

UC Agriculture & Natural Resources

Proceedings of the Vertebrate Pest Conference

Title

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Journal

Proceedings of the Vertebrate Pest Conference, 19(19)

ISSN

0507-6773

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Publication Date

2000

DOI

10.5070/V419110223

CONTROLLING GULLS AT LANDFILLS

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ABSTRACT: In spite of significant progress toward the application of recycling and other waste minimization processes, active landfills are expected to remain a common feature on the landscape for the foreseeable future. The availability of food and habitat at landfills will continue to act as a catalyst for a variety of human-wildlife conflicts. In this paper, we will focus specifically on on-site and off-site conflicts and management alternatives to resolve conflicts associated with gulls at landfills. Case histories of gull damage management programs conducted by Wildlife Services will be presented to illustrate the effectiveness of control strategies adapted to meet site-specific management objectives at landfills in the northeastern United States.

KEY WORDS: gull, landfill, waste, control, harassment, hazard, conflict, damage, airport, property, New Hampshire, New York, Vermont, northeast

Proc. 19th Vertebr. Pest Conf. (T.P. Salmon & A.C. Crabb, Eds.) Published at Univ. of Calif., Davis. 2000.

(March 6-9, 2000, San Diego, California)

INTRODUCTION

Municipal solid waste (MSW) landfills provide foraging opportunities and loafing areas for a variety of gull species. Herring (*Larus argentatus*), ringed-billed (*L. delawarensis*), great black-backed (*L. marinus*) and laughing gulls (*L. atricilla*) are the most common gull species reported at landfills in the eastern United States (Patton 1988; Hunt 1997). The number and species of gulls observed at landfills varies by site and season, with greater abundance often associated with landfills nearer to larger bodies of water and during migration and over wintering periods (Horton et al 1983; Patton 1988; Risley et al. 1984, Belant 1997). Estimates of gulls using landfills range from several hundred (Hunt 1997) to about 50,000 (Patton 1988), but the number of gulls seen at any point in time may under-represent the total community using the facility (Belant et al. 1993; O'Callaghan et al. 1999).

Landfills that accept food waste are usually located near human population centers. Invariably, this leads to the potential for a broad range of conflicts (Belant 1997). On-site issues may include: safety concerns for equipment operators because of reduced visibility as gulls move in large flocks at the working face; inability to meet regulatory requirements to control gulls as potential disease vectors; corrosion of equipment; and increased bacterial counts from gull fecal material in storm water discharge (Portnoy 1992). Hazards gulls pose to air traffic represent a serious and complex problem that is often exacerbated by the proximity of landfills to airports (Blokpoel 1976; Solman 1984; Dolbeer et al. 1993; Cleary et al. 1997). Other off-site conflicts may occur

when gulls loaf or stage on building rooftops as they move to and from landfills. Such behavior often results in health concerns arising from the deposition of gull feces and landfill waste carried off-site by gulls; aesthetic issues from the accumulation of feathers, landfill debris and feces; and structural damage to property (Vermeer et al. 1988). In addition, gulls that feed at landfills may also frequent nearby fast food or food processing facilities, creating public health concerns. Gulls also create health concerns at municipal water supply sources (Hatch 1996) or waste water and sewage treatment facilities.

Landfills are mandated by Federal regulation (Federal Register 1991), and often more strict State regulation, to control potential vectors such as gulls. Daily waste covering practices are specified to help meet this mandate. Covering practices as an independent control tactic may have only minimal effect on reducing gull conflicts. However, when coordinated with other control methods such as harassment, proper daily covering practices are integral to achieving site-specific gull management objectives.

In this paper we present case histories of control programs used to address gull conflicts at landfills in the northeastern United States (Figure 1) to illustrate project complexity and the effectiveness of current strategies. We also identify additional methods not covered by the case histories that may have applicability in other site-specific scenarios. Finally, we identify issues that wildlife professionals should devote attention to in the future in addressing gull conflict management at landfills.



