The Hackensack
MEADOWLANDS
Development Commission

LANDFILL WILDLIFE HABITAT FIELD DEMONSTRATION PROJECT

ENVIRONMENTAL OPERATIONS

GRANT PROPOSAL

Spring, 1992

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ADDENDUM

LANDFILL WILDLIFE HABITAT
Hackensack Meadowlands District, New Jersey

Like the miner's canary, the birds of the Meadowlands provide visible means of measuring environmental quality. The broad wetland open space is required by migratory species, and provides a Mecca for those humans who wish to intersect with their flight path. Freshwater, scarce in this brackish preserve, is becoming more prevalent in the basins formed by differential settling on landfills. Herein lies the question we would like to investigate: Are we making the most of our role as host, or can we devise management strategies to better serve our guests?

Background

The Hackensack Meadowlands District is a 32 sq. mile subsection of the NY/NJ Harbor Estuary. The Meadowlands District is, in a sense, a microcosm of the estuary, in that much of the original wetlands have been lost forever to development.

Remaining wetlands throughout the district provide critical habitat for the survival of large numbers of a variety of shorebirds, wading birds, waterfowl and many other wetland-dependent species, several of which are endangered.

The Meadowlands are also typical of the regional estuary in that 28 landfills occupy substantial acreage of what were formerly wetlands. Many of these landfills have begun to develop into valuable wildlife habitat, including freshwater wetlands, through the natural succession of volunteer plant species.

Any additional wetlands and adjacent upland edge would significantly enhance the productivity of remaining wetlands. This is particularly true where the landfills abut the water, removing resting area for shorebirds at high tide.

Most of the "orphan" landfills in the Meadowlands District, as well as the rest of the NY/NJ Harbor Estuary will eventually be capped as part of landfill closure programs. We are presently attempting to develop a set of Best Management Practices for a District-Wide Plan for creation of wildlife habitat atop closed landfills, emphasizing wetlands. This work will serve as a model for similar plans throughout the region, and elsewhere nationwide, wherever coastal wetlands and landfills compete for space.

Actions to Date

Established in 1969, the Hackensack Meadowlands Development Commission (HMDC) is a pioneer in balancing the competing demands on the diminished urban wetland resource. Among its first actions was the implementation of a ban upon further landfill creation or lateral expansion of existing landfills which were built upon former wetlands.

Since that time, the HMDC has initiated a series of actions designed to improve regional water quality, and to reduce the potential export of contaminants into the environment. These programs include landfill closure and leachate containment programs, and two operating methane recovery systems.

At present, a Special Area Management Plan (SAMP) is being developed with State and Federal environmental agencies, including the EPA, ACOE, NOAA, and NJDEP. This SAMP will result in a District wide level management plan to achieve net environmental improvements.

In the Winter of 1991, the HMDC convened a "meeting of the minds," to conceptualize approaches for landfill habitat investigations.

Field Demonstration Project

Those assembled, representing a cross-section of experts, identified key elements which focus on the utilization of landfills by wildlife. Richard Kane, New Jersey Audubon Society Director of Conservation (1991), called for cooperative ventures to advance the transformation of Meadowlands Landfills to serve the cause of migratory bird conservation. Researchers, led by Dr. Steven Handel from Rutgers, are investigating the feasibility of restoring native woodlands to these derelict areas. Their botanical project, if successful will provide the basis for a how-to manual for communities throughout the state.

HMDC Environmental Operations has initiated an inventory of existing landfill habitats, to provide baseline data on natural succession tendencies of plant communities in local landfill environments. The results of this preliminary survey were presented at the Fifth Hackensack River Symposium (Fairleigh Dickinson University 1991) by Ken Scarlatelli, staff ecologist. By cataloguing those plant species that have successfully returned to the barren landforms and considering their relative merit as foodstuff, recommendations can be made for future habitat management and restoration efforts.

Project Description

To stay the course, building upon preliminary investigations to attain the goal of transforming valuable wildlife habitat from derelict landscapes, the HMDC program for 1992 includes documenting the habitat itself, and determining if pathways exist for the movement of contaminants from landfill to biota. To address these questions, we propose the following:

1. To systematically survey the wildlife habitat and usage on all landfills, active, closed or orphaned, within the Hackensack Meadowlands District. Natural succession of vegetation will be inventoried, with the ultimate goal being the generation of recommendations for potential habitat management and restoration efforts on these and similar sites within the region.

