

APPENDIX G

TECHNICAL COMMENTS ON THE PROPOSED REVISIONS TO THE 1989 WETLAND DELINEATION MANUAL¹

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On 10 January 1989, the U.S. Environmental Protection Agency, U. S. Army Corps of Engineers, Department of Agriculture Soil Conservation Service, and Department of Interior Fish & Wildlife Service adopted an interagency document entitled "Federal Manual for Identifying and Delineating Jurisdictional Wetlands." It provided guidance for identifying and delineating wetlands for various purposes, most particularly for determining wetlands under the jurisdiction of the Clean Water Act, Section 404 regulatory program. On 14 August 1991, this same interagency consortium proposed a revision to the 1989 manual [Federal Register 56(157):40446-40480]. At that time, there was a request for public comments on the proposal, which comments were to have been submitted by 15 October 1991.

The 1989 manual was quite detailed, and with the exceptions discussed below, its use generally enabled an accurate delineation of wetland. The 1991 proposed revision continues to rely on the determination of the presence of hydric soils, hydrophytic vegetation, and evidence of hydrology as essential parameters. Page 40446 presents the following goal: *Of paramount importance . . . is to maintain and improve the scientific validity of our delineation methods.* Immediately following this stated goal six concerns having to do with the 1989 manual are listed. These concerns essentially imply that the application of the 1989 manual delineates too much wetland. The revision proposes to make the visible manifestation of hydrology requisite during the drier months of the year, a restriction which essentially limits the term "wetland" to permanent water bodies. It is my opinion that such a reliance on hydrology is not a scientifically valid approach to wetland definition. Certainly, hydrology is a *driving force* in wetland development, but when water is no longer present, proof of the length of

its tenancy becomes problematic. While there were technical, scientifically-based problems with the 1989 manual, they are not addressed adequately in the proposed revision. These problems persist, with the added problem of the impracticality of having to prove hydrology during the growing season.

As in the 1989 manual, vegetational analysis still relies appropriately on the National Wetland Categories for species, as described by Reed (1988), where plants are categorized as obligate wetland inhabitants, upland inhabitants, or facultative to either side of the hydrological gradient. Some fundamental misconceptions are carried over from the 1989 manual regarding community classification, species dominance, and the inclusion of non-native species in the delineation calculations.

Another problem with the 1989 manual, made much worse by the proposed revision, is the attempt to find a single definition of a wetland that encompasses the estuaries of southern Florida and those in the prairies of Illinois. One reason the National Wetland Categories (Reed, 1988) are valid wetland indicators, when applied appropriately, is the division of the United States into physiographic regions with each species being evaluated on its autecology in each region. A similar strategy should be explored for wetland definition. Indeed, while the proposed revision accepts the valid notion that in various biomes individual species vary in their likeliness to grow in wetlands, it seems illogical to assume that a wetland definition would not be more accurate if it were more specific to each region.

Neither the 1989 manual nor the proposed revision addresses another important aspect of wetland identification: wetland mitigability. The structure and function of some wetlands are

¹ This paper is an edited and revised rendering of a letter which the author submitted to Gregory Peck, U.S.E.P.A., Washington, DC, in response to a request for public comments on the proposed revisions to the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands.

easily replicated using current expertise and technology, while others are of such complex synecological character that routine mitigations are unable to reproduce their viability. An assessment of the degree of mitigability regarding a target wetland should be made at the time of delineation in order to aid regulators in determining terms of permit approval. If such assessments were made, many permits could be handled quickly and expeditiously, while in other cases the applicant would know immediately that permit approval could be problematic.

HYDROLOGY

Evidence of the occupancy of water on a site is important, but the duration or amplitude of occupancy is difficult to determine when water is absent. One of the guidelines in the proposed revision governing the measurement of wetland hydrology states that soil saturation must persist *for 21 or more consecutive days during the growing season* or sustain *inundation for 15 or more consecutive days*. Growing season and indicators of wetland hydrology are both problematic criteria.

