



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

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Project Title Determination & Elimination of the Toxic Effects of Fire-Retardants on Oncorhynchus mykiss in Aquatic Ecosystems	
Abstract Objectives/Goals The objectives in this experiment were to first determine the most effective fire-retardant and method to drop the fire-retardant so as to maximize survival of aquatic organisms. The second objective was to pinpoint the agent in the fire-retardant causing acute toxicity toward stream dwelling organisms through observation, chemical analysis, and dissections. Once this was identified and data was acquired an equation could then be developed to determine what minor alterations to fire-retardants chemical compositions would result in a completely non-toxic fire-retardant. Methods/Materials A stream environment was designed and created with all the specifications of a real stream and then verified based on research conducted. Once all the specifications were met, the organisms were added to the test and control stream. A retardant drop simulation was then created to replicate retardants being dropped in the field, through the use of aluminum wire and plexi-glass. The organisms were left in the simulated environment where concentrations of components, chemical properties, and mortality rates were measured periodically. A total of 570 fish were used in this experiment. Results The retardant manufactured by Astaris (D75) proved to have a much higher survival rate than the retardant manufactured by Fire-Trol (GTS). The most effective coverage level (amount of retardant dropped maximizing retardants potential) for D75 retardant was coverage level 5. GTS retardant at coverage level 6 proved to be its most effective coverage level. The components in the fire-retardants causing acute toxicity were the ammonia and sodium ferrocyanide compounds. This data was analyzed and used to create the "Toxicity Elimination" equation, which makes fire retardants completely non-toxic, through minor alterations to their chemical compositions. Conclusions/Discussion With the results I acquired, I recommend D75 be dropped at coverage level 5 and GTS fire retardant be used at coverage level 6 to maximize the retardant's potential. I recommend D75 be used in place of GTS and that each retardant company use the "Toxicity Elimination" equation to rework their retardants formulation in order to eliminate toxicity. Through these changes, the toxicity of fire-retardants can be eliminated while still allowing the retardant to retard the fire.	
Summary Statement The effects of fire-retardants on a stream organism are being tested in a recreated stream environment to acquire data to determine adjustments to procedures and an equation that can be used to eliminate the toxicity of the fire-retardants	
Help Received In this experiment I acquired the measuring equipment and devices necessary for chemical testing through the forest service, Fish and Game, Fresno State, and my high school	