   With guidance by the HMDC staff, this study will be incorporated into efforts promoting environmental education by utilizing students whose expression of future careers in environmental science has been recognized.

2. Acknowledging the importance of wetlands as critical habitat, we will focus on the observation and documentation of vegetation, wildlife usage, and differential contaminant transport in naturally occurring and engineered freshwater ponds. With the opportunity to choose from among several different habitats and to control variables by design, this study will be unique in its scope.

A broad spectrum of potential contaminants can be analyzed at the HMDC state certified laboratory. All environmental compartments, from substrate through vegetation into biota, will be investigated. The resultant information will satisfy the need for insuring the integrity of this habitat.

Resources

The HMDC has a long history of incorporating public and private partnerships in reaching its research goals. In this instance we can supply technical guidance and a labor force consisting of highly skilled scientists leading motivated students.

Facility

The Hackensack Meadowlands Development Commission Environmental Operations Research Laboratory is a state certified waste water monitoring facility. It has been the center for research investigations into contaminents in the air, water, sediment soils and biota of landfills and the surrounding estuary.

Key Staff

Anne Galli,
Director Environmental Operations
Ken Scarlatelli,
Wetlands Specialist
Don Smith,
Natural Resource Specialist
Edward Konsevick,
Laboratory Manager
Paul Lupini,
Enviornmental Chemist
Katy Weidel,
Senior Landscape Architect

Needs

Financial assistance is needed to provide a stipend to interns, to offset construction costs of designed ponds, and to supply expendable equipment utilized in the field and laboratory.

DRAFT BUDGET (One Year)

	GRANT REEQUEST	HMDC CONTRIBUTION
Senior Personnel		10,500
Field & Laboratory Assistants 5 @ $2,100	$10,500	
Construction materials for control site	10,000	
Expendable equipment	1,000	1,000
Total Direct Costs	21,500	11,500
Indirect Costs (10%)	2,150	
	23,650	11,500
Grand Total	$35,150	

TOXICANT TRANSPORT THROUGH LANDFILL VEGETATION

Don Smith, HMDC Staff Naturalist

January 11, 1991

As a follow up to our conversation pertaining to managing the old sanitary landfills in the District for wildlife, and how the wildlife may or may not be affected by toxins in the contaminated soils, I am proposing the following:

Since all of the old landfills in the District will not be covered with a liner prior to soil covering, there is opportunity for heavy metals and other toxins to be transported into the food chain via the vegetation which is or will be established on these sites.

To address this potential problem, I suggest that we conduct an in-depth study of soils, vegetation, and animals to establish the extent, if any, that this problem presently exists.

This study should be conducted by HMDC personnel, with input from the scientific community and cover the following:

1. Background soil sampling from various landfills for mercury, cadmium, lead, chromium, and perhaps others.

2. Sample roots, rhizomes, stems, leaves, and seeds or fruit from existing vegetation.

3. Sample tissue from small mammals, mice, voles, and rabbits, and pheasants and red-wing blackbirds to establish background levels, and compare to vegetation levels.

4. Establish a control plot to clean fill on top of an old landfill and plant the same vegetation community which is growing on adjacent contaminated soil, and to monitor the migration, if any, of toxins occurring through plant root growth at various cover depths. We should also sample the vegetation from the slope adjacent to the Environment Center.

At this time I feel that we should fund this through environmental bond initiative funds, since so much of our open space planning will involve the District landfills, and this issue must be addressed.

This should be an agenda item for our February 21 meeting of the minds.

THE NATURALIST'S POSITION: DEFINING THE CHALLANGE

LANDFILL HABITAT FEASIBILITY MEETING
HMDC Environment Center
February 21, 1991

I would like to take this opportunity to thank everyone for attending what I thought was a very stimulating and productive session. Now it is up to us to carry this concept further by addressing the concerns and issues, which were generated during our meeting. Following is a list of the issues which we addressed and questions and concerns were identified.

