

1999). Detrimental effects of wild pigs on the Central California tiger salamander include both predation and habitat modifications. One recognized expert on wild pigs in California states that he has found bullfrogs, snakes, and newts in pig stomachs, and he believes that California tiger salamanders would be consumed by pigs, if encountered (R. Barrett, University of California, Berkeley, pers. comm. 2002), a view also shared by another wild pig expert in Florida (R. Belden, Florida Wildlife Commission, pers. comm. 2002). The nocturnal behavior of wild pigs, and their affinity for ponds and watering holes in oak woodlands of foothills and other fringe areas of the Central California tiger salamander's range, coupled with the nocturnal movements of Central California tiger salamanders during the rainy season, could result in considerable predation. In addition, wild pigs may cause ecological damage to Central California tiger salamander habitat, including consumption of vegetation for food, and rooting and digging, which may change plant successional patterns, soil properties, water infiltration rates, water quality (Synatzske 1993), or the small-mammal burrows the salamander needs during estivation.

California tiger salamanders are also likely preyed on by many species of native fish and wildlife. In healthy salamander populations, such predation should not be a significant threat. But when combined with other impacts, such as predation by nonnative species, contaminants, migration barriers, or habitat alteration, it may cause a significant decrease in population viability. Native predators including avian species, such as great blue herons (*Ardea herodias*) and snowy egrets (*Egretta thula*), western pond turtles (*Clemmys marmorata*), various garter snakes (*Thamnophis* spp.), larger California tiger salamanders, larger spadefoot toads (*Scaphiopus hammondi*), and California red-legged frogs (Peters 1993; Hansen and Tremper 1993). In Arizona, larval tiger salamanders are preyed upon by adult predaceous diving beetles (*Dytiscus dauricus*) (Holomuzki 1986); turkey vultures (*Carthartes aura*) have been observed feeding on larval or adult tiger salamanders (Duncan 1999).

D. The Inadequacy of Existing Regulatory Mechanisms

The primary cause of Central California tiger salamander decline is the loss, degradation, and fragmentation of habitat due to human activities. Federal, State, and local laws have been insufficient to prevent past and ongoing

losses of the limited habitat of the Central California tiger salamander, and are unlikely to prevent further declines of the species.

Federal

Clean Water Act. Under Section 404 of the Clean Water Act (CWA) (33 U.S.C. 1251 *et seq.*), the U.S. Army Corps of Engineers (Corps) regulates the discharge of fill material into waters of the United States, including wetlands. Section 404 regulations require applicants to obtain a permit for projects that involve the discharge of fill material into waters of the United States, including wetlands. However, normal farming activities are exempt under the CWA and do not require a permit (53 FR 20764; Robert Wayland III, Environmental Protection Agency (EPA), *in litt.* 1996). Projects that are subject to regulation may qualify for authorization to place fill material into waters of the United States, including wetlands, under several nationwide permits. The use of nationwide permits by an applicant or project proponent is normally authorized with minimal environmental review by the Corps. No activity that is likely to jeopardize the continued existence of a threatened or endangered species, or that is likely to destroy or adversely modify designated critical habitat of such species, is authorized under any nationwide permit. An individual permit may be required by the Corps if a project otherwise qualifying under a nationwide permit would have greater than minimal adverse environmental impacts.

Recent court cases may further limit the Corps' ability to utilize the CWA to regulate the discharge of fill or dredged material into the aquatic environment within the current range of the California tiger salamander (*Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, 531 U.S. 159 (2001) (SWANCC)). The effect of SWANCC on Federal regulation of activities in wetlands in the area of the Central California tiger salamander has recently become clear by the Corps' decision not to assert its jurisdiction over the discharge of fill material into several wetlands within the range of the Central California tiger salamander. In a letter from the Corps, dated March 8, 2002, concerning the discharge of fill into 0.18 ha (0.45 ac) of seasonal wetlands southwest of the intersection of Piner and Marlow Roads (Corps File Number 19736N), the Corps referenced the SWANCC decision and reiterated that the subject wetlands were not "waters of the United States" because they were: (1) Not navigable waters; (2)

not interstate waters; (3) not part of a tributary system to 1 or 2; (4) not wetlands adjacent to any of the foregoing; and (5) not an impoundment of any of the above. The letter further stated that the interstate commerce nexus to these particular waters is insufficient to establish CWA jurisdiction, and therefore, not subject to regulation by the Corps under Section 404 of the CWA. The Corps also cited the SWANCC decision as their reasoning for not taking jurisdiction over fill of Sonoma County California tiger salamander breeding pools at the recently constructed South Sonoma Business Park (Corps File Number's 23540N, 249420N).

When on- or off-site mitigation is required by the Corps as a condition of a Section 404 permit to fill certain wetlands, there is often low probability that affected Central California tiger salamander habitat functions (if any) would actually be compensated and replaced by the ensuing mitigation action(s).

Semlitsch (1998) examined published literature for six species of pond-breeding ambystomatid salamanders from five states and concluded that a buffer zone encompassing 95 percent of a given population would need to extend 263 m (534 ft) from a wetland's edge into surrounding terrestrial habitat in order to give adequate protection. More recently, Trenham (2001), although cautioning that essential terrestrial habitats and buffer requirements are still relatively poorly understood, concluded certain populations of California tiger salamanders have migrated distances of 670 m (2,200 ft) between breeding ponds, and that plans to maintain local populations of California tiger salamanders should include pond(s) surrounded by at least 173 m (567 ft) wide buffers of terrestrial habitat occupied by burrowing mammals. Preliminary results of a study located at Jepson Prairie have determined that adult California tiger salamanders migrate up to 400 m (1,312 ft) from their breeding pond (P. Trenham, pers. comm. 2002).

Management plans that focus only on preserving ponds or wetlands, without consideration for associated terrestrial habitat, are likely to fail to maintain viable amphibian populations (Marsh and Trenham 2001). However, even with inclusion of terrestrial habitat buffers, recent studies have demonstrated that restored wetlands are often still only partially successfully recolonized by the full amphibian assemblages being targeted for restoration (Lehtinen and Galatowitsch