Peer Review Plan

Date: 4/30/2018

Source Center: U.S. Geological Survey (USGS)
Northern Rocky Mountain Science Center
800 E. Beckwith Ave.
Missoula, MT 59801

Title: Effects of Persistent Energy-related Brine Contamination of National Wildlife Refuge Wetlands on Amphibian Abundance

Subject and Purpose: To help inform sustainable energy development, it is important to understand the ecological effects of historical and current production practices. The Williston Basin overlaps North America's Prairie Pothole Region, one of the world's largest prairies and wetland ecosystems. This region has a long history of oil production, but like in many other energy shale areas, advances in extraction technology have spurred increases in energy production. Although historical disposal practices that released chloride rich co-produced waters (brines) into the environment are no longer used, spills still occur frequently. However, there has been little research on the size and persistence of salinization from oil-related waste products on aquatic species, especially at population- or community-levels.

This product documents results from sampling 33 wetlands for 3 amphibian species in Montana and North Dakota during 2015-2017, primarily on National Wildlife Refuge lands, and used N-mixture models to determine how abundance varied with evidence of brine contamination. To provide insight into the effects of historical versus contemporary contamination, we also estimated the effect of well density and age on wetland water quality and amphibian abundance. Abundance of boreal chorus frog (*Pseudacris maculata*) larvae declined most rapidly in response to elevated chloride (range: 0.04–17500 mg/L), followed by the northern leopard frog (*Rana pipiens*) and barred tiger salamander (*Ambystoma maculata*). Water quality and population- and community-level abundance of amphibians were more strongly related to nearby wells (≤800 m) installed prior to 1982 than to wells installed since 1982, after which brines could no longer be stored in unlined reserve pits that often leaked into the groundwater. These results suggest historical brine management practices were the primary driver of contamination and reduced amphibian abundance in the wetlands we sampled, reflecting multi-decadal ecological effects. These persistent effects also underscore the critical need for tools to restore landscapes affected by brine contamination. The product will be submitted to the journal *Conservation Biology* for publication.

Impact of Dissemination: This information product is considered by the USGS to be Influential Scientific Information.

Timing of Review (Including Deferrals): May - June 2018. Deferrals are not anticipated at this time.

Manner of Review, Selection of Reviewers, and Nomination Process: The review will be conducted via individual letters to the peer reviewers. USGS will select the peer reviewers pursuant to Survey Manual chapter 502.3 –Fundamental Science Practices: Peer Review (http://www.usgs.gov/usgs-manual/500/502-3.html).

Expected Number of Reviewers: Anticipates a total of three reviewers.

Requisite Expertise: Population ecology, amphibian ecology.

Opportunity for Public Comment: No opportunity for public comment is formally incorporated for this product.

Agency Contact: peer_review_agenda@usgs.gov.