

The Consulting Industry in Wetland Rehabilitation

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1. Introduction

Consultants play and will continue to play a major role in wetland rehabilitation. However, consulting practices often do not further progress in the field. The lack of consultant contributions to the peer-reviewed literature or peer-reviewed analyses of projects by consultants, the difficulties in accessing consultant reports, and a perceived need by many consultants to limit outside reviews of their work reduce the ability of others to learn from that work. Additionally, the contrasts between the near-absence of peer-reviewed data or results and the number and character of consultant advertisements, coupled with philosophical issues in rehabilitation, have led to a schizophrenic perspective on the role of consultants—from that of most consultants, who feel they generally do a more than adequate job, to others who feel that much consultant-derived rehabilitation is unsuccessful.

The restrictions on information flow and other problems in consulting, such as the separation between designers and builders, are resolvable but will require significant efforts. The consulting community and its individual members must decide to report project results in a reviewable fashion, support outlets that publish material derived from consulting reports, and continue to work on resolving the business issues that impede progress in the field.

2. The Role of Consultants

Consulting is a professional endeavor carried out in support of a client's objectives (Block 1981). Consultants are usually highly qualified in specific fields and provide an expertise not available in a client's employee base (Greenbaum 1990). Consultants often form a significant part or the entirety of any project team that requires diverse technical skills (Thomsen 1989). The typical wetland rehabilitation consultant or consulting firm provides technical skills on a for-profit basis. The firms for which wetland consultants work are varied, from one-person shops, through small and medium-sized firms specializing in wetlands, to large and very large firms that have a general, non-wetland expertise (often engineering) but that also have wetland sections or personnel.

Consultants are not all found in for-profit firms, however. Non-profit corporations are frequently consultants in wetland rehabilitation. Ducks Unlimited, Inc., for example, provides assistance to landowners (typically farmers in Canada, the United States, and, more recently, Mexico) to construct or enhance wetlands. A nonprofit may also act as the facilitator organization through which skills are passed. Non-governmental organizations or similar governmental organizations, such as the California (USA) Coastal Conservancy, secure funds from other entities and disburse these to other groups for wetland rehabilitation or engage technical consultants to support rehabilitation efforts by these groups. Government agencies and academics also may act as consultants. The United States Army Corps of Engineers staff (one of the country's primary governmental entities involved in wetlands) has consulted to other federal agencies on a variety of international projects, most recently the proposals to modify the hydrology of the Pantanal.

The number of wetland consultants has grown significantly in the past two decades. Figure 1 depicts Society of Wetland Scientists membership by employment category for 1986,

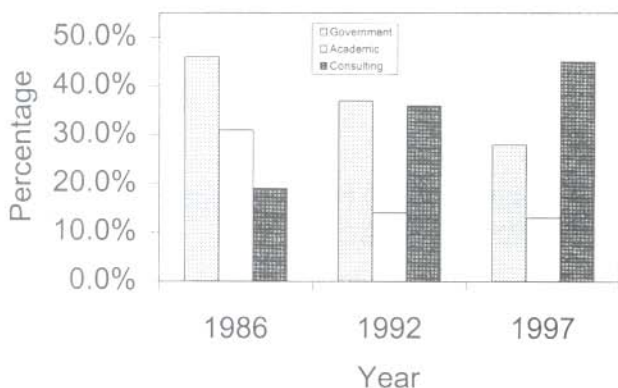


Figure 1. Percent of Society of Wetland Scientists membership by employment category. 1986 and 1992 data are from Ludwig and Leitch (1994) and 1997 data are from Jan Keogh (personal communication). Categories for students, industry, and non-profit organizations are not shown.

year over the past decade. These numbers also reflect only those who describe their primary employment as consultants and do not include professionals in other disciplines who, as noted above, may consult part-time.