ENVIRONMENTAL CONCERNS

Older landfills in HMDC District will be covered with clean soil when free sources can be found. Since funding is not available to cap these sites, we will have to look at the following.

a. Addressed the toxicant question, how much of what is moving through which plants and animals?

b. It seems that the existing work done on plant toxicant uptake on sanitary landfills is limited so we will have to generate the data.

c. Bio accumulation studies. City College has modeled leachate generation and found that just capping the top and not the steep side slopes is adequate, we should obtain data.

d. Look at ways and means for containing toxicants, possibly through plant uptake and then incineration of plant material when appropriate.

e. Long term monitoring of sampling sites, plant, water, animals.

f. Insects and other soil invertebrates must be examined for toxicants.

g. Funding for the research - HMDC closure funds? Private grants, or EPA. HMDC will pursue this issue.

h. Establish database at HMDC for information to be collected pertaining to these issues and continue data search.

WILDLIFE

Species for which habitat should be managed. This topic invoked a lot of discussion. Perhaps we should take direction from knowing which species are being contributed by landfills now. Woodlands, grassland, wetlands, and variations of each would probably cover all needs. Since this area lost most of its freshwater wetlands which can't be restored, due to higher salinities then perhaps this habitat could be created on the closed landfills. Shallow areas for shorebirds, deeper ponds for waterfowl, wading birds, and grebes. Grassland for sparrows, larks, raptors, butterflies.

Two views were expressed as to whether management should be species or habitat driven. Need to look more closely at passerine species utilization of early successional stages on landfills, particularly regarding food sources. Should review Urner & Bent's listings of birds to determine historic species utilization in the Meadowlands.

PLANT COMMUNITIES

We should concentrate on native plant communities. Look at which communities are of the most concern, and if possible, plant to recreate them. Evergreen plantings would provide good nesting cover and wind breaks for many species, such as owls and song birds and replace habitat lost from residential backyards. We will have a native plant experiment underway this spring on the 15W site.

THE MEETING OF THE MINDS:
BUILDING A CONSENSUS

Questions or tasks which are important include:

a. Are there plant communities that uptake metals differently?

b. Need a list of plants that are not good bioaccumulators but which are good food.

c. Need to know which plants are most beneficial to wildlife.

d Need an ongoing record of plant succession on landfills.

e. Need to know what we are going to "loose" if we manage.

f. Are early successional stages preferable?

g. Research to determine if landfill soils support native or exotic plant species differentially.

In general, a consensus appeared that efforts should be focused on maximizing diversity of habitats and wildlife species and that we should think in terms of communities rather than individual species.

PUBLIC AND POLITICAL CONTACTS

We have spread the work about this to the regulators. Possibly HMDC would co-host a conference. HMDC's Critical Issues Program could be an important means for reaching many. HMDC will make short videos on the subject. Perhaps we could plug into Harbor Estuaries Program. We need words and pictures of this issue published to generate broader baseline support.

BRIGHT IDEAS FROM RUTGERS
Facelift for a Landfill:
Rehabilitating Landfill an Ecological Challenge
May, 1991

New Brunswick, NJ - The rehabilitation of 20 acres of an old landfill in the New Jersey Meadowlands could become a national model for restoring other blighted sites.

"The Challenge," says Steven N. Handel, the Rutgers plant ecologist leading the project, is "applying basic ecological principles," to convert a formerly garbage- and junk-strewn site near Exit 15W of the New Jersey Turnpike in Kearny into a woodland.

Should the restoration efforts succeed, he says, it could be expanded to some of the remaining 2,000 acres of old landfills in the Meadowlands. "Hopefully," he adds, "it could become a model for adoption nationally."

Managers of other landfills are keeping an eye on Handel's work, he says, noting that those in charge of the Fresh Kills Landfill in Staten Island - purportedly the world's largest with 2,800 acres - have been in touch with him about rehabilitating that site.

Handel conceived of the idea for the restoration a couple of years ago during a day's field trip with his class to the Meadowlands.

Subsequently, he won approval of the Hackensack Meadowlands Development Commission, with which Handel is working, and other governmental agencies. A grant of $96,000 from the Schumann Fund for New Jersey is helping him carry out the pilot project. Work commenced about 18 months ago.

More than 4,000 truckloads of clean soil were removed from a Manhattan building site and spread over the tract. The fill has been topped with about 12,000 cubic yards of composted leaf mulch to facilitate plant growth, and a light covering of grass will be grown to prevent soil erosion.

