Paving the way to lake clarity

By Andrea Buxton

Keeping roads in good condition in the Lake Tahoe Basin has always been a struggle, especially when winters wreak havoc on the asphalt surface.

While diligently removing snow so that we may all travel safely, heavy snow removal equipment with large tires covered in hefty chains chew up the surface of the road. Road sand, critical in keeping vehicles from sliding on icy roads, combined with normal vehicular traffic, also grind and crush the pavement surface. The frequent freeze-and-thaw process contributes to asphalt cracking. Dodging pot holes is a requirement for driving safely in the Tahoe Basin. In turn, poor road conditions damage vehicles, increasing the cost of vehicle maintenance.

“Vehicle wear such as popped tires and worn shocks and struts are costs the public pays for inadvertently, and may be greater than or equal to the cost of investing in improving the road surface,” says Russ Wigart, storm water program coordinator with El Dorado County.

It is obvious that poor road conditions lead to more dangerous driving and cycling conditions, unsightly roads, more wear and tear on vehicles, and higher maintenance costs. However, there is a new reason to care about the condition of our roads—water quality. Degrading pavement contributes to an increase in fine sediment particle concentration in storm water runoff. Fine sediment particles are the leading cause of lake clarity decline.

When the pavement surface gets destroyed by heavy equipment, chains, and normal vehicular traffic, the degraded asphalt

gradually gets ground into smaller and smaller particles, resulting in very small sediment particles. When these tiny particles get into Lake Tahoe via storm water runoff, they stay suspended in the water column because gravity is not strong enough to settle them to the bottom, making the lake look cloudy.

A recent study, conducted by El Dorado County, UC Davis, and Texas Southern University collected storm water samples from two roads in South Lake Tahoe to identify the major sources of clarity-reducing fine sediment particles in urban runoff. Molecular markers were used to calculate the fraction of fine sediment particles that came from each source. The major sources were roadside soil, pavement wear, and traction abrasives (road sand). There were no significant differences between the two sampling sites.

“The results of our study suggest that pavement wear is the second largest source of fine sediment in urban storm water runoff and fine sediment directly affects Lake Tahoe’s clarity,” says Wigart.

Depending on the time of year and type of precipitation, the contribution of fine sediment particles to urban stormwater runoff from roadside soil ranged from 20 to 70 percent, pavement wear ranged from 18 to 53 percent, and traction abrasives ranged from 7 to 21 percent.

Additionally, a smooth road in good condition is much easier to sweep. Road-sweeping machines are much more effective at picking up fine sediment if the road surface is not covered in cracks and potholes that retain sediment.

Asphalt mix design has come a long way in the last decade and is now engineered for better durability. Adding polymers to the mix increases surface elasticity, allowing the road surface to better resist temperature changes and wear and tear from tire chains and heavy equipment. This mix not only limits

the production of fine sediment particles from the road surface, but reduces the cost of road upkeep as well. The city of South Lake Tahoe has been using polymer-based asphalt for the last several years, but it is estimated that less than 10 miles of roads have been repaved with the new mix to date.

These findings imply that maintaining pavement in good condition not only improves public safety and decreases vehicle damage, but could positively impact urban storm water quality and ultimately lake clarity. El Dorado County and the Tahoe Resource Conservation District would like to continue investigating the relationship between high-quality roads and reduced fine-sediment particles in urban storm water runoff.

“Our ultimate goal is to get good pavement condition recognized as a best management practice for improving urban storm water quality in the Lake Tahoe Basin,” says Wigart. “The results would be a win for lake clarity and a win for public safety. Combining better roads with responsible snow removal and sanding operations could be the future for improving driving experience, reducing vehicle wear, and improving lake clarity.”

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