Distribution of the Invasive New Zealand Mud Snail in Sediments of Spirit Lake, Mount St. Helens, with Comparison to Vegetation Abundance

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Abstract:

Spirit Lake is an ecosystem undergoing long-term ecological change following the 1980 eruption of Mount St. Helens. Ongoing disturbances include the invasive New Zealand mud snail (*Potamopyrgus antipodarum*), first detected in the lake in 2016. Because this species has a high reproductive rate and can outcompete native invertebrates, understanding the environmental factors that influence its distribution is essential for predicting its spread in post-disturbance systems. This study evaluated whether sediment characteristics influence mud snail distribution within Spirit Lake. Sediment samples were collected using a Ponar dredge and analyzed for grain size and snail abundance. The relationship between median grain size and mud snail density was assessed using linear regression. Sediments were silt-dominated and ranged from poorly to very poorly sorted, with phi sorting values of 1.71-2.44, reflecting post-eruption substrate. Few sediment samples contained mud snails; detections occurred only in samples with more silt than sand. Mud snail density was not correlated with median grain size ($p > 0.05$). Mud snail density in sediment did not show a significant correlation with density in vegetation samples collected at the same locations ($p = 0.155$). In contrast, native *Gyraulus deflectus* density was significantly correlated between sediment and vegetation samples ($p = 0.0009$). These results show that mud snails exhibit patchy, low-abundance distribution within sediments. The lack of a strong sediment–vegetation relationship for mud snails suggests that they may not yet be fully established or competitively dominant in Spirit Lake.