Growing Season. As defined in the proposed revision, the growing season is . . . *the interval between 3 weeks before the average date of the last killing frost in the spring to 3 weeks after the average killing frost in the fall*. Growing season is defined arbitrarily by a parameter based upon the average frost-free days, with a 3-week extension period at each end. In the central Great Lakes Region, the attempt to define a wetland as having a fundamental relationship to the "growing season" is untenable. If the logic of the proposed revision is followed, soil hydration outside the growing season is considered irrelevant.

Since the point of wetland delineation is to identify correctly those areas which receive standing water or chronic soil hydration, criteria should be designed which are helpful toward that end. The proposed revision attempts to establish criteria, which when adhered to, are inconsistent with accurate wetland delineation. Wetlands are characterized not by annual crop plants but by plants native to a region. Therefore, attentiveness to

growth and maturation patterns of the native plants in a given region is informative with regard to growing season definitions. The growing season as it is defined by the proposed revision is about 2 months shorter than is expressed in nature.

According to the National Climatic Data Center, from 1951-1980, in the Chicago region, there was a 50% probability that a late spring freeze would occur after 3 May and that an early fall freeze would occur before 10 October. May 3rd is in the 18th week of the year, so the beginning of the growing season as defined by the proposed revision would occur 12 April, the 15th week. October 10th is in the 40th week of the year, so the end of the growing season would fall in the 43rd week. According to the criterion in the proposed revision, the Chicago region's growing season is 28 weeks in duration. This parameter does not encompass the growing season of native flowering plant species.

In the Chicago region, there are 1570 native vascular plants (Swink & Wilhelm, 1979).² Flowering periods of 1252 of these, including grasses and sedges, have been documented. It has been recorded over the past decades, for example, that *Actaea pachypoda* (White Baneberry) has been in anthesis during the period 30 April to 4 June. In the case of most species, these dates are the extremes of flowering and were not recorded in the same year. Presumably, in any given year, any plant species is likely to be in bloom near the midpoint of its phenological range. In the case of *A. pachypoda*, the early date falls in the 17th week of the year and the late date in the 22nd week. The midpoint in the flowering period of *A. pachypoda* is week 19.5 or 13 May.

Fifteen Chicago region species have their midpoint blooming ranges in the 5 weeks prior to the beginning of the growing season as defined by the proposed revision, the earliest blooming midpoint falling in week 10 (8-14 March). It stands to reason that spring growth begins normally at least a week earlier, week 9 (1-7 March). None of the species of the Chicago region have midpoint blooming ranges after the

² The Chicago region, as defined by Swink & Wilhelm (1979) includes 3 counties in southeastern Wisconsin, 11 in northeastern Illinois, 7 in northwestern Indiana, and 1 in southwestern Michigan.

43rd week, but nine have midpoint ranges after the 40th week. Since these species must then have time to mature fruit, an additional 2 or 3 weeks of nutrient movement is necessary. The practical end of the growing season then falls during week 45, 2 weeks after the end of the growing season as defined by the proposed revision.

When the 6 additional weeks of spring are added to the 2 additional weeks of fall, the documented growing season of native vascular plants in the Chicago region is 8 weeks longer than that defined for this region by the proposed revision. The actual growing season begins with the 9th week and ends during the 45th week in our region. Clearly, the 3-week criterion used in the proposed revision has no scientific basis in defining either the beginning or the end of the growing season in this region.

Also, the new manual would presume that soil inundation or saturation is not important prior to or after the growing season or that the effects do not differ materially from soils in unsaturated lands. However defined, the criterion in the proposed revision is that, in order to meet the definition of wetland, an area must be . . . *inundated for 15 or more consecutive days, or saturated from surface water or from ground water to the surface for 21 or more consecutive days during the growing season.*

In the Chicago region, as in much of the prairie biome, microbial activity is evident in anaerobic respiration that can occur any time during the year when the ground is unfrozen. Since the whole point of wetland delineation is to identify wetlands, land areas where water accumulates, arbitrary parameters such as growing season circumscription are superfluous. Even if the growing season were more rationally defined, there would be no scientific basis in ignoring the effects of anaerobic activity and nutrient movement on soil morphology during the dormant months.

Wetland Hydrology Indicators: On page 40452 of the proposed revision, four wetland hydrology indicators are listed, only one of which must be present. While this appears to be an expansive suite of options, in practice it is cumbersome and contradictory, and application can give counter-

intuitive results. Numbers 1 and 2 are not real options.

