Pikes Peak Highway Corridor

The Mountain

Pikes Peak, rising to a majestic 14,110' above sea level, dominates the front range of the Southern Rocky Mountains. The mountain was named for Zebulon Montgomery Pike, who was the first non-Native American to describe and map the mountain. Pike was dispatched by President Thomas Jefferson to describe the lands acquired in the Louisiana Purchase of 1803.

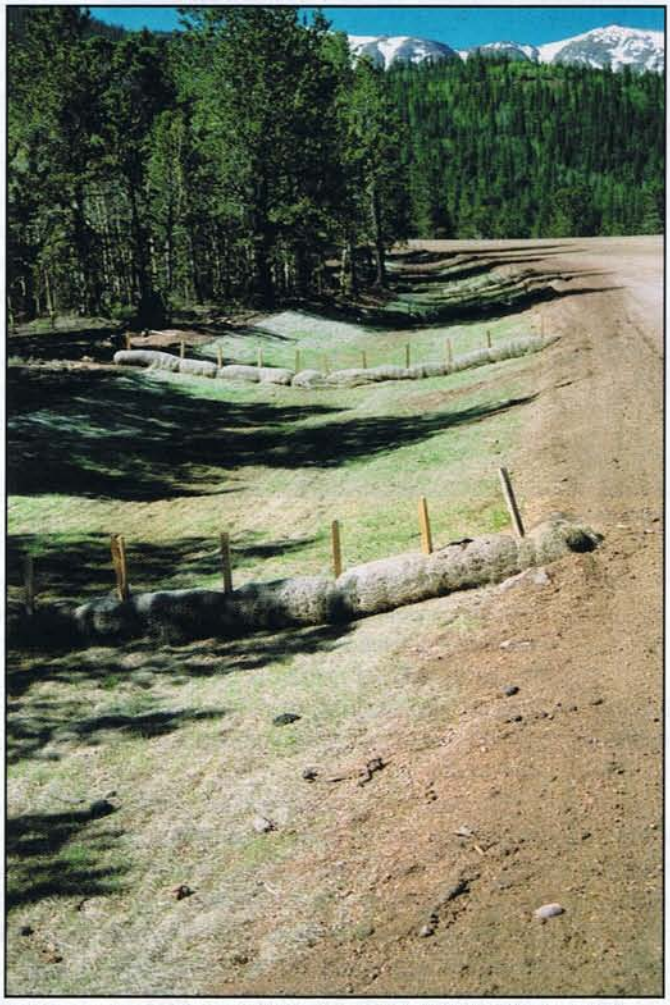
The Ute and Plains Indians were the original inhabitants of the Pikes Peak Region. These Native Americans seldom stayed on the mountain, but used an extensive trail system through the region to access into South Park renowned as a rich hunting ground.

Members of the Pike expedition attempted to climb what they called "The Grand Peak" on November 24, 1806, but were turned back by bad weather. Dr. Edwin James of the Long Expedition accomplished the first recorded ascent of the peak on July 14, 1820. The first woman to make the ascent to the summit was Julia Archibald on August 5, 1858.

The initial gold rush of 1859 lured prospectors and explorers to the Pikes Peak and Denver regions of the Colorado Territory. Pikes Peak became the symbol and the landmark of the western expansion into the Territory, as is exemplified by the popular slogan of the day, "Pikes Peak or Bust".

Several man-made structures have adorned the Pikes Peak summit. The U.S. Army Signal Corps constructed the first, a U.S. Signal Service/Weather Station, in 1873. In 1899 a steel observation tower was constructed next to the weather station, but was subsequently moved in 1900 to the top of a second story addition to the "Summit House".

In 1892 the Pike National Forest was established, and this new forest unit encompassed the famed mountain peak.



After seven months of winter, grass grows through the ECB.

