



Biologist conducting water quality measurements.

exposure to some type of antiestrogenic compound that blocks the conversion of testosterone to estrogen. All other parameters measured (health, histopathology, and analytical concentrations) were similar to reference values or considered within normal ranges. Only the two non-Refuge sites showed both elevated contaminants in tissue and abnormal hormone results.

**RISK ASSESSMENT.** The weight-of-evidence risk assessment indicates that the receptors of greatest concern at the refuge are amphibians and aquatic life. Nutrient concentrations could affect aquatic life at nearly all locations sampled on the Refuge based on extent of exposure, although the greatest potential impact from both pesticides and nutrients is at Brown Creek reflecting a source outside the Refuge.



Oregon Chub



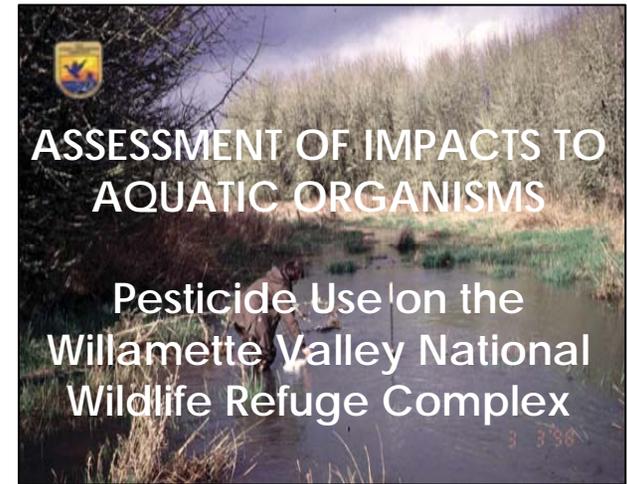
Preparing to take blood sample from western pond turtle.

**CONCLUSIONS.** The results of this study indicate that there are numerous sources of pesticides and fertilizers in and around the refuge, and some of these agrochemicals are entering waterways important to the refuge. The pesticides of most serious concern originate outside the Refuge, and Refuge personnel have limited ability to manage pesticide application occurring off-refuge lands. However, we recommend several management actions be taken on the Refuge to help minimize pesticides and nutrients from entering waterways and to further assess the health of western pond turtle populations.

**REPORT IS AVAILABLE.** A complete copy of the report is available at the Oregon Fish and Wildlife Office website:  
<http://www.fws.gov/oregonfwo/index.asp>



**CONTACT INFORMATION:** For more information, please contact the Oregon Fish and Wildlife Office's Environmental Contaminants staff at 503-231-6179.



The U.S. Fish and Wildlife Service has released a report entitled, *Assessment of Impacts to Aquatic Organisms from Pesticide Use on the Willamette Valley National Wildlife Refuge Complex*.

**OBJECTIVE.** The objective of this investigation was to sample both water and biota, and use a weight-of-evidence approach, to determine if chemicals used in agriculture (known as agrochemicals), on or around the Refuge, pose a risk to aquatic species.

**AGROCHEMICAL SOURCES.** Providing high quality forage for wintering Canada geese is the primary habitat management objective for the Willamette Valley NWR Complex. To accomplish this, much of the land within the Refuge is managed for grass production which involves applications of herbicides, fungicides, and fertilizers.



Northern Red-Legged Frog

Other agrochemicals such as insecticides are applied to agricultural land outside the refuge. Some of these agrochemicals have the potential to enter aquatic habitats within the Refuge and could impact species such as amphibians, turtles, or the federally-listed Oregon chub.

**REFUGE SELECTION.** William L. Finley NWR was selected for this investigation because it is the largest refuge within the Willamette Valley NWR Complex and has the most cultivated land.