Figure 1. Wildlife Services gull management projects at landfills in New York, Vermont, and New Hampshire.

CURRENTLY USED INTEGRATED CONTROL STRATEGY

In each case history, non-lethal pyrotechnics and attention to landfill cultural practices were central to the control strategy. At least one Wildlife Services (WS) specialist staffed each landfill to conduct persistent and aggressive integrated harassment daily at Lebanon, Nashua, and Turnkey landfills in New Hampshire. At Colonie and Albany, New York landfills, one WS specialist was present daily from fall through spring to address migratory and wintering gulls issues. A mix of screamers, bangers, and shell crackers was used when gulls attempted to access each landfill, although screamers were used most frequently because they were effective while not producing as much off-site noise as other pyrotechnics. A U.S. Fish and Wildlife Service (FWS) depredation permit was issued to each landfill, allowing a limited number of gulls to be taken to enhance non-lethal methods. A strict shooting protocol was followed when gulls did not respond to pyrotechnics that included removing gulls from larger flocks or persistent individual gulls that could act as decoys. Human effigy silhouettes constructed from plywood (4' x 8') and painted with the fluorescent orange color worn by landfill and WS personnel were often placed at potential loafing sites and movement corridors. Effigies were periodically moved to different locations to assist in cueing gulls to imminent danger as they approached the landfill. Occasionally propane cannons were used on loafing areas on landfills. The ability to maintain as small a working face as practical and to adequately cover waste during and at the end of each operational day was integral to the control strategy.

Other methods available for use in an integrated program include: 1) habitat management, particularly grass management on capped portions of landfills that

may serve as loafing sites; 2) overhead wires on active and capped portions of landfills (Forsythe et al 1984; McLaren et al. 1984); 3) gull distress calls; 4) bird of prey kites and predator-eye or other balloons; and 5) the repellents methyl anthranilate (ReJeX-iT™ TP-40 of AP-50) (Dolbeer et al. 1993a) and Avitrol®. Falcons may have applicability on landfills used by smaller and fewer gulls. Lasers currently being tested by WS' National Wildlife Research Center scientists may hold promise as a method.

DEFINITIONS/DATA METHODS

Harassment is defined as the use of scaring methods (primarily pyrotechnics) to deprive gulls of access to landfills. The term "gulls harassed" likely includes multiple counts of the same gulls attempting to access the landfill. There was no attempt to distinguish among individual gulls when conducting control programs.

Efficiency rating is calculated as follows: number of gulls harassed/number pyrotechnics fired. It is used as a simple index of the number of gulls harassed per pyrotechnic fired.

Unless noted otherwise, data are reported by federal fiscal year (i.e., October 1 to September 30), or for Lebanon, by project year (September 1 to August 31). Given the little temporal and biological difference, "year" is used in the text.

CASE HISTORIES

Lebanon Regional Solid Waste Landfill, Lebanon, New Hampshire

The city of Lebanon owns and operates the landfill and airport. The landfill is located about 5,000 ft. from the airport, a Federal Aviation Administration (FAA) certificated facility that serves piston and turbine powered aircraft. Both facilities are less than one mile from the Connecticut River, a migration corridor for ring-billed, herring, and great black-backed gulls. The landfill processes about 145 tons of MSW/day on a single, relatively small working face (10,000 sq. ft.); nevertheless, food waste is exposed and potentially accessible by gulls until the face is covered at the end of daily operations.

In 1995, the City proposed an expansion to provide an additional 25 years of disposal capacity (Musselman et al. 1998). As a result, the City had to comply with Environmental Protection Agency (EPA) regulation, 40 CFR Subpart B, 258.10 (Federal Register 1991) that requires landfills within 5,000 ft. of piston powered and 10,000 ft. of turbine powered aircraft to demonstrate that, "... units are designed and operated ..." to not pose hazards to aircraft. FAA Advisory Circular No. 150/5200-33 provides similar guidance (USDOT 1997). In addition, New Hampshire Department of Environmental Services (NHDES) rules had to be met.