The Road

Access to the mountaintop was provided through the completion of a toll road in 1889, thus making travel to the summit possible by horse-drawn carriages. Two years later, in 1891, a cog railway made its first journey to the summit. The carriage road could not compete economically with the cog railway, and was abandoned shortly after 1891. It was during this period, in 1893, that Katherine Lee Bates ascended the mountain. It was from this trip that she was inspired to write the words to the poem "America the Beautiful", which was published July 4, 1895. The first "horseless carriage", a "Locomobile Steamer", made the first trip to the mountaintop in 1901.

The increasing popularity of the automobile led to the construction of the auto road in 1915 by Spencer Penrose; under a U.S. Forest Service issued special use permit. The new toll road opened in 1916 for automobile use, which was also the first year that the Pikes Peak Auto Hill Climb was conducted. The popular road race continues as an annual event staged on the road.

In 1935 Penrose relinquished the permit and improvements back to the United States. Upon relinquishment the road was added to the Colorado State Highway System, since the Forest Service did not have the funds necessary to operate and maintain the road. The state managed the road from 1935-1948, utilizing a special gas tax to generate moneys needed for the road. In 1947 an amendment to the state gasoline tax statute limited the uses of the special gas tax funds, and this revenue source could no longer be used. The State ceased maintenance of the road on June 1, 1948.

Both the City of Colorado Springs and the U.S. Forest Service recognized the importance of the Pikes Peak Highway as a tourist attraction and it's impact on the local economy. However the Forest Service still did not have adequate funds budgeted for operation and maintenance of the road, and the City could not justify use of general revenue funds on the road. The solution was gained through the issuance of a Special use permit to the City on May 18, 1948, which required a special exception to allow the operation of a toll road on Forest Service lands. Thus the toll road was reinstated, and the City continues to provide operations and maintenance of the road corridor under this historical partnership, now known as Pikes Peak-America's Mountain.

The road presently consists of both paved and unpaved segments. The paved portion of the road extends from the entrance/toll station to approximately

Pikes Peak's road crew begin TRM installation.

10,000' elevation. Above 10,000' to the summit the road is gravel surfaced.

The Problem

Preparation of the Pikes Peak Highway Corridor Recreation Master Plan identified main issues/themes pertaining to use and management of the corridor.

Among the many issues identified during the development of the plan, dust and erosion control including repair of existing damage from ongoing erosion, surfaced as a primary concern for both the public as well as Pikes Peak-America's Mountain and the Forest Service.

The unpaved gravel surfaced portion of the road, above 10,000' to the summit, represents the greatest challenge. The gravel surfaced roadway contributes to ongoing air pollution problems due to dust generated by traffic on the road, as well as to down-stream water quality impacts from transported sediment loads. Most of the ditches, and cut and fill slopes along the higher alpine portion of the road, are sparsely vegetated at best, and therefore continue to erode over time.

Pikes Peak-America's Mountain is preparing to upgrade the gravel surfaced road to provide a more stable surfacing treatment, and to re-vegetate disturbed cut and fill slopes and ditches, to prevent downstream water quality impacts due to transported sediments.

Ongoing studies, being prepared by the consulting engineering firm Knight Piesold Consulting, are analyzing various alternatives for road surfacing treatments of the gravel surfaced portion of the roadway. They are also analyzing methods of stabilizing and vegetating ditches and slopes within the corridor.

A variety of erosion control methods for the cut and fill slopes and ditches are being considered. Hard armor, permanent turf reinforcement and degradable temporary products are being evaluated by the consultant to prescribe the most cost effective, systems approach, to dealing with the existing and long-term challenges.

A Solution

Pikes Peak-America's Mountain, the American Excelsior Company and the Buckley Powder Co. have partnered in the installation of a new turf reinforcement mat, Recyclex™-TRM, being evaluated for use in future upgrading of the Pikes Peak Road.

The turf reinforcement mat, developed and tested by the American Excelsior Company, consists of a fiber matrix manufactured from 100% post-consumer recycled polyester plastic. For each pound of fiber used, 20 plastic beverage bottles are diverted from the solid waste disposal system and our nation's landfills. The turf reinforcement mat is unique, and it conforms to current Federal Government Executive Order 13101, that directs Federal Agencies to encourage the procurement of products utilizing post consumer recycled materials.