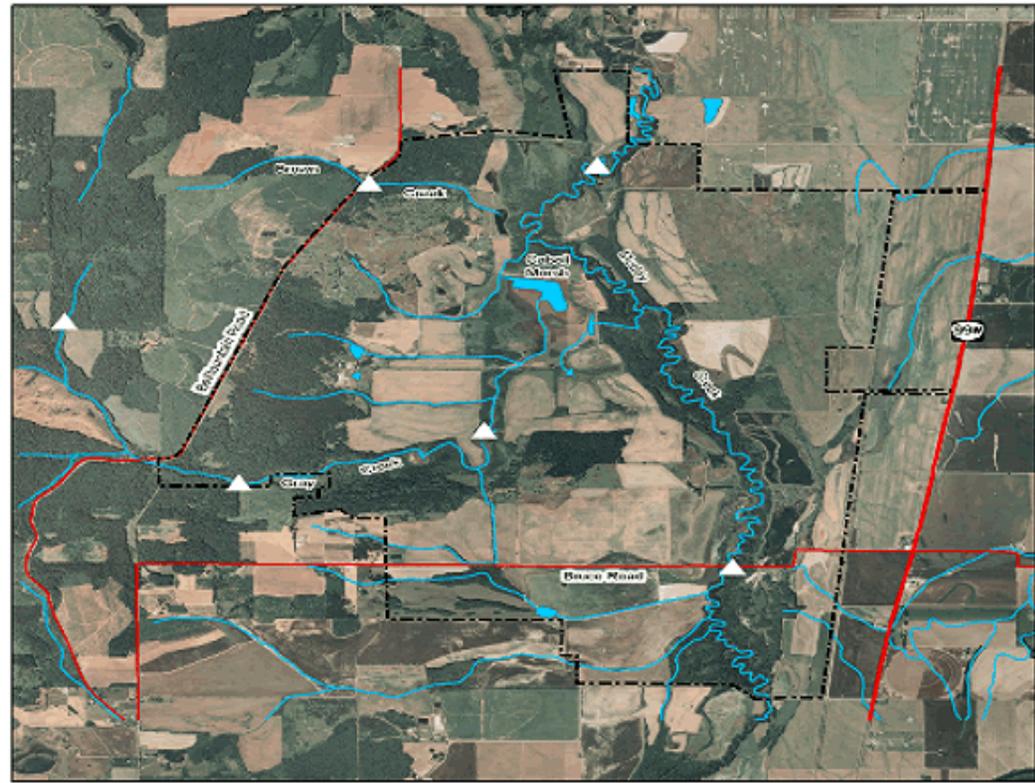
**STUDY COMPONENTS AND ORGANIZATION.**

These components were used as individual lines of evidence to evaluate risk of agrochemicals to aquatic organisms on the Refuge:

- 1) evaluation of pesticide use practices;
- 2) collection of continual water quality measurements;
- 3) water sampling for pesticides and nutrients;
- 4) analysis of blood plasma from carp and turtles for endocrine disrupting compound exposure;
- 5) fish health assessment;
- 6) fish tissue analysis for organochlorine pesticides.

Multiple lines of evidence create more confidence in making decisions suitable for Refuge management because the approach considers all the information gathered from the investigation. By framing the assessment with this weight-of-evidence approach, risk to the receptors of concern and organizational levels is more clearly evident and the information can be used in

**Agricultural land uses associated with Finley NWR**



--- Refuge boundary  
 — roads  
 △ sample site locations

carrying out the Fish and Wildlife Service mission to protect and conserve natural resources.

**PESTICIDE RESULTS.** The pesticide monitoring component of this study indicated very few pesticides detected in Refuge aquatic systems; however, there could be effects to aquatic communities from exposure to atrazine and chlorpyrifos in Brown and Muddy Creeks. The greatest potential impact is at Brown Creek which reflects a source of pesticides outside the Refuge. Muddy Creek is less impacted but pesticide concentrations indicate sources from both on and off the Refuge.

**NUTRIENT RESULTS.** Nutrient monitoring indicated that several forms of nitrogen and phosphorus exceeded aquatic life criteria in three creeks sampled. Sources of nutrients appear to be from both on and off the Refuge.

**HORMONE RESULTS.** The hormone values measured in biotic samples from Refuge sites were within normal ranges except for western pond turtles at Finley National Wildlife Refuge. At Finley, higher testosterone values were observed in females and the female hormone ratio was atypically low compared to reference turtles. This indicates



Western Pond Turtle