

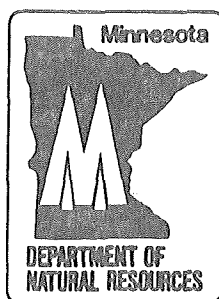
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FUTURE TRENDS

*A series of one-page briefs identifying significant trends that may profoundly influence
natural resource management*

Compiled by the
DIRECTIONS '91 PLANNING TEAM



December 20, 1989
Project: 1991-93 Strategic Planning and Budgeting Process
(Directions '91)

APR 4 1990

INTRODUCTION

Background: In the spring of 1989, the DNR Directions '91 Planning Team convened an informal group of individuals from several state agencies and from the private sector to identify significant trends in society that may profoundly influence natural resources management. The intent was to initiate a process that helps:

- 1.) position ourselves better for the future through anticipating and evaluating changing conditions,
- 2.) broaden horizons of resource and people managers, and
- 3.) improve our ability to market resource management needs to the public and to the Legislature.

The Process and Results: The future trends group met on July 26, 1989 and in a plenary session developed a large number of critical future trends under the following categories: Institutional, Biological, Economic, Social and Political. Smaller groups then assessed the implications of these trends for the DNR. Following the meeting the Directions '91 Planning Team compiled the results. A set of 58 trends were synthesized and brief descriptive statements developed for a draft Future Trends report. The Commissioner's Management Team (CMT) reviewed the draft report and selected 16 trends as priorities for department action. For each of these, one page trend reports - more complete descriptions of individual trends and their implications for the department - were compiled and appear in this document. Future trend reports will be distributed throughout the department as useful aids in the 1991-93 Strategic Planning and Budgeting Process (Directions '91).

DEPARTMENT OF NATURAL RESOURCES
PROJECT: 1991-1993 STRATEGIC PLANNING
AND BUDGETING PROCESS
(DIRECTIONS '91)

October, 1989

FUTURE TRENDS

I. INSTITUTIONAL

- * 1. Integrated Resource Management
- * 2. Public Involvement
- * 3. Biological Diversity Management
- * 4. DNR Reorganization and Decentralization
- * 5. Mobility/Career Enhancement
- 6. Public/Private Cooperation
- * 7. Conflict Management
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II. BIOLOGICAL

- * 1. Degradation of Natural Systems
- 2. Great Lakes Degradation
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- * 4. Exotic Species
- 5. Acid Deposition
- * 6. Hazardous Chemicals
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- 8. Biotechnology
- * 9. Sustainable Agriculture
- 10. Oceanic Degradation

III. ECONOMIC

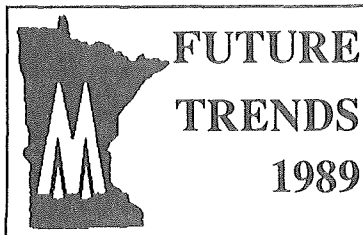
- 1. Interdependent Global Economy
- 2. Gramm-Rudman
- 3. Gas/Oil Price Increases
- 4. Agricultural Economy
- 5. International Resources Markets
- 6. Decline in Living Standards
- 7. Economics of Pollution
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- * 9. Increasing Recreation Demands
- 10. New Federalism
- 11. GNP Standards
- 12. Economic vs Environmental Limits

IV. SOCIAL FORCES

- 1. Non-consumptive Recreation
- 2. Drugs/AIDS
- 3. Aging Population
- * 4. Future Generations
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V. POLITICAL

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- 2. Public Environmental Focus
- 3. Grassroots Activism
- * 4. New Urban Majority
- 5. Voter Apathy/Helplessness
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- 8. Two Year Vision
- 9. Legislative Change
- 10. USSR in Transition



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Degradation of Natural Systems

TRENDS

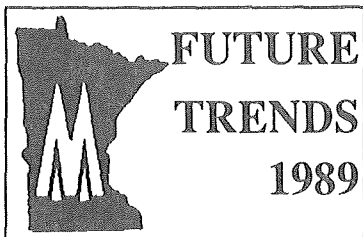
The international loss and degradation of natural systems due to agricultural expansion, urban development, environmental contaminants, and invasion of exotic species has become critical. In Minnesota, wetlands, native prairies, old-growth forests, shorelands, blufflands, lakes and rivers, and groundwater systems are the ecosystems most severely threatened.

