Quicks

Jokes

Grand Canyon — 1903 - Grand Canyon - "Don't Change it, you can't improve it."

"1st use of square dial."
- square dial for Indian Soldier in Cuba.

May 6, 1903

June 4 Lincoln's

"To keep this great wonder of nature as it is now."

"Leave it as it is. You can not improve on it. The ages have been at work on it, and man can only mar it. What you can do is to keep it for

- 2 -

children. gr. c'o c's and all who come after you as one of the great, which every Am. if he can travel should see."

We have gotten past the stage my fellow c's, when we are to be pardoned if we treat any part of our country as something to be skinned for 2 or 3 yrs. for the use of the present generation, whether it is the forrest, the water, the scenery. Whatever it is, handle it so that your c's c will get the benefit of it."

POTUS

(Lange/Wallace)
June 7, 1989
9:15 a.m.
[DUCKS.DOC]

PRESIDENTIAL REMARKS: DUCKS UNLIMITED -- SIXTH INTERNATIONAL WATERFOWL SYMPOSIUM
CRYSTAL GATEWAY MARRIOTT
THURSDAY, JUNE 8, 1989
1:00 P.M.

Thank you, Harry. Ambassador Burney of Canada; Secretary Lujan; Secretary Reilly; members of Congress; friends. You know, when my grandson was 10 years old, we went fishing on Wyoming's Jackson Lake, the Tetons soaring up to the sky. A beautiful day, one you see on postcards. Everything sparkled. That day remains fixed in my mind.

It's true, our children <u>will</u> inherit the earth. So any vision of a kinder, gentler America -- any nation concerned about its quality of life, now and forever -- <u>must</u> be concerned about conservation. It will not be enough to merely halt the damage we've done. **Our natural heritage must be <u>recovered</u> and <u>restored</u>.**

We saw it at Mt. St. Helens -- we see it now in Yellowstone Park, and in the growth of Spring -- nature healing its wounds, coming back to life. We can and should be nature's advocate. That means an active stewardship of the natural world. It is time to renew the environmental ethic in America -- and to renew U.S. leadership on environmental issues, around the world. **Renewal is the way of nature. It must now become the way of man.**

And that's why I wanted to talk to you today. When this organization was founded over fifty years ago, in the Dust Bowl days, there was just a handful of you committed to preserving and restoring our wetlands. And just about that time, a few hunters got together and formed a little group called Ducks Unlimited. **Thank goodness they did.**

Since then, you've set aside over five million acres as habitat. Raised nearly half a billion dollars. Started wetlands projects in each of the fifty states. For a simple reason: 75 percent of the remaining wetlands in the continental U.S. are privately owned. **We can't do it without your help.**

The partnerships you've set up with state and federal agencies -- and with conservation groups like the Nature Conservancy and the National Wildlife Foundation -- have been outstanding.

That's good news for ducks. [[Let me warn you, though, anybody who looks like a duck... or walks like a duck... is going to hear from Dick Darman. The thought of "Ducks Unlimited" keeps him up at night.]] But your work is even better news for America. What you're doing represents just the kind of local, on-site, private-sector initiative we must bring to <u>every</u> environmental challenge.

As you know too well, our wetlands are being lost at a rate of nearly half a million acres a year. So every year, fewer mallards and pintails make it to the pothole country. You may remember my pledge, that our national goal would be no net loss of wetlands. **Together, we're going to deliver on the promise of renewal. I will keep that pledge.**

I've set up an Interagency Task Force, under the Domestic Policy Council, to work with you -- with government at all levels -- and with the private sector -- to stop the destruction of these precious habitats. Their first task is to develop a united federal policy for the North American Waterfowl Management Plan here, and in Canada. Canada has lost over 40 percent of her wetlands. **The time has come to say stop.**

To support the Plan, this week Secretary Lujan proposed a new trust fund -- using interest from the Pittman-Robertson Fund -- that would contribute about $10 million dollars. Our goal is to restore a fall flight of more than 100 million birds. We're looking at legislation from Senators Mitchell and Chaffee, and Congressmen Dingell and Conte. There are a few details to be worked out, but the basic thrust of the legislation is sound. **I look forward to signing a bill to conserve North American wetlands this year.**

We've asked for nearly $200 million in new funding for acquisitions under the Land and Water Conservation Fund. We've also increased funding for coordinated water quality programs, to protect the wetlands we already have. And, **for the first time in seven years, some of those dollars will go toward <u>acquiring</u> wetlands.**

But we're looking far beyond the federal role. We want to improve the management of federally-owned wetlands, by leasing them to concerned groups like yours. And, you know, the local momentum is picking up. Just last month, Maryland's Governor Schaefer approved the nation's first state non-tidal wetlands law. It's an outstanding piece of work. EPA Administrator Bill Reilly emerged as a key supporter for that bill -- and I'm encouraging him to do more.

We're working with American farmers through the Farm Bill program, to provide technical assistance for wetland conservation. Wherever wetlands <u>must</u> give way to farming or development, they will be replaced or expanded elsewhere. It's time to stand the history of wetlands destruction on its head: **from this year forward, anyone who tries to drain the swamp is going to be up to his ears in alligators.**

Let me spend a few minutes outlining our environmental philosophy. Our approach to wetlands conservation is driven by a

new kind of environmentalism -- a set of principles that apply to all of the environmental challenges we face. We believe that pollution is not the inevitable by-product of progress. So the first principle is that **sound ecology and a strong economy can coexist**. But let's remember: **the burden of proof is on man, not nature.**

The fact is, our ecology and the economy are interdependent. Environmentalists and entrepreneurs must see how much their interests are held in common. **It's time to harness the power of the marketplace in the service of the environment.**

The second principle is that a true commitment to restoring the nation's environment **requires more than just a federal commitment.** The tradition of purely federal, "top-down" directives will never again be enough. So we're working to promote more creative state and local initiatives, drawing the energy of local communities and the private sector into the cause of conservation. All of you in this room have made that commitment -- **now, it must be an all-American commitment.**

Our third principle is obvious, but too rarely acted upon: that **preventing pollution is a far more efficient strategy** than struggling to deal with problems once they've occurred. For too long, we've focused on clean-up and penalties after the damage is already done. It's time to re-orient ourselves using

technologies and processes that reduce or prevent pollution -- to stop it before it starts. **In the 1990s, pollution prevention will go right to the source.**

Technology has given us tremendous, awesome power to alter the face of the earth. We must use it to do good. Environmental soundness and industrial design must be partners. Industry is making -- and must continue to make -- environmental soundness **an essential fact of American industrial life.**

We've already taken several steps in that direction. As you know, I've called for the elimination of CFCs by the year 2000. We've also reviewed the Corporate Average Fuel Economy (CAFE) standards. We've tightened the standard, as the law originally intended. More efficient cars are good for our environment, and good for our energy security. We're going to promote the use of alternative, "neat" fuel technology. And I've proposed full funding to develop clean coal technology.

