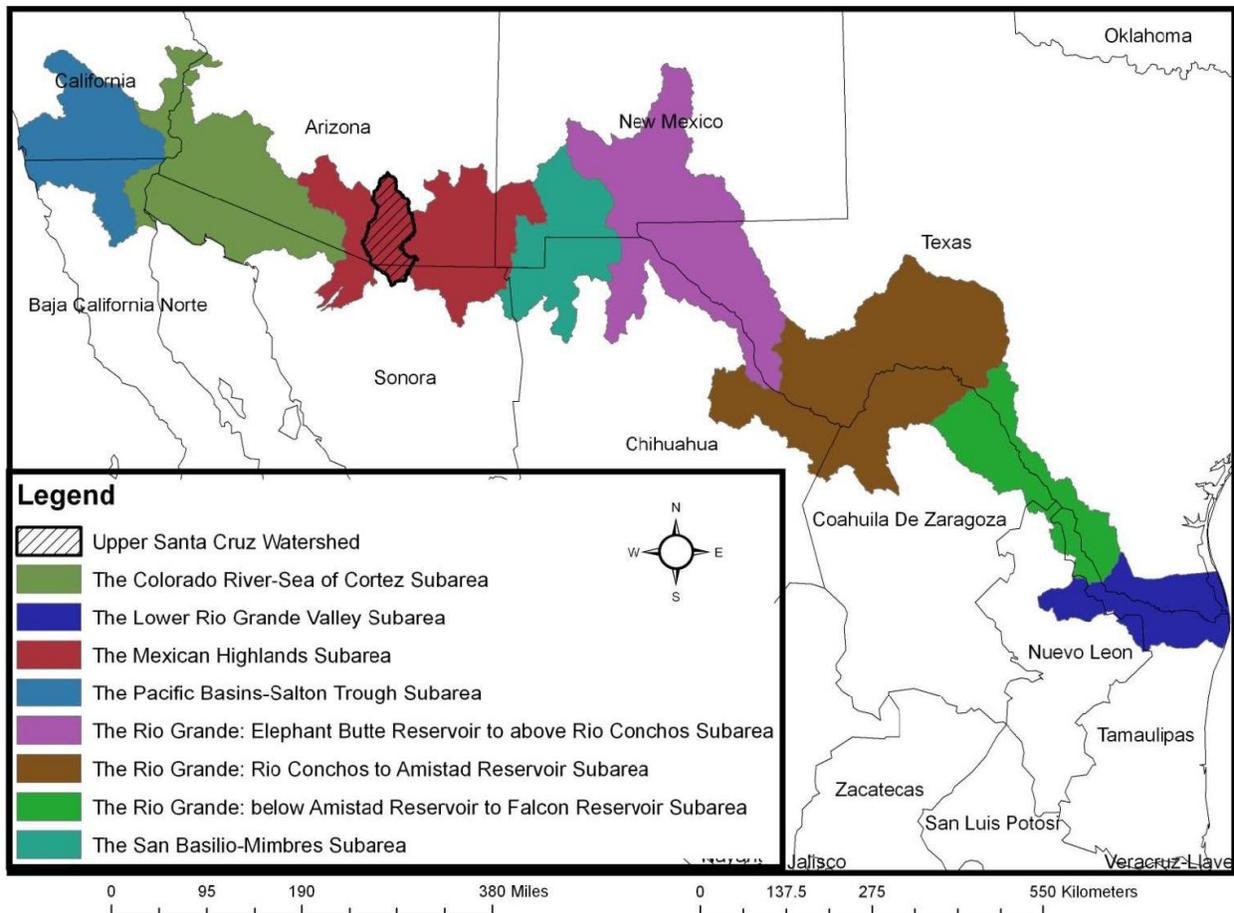


## The Border Environmental Health Initiative: Investigation of the Transboundary Upper Santa Cruz Basin

The objective of our research is to understand and document the complex movement of natural and anthropogenic contaminants through the Upper Santa Cruz River Watershed. Limited rainfall, reliance on ground water, high rates of population growth and poverty combine with a complex binational, bicultural environment to place unique pressures on human and ecosystem health in the US-Mexico border. Surface water is scarce and unreliable, making ground water the primary—and in some areas the only—water source. Declining water tables and increasing use of border ground-water resources by municipal and other water users have raised serious concerns about the long-term quality and availability of this supply. Managing shared water resources requires cooperation in assessing and understanding these resources and their impact on human and ecosystem health. Urban development, mineral contamination, irrigation, sewage effluent, and even global climate change all have the potential to alter the stability of the fragile systems in the borderland region. Despite the critical nature of water in maintaining human and environmental health in the desert southwest, current knowledge of the manner in which natural and anthropogenic forces interact to limit water quality and quantity is inadequate. The Upper Santa Cruz Basin (see figure) is a microcosm of border complexity including farming, ranching, mining, twin cities, large population, industry, trade, and shared surface and ground water.



As a first step to addressing this need, a multidisciplinary team of USGS scientists is working to identify risks to animals and people from contaminants in water resources within the Upper Santa Cruz Basin and the potential for rapidly amplifying impacts to ecosystems and human health. This includes tracking organic and inorganic contaminants as well as pathogens and their surrogates from sources to sinks in soil, water, plants, and animals. Existing ground-water models and a new surface-water model will be used to assess contaminant and sediment transport.

Scientists will work to identify risks to water resources in the Santa Cruz Watershed. Specifically, by studying 1) natural surface and ground water flow, 2) anthropogenic water flow (e.g. flood diversion, sewage effluent, wells, irrigation), 3) human population growth and urbanization, 4) sources and distribution of mineral contaminants, 5) sources and distribution of disease, and 6) the health of local flora and fauna—in an effort to understand the potential amplification and impacts to human populations in this region. We are studying the movement of contaminants from urban areas and mines through groundwater and surface water to stream- and lake-bed sediments, as well as bioamplification of contaminants in macroinvertebrates, fish, and birds. Areas of research and sampling efforts mimic points identified in a report by King et al. (1999) of sites sampled in 1997 (the red triangles on the map), including the Nogales Wash up- and downstream of the remodeled wastewater treatment plant (IWWTP), after the confluence with the Sonoita Creek, and at Tubac (see figure).

