MOLLUSKS

Asian Clam *Corbicula fluminea*

Ecology: Asian clams are bi-valve filter feeders that remove particles (plankton) from the water column. The Asian clam is distinguished by an outer shell of yellow-brown with concentric rings which flake, leaving white spots. The inside of their shells are pearl to purple in color.

Their ability to reproduce rapidly, coupled with a low tolerance for cold temperatures, produces wild swings in population sizes, from year to year, in northern water bodies. *C. fluminea* is found at or slightly below the sediment surface, in both lotic and lentic habitats, over its native range in southeastern Asia. In the United States, *C. fluminea* has been most successful in well-oxygenated clear waters (Belanger et al. 1985; Stites et al., 1995). Fine clean sand, clay, and coarse sand are favored substrates, although they may be found in lower numbers on most substrate types (Belanger et al. 1985). Maximum Asian clam density has been reported to vary between 1,000/m^2 (Stites et al. 1995) and 2,320/m^2 (Sinclair 1971a; Sinclair 1971b). *C. fluminea* is more common and occurs at higher densities in stream pools than in stream runs (Blalock and Herod 1999).

In their native habitat, Asian clams occur mostly in freshwaters, however, they have been reported from brackish and estuarine habitats, but are typically not as abundant in such habitats as in freshwaters (Carlton 1992). Asian clams can tolerate salinities of up to 13 ppt for short periods of time. If allowed to acclimate, they may tolerate salinities as high as 24 ppt (King et al. 1986), though; lower salinities are preferred (Morton and Tong 1985).

This species also appears to tolerate low temperatures well. Viable populations have been reported surviving temperatures of 0-2°C in the Clinton River, Michigan (Janech and Hunter 1995). However, low temperatures do limit reproduction, since veligers are typically released at temperatures of 16°C or higher (Hall 1984).

Life span varies with habitat, with a maximum reported life span of approximately 7 years (Hall 1984). *C. fluminea* can self-fertilize releasing up to 2,000 juveniles per day and more than 100,000 juveniles in a lifetime. Juveniles are only 1mm long when discharged and take one to four years to reach maturity. Adults can reach lengths up to 5 cm (Hall 1984).

Distribution:

The first collection of *C. fluminea* in the United States was recorded in 1938, along the banks of the Columbia River, near Knappton, Washington. (Counts 1986). Currently, it is found in 38 states and the District of Columbia. (Foster 2008).

In Utah (Figure 1), there has been a known population of *C. fluminea* in Lake Powell since the mid 1970's. This population, however, was likely established in the Colorado River prior to completion of the Glen Canyon Dam, in 1960 (Pers. Comm. 2008. Larry Dalton, Aquatic Invasive Species Coordinator, Utah Division of Wildlife Resources).

Recently, they have been found at various locations along the Jordan River, which flows from Utah Lake, into the Great Salt Lake (Pers. Comm. 2008. Larry Dalton, Aquatic Invasive Species Coordinator, Utah Division of Wildlife Resources). The Jordan River provides water to a significant canal system, so the clams are probably throughout Utah Valley and the Salt Lake Valley. Utah Lake is an essential element of the Central Utah Project, receiving water as a trans-basin diversion from the Green and Colorado River drainages via Strawberry Reservoir. The reservoir receives water from 10 south slope Uinta Mountain drainages via an extensive underground collection system. Those drainages would have eventually entered the Green River and the Colorado River, which drain into Lake Powell. The fouling effects of Asian clams will likely create problems within this system (Pers. Comm. 2008. Eric Larson, Central Utah Project Coordinator, Utah Division of Wildlife Resources). *C. fluminea* was confirmed in northern Utah's Willard Bay (both its inflow and outflow) in the Spring of 2007 (Pers. Comm. 2008. Larry Dalton, Aquatic Invasive Species Coordinator, Utah Division of Wildlife Resources); it receives water from the Weber River. *C. fluminea* is also found in Yuba Reservoir in south central Utah (Pers. Comm. 2008. Don Willey, Central Region Aquatic Program Manager, Utah Division of Wildlife Resources).

Pathways of Introduction: *C. fluminea* was thought to have first entered the United States as a food item (Foster 2008). *C. fluminea* is thought to spread primarily by humans through activities such as bait bucket introductions (Counts 1986), accidental introductions associated with imported aquaculture species (Counts 1886), and intentional introductions by people who buy or sell them as a food item in markets (Devick 1991). The only other noteworthy dispersal agents are water currents or flooding events (Isom 1886).

