

Controlling dust in ecologically sensitive areas is a delicate matter. Squaw Creek National Wildlife Refuge management, a wetland and protected area for migratory birds in Northwestern Missouri, recognized the need for dust control on the Refuge. As wetlands are among the most biologically diverse ecosystems on Earth, the environmental impact of products used on the Refuge was a primary concern when addressing dust control. The Refuge management invited EnviroTech Services, Inc. to participate in a study of dust control products after selecting EnviroTech's durablend-C<sup>™</sup> through a rigorous screening process. The study not only found durablend-C<sup>™</sup> to be safe for invertebrates and aquatic organisms on the Refuge, but durablend-C<sup>™</sup> produced equal, if not better, results than the competing product. Indeed, a single application of durablend-C<sup>™</sup> performed as well or better than two applications of the alternative product tested over the same timeline without compromising the ecosystem.

Dust control is an ever-present concern for those responsible for maintaining unpaved roadways. Particulate matter poses a hazard to the health and safety of those traveling the roadways, to the wellbeing of plant and animal life adjacent to the roadways and to the longevity of the road surface itself. The least expensive dust control solutions, magnesium or calcium chloride treatments, are undesirable in ecologically sensitive areas and other alternative dust control products can be toxic to roadside organisms. Finally, the biochemical and chemical oxygen demands (BOD and COD) of alternative dust control products are often massive. When evaluating the best options, the field of available products narrows rapidly.

EnviroTech Services, Inc. developed the durablend<sup>™</sup> line of products to provide alternative dust control solutions for roadways with an array of concerns that cannot be addressed with traditional treatments of magnesium chloride or calcium chloride alone. Utilizing polymer-based technology durablend<sup>™</sup> products fix chlorides in the road, mitigating leaching into the environment, while maintaining relatively low BOD and COD. Further, the product line offers longevity and performance that is unparalleled.

When used in conjunction with a compaction aid in EnviroTech's proprietary Compact & Cap<sup>™</sup> program, durablend<sup>™</sup> products provide a water resistant surface to the roadway, trap fine particles to the road surface and protect the soil of the road from erosion.



Images 1 and 2: Application of durablend-C<sup>™</sup> (Kunz, Linder, & Little, 2016), (Internal Image)



Squaw Creek National Wildlife Refuge is a protected wetland in Northwestern Missouri that hosts the migration of millions of waterfowl every spring and autumn and is the permanent home to many other plants and animals. Managers of the Refuge recognized the delicate nature of providing dust control along the 10-mile unpaved road that abuts the wetland. With 140,000 visitors per year, the need to control dust for the sake of health and safety as well as the longevity of the road was vital.



Image 3: Auto tour loop immediately adjacent to the wetland (Kunz, Linder, & Little, 2016)



Image 4: Typical dust conditions prior to treatment (Kunz, Linder, & Little, 2016)

## The Squaw Creek NWR Study

"Quantifying the Effect of Dust Control Treatments at Squaw Creek National Wildlife Refuge: Roads and Roadside Organisms" is a study organized by the United States Geological Survey to determine if dust control products are safe for the Refuge's complex and sensitive ecosystem. Investigators screened many of the products available on the dust control market for suitability based on the following selection criteria:

1. Classified as practically non-toxic in laboratory tests;

2. Appropriate for the Squaw Creek National Wildlife Refuge setting as determined by respective vendors;

3. Requiring an application procedure that was feasible, based on available equipment and Refuge staff;

4. Agreed upon by Refuge management.



Consultations with EnviroTech's field application scientists included analysis of soil samples from the road base, weather, climate and traffic data, as well as review of previous positive outcomes in using this program with various road surfaces.

The Refuge management selected EnviroTech's Compact & Cap<sup>™</sup> program with durablend-C<sup>™</sup> for the scientific study that began in June of 2014. A competing product was also selected for the study. Approximately three miles of Refuge road were professionally prepared with non-native limestone road base and graded, creating an unpaved road of very high quality with excellent shape. Both durablend-C<sup>™</sup> and the competing product were applied to one mile of road each, in half-mile sections, and approximately one-half mile of prepared road was left untreated as a control section.

In this application, the Compact & Cap<sup>™</sup> program utilized calcium chloride as a compaction aid and finished the road with durablend-C<sup>™</sup>. By doing so, EnviroTech provided the superior functionality of calcium chloride in compacting the road while protecting the road and environment from product leaching and dust erosion with the durablend- C<sup>™</sup> cap.