The fourth principle is a recognition that **environmental problems respect no borders.** So we're working with nations around the world, to provide leadership in finding cooperative, international solutions. From Japan to Brazil, we're discussing ways to reverse rainforest devastation. We've recommended a ban on international shipments of hazardous waste, unless an

agreement is signed that makes sure waste is disposed of safely. Even our recommendation to ban the importation of elephant ivory underscores this new international emphasis.

And in Germany two weeks ago, I announced our intention to provide technical assistance and new technologies to the nations of Eastern Europe, to help them handle pollution problems. Some of the rivers in those countries are now so polluted, they can't even be used for industrial cooling -- because they're too corrosive.

The fifth and final principle is that existing environmental laws will be **vigorously and firmly enforced.** I've requested funds to hire more environmental prosecutors at the Justice Department. And next week, Administrator Reilly will deliver to Congress a report on overhauling the Superfund Program for hazardous waste. Our message about environmental law is simple: **Polluters will pay.**

Finally, on Monday, I will unveil the most sweeping changes to the Clean Air Act since it was last amended twelve years ago. It will allow us to recover and restore precious forests, lakes, and streams. And whether Americans live near factories, in cities, or in high woodland country, **it will significantly improve <u>every</u> North American's quality of life.**

Behind all of the studies, the figures, and the debates, the environment is a moral issue. For it is wrong to pass on to future generations a world tainted by present thoughtlessness. It is unjust to allow the natural splendor bestowed to us to be compromised. It is imperative that we preserve the earth and all its blessings -- to **meet the challenge of renewal.**

Some forty years ago, a man named Aldo Leopold wrote a book some of you may have heard of. It was called A Sand County Almanac. In it, he talked about values -- values that I think you and I share. "That land is to be loved and respected," Leopold wrote, "is an extension of ethics." That was forty years ago. Since then, millions of acres of wetlands, habitat for so many plants and animals, have disappeared. And they continue to vanish at an alarming rate -- some one-half million acres a year.

I want to ask you today what the generations to follow will say of us forty years from now. It could be that they will report the loss of many million acres more. The extinction of species. The disappearance of wilderness and wildlife.

Or they could report something else. They could report that, sometime around 1989, things began to change. That we began to hold on to our parks and refuges. That we protected our species. And that, in that year, the seeds of a new policy about our valuable wetlands were sown -- a policy summed up in three

simple words: "**No net loss.**" I prefer the second vision of America's environmental future.

A man I greatly admire, Theodore Roosevelt, was the first President to act on that ideal. When he set aside the Grand Canyon as a national monument of nature, his words of warning were driven by great personal conviction. "Leave it as it is," he said. "You cannot improve on it. The ages have been at work on it, and man can only mar it. What you can do is to keep it -- for your children, and your children's children..."

Recovery, restoration, and renewal -- that is our moral imperative. From today forward, it is the ethical legacy we must inspire in every American.

To one of the great private sector organizations in America: I thank you. God bless you. And God bless the United States of America.

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[[ONE OF MY GREATEST PLEASURES IS GOING FISHING WITH MY GRANDCHILDREN. SEEING THE GRAND TETONS THROUGH THE EYES OF A TEN YEAR OLD GRANDSON, OR TEACHING OUR 6 YEAR OLD TWIN GRANDDAUGHTERS ABOUT THE WONDERS OF THE OCEAN, MAKES LIFE REALLY SING FOR ME. WHEN I AM OUT IN THE GREAT OUTDOORS WITH MY OWN KIDS OR GRANDKIDS, I REALIZE HOW TRUE IT IS, THAT OUR CHILDREN WILL INHERIT THE EARTH.]]

SO ANY VISION OF A KINDER, GENTLER AMERICA -- ANY NATION CONCERNED ABOUT ITS QUALITY OF LIFE, NOW AND FOREVER -- MUST BE CONCERNED ABOUT CONSERVATION. IT WILL NOT BE ENOUGH TO MERELY HALT THE DAMAGE WE'VE DONE. OUR NATURAL HERITAGE MUST BE RECOVERED AND RESTORED.

WE SAW IT AT MT. ST. HELENS -- WE SEE IT NOW IN YELLOWSTONE PARK, AND IN THE GROWTH OF SPRING -- NATURE HEALING ITS WOUNDS, COMING BACK TO LIFE.

WE CAN AND SHOULD BE NATURE'S ADVOCATE. THAT MEANS AN ACTIVE STEWARDSHIP OF THE NATURAL WORLD. IT IS TIME TO RENEW THE ENVIRONMENTAL ETHIC IN AMERICA -- AND TO RENEW U.S. LEADERSHIP ON ENVIRONMENTAL ISSUES, AROUND THE WORLD. RENEWAL IS THE WAY OF NATURE. IT MUST NOW BECOME THE WAY OF MAN.

AND THAT'S WHY I WANTED TO TALK TO YOU TODAY. WHEN THIS ORGANIZATION WAS FOUNDED OVER FIFTY YEARS AGO, IN THE DUST BOWL DAYS, THERE WAS JUST A HANDFUL OF YOU COMMITTED TO PRESERVING AND RESTORING OUR WETLANDS. AND JUST ABOUT THAT TIME, A FEW HUNTERS GOT TOGETHER AND FORMED A LITTLE GROUP CALLED DUCKS UNLIMITED. THANK GOODNESS THEY DID.

SINCE THEN, YOU'VE SET ASIDE OVER FIVE MILLION ACRES AS HABITAT. RAISED NEARLY HALF A BILLION DOLLARS. STARTED WETLANDS PROJECTS IN EACH OF THE FIFTY STATES. FOR A SIMPLE REASON: 75 PERCENT OF THE REMAINING WETLANDS IN THE CONTINENTAL U.S. ARE PRIVATELY OWNED. WE CAN'T DO IT WITHOUT YOUR HELP.

THE PARTNERSHIPS YOU'VE SET UP WITH STATE AND FEDERAL AGENCIES -- AND WITH CONSERVATION GROUPS LIKE THE NATURE CONSERVANCY AND THE NATIONAL WILDLIFE FOUNDATION -- HAVE BEEN OUTSTANDING.

THAT'S GOOD NEWS FOR DUCKS. REMEMBER, THOUGH, WHAT DICK DARMAN SAID ABOUT TAXES. ANYTHING THAT LOOKS LIKE A DUCK... OR WALKS LIKE A DUCK... IS GOING TO HEAR FROM DICK. [[POOR GUY. THE THOUGHT OF "DUCKS UNLIMITED" KEEPS HIM UP AT NIGHT.]]

