*Wildlife Damage Management, Internet Center for*

*Bird Control Seminars Proceedings*

*University of Nebraska › Lincoln* *Year* 1968

# STATUS OF BIO-SONICS IN PEST BIRD CONTROL

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Bioacoustics is defined as the study of biologically significant sounds originated by animals, and the mechanisms which produce and receive these sounds. Many of these sounds are audible to the human ear but some are above the human hearing range and fall into the ultrasonics class. There are sounds used by animals which are near or below the normal human hearing range in pitch, as in certain fish. Bioacoustics comprises a broad field of investigation and is an area which has only recently been explored. Improvements in electronic audio equipment have provided the impetus which launched recent bioacoustical investigations and as this equipment is further perfected we may expect additional startling developments. Our concern here, today, is with the status of Bioacoustics as it is applied to the control of pest animals, particularly birds. This phase is popularly known as bio-sonics.

Before I proceed I wish to digress a bit on this term "control". In reading reports of various pest animal experiments, one notes that most authors claim this or that experiment resulted in control but they do not define what they consider to be control. This leaves one guessing as to the effectiveness of the procedure or method used. Did they eliminate all, half, or just a few of the birds? Eliminating a few troublesome individuals constitutes control in some situations and in others a reduction of 100,000 birds is only 3 or 5% of the total population in the problem. Besides population estimates, the amount of crop damage observed before and after the experiment often serves as a useful criterion for evaluation, and there are other criteria which can be used. It would appear that some sort of standard should be adapted by workers in this field as to what constitutes effective control. In my work with bio-sonics I have arbitrarily set up a standard in which I do not consider a control program effective unless the bird population is reduced by at least 80% in the first week and maintains this level or better for the duration of the program. I have, at times, and with certain species, achieved 95% control but only once, with sparrows, did I get 100% clearance. I must admit that there have been other times when I got zero percent control in which case it was back to the old drawing board. But let us return to bio-sonics.

Bio-sonics involves the use of birds' communication sounds, usually their alarm or distress sounds, to repel or discourage others of the same species. In general, these sounds are quite species specific in that one species does not respond to the alarm sounds of another species. There are, however, exceptions to this,

particularly in species which normally associate together. Gulls are an example. Nature provides against the useless expenditure of energy by attuning each species' hearing mechanisms to certain audio parameters to which it responds and it discriminates against all others. Imagine, if you will, the chaos which would exist in nature if all species responded to each other's alarm sounds. They would be continually in an escape mode with little time for feeding, mating, or other activities.

The species specific nature of birds' alarm sounds is an important factor in bio-sonics control particularly when evaluating the results of a control program. As an example, let us assume a program is organized to control starlings and only starling sounds are used. We may find, after a week or so, that the starlings are conspicuous by their absence but the associated blackbirds, grackles, and robins are still there simply because they are unable to respond to starling sounds. Yet, to your client, birds are birds, and he regards the results as unsuccessful even though it was highly successful against the target species. Another common cause of unsuccessful bio-sonics programs is incorrect identification of the target species. I frequently have provided starling sounds for clients who then complained the results were poor. Personal investigation in these cases revealed that blackbirds, grackles, and even robins had been misidentified as starlings. There are many other reasons why the correct identification of the target species is important. Birds' habits and behavior patterns vary widely with each species and this must be considered in any bird control program. The field investigator who neglects to acquaint himself with his target species' behavior patterns stands little chance of success.

Briefly, the development of an effective control sound involves recording the sound in the field, usually alarm sounds are best, then evaluating the response to this sound, also in the field. If the sound appears to have possibilities you then determine the most effective projection timing and techniques and finally conduct several field tests extending over several weeks. You then repeat the tests at another time of the year because some species respond differently in the spring and summer than they do during the fall and winter. I have found that sounds developed in the laboratory are of little value in control work. There are many reasons for this and I would be glad to answer any questions on this subject later. But, I can assure you there is no substitute for field work in this business.

Actually, in bio-sonics, we have put the cart before the horse. By extensive empirical testing we have developed effective control sounds for many species of birds, but only recently did we begin to learn how and why they work. We are getting an inkling of how certain sounds affect birds both physiologically and psychologically, but it will be a long time before we learn all the answers, if ever.

With the assistance of recently developed electronic equipment we are now able to learn something of bird alarm sounds themselves. We find they vary widely in their respective parameters, as one would expect. During the past twelve years I have recorded the distress and alarm sounds of 165 different species representing 42 families in 14 orders. To date, I have analyzed the alarm sounds of 60 of these species and thus far, no two are alike. Furthermore, no recognizable pattern has emerged which is common to all species. Perhaps there is one but it certainly has escaped me. If such a pattern can be identified it may be possible to control all species with one common sound but at present this is just wishful thinking.

