

**PATTERNS OF WETLANDS OWNERSHIP AND PERMIT APPLICATIONS  
IN THE HUDSON BASIN: IMPLICATIONS FOR POLICY**

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Gurwick, N. P., and B. L. Bedford. 1996. Patterns of wetlands ownership and permit applications in the Hudson basin: implications for policy. Section VI: 39 pp. In J. R. Waldman, W. C. Nieder, and E. A. Blair (Eds.). Final Reports of the Tibor T. Polgar Fellowship Program, 1995. Hudson River Foundation, New York.

## ABSTRACT

Under New York State's freshwater wetlands regulation program, landowners must receive a permit from the Department of Environmental Conservation (DEC) before beginning non-exempt activities within 100 feet of DEC-regulated wetlands. Current administrative initiatives at DEC emphasize: (1) non-regulatory approaches to wetlands protection; and (2) treating regulated persons and institutions as clients. To provide information that may help DEC set priorities for its non-regulatory wetlands programs in a time of staff and budget cuts, we described the spatial distribution of wetlands and of pressure on the wetlands resource. We used DEC's wetlands maps and local property tax maps to characterize the distribution of wetlands acreage among parcel size classes and land use types in the Hudson Basin. We found that most acreage of DEC-regulated wetlands falls on parcels between 10 and 500 acres in size. These wetlands are also distributed unevenly among land use classes. The pattern of land use varies among DEC Regions, but agricultural and residential lands account for a substantial proportion of wetlands acreage in all three regions. To describe how pressure on the wetlands resource varies throughout the Basin, we developed an index relating numbers of permit applications to numbers of wetlands in each county. Pressure is greatest in Albany County (index value 2.0) and lowest in Washington County (index value 0.2). To develop recommendations for improving service to persons affected by DEC's wetlands regulation program, we also used findings from research about: (1) citizen participation in policy-making; and (2) how new ideas spread through groups. This work points to the importance of: (1) identifying stakeholder groups with sufficient specificity to match programs with appropriate audiences; and (2) using appropriate intermediary institutions for communicating with wetlands owners.

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**INTRODUCTION**

In 1975, the New York State legislature passed the Freshwater Wetlands Act ("the Act"), declaring the following as state policy:

to preserve, protect, and conserve freshwater wetlands and the benefits derived therefrom, to prevent the despoliation and destruction of freshwater wetlands, and to regulate use and development of such wetlands to secure the natural benefits of freshwater wetlands, consistent with the general welfare and beneficial economic, social and agricultural development of the state. (New York State, 1975)

This legislation arose from an initiative within the New York State Department of Environmental Conservation (DEC), and DEC has implemented the freshwater wetlands regulation program since its inception. DEC staff have three primary responsibilities directly related to this program: mapping, delineation, and permit application review. Mapping and delineation responsibilities rest with staff in the Division of Fish and Wildlife, Bureaus of Wildlife (BOW) and Environmental Protection (BEP). Permit review is conducted primarily by staff in the Division of Regulatory Services (DRS). All aspects of the program are largely decentralized and administered by staff in regional offices.

As outlined in the Act, DEC conducted an inventory of freshwater wetlands 12.4 acres or larger and additional freshwater wetlands of "unusual local importance" (NYS 1975, Sec. 24-0301). DEC used this inventory to show the approximate boundaries of wetlands within their jurisdiction on 1:24,000 USGS base maps. Following an extensive review process, these maps were filed with town and county clerks. This process continued on a county-by-county basis; maps for the final county were filed in September, 1995. The

wetlands maps are intended to inform landowners about the approximate locations of regulated wetlands, and to help landowners determine whether their land may fall within DEC's jurisdiction.

When the New York State Legislature passed Article 24, social and political support for land use regulation was strong. Three years earlier, Bosselman and Callies (1972) wrote:

This country is in the midst of a revolution in the way we regulate our land.... The tools of the revolution are new laws taking a wide variety of forms but each sharing a common theme - the need to provide some degree of state or regional participation in the major decisions that affect the use for our increasingly limited supply of land.

In 1973, the year after Bosselman and Callies' writing, congress considered passing a National Land Use Policy Act (Cullingworth 1993, Ch. 5).

Compared with the mid-1970s, judicial and legislative activity in the 1990s indicates strong resistance to Federal- or State-level land use regulation.<sup>1</sup> Recent years have witnessed a profusion of legal scholarship addressing the question: To what extent and under what circumstances do land owners affected by wetlands regulations deserve financial compensation under the U.S. Constitution (e.g., Dennis 1995; Echeverria 1995; Rosenberg 1995; Bromley 1993; Runge 1993; Sax 1993; Alexander 1992; Mercurio 1992)? In the Federal Legislature, the years 1994-96 have witnessed repeated appearances of bills that would curtail government's ability to regulate environmentally damaging activities on privately owned land. Many of these bills proposed to grant

<sup>1</sup> In contrast to the legislative climate, survey data indicate that now, as then, public opinion strongly supports environmental protection and regulation, if not land use regulation specifically (Peter D. Hart Research 1994; Jones and Dunlap 1992; The Roper Organization 1992; Van Liere and Dunlap 1980).

property owners financial compensation for reductions in property values resulting from environmental regulation. Examples from the House of Representatives include H.R. 925, the Private Property Protection Act of 1995; H.R. 9, the Job Creation and Wage Enhancement Act; and H.R. 961, concerning Federal wetlands permitting under Section 404 of the Clean Water Act (Delaney 1995; Michelman 1995). In the Senate, S. 851, the Wetlands Regulatory Reform Act of 1995, would have directly eliminated Federal authority to regulate activities in 80-90% of wetlands currently under the jurisdiction of Section 404 of the Clean Water Act (Perciasepe and Zirschky 1995). In State Legislatures, as of April, 1995 over 90 regulatory takings bills had been introduced during the most recent sessions (Delaney 1995).

Administrative changes in wetlands policy at both State and Federal levels have been less extreme than those in proposed legislation. These initiatives stem from the assertion that persons subject to environmental regulations should be treated as customers of regulatory agencies. Policy statements on regulatory reform from executive branches and government agencies often include goals such as streamlining the regulatory process and eliminating ineffective or unnecessarily burdensome regulations (e.g., National Performance Review 1993).

In New York State, two DEC initiatives demonstrate the agency's intention to focus on a client-oriented approach in its regulatory programs. In 1994, DEC issued a report: "Improving Our Environment, Improving Our Economy: Regulatory Reform at the Department of Environmental Conservation." The report includes nine recommendations,

one of which is to eliminate unnecessary reviews and to accelerate permit processing (NYS DEC, 1994). This directive applies to the wetlands regulation program, among others.