This spring some 600 young trees and shrubs, including black locust, red maple and cherry trees and elderberry and bayberry shrubs, will be planted. The species have been chosen for their rapid growth and fast seed production, says Handel. He's also counting on birds eating the fruit and dispersing seed over the Meadowlands, resulting in the growth of thousands of seedlings.

The Rutgers ecologist says a record will be kept of the project and made available to any community or governmental agency interested in duplicating the project.

"The Meadowlands," says Handel, "was once a marshland and home for freshwater fish, ducks, muskrats and other small mammals. Over time, it became a dumping ground. We'd like to turn it into an attractive habitat for woodlands and wildlife. As the gateway to New York, we want to remove the eyesore of the landfill and replace it with an improved environment.

For further information, Handel can be reached at (908) 932-3341 at his office or at his home, (908) 526-5884.

Vegetation & Wildlife Habitat Survey On Three Landfill Communities of Different Ages

Ken Scarlatelli, HMDC Staff Ecologist

October 19, 1991

Vegetation was inventoried atop three landfills which had been abandoned for different periods of time, located within the Hackensack Meadowlands District. Several species of plants with demonstrate wildlife food values were identified. Structural diversity increased with plant community age, as did the occurrence of dense herbaceous monocultures. Bioaccumulation of heavy metals studies are ongoing; results are not available. Possible management implications include selection of species for restoration plantings. Attention should be given to species which provide wildlife habitat values, have high survival potential, and the ability to preempt establishment of undesirable species. Sources of fresh water may need to be considered.

INTRODUCTION

An inventory of naturally-occurring vegetation was conducted atop three abandoned landfills in the Hackensack Meadowlands District. The sites represent plant communities which have developed for three different periods of time since abandonment: 3, 20 and 30 years, respectively.

The goals of the study are: (1) to identify those species of vegetation which are likely to become established as volunteers on regional landfills following different period of abandonment; (2) to identify trends in the development of these communities; (3) to analyze the different age communities for wildlife habitat values; (4) to conduct a screening of representative plants for bioaccumulation of toxic materials; and (5) to make recommendations for potential habitat management and restoration efforts on these and similar sites in the region. Preliminary results of these ongoing studies are available.

The landfills chosen for study are all located within one mile of each other. All are built on what formerly consisted of intertidal estuarine wetlands. They range in size from about 80 to 400 acres and increase in height with more recent use. The 30 year old site ranges in elevation between 4 and 13 MSL; the 20 year old site is between 35 and 40 feet high; and the 3 year old site is between 90 and 200 feet above sea level. Some of the difference between community composition on the different age landfills may be attributable to differences in size, height, or composition of the landfill chosen. However, those factors are beyond the scope of this study.

METHODOLOGY

Plant communities were inventoried along two parallel straight-line transects which were established atop each landfill. Combined transect length on each site totaled 2,000 feet. Percent cover was visually estimated for each species along the transects and also within meter-square quadrants established at 50-yard intervals along each transect. Present cover calculations were done separately for both the transect and quadrant methods. These figures were then summed and averaged for each species. Statistical treatment of the raw data is still being evaluated.

Plant tissue samples were collected from specimens of common mugwort (Artemisia vulgaris) at each quadrant on the intermediate age landfill. Mugwort seeds will be collected from these quadrants as well. Fruit of pokeberry (Phytolacca americana) were also collected from this same landfill. These samples will be analyzed for selected heavy metal accumulation. Additional plans include the harvesting of several ring-necked pheasants (Phasianus colchicus) from this habitat for metals analysis. No bioaccumulation results from these efforts are available at this time.

PRELIMINARY RESULTS: CONSTRUCTING A BASELINE

RESULTS

Preliminary results of the inventory have identified several colonizing plant species with important wildlife food values. Several trends in plant community development atop area landfills may also be indicated.

The total number of species identified per site was relatively constant, ranging from about 21 to 25, and decreasing slightly with community age. Older sites also displayed greater structural diversity, with both the number and percent cover of tree, shrub, and vine species increasing with community age. Combined species numbers from these strata increased from 2 to 6, and percent cover increased 2-9 percent. However, the percentage of species with a tendency to from dense monocultures, notably common reed (Phragmites australis) and mugwort, increased with time since abandonment. These species occupy 17 percent cover in the three-year-old site, 78 percent in the twenty-year-old site, and 65 percent cover in the oldest site.