BUT YOUR WORK IS EVEN BETTER NEWS FOR AMERICA. WHAT YOU'RE DOING REPRESENTS JUST THE KIND OF LOCAL, ON-SITE, PRIVATE-SECTOR INITIATIVE WE MUST BRING TO EVERY ENVIRONMENTAL CHALLENGE.

AS YOU KNOW TOO WELL, OUR WETLANDS ARE BEING LOST AT A RATE OF NEARLY HALF A MILLION ACRES A YEAR. SO EVERY YEAR, FEWER MALLARDS AND PINTAILS MAKE IT TO THE POTHOLE COUNTRY. YOU MAY REMEMBER MY PLEDGE, THAT OUR NATIONAL GOAL WOULD BE NO NET LOSS OF WETLANDS.

TOGETHER, WE'RE GOING TO DELIVER ON THE PROMISE OF RENEWAL. I WILL KEEP THAT PLEDGE.

I'VE SET UP AN INTERAGENCY TASK FORCE, UNDER THE DOMESTIC POLICY COUNCIL, TO WORK WITH YOU -- WITH GOVERNMENT AT ALL LEVELS -- AND WITH THE PRIVATE SECTOR -- TO STOP THE DESTRUCTION OF THESE PRECIOUS HABITATS.

THEIR FIRST TASK IS TO DEVELOP A UNITED FEDERAL POLICY FOR THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN HERE, AND IN CANADA. CANADA HAS LOST OVER 40 PERCENT OF HER WETLANDS. THE TIME HAS COME TO SAY STOP.

TO SUPPORT THE PLAN, THIS WEEK SECRETARY LUJAN PROPOSED A NEW TRUST FUND -- USING INTEREST FROM THE PITTMAN-ROBERTSON FUND -- THAT WOULD CONTRIBUTE ABOUT $10 MILLION DOLLARS. OUR GOAL IS TO RESTORE A FALL FLIGHT OF MORE THAN 100 MILLION BIRDS.

WE'RE LOOKING AT LEGISLATION FROM SENATORS MITCHELL AND CHAFFEE, AND CONGRESSMEN DINGELL AND CONTE. THERE ARE A FEW DETAILS TO BE WORKED OUT, BUT THE BASIC THRUST OF THE LEGISLATION IS SOUND. I LOOK FORWARD TO SIGNING A BILL TO CONSERVE NORTH AMERICAN WETLANDS THIS YEAR.

WE'VE ASKED FOR NEARLY $200 MILLION IN NEW FUNDING FOR ACQUISITIONS UNDER THE LAND AND WATER CONSERVATION FUND.

WE'VE ALSO INCREASED FUNDING FOR COORDINATED WATER QUALITY PROGRAMS, TO PROTECT THE WETLANDS WE ALREADY HAVE. AND, FOR THE FIRST TIME IN SEVEN YEARS, SOME OF THOSE DOLLARS WILL GO TOWARD ACQUIRING WETLANDS.

BUT WE'RE LOOKING FAR BEYOND THE FEDERAL ROLE. WE WANT TO IMPROVE THE MANAGEMENT OF FEDERALLY-OWNED WETLANDS, BY LEASING THEM TO CONCERNED GROUPS LIKE YOURS.

AND, YOU KNOW, THE LOCAL MOMENTUM IS PICKING UP. JUST LAST MONTH, MARYLAND'S GOVERNOR SCHAEFER APPROVED THE NATION'S FIRST STATE NON-TIDAL WETLANDS LAW. IT'S AN OUTSTANDING PIECE OF WORK. EPA ADMINISTRATOR BILL REILLY EMERGED AS A KEY SUPPORTER FOR THAT BILL -- AND I'M ENCOURAGING HIM TO DO MORE.

WE'RE WORKING WITH AMERICAN FARMERS THROUGH THE FARM BILL PROGRAM, TO PROVIDE TECHNICAL ASSISTANCE FOR WETLAND CONSERVATION.

WHEREVER WETLANDS MUST GIVE WAY TO FARMING OR DEVELOPMENT, THEY WILL BE REPLACED OR EXPANDED ELSEWHERE. IT'S TIME TO STAND THE HISTORY OF WETLANDS DESTRUCTION ON ITS HEAD: FROM THIS YEAR FORWARD, ANYONE WHO TRIES TO DRAIN THE SWAMP IS GOING TO BE UP TO HIS EARS IN ALLIGATORS.

LET ME SPEND A FEW MINUTES OUTLINING OUR ENVIRONMENTAL PHILOSOPHY. OUR APPROACH TO WETLANDS CONSERVATION IS DRIVEN BY A NEW KIND OF ENVIRONMENTALISM -- A SET OF PRINCIPLES THAT APPLY TO ALL OF THE ENVIRONMENTAL CHALLENGES WE FACE. WE BELIEVE THAT POLLUTION IS NOT THE INEVITABLE BY-PRODUCT OF PROGRESS. SO THE FIRST PRINCIPLE IS THAT SOUND ECOLOGY AND A STRONG ECONOMY CAN COEXIST. BUT LET'S REMEMBER: THE BURDEN OF PROOF IS ON MAN, NOT NATURE.

THE FACT IS, OUR ECOLOGY AND THE ECONOMY ARE INTERDEPENDENT. ENVIRONMENTALISTS AND ENTREPRENEURS MUST SEE HOW MUCH THEIR INTERESTS ARE HELD IN COMMON. IT'S TIME TO HARNESS THE POWER OF THE MARKETPLACE IN THE SERVICE OF THE ENVIRONMENT.

THE SECOND PRINCIPLE IS THAT A TRUE COMMITMENT TO RESTORING THE NATION'S ENVIRONMENT REQUIRES MORE THAN JUST A FEDERAL COMMITMENT.

THE TRADITION OF PURELY FEDERAL, "TOP-DOWN" DIRECTIVES WILL NEVER AGAIN BE ENOUGH. SO WE'RE WORKING TO PROMOTE MORE CREATIVE STATE AND LOCAL INITIATIVES, DRAWING THE ENERGY OF LOCAL COMMUNITIES AND THE PRIVATE SECTOR INTO THE CAUSE OF CONSERVATION. ALL OF YOU IN THIS ROOM HAVE MADE THAT COMMITMENT -- NOW, IT MUST BE AN ALL-AMERICAN COMMITMENT.

OUR THIRD PRINCIPLE IS OBVIOUS, BUT TOO RARELY ACTED UPON: THAT PREVENTING POLLUTION IS A FAR MORE EFFICIENT STRATEGY THAN STRUGGLING TO DEAL WITH PROBLEMS ONCE THEY'VE OCCURRED. FOR TOO LONG, WE'VE FOCUSED ON CLEAN-UP AND PENALTIES AFTER THE DAMAGE IS ALREADY DONE.