- In Minnesota, 9 million wetland acres have been drained or filled (primarily for agricultural production) since settlement. Despite their known value to wildlife and water quality, 5,000 wetland acres are destroyed each year.
- More than 99% of Minnesota's original 18 million acres of native prairie has vanished. What remains supports more than 40% of the state's endangered species. Yet prairie is still being converted; in 1985, more than 5,000 acres were plowed under in one county alone.
- Since settlement, Minnesota's forest acreage declined 42%; 18.4 million acres remained in 1977. Today, only a few thousand acres of old-growth forest remain outside of the Boundary Waters Canoe Area; the lack of comprehensive data on their distribution and lack of protection efforts results in continued loss of these valuable ecosystems.
- Increasing development of southeastern Minnesota's blufflands threatens this scenic resource and its biological diversity. Bluffland ecosystems are among the state's richest in endangered species.
- Lake and river systems are threatened by increasing recreational and commercial use, and continued non-point source pollution and sedimentation. Conflict between commercial and recreational interests regarding use of the Lower St. Croix and the Mississippi River is growing. Ditching, tiling, and channelization of river headwaters decrease water quality, cause flooding, and destroy aquatic habitats.
- Growing demand for lakeshore property and careless development results in increasingly scarce shoreland ecosystems and diminished lake water quality. As the supply of lakeshore sites is reduced, rivershores may face increasing development pressure.

IMPLICATIONS

As human impacts increase, DNR management efforts to protect and restore natural systems will become increasingly important. Despite what has already been lost, Minnesota has more and/or better remaining examples of the major ecosystem types native to the Midwest than does any other state.

- Even within managed areas, natural systems will become increasingly threatened from outside sources, such as pesticides, acid rain, and exotic species. Protecting natural ecosystems will require management of the larger landscapes and watersheds in which they occur. This demands that the DNR coordinate its management activities with local governments, other state and federal agencies, and private sector resource-oriented interests.
- As natural systems become increasingly scarce, the DNR will need to develop restoration technologies to reclaim damaged habitats. Current restoration techniques are expensive and results often fall short of expectations.
- To mitigate further losses, the DNR should accelerate its natural system research and inventory programs, establish long-term monitoring programs to identify and assess changes in the landscape, and protect remaining pristine natural systems.
- Conservation initiatives that promote public/private partnerships (such as the Reinvest in Minnesota program [RIM]) need to be developed and strengthened.



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Hazardous Chemicals

TRENDS

American agriculture is increasingly dependent on the use of pesticides. The structure of current government farm programs encourages pesticide-oriented farming practices such as growing monocultures, abandonment of crop rotation, and maximizing production on each unit of land.

■ "Since 1945, pesticide use has increased tenfold, and at the same time crop loss from insects has increased twofold." The National Academy of Sciences has recently recommended changing federal farm programs to quit encouraging use of agricultural chemicals.

■ Pesticide use can impact fish and wildlife populations through direct toxic or physiologic affects, destruction of habitat and alteration of food chains. In recent years there has been a trend toward use of pesticides that break down rapidly and do not create persistent residues. However, the direct toxicity of many compounds to fish and wildlife is very high. Application techniques have also become more specific and directed to the particular pest.

■ Toxic substances (including PCBs and pesticides) are still accumulating in the Great Lakes. Recent reports recommend that state health departments need to reexamine and strengthen warnings about fish consumption.

■ Despite some positive trends in pesticide use there is still cause for concern about the impact of pesticide use on fish and wildlife resources and the utilization of this resource by citizens of the state.

