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EFFECTIVE USE OF SOUND TO REPEL BIRDS FROM INDUSTRIAL WASTE PONDS

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Birds are not normally attracted to waste ponds as a food source but, rather, as a place to loaf or rest. This is why sound patterns designed to affect bird behavior act as an effective deterrent to birds in these less attractive sites. The number and species of local or resident birds that frequent the site depend upon the degree of suitability found during their first visit. They can often be discouraged from using a waste pond by eliminating or reducing nearby roosting, loafing, nesting sites, and preferred food sources.

Migratory birds present a different problem in that as they move into or fly over an area, on a seasonal basis, large flocks often will visit a waste pond. They are not interested in roosting or nesting, just resting and dabbling for food items. By the time they discover that there is no food in the pond, many of them have either absorbed or ingested a lethal quantity of waste materials. In waste pond situations an integrated management program incorporating sound and visual devices has been effective in repelling the birds before they land.

Generally speaking, each bird species responds differently to a given sound pattern. Sound patterns elicit an aversion response that can be rated simply as poor, fair, good, and excellent. There are three principal sound types to work with which can be easily understood with a few basic definitions.

Acoustical sound is artifically produced. Acoustical sound generators produce a multitude of electronically synthesized sound from screeches to warbles to the sound of a shotgun blast. These sounds frighten birds and interfere with interflock communications or, for an undefined reason, effectively deter or repel birds. Most species can initially be repelled by some form of acoustical sound.

Av-alarm produces a wide range of sounds and can be adapted to practically any situation. It is powered by a 12-volt automobile battery or can be adapted to alternating current with the use of a trickle charger.

Propane-powered exploding cannons produce a sound similar to that of a shotgun blast. When modified they provide good visual movement in addition to the simulated shotgun blast.

A small pistol fires a whistling projectile nearly 200 yards and is an extremely effective tool for disbursing large numbers of birds before they establish a landing pattern.

Biosonic sound is the recorded distress or alarm call of an individual species. The call, which is amplified and played back through a loud speaker, is species-specific. Birds that hear their recorded alarm call quickly respond by departing the area. Not all species have a distress or alarm call. Biosonic and acoustical sound devices are used internationally to discourage gulls from frequenting major airports.

Ultrasonic sound cannot be heard by humans. A European device called Ultraton produces sound from the audible to ultrasonic range. Recent tests with this device in the ultrasonic mode have been effective in repelling bats. Birds normally do not respond to ultrasonic sound to a significant degree.

ADAPTATION

Even the most sensitive species will adapt and become nonresponsive to any sound pattern if the sound generator is placed next to a waste pond and remains unattended. The key to overcoming adaptation is to add a visual stimulus and to integrate several sound types. The visual stimulus is accomplished by using a sound generator that moves as the sound is emitted. Integrating several sound types requires the use of more than one type of sound generator.

Most waste ponds are small enough that sound devices can be placed around the perimeter with good sound penetration. Occasionally, sound devices must be placed on floating platforms for optimum coverage.

TYPICAL PROGRAM

A typical program involves a 40-acre chemical settling pond at a large plant in Central California. Because the facility is located in the Pacific flyway (a major migration route for migratory waterfowl) surrounded by agricultural crops and in the range of several fully protected bird species, several studies were made to determine use patterns and toxic hazards to birds using the pond. These studies revealed that a hazard did exist to birds on a year-round basis.

Because of the monumental expense and engineering difficulty of netting the 40-acre pond, a bird management program was designed and initiated by BlueBird Enterprises in November 1978. Data obtained from November 1978 through February 1979 were compared with the survey data that had been collected by Western Ecological Services Company (WESCO) the prior year (1977-1978) for the same four-month period (Tables 1 and 2).

To effectively deal with the diversity of species observed at the pond, four different sound devices were used. Six Av-alarm units were placed around the pond and mounted on 10-20 foot telescoping tripod towers. A portable Av-alarm unit was used to determine the most effective range of sound patterns for the species involved. Once these data were recorded the stationary units were adjusted accordingly, and sound patterns within the effective range were changed each week. These units turn off and on by use of a built-in photo-cell timer and operate on alternating current, thus providing for total automation. Two units operate at night, and four operate during the day.

Six propane guns were adapted to rotate 360 degrees at random when fired. Special modifications to the megaphone extension allowed their operation in windy conditions. Wind blowing down the megaphone will displace the propane gas and cause the device to misfire. Each gun was equipped with a timing device for automatic operation.

A portable biosonics unit was hand carried and used on occasion for gulls. The hand pistol and whistle bombs were used to frighten off large flocks of starlings and blackbirds that were flying into the nearby crops.

