



# ROTENONE

## Its Use in Fisheries Management

Rotenone, properly used, is a valuable tool in fisheries management. Texas Parks and Wildlife Department personnel often receive inquiries from people who want to know how to use rotenone to eradicate fish in their ponds. For one reason or another, many ponds support sizable populations of undesirable fishes such as gizzard shad, carp and green sunfish. Usually a pond with an undesirable fish population offers only fair to poor fishing. To restore good fishing, the owner can either drain the pond, or use a fish toxicant such as rotenone to kill the fish, and restock with desirable fishes.

Rotenone is found in Australia, Oceania, southern Asia, and South America as a naturally-occurring substance derived from the roots of tropical plants in the bean family including jewel vine and lacepod. It has been used for centuries to capture fish in areas where these plants are naturally found. Fisheries managers in North America began to use rotenone for fisheries management in the 1930s. Rotenone is also used as a natural insecticide on crops and livestock.

At first, rotenone was mainly used to eliminate undesirable fish populations so that sport fish could be managed for fishing without competition. Today, the most frequently reported uses are:

- control of undesirable fish to support recreational fisheries
- eradication of exotic fish
- eradication of competing fish species in rearing facilities
- population sampling
- treatment before reservoir impoundment
- eradication of fish to control disease, and
- restoration of threatened or endangered species.

The U.S. Environmental Protection Agency (EPA) has approved the use of rotenone formulations to control and sample fish populations in lakes, ponds, reservoirs, and streams. Only certified pesticide applicators can apply rotenone. The powdered and liquid formulations of rotenone are designated as restricted-use pesticides due to their aquatic toxicity and potentially adverse effects on humans through inhalation. Powdered



formulations are further designated for restricted use due to their acute oral toxicity. Applicators may be held liable for any damages caused by the misuse of rotenone.

Other restrictions on rotenone use include a prohibition on use of fish killed by rotenone for food or feed, a prohibition on use of water treated with rotenone to irrigate crops, and prohibition on release of treated water within one-half mile upstream of potable water or irrigation water intakes in a pond or reservoir. Waters or fish containing rotenone residues cannot be consumed because the EPA has not established residue tolerances. Swimming is not allowed in rotenone-treated water until the application has been completed and all the rotenone has been thoroughly mixed into the water. Rotenone is safe for all livestock in watering tanks except for swine. Restrict swine from the water source until the rotenone has been detoxified.

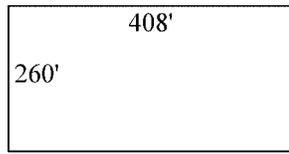
Rotenone kills fish not by removing oxygen from the water, but by inhibiting oxygen transfer and cellular respiration. All fishes are sensitive to rotenone, but some species are more easily killed than others. Gizzard shad and common carp are more sensitive than bluegill and largemouth bass, while channel catfish and bullheads are the most resistant.

The pond owner who has decided to treat a pond must first determine the volume of water to be treated. Both the surface area and the average depth must be determined. Surface acreage multiplied by average depth, in feet, equals the volume in acre-feet.

If the pond is rectangular in shape, the length in feet would be multiplied by the width in feet. The total number of square feet should be divided by the number of square feet in one acre (43,560).

**Example:**

Pond length = 408 ft.  
Pond width = 260 ft.



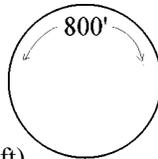
$$\text{Surface acres} = \frac{\text{Length (in feet)} \times \text{Width (in feet)}}{43,560}$$

$$\text{Surface acres} = \frac{408 \times 260}{43,560} = \frac{106,080}{43,560} = 2.44$$

If the pond is circular, the distance around the shoreline (perimeter or circumference) of the pond should be measured in feet. That number should be multiplied by itself and then divided by 547,390.

**Example:**

Shoreline distance = 800 ft.



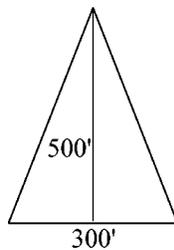
$$\text{Surface acres} = \frac{\text{Shoreline (ft)} \times \text{Shoreline (ft)}}{547,390}$$

$$\text{Surface acres} = \frac{800 \times 800}{547,390} = 1.17$$

If the pond is triangular, the base and the height should be measured.

**Example:**

Base = 300 ft.  
Height = 500 ft.



$$\text{Surface acres} = \frac{1}{2} (\text{Base} \times \text{Height})$$

$$= \frac{1}{2} \times 300 \times 500$$

$$\text{Surface acres} = \frac{1}{2} \times 300 \times 500}{43,560} = 1.72$$

Average depth is calculated by making a series of depth soundings throughout the pond. Soundings should be made every 15 or 20 feet apart in straight lines across the pond. Each row of soundings should begin and end with a zero. The depth measurements should be added and then divided by the number of soundings made (including zeros) to obtain the average depth.

The amount of rotenone to use depends upon its strength, the type or types of fish present, and the volume of water to be treated. Most commercial formulations contain either 2.5 or 5 percent rotenone, in either liquid or powder form. The liquid is preferred by many workers because it is easier to apply, but the powder is usually more available. Powdered rotenone is found in most farm and ranch supply stores; liquid rotenone may have to be purchased from a fish farming supply store or chemical distributor. Care should be taken to read and follow label directions carefully.

If 5% liquid rotenone is used, an application rate of 1 gallon per acre-foot of water is recommended. Liquid rotenone should be diluted with water (5 parts water to 1 part rotenone) before applying. The rotenone mixture can be applied by spraying, gravity flow from a barrel, or merely pouring from a bucket.

If 5% powdered rotenone is used, an application rate of 10 pounds per acre-foot of water is recommended. The powder should be diluted with enough water to make a slurry. The slurry can then be distributed throughout the pond. Dry powdered rotenone should not be poured directly into the pond.

Generally, the surface water should be at least 70 degrees for best results. If water is more than 15 feet deep, the rotenone mixture should be applied to lower depths with a weighted hose. It usually takes less than 30 minutes for rotenone to affect small fishes, but may take several hours to kill larger fish. Water treated with rotenone is usually nontoxic to fish within two weeks. Detoxification rates depend largely on amount of sunlight and water temperature. If there is any doubt about whether the water is detoxified, a few live fish can be placed in a minnow bucket and suspended in the pond. If the fish are still alive after 24 hours, the pond is ready for restocking.

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