IT'S TIME TO RE-ORIENT OURSELVES USING TECHNOLOGIES AND PROCESSES THAT REDUCE OR PREVENT POLLUTION -- TO STOP IT BEFORE IT STARTS. IN THE 1990S, POLLUTION PREVENTION WILL GO RIGHT TO THE SOURCE.

TECHNOLOGY HAS GIVEN US TREMENDOUS, AWESOME POWER TO ALTER THE FACE OF THE EARTH. WE MUST USE IT TO DO GOOD. ENVIRONMENTAL SOUNDNESS AND INDUSTRIAL DESIGN MUST BE PARTNERS.

INDUSTRY IS MAKING -- AND MUST CONTINUE TO MAKE -- ENVIRONMENTAL SOUNDNESS AN ESSENTIAL FACT OF AMERICAN INDUSTRIAL LIFE.

WE'VE ALREADY TAKEN SEVERAL STEPS IN THAT DIRECTION. AS YOU KNOW, I'VE CALLED FOR THE ELIMINATION OF CFC'S BY THE YEAR 2000. WE'VE ALSO REVIEWED THE CORPORATE AVERAGE FUEL ECONOMY (CAFE) STANDARDS. WE'VE TIGHTENED THE STANDARD, AS THE LAW ORIGINALLY INTENDED.

MORE EFFICIENT CARS ARE GOOD FOR OUR ENVIRONMENT, AND GOOD FOR OUR ENERGY SECURITY. WE'RE GOING TO PROMOTE THE USE OF ALTERNATIVE, "NEAT" FUEL TECHNOLOGY. AND I'VE PROPOSED FULL FUNDING TO DEVELOP CLEAN COAL TECHNOLOGY.

THE FOURTH PRINCIPLE IS A RECOGNITION THAT ENVIRONMENTAL PROBLEMS RESPECT NO BORDERS. SO WE'RE WORKING WITH NATIONS AROUND THE WORLD, TO PROVIDE LEADERSHIP IN FINDING COOPERATIVE, INTERNATIONAL SOLUTIONS. FROM JAPAN TO BRAZIL, WE'RE DISCUSSING WAYS TO REVERSE RAINFOREST DEVASTATION. WE'VE RECOMMENDED A BAN ON INTERNATIONAL SHIPMENTS OF HAZARDOUS WASTE, UNLESS AN AGREEMENT IS SIGNED THAT MAKES SURE WASTE IS DISPOSED OF SAFELY.

IN GERMANY TWO WEEKS AGO, I ANNOUNCED OUR INTENTION TO PROVIDE TECHNICAL ASSISTANCE AND NEW TECHNOLOGIES TO THE NATIONS OF EASTERN EUROPE, TO HELP THEM HANDLE POLLUTION PROBLEMS. SOME OF THE RIVERS IN THOSE COUNTRIES ARE NOW SO POLLUTED, THEY CAN'T EVEN BE USED FOR INDUSTRIAL COOLING -- BECAUSE THEY'RE TOO CORROSIVE. AND EVEN OUR RECOMMENDATION TO BAN THE IMPORTATION OF ELEPHANT IVORY UNDERSCORES THIS NEW INTERNATIONAL EMPHASIS.

THE FIFTH AND FINAL PRINCIPLE IS THAT EXISTING ENVIRONMENTAL LAWS WILL BE VIGOROUSLY AND FIRMLY ENFORCED. I'VE REQUESTED FUNDS TO HIRE MORE ENVIRONMENTAL PROSECUTORS AT THE JUSTICE DEPARTMENT. AND NEXT WEEK, ADMINISTRATOR REILLY WILL DELIVER TO CONGRESS A REPORT ON OVERHAULING THE SUPERFUND PROGRAM FOR HAZARDOUS WASTE. OUR MESSAGE ABOUT ENVIRONMENTAL LAW IS SIMPLE: POLLUTERS WILL PAY.

FINALLY, ON MONDAY, I WILL UNVEIL THE MOST SWEEPING CHANGES TO THE CLEAN AIR ACT SINCE IT WAS LAST AMENDED TWELVE YEARS AGO. IT WILL ALLOW US TO RECOVER AND RESTORE PRECIOUS FORESTS, LAKES, AND STREAMS. AND WHETHER AMERICANS LIVE NEAR FACTORIES, IN CITIES, OR IN HIGH WOODLAND COUNTRY, IT WILL SIGNIFICANTLY IMPROVE EVERY NORTH AMERICAN'S QUALITY OF LIFE.

SO THOSE ARE OUR FIVE PRINCIPLES: HARNESSING THE POWER OF THE MARKETPLACE; STATE AND LOCAL INITIATIVE; PROMOTING PREVENTION; INTERNATIONAL COOPERATION; AND STRICT ENFORCEMENT. BUT BEHIND ALL OF THE STUDIES, THE FIGURES, AND THE DEBATES, THE ENVIRONMENT IS A MORAL ISSUE. FOR IT IS WRONG TO PASS ON TO FUTURE GENERATIONS A WORLD TAINTED BY PRESENT THOUGHTLESSNESS. IT IS UNJUST TO ALLOW THE NATURAL SPLENDOR BESTOWED TO US TO BE COMPROMISED.

IT IS IMPERATIVE THAT WE PRESERVE THE EARTH AND ALL ITS BLESSINGS -- TO MEET THE CHALLENGE OF RENEWAL.

SOME FORTY YEARS AGO, A MAN NAMED ALDO LEOPOLD WROTE A BOOK SOME OF YOU MAY HAVE HEARD OF. IT WAS CALLED A SAND COUNTY ALMANAC. IN IT, HE TALKED ABOUT VALUES -- VALUES THAT I THINK YOU AND I SHARE. "THAT LAND IS TO BE LOVED AND RESPECTED," LEOPOLD WROTE, "IS AN EXTENSION OF ETHICS." THAT WAS FORTY YEARS AGO.

SINCE THEN, MILLIONS OF ACRES OF WETLANDS, HABITAT FOR SO MANY PLANTS AND ANIMALS, HAVE DISAPPEARED. AND THEY CONTINUE TO VANISH AT AN ALARMING RATE -- SOME ONE-HALF MILLION ACRES A YEAR. I WANT TO ASK YOU TODAY WHAT THE GENERATIONS TO FOLLOW WILL SAY OF US FORTY YEARS FROM NOW. IT COULD BE THAT THEY WILL REPORT THE LOSS OF MANY MILLION ACRES MORE. THE EXTINCTION OF SPECIES. THE DISAPPEARANCE OF WILDERNESS AND WILDLIFE.