In the first phase, Hunt (1997) surveyed gulls near the airport and landfill and reported a fall-winter peak in abundance of about 1,000 ring-billed, herring, and great black-backed gulls (Figure 2). In September 1997, with the Hunt (1997) data as one benchmark for measuring effectiveness, WS initiated an aggressive integrated harassment program to discourage gull access to the landfill.

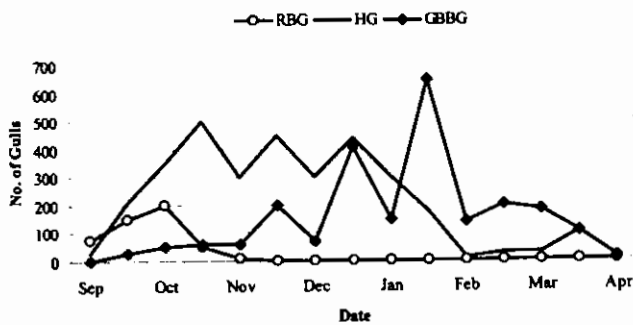


Figure 2. Ring-billed herring and great black-backed gull species composition in the Lebanon, New Hampshire area 1996/97 (adapted from Hunt 1997).

A total of 4,447 and 3,517 gulls were harassed at the Lebanon landfill in 1998 and 1999, respectively, with peak attempts to access the landfill occurring in December (Table 1). Herring gulls accounted for 63% and 69% of gull activity in 1998 and 1999, but their presence decreased precipitously by the end of December each year. Great black-backed gulls made up 35% and 30% of the activity, peaking in December but with increased activity in October that persisted through March. Ring-billed gulls were present in low numbers from September to November, accounting for $\leq 2\%$ of gull activity. The temporal composition of the gull community using Lebanon with harassment in place was similar to that reported by Hunt (1997), with the exception of the lower relative abundance of ring-billed gulls. It appears that with harassment in place, ring-billed gulls may have migrated through the area rather than stopping and establishing some site fidelity at the landfill as they had in the past.

Harassment efficiency was greatest during the fall and winter, when larger flocks (≥ 5 gulls) were present and responded with fewer pyrotechnics (Table 1). During the summer, persistent single gulls or small flocks of local birds required the use of proportionately more pyrotechnics. The decline in overall efficiency from 2.4 in 1998 to 1.5 in 1999 could be related to greater persistence in gulls attempting to access the landfill. Only six gulls were taken to support non-lethal harassment in 1999. Increasing take commensurate with the 100 permitted by the FWS for 1998 may have enhanced pyrotechnic efficiency; 25 gulls were taken in 1998.

Since the project began, gulls have had nearly zero access to food waste at the working face, and they have not been allowed to loaf for extended periods. More importantly, denying gulls landfill access has resulted in low levels of gull activity at the airport. From November 1998 to January 1999, no gulls were observed in 50 of 123 monitoring days. Mean number of gulls per observation period and day were 0.6 and 1.2, respectively. The maximum number of gulls observed at the airport was 23 during September (Figure 3). Fifteen gulls were reported struck by aircraft in ten separate

incidents from October 1990 to June 1996; two gulls have been struck in separate incidents with control in place from September 1998 through March 2000. However, since Wildlife Services began work in Lebanon, airport management is perhaps more sensitized to the need to report strikes.