In 1993, DEC organized four round table discussions throughout the state to solicit input for drafting a state wetlands conservation plan. Participants represented numerous stakeholder groups, including agency staff, farmers, contractors, developers, local government officials, and conservation advocates. Meeting summaries prepared by agency staff categorize topics as: regulation, incentives & disincentives, planning/coordination, information & education, and acquisition. The organization of the Draft Wetlands Conservation Plan reflects these categories (NYS DEC, 1996). DEC's decision to organize these round tables and to highlight numerous non-regulatory approaches to wetlands conservation in the Plan reflects an intention to incorporate views and needs of the regulated public into the policy process.

Implementing the Plan's recommendations will be difficult. That effort will require additional resources at a time when DEC has seen reductions in budget and staff. As a result, DEC has limited capacity to enhance the user-friendliness of its regulatory program and to bolster its non-regulatory wetlands protection programs. To provide information that may help DEC, we described the spatial distribution of wetlands and of pressure on the wetlands resource.

We asked three questions designed to help prioritize the use of limited resources in one specific geographic area of New York State: the lower Hudson Basin (Figure 1): (1) does the total wetlands acreage regulated by DEC fall unequally among parcels of different size classes? (2) does the total wetlands acreage regulated by DEC fall unequally among parcels characterized by different land uses? (3) does pressure to alter wetlands differ among geographic subregions of the Hudson Basin? We chose these criteria because they could be used at the geographic scales relevant to DEC's wetlands protection program, with reasonable amounts of staff time and readily available information and technology.

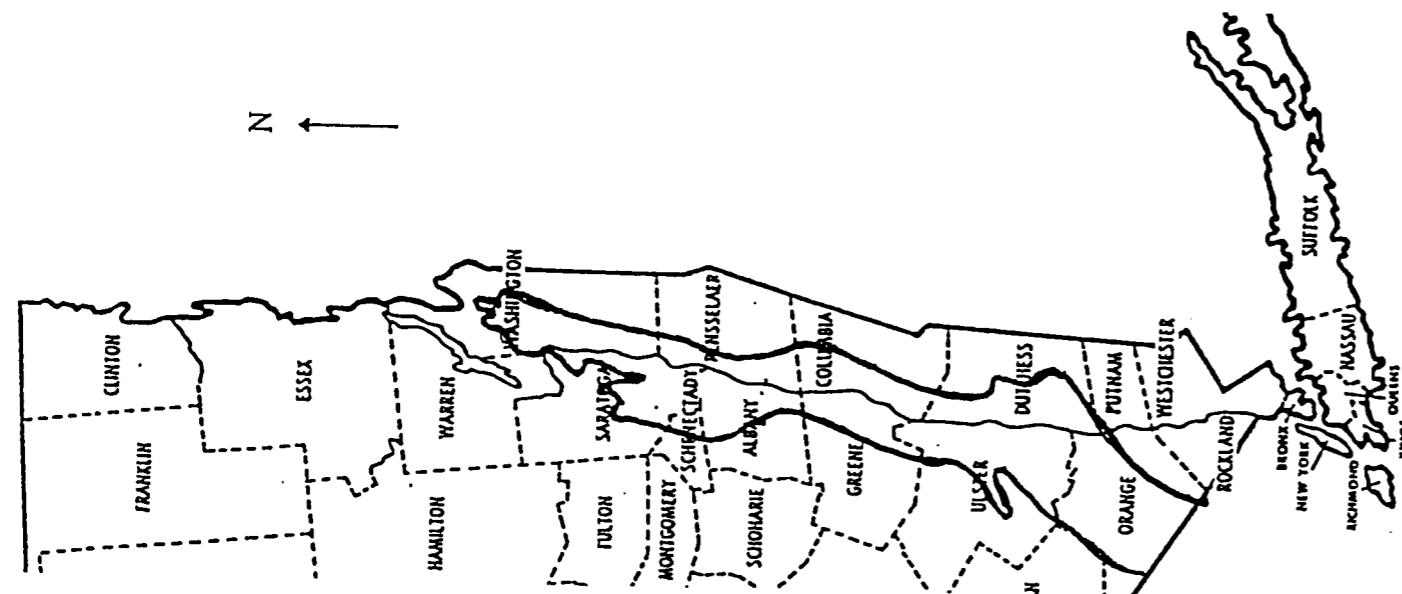
To develop recommendations for improving DEC's service to persons affected by DEC's wetlands regulation program, we also used findings from research about: (1) citizen participation in natural resource policy-making; and (2) how new ideas or practices spread through a group. Research on citizen participation stresses the importance of developing appropriate strategies for working with specific stakeholder groups (e.g., Enck and Brown 1996). Studies of how and why people adopt new practices or beliefs have pointed towards the importance of how a potential information user perceives the person or institution providing information (Rogers 1995). We investigated the extent to which permit applicants can be divided into groups with specific sets of information and service needs. We used this information both to evaluate the need for treating permit applicants as a set of multiple, distinct stakeholder groups, and to consider the routes by which DEC can most effectively gain support from permit applicants.

## METHODS

### Wetlands Distribution:

We selected a random sample of 159 wetlands, stratified by county, from the 1,701 DEC-regulated wetlands in the Hudson Basin (Cochran 1977, Ch. 5,5a). We used DEC's wetlands regulation maps to identify approximate locations of wetlands boundaries. We enlarged appropriate sections of the wetlands maps and overlaid them on property tax maps to identify all parcels intersecting the wetland. For each parcel we estimated the proportion falling inside the wetlands boundary, and from the tax rolls we recorded parcel acreage, owner name and address, parcel location, and property classification code. We assigned each parcel to one of six size classes based on acreage, and to one of ten land use categories based on assessors' codes (NYS DEA 1991). We estimated the total wetlands acreage falling in each size class and in each land use class, and calculated 95% confidence intervals around these point estimates (Snedecor and Cochran 1989, Ch 6, 12).