Number 1: A minimum of 3 years of hydrologic records collected during years of normal rainfall and correlated with long-term hydrologic records for the specific geographical area that demonstrates the area meets the wetland hydrology criterion. Three years of hard hydrologic data almost never exist in the Chicago region, and no developer I have ever worked with would be willing to finance such a study or defer his development plans that long. In practice, it is a wholly impracticable option, though if such a data set were to exist already for a site it would be unwise to ignore it.

Number 2: Examination of aerial photography for a minimum of 5 years [which] reveals evidence of inundation and/or saturation in most years [3 of 5, 6 of 10] and correlated with long-term hydrologic records for the specific geographical areas demonstrate that the area meets the wetland hydrology criterion. In those instances where photographs show such standing water, it is impossible to tell when it got there and how long it will remain at any given topographic level. Rain gauge data on midwestern thunderstorms from Wheaton, Illinois or O'Hare Airport in Chicago are useless in determining actual rainfall patterns even in nearby areas. So correlations are impossible. Again, in practice, this is a wholly impracticable option, though if such data were to exist already for a site it would make sense to utilize it.

Number 3: One or more primary hydrologic indicators, which when considered with evidence of frequency and duration of rainfall or other hydrologic conditions, provide evidence sufficient to establish that an area is inundated for 15 or more consecutive days or saturated from surface water or from groundwater to the surface for 21 or more consecutive days during the growing season in most years, are materially present.

- a. *Surface water inundation.*
- b. *Observed free water at the surface in an unlined bore hole.*
- c. *Water can be squeezed or shaken from a soil sample taken at the soil surface.*
- d. *Oxidized stains along the channels of living roots.*

- e. *Sulfidic material within 12 inches of the soil surface.*
- f. *Specific plant morphological adaptation/responses to prolonged inundation or saturation: pneumatophores, prop roots, hypertrophied lenticels, a[e]renchymous tissues, and floating stems and leaves of floating-leaved plants growing in the area, and buttressed trunks or stems.*

With respect to items "a-c," I have never had the opportunity during a routine wetland determination to spend the time to defer delineation so that I could actually observe that portion of the wetland border which remained under water for 15 days or saturated for 21 even in one year, much less "most years." During a wetland delineation attempt at the West Chicago Prairie in September, 1991, on a morainic region west of Chicago, evidence of items "d-f" were searched for in well-documented, undisturbed wet prairie and sedge meadow plant communities; none could be found. There is no scientific basis for expecting these features to be present in such communities.

Number 4: If none of the indicators in items 1, 2, or 3 is [sic] present, one or more of the following secondary hydrologic indicators should be used in conjunction with corroborative information that supports a wetland hydrology determination. These secondary indicators may only be used in conjunction with other corroborative information that indicates wetland hydrology.

- a. *Silt marks that indicate inundation.*
- b. *Drift lines.*
- c. *Surface-scoured areas.*
- d. *Other common plant morphological adaptations/responses to hydrology; shallow root systems and adventitious roots.*

In undisturbed midwestern prairie wetlands and minerotrophic fens and sedge meadows, items "a-c" are not likely to be seen. Such wetlands are prevailingly ombrotrophic or minerotrophic, so evidence of surface flows laden with sediments are irrelevant factors. Occasionally evidence

from item "d" can be present, but by no means routinely.

The attempts to define wetlands uniformly across physiographic provinces and to keep hydrology as a discrete criterion lead naturally to absurd conclusions. In practice, the proposed revision excludes most natural wetlands of the Prairie Biome from wetland status. The fact that this region receives 80-100 cm of precipitation per year over every square centimeter suggests that water must go somewhere. Actually, the two features which do corroborate hydrology in the Midwest, soils and vegetation, have been singularly excluded from consideration. Soils and vegetation resident on a site have a chemical and genetic imprint which transcends our ability to think up all the ways of discerning a pattern of hydrology.

VEGETATION

One of the most serious problems with the 1989 manual, and which persists in the proposed revision, is the inclusion of weed (non-native) species in the vegetational analyses. Another is an attempt to define "dominant species." The requirement to discriminate wetland plant communities does not lead to spurious results, necessarily, but it is irrelevant in determining wetland borders. The only relevant information in delineation is that which discriminates the wetland from the upland, the area which delineates the jurisdictional wetland.