Management Considerations: Although the Asian clam grows and disperses less rapidly than the *Dreissena* mussels, it too is causing considerable fouling problems and is threatening native species. Costs associated with its fouling damage are about $1 billion/yr (Office of Technology Assessment 1993). *C. fluminea* populations are controlled by a variety of methods. Where intakes pipes are fouled, thermal regulation is employed, whereby water in the pipes is heated to temperatures exceeding 37°Celsius. However, this method is not practical in most water systems (Balcom 1994). Mechanical methods, such as using screens and traps, can effectively dispose of older clams and remove body tissue and shells from the system (Balcom 1994). Chemicals, such as small concentrations of chlorine or bromine, are used to kill juveniles and sometimes adults. (This method is very effective, but because of increasing restrictions on the amounts of these chemicals that may be released from a facility, managers have been moving away from this method (Balcom 1994).

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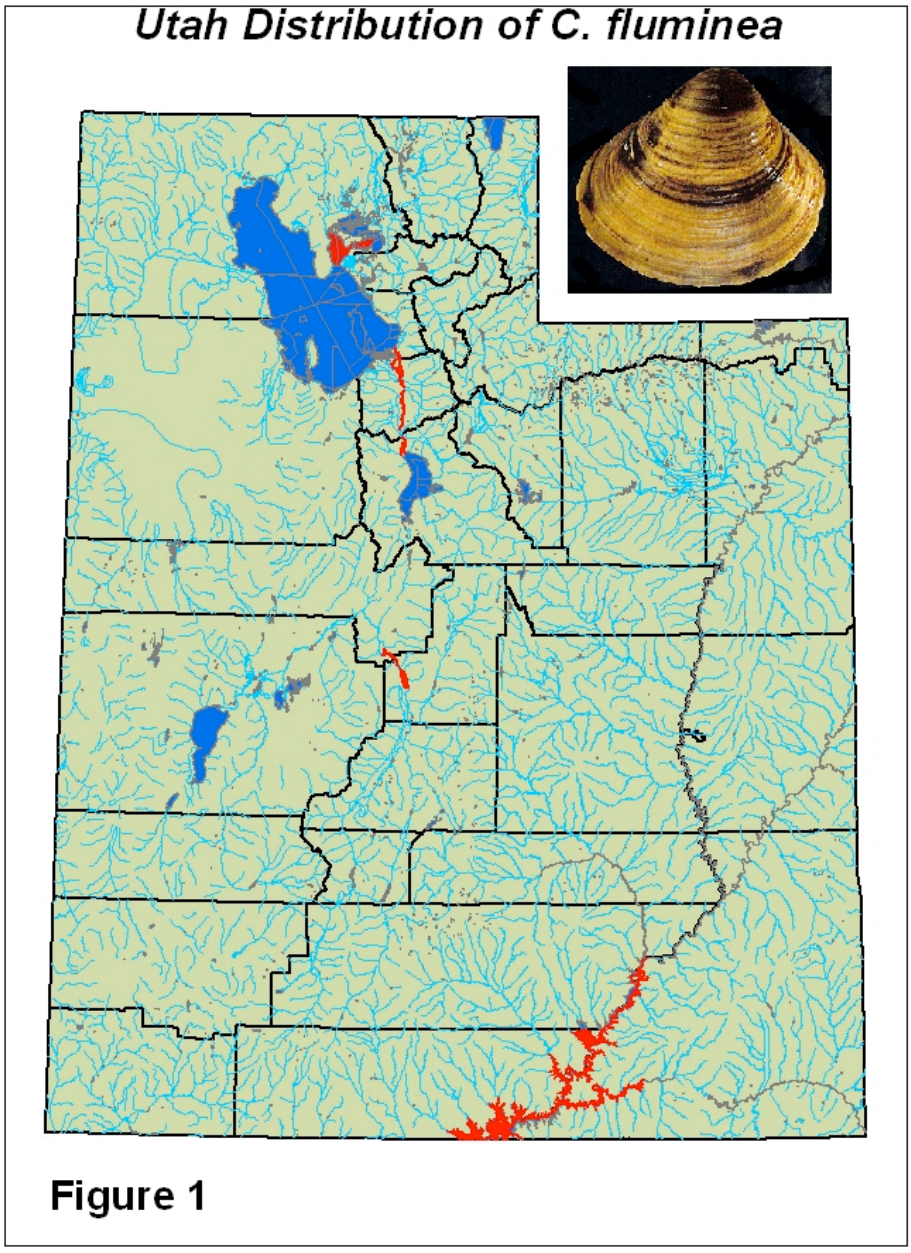

Figure 1