

ABSTRACT

In 1996 and 1997, the United States Fish and Wildlife Service (Service) Utah Field Office undertook a comprehensive assessment of contaminants at over 30 wetland sites around the Great Salt Lake (GSL), in northern Utah. At 4,400 km² (1,700 mi²), the GSL is the 4th largest natural water body west of the Mississippi River and the largest saline lake in the continental United States. The GSL supports hemispherically significant numbers (measured in percent of global population) of a number of bird species including Wilson's phalarope (*Phalaropus tricolor*), eared grebe (*Podiceps nigricollis*), American avocet (*Recurvirostra americana*), black-necked stilt (*Hymantopus mexicanus*), snowy plover (*Charadrius alexandrinus*) and others. We assessed important avian habitats on the lake including freshwater and estuarine "transitional" wetlands on the GSL's southern and eastern shores, and the open waters of the lake. Trace metals and organic constituents were measured in over 600 samples of sediments, invertebrates, fish and avian eggs; biomarkers of exposure and/or effect (acetylcholinesterase and ethoxyresorufin-*O*-deethylase enzymes, endocrine hormones 17 β -estradiol and 11-ketotestosterone, and polynuclear aromatic hydrocarbon metabolites) were measured in fish as well. In the open waters of the lake, investigation focused on sediments, brine shrimp, and liver tissue from eared grebes, which forage on the lake in the fall and winter as part of a protracted migratory stop-over where they use the lake to undergo a complete feather molt and replacement. Results of this investigation indicated that in general while a number of anthropogenically generated constituents could be observed in sediments and biota around the GSL, there were only a few locations where these constituents were present at levels of concern for the health or management of migratory bird populations. Biomarker data did not indicate that there were any consistent trends in exposure to constituents associated with the biomarkers in fish. Follow-up studies were performed in 1999 and 2000 in areas where data indicated that birds might be exposed to elevated contaminant concentrations. These included an investigation of elevated mercury concentrations in eggs of birds and contaminated sediments at the outfall of an industrial/irrigation canal in southern Farmington Bay, and sediments contaminated with metals associated with mining on the south shoreline of the GSL. These investigations concluded that sediment-foraging birds using a localized area of southern Farmington Bay may be exposed to concentrations of mercury and other contaminants that could cause adverse effects (e.g., impacts to growth, reproduction and/or survival), and that there were localized areas of elevated selenium exposure, associated with the operations and past waste management practices of a large copper smelting facility located on the south shore of the GSL. Data collected during this study also supported a hypothesis that mercury, possibly originating from atmospheric deposition, was being captured by biota within the open waters of the lake where it could be bioaccumulated by birds that use the lake as migratory stop-over habitat. Findings from this study have been used since their collection to inform additional efforts to manage and improve avian and other wildlife habitat on the GSL, including the establishment of a site-specific water quality standard for selenium in the wetlands and open waters of the GSL; and further investigation of the origin, bioavailability and effects of mercury exposure to birds in the GSL ecosystem.

KEYWORDS: Great Salt Lake Contaminants Assessment, Great Salt Lake Wetlands, Great Salt Lake Open Water, Salt Lake City, Utah, Ogden, Farmington Bay, Ogden Bay, Jordan River, Ogden River, Weber River, Bear River, Bear River Migratory Bird Refuge (BRMBR), Contaminants Investigation, sediments, invertebrates, biota, bird eggs, metals, mercury, selenium, organochlorines, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs),

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