Species identified atop the landfill which are known to provide food value for local wildlife include blackberry (Rubus allegheniensis), mulberry (Morus rubra), goldenrods (Solidago spp.), staghorn and smooth sumac (Rhus typhina, R. glabra) smartweeds (Polygonum spp.), cattails (Typha latifolia),sunflower (Helianthus annus), swithgrass (Panicum virgatum), and pokeberry (Martin, Zim, and Nelson 1951).

Documentation of the food value of mugwort is not extensive. However, this species appears very similar in seed type, dispersal, and availability to that of common ragweed (Ambrosia artemisiifolia). The seeds of ragweed provide wildlife food values which rank among the highest for upland herbaceous plants in the Northeast (Marint, Zim, and Nelson 1951), and many wildlife species known to feed on ragweed are also residents of area landfills. Therefore, the wildlife food value of mugwort is suspected to be high and will be the focus of further review.

Woody plants identified include eastern cottonwood (Populus deltoides), rebud (Cercis Canadensis), mulberry, Tree-of-Heaven (Ailanthus altissima), smooth and staghorn sumac, and white poplar (Populus alba).

MANAGEMENT IMPLICATIONS

Final recommendations regarding habitat management and restoration efforts atop local landfills must await the outcome of bioaccumulation studies. The results of additional studies being conducted by HMDC and by Rutgers University elsewhere within the Meadowlands District must also be considered. However, it appears that a variety of volunteer species with wildlife food values exists on abandoned landfills. Because of their demonstrated ability to become established and to survive in landfill environments, they deserve consideration in future habitat restoration planning on these sites.

It also appears that, unless controlled, mugwort and common reed tend to form monocultures on these sites. Common reed provides little habitat value for most wildlife, and mugwort is widely considered to be a n undesirable species (partly because of its association with hay fever). In any event, monocultures are rarely a preferred management objective.

One way to preempt the encroachment of unwanted species may be to establish stands of those species which are both valuable to wildlife, which tend to form dense patches, and which are known to colonize landfills; i.e., blackberry.

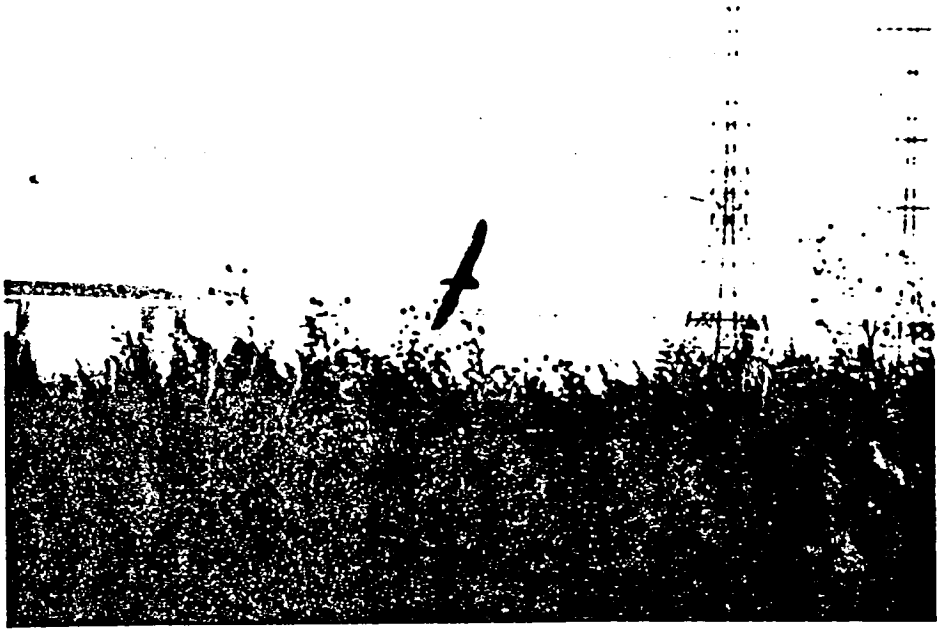
If wildlife are to be encouraged to utilize landfill habitat, then structural diversity should be increased within plant communities on these sites. Rates of development of woody perennials appear to be retarded in these environments and may need to be supplemented with plantings of appropriate species.