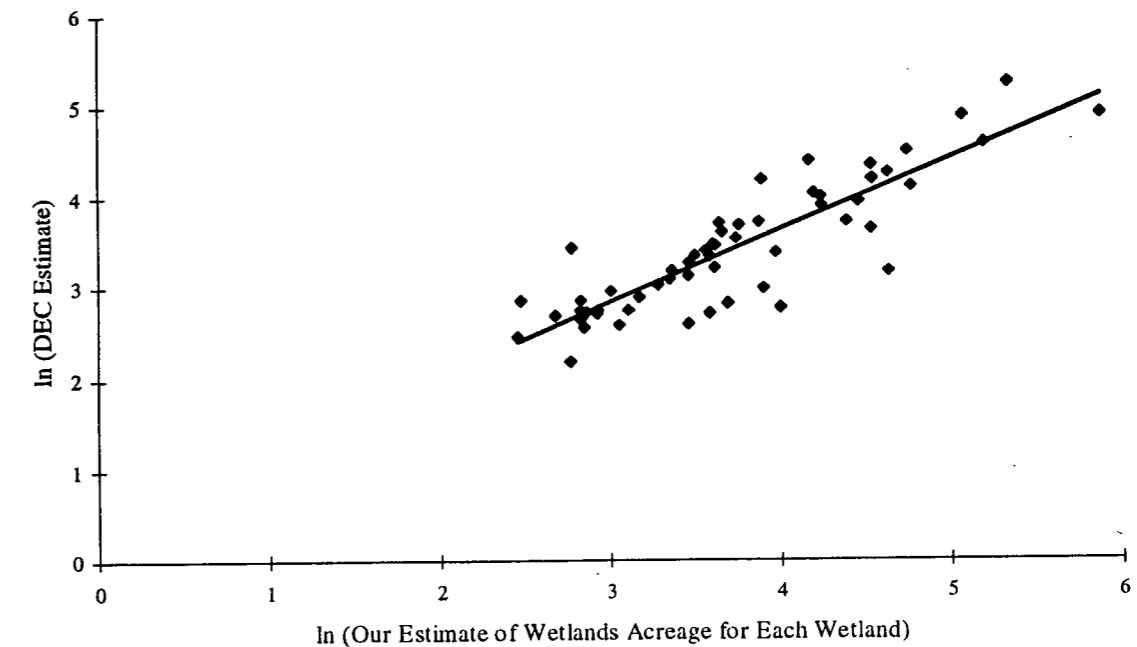
Figure 1. The Lower Hudson Basin, as defined by DEC's map of Ecozones in New York State.



### *Comparison with DEC-estimates of wetlands acreage*

To check our estimates of wetlands acreage for each parcel, we summed those estimates for all parcels intercepting each wetland and compared the sum with DEC's estimate of acreage for that wetland. The DEC estimates we used are calculated from digitized wetlands maps using Arc/Info. Both our estimates and DEC's estimates rely on the wetlands maps, which show *approximate* locations of wetlands boundaries. Analysis by linear regression indicates that our estimates explain 73% of the variation in acreage among wetlands based on DEC estimates (Figure 2, Table 1). The estimated total wetlands acreage for our sample falls within 4% of the sample wetlands acreage based on DEC's figures.

Figure 2. Plot of our estimate of the acreage of each wetland vs. DEC's estimate of the acreage of each wetland. Data are log transformed.  $R^2=0.76$ ,  $p<0.001$



**Table 1.** ANOVA table for wetlands acreage for each wetland estimated by map overlays against acreage per wetland estimated by DEC. Data are log transformed.

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	20.54144	20.54144	169.6537	2.68E-18
Residual	54	6.538248	0.121079		
Total	55	27.07969			

Pressure on Wetlands by Subregion

DEC provided us with records of all applications submitted for freshwater wetlands permits between 1989 and 1994. We selected applications for projects located in towns that fell at least 50% within the Hudson Basin, defined according to DEC's map of ecological zones in New York State. Based on the applicant name, we assigned applicants to one of four groups: "individual," "commercial," "municipal," or "State, Federal, and quasi-governmental." We also coded each application to indicate whether the applicant had submitted multiple applications during the five-year period. Because we were able to census the population of interest, we interpreted our comparisons of permit applicant distributions among years and applicant types without statistical tests.

To examine spatial variation along a North-South gradient within the Hudson Basin, we used the ten counties that intersect the Basin as convenient subregions. For each county, we considered only the area that fell within the Basin. We also aggregated data for each of the three DEC Regions that intersect the Basin (Regions 3, 4, and 5) to investigate implications for wetlands policy as it is implemented by each Region. Of the ten counties

in the Hudson Basin, Region 3 includes Dutchess, Ulster, and Orange; Region 4 includes Greene, Columbia, Albany, Rensselaer, and Schenectady; and Region 5 includes Saratoga and Washington.

We considered the number of applications for wetlands permits to be a reasonable proxy for the extent of pressure on the wetlands resource. To compare the magnitude of pressure between areas, we calculated an index by dividing the number of permit applications in each county by the number of wetlands in that county. Because the purpose of the index is to *compare* pressure between geographic areas, we decided to standardize it for convenience. To arrive at an average index value of 1, we multiplied the result by a scalar (2.17).

**RESULTS**

Wetlands Ownership

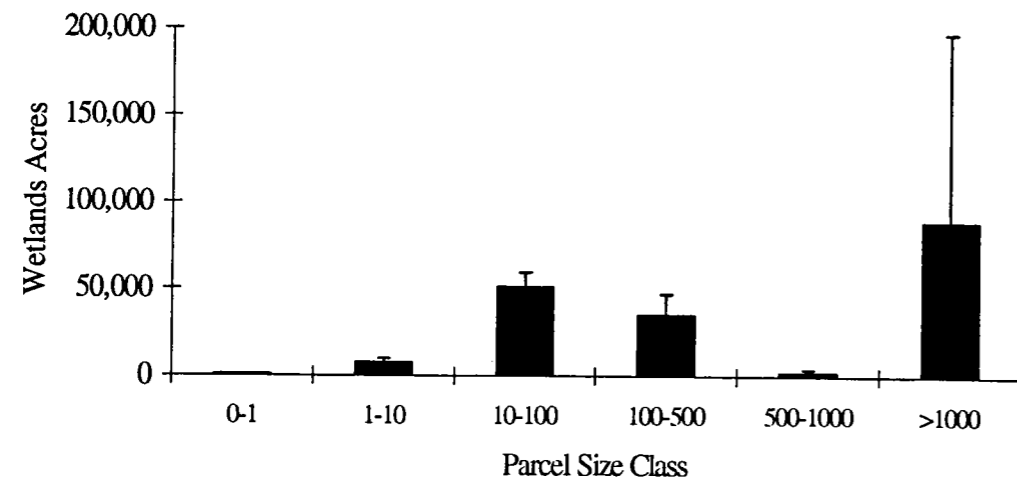
*Distribution by Parcel Size Class*

DEC-regulated wetlands within the Hudson Basin are distributed unequally among parcel size classes (Figure 3). The proportion of wetlands acreage captured by a class is not correlated with the number of parcels in that class (Table 2). We can estimate with reasonable confidence intervals the total wetlands acreage captured by five of the six parcel size classes. Because only 4 of 1,205 parcels in our sample were larger than 1,000 acres, we cannot estimate with confidence the total acreage captured by parcels in that

size class. In addition, three of these parcels were subsections of a single unusual property (Stewart Airport). For these reasons, we consider that size class separately.