Bird counts and equipment checks were made in the early morning, at noon, and in the evening. Each bird count period was 30 minutes. Observers were trained in bird identification. Bird identification and weather data were recorded on each field check. I

Table 1 was compiled by WESCO as part of a detailed study in 1977 -1978 to document and determine the extent of damage caused by the waste water to bird life in the area. The WESCO observation technique differed from that used by the author in that three 8-hour observation days were completed each month. An observation day consisted of two 4-hour periods. The first began at sunrise; the second, about 3 1/2 hours before sunset and continued to 1/2 hour past sunset. One 30-minute observation at mid-

night was made per month. No birds were observed during the midnight observations.

Comparison of Tables 1 and 2 indicates that the total number of birds observed was greater in the 1978-1979 study than in 1977-1978, while the variety of species observed was just the reverse. It is important to keep in mind that the comparison is between a relative index of the bird population and not an absolute population count.

On the other hand, the author of the 1977-1978 study "noted that the field observations were conducted during the fall and winter which followed two years of drought conditions in California. With the amount of natural surface water normally used by waterfowl in the Valley reduced, large artificial ponds, such as this waste pond, would tend to attract more birds than under normal conditions. Similar studies during normal rainfall years will have to be completed before a definite comparison can be made. It is also important to note that numbers of birds visiting the Mendota Wildlife Area (10 miles away) at the time of our field studies was about 50 percent below normal, probably due to both reduced water area and lower numbers of migrating waterfowl." This suggests that the increase in bird numbers in 1978-1979 is a response to the increased rainfall and generally more favorable conditions.

Comparing the number of dead birds found before and after the bird management program; In 1977-1978, "a total of 27 dead birds were found. Of these, 19 were waterfowl, 6 were gulls, and 2 were shorebirds. A total of 17 were found on the first day of the 3-day observation period; 6 were estimated to have been dead for one week or longer, while 11 were estimated to have been dead from one to five days. Six mortalities were found on the second or third day of the observation period, indicating that these birds had died no more than 12 hours prior to discovery. Four gulls which had been observed drinking the pond water over a period of 30 minutes to one hour died shortly thereafter in the pond or on the bank. All dead birds were found in the pond, on the bank, or on the adjacent service road. There was no indication that these birds had died from any cause other than voluntary ingestion of the pond water. This conclusion is based on the behavioral and physiological response of the animals observed in the pen studies and in the field."

In 1978-1979, after the bird management program had begun, two dead birds were found in the second month of the program - a rudy duck and a coot. As of July 1979, no further mortalities have been observed. The success of this management approach is attributed to the integration of several sound systems, close monitoring of bird behavior, alteration of preferred bird habitat near the pond, and the weekly modification of sound patterns to overcome tendencies toward adaptation.

From a cost and operational standpoint, the use of sound systems for repelling birds from waste ponds is practical and effective when used in a well designed integrated management program. The total equipment cost for the 40-acre waste pond described earlier was a little over $10,000. Bids to net the 40 acre pond ranged from $500,000 to $900,000. Aside from the cost and the installation process, there are several disadvantages to netting; namely, ducks attempting to land on a netted pond are usually injured, and in windy weather accumulating debris becomes difficult to remove without damaging the net.

However, each situation should be evaluated separately. Depending upon the bird species and the size of the pond, it is occasionally more effective and efficient to combine the use of sound with visual deterrents, netting, or wire stringers.

Special thanks are given to Valley Nitrogen Producers for releasing this data and to Mr. Tom K. Palmer for critical review of the paper.

DISCUSSION

Q: Did you mean to imply they were actually ingesting enough heavy metals that they were sinking because of an increase in density?

A: No, I didn't. Frankly, I don't have the slightest idea what the physiological effect is. All I can tell you is the consulting firm that did this work has a very detailed paper, and the laboratory analysis has indicated something to the effect that the metals, or something in the water, breaks down certain tissues.

Comment: Birds will sink if there is detergent in the water.

Q: How many devices do you use in the 40-acre pond?

A: We had six Av-Alarm units and eight zon guns.

Q: Were these units moved about?

A: No. Normally in our crop protection programs we do that. When we started, the zon guns were stationary; but the rotation of the zon guns seems to be beneficial.

Q: What kind of time element was involved?

A: We have them running 24 hours/day. I don't think that is necessary, but that is the demand put on our company by Fish and Game. There is sound going off every 30 seconds on the pond.

Q: Did you have problems with any other animal species?

A: No, we didn't There are very few snakes. Agriculture is so intensive in that area, and there is just not much native land nearby. The consulting firm didn't record any snakes.

Q: All species of birds were tallied as they flew over?

A: That's correct.

TABLE 1. Summary of species and behavioral patterns observed at cooling pond, November through February, 1977-78.