Consulting is also the primary entry point of new professionals into the field. With cutbacks in governmental and academic employment over the past two decades, consulting tends to be the most available employment opportunity for wetland ecologists entering the job market, a conclusion supported by interviews with recent graduates and a survey of the Society of Wetland Scientist's *Bulletin* and other sites that provide employment announcements. Project-specific presentations at national and chapter meetings of rehabilitation-oriented societies, including Society of Wetland Scientists and Society for Ecological Restoration conferences, are dominated by consultants. Surveys of completed projects reflect a similar dominance. For example, 82% of the 115 completed rehabilitation projects in coastal California reviewed by Zentner (1987) had been planned by consultants. Other regions reported higher numbers of completed projects at that time and a similar role for consultants (Ed Garbisch, Personal Communication; Robin Lewis, Personal Communication).

Along with the growth in the number of consultants has come a significant increase in consultant advertising. The World Wide Web contained 1,500 sites offering wetland rehabilitation consulting services in November 1997 when queried using the key term combination "wetlands + restoration + consultant." The services ranged from water quality engineering through landscape architecture and included ecologists, lawyers, and regulatory specialists, reflecting the broad spectrum of fields occupied with some facet of wetland rehabilitation. The sites varied from simple lists of services to well-illustrated project examples with either implied or baldly stated promises of successful future work.

It is difficult to determine the effect of wetland legislation in the United States on the growth in numbers of consultants, although it has obviously been responsible for a large number of consulting jobs and completed projects. However, a number of countries have strong legislation or regulation of wetlands (although without, perhaps, the degree of advocacy that occurs in the United States) accompanied by the use of rehabilitation as mitigation. Additionally, international aid organizations and multinationals eager to develop local resources but sensitive to environmental concerns are increasingly using consultants to rehabilitate wetland resources. At this time, many of these consultants are not local and their integration with local capabilities is uneven. However, these consulting entities are often using local talent that is, in turn, beginning to develop its own consulting capabilities. Accordingly, although the rehabilitation consulting industry is presently strongly dominated by USA and western European firms, the number of firms based in other countries is beginning to rise and is likely to continue to expand.

1992, and 1997. The 1986 and 1992 data are from the Ludwig and Leitch (1994) survey of the Society's members while the 1997 data are taken from the Society's membership application forms. In 1997 consultants made up almost half of the Society, while they comprised only about 20% of the Society only 10 years earlier. The growth in absolute numbers of consultants is also significant. In 1986, the Society had 700 members, in 1992 it had 2,800 members, and in 1997 it had 4,100 members (Jan Keogh, Personal Communication). Extrapolating from these data, the number of wetland consultants has grown by almost 40% per

3. Diversity and Standardization

The growth in numbers of consultants and the attendant variety of disciplines or countries from which these consultants spring is, under ideal conditions, a great benefit. Wetland rehabilitation is a complex endeavor and requires a great breadth of expertise. Wilcox (1987) created a model of wetland research efforts to show that at least ten different disciplines were needed to produce acceptable results, a finding that is also relevant to wetland rehabilitation. The diversity of consultants also ensures that the full range of rehabilitation needs can be met. For example, while Ducks Unlimited could be working with farmers in a local community on wetlands in an agricultural context, a for-profit firm could be working for a local developer or public works agency to develop a rehabilitation mitigation plan for another wetland, and a nonprofit organization could be assisting a local school rehabilitating an adjacent marsh.

Practically, though, the diversity of consulting entities makes communication among consultants extremely difficult. Most consultants enter wetland rehabilitation with training in a specific field, but those fields are extremely diverse. Consultants tend to adhere to the standards and practices of the field in which they trained, read the journals of those fields, and attend those meetings unless their new occupation provides both practicable alternatives and strong incentives to adopt them. The limited current curricula in rehabilitation, lack of common standards, and absence of a unified field make even simple communication among practitioners difficult.

These issues may be resolved at least partially in the future as more academic institutions offer rehabilitation course work. The Society for Ecological Restoration has launched a peer-reviewed journal specific to rehabilitation, *Restoration Ecology*, and Society of Ecological Restoration members have begun the New Academy that will attempt to cross traditional boundaries in its course offerings. The New Academy may also provide an important venue for consultants to educate others; it emphasizes practical experience in its instructors and consultants could be a high proportion of teachers. As importantly, Bill Jordan has promoted development of a philosophy of rehabilitation through *Restoration and Management Notes* that may greatly aid in fostering a collective perspective. Consultants must support these efforts if only for selfish reasons: an appropriate education provides better new employees. Consultants can also form partnerships with academic institutions to direct graduate students into research efforts involving consultant-completed rehabilitation projects. Finally, the New Academy may be the best way to create a uniform language among practitioners as it will engage the diverse groups that are now practitioners.