The Refuge then collected data specific to the health and wellbeing of the environment following road treatment. Aggregate samples were taken from each study section and leachates from the samples were used in 96-hour toxicity tests with juvenile trout. This test was executed with samples taken immediately following application and at 11 and 16 months post-application. Additionally, 12 months following application two types of traps were set up to collect and count invertebrates (primarily flying and ground-dwelling insects) along the study sections of road.

Neither product used in the study significantly affected rainbow trout in short-term toxicity tests at any interval of testing, compared to the control section of road (see Table 1). Further, neither treatment reduced the number of invertebrates trapped, compared to the control section (see Figure 1).

Aggregate sample source and timing		Rainbow trout survival	Conductivity (µS/cm)	pН	Hardness (mg/L as CaCO <sub>3</sub> )
durablend-C™	At application	100%	1780 (136)	6.95 (0.04)	788 (65)
	11 months	100%	496 (68)	7.08 (0.15)	216 (30)
	16 months	100%	423 (97)	7.1 (0.22)	185 (43)
EnviroKleen®	At application	100%	124 (17)	7.5 (0.37)	56 (5)
	11 months	100%	68 (7)	7.4 (0.34)	34 (9)
	16 months	97%	90 (22)	7.26 (0.1)	43 (8)
Untreated	At application	100%	85 (12)	7.59 (0.67)	47 (7)
	11 months	100%	93 (22)	7.67 (0.72)	49 (7)
	16 months	100%	79 (13)	7.62 (0.72)	43 (1)
Control water <sup>1</sup>	n/a	93%	253 (1)	7.81 (0.26)	106 (0)

<sup>1</sup>CERC well water diluted to a hardness of ~100 mg/L as CaCO<sub>3</sub>

 Table 1. Leachate test results from treated and untreated aggregates collected from Squaw Creek roads at three sampling periods. Survival values are from three replicate jars with five fish/jar. Water quality values are means (n=2-4) with standard deviations in parentheses. (Kunz, Linder, & Little, 2016)



Figure 1: Roadside invertebrate captures on sticky traps (left) and during two cycles of pitfall trapping (right) during summer 2015, approximately one year after initial product applications. Error bars represent standard deviations. Dotted reference line=untreated control value. (Kunz, Linder, & Little, 2016)

The study did not focus solely on the effects of the products on road-side life, however. Quantitative analysis of the products' performance was also completed using a mobile-mounted DustTrak DRX meter. The DustTrak data, represented by the graphs in Figure 2, illustrate how the test sections of durablend-C<sup>™</sup> consistently suppressed significantly more dust than the untreated section. The durablend-C<sup>™</sup> sections also performed as well as, if not better than, the sections treated with the competing product.



Figure 2: Dust production (average total particulate matter) measured while driving on test sections under standard conditions on three sampling dates (1 sample/sec, n=3 trips/section). Error bars represent standard deviations. (Kunz, Linder, & Little, 2016)

When reviewing the weather pattern for the area over the period of data collection, durablend-C<sup>™</sup>'s performance was consistently maintained over a wide array of temperatures, humidity and moderate-to-heavy precipitation.



Table 1: Weather data for Squaw Creek NWR, June, 2014 to August, 2015 (Weather Underground, 2016)

Testing durablend-C<sup>™</sup> in such a rigorous fashion allowed for third-party scientific analysis of the product's effectiveness. The data clearly show the advantage of durablend-C<sup>™</sup> treatment in a Compact & Cap<sup>™</sup> program over that of no treatment. It is also important to consider that a maintenance application of the competing product was required 10 months after the initial treatment. Not only did durablend-C<sup>™</sup> perform as well or better than that product over the course of the study, but one application of durablend-C<sup>™</sup> in a Compact & Cap<sup>™</sup> program did so over two applications of the competing product.

Through the Squaw Creek National Wildlife Refuge dust control study, durablend-C<sup>™</sup> was found to be a safe and highly effective product when used in EnviroTech's proprietary Compact & Cap<sup>™</sup> program. durablend-C<sup>™</sup> protected the sensitive environment from compaction-aid leaching, protected the road from dust erosion and sustained the stability of the road over a long period of time.

For more information regarding durablend-C<sup>™</sup> and the Compact & Cap<sup>™</sup> program, please visit EnviroTechServices.com.



## References

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- Kunz, B. K., Linder, G., & Little, E. E. (2016, January 11). USGS Columbia Environmental Research Center. Retrieved from United States Geological Survey: http://www.cerc.usgs.gov/Assets/UploadedFiles/ExternalDocs/2016%20TRB%20Kunz%20et%20 al.%20Visual%20Aid%20Submission.pdf

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