Considering only the five smaller size classes, most wetlands acreage (89%) falls in parcels of 10-100 or 100-500 acres in size. Parcels within these two size classes account for approximately 46% of all parcels in the sample. Of the estimated total wetlands acreage in the Basin, less than 1% falls on parcels smaller than 1 acre. The number of parcels in this size class accounts for 13% of parcels in the sample. Parcels 1-10 acres in size and 500-1,000 acres in size capture no more than 8% and 2%, respectively, of the total wetlands acreage in the basin. The number of parcels in each of these size classes accounts for 39% and 0.5%, respectively, of parcels in the sample.

**Figure 3.** Acreage of DEC-regulated wetlands in the Hudson Basin falling in parcels of different size classes. Error bars indicate 95% confidence intervals.



**Table 2.** Estimated numbers of parcels intersecting wetlands and estimated wetlands acreage in each parcel size class in the Hudson Basin. Percentages are calculated without including the largest size class.

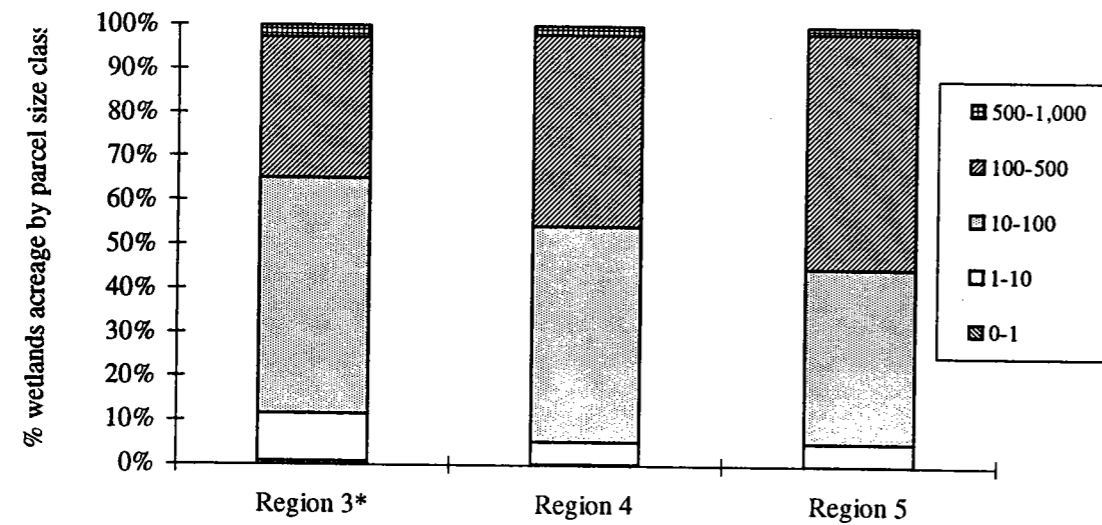
Parcel Size Class (acres)	# of Parcels	% of all Parcels	Wetlands Acreage	% of Wetlands Acreage
0-1	1,844	13%	541	0.6%
1-10	5,566	39%	7,801	8%
10-100	5,281	37%	50,957	53%
100-500	1,274	9%	34,831	36%
500-1,000	73	0.5%	2,174	2%
>1,000	no estimate	no estimate	no estimate	no estimate

Point estimates of wetlands acreage in the two dominant size classes (10-100, 100-500) suggest that the proportion of wetlands acreage in 10-100 acre parcels decreases from Region 3 to Region 4 to Region 5 (Figure 4). However, statistical analyses do not show that wetlands acreage captured by these two size classes differs among DEC Regions.

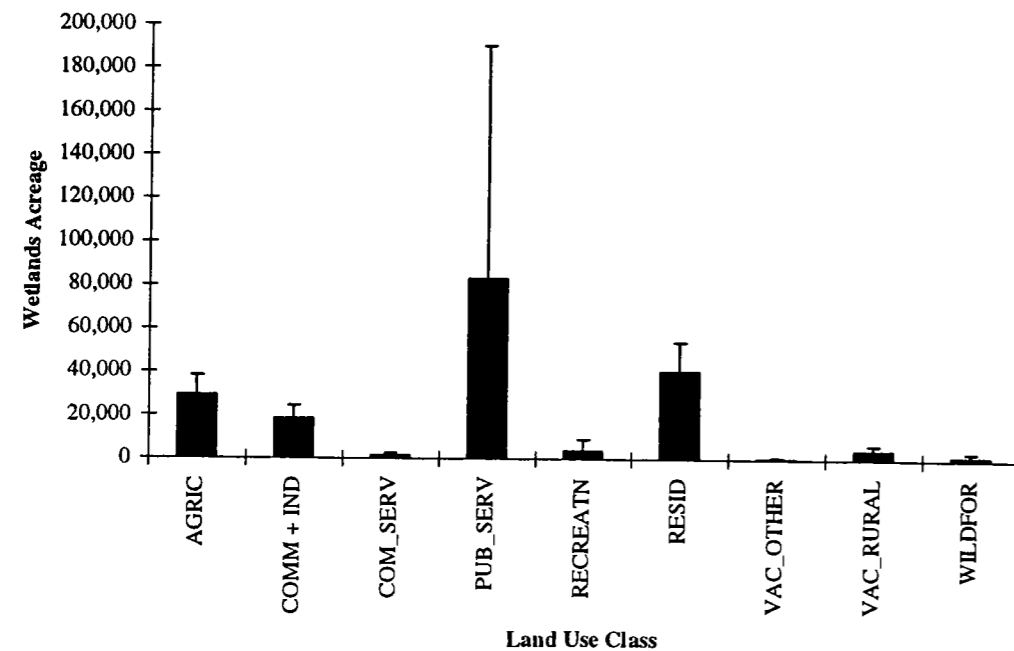
*Distribution by Land Use Classification*

Four land use classes dominate the distribution of wetlands acreage: public service, agricultural, residential, and commercial & industrial (Figure 5). The confidence interval on public service lands is too large to interpret meaningfully (82,091 +/- 107,511 acres). The uncertainty in the estimate of public service lands arises because a small number of parcels in the sample (4) capture a large extent of wetlands. These are the same parcels that contributed to high uncertainty surrounding acreage in parcels >1,000 acres in size.

**Figure 4.** Distribution of wetlands acreage among parcel size classes and DEC Regions. The \* after Region 3 indicates that 4 very large Public Service parcels were excluded for analysis.

