U.S. Fish & Wildlife Service

Environmental Contaminants Program Fact Sheet

Abnormalities in Wood Frogs from National Wildlife Refuges in Alaska

Background

In 1995, a group of Minnesota middle school students, out for a day of wetland exploration, encountered frogs with misshapen, missing and extra limbs. The discoveries made national news, and in the years since, abnormal frogs have been reported at sites scattered throughout the country and around the world.

In response to the increasing number and range of reported abnormalities, in February of 2000, the U.S. Fish and Wildlife Service launched a preliminary investigation of abnormal amphibians on National Wildlife Refuges (Refuges) across the country. The goals of this effort were to identify Refuges with significant numbers of abnormal amphibians, and to investigate what role, if any, environmental contaminants might play in causing the abnormalities.

Malformation or Deformity?

The phrases abnormality, malformation, and deformity are often used interchangeably. For our purposes, abnormality is defined as missing, extra, or unusual body parts based on field observations. A malformation occurs when something goes wrong during development, and an organ or body part forms improperly. A deformity occurs when a body part that already exists becomes disfigured.

Amphibian Malformations in Alaska

Although six species of amphibians occur in Alaska, only the wood frog (*Rana sylvatica*) is commonly found on Refuge lands. This is the first study conducted on the geographic range or prevalence of amphibian abnormalities in the state. There have been several reports of abnormal frogs around the greater Anchorage area, however, no additional testing was done on these frogs so the types and causes of the abnormalities are unknown. In 1999, two wood frogs with missing eyes were captured from Eklutna Lake, located approximately 20 miles north of Anchorage. Pathology reports indicated that an optic nerve was undeveloped in the two frogs. This implies that these frogs were malformed, because remnant optic nerves would have been present if the abnormalities were deformities resulting from injury.

Malformed wood frog from the Kenai National Wildlife Refuge: Photo on left shows preserved frog with malformations while photo on right shows x-ray of same frog. Notice missing pelvic bones in x-ray, as well as obvious missing hind limb. Photo and x-ray courtesy of USGS-NWHC.

Kenai National Wildlife Refuge

The Kenai Refuge was the first Refuge in Alaska to be surveyed for abnormal frogs. It was chosen primarily because refuge biologists had historical information on wood frogs within the Refuge.

Additionally, the Refuge has known contaminant issues. Potential contaminant sources include oil and gas development; industrial development near the Refuge boundaries; and contamination associated with mining, pesticide application and atmospheric transport. Exposure to environmental contaminants, ultraviolet radiation, disease agents, nutritional deficiencies, or some combination of these factors may contribute to abnormalities in amphibians.

During the summer of 2000, Service environmental contaminants specialists and refuge biologists began looking for abnormal wood frogs on a subset of ponds on the Kenai Refuge. Of the 348 frogs and late-stage tadpoles examined, 30 (or 8.6%) had one or more abnormalities.

Abnormality rates at individual ponds ranged from 0-19%. A small number of physical abnormalities is expected naturally in amphibian populations, and a background level of 0-2% is considered normal.

Some of the anomalies from frogs collected on the Kenai included missing legs, missing feet, partial legs, misshapen legs, clubfeet and missing eyes. This study only investigated presence of abnormal frogs from a subset of ponds in the Kenai National Wildlife Refuge, and thus no cause can currently be ascribed to these abnormalities.

Two more years of sampling were conducted on the Kenai Refuge in the summers of 2001 and 2002. In 2001, 397 frogs were examined, and 22 abnormal frogs (or 5.5%) were found. Abnormality rates in individual ponds ranged from 4-11%. In 2002, 543 frogs were collected and 54 (9.9%) of them were abnormal. In 2002, pond-specific abnormality rates ranged from 6-15%. Abnormal frogs have been sent to the National Wildlife Health Center in Madison, WI, in order to use radiography to document the type of abnormality, if possible.

Other Refuges in Alaska

In 2001 and 2002, surveys were also conducted in the Arctic Refuge, south of the Brooks Range, and in the Yukon Delta Refuge, near Bethel. At the Arctic in 2001, 9 of the 352 frogs (or 2.6%) examined were abnormal. In 2002, in the Arctic, 7 of the 266 frogs (2.6%) were abnormal. Pond-specific abnormality rates ranged from 0-6% in both 2001 and 2002. In 2002, the only year Yukon Delta was effectively sampled, none of the 280 frogs examined were abnormal. Biologists from three other Refuges (Innoko, Kanuti and Koyukuk) began collecting preliminary information that will provide valuable background for future sampling events.

Searching for frogs on the Kenai National Wildlife Refuge. Photograph by Paul Cotter, USFWS

Future Efforts in Alaska

The Service is continuing to work on this issue by focusing on the following objectives.

I. Continue the study of abnormal frogs on previously surveyed refuges and conduct initial sampling on other refuges in Alaska that have wood frogs.

II. On refuges where the initial study found >3% abnormalities in wood frog populations, identify stressors at the site that may contribute to these abnormalities.

III. Take steps to identify potential causes of abnormalities through evaluation of stressors in the field and laboratory experiments.

Efforts in Other States

As of December, 2002, 85 Refuges in 40 states have been monitored at least once for abnormal frogs, and many Refuges have been visited more than once. Additional information on amphibian declines and deformities can be found at *http://www.contaminants.fws.gov/issues/amphibians.cfm*

Partnerships

The U.S. Fish and Wildlife Service is working with a wide range of partners to address the problems of amphibian declines and abnormalities. The Service is focusing its amphibian monitoring efforts on refuge lands to evaluate and restore or maintain the integrity and health of our National Wildlife Refuges. Additionally, we are sharing information with the U.S. Geological Survey, the U.S. Amphibian Research and Monitoring Initiative, other federal and state agencies, and with the public.

The investigation of malformed frogs on the Kenai Refuge (from 2000) was published in 2002 under the following citation:
Trust K.A. and Tangermann, H. 2002. National Malformed Amphibian Study, FY2000: Kenai National Wildlife Refuge, Annual Progress Report. U.S. Fish and Wildlife Service Technical Report. WAES-TR-02-01. 19 pp.

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For more information about the Environmental Contaminants Program in Southcentral Alaska, please contact the Anchorage Fish and Wildlife Field Office at 907/271- 2888

Visit the Environmental Contaminants Program Home Page at http://www.contaminants.fws.gov

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