bass, while those in the Hodenpyl reach had higher a mean CPUE for brown trout and smallmouth bass (Table 1). We are currently analyzing our data to determine significance of these results and examining the effects of LWD on invertebrate communities and channel morphology.

The results from this project will improve our understanding of the effect of adding LWD to larger rivers in the midwestern United States. This information will be useful in guiding further habitat restoration efforts, while also maximizing the benefits gained from the limited funds available to management agencies for these activities.

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Using Rotenone™ to Enhance Native Amphibian Breeding Habitat in Ponds (Illinois)

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Increases in populations of exotic fishes can contribute to declines in native amphibian populations, but only a handful of studies (for example, Bull and Marx 2002) have quantified the effects of native predator species introduced to new habitat. With this in mind, we studied the response of amphibian populations to breeding habitat enhancement after introduced populations of native fish were chemically removed from two of four neighboring ponds located in ravines at Warbler Woods Nature Preserve in east-central Illinois.

The ponds range from 39 to 70 feet wide and are separated by as much as 260 feet of deciduous forest interspersed with patches of oldfield habitat. We labeled the ponds from east to west, respectively, A through D. Pond D is semi-permanent and dried out in 2001. At the beginning of our study, Ponds A and D had no fish, while Pond B had black bullheads (*Ameiurus melas*) and Pond C had bluegills (*Lepomis macrochirus*) and green sunfish (*Lepomis cyanellus*)—all of which were introduced at an indeterminate time.

In May 2000, we installed a drift fence-pitfall trap array around each pond to determine the amphibian species present. The traps consisted of 10-inch (25.4-cm) plastic buckets placed at 24.5-ft (7.5-m) intervals along both sides of a 14-inch (35.6-cm) tall aluminum screen fence, with each bucket buried so that its opening was flush with the soil surface (Heyer and others 1994).

From May 26, 2000 until December 7, 2002 we monitored the traps every other day, except for the dormant periods of both years. We recorded the location of each individual collected, measured snout-vent lengths, and marked cohorts of individuals by clipping a different toe for each year of the study (Heyer and others 1994). We also surveyed breeding choruses at each pond on several warm, rainy nights during the first three months of each breeding season. We estimated recruitment by dividing the number of juveniles of a species leaving each pond after metamorphosis by the number of adult females of that species entering that pond throughout the breeding season.

After closing the traps in December 2001, we had Rotenone™, a plant-derived isoflavonoid piscicide commonly used in lake fisheries management, applied to Ponds B and C. The concentration applied depended on the species to be removed (7 and 3.5 ppm for Ponds B and C, respectively). Rotenone has an effective time of about 20 days, so any residual poison was rendered inert well before amphibian breeding activity in 2002.

We observed effects of the pesticide on fish populations at Pond C within an hour of application, and have not recorded any fish there since December 2001. Because the Rotenone was not as effective at Pond B (we observed several small bullheads in the following spring), a second dose was applied in January 2003. We have not recorded any bullheads in the pond since that time.

In 2002, we recorded greater numbers of several amphibian species using Ponds B and C than in 2001, including smallmouth salamanders (*Ambystoma texanum*), American toads (*Bufo americanus*), wood frogs (*Rana sylvatica*), and southern leopard frogs (*R. utricularia*) (Table 1). When pooled over all species, the num-

Table 1. Percent change in numbers of amphibians (for each of five species) caught in pitfall traps around four ponds at Warbler Woods Nature Preserve from 2001 to 2002. Reported data represent the mean values (±1 standard error) of two control ponds, and two ponds treated with Rotenone™ between years.

Species	Treatment	Percent change
smallmouth salamander	control	82.3 ±0.2
	enhanced	609.8 ±336.5
American toad	control	189.9 ±65.8
	enhanced	206.3 ±136.6
bullfrog	control	40.0 ±5.0
	enhanced	101.4 ±3.6
wood frog	control	187.5 ±7.5
	enhanced	187.5 ±12.5
southern leopard frog	control	325.0 ±125.0
	enhanced	950.0*
All species pooled	control	164.9 ±99.2
	enhanced	411.0 ±321.8

*this species was seen at only one enhanced pond throughout the study.

bers of individuals caught in the treated ponds increased substantially compared to control ponds (Table 1). We also observed a two-fold increase in the numbers of spring peepers (*Pseudacris crucifer*) in the year following piscicide application.

When pooled across species, the percent increase in recruitment was four times higher in Ponds B and C (873.4 percent) than in Ponds A and D (219.2 percent). This estimate does not include bullfrogs (*Rana catesbeiana*) because their two-year larval development period prohibits the computation of this ratio. Surprisingly, although bullfrog larvae were present at the time of Rotenone application, we recorded similar numbers of bullfrog metamorphs emerging from Ponds B and C between years (101.4 percent change).

Removal of predators especially benefited smallmouth salamanders, southern leopard frogs, and wood frogs, the latter of which has shown population declines in Illinois (Phillips and others 1999). Furthermore, the increases in breeding aggregations and recruitment indicate that Rotenone had no negative effect on pond-breeding amphibians. We are continuing to monitor the population dynamics of the amphibian species that use the ponds and plan to assess dispersal rates between ponds.

We recommend dormant season application of Rotenone for the enhancement of amphibian breeding habitat in small, shallow ponds or lakes from which introduced fish cannot be effectively removed through other means. In light of a recent study linking exposure to high concentrations of Rotenone to Parkinson's disease (Betarbet and others 2000), care should be taken to apply Rotenone according to the product label.

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RECLAMATION AND REHABILITATION

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Denitrification and Soil Characteristics of Wetlands Created on Two Mine Soils in East Texas, USA. 2004. Johns, D., College of Forestry, Stephen F. Austin State University, Nocogdoches, TX 75962; H. Williams, K. Farrish and S. Wagner. **Wetlands** 24(1):57-67.

The authors compared wetlands created after lignite mine reclamation to natural wetlands using an acetylene inhibition/gas chromatography method and other tests to determine denitrification rate and capacity, soil pH, texture, total nitrogen, and other soil qualities. They determined that denitrification rates were similar in both types of wetlands suggesting that something other than total nitrogen, organic matter, ammonium, and pH influences denitrification rates. Denitrification capacity was greater in natural wetlands, which they suggest means organic matter and ammonium are linked to denitrification capacity when not regulated by moisture or nitrate.

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Cleaning Up Drainage From Mine Spoils Restores Trout Streams. 2004. Oertel, B., 918 B 1st Ave. South, P.O. Box 1197, Fort Dodge, IA 50501. **Land and Water** 48(1):22-25.

Excess iron and aluminum from acid mine drainage from abandoned mines kept fish and other aquatic life from thriving in streams near Somerset, Pennsylvania. Seventeen groups used legislatively mandated funds to clean up streams at two sites using a series of settling ponds and cattail (*Typha* spp.) wetlands. Limestone placed in some of the ponds helped change the pH from 3-3.5 when the water entered the pond and wetland system to 6.5-7.5 when it entered the stream. This rise in pH caused the iron and aluminum to drop out of the water. A system of perforated pipes allows the aluminum and iron to be drained from selected ponds. Healthy trout caught in nearby streams attest to the methods' success.