IMPLICATIONS

Recent studies indicate there is a large potential for aerially applied insecticides to enter wetlands and reduce their value for waterfowl and other wildlife. Further investigation is necessary to better define these effects. A coordinated effort by farmers, wildlife managers and pesticide regulatory agencies is needed to minimize these impacts.

■ There is increasing evidence that low amounts of pesticides (mostly herbicides) move off site to locations where they may be undesirable. In a recent survey, 39% of wells tested in Minnesota contained residues of agricultural pesticides. There is growing evidence that low levels of certain contaminants can increase the chances for cancer occurrence in the general population over life time exposure.

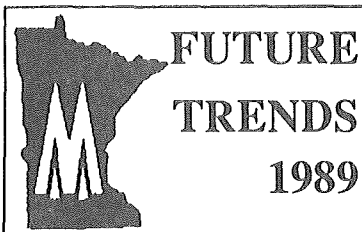
■ Low level contaminant residues (including pesticides) in fish consumed by anglers can drastically influence angling activity and reduce associated economic benefits to local communities. Where flesh contaminants have resulted in advisories, reductions in fishing pressure as high as 75% have occurred. The reduction in economic activity associated with angling has caused severe economic loss to local communities.

■ The use of herbicides can result in drastic alteration of food and cover plants necessary for wildlife populations. Crop fields, roadside ditches and ditch banks offer less protection and food for wildlife species if they have been treated with broad spectrum herbicides. There is need to set aside areas where desirable vegetation is left in a natural state.

■ Despite widespread pesticide use, detailed information is lacking on the location and extent of pesticide use by specific compound. This information is necessary to make correlations with other information such as the occurrence of fish and wildlife kills, status of fish and wildlife populations, residues in surface and groundwater, and human epidemiology.

Prepared by: Directions '91 Planning Team

For more information contact Jack Skrypek, Ecological services Section (296-0783).



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TRENDS

Exotic Species

The mixing of exotic species from around the world is causing major dislocations of native flora and fauna. Exotic, or non-native species, are a growing threat to lakes, wildlife areas, parks, agricultural lands, roadsides and the ecological balance in our state. For example, purple loosestrife plants, Eurasian watermilfoil plants, and river ruffe fish are posing serious threats to our natural systems.

■ The biological components of Minnesota's ecological communities have changed significantly since the early 1800's. In Minnesota, 392 plant species or 20% of all wild plant species are exotic. Several animal species have also naturalized.

■ Some exotics are intentionally introduced for ornamental, conservation, or agricultural purposes. Purple loosestrife, a horticultural ornamental has aggressively invaded 20,000 acres of wetlands and in many sites displaced nearly all the valuable native vegetation. New exotics are continually proposed for use in aquaculture and game farms.

■ Horticulture, forestry, and fisheries researchers are developing altered versions of native species that, by definition, are exotic species and could have negative impacts on individual native species and entire ecosystems.

■ Exotic species are also accidentally introduced by international and interstate transportation. The European River Ruffe was introduced into St. Louis River from a foreign ship's ballast. Eurasian watermilfoil, found for the first time in Minnesota in 1987, spread rapidly throughout Lake Minnetonka after presumably being carried by boats from an infested lake in another state.

■ After passing purple loosestrife and Eurasian watermilfoil bills, the Minnesota Legislature recognized the importance of addressing the increasing problems related to exotic species. It mandated the establishment of an interagency task force to review the issue and make recommendations to the House and Senate Natural Resources Committees.

IMPLICATIONS

Exotic species threaten Minnesota's natural systems. Future management will need to consider the impacts of exotic species. The state must find ways to minimize harmful impacts of exotic species on fish and wildlife habitat, native plant communities, recreation, and visual aspects of our natural heritage.

