

## **The role of ecologists in the environmental consulting industry of the United States of Amerika**

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Mit der Unterzeichnung des "Gesetzes über Nationale Umweltpolitik" (National Environmental Policy Act) im Jahre 1970 begann in den Vereinigten Staaten ein Jahrzehnt des Umweltbewußtseins. Dieses Gesetz hat zusammen mit vielen weiteren Umwelt-Gesetzen und -Verordnungen außerordentliche technische Anforderungen an die staatliche Verwaltung gestellt. Eine weitere Folge war die Gründung von Hunderten von Umweltberatungs-Firmen, die insgesamt rund 5000 Ökologen beschäftigen.

Die Tätigkeit dieser Ökologen in Umweltberatungs-Firmen erstreckt sich auf Aufgaben wie Feststellung der Umweltauswirkung und Umweltverträglichkeit, Rekultivierung von Abbaustätten für Bodenschätze, Standortwahl von Kraftwerken, Gewässerpflege, Ausbaggerungs-Auswirkungen, Landnutzungsplanung und Untersuchungen der Auswirkung der Ablagerung von gefährlichen Abfällen.

Die zunehmende Beschäftigung von Ökologen in der Umweltberatungs-Industrie zeigt sich auch im raschen Wachstum der Sektion für Angewandte Ökologie der Ecological Society of America (ESA). Diese Sektion ist die größte der ESA und umfaßt z.Z. 2584 Mitglieder. Die ESA hat kürzlich ein "Beglaubigungs-Programm" ins Leben gerufen, um diejenigen Ökologen zu erfassen und ihnen zu helfen, die ökologische Prinzipien in die Entscheidungsprozesse unserer Gesellschaft einzubringen versuchen.

Wegen der Verabschiedung mehrerer wichtiger Umweltschutzgesetze in den letzten Jahren dürfte sich die Beschäftigungsmöglichkeit von Ökologen durch Beratungsfirmen während der 80er Jahre günstig entwickeln.

*Environmental consulting, land use.*

### 1. Introduction

Before 1970, graduating ecologists in the United States found themselves with two prospective employers: government agencies and universities. The most prestigious positions were commonly perceived to be those involving university teaching and research in biological disciplines closely related to ecology. Government agencies such as state and federal fish and wildlife departments, the U.S. Forest Service, and the National Park Service employed ecologists both for field and office positions. However, the number of new openings per year was insufficient to absorb the large number of ecologists (and other biologists) graduating each year.

Since 1970, however, a new niche has developed which has been filled by several thousand ecologists, the total number being uncertain since no single society or professional association exists which represents these "professional ecologists" mentioned by GHISELIN (1974) and others. However, a reasonable estimate, including full- and part-time workers, of the number of ecologists employed in consulting could be as high as five thousand. As used here, the term "ecologist" includes all biologists whose talents are directed toward the resolution of applied ecological problems.

The questions to be addressed by this paper include: where did these positions come from and what types of work do these scientists do? For whom do they work and, more important, what does the future hold for these ecologists?

### 2. How did the "professional ecologist" niche develop?

The primary mover for this employment bonanza was the implementation of the National Environmental Policy Act (NEPA) on January 1, 1970. This act formalized a growing conviction among Americans that environmental considerations must be included in federal policies and projects, and that "business-as-usual" without considering the long-range environmental consequences was not to be tolerated. Americans had become deeply concerned about air that was often unsafe to breathe, rivers that were no longer fishable or swimmable, diminishing open space, pollution of drinking water sources, and reckless disposal of toxic wastes throughout the land. Although specific legislation was passed in the 1970's to attack each of these problems, NEPA was the cornerstone which mobilized American

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environmental concern and ensured ecologists a role in a great deal of future project and policy decision-making.

Simply stated, NEPA, particularly through Section 102 of the Act, required that all federal policies, regulations and actions incorporate general environmental protection goals via the preparation of environmental impact statements (EIS) on any major action. Such actions were later clarified through the courts to include not only specific projects, such as dams, but also general policies such as the degree of protection to be afforded to pristine areas such as wild and scenic rivers. Even further, EIS's were required for industrial projects if they needed a federal license, as for conventional or nuclear power plants.