4. Design and Construction

Exacerbating the problems resulting from the diversity of fields in wetland rehabilitation is the division between consulting entities that complete rehabilitation plans and consultants that actually build wetland rehabilitation projects. This split parallels the separation found between other design professions (architects and engineers, for example) and contractors, a separation which is centuries if not millennia old.

Although this division between design and construction often seems inevitable, it is extremely damaging for wetland rehabilitation. Most wetland rehabilitation plans today may be completed by a consulting ecologist but construction is generally carried out by a licensed contractor, often one without wetland-specific experience. Unless a rehabilitation ecologist skilled in construction is on-site, contractors faced with unpredicted problems in a rehabilitation project are forced to make their own decisions regarding project implementation. Because there are few standard specifications for rehabilitation projects at this time and rehabilitation projects are often complex with many opportunities for unpredicted conditions, there are always difficult decisions to make at the construction stage. Zentner (1989) found that 21% of the unsuccessful rehabilitation projects in California between 1975 and 1985 were the result of inappropriate choices made during construction.

A project from California (USA) provides a typical example. The project plans had called for stripping the topsoil from an existing wetland and reapplying it to a newly excavated basin to construct a freshwater marsh. Upon review of the completed basin, it was clear that the reappplied

material was not topsoil. The contractor noted that, in accordance with standard specifications, the topsoil had been stripped from the site during the clearing and grubbing phase, the typical first phase of all construction work. The salvaged "topsoil" was actually a relatively sterile subsoil that did not promote plant growth.

There are a number of wetland rehabilitation ecologists who have become licensed contractors or developed construction firms, but these remain a minority. Rehabilitation consultants may have a diversity of backgrounds but these are typically science-based or design-based. Contractors, in contrast, generally have quite different backgrounds. There are also significant problems in combining design and construction functions and individuals in a consulting firm. First, business practices (and costs) are quite different for designers and contractors. Both must have professional insurance, for example, but of a very different form. Designers are typically thought to be relatively free from physical hazards and their workplace injury insurance rates are relatively low. Design errors can lead to significant future problems, though, necessitating relatively high errors and omissions insurance. Contractors, on the other hand, are generally subject to physical hazards but do not design, leading to high injury and low errors insurance rates. A design-build firm (which employs both designers and contractors) pays high rates for both forms of insurance. For example, a design-build firm in the United States with gross annual revenues of \$3 million will spend almost \$12,000 more per year than two separate design and construction firms, about 0.4% of gross revenue (Issek, Personal Communication).

Other business issues also tend to keep design and construction apart. Taxes, costs for equipment, supplies, inventory, and many similar matters are strikingly different for design and construction firms. For example, wetland rehabilitation contractors deal in large numbers of plants, soil, and similar materials. These are all items that are subject to sales or value-added taxes; accounting for these taxes and inventories of materials that are also subject to tax is of such a different character than design tax issues that separate accountants are often required.

The development of standard plans and specifications and open communication on all project results would greatly reduce the problems inherent in the designer-contractor split. The American Society of Civil Engineers has begun to address rehabilitation standards but this effort appears to be some time from fruition. These efforts should be encouraged and rehabilitation consultants should be actively engaged in the review and refinement of these standards.

Whether specifications are developed or not, an Ecological Monitor should be present during all rehabilitation work. The Ecological Monitor could observe the work to ensure that it is in general compliance with the construction documents and permits, review change orders and revised plans, interpret the contract documents for the contractors, and suggest ways to mitigate problems. Rehabilitation plans should require that the Monitor complete a construction log with notations for every site visit, sign a copy of the as-built drawings, and certify that the project was built in conformance with the construction documents. The as-builts and construction log should then be deposited within 6 weeks of close of construction with a local public agency. A regional rehabilitation clearinghouse would be an even more appropriate entity for deposit of these materials in areas where significant rehabilitation activities occur.