▨ Herring gull ▨ Great black-backed gull ▨ Ring-billed gull

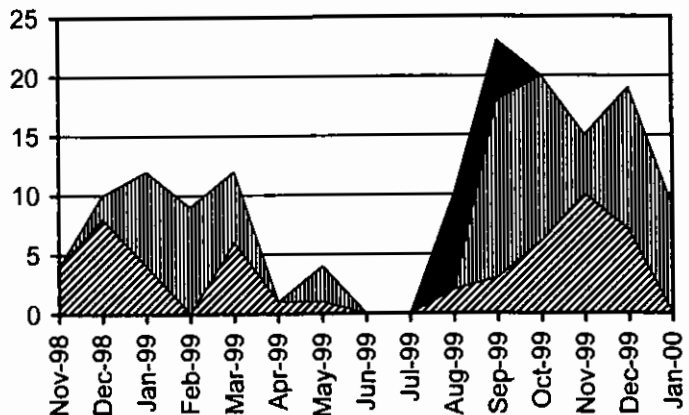


Figure 3. Total gulls observed as a result of monitoring at Lebanon Airport, New Hampshire (1998 to 2000).

The NHDES expressed concern that control may result in increased gull activity near fast food restaurants (plaza) that occur, in part, between the airport and landfill. Hunt (1997) reported routinely sighting between 50 and 150 gulls along the plaza from September to late February. Although our monitoring methods differed from Hunt (1997), the mean number of gulls WS observed along the plaza with control in place was lower, ranging from near zero to 38, with one peak averaging slightly over 100 gulls in March 1998.

Lastly, Keene landfill was used as a monitoring site for comparison with Lebanon. Keene is 60 miles south of Lebanon in the Connecticut River Valley and was similar in most respects, except that no gull harassment was in place and there were no airports nearby. From October 1998 to September 1999, an average of almost 2,500 gulls/monitoring day was recorded loafing and foraging at the landfill, peaking in December at 6,500/monitoring day (monitoring was not conducted during the summer). Some of these gulls were undoubtedly forced south to Keene from Lebanon.

Four Hills Landfill, Nashua, New Hampshire

Four Hills Landfill is municipally-owned and operated. Residential development has encroached on and envelopes the landfill perimeter. The landfill is in the lower Merrimack River Valley, a gull migration corridor, and about 40 miles from the Atlantic Ocean, a source of nesting, staging, and migratory gulls. The ratio of herring and great black-backed gulls at Nashua was approximately 60:40. The landfill processes about 230 tons of MSW/day on a small working face that is about 2,500 sq. ft.; nevertheless, exposed food waste is potentially accessible by gulls.

The primary need for control at Nashua was related to gulls staging and loafing on rooftops of a nearby condominium complex (Ledgewood Hills) as they

Table 1. Number of gulls harassed by species at the Lebanon Landfill (1997 to 1999)

1997-1998	GBB Gulls	Her. Gulls	RB Gulls	Total No. of Gulls	No. of Gulls Per Visit	Avg. Gulls Per Visit	No. of Pyrotechnics Fired	No. of Gulls Harassed Per Pyrotechnic Fired (Efficiency Rating)
September	41	614	0	655	119	6	348	1.9
October	34	570	13	617	191	3	560	1.1
November	165	564	22	751	126	7	260	2.9
December	410	1,004	0	1,414	113	13	310	4.6
January	311	7	0	318	83	6	177	1.8
February	253	0	0	253	54	5	80	3.2
March	356	21	0	377	63	6	92	4.1
April	24	13	0	37	20	2	19	1.9
May	4	7	0	11	11	1	15	0.7
June	0	8	0	8	4	2	6	1.3
July	0	2	0	2	2	1	1	2.0
August	1	3	0	4	4	1	4	1.0
Total	1,599	2,813	35	4,447	790	6	1,872	2.4
	35%	63%	2%					