The analytical protocol described by the manual, which is far too involved to recapitulate or summarize here, does not do well in defining the wetland border. Trying to identify plant communities by the method described is essentially subjective, since the plant communities are chosen in an entitative process, then described by a transect. There are well-known ordination techniques which can define plant communities, if that is the goal. Following the wetland manual, even if the plant community is chosen well, the data treatment tends to average any variation in it, and still the wetland border remains undressed. For all that, the method is unnecessarily complicated and can be far too time-consuming in diverse wetlands, and assessments are overly influenced by "dominant" species. A much simpler, more reliable, alternative is presented below as the various issues are explored.

Native versus Adventive Species: With the exception of a couple hundred rare waifs and scarcely spontaneous exotics, there are 2083 species of vascular plants which comprise the spontaneous flora of the Chicago region. Of these, 513 (25%) are known to be weeds (adventives) from Eurasia or from districts remote from the Chicago region. Adventive species have been in the area less than 1.5% as long as the natives, and their adaptation is to an altogether different ecological context. The presence of these adventive species informs us little about the wetness or dryness of a site. Since they are adapted primarily to the agricultural, well-drained arable soils of the Northern Hemisphere, the extent of their presence reveals more of a disturbance history and post-settlement land use. The remaining 1570 species are believed to be native to the region. The adaptability of these native species to wet or to dry ground can be regarded as a more profound indicator, inasmuch as each of these elements played a role in some presettlement plant community. Each one has been adapting to some facet of local hydrologic gradient throughout much of the Holocene.

If the goal is to determine site wetness based upon vegetation, then the use of native species as indicators is a strong measure. Table 1 shows the difference between the proportion of native and adventive species in each National Wetland Category. The more even distribution of native species among wetland plant categories reflects adaptation of native vegetation communities to gently variable hydrologic gradients typical of undulating topographies. The weed flora indicates a history primarily of disturbed, well-drained soils. An immense amount of experience locally has shown that when adventive species are incorporated into an analysis of wetness, results can be spurious.

Dominant Species: Problems also can arise when the focus is on dominant species. The problem is that dominant species have no fundamental significance as indicator plants. Not only are dominant species usually larger physically when compared to associated species and likely to be more obvious along the transect, they also tend to change with the season. Because calculation of dominance includes an estimate of basal area or cover, the results can also vary with the vicissitudes of annual climatic variation.

Small, or less easily identified, species are frequently excluded or their presence de-emphasized. *Solidago altissima*, a FACU species, can be shown to dominate disturbed wetland areas in the Chicago region in late summer, and when it does, the wetland area can appear as non-wetland. If, however, interstitial species such as *Amphicarpa bracteata* (FAC), *Bidens frondosa* (FACW), *Carex brevior* (FAC), *C. granularis* (FACW+), *C. lanuginosa* (OBL), *Geum canadense* (FAC), and *Polygonum coccineum* (OBL) are included as equal indicators, the area is shown to be populated predominantly by hydrophytic species; it is likely that the *Carex* species would have been dominant in spring. Similar confusions can work in reverse, where a mesophytic area might appear at some time to be dominated by a hydrophyte.

Each species, large or small, easily identified or not, has a long genetic memory of where it grows. Since all species grow in habitats to which they are suited, each species present in an area or in a sampling quadrat provides information equally about the wetness of the spot upon which it grows. When all *native* species identifiable in an area are analyzed together, reliable indices of wetness are obtainable.

Sampling Transect. The National Wetland Category defines the estimated probability of a species to occur in wetlands. The wetland categories included in the hydric to xeric range, *OBL* to *UPL* (see Table 1), can be expressed as 11 coefficients of species wetness, where:

$$OBL = -5, FACW+ = -4, FACW = -3, \dots, \\ FAC = 0, \dots, UPL = 5$$

This is essentially the same scale as presented in the 1989 manual, but with values given to the +/- categories described by Reed (1988) as well. Values on the wet side of *FAC* are given negative numbers so that a transect, when graphed, displays wetland portions of the transect on the negative y axis (Figure 1).