5. Performance Standards and Experimentation

As one academic remarked, "even though I am writing proposals and applying for funds like a consultant and may be living on 'soft money', if I find something interesting in the work and end up publishing papers remarkably different from my stated goals, my funding sources are generally not overly concerned. In a consulting setting, I have to meet specific goals, write reports which match those goals, provide results on a specific timetable, and complete all of this within a fixed budget."

The strictures of consulting practice mandate a relatively rapid pace, a continual search for more efficient means to complete the work at hand, and a strong focus on developing opportunities for future work (Stitt 1990). Under the best conditions, these constraints can result in rapidly- but well-developed work, products that have a certain guaranty of meeting project goals, and the development of new technologies. Under poor conditions, work is not produced on time or within the budget and the project fails miserably with no redress or remediation.

Under almost any conditions, these strictures provide few incentives for experimentation. Much of the work within an academic setting is experimental; in these cases, the failure of a rehabilitation project to meet specific goals is not an issue, at least theoretically, because failures provide important information. Even in a governmental setting, experimentation is encouraged (although this may be observed more in the breach than in practice) because the information derived from failures becomes public data and advances the general state of knowledge. In the consulting field, the work is expected to meet performance standards; these standards do not generally include an experimental component. This goes so far as to result in contracts that specify survival rates for plant material. In short, consultants must construct successful projects—however that is defined by the client—and this requirement minimizes experimentation. Once a formula for success is identified, that formula is followed as often as possible. But experimentation is a keystone of scientific work and is almost mandatory for publishing in peer-reviewed journals; without it, project results are, as one skeptic noted, too much like “how I spent my summer vacation.”

The results are quite noticeable in peer-reviewed journals. Of twenty-nine issues of the journal *Wetlands* published between 1983 and 1997, for example, only forty of the 708 total authors (6%) were consultants, while 471 (67%) were academics or students and 182 (26%) were government employees. Over this same period, *Wetlands* has grown from one annual issue of about 100 pages to its present four issues per year with more than 150 pages per issue. A review of other leading peer-reviewed journals with frequent articles on wetland rehabilitation, such as *Restoration Ecology*, the *Journal of Hydrology*, the *Canadian Journal of Botany*, *Archive fur Hydrobiologie*, and the *Australian Journal of Marine and Freshwater Research*, shows the same pattern. There is little or no incentive for a consultant to publish in a peer-reviewed journal. The time lag between submittal and publication in peer-reviewed journals is generally at least 1 and usually 2 years, a significant period in a rapidly evolving field. The use of wetland topsoil to inoculate constructed wetland basins has been discussed, for example, from at least 1985 by consultants in society conferences and noted several times in the pages of *Restoration and Management Notes* and the *Wetland Journal*. However, few peer-reviewed discussions about the use of wetland topsoil have appeared in peer-reviewed journals; one exception is the recently published article by Brown and Bedford (1997).

There are also several disincentives to publishing project results. The growth of consulting and the diversity of consulting entities has greatly enhanced competition among consultants. Many consultants are reluctant to provide copies of reports to others due to proprietary information concerns or the belief that other consultants will use the information. Some consultants have gone so far as to copyright project materials to ensure that they cannot be used by others; most simply make it very difficult for other consultants to review the material. Similarly, although much of the work product from consultants is potentially available as gray literature (reports and similar documents in government agency files), this information is often extremely difficult to access due to governmental restrictions on information and consultant efforts to reduce access. Procedures as simple as filing practices (or lack thereof) have also greatly hampered researchers.