1998-1999	GBB Gulls	Her. Gulls	RB Gulls	Total No. of Gulls	No. of Gulls Per Visit	Avg. Gulls Per Visit	No. of Pyrotechnics Fired	No. of Gulls Harassed Per Pyrotechnic Fired (Efficiency Rating)
September	1	139	0	140	44	3	177	0.8
October	6	465	1	472	103	5	463	1.0
November	250	866	6	1,122	138	8	627	1.8
December	545	772	0	1,317	129	10	442	3.0
January	117	134	0	251	77	3	259	1.0
February	58	8	0	66	30	2	86	0.8
March	74	39	0	113	43	3	172	0.7
April	2	11	0	13	7	2	24	0.5
May	3	3	0	6	4	2	12	0.5
June	0	2	0	2	2	1	1	2.0
July	0	2	0	2	1	2	1	2.0
August	0	0	13	13	6	2	14	0.9
Total	1,056	2,441	20	3,517	584	6	2,278	1.5
	30%	69%	1%					

accessed the landfill. This resulted in potential structural damage to roofing, roofing fixtures, building paint, and automobile paint; health and aesthetic concerns from the accumulation of fecal material, feathers, and landfill debris left by gulls; the attraction of rodents to accumulated debris at the site; and excessive gull noise. The City was likely to be sued by the condominium association if they did not address the gull damage. The City was unwilling to set a precedent of installing overhead wires on condominium rooftops, which would have likely reduced the site-specific problem, but could have resulted in similar off-site conflicts as the gulls shifted to other rooftop sites. In fact, the installation of overhead wires on rooftops by a nearby condominium association nearer to the landfill may explain why gulls began using Ledgewood Hills.

In September 1996, WS began harassment with the goal of reducing gull access to the landfill to near zero. An initial estimate of 2,500 gulls was obtained in September by independent, direct counts of gulls loafing on the landfill by three WS biologists. This represents a pre-migration estimate. Bollengier's (1984) estimate of 15,000 gulls using the Manchester Landfill (25 miles north of Nashua in the Merrimack River Valley; Manchester closed in the mid-1990s) during peak migration provides a rough pre-harassment index of number of gulls that potentially used Nashua landfill.

In each year since the project began there has been about a 50% reduction in the number of gulls harassed, from 74,099 in 1996/97 to 19,195 in 1998/99, suggesting a positive long-term effect of denying gull access to the landfill (Tables 2 and 3). A similar but more pronounced pattern than was observed at Lebanon (Table 1).

Harassment efficiency was 6.9 in 1996, declining slightly to 5.2 since that time. However, the number of pyrotechnics fired decreased in direct proportion to the reduced number of gulls attempting to access the landfill each successive year since the project began. Like Lebanon, harassment of single or small flocks of persistent, local gulls during the summer required greater numbers of pyrotechnics.

Project success was dependent on positive results at Ledgewood Hills condominiums and the absence of additional complaints of gulls using other rooftop complexes in the vicinity of the landfill. Results of daily monitoring at Ledgewood Hills show a precipitous decline from 1,344 to 406 in total gulls loafing on the rooftops by December 1996, one month into the project. A total of 224 and 183 gulls was observed in 1998 and 1999, respectively, peaking in January. No other complaints have been received regarding large numbers of gulls staging or loafing on rooftops around the City of Nashua.

Turnkey Recycling and Environmental Enterprise Facility, Rochester, New Hampshire

Turnkey is a 1,200-acre, state-of-the-art waste management facility that includes a large regional landfill. Turnkey typically processes 3,000 tons of MSW daily on one or more working faces. Turnkey is within 10 miles of the Atlantic Coast and less than 25 miles from the Isles of Shoals, an archipelago off the Maine-New Hampshire coast that supports abundant breeding colonies of herring (Elkins 1994) and great black-backed gulls (Slate 1994).

The need to initiate gull damage management was related to: health concerns from fecal material and landfill debris deposited directly on landfill employees and

Table 2. Number of Gulls Harassed at the Nashua Landfill (1995 to 1997).

1996-1997	Number of Gulls	Number of Pyrotechnics	Efficiency Rating
November	10,581	1,471	7.2
December	8,254	953	8.7
January	9,145	630	14.5
February	6,768	436	15.5
March	13,987	712	19.6
April	11,321	943	12.0
May	2,520	807	3.1
June	2,193	933	2.4
July	2,282	1,059	2.2
August	2,819	1,066	2.6
September	4,211	1,689	2.5
Total	74,081	10,699	6.9

Table 3. Number of gulls harassed at the Nashua Landfill (1997 to 1999).