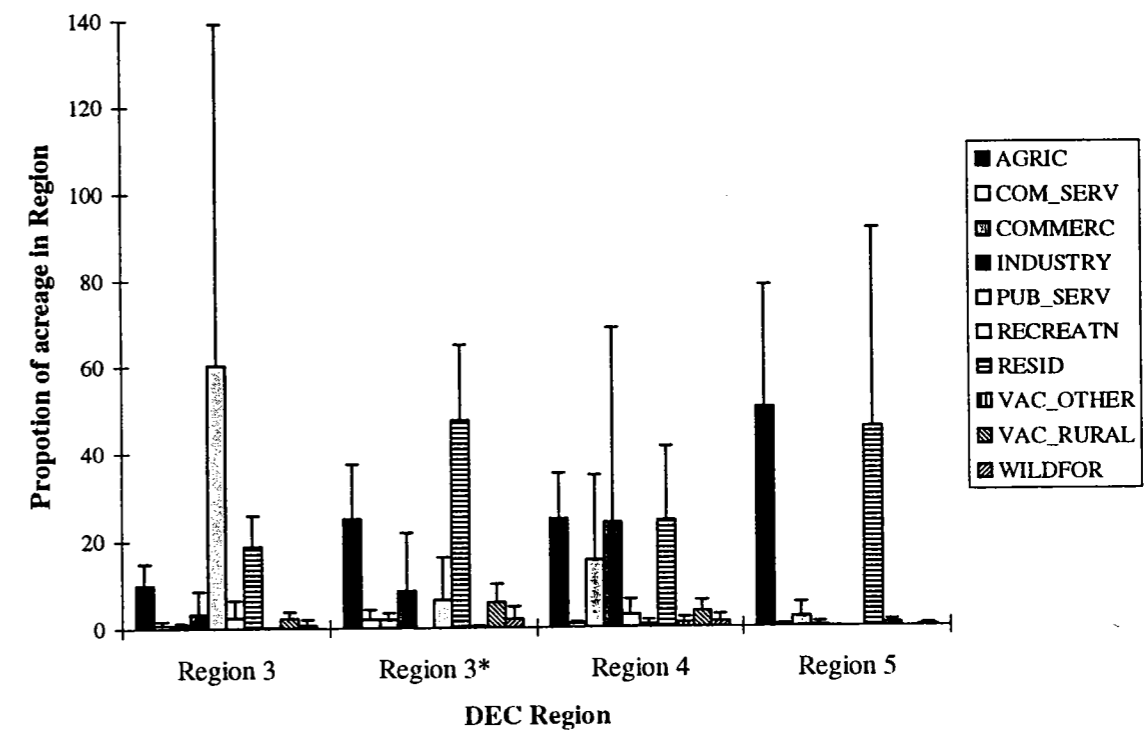


**Figure 5.** Distribution of wetlands acreage in the Hudson Basin among different land use classes. Error bars are 95% confidence intervals. AGRIC - Agriculture; COMM + IND - Commercial and industrial; COM\_SERV - Community service; PUB\_SERV - Public service; RESID - Residential; VAC\_ - Vacant; WILDFOR - Wild and forested.



The pattern of agricultural and residential land uses capturing a large percentage of DEC-regulated wetlands holds in all three DEC Regions (Figure 6). In Region 5, no other land use class captures a significant proportion of the total wetlands acreage. In Region 4, parcels characterized by commercial or industrial uses capture 40% of DEC-regulated wetlands. In both Regions, wetlands acreage is distributed equally between residential and agricultural uses. Region 3 includes the large wetlands acreage on 4 parcels in the sample, classified as public service. As in the analysis of parcel size, we treat these parcels separately to describe the distribution of wetlands among land use classes. Excluding the influence of public service lands in Region 3 (shown as Region 3\* in Figure 6), 10% of

**Figure 6.** Variation between DEC Regions of the distribution of wetlands acreage among land use classes. For land use class abbreviations (legend) see Figure 5 caption. The column labeled Region 3\* excludes 4 very large Public Service parcels.

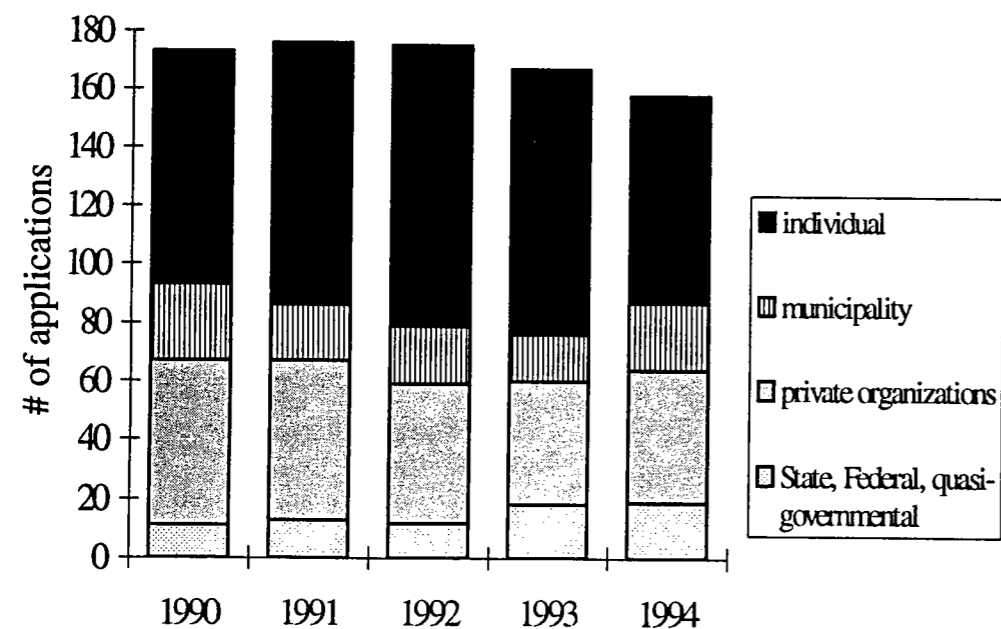


wetlands acreage falls on industrial and commercial land, and the ratio of wetlands on agricultural land - to - wetlands on residential land is approximately 1:2.

Permit Applicants

Between 1990 and 1994, DEC received an average of 170 permit applications per year from applicants in the Hudson Basin. In all years, at least 45% of applications came from individuals, substantially more than from any other applicant group (Figure 7).