The EIS requirement applied to all federal agencies. In addition, the term "environmental impact" was taken to include all likely affected systems of a project - social, economic, physical, aesthetic, historic, and ecological.

As NEPA's requirements were clarified over the years, most federal agencies accepted the law's mandate and integrated an environmental perspective into their decision-making process. Since a large number of projects were touched by federal money or regulation, a large proportion of public works development and industrial expansion was affected by the environmental assessment process. In addition to federal requirements, twenty-five states and Puerto Rico have followed this pattern of adopting the principle of environmental impact assessment, as have some cities. Due to this process, there are few major, possibly deleterious projects undertaken in the United States which are not scrutinized as to their possible short- or long-term environmental effects.

### 3. By whom were professional ecologists employed?

The burden of preparing EIS's fell equally on all federal agencies. For some, such as the Corps of Engineers with all its public works projects, the Department of Transportation with its miles of proposed interstate highways, and the Environmental Protection Agency with its thousands of sewage treatment plant projects, the additional work load was overwhelming. Some of this work was completed by existing agency staff, but much of it was submitted for bids by private contractors, usually engineering companies responsible for the project's construction. Engineering firms quickly realized that specialists would be required to respond to the demands of EIS's, and ecologists, among others, were brought onto the scene. Ecological talent entered the consulting industry via three main avenues.

*First*, some of the earliest firms specializing in EIS work were formed by university professors or scientists from non-profit research institutions retained to conduct environmental impact studies. It often became the pattern that an industry burdened by certain environmental requirements turned to a local university in order to study concerns raised by the regulatory agency.

For instance, a university professor might have received a contract to study the thermal effects of a power plant's once-through cooling water on the receiving ecosystem. Once completed, the study might have generated follow-up studies or produced interest on the part of other power companies. Faced with an expanding consulting practice which could impair his teaching duties, the professor then had to decide to abandon either consulting or teaching and pursue the other full-time. Among American universities which spawned environmental consulting firms via this pattern are: Johns Hopkins, Cornell, New York University, Colorado State, Delaware, and others.

*Second*, some of the large construction firms hired natural scientists to conduct environmental assessments for projects under their management. In this way, ecologists were added to the pool of engineers generally responsible for completion of construction projects. These ecologists worked solely on internal projects for the mother firm and did not apply their talents to projects outside their usual engineering vistas, be they power plants, oil pipelines, dams, or highways.

*Third*, other ecologists joined architect/engineering (A/E) firms which had decided, due to demand, to extend their services into environmental studies. Many of these firms were originally involved in municipal/civil works such as the design of wastewater treatment systems and found the step from sanitary engineering to aquatic ecology a small one to take. In this way, ecologists became part of an interdisciplinary team primarily concerned with studies relating to the impacts of effluents on aquatic systems. Over a period of time, services of A/E firms expanded to include studies on the effects of: ocean dumping of industrial wastes, strip mining of coal, construction of pipeline rights-of-way, development of new military bases, and development of offshore oil and gas

fields. The ranks of the ecologists, originally intended by the firms to conduct only stream surveys, soon swelled to cover the complete spectrum of environmental services needed by government and industry.

A/E firms very likely employ the largest total number of ecologists. In the 1979 Engineering News Record tabulation of the 450 largest A/E firms (all those with greater than \$3 million billings per year), over 80% listed service capability in the environmental area. Although much of the work in this category may be related to engineering tasks such as wastewater treatment or air pollution control, most of the listed firms offer services requiring ecological and related scientific personnel.

#### 4. What other legislative directives aided the "professional ecologist's" niche?

Section 102 of NEPA has had a great influence on the utilization of ecologists for the completion of environmental impact statement work (CORWIN et al. 1975). However, an EIS must examine all aspects of a project, not only the ecological. The role of ecologists in EIS development depends on the severity and types of anticipated effects. For a dredging project, ecological involvement would be extensive, while for an airport expansion, ecologists might play only a minor role. One of NEPA's offspring, the Clean Water Act (CWA), which earlier served the country as the Federal Water Pollution Control Act, may have had an even greater beneficial impact than NEPA on ecological employment.