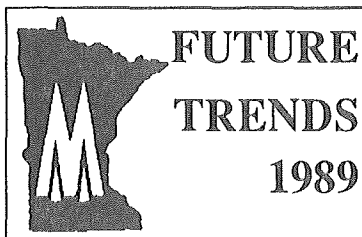
■ The Department of Natural Resources and other agencies must promote increased public awareness of exotic species impacts to help prevent their spread.

■ Resource managers must be kept abreast of the ecological consequences of present and potential exotic species and appropriate management techniques.

■ Management of exotic species can be very expensive. Control of Eurasian watermilfoil on Lake Minnetonka for one summer is calculated at \$565,000. European carp eradication in Lake Christina cost \$300,000. One year's purple loosestrife control in a heavily infested state park cost \$5,000.

■ "Controllable" exotic species should be managed to minimize their impacts and spread. In many cases, there are not ecologically satisfactory eradication and control methods available for containing exotic species. Therefore, preventing introduction and researching control methods are important strategies.

■ Agency or private plans to introduce exotic species should receive interdisciplinary review and study. State and federal governments must establish a regulatory process for commercial raising of exotics and proposed beneficial uses of exotics. State and federal regulations controlling the introduction of exotics should be strengthened.



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Integrated Resource Management

TRENDS

Emerging environmental problems are complex and interrelated; they will not be successfully treated as isolated problems addressed by single disciplines. In response, natural resource agencies are increasingly moving towards more comprehensive integrated management strategies.

- Most of today's major environmental problems are also long-term in duration, and regional or national in scope. Regional forums and partnerships such as the U.S. Forest Services' Upper Great Lakes Biodiversity Committee, the Flyway Council, and the Great Lakes Charter are playing an increasing role in addressing environmental issues.
- Emphasis is shifting from single-species management to conservation of entire ecological systems for a wider range of environmental, economic, and social objectives. This trend is perhaps best illustrated in the biological diversity concept - management for the full variety of living organisms and their ecosystems. The biodiversity concept provides a framework for a broad range of disciplines to integrate their skills and perspectives in achieving sustainable conservation goals.
- The recent development of "Best Management Practices" integrates water quality goals into forest management activities and is another example of integrated resource management now being implemented throughout the Upper Great Lakes States.
- The DNR Forestry-Wildlife Guidelines, a working example of integrated resource management, are being expanded to accommodate emerging resource concerns such as protection of old-growth forests. New DNR initiatives such as Ecological Classification System (ECS) development will further improve integrated management on forest lands.
- The emergence of new integrative fields of research - Landscape Ecology, Conservation Biology, and Restoration Ecology - are providing holistic approaches to natural resources management.

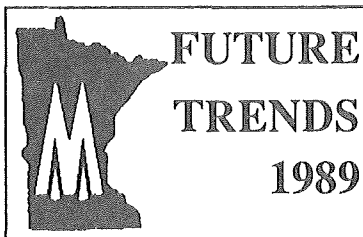
IMPLICATIONS

Implementing more integrated ecological approaches to natural resource management will require trade-offs. Single resource management objectives may need to be modified in order to meet long-term goals of maintaining ecosystem health and providing multiple resource benefits to a broader public.

- Integrated resource management will require greater emphasis on cooperative agreements between federal, state, and private agencies with land management responsibilities. Examples include: the Comprehensive Local Water Management Act (ILOB) that provides the framework for a coordinated local/state partnership in water resource management; and the Reinvest in Minnesota (RIM) program, a multi-agency effort to enhance habitat.
- Moving beyond fragmented natural resource management will require investments in forums and other support structures for interdisciplinary research and practice. For example, a permanent forest policy forum is needed to address increasingly complex forestry issues and to provide a framework for coordinating forest management efforts. Natural resource management will increasingly involve opening the decision-making process to the public for evaluation and participation.
- New types of holistic, integrative training programs will be necessary to help environmental managers address interdisciplinary environmental problems. Research is needed to accelerate development and application of geographic information systems (GIS) necessary for integration of diverse databases.