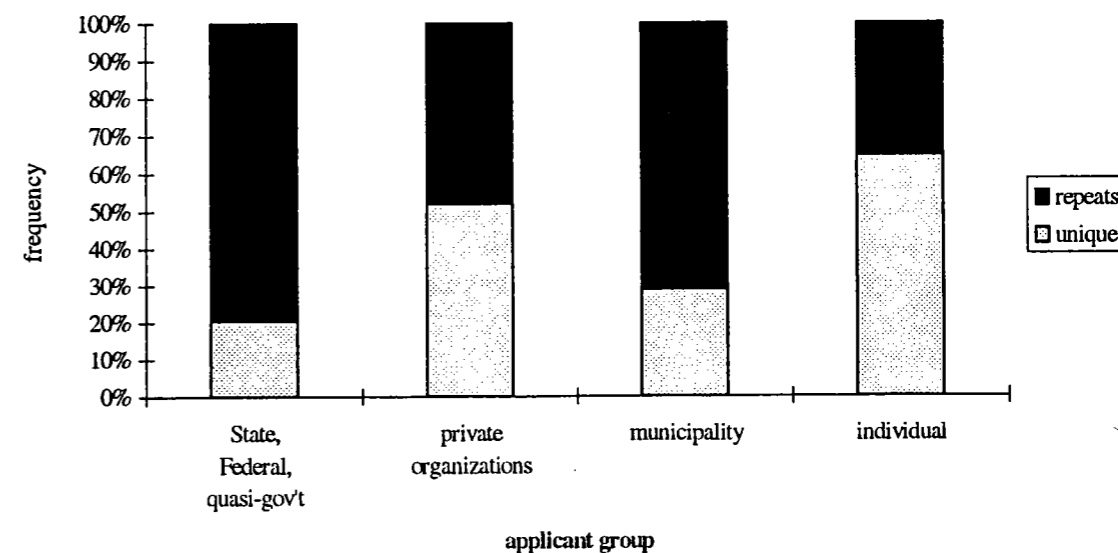
**Figure 7.** Numbers of applications for DEC freshwater wetlands permits, from applicants in the Hudson Basin 1990-1994, by group.



Applications from private organizations accounted for 25-32% of the application pool in each year. On average, municipalities and other public organizations accounted for 12% and 9% of the applicant pool, respectively. The proportion of applications from other public organizations (as well as the number of applications) increased steadily during this period from 6% in 1990 to 12% in 1994.

The extent to which applicants submitted multiple applications differed among the four applicant groups (Figure 8). 80% of applications from public organizations were submitted by an organization that had submitted a previous application between 1990 and 1994. Repeat applications accounted for 71%, 48%, and 35% of applications from municipalities, other public organizations, and individuals, respectively.

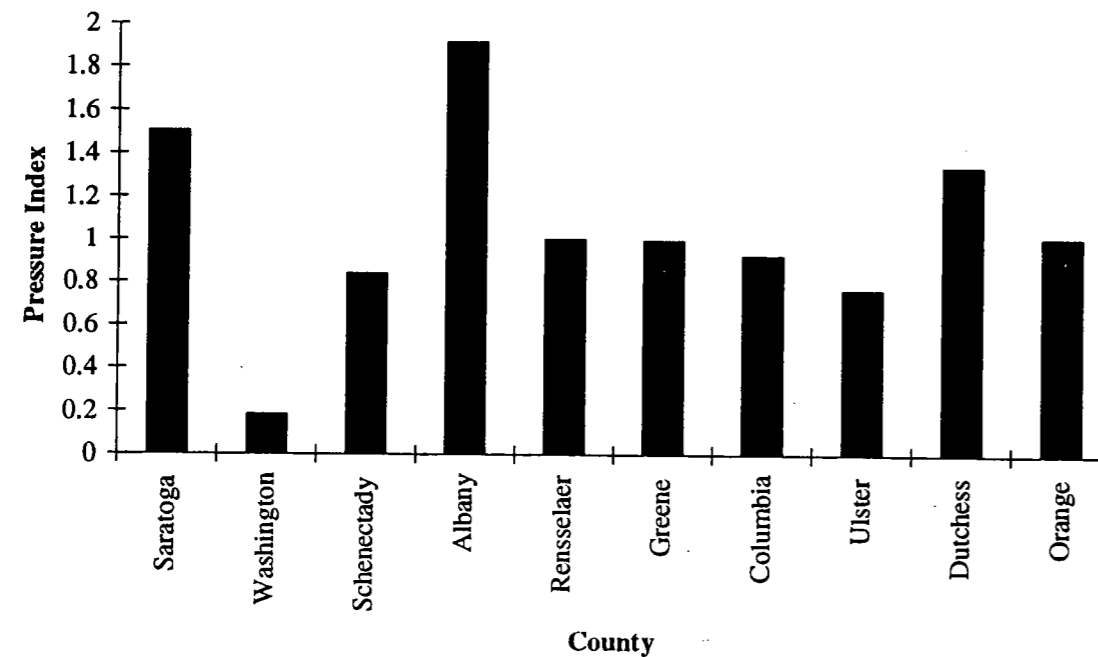
**Figure 8.** Proportion of applications for DEC freshwater wetlands permits from each applicant group submitted by applicants who previously applied for a permit.



### Pressure Index

The index value remains near 1 for six of the ten counties. In only two cases does the index depart sharply from 1. Washington County yields an index value of 0.2, and Albany County yields a value of 2.0 (Figure 9).

**Figure 9.** Index of pressure on the freshwater wetlands resource, by county (see text). Counties are listed roughly North-South from left to right.



### Number of Parcels in the Hudson Basin

We used a simple calculation to estimate the total number of wetlands owners in the Hudson Basin. For each county, we multiplied the mean number of parcels per wetland in our sample by the total number of wetlands in the Basin in that county. We added the results for all counties to arrive at an estimate of 14,000 wetlands owners in the Basin.

## DISCUSSION

Prior to collecting these data, it was not possible to compare wetlands acreage among parcel size classes or land use types. We know of no published data that describe wetlands distribution at a similar geographic scale. This data set constitutes a pilot effort to examine the potential usefulness of this approach as a tool for wetlands management.

### Implications of ownership data for public policy

The data presented in Table 2 show clearly that parcels between 10 and 500 acres in size that include DEC-regulated wetlands in the Hudson Basin contain a disproportionately large acreage of wetlands. DEC should consider targeting wetlands conservation programs at landowners of such parcels.

The wetlands acreage captured by parcels in the 10-100 acre class does not differ from the acreage captured by the 100-500 acre class, but the number of 10-100 acre parcels is much larger than the number of 100-500 acre parcels. Considering only the acreage of wetlands, it would be most efficient to focus on owners of 100-500 acre parcels.

However, both classes contain large amounts of wetlands acreage in the Hudson Basin, and we expect that opportunities for conservation may differ between these groups.

Specifically, although our data are insufficient to cross-tabulate size class data with land use data, they support the hypothesis that many of the 100-500 acre parcels are farms. In our sample, 40% of 100-500 acre parcels were classified as agricultural, compared with

20% of 10-100 acre parcels. Wetlands on agricultural land present an unusual set of management issues. First, normal farming practices are exempt from New York's wetlands regulations (Article 24). Therefore, the potential benefits of voluntary wetlands protection by farmers are greater than for landowners where fewer exemptions apply. Second, because many wetlands were lost to drainage for agriculture, farmland includes a disproportionate number of potential sites for wetlands restoration.