Sections 316(a) and (b) of the CWA, require that:

- a) steam electric generating stations utilize "the best available technology" (cooling towers) to reduce adverse impacts unless the plant can demonstrate that a lower level "will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water".
- b) "the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact".

Section 316(a) thus demands minimization of thermal effects while Section 316(b) is concerned with reducing adverse effects of impingement and entrainment at water intakes.

During regulatory hearings in 1974 on these proposed regulations, as it became clear that the U.S. Environmental Protection Agency would require detailed, long-term studies to show lack of harm from thermal effluents, one hearing participant was overheard to say, "This section of the law should be called the 'Biologists' and Lawyers' Employment Act'".

So it became. As stated by COUTANT (1976), a few years after implementation of the Clean Water Act, "For the practitioners of aquatic ecology, the current social picture revolving around PL 92-500 (CWA) projects some awesome consequences. Meeting this demand (studying thermal impacts rather than building cooling towers) in the next five years will be hampered by a lack of qualified ecologists, bio-power in the field of aquatic ecology is already spread thinly by similar study requirements by the Nuclear Regulatory Commission (formerly a part of the AEC) and various state agencies." Dr. Coutant's prediction was correct. Many power companies chose to study the effects of once-through cooling on the environment rather than blindly go about constructing 20 million dollar cooling towers. Biological manpower was not immediately available and thousands of jobs were laid open for ecologists. The utility industry trade group, Edison Electric Institute (EEI), estimates that expenditures for 316(1) and 316(b) studies have reached a hundred million dollars since the law was passed (EEI, Washington, D.C., personal communication, August 1980).

Although research on power plant effects on aquatic ecosystems goes back over 20 years (TREMBLEY 1960), the greatest volume of work by power companies was contracted for during the mid-1970's. Dozens of engineering and environmental consulting firms took part in this unparalleled aquatic ecological research program. As before, much of the work went to consulting firms; little was conducted by "inhouse" staffs of power companies because they had no corporate experience utilizing ecologists. For most power companies it was cheaper to contract the work out. By the late 1970's this volume of work was so great that several dozen firms throughout the United States each conducted millions of dollars worth of ecological research per year on thermal effects and/or impingement-entrainment impacts. The "Biologists and Lawyers Employment Act" fulfilled its promise abundantly.

## 5. Advantages of professional ecologists

Although a large number of industries and utilities now have ecologists on their "in-house" environmental staffs, professional ecologists are still being used on a great variety of assignments. The advantages that such consultants can muster over in-house staffs are:

### 5.1 Manpower

Professional ecologists working for consulting firms fill an obvious manpower shortage due to the great number of tasks required under the deluge of environmental legislation passed since 1970. Government and industry do not, generally, have sufficient staff to conduct biological field surveys, prepare responses to proposed legislation, comply with dozens of permit applications, or write the multitude of environmental assessment reports required by these regulations.

### 5.2 Expertise

In addition to providing manpower, professional ecologists also provide expertise within specific technical areas. For instance, a consulting firm may become involved in impingement/entrainment studies for power plants and, over a period of years, establish its biologists as preeminent in that field. Some firms have followed just such a pattern by concentrating their environmental expertise. One firm, founded by a professor of a leading university has conducted dozens of biological studies related to power plant operations in the United States. This firm's scientists regularly take part in various scientific symposia and publish papers in refereed journals (as do many scientists in consulting). Similarly, other consulting firms are known for their expertise in offshore marine ecology, strip mining reclamation, bioassay studies, knowledge of Great Lakes ecosystems, coastal zone planning, and assessment of effects of pipeline emplacement. Although many firms consider themselves capable of conducting most types of environmental assessment studies, each commonly becomes associated with and known for a specific area of technical expertise (niche) and expertise in a geographic region (habitat).

### 5.3 Objectivity

The ability to conduct work on an unbiased basis on a project is a third advantage provided by professional ecologists. If a consultant is hired to conduct fisheries surveys before and after the Corps of Engineers dredges a particular harbor, that consultant will be paid no matter what the results of the field work indicate. The consultant commonly has no personal stake in the outcome of a project.