OR THEY COULD REPORT SOMETHING ELSE. THEY COULD REPORT THAT, SOMETIME AROUND 1989, THINGS BEGAN TO CHANGE. THAT WE BEGAN TO HOLD ON TO OUR PARKS AND REFUGES. THAT WE PROTECTED OUR SPECIES. AND THAT, IN THAT YEAR, THE SEEDS OF A NEW POLICY ABOUT OUR VALUABLE WETLANDS WERE SOWN -- A POLICY SUMMED UP IN THREE SIMPLE WORDS: "NO NET LOSS." I PREFER THE SECOND VISION OF AMERICA'S ENVIRONMENTAL FUTURE.

A MAN I GREATLY ADMIRE, THEODORE ROOSEVELT, WAS THE FIRST PRESIDENT TO ACT ON THAT IDEAL. WHEN HE SET ASIDE THE GRAND CANYON AS A NATIONAL MONUMENT OF NATURE, HIS WORDS OF WARNING WERE DRIVEN BY GREAT PERSONAL CONVICTION. "LEAVE IT AS IT IS," HE SAID. "YOU CANNOT IMPROVE ON IT. THE AGES HAVE BEEN AT WORK ON IT, AND MAN CAN ONLY MAR IT. WHAT YOU CAN DO IS TO KEEP IT --FOR YOUR CHILDREN, AND YOUR CHILDREN'S CHILDREN..."

RECOVERY, RESTORATION, AND RENEWAL -- THAT IS OUR MORAL IMPERATIVE. FROM TODAY FORWARD, IT IS THE ETHICAL LEGACY WE MUST INSPIRE IN EVERY AMERICAN.

TO ONE OF THE GREAT PRIVATE SECTOR ORGANIZATIONS IN AMERICA: I THANK YOU. GOD BLESS YOU. AND GOD BLESS THE UNITED STATES OF AMERICA.

# # #

- National airport
U.S. Air #497 - 12:35

Michael DeLand - E.P.A.
(617) 565-3715
FTS 835-3400

Dave Struse
Connie

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Mike DeLAND
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Frank Bracken
Undersec. Interior
in Senate

Constance Herman
Assistant Sec.
Interior
- Senate

EPA

Mariam Bach
Acting
Science + Wate

Get

- Leadership in technology? - Juanita Deegan
- Groups + Members - Nancy
- ~~Wetlands - Low Levels Budget~~
- ~~Legislation - Pollution Prevention~~ - Nancy / Grady

= $206 m land + water conservation?
Budget message

Proj. 88 - using

John Heinz Env. Defense Fund.
Jean Wirth

Harvard's Kennedy School

- Protection - agreed levels

- Leadership
Clean Coal Technology
Op for Am + Am Labs for us to
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Enable us + all nations to keep growing
opportunity to be tech leader in helping

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SINCE THEN, YOU'VE SET ASIDE OVER FIVE MILLION ACRES AS HABITAT. RAISED NEARLY HALF A BILLION DOLLARS. STARTED WETLANDS PROJECTS IN EACH OF THE FIFTY STATES. FOR A SIMPLE REASON: 75 PERCENT OF THE REMAINING WETLANDS IN THE CONTINENTAL U.S. ARE PRIVATELY OWNED. **WE CAN'T DO IT WITHOUT YOUR HELP.**

THE PARTNERSHIPS YOU'VE SET UP WITH STATE AND FEDERAL AGENCIES -- AND WITH CONSERVATION GROUPS LIKE THE NATURE CONSERVANCY AND THE NATIONAL WILDLIFE FOUNDATION -- HAVE BEEN OUTSTANDING.

THAT'S GOOD NEWS FOR DUCKS. REMEMBER, THOUGH, WHAT DICK DARMAN SAID ABOUT TAXES. ANYTHING THAT LOOKS LIKE A DUCK... OR WALKS LIKE A DUCK... IS GOING TO HEAR FROM DICK. [[POOR GUY. THE THOUGHT OF "DUCKS UNLIMITED" KEEPS HIM UP AT NIGHT.]] BUT YOUR WORK IS EVEN BETTER NEWS FOR AMERICA. WHAT YOU'RE DOING REPRESENTS JUST THE KIND OF LOCAL, ON-SITE, PRIVATE-SECTOR INITIATIVE WE MUST BRING TO EVERY ENVIRONMENTAL CHALLENGE.

AS YOU KNOW TOO WELL, OUR WETLANDS ARE BEING LOST AT A RATE OF NEARLY HALF A MILLION ACRES A YEAR. SO EVERY YEAR, FEWER MALLARDS AND PINTAILS MAKE IT TO THE POTHOLE COUNTRY. YOU MAY REMEMBER MY PLEDGE, THAT OUR NATIONAL GOAL WOULD BE NO NET LOSS OF WETLANDS. **TOGETHER, WE'RE GOING TO DELIVER ON THE PROMISE OF RENEWAL. I WILL KEEP THAT PLEDGE.**

I'VE SET UP AN INTERAGENCY TASK FORCE, UNDER THE DOMESTIC POLICY COUNCIL, TO WORK WITH YOU -- WITH GOVERNMENT AT ALL LEVELS -- AND WITH THE PRIVATE SECTOR -- TO STOP THE DESTRUCTION OF THESE PRECIOUS HABITATS. THEIR FIRST TASK IS TO DEVELOP A UNITED FEDERAL POLICY FOR THE NORTH AMERICAN WATERFOWL MANAGEMENT PLAN HERE, AND IN CANADA. CANADA HAS LOST OVER 40 PERCENT OF HER WETLANDS. **THE TIME HAS COME TO SAY STOP.**

TO SUPPORT THE PLAN, THIS WEEK SECRETARY LUJAN PROPOSED A NEW TRUST FUND -- USING INTEREST FROM THE PITTMAN-ROBERTSON FUND -- THAT WOULD CONTRIBUTE ABOUT $10 MILLION DOLLARS. OUR GOAL IS TO RESTORE A FALL FLIGHT OF MORE THAN 100 MILLION BIRDS. WE'RE LOOKING AT LEGISLATION FROM SENATORS MITCHELL AND CHAFFEE, AND CONGRESSMEN DINGELL AND CONTE. THERE ARE A FEW DETAILS TO BE WORKED OUT, BUT THE BASIC THRUST OF THE LEGISLATION IS SOUND. **I LOOK FORWARD TO SIGNING A BILL TO CONSERVE NORTH AMERICAN WETLANDS THIS YEAR.**

WE'VE ASKED FOR NEARLY $200 MILLION IN NEW FUNDING FOR ACQUISITIONS UNDER THE LAND AND WATER CONSERVATION FUND. WE'VE ALSO INCREASED FUNDING FOR COORDINATED WATER QUALITY PROGRAMS, TO PROTECT THE WETLANDS WE ALREADY HAVE. AND, **FOR THE FIRST TIME IN SEVEN YEARS, SOME OF THOSE DOLLARS WILL GO TOWARD ACQUIRING WETLANDS.**

BUT WE'RE LOOKING FAR BEYOND THE FEDERAL ROLE. WE WANT TO IMPROVE THE MANAGEMENT OF FEDERALLY-OWNED WETLANDS, BY LEASING THEM TO CONCERNED GROUPS LIKE YOURS. AND, YOU KNOW, THE LOCAL MOMENTUM IS PICKING UP. JUST LAST MONTH, MARYLAND'S GOVERNOR SCHAEFER APPROVED THE NATION'S FIRST STATE NON-TIDAL WETLANDS LAW. IT'S AN OUTSTANDING PIECE OF WORK. EPA ADMINISTRATOR BILL REILLY EMERGED AS A KEY SUPPORTER FOR THAT BILL -- AND I'M ENCOURAGING HIM TO DO MORE.