Our data also show that parcels under one acre in size contain less than one percent of the wetlands acreage in the Basin. In the absence of compelling information to do otherwise, DEC should limit the resources it allocates to programs that target this group. We observed that small parcels often occur in large groups (30 or more contiguous parcels), along the edge of a wetland. It is possible that many owners of small parcels in the same place will apply for permits to conduct similar projects. In such situations, DEC might benefit by addressing these landowners as a group. A single informational meeting for such a group could: (1) limit the time and resources necessary to respond to these landowners in the long term; (2) ensure the group receives consistent, accurate information; and (3) increase the likelihood that landowners will view DEC as a helpful, educational institution as well as a regulatory agency.

Despite uncertainty surrounding our estimate of wetlands acreage included in parcels greater than 1,000 acres in size, our data have clear implications for DEC. Regardless of the total acreage captured by these parcels, the number of parcels (and hence owners) is certainly small compared with the associated wetlands acreage. In addition, such large

parcels offer opportunities for wetlands management and conservation that are not usually present in other situations.

#### Implications of application data for public policy

Previous studies on the role of citizen participation in natural resource policy development and implementation provide a sound theoretical basis for exploring the extent to which the pool of permit applicants is comprised of multiple stakeholder groups. For example, Enck and Brown (1996), writing on citizen participation in beaver management in New York, emphasize the importance of stakeholder-specific and locality-specific strategies.

We caution that frequencies of applications must be viewed as a first step towards understanding the pressure on the wetlands resource. Crafting specific policy recommendations will require information beyond that available at present. For example, we would need to know how frequently applications from institutions with a high "repeat rate" actually originate in the same branch, or closely related branches, of those organizations. For example, applications from the state or federal agencies could originate from various regional offices or from a central coordinator. We also would need to know the extent to which repeat applications from a single institution resemble each other. Such data are available in hard copy records of permit applications at DEC's regional offices. A more thorough analysis would also distinguish between: applications for major and minor projects; new applications and applications for a permit modification or renewal; and applications for permits and requests for letters of non-jurisdiction.

Nevertheless, our data suggest some important avenues for exploring administrative modifications in DEC's wetlands regulation program. The data for permit applicants show that easily identifiable groups of applicants (e.g., individuals, municipalities) differ dramatically in their application behavior, measured with the numbers of applications they submit and the extent to which the same individuals, or institutions, submit multiple applications. This finding is an important step towards: (1) identifying the needs of distinct applicant groups; and (2) enabling DEC to tailor their information and regulation programs to meet the needs of a diverse applicant pool. We expect a municipality that submits multiple applications to require a different kind of service from DEC than an individual who submits a single application.

#### Use of the Pressure Index

Pressure on the wetlands resource varies by one order of magnitude among counties in the Hudson Basin. In a policy context, the index is a coarse planning tool, which should be used in combination with additional information about each area for which it is calculated. Protection and management strategies differ in the kinds of resources they require for implementation. We suggest that DEC consider identifying strategies most appropriate for areas that differ in the degree of pressure on the wetlands resource. From a research perspective, the index provides a useful model for exploring the determinants of permit application frequency at a landscape scale. Future development of our data base could include coupling this index with measures of population density and housing starts.

#### Potential for DEC Response

##### *Institutional Characteristics*

In some ways, DEC is well positioned to educate wetlands owners about the regulation program and non-regulatory opportunities for wetlands protection, and to help wetlands owners meet their own land use objectives while respecting the limitations of Article 24. First, agency staff have at least two opportunities to interact with landowners: during BOW/BEP site visits, and by phone or at a DEC office during DRS's application review. Second, although identifying wetlands owners with the precision required for this study is a resource-intensive process, DEC can identify a large percentage of large-parcel owners with substantially less effort by using data in electronic format from the NYS Division of Real Property Tax Services. In particular, DEC could use this database to identify parcels larger than 500 acres in size, which will be small in number but which capture a disproportionate extent of wetlands acreage and which offer unusual opportunities for wetlands management when landowners are willing to cooperate.

In other parts of New York State, DEC has made contact with individual landowners a priority. In the region surrounding the Montezuma National Wildlife Refuge, DEC is working in cooperation with the National Fish and Wildlife Service's Partners in Wildlife Program. The objective is to use wetlands restoration on private lands to create a pattern of wetlands throughout the region that will serve as habitat for waterfowl. This project demonstrates that DEC has, at least to a degree, the institutional capacity to engage in

outreach to landowners. It also provides the agency with a base of experience from which to begin future programs oriented towards specific groups of landowners and permit applicants.

DEC staff also work under several disadvantages. First, they see landowners primarily when the owner wants to develop the property (e.g., add a deck, repair a road, build a pond, subdivide the land). Second, personal interviews with DEC staff and a mail survey of wetlands owners indicate that some landowners view DEC as an adversary rather than as a potential partner in land management (Gurwick and Knuth, unpublished data). This relationship arises in part from DEC's institutional responsibilities that involve regulation other than wetlands permits (e.g., pesticide application, wastewater treatment, stream protection). Third, DEC has a limited capacity to work one-on-one with wetlands owners; DEC's staff is small compared to the total number of wetlands owners in the Hudson Basin, which we estimate to be 14,000 persons.

Although DEC lacks formal mechanisms to distinguish between types of permit applicants based on the criteria we employed, the agency does distinguish between applicants who propose projects with potentially large impacts ("major projects") and those whose proposed projects are likely to have small impacts ("minor projects"). Interviews with DEC staff also indicate that some staff use different approaches with real estate developers

and consultants compared to individual homeowners. These formal and informal existing mechanisms show that DEC recognizes a benefit to distinguishing between types of permit applicants.

#### *Staff Attitudes*

Without staff support, implementing recommendations of the Draft Wetlands Plan would be difficult. Three lines of evidence - document analysis, personal interviews, and a self-administered mail survey - indicate that DEC staff appear enthusiastic to make the wetlands regulation program easier for permit applicants to negotiate. First, in 1990-92, the Division of Fish and Wildlife used a comprehensive staff involvement process to articulate a "Statement of Values." This statement includes strong wording about the Division's intention to respond to public needs:

We will work with all segments of the public to identify their needs and interests in fish and wildlife. Effective communication with the public is essential for honest exchange of information and mutual education. We support and will provide for a free and open exchange of information so we may listen and learn as well as speak and teach. (Barnhardt et al. 1993).

Second, a self-administered mail survey of staff in two DEC Bureaus (Environmental Protection and Wildlife) conducted in 1995 showed that a majority of staff believe the wetlands regulation program should: (1) help wetlands owners meet their land use objectives; and (2) assist landowners in complying with wetland law (Gurwick and Knuth, unpublished data).

Third, staff in the freshwater wetlands program have taken steps to respond specifically to different types of applicants. At least in some regions, staff have worked to simplify the

permitting process for small projects that are: (a) unlikely to cause serious impacts; and (b) likely to receive permits under a more lengthy review process (N. Heaslip, personal communication).