We are more interested here, in the responses of birds to various sounds. I have time to dwell on this only briefly but those of you who are interested in the details will find them in my recent paper published in the *Living Bird.* (Alarm Sounds and Response of Birds and Their Application in Controlling Problem Species. Cornell Laboratory of Ornithology, 7th Annual Living Bird, 1968: 2746. Ed.)

Like its alarm sound, each species has its own response pattern. These patterns usually fall into four different types of behavior; the bird freezes in place; flies or runs to the nearest cover; flies out of the area; or sits and looks at you and sometimes they don't even bother to look at you. Some species are timid or shy, some are brazen and bold, but most of them fall between these two extremes. In addition to this, certain birds in a species exhibit individual behavior patterns which defy interpretation. They will remain after all the other birds have left and we don't have the answer to this. These are the birds which constitute the small refractory residue which we commonly observe in our work. Maybe they like to live dangerously. I could go on for hours describing the behavior patterns of all the species I have worked with but I know you are more interested in the practical aspects of bio-sonics so I'll move on to that subject.

The sounds used in bio-sonics are natural bird sounds. These are reproduced on tape, amplified, and projected over or through an infested area. There is nothing miraculous or mysterious about these sounds, they are simply birds' alarm stimuli. They have no supernormal qualities that I know of and it is absurd to expect a few exposures to these sounds to miraculously and permanently clear an area of birds. One must remember that in nature birds are constantly being exposed to their alarm sounds and yet they remain in the area. It is my observation, however, that repeated exposures to alarm stimuli will cause certain species to avoid an area, provided, they are not nesting there. Many species develop a strong site tenacity for their nesting areas and are almost impossible to evict from their territories. There are other species, of course, that quickly abandon their nests if they are molested but usually these are not pest species. Birds in general develop strong attachments for preferred feeding and roosting areas, but they can be successfully evicted from such places.

A successful program with bio-sonics involves not only the pertinent sound but also the application and distribution of this sound. If you don't get an insecticide on or in an insect it has little effect. In the same way birds are unable to respond if they cannot receive the sound, and, with sufficient intensity.

The most effective method of applying sounds in crops is to project it from a sound truck or mobile unit. But this involves labor and vehicle costs for the period during which the crop is vulnerable to bird depredation. Most growers are willing to sacrifice efficiency in order to eliminate these high costs and this has resulted in the development of sophisticated automatic electronic equipment which requires little attention. My experience has shown that this stationary apparatus, with revolving speakers, covers considerable acreage, and quite effectively. It depends somewhat on which species of birds are involved and other factors. The use of battery power makes the equipment independent of utility power which usually is not available in field crops. Since 12 volt automobile batteries are readily available, and can be re-charged, the equipment has been designed for

this type of power. Photo-cells actuate the unit in the morning and switch it off at night. A variable programmer projects the sound at preset intervals. To reduce the risk of bird inurement to the sound, four selections of sound are available and these are manually selected by a switch. This is also useful where several target species are present. Yet, with all this automation there are many users who fail to keep the batteries charged or neglect to change programs occasionally. And this brings me to one of my pet peeves and I'm sure you share my experience.

You can provide many growers with the best and most effective bird control available and they still won't use it properly, or they expect someone to do it for them. Most growers, it is true, have many things to think about, but from their complaints of bird depredations one would assume that birds are their major problems and they would be more than willing to exert so me effort to correct their condition. But the most you can expect is their co-operation for the first two or three days and after the first week, which is the critical time, you find dead batteries, empty bait troughs, and other evidence of neglect. Shotgun patrols work 40 hours per week and overlook the fact that birds work on an average of 91 hours per week and do not suspend activities on week-ends or holidays. They must eat every day and usually do so before control crews are in the field in the morning and again after the crews have left for the day. Effective bird control is a daylight to dark activity, seven days a week, and unfortunately, birds' working hours do not correspond with man's working hours. All of which points up the fact that the public must be educated in bird control. They must realize that no quick, easy, cheap, yet effective method of bird control has been developed to date. This is going to be difficult in a nation which depends on spray cans, push buttons, and miracle drugs to solve all their problems. We can only provide the tools: electronic, chemical, mechanical, or what have you, and outline their uses. The rest depends on how much effort the user is willing to provide. The final answer may well be specialized bird control firms who will provide the necessary material, equipment, and service, similar to crop dusters and other insecticide applicators. But considerable missionary work will be required before this becomes popular. Having said that, I'll return to bio-sonics.

Sound has been used to protect many fruit crops from starlings, robins, finches, and several minor species. These crops are in wine and table grape vineyards, cherry orchards, berry crops, apples, pear and figs. Bio-sonics has successfully kept industrial areas clear of starlings and gulls and it has cleared many objectionable roosts of starlings. It has been used with success in urban areas, airports, and elsewhere. But, it is not yet a panacea for all bird problems and I am the first to admit that there have been failures. I console myself by reviewing the results of other methods and none of them are perfect, either. I've personally tested all of them with one exception, and that is chemosterilants. I'm still young enough to be concerned about my reproductive capabilities and I don't wish to take chances with materials I am not familiar with.