WE'RE WORKING WITH AMERICAN FARMERS THROUGH THE FARM BILL PROGRAM, TO PROVIDE TECHNICAL ASSISTANCE FOR WETLAND CONSERVATION. WHEREVER WETLANDS MUST GIVE WAY TO FARMING OR DEVELOPMENT, THEY WILL BE REPLACED OR EXPANDED ELSEWHERE. IT'S TIME TO STAND THE HISTORY OF WETLANDS DESTRUCTION ON ITS HEAD: **FROM THIS YEAR FORWARD, ANYONE WHO TRIES TO DRAIN THE SWAMP IS GOING TO BE UP TO HIS EARS IN ALLIGATORS.**

LET ME SPEND A FEW MINUTES OUTLINING OUR ENVIRONMENTAL PHILOSOPHY. OUR APPROACH TO WETLANDS CONSERVATION IS DRIVEN BY A NEW KIND OF ENVIRONMENTALISM -- A SET OF PRINCIPLES THAT APPLY TO ALL OF THE ENVIRONMENTAL CHALLENGES WE FACE. WE BELIEVE THAT POLLUTION IS NOT THE INEVITABLE BY-PRODUCT OF PROGRESS. SO THE FIRST PRINCIPLE IS THAT **SOUND ECOLOGY AND A STRONG ECONOMY CAN COEXIST.** BUT LET'S REMEMBER: **THE BURDEN OF PROOF IS ON MAN, NOT NATURE.**

THE FACT IS, OUR ECOLOGY AND THE ECONOMY ARE INTERDEPENDENT. ENVIRONMENTALISTS AND ENTREPRENEURS MUST SEE HOW MUCH THEIR INTERESTS ARE HELD IN COMMON. **IT'S TIME TO HARNESS THE POWER OF THE MARKETPLACE IN THE SERVICE OF THE ENVIRONMENT.**

THE SECOND PRINCIPLE IS THAT A TRUE COMMITMENT TO RESTORING THE NATION'S ENVIRONMENT **REQUIRES MORE THAN JUST A FEDERAL COMMITMENT.** THE TRADITION OF PURELY FEDERAL, "TOP-DOWN" DIRECTIVES WILL NEVER AGAIN BE ENOUGH. SO WE'RE WORKING TO PROMOTE MORE CREATIVE STATE AND LOCAL INITIATIVES, DRAWING THE ENERGY OF LOCAL COMMUNITIES AND THE PRIVATE SECTOR INTO THE CAUSE OF CONSERVATION. ALL OF YOU IN THIS ROOM HAVE MADE THAT COMMITMENT -- **NOW, IT MUST BE AN ALL-AMERICAN COMMITMENT.**

OUR THIRD PRINCIPLE IS OBVIOUS, BUT TOO RARELY ACTED UPON: THAT **PREVENTING POLLUTION IS A FAR MORE EFFICIENT STRATEGY** THAN STRUGGLING TO DEAL WITH PROBLEMS ONCE THEY'VE OCCURRED. FOR TOO LONG, WE'VE FOCUSED ON CLEAN-UP AND PENALTIES AFTER THE DAMAGE IS ALREADY DONE. IT'S TIME TO RE-ORIENT OURSELVES USING TECHNOLOGIES AND PROCESSES THAT REDUCE OR <u>PREVENT</u> POLLUTION -- TO STOP IT BEFORE IT STARTS. **IN THE 1990S, POLLUTION PREVENTION WILL GO RIGHT TO THE SOURCE.**

TECHNOLOGY HAS GIVEN US TREMENDOUS, AWESOME POWER TO ALTER THE FACE OF THE EARTH. WE MUST USE IT TO DO GOOD. ENVIRONMENTAL SOUNDNESS AND INDUSTRIAL DESIGN MUST BE PARTNERS. INDUSTRY IS MAKING -- AND MUST CONTINUE TO MAKE -- ENVIRONMENTAL SOUNDNESS **AN ESSENTIAL FACT OF AMERICAN INDUSTRIAL LIFE.**

WE'VE ALREADY TAKEN SEVERAL STEPS IN THAT DIRECTION. AS YOU KNOW, I'VE CALLED FOR THE ELIMINATION OF CFC'S BY THE YEAR 2000. WE'VE ALSO REVIEWED THE CORPORATE AVERAGE FUEL ECONOMY (CAFE) STANDARDS. WE'VE TIGHTENED THE STANDARD, AS THE LAW ORIGINALLY INTENDED. MORE EFFICIENT CARS ARE GOOD FOR OUR ENVIRONMENT, AND GOOD FOR OUR ENERGY SECURITY. WE'RE GOING TO PROMOTE THE USE OF ALTERNATIVE, "NEAT" FUEL TECHNOLOGY. AND I'VE PROPOSED FULL FUNDING TO DEVELOP CLEAN COAL TECHNOLOGY.

THE FOURTH PRINCIPLE IS A RECOGNITION THAT **ENVIRONMENTAL PROBLEMS RESPECT NO BORDERS.** SO WE'RE WORKING WITH NATIONS AROUND THE WORLD, TO PROVIDE LEADERSHIP IN FINDING COOPERATIVE, INTERNATIONAL SOLUTIONS. FROM JAPAN TO BRAZIL, WE'RE DISCUSSING WAYS TO REVERSE RAINFOREST DEVASTATION. WE'VE RECOMMENDED A BAN ON INTERNATIONAL SHIPMENTS OF HAZARDOUS WASTE, UNLESS AN AGREEMENT IS SIGNED THAT MAKES SURE WASTE IS DISPOSED OF SAFELY.

IN GERMANY TWO WEEKS AGO, I ANNOUNCED OUR INTENTION TO PROVIDE TECHNICAL ASSISTANCE AND NEW TECHNOLOGIES TO THE NATIONS OF EASTERN EUROPE, TO HELP THEM HANDLE POLLUTION PROBLEMS. SOME OF THE RIVERS IN THOSE COUNTRIES ARE NOW SO POLLUTED, THEY CAN'T EVEN BE USED FOR INDUSTRIAL COOLING -- BECAUSE THEY'RE TOO CORROSIVE. AND EVEN OUR RECOMMENDATION TO BAN THE IMPORTATION OF ELEPHANT IVORY UNDERSCORES THIS NEW INTERNATIONAL EMPHASIS.

