it happens to these guys what about the other guy who isn't as conscientious,'" said Doug Hoffman, vice president of Balsam Mountain Preserve.

Balsam Mountain Preserve has been a leader in water quality in particular. For starters, the development set aside 50- to 200-foot corridors along streams for protection under conservation easements. They repaired streams degraded by logging practices of the paper company that owned the land before them. They've even worked to restore native brook trout in one stream.

"This group in particular has done a lot better job than most at really making the right efforts that far exceed what it is typical at a development," said Clement Riddle, an environmental consultant that works for Balsam Mountain Preserve. "They have tried to be a model."

The development has partnered with N.C. State University researchers as a field laboratory for new and improved methods of keeping sediment out of streams, with the aim of making the new techniques standard practice by developers in the mountains.

When the development did impact the environment — primarily with the construction of roads and the golf course — and had to mitigate for those impacts, the mitigation went beyond what regulatory agencies required.

"We were just as surprised as anyone else," said Mark Cantrell with the US Fish and Wildlife Service. "Balsam Mountain Preserve really was a model for how to create a design that had a minimal impact as well as for mitigation that preserved and restored a great area of stream, significantly more than was impacted. They have

done more than their fair share to protect the streams and habitat.”

Downstream neighbors

Doug Hoffman, the vice president of Balsam Mountain Preserve, said the company will do whatever it takes to satisfy downstream neighbors dealing with scoured creek banks and mud slicks in their yards as a result of the dam break.

“The first morning they were obviously upset. Rightfully so. I would be upset, too” Hoffman said. “We have gone to them and said whatever it takes to make it right. I think the neighbors understand we didn’t want this to happen and we will do everything we can to make it right.”

A public hearing last week on Jackson County’s proposed development regulations served as a forum for some downstream neighbors angered by the disaster.

“The beautiful creek in front of my house is absolutely destroyed,” said Jennifer Krell, who lives along Scotts Creek. “It is covered in silt and sludge and is ecologically dead from the accident at Balsam Mountain Preserve. It is an absolute outrage.”

Paul Tapp said his yard was buried in six inches of mud.

“It was just a mess,” Tapp said.

Reuben Moore verbalized the sentiment that passed through the mind of anyone who saw Scotts Creek the day following the disaster.

“I stared at that water. I wasn’t sure if it was water or not. It was like liquid mud,” Moore said.

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