Prepared by: Directions '91 Planning Team

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Biological Diversity Management

TRENDS

The accelerating erosion of biological diversity, the full spectrum of living organisms and their ecosystems, has elevated the maintenance of biological diversity to a primary issue in natural resource management.

- In mid-August, the National Science Board (the policy making arm of the National Science Foundation) endorsed a wide-ranging research and education plan for countering the world-wide loss of biological diversity.
- In 1989, legislation (H.R. 1268) mandating the establishment of a national policy on biological diversity was introduced in Congress by William Scheuer and 126 co-sponsors.
- The US Forest Service has the statutory responsibility to conserve biological diversity. Its Upper Great Lakes Biodiversity Committee was recently organized to encourage management of landscapes to maintain and restore regional biological diversity in Minnesota, Wisconsin, and Michigan.
- Recent conservation biology studies show that biodiversity cannot be adequately protected through a piecemeal approach of establishing systems of small isolated reserves. In response, biodiversity management goals are now being extended to lands used primarily for commodity production. For example, the US Forest Service North Central Experiment Station in St. Paul has established a Landscape Ecology research program to address the integration of biodiversity into forest management.
- Innovative resource management approaches, such as the "New Forestry" alternative advocated by Dr. Jerry Franklin, are providing specific strategies to maintain biological diversity. They are based on ecosystem-level management that better accommodates ecological values while allowing for production of commodities.

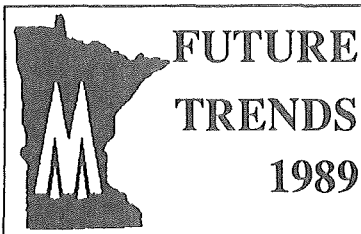
IMPLICATIONS

Effective management of biological diversity in Minnesota will require greater interdisciplinary coordination between DNR foresters, wildlife biologists, ecologists, field managers, and planners. New management plans must adopt more holistic ecological approaches that provide for 1) viable populations of all native species, especially those sensitive to anticipated environmental changes, and 2) maintenance of the full range of natural communities and ecosystems across regional landscapes.

- Traditional resource management policy and practice must integrate principles of conservation biology and ecosystem management rather than treating biological diversity as a series of separate concerns about specific rare species and communities.
- Maintenance of biological diversity will require management at the level of functional natural units such as watersheds and landscapes. This effort will require new and creative uses of public/private partnerships, zoning, conservation easements and other land protection mechanisms. Comprehensive resource programs such as RIM need to be accelerated; new conservation initiatives (e.g., "No Net Loss" wetland policy and sustainable agriculture programs) need to be advocated.
- A comprehensive inventory of Minnesota's biological diversity is needed.
- New innovative approaches in forestry practices will be necessary to achieve fiber production objectives while maintaining biological diversity in forest landscapes.
- The DNR will need to train personnel in conservation biology and landscape ecology.

Prepared by: Directions '91 Planning Team

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Increasing Recreation Demands

TRENDS

Recreation use of resources has intensified, especially on the highest amenity resources. Trends indicate increased demand for a variety of activities. The same resources and same general geographic areas appear to be the recipients of the increased use. Conflicts exist between people who desire incompatible recreation forms. Public recreation facilities, both state and local, have deteriorated in part because of heavy use, but also due to lack of reinvestment.

- Twenty-first century Minnesotans will likely recreate more often, but for shorter periods and closer to home. They will be seeking less strenuous forms of recreation, especially in close proximity to other leisure time opportunities and amenities.
- Aging, greying "baby boomers" are becoming concerned about health and fitness, while increasing urbanization, suburbanization, and technological complexity have spawned a "back to nature" — or "high touch" — movement.
- Minnesotans have shown a renewed interest in conservation and environmental issues, and increasingly they want a better understanding of the natural, cultural, and historic significance of the areas they visit.