In a memo to the director of the Division of Fish and Wildlife, the Beaver Management

Team wrote:

1. There has been insufficient evaluation of how to best meet the public's wetland needs. As a result, too many of the Division of Fish and Wildlife's resources have been used for Article 24 at the expense of other important Division programs.

...

3. It is biologically unnecessary and fiscally inappropriate to apply the same level of regulatory protection to wetlands statewide. This approach also causes political problems (NYS DEC, 1992, p.30).

Although this memo mirrors the Team's dissatisfaction with aspects of the wetlands regulation program, it also demonstrates that staff are receptive to developing stakeholder-specific programs.

#### *Implications of Research on Citizen Participation and Diffusion of Information*

In addition to identifying groups of wetlands owners and permit applicants, and setting priorities among them, DEC could court wetlands owners in the Hudson Basin by forming partnerships with institutions well-positioned to reach wetlands owners. Studies on the spread (diffusion) and use (adoption) of new ideas or practices (innovations) support this argument. Researchers have considered the relationship between characteristics of change agents (those individuals and institutions responsible for conveying new information) and

clients (potential users of that information). These studies have examined the extent to which characteristics of change agents influence the clients' responses to information.

The importance of change agents has been documented in a wide variety of contexts (Rogers, 1995). For example, Winchell (1996) used a diffusion-adoption framework to study the use of natural resource conservation practices by farmers in the French Creek watershed in western New York. He concluded: "The potential adopters' perceptions of the change agent may directly influence their adoption decision or influence individuals' perceptions of the attributes of the innovation...."(p.45) Based on a review of adoption-diffusion literature, Rogers (1995) concludes that two important attributes of change agents determine their ability to act effectively in the innovation/diffusion process: trustworthiness and client orientation.

Enck and Brown (1996), considering program implementation decisions at DEC, stressed the importance of local institutions in citizen participation. Among their recommendations for citizen participation strategy in New York beaver management, they wrote: "Identify and facilitate use of local institutions; provide organization and sustainability for citizen participation, increase credibility of decision."(p.29) Similarly, they argued that: "Institutions can also act as a link between local stakeholders (e.g., landowners) and external organizations (e.g., DEC). Local persons often are used to operating through local institutions."(p.35)

DEC has previously recognized the potential benefits of working with locally-based institutions. In 1987, St. Lawrence County's Soil and Water Conservation District hired two technicians who installed water-level control devices in beaver ponds with support and training from DEC. A multi-party task group working to resolve beaver management conflicts stressed the need for coordination among state, county, and town governments. The group advocated improved communication between DEC and locally-based organizations such as the Natural Resource Conservation Service, Cooperative Extension, and Soil and Water Conservation Districts (Beaver Management Working Group, 1994). Recognizing that landowners use local government offices as a key point of contact, the wetlands regulation program distributes the wetlands maps to County and Town Clerks. In addition, personal interviews have shown that staff at such institutions are amenable to working with DEC on wetlands issues (Gurwick and Knuth, unpublished data). Given the large number of wetlands owners in the Hudson Basin and DEC's staff and budget limitations, we suggest that DEC consider forming partnerships with locally-based institutions to identify and meet expectations of specific stakeholder groups relevant to the wetlands program.

## CONCLUSIONS

To implement the kinds of programs outlined in the Draft Wetlands Conservation Plan (NYS DEC 1996), we recommend that DEC: (1) draw on findings from research on citizen participation and the spread of knowledge and practices, which consistently demonstrate the importance of identifying specific stakeholder groups and communication paths for program implementation; (2) use criteria such as those we present here (parcel size, land use, applicant characteristics, pressure on the resource) to enhance the efficiency of efforts to contact wetlands owners, and to match programs with specific landowner groups; and (3) draw on its own institutional experience working with specific groups of wetlands owners in regulatory and non-regulatory contexts.

Wetlands are distributed unequally among parcel size classes. This finding should help DEC to establish contact with wetlands owners where staff size is small compared with the number of wetlands owners in the Basin. Owners of parcels larger than 10 acres in size constitute roughly 47% of all wetlands owners in the Hudson Basin and own over 90% of the wetlands acreage. Any effort DEC might make to work more closely with landowners should target owners of large and intermediate sized parcels and place lower priority on the many owners of smaller parcels who collectively own a small proportion of DEC regulated wetlands.

Wetlands also are distributed unequally among land use classes. However, this pattern is more complex than the distribution among parcel size classes, and it varies among DEC

Regions within the Hudson Basin. Both residential and agricultural uses capture a large percentage of wetlands acreage in all DEC Regions, and these land uses may offer different kinds of wetlands management and protection options. DEC staff should consider the Region-specific distribution of wetlands among land use types when designing implementation strategies for the Wetlands Conservation Plan.

Because our sample of wetlands includes four parcels that contain over 600 acres of wetlands each, we suggest that DEC: (1) use resources available from the Division of Real Property Tax Services to identify parcels larger than 500 acres in size; and (2) target owners of these parcels for appropriate programs, based on current land use and each owner's land use intentions.

Wetlands permit applicants can be divided into groups which differ in the number of applications they submit and the frequency with which individual applicants submit multiple applications. Further research on the characteristics of permit applicant sub-groups should enable DEC to implement the wetlands regulation program in ways that enhance applicants' satisfaction levels.

Pressure on the wetlands resource, as measured by our index, is relatively constant among six of ten counties in the Hudson Basin, with sharp departures in only two counties. The premise is that protection and management strategies differ depending upon the degree of

pressure on the wetlands resource. In its current stage of development, this index is a coarse planning tool that should be used as a filter to identify geographic areas that merit further investigation.

Because DEC has limited staff and budget resources, the Agency should identify appropriate locally-based organizations to serve as intermediaries or partners in delivering non-regulatory programs. Choosing effective groups could both increase the frequency of contact with wetlands owners before they request permits and decrease the likelihood that owners will respond negatively to wetlands protection programs on the basis of prior impressions of DEC.

### Acknowledgments

We thank the New York State Department of Environmental Conservation and for funding a study of wetlands owners and permit applicants that provided the background data for this study. We thank the Hudson River Foundation and the Hudson River NERR for awarding the senior author a Tibor T. Polgar Fellowship that enabled us to conduct the analysis presented in this paper. Dr. John Waldman at the Hudson River Foundation and Betsy Blair at the HRNERR have been particularly supportive of this work. We also thank key staff at DEC who participated in personal interviews, loaned us copies of DEC's wetlands maps, and provided records of wetlands permit applications. The Human Dimensions Research Unit in the Department of Natural Resources at Cornell provided support in conducting research on wetlands ownership. Dr. Steven Schwager in the Biometrics Unit at Cornell advised us on appropriate statistical procedures. Dr. Barbara Knuth provided valuable input about policy implications of our data, and commented on earlier versions of this paper.

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