1997-1998	Total No. of Gulls	Number of Gull Visits	Avg. Gulls Per Visit	Number of Pyrotechnics Fired	Number of Birds Harassed Per Pyrotechnic Fired (Efficiency Rating)
October	3,784	466	8	920	4.1
November	3,636	300	12	616	5.9
December	5,037	308	16	672	7.5
January	3,120	259	12	555	5.6
February	3,325	235	14	507	6.6
March	6,122	360	17	871	7.0
April	2,868	233	12	518	5.5
May	2,033	242	8	483	4.2
June	1,625	235	7	468	3.5
July	882	184	5	410	2.2
August	1,106	158	7	323	3.4
September	1,465	192	8	348	4.2
Total	35,003	3,172	11	6,691	5.2

1998-1999	Total No. of Gulls	Number of Gull Visits	Avg. Gulls Per Visit	Number of Pyrotechnics Fired	Number of Birds Harassed Per Pyrotechnic Fired (Efficiency Rating)
October	3,262	270	12	508	6.4
November	1,282	158	8	257	5.0
December	815	125	7	163	5.0
January	2,629	254	10	451	5.8
February	1,182	150	8	280	4.2
March	3,410	258	13	476	7.2
April	2,162	187	12	342	6.3
May	404	91	4	170	2.3
June	237	78	3	145	1.6
July	619	92	7	147	4.2
August	1,498	143	10	288	5.2
September	1,695	193	9	430	3.9
Total	19,195	1,999	10	3,657	5.2

clients; safety issues related to lack of visibility from large numbers of gulls lifting off and landing on the working face where up to seven 100,000 lb. pieces of heavy machinery (four compactors and three bulldozers) and ten or more large garbage trucks are active at the same time during normal operations; landfill debris dropped by gulls on private properties adjacent to the landfill; equipment damage by corrosive gull droppings; increased bacterial counts in storm water retention ponds; inability to comply with state and federal regulations to "control potential vectors"; and the need to proactively have the ability to address potential future conflicts with abutters as the landfill expands.

Great black-backed and herring gulls dominate the gull community using Turnkey. Unofficial estimates of peak numbers of gulls using Turnkey range as high as 50,000. In an attempt to benchmark gulls numbers, WS used an overlapping series of panoramic 35 mm slides to census gulls as an index of the community present at one point in time. The maximum number of gulls counted was 5,745 on November 30, 1997, but based on Belant (1993) in excess of 30,000 different gulls may be using the facility. The size of the breeding colonies on the Isle of Shoals, 12 miles off the coast of New Hampshire/Maine, suggests this estimate is not unreasonable (Elkins 1994; Slate 1994).

The challenge at Turnkey is illustrated by the frequency and variability of pyrotechnic use and gulls harassed (Figure 4). Since the project began on September 13, 1999, 173,049 pyrotechnics have been fired through January 31, 2000. WS has removed 105 gulls during that period to enhance the effectiveness of non-lethal pyrotechnics. Preliminary indications are that two full-time WS staff present daily during the fall-winter period can effectively meet the management goals with enhancement from limited shooting, but the financial costs for this labor intensive approach are high. Other methods such as command fired propane cannons, effigies, and occasional use of Avitrol® as a repellent will likely be integrated into the current strategy to reduce long-term costs. The potential to use overhead wires on a portion of a new landfill cell is under consideration.