THE FIFTH AND FINAL PRINCIPLE IS THAT EXISTING ENVIRONMENTAL LAWS WILL BE **VIGOROUSLY AND FIRMLY ENFORCED.** I'VE REQUESTED FUNDS TO HIRE MORE ENVIRONMENTAL PROSECUTORS AT THE JUSTICE DEPARTMENT. AND NEXT WEEK, ADMINISTRATOR REILLY WILL DELIVER TO CONGRESS A REPORT ON OVERHAULING THE SUPERFUND PROGRAM FOR HAZARDOUS WASTE. OUR MESSAGE ABOUT ENVIRONMENTAL LAW IS SIMPLE: **POLLUTERS WILL PAY.**

FINALLY, ON MONDAY, I WILL UNVEIL THE MOST SWEEPING CHANGES TO THE CLEAN AIR ACT SINCE IT WAS LAST AMENDED TWELVE YEARS AGO. IT WILL ALLOW US TO RECOVER AND RESTORE PRECIOUS FORESTS, LAKES, AND STREAMS. AND WHETHER AMERICANS LIVE NEAR FACTORIES, IN CITIES, OR IN HIGH WOODLAND COUNTRY, **IT WILL SIGNIFICANTLY IMPROVE <u>EVERY</u> NORTH AMERICAN'S QUALITY OF LIFE.**

SO THOSE ARE OUR FIVE PRINCIPLES: <u>HARNESSING THE POWER OF THE MARKETPLACE; STATE AND LOCAL INITIATIVE; PROMOTING PREVENTION; INTERNATIONAL COOPERATION</u>; AND <u>STRICT ENFORCEMENT</u>.

BUT BEHIND ALL OF THE STUDIES, THE FIGURES, AND THE DEBATES, THE ENVIRONMENT IS A MORAL ISSUE. FOR IT IS WRONG TO PASS ON TO FUTURE GENERATIONS A WORLD TAINTED BY PRESENT THOUGHTLESSNESS. IT IS UNJUST TO ALLOW THE NATURAL SPLENDOR BESTOWED TO US TO BE COMPROMISED. IT IS IMPERATIVE THAT WE PRESERVE THE EARTH AND ALL ITS BLESSINGS -- TO **MEET THE CHALLENGE OF RENEWAL.**

SOME FORTY YEARS AGO, A MAN NAMED ALDO LEOPOLD WROTE A BOOK SOME OF YOU MAY HAVE HEARD OF. IT WAS CALLED A SAND COUNTY ALMANAC. IN IT, HE TALKED ABOUT VALUES -- VALUES THAT I THINK YOU AND I SHARE. "THAT LAND IS TO BE LOVED AND RESPECTED," LEOPOLD WROTE, "IS AN EXTENSION OF ETHICS." THAT WAS FORTY YEARS AGO. such! SINCE THEN, MILLIONS OF ACRES OF WETLANDS, HABITAT FOR SO MANY PLANTS AND ANIMALS, HAVE DISAPPEARED. AND THEY CONTINUE TO VANISH AT AN ALARMING RATE -- SOME ONE-HALF MILLION ACRES A YEAR.

I WANT TO ASK YOU TODAY WHAT THE GENERATIONS TO FOLLOW WILL SAY OF US FORTY YEARS FROM NOW. IT COULD BE THAT THEY WILL REPORT THE LOSS OF MANY MILLION ACRES MORE. THE EXTINCTION OF SPECIES. THE DISAPPEARANCE OF WILDERNESS AND WILDLIFE.

OR THEY COULD REPORT SOMETHING ELSE. THEY COULD REPORT THAT, SOMETIME AROUND 1989, THINGS BEGAN TO CHANGE. THAT WE BEGAN TO HOLD ON TO OUR PARKS AND REFUGES. THAT WE PROTECTED OUR SPECIES. AND THAT, IN THAT YEAR, THE SEEDS OF A NEW POLICY ABOUT OUR VALUABLE WETLANDS WERE SOWN -- A POLICY SUMMED UP IN THREE SIMPLE WORDS: **"NO NET LOSS."** I PREFER THE SECOND VISION OF AMERICA'S ENVIRONMENTAL FUTURE.

A MAN I GREATLY ADMIRE, THEODORE ROOSEVELT, WAS THE FIRST PRESIDENT TO ACT ON THAT IDEAL. WHEN HE SET ASIDE THE GRAND CANYON AS A NATIONAL MONUMENT OF NATURE, HIS WORDS OF WARNING WERE DRIVEN BY GREAT PERSONAL CONVICTION. "LEAVE IT AS IT IS," HE SAID. "YOU CANNOT IMPROVE ON IT. THE AGES HAVE BEEN AT WORK ON IT, AND MAN CAN ONLY MAR IT. WHAT YOU CAN DO IS TO KEEP IT --FOR YOUR CHILDREN, AND YOUR CHILDREN'S CHILDREN..."

RECOVERY, RESTORATION, AND RENEWAL -- THAT IS OUR MORAL IMPERATIVE. FROM TODAY FORWARD, IT IS THE ETHICAL LEGACY WE MUST INSPIRE IN EVERY AMERICAN.

TO ONE OF THE GREAT PRIVATE SECTOR ORGANIZATIONS IN AMERICA: I THANK YOU. GOD BLESS YOU. AND GOD BLESS THE UNITED STATES OF AMERICA.

# # #

A NOTE FROM: 

Jack Lorenz
Executive Director

6/5/89

TO KATHY IRAVONS

Hi Kathy –

attached are a League report on possible impacts of acid rain on Duck – plus three scientific reports, which back up our concerns.

This data may be useful in preparing the President's remarks to the DU symposium and/or future statements re acid rain.