When transects are laid out along the hydrologic gradient (catena), quadrats can be placed at regular intervals. An inventory of the species present in a quadrat is taken, the native species discriminated, and their coefficients of species wetness summed and divided by the number of species. When these quadrat wetness coefficients of each 3 quadrats are averaged sequentially,

vegetational representations of the catena are produced. Inclusion of metrics such as cover and density warps wetness values much in the same way calculations of dominance do; simple species presence gives the more accurate measure.

Figure 1 shows an example of a vegetation transect compared to topography. The transect traverses an undulating mesophytic prairie/wet prairie/sedge meadow complex. Note that the wetland border is slightly higher on the catena to the right where the slope is much gentler and probably less easily drained. The correlation between hydrophytic vegetation calculated in this way and hydric soils is remarkable only if one is surprised to discover that native plants do not grow randomly across the landscape, that they sort themselves with others into time-honored niches with disarming regularity.

When a series of transects is laid out in this fashion along the catena, the borders of the wetland can be associated with those areas of the x axis on the graph where the line intersects 0 on the y axis. The type of community is of little interest to the developer, stratum ranking is unnecessary, and complicated statistical calculations are superfluous. Neither is there a need to rely upon questionable formulations such as species dominance or to depend upon individual indicator species. Reliance upon such factors and the failure to exclude weeds can lead to frustrating results when attempting to correlate wetland plant communities with hydric soils.

It is probable that all of these factors lead the writers of the proposed revision to the spurious conclusion that there are . . . *certain difficulties in identifying wetlands from a purely botanical standpoint* . . . In fact, in almost all cases, a rational analysis of the vegetation can provide a very robust circumscription of wetland. Certainly, taken together with the soil characteristics, very accurate inferences can be made concerning the extent to which water has lain in the area.

Figure 2 shows the difference in wetland border determination when adventives are included in the calculations. In this case, the quadrats were at 4-meter regular intervals, so the transect shows that there was a 10-12 meter difference between the use of natives only *versus* natives with adventives. The transect was taken on a gradual slope where the soil changed from somewhat poorly

drained to hydric. The point at which the native vegetation line drops below 0 is the most reliable correlative datum with the soil. A transect as described by the manual, depending perhaps on dominance assessment during a particular year or time of year, might have concluded that the site had no wetland, yet hydric soil was the prevailing substrate. There are occasions when no native species are present, and under such circumstances the mean coefficient of wetness value will be 0. Soil alone then becomes the most reliable feature; in our experience such areas usually are not wetland.

WETLAND MITIGABILITY

In connection with Section 404 of the Clean Water Act and its administration by the U.S. Army Corps of Engineers, two aspects of wetlands are emerging as important: definition and mitigability. Many wetlands in the prairie biome today consist largely of monocultures of either Reed Canary Grass or Cattails. Large tracts of moist ground and sediment-laden river bottoms have become dominated by weedy trees, under which very little else grows. The seeds of these weedy species are ubiquitous, and because they are responsive to wide tolerances in basin engineering, restoration of such wetlands often can be achieved, but their long-term diversity is very limited. Conversely, a few of our remaining wetlands are remnants of natural systems, wet prairies, sedge meadows, and fens which provide habitats for hundreds of rare native species of plants and animals. The seeds of most of these plants are not available commercially, and little is known about their propagation or autecology. Impacts on wetlands which contain significant numbers of such species are inevitable and, consequently, *irreversible and irretrievable*. It is, therefore, important to determine the extent to which impacts on individual wetlands are mitigable.

It long has been recognized that a native flora displays varying degrees of tolerance to disturbance, as well as varying degrees of fidelity to specific habitats (Braun-Blanquet 1932). Many species, regarded as "conservative" (Wilhelm & Ladd 1988), are floristic elements which, through millennia, have become supremely adapted to niches determined by a specific set of biotic and abiotic factors. These factors include local edaphics and extremes of drought, humidity,

inundation, fire, temperature, faunal interactions, etc. Although these factors in the aggregate have changed over time, the changes have been gradual enough and buffered sufficiently by system complexity to allow gene pools to adapt. When changes occur rapidly, as they have in the postsettlement period, both species diversity and populations of conservative species on a given tract are diminished in accordance with the severity of the changes.