During the past, however, conflict of interest claims were, at times, levied against firms working for an industry where the "clean" environmental outcome of the resulting report would be of great benefit to the industry. This issue of environmental ethics (SCANLAND 1978) generally has been laid to rest by peer pressure, a maturing environmental consulting industry, intense public review of environmental reports, and specific regulations (COUNCIL ON ENVIRONMENTAL QUALITY 1978) on the preparation of environmental impact statements. As information has been accumulated over the years on environmental effects of various actions (e.g., western coal development), the level of accuracy of "impact prediction" by the funding agency, based on objective biological data, has improved. The role of professional ecologists in the fields of objectivity and scientific accuracy is being recognized as increasingly important (STATES 1980).

### 5.4 Speed of response

The fourth reason why a client would choose to use an ecological consultant is speed of response. Although a university research institute may represent the latest word in the study of acid rain effects on local ecosystems, only a consulting firm generally is capable of mobilizing four synoptic field teams in two geographic locations to study the impact of acid rain on leaf emergence at a specific time and complete a final report needed for regulatory support within a few months. Consultants are not hindered by teaching duties, university responsibilities, or the publish-or-perish syndrome common to academic institutions. Furthermore, the pool of ecological talent available tends to move very rapidly to those firms/regions where the greatest volume of work needs to be conducted. Just as some ecologists were being laid off in the late 1970's as the number of power plant studies decreased, increased manpower was needed to study western coal mining impacts, coal gasification projects, new pipeline corridors, and new military projects. The shift in the ecological employment centers from the East Coast to the West was accomplished in a very short time.

## 6. Recognition of and prognosis for professional ecologists

The Ecological Society of America (ESA) recognizes the role of professional ecologists in the scientific community, as indicated in the recently enacted Certification Program (ESA 1978). As stated therein, "the purpose of certification is to serve the needs of a significant portion of the Ecological Society of America membership who seek to incorporate ecological principles in the decision-making processes of our society". This program is meant, "to guide biologists, governmental agencies, courts, and the public in defining minimum standards of education and experience for professional ecologists, and to encourage all practicing ecologists to meet such standards". Professional ecologists are represented in ESA by the Applied Ecology Section. This section totals over 2500 members and is the largest section within the society. The field of applied ecology within which professional ecologists practice is important and influential.

The system of professional ecologists in the consulting industry has been strengthened over the years by the movement of professionals between A/E firms, academia, non-profit research organizations, and government agencies. Furthermore, during the last ten years of intense environmental activity in the United States, there has been much cooperative effort by scientists in government, consulting, and industry. These activities have allowed for a broad-based dialogue on environmental issues, discussion of legislative costs/benefits, and resolution of environmental problems. The movement of scientists has further increased the cooperation among the various interest groups concerned with the natural environment and its utilization. Few consulting firms have worked for government or industry alone. Rather, they have worked for all manner of clients and served as pollinators of information and data between various constituent groups to help promote a balanced, well-reasoned approach to environmental protection.

Future employment opportunities for professional ecologists in the United States should remain steady. Again, federal legislation is playing the major role in this employment opportunity. The Toxic Substances Control Act, passed in 1977, places great emphasis on the availability of ecologists trained in toxicological studies. A draft study by the National Academy of Sciences and the Environmental Protection Agency on eco-toxicology indicates that biological problems associated with past and future hazardous waste disposal, as well as development and distribution of new chemical compounds, are so critical that they will ensure the involvement of ecologists in various types of work for a number of years.

The Resource Conservation and Reclamation Act, implemented in March of 1980, will also provide opportunities for ecologists in the assessment of hazardous waste disposal sites, the monitoring of leachates and effluents from such sites, and their effects on terrestrial and aquatic communities. Other regulations, such as the Rare and Endangered Species Act, the Clean Air Act, the Safe Drinking Water Act, and the Marine Protection, Research and Sanctuaries Act (known as the Ocean Dumping Act) all place burdens of environmental monitoring on industry and government. Professional ecologists will continue to play a role in the implementation of federal and state environmental programs in the United States during the decade of the 1980's.

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