Hydraulic testing of the turf reinforcement mat was performed at the Erosion Lab in Rice Lake, Wisconsin during the summer of 2000, utilizing standard protocols published by the American Society for Testing and Materials for the testing of Erosion Control Blankets. This proved that the material can withstand bed shear stress forces in excess of 8 pounds per square foot, and velocities in excess of 15 feet per second in a fully vegetated condition.

A test section of roadside ditches, approximately 1,660 feet in length, was installed in October of 2000 by road maintenance personnel under the direction of Capital Projects Manager Jack Glavan, P.E., Ph.D. Assisting the Pikes Peak Road Crew with guidance on material installation procedures were Lee Johnson, CPESC, Buckley Powder Co., and Howard Wagner, Landscape Architect/CPESC, American Excelsior Company.

The section of roadway selected for evaluation of ditch protection systems was particularly challenging. This section of the road, approximately mid-way to the summit, at an approximate elevation of 10,500 feet, climbs at an average 9% grade with numerous switchbacks above and below the test section.

Soils consist of coarse, granular decomposed rock, with very little organic content. Topsoil is practically non-existent. These primitive soils are highly susceptible to wind and water erosion.

The road maintenance crew graded the ditch to a consistent cross section prior to the installation of the erosion control system. Recyclex'-TRM was installed across the entire ditch width and staked in place using triangular wood stakes along the bottom. Steel wire staples were used to anchor the material on the side slopes. An anchor trench was constructed at the edge of the road shoulder, and the TRM was bedded in the trench prior to backfilling and compaction.

The completed TRM installation was then soil loaded with 1-1 1/2" of topsoil, which was amended with additives, and then seeded with a native grass seed mix approved by the Forest Service. Once vegetation becomes established, the plant root systems interlocks with the fiber matrix of the permanent TRM, which raises the

resistance of the vegetation to withstand significantly higher hydraulic forces than the vegetation alone can stand.

Final surface protection was provided by the installation of excelsior Sediment Logs at approximately 25' intervals to serve as energy dissipaters. Double net Curlex® II excelsior erosion control blankets were installed over the finished seedbed to provide initial surface protection, and to create ideal germination and growing conditions for emerging vegetation. The erosion control blankets were wrapped over the excelsior logs to prevent undermining.

The opposite side of the road represents less severe conditions due to a limited watershed draining into the roadside ditch line. This section is divided into three sections by culverts that provide for two entry points into an adjacent picnic area.

This ditch will receive a different treatment consisting of Curlex® III heavy-duty degradable erosion control blankets, with approximately 25' of Curlex® Enforcer biocomposite turf reinforcement mat below the culvert outlets to protect against scour. Riprap aprons are to be placed at the pipe outlets, over the top section of the TRM, to provide energy dissipation and additional protection at these critical points.

Soil loading of TRM to insure root reinforcement instead of stem reinforcement.

This combination of products represents a logical, and cost effective, system to deal with the differing conditions represented within the length of the test section.

Spring 2001

The seed mix that was installed in the fall included a nurse crop of annual rye grass, along with a blend of native seed approved by the U.S. Forest Service for use within the road corridor. An inspection in

Temporary erosion control blanket (ECB) over the soil loaded TRM.

May of 2001 showed the initial germination of cool weather grasses was underway, and a good stand of vegetation was developing.

Snowmelt runoff, and early spring thunderstorm activity, had impacted the site with no obvious failures or erosion having occurred. Early season grading operations on the gravel road, to prepare for the visitor season and the annual Pikes Peak Road Race, had deposited loose material along the road edge adjacent to the ditch. Flowing water from late afternoon thunderstorms had transported sediments into the ditch from the roadway surface. The temporary degradable erosion control blankets, in combination with the energy dissipation Sediment Log ditch checks, had controlled and stopped the transport of water-borne sediments after only a few feet.

The combination of permanent turf reinforcement mat, temporary degradable erosion control blanket, and energy dissipation ditch checks provided an effective systems approach to ditch stabilization/revegetation for the project. **L&W**

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