Species conservatism, the degree of faithfulness a native plant displays to a specific habitat or set of environmental conditions, is the basis for the natural area assessment rationale (Wilhelm & Ladd 1988), describing a conservatism scaler spectrum of 0-10 for native species, with 0 coefficients assigned to the weediest species and 10 values assigned to very conservative species. The natural quality of an area is reflected by its richness in conservative species.

Five hundred thirty-four native species, about 34% of the native flora (322 hydrophytes) were given a coefficient of species conservatism, outside of the philosophical spectrum, of 15 or 20 for the Chicago region flora (Swink & Wilhelm 1979). Such values were given to species which the authors regarded as very rare or extirpated in the region. Typically, such species occupied plant communities which either were very rare locally to begin with or whose habitats have been very susceptible to post-settlement disturbances. A few natural wetland communities, such as bogs and fens, have high concentrations of species with values of 15 and 20.

About 11% of the native flora, including 99 hydrophytes, were given values from 0 to 3. Species in this category essentially comprise the New World analogues to the Old World "camp-following" weeds. It is believed that these are the species which exploited the compacted, disturbed, nutrient-rich soils of Indian villages, buffalo wallows, and the like. Such species played only minor roles in stable natural communities. Today, along with Eurasian weeds, they occupy more than 99% of the land in the region which is not paved over or farmed.

The remaining 55% of the native flora, 867 species (493 hydrophytes), is comprised of variously conservative species, those species were given values from 4-10, depending on their fidelity to stable native conditions. Most of the natural plant communities of the Chicago region are characterized by their inhabitation by conservative species.

Generally, the more disturbance an area has suffered since European settlement, the more likely it is to be populated prevalingly by species with values at the low end of the conservatism range. In disturbed areas, attrition of conservative elements occurs even as less conservative elements, already suited to the changes, broaden their genetic diversity and adaptation to an array of disturbed conditions. The conservative elements, supplanted in place, have neither refugia, effective migration routes, nor the time to adapt or relocate. Rather, their populations are depleted repeatedly until their ultimate extirpation.

To obtain a qualitative evaluation of a wetland site, the indices can be applied in the manner described by Swink & Wilhelm (1979) and Wilhelm & Ladd (1988).³ According to Swink & Wilhelm, indices obtained for areas in the Chicago region are applied as follows:

"If the Natural Area Rating Index of a given area is 35 or 40, one can be relatively certain that there is sufficient native character to be of rather profound environmental importance in terms of a regional natural area perspective. Areas which rate in the 50's and higher are of paramount importance; such areas are extremely rare, probably occupying less than 0.02 per cent of the total land area in the Chicago region. Areas which rate less than 35 can usually be assumed to have suffered significantly from abuse or degradation."

Many wetlands today are clearly in the latter category in that they have indices significantly lower than 35. Generally, the lower the index of a particular wetland, the more capable we are

³ The Natural Area Index is derived by summing the coefficients of conservatism of all the species in a unit area and dividing the sum by the number of species, yield a mean coefficient of conservatism. That mean value is multiplied by the square root of the number of species to yield the index.

technically of re-establishing it or mitigating its loss with equivalent conservatism, amenities, or function.

It is yet to be demonstrated that stable natural communities, with indices in the high 30's, can be established *de novo* routinely and that such communities can be sustained at that quality level. Certainly, most open ground today, left to "succeed" on its own, is incapable of obtaining such quality. Today, the species involved in site recolonization are mostly those which have been given values of 0 to 3. Species involved in stable, diverse constellations, those given values of 4 or higher, are either absent from the region, or their populations are too disparately distributed to coalesce into any complex natural community. Such community coalescence potentials are further retarded by the fact that any succession today must take place in a universe of species that consists partly of adventive elements. Even when rich "mixes" of "pure live seed" of native species are sowed on a site, the chronic absence of fire and excessive amounts of surface runoff waters in contemporary wetland ecosystems render these plants unsuccessful in competition with non-native elements.