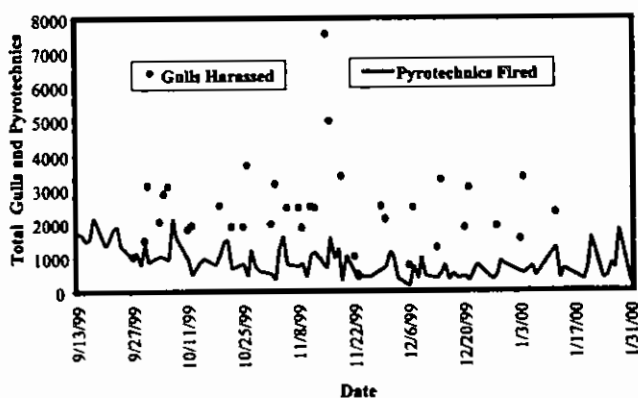


Figure 4. Gulls harassed and pyrotechnics fired at Turnkey Landfill, New Hampshire (1999 to 2000).

Colonie and Albany Municipal Landfills, Cohoes and Albany, New York

Wildlife Services became involved in gull damage management at Colonie Landfill in 1995. A similar control program was initiated by Wildlife Services in 1996 at the Albany Landfill, 8 miles south of the Colonie site. The next closest active landfills are approximately 175 miles to the west and 90 miles to the south. The peak number of gulls observed at both facilities ranged from 3,500 to 4,000 during the fall and winter months. Undoubtedly many of the same gulls use both facilities.

The 116-acre Colonie landfill is a municipally-owned and operated facility that processes about 160,000 tons of waste per year. The average working face is 40,000 sq. ft.; daily cover material consists of combination of sand and Posi-shell®. The landfill is situated on a peninsula on the southern bank of the Mohawk River, which provides an ideal loafing and staging area for ring-billed, herring and great black-backed gulls within site of the working face.

The 125-acre Albany Landfill is also municipally-owned and processes about 260,000 tons of waste annually. The average working face is 20,000 sq. ft. Daily cover material is similar to the Colonie site. The landfill is located in an urban/suburban setting with both commercial and residential areas adjacent to the landfill. The flat-topped roofs of warehouses have become important loafing sites for gulls. Wildlife Services has tested Allsop Helikite® to successfully discourage loafing on these buildings as part of the integrated gull management program. Another component of the gull control program as outlined in the New York Department of Environmental Conservation landfill operations permit involves off-site bird management at Fox Run Estates, a trailer park adjacent to the landfill. Wildlife Specialists visit this site five to eight times daily and use pyrotechnics to harass and disperse starlings, crows, and occasionally gulls.

The focus of both programs is to reduce conflicts associated with ring-billed, herring, and great black backed gulls, as well as other birds, to maintain compliance with the New York Vector Control Law (6 NYCRR 360 1.14) that states "the facility must be maintained so as to prevent or control on-site populations of vectors using techniques appropriate for protection of human health." These landfills also need to manage birds to reduce excessive droppings on workers and equipment, as well as nearby private homes and vehicles. The Colonie landfill also had concern for customer safety after a local resident driving a small pick up was forced off a landfill service road by a large flock of gulls. Wildlife Services provides one full-time specialist at each of these landfills during the fall and winter months (November to April) to coincide with peak gull migration and staging in the Hudson and Mohawk River Valleys.

Colonie and Albany landfill management objectives have been met by focusing control effort during the fall-winter-spring migration and staging period. In general, the number of gulls harassed by month declined from 1997 to 1999 in a similar but less marked fashion than the pattern observed at Nashua (Figure 5, Tables 2 and 3), where gull control occurs year round. However, in contrast to Lebanon, the gull community at Colonie

continues to be composed of appreciable numbers of ring-billed gulls (Figure 6). At Lebanon, ring-billed gulls have been rarely observed over two years since control was instituted. These contrasting species composition patterns may be related to inability of migrating ring-billed to establish site fidelity with year round control in place at Lebanon. At Colonie, control begins after fall migrants have arrived and spent some time at the landfill.