The dearth of peer-reviewed (or at least skeptically screened) information from the consulting industry has greatly slowed progress in improving the quality and predictability of rehabilitation projects. However, the results of consultant work are still significant and important if only for reference to other practitioners seeking to construct similar projects. The existing outlets for consultant publishing, such as *Restoration and Management Notes* and the recently expanded *Wetland Journal*, must be supported by the consulting community. The Association of State Wetland Managers has also made significant efforts to include consultants in their symposia, almost all of which result in proceedings. Governmental agencies can support these efforts by requiring that project results be published in some form and by providing standards for consultants (which should also be included in newsletter publications). The standards can be simple but should be oriented towards subsequent project review by others and should include requirements that the author(s) provide a good map of the project location, the location of the rehabilitation plan for future review (including any agency file numbers), and a guarantee that the plan and site will be available for review by the public.

Rehabilitation plans must also be considered public information. Once plans are completed, they should be sent to a regional clearinghouse. Combined with the Ecological Monitor reports advocated above, these plans would provide much of the information needed by reviewers interested in objective analyses of rehabilitation projects. Finally, more attention must be paid to the business of rehabilitation. *Restoration and Management Notes* has been the only publication to date that has reviewed rehabilitation businesses, although much of that was published several years ago (Ross 1985, Sauer 1988, Kerans 1990). The business concerns noted above could be addressed through an organization of professional consultants. Professional organizations sometimes begin as a way of restricting access under the guise of seeking acceptability (Grassetti 1997), though, a happenstance that must be addressed and resolved.

6. Rehabilitation Ideology and Consulting

Several very different philosophies have developed in the field, leading to a certain degree of tension. Bill Jordan (1990) has discussed these philosophies at length. Among this blend of philosophies, Jordan has distinguished a preservationist ethic and a utilitarian ethic; the preservationist ethic calls for strict preservation of remaining wetland resources, while the utilitarian ethic calls for recognition of the many needs of society and development of a framework in which conservation can succeed without placing undue restrictions on society. These two ethics have often clashed (see Katz 1991 and Zentner 1992, for example). The conflict was well illustrated at the first annual Society for Ecological Restoration conference in 1989. Consultants were generally vilified and at one point described as "biostitutes" (Sayen 1989).

The conflict was not eased by early reviews of rehabilitation work. Due to the number of projects completed by consultants, surveys of completed work undertaken by academic and government scientists have been read as a judgement on consultants. The conflicts resulting from these surveys have been exacerbated by publication of one or more rejoinders published by consultants. Race (1985), for example, completed one of the first surveys of rehabilitation work, covering salt marsh rehabilitation projects in San Francisco Bay, and determined that most of these projects were not successful. A reply by Harvey and Josselyn (1986) noted that many of the unsuccessful projects were actually experiments and should not have been inventoried. The succeeding claims and counterclaims by these authors and others failed to note that the original article was, essentially, concerned with assertions of success by a number of practitioners; Race had simply noted that these assertions were, at best, premature. This pattern has continued (see Rieger 1991 and Zedler and Langis 1991, for example).

7. Practice and Commitments

Consultants work for the period of a contract. Under the best conditions, this includes development of a rehabilitation plan, construction or monitoring of construction, and post-construction monitoring and maintenance. At the conclusion of this period, the consultant leaves but the rehabilitation effort remains. Many projects are built near or within existing or developing communities; these communities may have a significant degree of experience with local natural landscapes or very little experience. Unless the consultant or the client ensures that this community accepts this modified landform, the rehabilitation project is likely to ultimately fail, either through misuse or modification. This issue has not become apparent or even apparently significant yet, due to the youth of rehabilitation consulting. As more projects reach the end of the post-construction monitoring period and rehabilitation consultants move on to other projects or other locales and the local community begins to interact with the wetland, this issue will gain prominence. To ensure that this eventuality is not marked by the usual contention facing wetland issues, consultants must ensure that adequate and appropriate maintenance and monitoring manuals or other communications are developed with the local community and that members of that community have made a commitment to safeguard and maintain the resource. Anyone involved in a successful rehabilitation project enjoys revisiting that project; rehabilitating a wetland is a commitment to the future, providing future generations with a part of the natural world to treasure. Sharing that vision with the local community and working with them to integrate the

project into the local landscape can multiply that sense of commitment to the natural world by many times and provide a base of enthusiasm for more and better work.

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