In the application of mitigation technologies in the Chicago region, certain ecological limitations must be kept in mind. In the modern era, there are for the most part, only about 150 native wetland species available for the spontaneous recolonization of open ground. These species have a mean value of about 2.5. This means that the highest index likely to be measured is about 30. In order to achieve higher ratings, the planting of conservative species must be prescribed. In today's restoration efforts, the planting of 60 conservative species, with a value of 4 or higher, is considered a rich planting. Present in any community is a cohort of non-conservative elements, so if the planted community can be made to consist of plants with a mean value of 4.0, a cohort of 100 species would be needed to achieve an index of 40. The highest index which has been achieved to date is 39, from 139 native species with a value of 3.34.⁴

The problem with getting conservative native plants to grow on a site is that most of our natural communities require specific hydrologies, water qualities, and soil pH levels, and they often require annual fire. Such conditions are yet beyond the technical capabilities of most engineers and plantmen today. For most Chicago region natural wetland communities, the likelihood that each could be restored in a contemporary mitigation effort is remote.

I realize that most regions of the country have not approached their flora with this in mind. That does not mean, however, that these same relationships do not exist elsewhere or that they can be ignored simply because it is complicated and would require attention. Each region must find a rational way to codify its flora such that land custodians and resource agencies can determine the magnitude and reversibility of proposed impacts. Any manual which deals with wetland delineation in the context of the Clean Water Act must acknowledge that all wetland is not equal in its quality, function, and replaceability.

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⁴ One of the wet prairie restorations at the Des Plaines River Wetland Demonstration Project in Wadsworth, Illinois.

Table 1. Definitions of National Wetland Categories, along with the percent of Chicago region native (1570) and adventive (513) species in each Category.

Native Flora	Weed Flora	Wetland Category	Symbol	Definition
27.9%	3.7%	Obligate Wetland	OBL	Almost always occurs in wetlands under natural conditions (est. greater than 99% probability).
16.3%	5.6%	Facultative Wetland	FACW	Usually occurs in wetlands, but occasionally found in non-wetlands (est. 67-99% probability).
14.1%	13.3%	Facultative	FAC	Equally likely to occur in wetlands or non-wetlands (est. 34-66% probability).
14.4%	18.7%	Facultative Upland	FACU	Occasionally occurs in wetlands, but usually occur in non-wetlands (est. 1-33% probability).
27.3%	58.7%	Upland	UPL	Almost never occurs in wetlands under natural conditions (est. less than 1%).