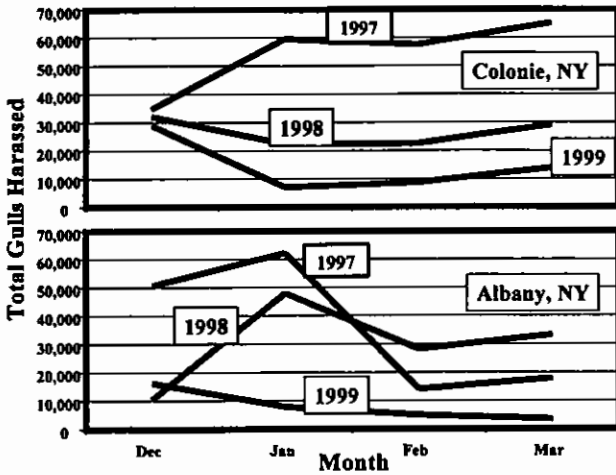


Figure 5. Total gulls harassed at Albany and Colonie Landfills, New York (1997/99).

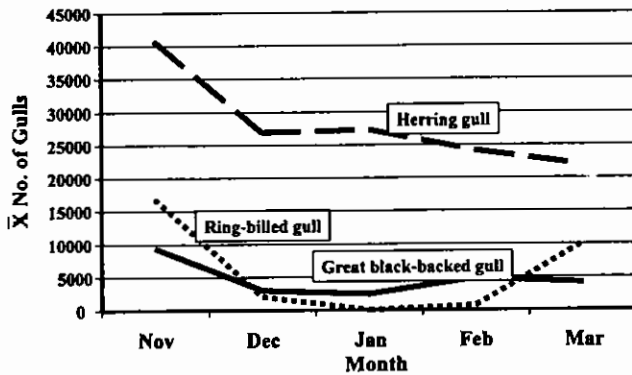


Figure 6. Average number of gulls harassed by species at Colonie Landfill, New York (1997/99).

CONCLUSIONS AND SUMMARY

Gull control at landfills can be effective in meeting site-specific management objectives of reducing conflicts. Other researchers have reported similar conclusions for strategies relying on pyrotechnics (Southern and Southern 1984) as well as other methods (Risley and Blokpoel 1984; McLaren et al. 1984; Forsythe and Austin 1984). Success hinges on formulating control strategies adapted to the unique set of on and off-site environmental factors at each landfill, underscoring the need to consider each prospective control project on a site-specific basis.

Projects designed to reduce daily gull use at landfills from several thousand to near zero must be based on need and initiated only if there is a strong likelihood that long-term off-site conflicts can be substantially reduced. Although the Lebanon landfill case history illustrates that on-site control can successfully mitigate against gull hazards at the nearby airport, similar positive results may not be achievable at other sites where landfills and airports are within the 5,000 or 10,000 ft. threshold. Policy makers should continue to apply the minimum 5,000'/10,000'/5 mile recommendation in the FAA circular (USDOT 1997) and EPA regulations (Federal Register 1991) in site selection for these typically incompatible land uses. "Low tech" solutions that rely heavily on pyrotechnics require dedication of continuous staff time to gull control projects. Landfills with a need for control using such strategies should consider the additional staff time and expertise as a long-term part of "the cost of doing business."

Several researchers have suggested that the energy subsidies available at landfills are implicated in increases in gull abundance throughout North America (Drury and Nisbet 1972; Patton and Hanners 1984; Blokpoel and Tessier 1986). Given that many of the gull species that use landfills are widely distributed and migratory, wildlife professionals should explore regional or flyway approaches to augment site-specific gull management. Gull damage management will likely continue to be necessary at specific landfills, but regional or flyway management designed and administered to achieve regional population goals should lessen the frequency and intensity of site-specific conflicts. Given that each U.S. citizen generates 106 lbs. of food waste/year and that a portion of those food scraps make up about 15% of MSW landfilled annually (Miller 1998), wildlife professionals and landfill engineers should work closely in the development and application of emerging technologies that will reduce the attractiveness of landfills to gulls and other wildlife.

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