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Applications for Unmanned Aerial Systems

An unmanned aerial system (UAS) is a combination of an unmanned aerial vehicle (UAV), ground-based controller, instrument payload, and communication system. GEI recognizes the significance of UAS technology and the engineering and ecological capabilities that UASs provide. GEI has a UAS team that includes FAA certified UAS pilots that utilize the latest UAS technology and associated processing software. UASs are unique tools that can be equipped with a variety of payloads to capture data from an aerial perspective. These data can then be utilized for a variety of ecological applications including topographic modeling, habitat mapping and classifications, vegetation mapping, ecosystem assessments, habitat restoration, and monitoring ecological disturbances.

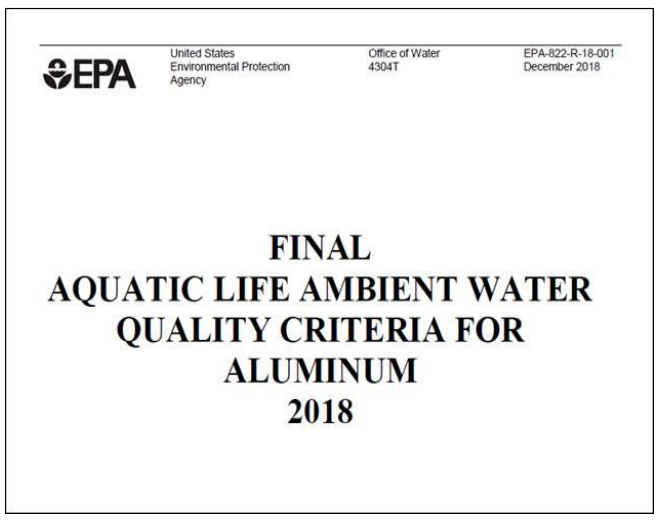
Please contact Shai Kamin at skamin@geiconsultants.com for more information about applications for UAS.

GEI Scientists Contribute to New National Guidance from the EPA

GEI scientists Bob Gensemer (Fort Collins) and Steve Canton (Denver/Fort Meyers, FL) have authored significant scientific contributions to EPA's new aquatic life criteria for aluminum that were just released in December. EPA's aquatic life criteria are used by states and tribes as the technical basis of water quality standards used in many Clean Water Act regulatory programs. Bob and Steve have been working on developing and publishing new scientific work with aluminum since 2006, including reports and expert testimony used in Triennial Reviews of water quality standards in New Mexico (2009) and Colorado (2010). Most recently, GEI has participated on the project team funded by the U.S. and European aluminum industries that developed much of the new toxicity data used by EPA to derive these new criteria.

To read more about the criteria, please visit www.epa.gov.

Or, contact Bob Gensemer, Ph.D. at bgensemer@geiconsultants.com.



EPA United States Environmental Protection Agency | Office of Water 4304T | EPA-822-R-18-001 December 2018

FINAL AQUATIC LIFE AMBIENT WATER QUALITY CRITERIA FOR ALUMINUM 2018

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Evaluating the Effects Of pH, Hardness, and Dissolved Organic Carbon on the Toxicity of Aluminum to Freshwater Aquatic Organisms Under Circumneutral Conditions

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Abstract: Although it is well known that increasing water hardness and dissolved organic carbon (DOC) concentrations mitigate the toxicity of aluminum (Al) to freshwater organisms in acidic water (i.e., pH < 6), these effects are less well characterized in natural waters at circumneutral pHs for which most aquatic life regulatory protection criteria apply (i.e., pH 6–8). The evaluation of Al toxicity under varying pH conditions may also be confounded by the presence of Al hydroxides and freshly precipitated Al in newly prepared test solutions. Aging and filtration of test solutions were found to greatly reduce toxicity, suggesting that toxicity from transient forms of Al could be minimized and that precipitated Al hydroxides contribute significantly to Al toxicity under circumneutral conditions, rather than dissolved or monomeric forms. Increasing pH, hardness, and DOC were found to have a protective effect against Al toxicity for fish (*Pimephales promelas*) and invertebrates (*Ceriodaphnia dubia*, *Daphnia magna*). For algae (*Pseudokirchneriella subcapitata*), the protective effects of increased hardness were only apparent at pH 6, less so at pH 7, and at pH 8, increased hardness appeared to increase the sensitivity of algae to Al. The results support the need for water quality–based aquatic life protection criteria for Al, rather than fixed value criteria, as being a more accurate predictor of Al toxicity in natural waters. *Environ Toxicol Chem* 2018;37:49–60. © 2017 SETAC

Keywords: Aluminum; Toxicity; pH; Hardness; Dissolved organic carbon

Ecological Design Support for Stream Restoration

Incorporating biological knowledge into the stream restoration process helps ensure that the designs benefit the resident aquatic community in the project area. GEI is currently working on several ecological design support projects in the Rocky Mountain Region. Ecological design support involves performing detailed project-reach assessments to identify limiting factors to the aquatic community, resulting in scientifically-based recommendations for eliminating or reducing them. Integrating biological expertise into restoration design combines novel data analyses and state-of-the-art collaboration between engineers, riparian ecologists, and aquatic biologists for a more effective restoration project. The fisheries goals for each project are site- and species-specific and range from improving overwintering habitat in northern Wyoming to creating high-flow refuges for larvae for rare species in a southern Colorado foothills stream.

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