Sources of fresh water should also be considered. Waters surrounding the landfills are generally brackish and may receive leachate contamination from the landfills. Small fresh water ponds which have developed atop the landfills studied were intensively used during the study period by waterfowl, gulls, and some shorebirds. Maintenance of existing ponds and establishment of additional ponds should be consideration in habitat management and restoration planning for these areas.

Presented to the Fifth Annual Hackensack River Symposium
Fairleigh Dickinson University, Teaneck, NJ
October 19, 1991

NJAS • OPINION

LANDFILLS TO HABITAT



CHRIS STURM

Short-eared owls, like the one shown here flying over the Hackensack Meadows, are just one of many species that would benefit from the conversion of landfills to wildlife habitat.

The open space crisis in New Jersey is stirring some creative thinking about how to add to the open space inventory in a state coping with sprawl. One bright prospect in the search is the attention being paid to landfills and what to do with them as they approach closure. Because they are not useful for most purposes, landfills may be exempt from ordinary competing uses, and consequently are a valuable resource for creating wildlife habitat. There are thousands of acres of landfill in the state—1500 acres in the Hackensack Meadowlands District alone—and sanitary landfills in all twenty-one counties. Then there are development spoil sites and army corps spoil deposition sites created during dredging to keep waterways navigable. These latter, when they vegetate over and succeed to shrubs and trees, or when they receive clean sand, serve as nest sites for colonial waterbirds. The sanitary landfills and development spoil may also make an important habitat contribution just as the dredge sites have, although the vegetation and wildlife may be quite different.

The landfill acreage in the Hackensack Meadowlands is extensive and much of it is owned or controlled by the state. There is also closure money available, once the landfills reach their legal limit. This combination provides a unique opportunity to study what happens on landfills that are left to succeed naturally, and landfills that are used to create wetlands, grassland, and forest habitat. Wetlands can be created on the top or on the sides of a landfill and sometimes occur naturally. This is the case today on one landfill in the Meadowlands. Essential in planning for landfill conversion to habitat is a good wildlife census, during all four seasons, of the landfill and the adjacent habitat. Landfills are used by many mammals, nesting colonial waterbirds, wintering raptors, and a variety of songbirds both resident and migrant, at various stages of succession. For example, in early successional stages, indigo bunting is quite common on Meadowlands landfills, and unusual nesting birds such as dickcissel and blue grosbeak have both bred there. The possibility for adding migratory bird habitat where none now exists is intriguing and could be important, given the reported decline in numbers of many common migratory songbirds.

We think certain steps need to be taken to start the process of converting landfill to wildlife habitat. First there needs to be good cooperation between the public and private sectors on this issue. Some consulting firms have amassed considerable data on things like the uptake of metals by various plants, and what happens when the landfills are capped or not capped with liners. The practitioners who have to deal with the landfills every day have a wealth of experience to put on the table. Wildlife experts and botanists need to talk with each other about such things as whether to plant the landfills in native species, and which types of plants, and of course, what species ought to be attracted. Regulatory agencies responsible for the health of the environment will also want to sit at the table.

Perhaps the best place to begin such cooperative ventures is a conference, to get these people in the same room. What better place than the Hackensack Meadowlands, which has the landfills, some closed, some not. What might come out of such a conference would be useful publications on landfill management and conversion and possibly some demonstration projects.

We are not recommending the use of landfills as mitigation sites, however, for several reasons: the jury may still be out on creation as a long-term strategy, and we do not want to see mitigation money and energies spent on landfills when there already may be a funding source (closure moneys) which should properly be applied to the wildlife habitat conversion.

Closure funds should be used both for management and research, so that naturally succeeding landfills can be compared with manipulated ones. The best approach to landfill cover is to plant native species, although these may not be the species once occurring on the site because of changes over time. The landfill succession should be attractive to species already using the area or to species naturally moving in as a result of the succession. This is much more desirable than attempting to bring in a species community that doesn't belong. For example, in the Meadowlands there is a history of use by wetland species, grassland birds, shorebirds, and raptors. The management of landfills ought as far as possible to be compatible with these communities; hence the importance of a good census program. Eventually, as succession proceeds, new wildlife communities will appear and others will disappear. Meanwhile the cause of migratory bird conservation will have been well served.

—Richard P. Kane
Director of Conservation