Phase II MS4s have a period of 5 years to fully implement their programs. The District will continue to provide assistance to its local governments as requested and with the support of the Board. The District plans to hold quarterly meetings in the future.

Phase I Municipalities
The cities of Denver, Aurora, and Lakewood are "Phase I" MS4s under the EPA discharge regulations because of their population size (greater than 100,000). The cities prepared permit applications in 1992 and WQCD issued permits originally in 1996. The cities have fully implemented all of their original permit requirements. Permits for a second 5-year permit term were renewed on March 20, 2003.
Three significant changes were made to the permit conditions. One was to shift emphasis from inspection of industrial sites to education of industries. The second change was to revise the Construction Sites Program to be applicable to proposed developments greater than 1 acre (the previous criteria was 5 acres). The third change was additional reporting requirements in the wet-weather monitoring program. In 2003, the District developed a 5-year work plan with the U.S. Geological Survey that is designed to assess long-term trends in stormwater quality for watershed planning.

Protecting Trees from Beaver Damage

By Steve Materkowski, EIT, Engineering Inspector, South Platte River Program

An integral part of re-vegetation along the South Platte River has been the planting of Plains Cottonwoods and other native tree species. Unfortunately, many of these trees have been damaged or killed by beavers. Given the time, difficulty and expense of growing trees to maturity, these losses, in the limited areas of riparian growth in an urban environment, are not tolerable.
Originally we tried to protect trees using "chicken wire" cages. These proved to be mostly ineffective. Beavers can rip down this light wire or bite through it. The more recent practice suggests using a welded wire cage. Although this system works, it is unsightly.

In 2002, we became aware of the idea of painting trees to protect them from beaver damage. This "Beaver Paint" consists of a combination of latex paint and sand. Two areas along the South Platte River with active beaver populations were chosen for initial testing. Working closely with our routine maintenance contractor, we selected the type and color of paint to use and the proportions of sand to add to the paint. We found that using approximately 20 ounces of sand per gallon of exterior latex paint worked well. We painted a total of 100 trees at the two locations. The trees ranged from 2- to 24-inches in diameter. Some of them had recent beaver damage, which meant that the paint was applied not only to outer bark but to live inner fibers as well. So far the beavers have not damaged any more trees at these two sites. Secondly, after two growing seasons all trees in the test areas appear to be in good health.

Last summer, we had our contractor paint approximately 100 trees in South Platte Park. As of this writing, there has been no further beaver damage in those areas of the park. The Denver Parks Department is also experimenting with this method .

Based on our experience so far, we recommend the following paint-sand mix for beaver protection:
1 gal. exterior grade latex paint (match paint color to color of tree bark)
20 oz. playground sand
Mix in sand thoroughly.

It is very important to remove dirt from around the base of the tree and to paint, starting at the ground line, 3 feet up the tree. Apply a thick coat to all areas being painted. We suggest you experiment with the proportions and the color to get the best results. To match the color to the tree bark, get paint swatches from a supplier or have the supplier mix the color that you need.

Each application is unique but with proper mixing, only the beavers will know the paint is there. We do expect the trees will need to be repainted every few years. The exact maintenance cycle for this has yet to be determined.

Dust **(continued from page 7)**

recommended that these non-scientific initial data be better quantified through the use of more precise controlled measurements in existing sinks for atmospheric fallout (e.g., winterized swimming pools that have mesh type winter covers, lined ponds, etc.).

This less than formal data collection effort suggests that each 100 square feet of impervious surface can yield as much a 1.0 to 1.2 lbs (0.45 to 0.55 kg) of solids on an annual average basis. What fraction of this material actually makes it into stormwater has yet to be determined. If we assume 100% and an average of 30% of impervious surfaces in the metropolitan area have a direct hydraulic connection to the conveyance systems, each square mile of urban development here *can produce about 40 to 50 tons of TSS in stormwater runoff each year reaching our receiving water systes*. Considering that the Nationwide Urban Runoff Program data collected in the Denver area at commercial and residential sites by USGS indicates an average TSS concentration exceed 200 mg/L (EPA, 1983), the estimate using the unscientific samples collected this year compare well to the annual stormwater TSS loads one calculates using USGS data.

Conclusions
The observations made using simple atmospheric fallout dust capture techniques clearly show that:
1) Atmospheric fallout in the Denver area is a significant source of TSS in stormwater. 2) The fallout consists mostly of very fine particles that are hard to remove from the water column. 3) It does not matter what form the impervious surface takes, this fallout is shows up in stormwater runoff. 4) The less impervious surfaces that have a direct hydraulic connection to the conveyance system, the greater the chances for the turf lawns and landscaping to capture these fine particles before they reach the stormwater conveyance system. 5) The BMPs currently recommended in Volume 3 of the District's *Urban Storm Drainage Criteria Manual* are well suited for the removal of these fine solid particles from stormwater.