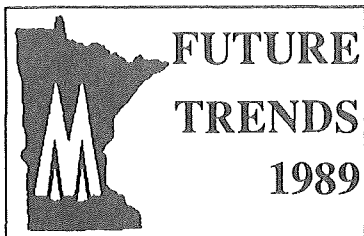
IMPLICATIONS

Growing, changing demands are often focused on Minnesota's most sensitive resources, such as the state's prime lakes, vanishing urban open space, and on increased use of already crowded surface water resources. New and emerging recreation demands often conflict with established uses of public lands.

- Increasingly, DNR outdoor recreation managers have become "people managers", but they must also balance recreational use and development with the need to protect, preserve, and actively manage natural, cultural, and historic features.
- The DNR will need to coordinate its efforts with other public and private recreation providers to leverage limited public resources, to capitalize on individual strengths, and to ensure balanced development of Minnesota's outdoor recreation system. Expanded partnerships in delivering recreation programs and services build understanding, support, and commitment and foster attainment of shared goals and objectives in a cost-effective manner.
- The DNR will need to coordinate its land acquisition and recreation facility development plans with those of other recreation providers, both public and private. A stable, reliable source of funding for public land acquisition and recreation facility development must be provided along with a renewed focus on needed maintenance, rehabilitation, and redevelopment of existing outdoor recreation facilities.
- The DNR will need to modify, tailor, and adapt existing outdoor recreation programs, services, and facilities to meet changed demands and to ensure visitor safety, security, and physical access.

Prepared by: Directions '91 Planning Team

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Environmental Education

TRENDS

In our increasingly urban society, many Minnesotans are becoming further removed from natural, ecological surroundings. Consequently, many lack even a basic understanding of environmental concepts, outdoor and life skills, or the ethical behavior and values associated with natural resources conservation.

- Education is increasingly recognized as the key to protecting and preserving Minnesota's environmental and natural resources over the long term.
- Nationally, an Environmental Education (EE) Act is being proposed to aid K-12 education systems in implementing EE.
- A state Strategic Plan for EE is being formulated to coordinate EE efforts of state agencies in both K-12 education and adult education.
- Creation of the Environmental Trust Fund in Minnesota emphasizes the increased public awareness and concern for environmental quality.
- Within the DNR, education efforts in the Bureau of Information and Education have greatly diminished.

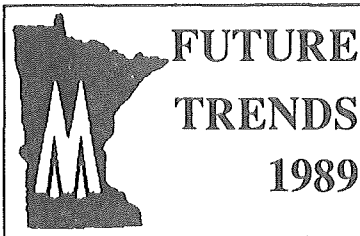
IMPLICATIONS

The state's formal education institutions cannot possibly reach all audiences, nor is Environmental Education required in Minnesota's schools beyond the elementary level. Increasingly, public and private agencies are being called upon to assist in efforts to provide environmental learning opportunities for all Minnesotans.

- Project Wild and Project Learning Tree programs help provide EE in formal and informal education settings. Park interpretive programs and other DNR educational programs need to be cognizant of EE inclusion. All DNR sponsored EE programs need continuing support.
- Statewide EE Coordination is needed to guide state agencies, including the DNR, and to help create and deliver quality EE programs.
- DNR personnel need to recognize the distinction between information and education. Each DNR Division needs to identify major user problems or public misconceptions and identify those that can be addressed through educational "packages" with clearly defined learner outcomes.
- EE involves addressing all the issues around a specific problem, encouraging people to study the issues and make wise decisions. Each DNR Division needs to study the complex issues involved in resource management, taking into account other Divisions' view points, public concerns, and economics, to make responsible environmental decisions.

Prepared by: Directions '91 Planning Team

For more information contact Karen VanNorman, Project Wild (297-2423), or Laura Noy, Project Learning Tree, (297-2214).



