

factors had to be considered. First, an efficient means of inducing a drug into the systemic circulation of an animal was necessary. The instrument for delivery had to be accurate within a reasonable range, and at the same time inflict a minimum of mechanical damage. Secondly, the selection of a drug was of paramount importance. The ideal drug had to possess the following characteristics:

1. The effective dose must not exceed the quantity which could be carried on the dart;
2. Stability;
3. Rapid absorption into the systemic circulation;
4. Rapid onset of action with sufficient immobilization of the subject;
5. A wide margin of safety (3X minimum);
6. Should not require an antidote;
7. Rapidly eliminated from circulatory system;
8. Have no effect on gestation;
9. Cause no permanent damage to an animal.

The method of delivery was acquired through the conversion of a Crossman Model 100, 101 or 102 air-rifle, designed to shoot small steel darts made from drill bits.

After screening numerous compounds to determine the presence or absence of the above 9 necessary characteristics, nicotine salicylate was selected. The dosage, safety factor and general pharmacological properties of this nicotine salt were determined on experimental goats. Observation obtained from 85 experimental shots were evaluated.

To date, 17 wild deer have been captured with the described technique and from all indications the response of the deer may be expected to closely parallel that of experimental goats.

This brief paper is a condensation of a detailed report which has been accepted for publication in the near future by the Journal of Wildlife Management, and is presented with the permission of the editor of the Journal.

## TECHNICAL FISH SESSION

### POLLUTION: ITS NATURE, DETECTION AND CONTROL PANEL

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- I. Normal Water.
  - A. What is unpolluted water?
  - B. What are its characteristics?
- II. Polluted water.
  - A. What is pollution?
    1. Can we divide pollution into groups which may be considered thusly?
      - a. Natural pollution (without man's aid)
      - b. Sewage
      - c. Industrial
    2. Can any form of pollution be considered helpful to man?
      - a. Increased fertility?
      - b. Disposal of waste from areas?
- III. What are the effects of the various kinds of pollutants?
  - A. To fish? (aquatic organism)
  - B. To recreation?

- C. To public health?
  - D. To agriculture?
  - E. To the re-use of water?
- IV. What standards of measurement do we have to determine the extent and harmful effects of pollution?
- A. How effective are bio-assays?
  - B. Can bio-assays provide us with a means to detect, evaluate and measure?
  - C. Can chemical tests take the place of bio-assays? How? In what way?
- V. What methods of pollution-control should we have or strive to attain?
- A. Should we advocate the abolition of all pollution?
  - B. Do we wish to stop pollution regardless of the effect it might have upon business in our states?
  - C. Can we ever control pollution without a knowledge of what pollution is and what harm it does?
  - D. Should pollution control be vested in a state water control board?

### SUMMARY

The above outline was presented to the assembly and the discussion proceeded section by section through the outline.

The definition of pollution as presented and accepted by the panel was of particular interest. The definition follows: pollution is the addition of any material that hinders the use of water for any purpose. The definition permits the addition of any material in any amount that does not harm the water for the use desired, thus permitting fertilization, but labels over-fertilization and other harmful materials as pollutants. Pollution becomes the addition of "too much" of anything.

The adoption of the definition by the panel limited the need for discussion upon the second and third sections of the outline. The question of water standards attracted considerable attention. Opinion tended to emphasize the difficulty of making standards to meet the needs of water used for different purposes, since different uses require different standards.

The value of bio-assays was stressed. Chemical tests were felt to be worthwhile but they do not necessarily determine the toxicity or harmful effects of the pollutants. Bio-assays and chemical tests are neither opposites nor parallels in purpose. Bio-assay tells the effect upon life and sometimes the presence of chemicals in too small a quantity to be tested chemically, while the chemical test tells what the material is.

Since pollution is the addition of harmful materials it was agreed that we should advocate the abolition of all pollution.

## BIOLOGICAL ASPECTS OF STREAM POLLUTION CONTROL IN ARKANSAS

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Although the Arkansas Water Pollution Control Commission recognizes that the combined work of the biologist, the chemist and the engineer is necessary to obtain a complete picture of any given stream pollution problem, the Commission has since its inception in 1949 been without the services of one or more of these basic technicians. Usually during its operative periods the Commission had only engineers on its staff and its work was; therefore, of necessity, restricted to surveys of waste treatment plants. With the increasing local demand for pollution abatement work on the Lower Ouachita River it became all too apparent that additional monetary assistance to the Commission was essential if the necessary abatement work was to be undertaken. Outside sources of funds were found, one being a \$15,000.00 sum from the Governor's Emergency Fund. Because of the magnitude of the problem in that it involved over 3,500