A common complaint is that bio-sonics merely moves the birds to another area and this is true—they aren't going to drop dead with fright and one has no control over where they go. But bio-sonics is not intended to be the final solution to bird problems—this must await the results of extensive research which is

far in the distant future. Bio-sonics is a stop-gap measure designed to enable a grower to harvest his crop or to eliminate troublesome concentrations of birds elsewhere. There are those who feel that lethal methods are the only solutions, and, it is true that, if they are successful, toxicants sometimes result in temporary relief. To my knowledge, however, no permanent results have ever been achieved by killing birds. Actually, these methods more often aggravate the condition by reducing populations to more favorable points on the population curve and stimulating greater reproductive efforts. In a few years you have more birds than before, and, like insects, they probably will develop immunity to your toxicants. Also, no one can predict as yet, the ecological effects of a bird extermination program. Even starlings are 50% beneficial and you may be interested to know they are one of our very few species which relish hairy caterpillars. The only other species I know of in the U.S. which eat hairy caterpillars are some of the cuckoos. This is not an endorsement of starlings but is merely another viewpoint to a complex situation.

Besides, there are only a few species of pest birds on which toxicants or drugs may be used legally. If you don't think so, try poisoning thousands of ducks to save 40 acres of rice. And, what do you do with the insectivorous species which decline to accept bait such as bluebirds, robins, tanagers, woodpeckers, and even starlings in the summer? In situations such as this bio-sonics shows promising possibilities.

Another common complaint is that the birds "get used to the sound." This is sometimes true under certain conditions; birds, like other animals, can, and do, adapt to various stimuli if they are incessantly exposed to it. The trick is to know what is incessant exposure. Also, some species, such as blackbirds, house sparrows and house finches have a tendency to inure to sounds more quickly than other species, but this can be largely overcome by presenting various deviations and variations of their basic alarm sound. For this reason we have provided four different tracks of sound on our equipment which can be selected as desired by the user.

This, then, outlines the present status of bio-sonics as I know it. Like other control methods, much remains to be done, and like them, it constitutes only a tool which must be used properly for best results.

DISCUSSION:

HAYDEN: I have observed in our area when they test the air raid warning system that birds take to the air and dogs howl. What about that?

BOUDREAU: In the siren there are certain components which are ultra-sonic frequencies, in other words above our human hearing frequencies. Dogs can detect this. The birds move because it is what we call the startle effect. You can do the same thing by beating on a dishpan. It's a strange sound to them and as a safeguard they usually move the first couple of times. Dogs respond to the ultra-sonic components of the sound by howling.

BORTZ: Let's assume that during the summer months you have a large group of starlings coming into a group of trees, starlings by the thousands into a grove of 30 to 50 trees. How effective would your biosonics be? How practical would it be?

BOUDREAU: It's been very practical in situations like that. We've found that the application of sound properly applied for a period of three or four nights usually clears the roost. This involves being there when the birds arrive, but you cut off the treatment before it gets too dark. Now this is where many people make a mistake; they carry the treatment on until dark, in which case the birds are unable to respond. Their response level raises to such a point that they're physiologically and psychologically unable to fly. They're in that roost because it's the safest place they know and they're not going to go someplace else when they can't see their way to do it; the low light intensity prevents their leaving.

MITTERLING: Gordon, I'm going to the defense of the farmer in the incidents you were talking about where he has this lackadaisical attitude. Most farmers who are producing a crop are pretty acute observers. There are two reasons for their attitude toward biosonics. Number one, they say it isn't worth it and why continue something that isn't worth it. Number two, they are confronted with this incomprehensible attitude that the problem really is not theirs in their local situations; it's a result of situations in the entire community. They just get tired and feel like throwing up their hands and quitting. I must say that as far as the farmer is concerned quite frequently it is not a situation where he loses interest or says the damage isn't occurring.

BOUDREAU: Maybe I should have qualified myself on that statement, Lloyd, and distinguished between eastern and western growers!

BRINK: I'd like to second Gordon's suggestion for definition of "control." If I have one body louse and I pick it off and put it on Ki Faulkner, I've got control. How much longer can we pass this thing along?

BOUDREAU: Well, that's why I brought the question up.

QUESTION: Does biosonics have any place in urban bird control?

BOUDREAU: Very much so. We're providing equipment which has a considerable amount of power, but it isn't necessary to turn this power all the way up. It's just like a T.V. set; it's got a volume control on it, but you don't have to use all the power there. Biosonics does have a place, yes.

DALTON: I notice you are very cautious not to say anything about pigeons. Do you have any ultra-sonic device for them?

BOUDREAU: I knew that would come up. I'll be very brutally frank with you; we haven't developed an alarm sound for pigeons, and the reason I haven't is that I don't think they have one.

DALTON: I've been wondering that myself.

BOUDREAU: I haven't been able to find one yet. No, I haven't done a thing for pigeons.