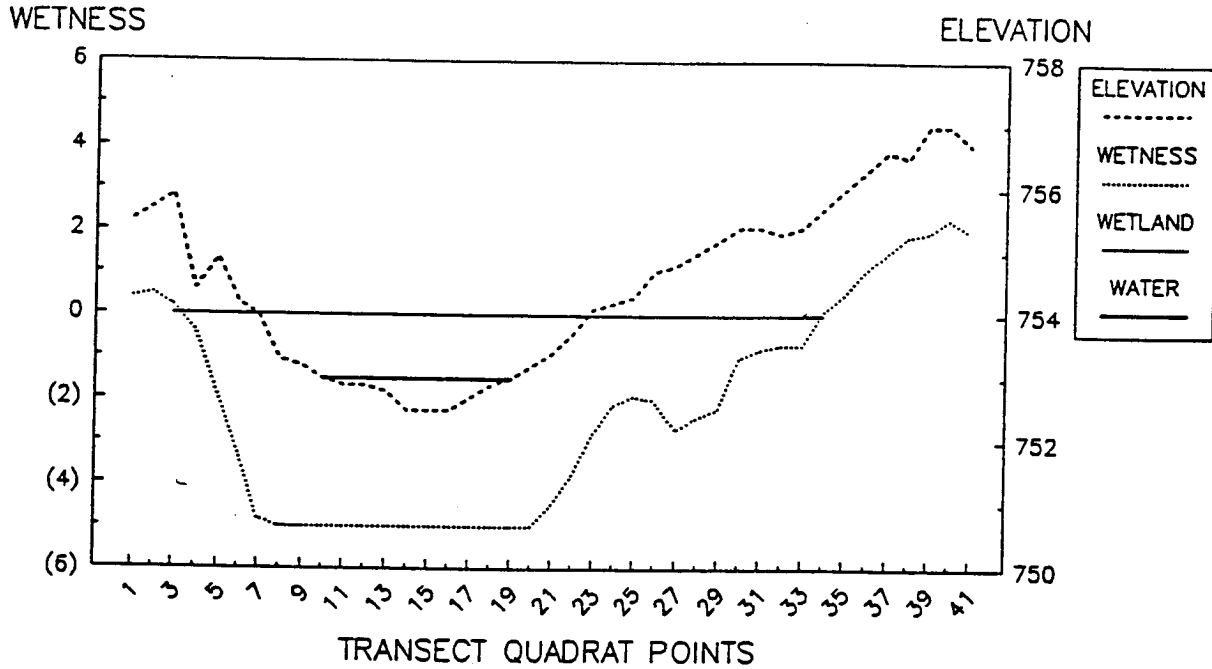


Figure 1. West Chicago Prairie. Transect consists of 41 quadrats 4 meters apart. Correlation between mean wetness coefficients (dotted line) per quadrat and topography (dashed line), shown in ft above mean sea level. The dark solid line is the normal water level. The lighter line, between quadrats 3 and 34, delineates the hydrophytic vegetation, and corresponds to the wetness axis rather than the elevation axis. (Unpublished data from Wayne Lampa, Du Page County Forest Preserve District, Du Page County, Illinois.)

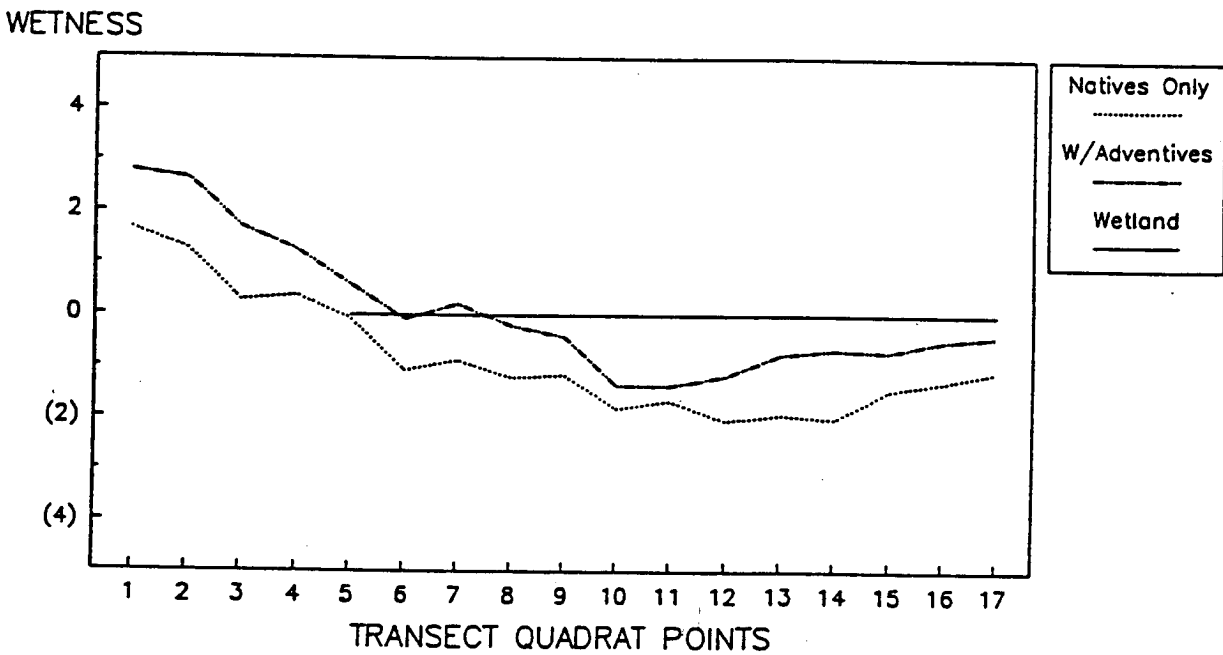


Figure 2. Disturbed wetland area in Du Page County, Illinois. Transect showing the disparity in hydrophytic vegetation assessment which can result when adventive species are included in the calculations. The dotted line shows native species only; the dotted-chained line shows the same transect, but with adventive species included. The solid line indicates the actual extent of wetland.