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Conflict Management

TRENDS

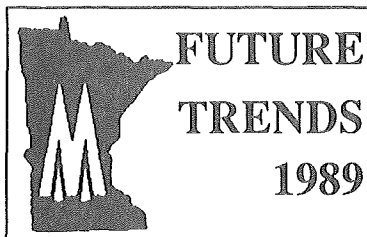
Since the mid-1970s, the techniques of negotiation and mediation have increasingly been applied to complex, controversial environmental disputes. These alternative approaches to litigation or administrative proceedings have been used to resolve conflicts regarding siting of highways, forest management, hazardous waste disposal, and water use. Federal and state agencies are also using negotiation in the development of policies and regulations. Currently, there is a trend to institutionalize negotiated or mediated approaches to conflict resolution, making their use part of standard management or administrative procedures.

- There is increased public scrutiny of resource management activities and regulatory enforcement as resource-oriented interest groups and concerned citizens seek to halt the loss or overuse of valuable natural resources. In an effort to more effectively respond to these concerns, DNR managers will be challenged on their objectives and methods.
- There is a growing expectation among major constituent and special interest groups that environmental disputes should be handled through cooperative negotiation instead of litigation.
- Approaches to negotiation will continue to change as people learn the value of "win-win" versus "win-lose" negotiations. DNR negotiators will be expected to participate effectively in consensus-building as groups seek dialogue instead of unilateral decisions.

IMPLICATIONS

Successful resource management and regulation in the arena of negotiation and dialogue will require DNR personnel at all levels of the agency to understand 1) the value and usefulness of consensus-based approaches to conflict management and 2) in which cases those approaches will be most effective.

- DNR staff who are required to participate in negotiations will need to be trained in the methods of interest-based, or win-win, negotiations so that Department interests can be promoted effectively.
- DNR managers and administrators will have to do an accurate job of conflict assessment and analysis and pre-negotiation planning so that the most appropriate conflict management technique is applied to a given situation to meet our needs and interests.
- Recognition and incentives should be provided to DNR staff who display competence in negotiations.
- The DNR will need to keep current in this expanding field as our constituents will increasingly demand innovative and cost-effective approaches to resolving environmental disputes.



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Mobility/Career Enhancement

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The changing composition and values of the workforce have implications for employee's career expectations. Simultaneously, organizations are undergoing changes such as flattening of the organization which may limit upward mobility opportunities. These changes in workforce and organizations apply to the DNR.

■ Along with these changes come changes in attitudes about work. Employees are questioning career loyalty versus loyalty to employer. Expectations of promotion, and career challenge are all undergoing changes. The mostly well-educated workforce of the DNR will reflect these attitudes.

■ The phenomenon of plateaued employees has been increasing due to the bulge of a "baby boom" employees all competing for limited promotional opportunities. The danger of employee burnout is ever increasing. The DNR has a high proportion of "baby boom" employees and will be impacted by this phenomenon.

■ Due to the increase of dual career employees, many employees are less willing to move geographically, are demanding worktime and workplace flexibility and may be experiencing work/family conflicts and stress. A high percentage of DNR employees have spouses who work outside the organization.

■ Organizations are increasingly flattening by eliminating many middle manager positions, by opening up the communications beyond the old chain-of-command style, and by creating autonomous work groups. The DNR will need to keep pace with organizational improvements to retain its valued employees.

■ Organizations are increasingly hiring specialists for very narrowly defined positions; many of which have limited career paths.

IMPLICATIONS

The DNR needs to create and foster alternative options for career movement. Organizational flexibility and opportunities for creativity and innovation need to be encouraged. The DNR needs to foster a flexible structure which enhances employee's freedom, enrichment and creativity to maintain a motivated and productive workforce.

■ Dual career paths, temporary mobility programs, and job enrichment programs will all be needed to address the plateauing issue.

■ Increased incentives and spousal services will be needed to encourage DNR employees to move geographically, especially to less desirable locations.

■ The DNR will need to train supervisors about career issues, work motivation and work/family issues in order for them to effectively work with their employees.

■ The DNR needs to expand its efforts to address the issue of innovation, and rewards and recognition.

Prepared by: **Directions '91 Planning Team**
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