INVASIVE SLUGS and FROGS

Species are considered invasive if they are not native to an ecosystem, and if they are likely to cause harm to human health, the economy, or the environment (Executive Order 13112).

European Black Slug *(Arion ater)*

The European black slug is native to the British Isles and much of northern Europe and thrives in wet, cool climates. Introduction of European black slug into Alaska has been relatively recent. Once introduced into eastern Prince William Sound, the species quickly established and spread. The ecological implications of black slug presence are unclear and merit further investigation. Information is also needed about the ecological role of native slugs and the likelihood of extirpation by the establishment of black slug populations. In the past two decades, its mating with the non-native (at northern latitudes) pest species *Arion vulgaris* (or Spanish slug) has resulted in a more resilient hybrid exhibiting increased tolerance to cold.

The black slug is mainly nocturnal and tends to avoid exposure to sunlight. The black slug is omnivorous, eating a variety of items. These slugs prefer to eat on cloudy days or at night. Mucus-production necessitates moist habitats. As decomposers/consumers, slugs inhabit an important niche, contributing to ecosystem health. A 2005 study suggested that slugs promote plant—especially forb—species. Additionally, slugs help disperse seeds and spores through their waste, and slugs facilitate nutrient cycling, and leaving behind their mucus, which facilitates decomposition.

Leopard slug *(Limax maximus)*

Leopard slugs are native to Europe, North Africa, and Asia minor. Leopard slugs are fairly cosmopolitan, occurring in Europe, Asia, Africa, North America, South America, Australia, and New Zealand (NatureServe 2009). Leopard slugs are invasive in North America, South America, Australia, and New Zealand (Forsyth 2004).

The leopard slug is able to survive in the more northern states in the US; it has been reported in just under 50 percent of the states and in several Canadian provinces (BC, ON, NF, NS; NatureServe 2009). The introduction of leopard slug, also known as giant garden slug, in Alaska is unknown. It has been reported in Wrangell, and likely occurs in other Southeast Alaska communities (Ferguson and Knight 2010). Leopard slugs likely occur throughout Southeast Alaska; however, surveys have not been completed for all regions.

Red legged-frog (*Rana aurora*)

Red-legged frogs are native to western North America, from Baja California to southwestern British Columbia. In Alaska, red-legged frogs were introduced from Washington State to Chichagof Island (southeast of Hoonah) in 1982. This population has been successfully reproducing and dispersing into nearby wetlands.

Red-legged frog tadpoles are algae grazers and can alter the abundance and composition of algae and periphyton, which could result in wide-spread changes to the aquatic food web. Red-legged frogs utilize habitats for foraging and breeding which are similar to native Alaskan amphibians including the wood frog (*Rana sylvatica*) and the western toad (*Bufo borealis*). It is possible that red-legged frogs carry pathogens or diseases that could harm native amphibians. Effects of this species are currently unknown but potentially include the displacement of the endemic boreal toad and wood frogs (MacDonald 2003).

Management strategies have not been developed for red-legged frogs in Alaska, although it is illegal to introduce any aquatic organism into Alaskan waters. Ironically, this species is declining throughout its native range, and a subspecies, the California red-legged frog (*Rana aurora draytonii*) is Federally-threatened. Research in Alaska will focus on assessing the effects of red-legged frogs on native Alaskan amphibians. Given the remoteness of its introduced range in Alaska, eradication of this species would be logistically improbable. Instead, it is possible that if populations continue to decline in its native range, the Alaskan population could be used to seed new populations for restoration efforts in the lower 48. However, that remains to be determined.

Pacific Chorus Frog (*Pseudacris regilla*)

Around 1960, a population of Pacific chorus frogs were released into a group of muskeg ponds near Ward Lake on Revillagigedo Island (MacDonald 2003). Pacific chorus frogs were also transported on Christmas trees into the Anchorage area in December 2009, but did not successfully establish (Halpin 2009). The Pacific chorus frog is found in 9 states, including Alaska and in British Columbia, Canada (NatureServe 2009). The Pacific chorus frog has an established breeding population on Revillagigedo Island in a single pond complex (MacDonald 2003). Currently, this population is thought to be having little effect on native amphibian species, because in recent years boreal toads and rough-skinned newts (*Taricha granulose*) have successfully reproduced in the same pond complex (Schrader and Hennon 2005).