OBSERVATION PERIOD / BEHAVIOR PATTERN	SPECIES: Mallard *Anas platyrhynchos*	Shoveler *Anas clypeata*	Cinnamon Teal *Anas cyanoptera*	Green-winged Teal *Anas crecca*	Blue-winged Teal *Anas discors*	Ruddy Duck *Oxyura jamaicensis*	Redhead *Aythya americana*	Lesser Scaup *Aythya affinis*	Canvasback *Aythya valisineria*	Coot *Fulica americana*	Unidentified Waterfowl	Ringbilled Gull *Larus delawarensis*	Unidentified Gulls	Forster's Tern *Sterna forsteri*	Sanderling *Crocethia alba*	Spotted Sandpiper *Actitis macularia*	Least Sandpiper *Calidris minutilla*	Common Egret *Casmerodius albus*	Unidentified Shorebird	Red-tailed Hawk *Buteo jamaicensis*	Marsh Hawk *Circus cyaneus*	Sparrow Hawk *Falco sparverius*	Prairie Falcon *Falco mexicanus*	Loggerhead Shrike *Lanius ludovicianus*	Killdeer *Charadrius vociferus*	Cowbird *Molothrus ater*	Unidentified Species	Cliff Swallow *Petrochelidon pyrrhonota*	Mourning Dove *Zenaida macroura*	Robin *Turdus migratorius*	House Finch *Carpodacus mexicanus*	Sparrows, Finches Unidentified Species	Starling *Sturnus vulgaris*	SUB TOTALS	MONTHLY TOTAL
November																																				
Dead when found[1]	2	3	2	1						1	2							1																	12	
Died during observation[2]											4																								4	
On pond - no drinking[3]					6							2																							8	
On pond - drinking[4]				3		1					10																								14	
Fly-over only[5]										12		11	6							1	1	1	1	5	6	2	10+	1							57	95
December																																				
Dead when found						2																													2	
Died during observation																																			0	
On pond - no drinking						1																													1	
On pond - drinking																																			0	
Fly-over only												2		5								1		3			2	1						15	29	32
January																																				
Dead when found						3	1	2	1								1																		8	
Died during observation																																			0	
On pond - no drinking						1		1									1																		3	
On pond - drinking						1																													1	
Fly-over only											12	9					2					2									5	20	1		51	63
February																																				
Dead when found										1																									1	
Died during observation																																			0	
On pond - no drinking																																			0	
On pond - drinking																																			0	
Fly-over only		2								7		4						1																	14	15
SPECIES TOTAL	2	5	2	4	6	9	1	3	2	20	16	31	15	5	2	3	1	1	1	4	1	8	6	2	12	1	1	5	20	1	15		4-month total 205		

[1]Found on pond or on bank. Some had evidence of vomit and/or bloody excrement.

[2]Observed on pond for length of time, later died on bank or in water. Some had evidence of vomit and/or bloody excrement.

[3]Observed on pond, but no drinking activity could be firmly established.

[4]Drinking activity on pond firmly established; bird later flew from pond area.

[5]No direct contact with pond water; observed in flight or perched on adjacent bank or fence.

COMPILED BY WESTERN ECOLOGICAL SERVICES COMPANY

Table2 Summary of species and behavioral patterns observed at the cooling pond, November thru February 1978 – 1979

OBSERVATION PERIOD / BEHAVIORAL PATTERN		Species: Mallard	Shoveler	Cinnamon Teal	Green-winged Teal	Blue-winged Teal	Ruddy Duck	Ring-necked Duck	Canvasback	Coot	Unidentified Waterfowl	Ringbilled Gull	Unidentified Gull	Dowitcher	Sanderling	Western Sandpiper	Common Egret	Unidentified Shoreland	Red-tailed Hawk	Marsh Hawk	Sparrow Hawk	White-tailed Kite	Cooper's Hawk	Killdeer	Swifts	Horned Lark	Meadow Lark	Mourning Dove	Raven	House Finch	Starlings	Starling	Brewers Blackbird	SUB-TOTALS	MONTHLY TOTAL
NOVEMBER	Dead																																	
	On pond-no drinking																																	
	On pond-drinking																																	
	Flyover	14											100								1			6		30				10	50		211	211
DECEMBER	Dead						1			1																							2	
	On pond-no drinking										1													1										2	
	On pond-drinking									1																							1	
	Flyover	3									6		4			6		2	2	1		1		3		80							108	113
JANUARY	Dead																																	
	On pond-no drinking																																	
	On pond-drinking																																	
	Flyover										1										1								50				52	52
FEBRUARY	Dead																																	
	On pond-no drinking																																	
	On pond-drinking																																	
	Flyover																				1	1		10					50			25	300	387	387
	SPECIES TOTAL	17					1			2	8		104			6		2	2	1	3	2		30		110			130	10	75	300	4-MONTH TOTAL	793

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