



Research Notes

Oregon Department of Transportation

RSN 06-07

March 2006

Clearing Up the Benefits of Chitosan Flocculant

Highway construction and maintenance activities done directly in streams disturb soil and rock in the stream bed creating turbidity. The intent of this project was to test the effectiveness of reducing construction generated turbidity by using a substance called chitosan. By flocculating soil particles together, chitosan causes them to settle out of the water more quickly, or to be more easily removed through filtration.



Water quality monitoring site for chitosan testing on Oak Creek in Corvallis, Oregon. Note the natural water clarity.

The results of this project indicate that chitosan can accelerate, or facilitate, the removal of suspended sediment from a stream by being directly added to the stream. Accomplishing this improvement requires adequate dosing and mixing of the chitosan in the stream. Doses of 0.25 mg/L were found to have little effect, while the effect of a dose of 0.5mg/L was noticeable. Common practice within filtration facilities is to

tailor the dosing to the turbidity of the water being treated. Doses up to 1.0 mg/L are recommended by the manufacturer of the chitosan used in this study. Even though the effects of the chitosan treatment were observable, fully exploiting the benefits of using chitosan will likely involve the use of some form of in-stream filters or retarding the flow of water.

Field testing was conducted in Oak Creek on the west side of Corvallis, Oregon. This test site had the added benefit of having numerous years of water quality, limnology, fisheries, and entomology data collected by an Oregon State University Limnology class. This longitudinal data will help in exploring possible negative, or positive, effects that the chitosan may have had on the stream ecosystem. So far, none of the testing or observations indicates any harmful effects from the chitosan treatment.

Water samples were collected immediately downstream of the sediment and chitosan introduction sites, as well as 115 ft downstream, to test for free chitosan in the water. These samples were tested for free chitosan by trying to force any chitosan out of solution, trapping it on filter paper, and then testing it with iodine. The results were somewhat difficult to interpret, but they seemed to indicate very minor amounts of chitosan were being detected at the threshold of the test.

Analysis of the field testing results prompted follow-up lab testing. The lab tests indicate that chitosan's effectiveness can be strongly influenced by properties of both the water and

the sediment. Clay mineralogy and water pH were both specifically identified as important factors. The tests indicated that some additional unidentified parameter(s) of the water quality in Oak Creek were also at work. The results from observing chitosan's performance for varying turbidity and pH, using Oak Creek water, were not completely consistent with published literature on the subject.

Careful site specific evaluation of all of these factors will need to be done prior to future testing of chitosan at construction sites.

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To request a copy of the report "*Assessing the Effectiveness and Environmental Impacts of Using Natural Flocculants to Control Turbidity*" by Qilin Li and Laura Kegley contact the ODOT Research Unit by phone, or view the report on the Research Unit web page listed below



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