Regards,

Jack

Acid Precipitation Effects on Forest Habitats: Implications for Wildlife

See Pgs 253, 254

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Abstract: *Forests ecosystems, with their stratified structure, provide a diversity of habitats for a variety of animals. The influence of acidic deposition on forests is being studied intensely, and preliminary research indicates that some forest resources are being affected. These effects and the potential for subsequent change in forest structure and function imply that an impact on the wildlife inhabitants is occurring. In most cases, these impacts are not direct, but instead reflect modifications of habitat and changes in trophic relationships. Detecting changes distinguishable from normal spatiotemporal variations in animal populations is difficult. The net result over time may be reductions or shifts in populations and species composition. This paper provides an overview of current information on the impact of acidic deposition on forest resources as it relates to animals.*

Resume: *Los Ecosistemas Forestales, con su estructura estratificada, proveen una diversidad de habitats a una variedad de animales. La influencia de depósitos acídicos en la selva está siendo estudiada intensamente, e investigaciones preliminares demuestran que algunos recursos forestales están siendo afectados. Estos efectos y el potencial cambio subsequente en la estructura y función del bosque implican que la vida silvestre está sufriendo un impacto. En la mayoría de los casos, estos impactos no son directos pero reflejan, en cambio, modificaciones del habitat y cambios en interrelaciones tróficas. La detección de cambios diferentes a variaciones espacio-temporales normales en poblaciones animales es difícil. El resultado neto bajo un período de tiempo puede ser reducciones o cambios en la composición de especies y poblaciones. Este informe provee un diagnóstico de la información vigente sobre el impacto que los depósitos acídicos tienen en los recursos forestales en cuanto a su relación con los animales.*

Introduction

Acid deposition continues to be a controversial subject that presents a number of unanswered questions (Baker 1987; Baker et al. 1987; Huckabee et al. in press). A review of the major ecosystem-level studies in North America involving acid deposition quickly establishes that the primary research emphasis has been on forests and aquatic systems (Table 1; Schreiber & Newman 1987). In these research programs, few studies investigate effects on animals (Schreiber & Villella 1985). A 1983 inventory of research on acid deposition and forest effects in the United States showed no specific research directed toward terrestrial wildlife (General Research Corporation 1983). More recently however, new research has been initiated on acidification and wildlife, particularly in reference to water birds (McCabe 1987).

In Scandinavia, where much of the initial acid rain

Table 1. Major ecosystem studies on the effects of air emissions in North America.

Name of study	Ecosystem (location)	Pollutant stress
Experimental Lakes Area (ELA) Watershed Studies	Northern coniferous forest (Ontario)	Acid deposition
Turkey Lake Forest Watershed Study	Northern deciduous forest (Ontario)	Acid deposition
Dorset Watershed Studies	Northern forest (Ontario)	Acid deposition
Montmorency Experimental Forest Study	Northern coniferous forest and associated lakes (Quebec)	Acid deposition
Kejimkujik Calibrated Catchment Program	Northern coniferous forest (Nova Scotia)	Acid deposition
Kaybob Gas Plant Study	Transition montane boreal forest (Alberta)	SO_2
San Bernadino Mountain Study	Mixed coniferous forest (California)	Oxidants
Hubbard Brook Ecosystem Project	Northern mixed deciduous coniferous forest (New Hampshire)	Atmospheric deposition including acid and trace element
Walker Branch Watershed Study	Mixed deciduous forest (TN)	Atmospheric deposition, including acid and trace element
Whitecourt Gas Plant Study	Mixed coniferous forest (Alberta)	SO_2
Integrated Lake-Watershed Acidification study (ILWAS)	Northeastern deciduous forest (New York)	Acid deposition

From Newman & Schreiber, 1984.

research was conducted, little effort has been made to investigate wildlife effects (e.g., Overrein, Seip, & Tollan 1980). The exception has been studies conducted in Sweden on the effects of freshwater acidification on birds (Eriksson 1987). In Poland and Czechoslovakia, there are several field programs to investigate the effects of industrial air emissions on forest animals. Although these projects do not deal with acid precipitation specifically, the information represents some useful examples of the direct and indirect effects of airborne pollutants on wildlife (Newman 1980).

Canadian research on long-range transport of air pollutants and acidic precipitation includes relatively few projects on terrestrial animals. There have been selected studies on amphibians, insectivorous birds, and some work on metal accumulation (Ontario Ministry of the Environment 1986). Limited research has been conducted on the effects of acid precipitation on wetland-dwelling wildlife (Blancher & McNicol 1986) and aquatic birds (e.g., DesGranges & Darveau 1985).

In the United States, a number of projects in the National Acid Precipitation Assessment Program (NAPAP) are developing information on forest ecosystem response to acidic deposition, but few projects deal specifically with animals using these habitats (ODR 1987). The few exceptions are the studies conducted on amphibians and waterfowl (e.g., Freda & Dunson 1985; Hunter et al. 1985) and reports summarizing the effects of literature on fish and wildlife (Borghi 1982).

Even though research and public interest concerning the effects of acid rain on wildlife resources have increased in the past few years, our understanding of the mechanisms of cause and effect and our estimate of the magnitude of effects remain uncertain. There are several reasons for this. First, acid precipitation is unlikely to exert a direct influence on most terrestrial wildlife. The acidification process, including interaction with the soil system, causes physiochemical changes in water. Only organisms that are limited by such conditions, such as fish and soil fauna, are directly affected. Wildlife species such as birds and mammals are not limited to the same degree by these changes in the environment and detectable effects are less immediate. Second, our ability to segregate the specific effects of acid precipitation from the host of factors that bear on the homeostasis of individuals or populations is limited. Acid precipitation represents another incremental impact that must be weighed against a multitude of subacute environmental stresses to which animal populations are exposed. As tools and technology are developed to improve these measurements, our understanding increases, but the costs associated with the multidisciplinary research required to follow changes in wildlife productivity and trophic structure are high.

Although the paucity of data prevents compilation of a list of definitive and conclusive statements on the impact of acid precipitation on forest wildlife, this paper examines some of the potential pathways for effects.

Where possible, we provide examples of research findings on acidic deposition and forest ecosystems that describe likely mechanisms for wildlife impacts.

Background

It may be helpful to develop some historical perspective on the problem. There are three categories of air pollutants: (1) photochemical oxidants, (2) particulates, and (3) acidifying air pollutants (Peterson 1982). Although this paper primarily addresses acidifying pollutants, it is important to recognize these other categories as part of the atmospheric composition that bathes the forest ecosystem and influences its structure and function. This is mentioned because much of the effects information on animal species comes from studies of this broader group of airborne pollutants. A number of the materials considered as atmospheric pollutants are essential to animals and plants in trace quantities. The difference between beneficial or necessary amounts and toxic amounts of the element may be small. Below the required amount, deficiency conditions occur; above it, the organism manifests toxic effects.

There have been numerous reported air pollution episodes involving injury or death to animals since the end of the nineteenth century (Newman 1980; Newman & Schreiber 1985). These incidents tend to be extreme cases where there were acute levels of exposure to gaseous pollutants. Some of the incidents involving the adverse effects of these airborne pollutants on mammals and birds are summarized in Tables 2 and 3. In the cases reported, the mammals are often herbivores. This mortality may have resulted mainly from the ingestion of heavily contaminated vegetation near the pollution source. The earliest incident, involving arsenic poisoning of fallow deer (*Dama dama*) in Germany, was recorded in 1887. Among birds, there are examples of granivores, insectivores, and carnivores being affected in various ways by air emissions. Effects may range from quite subtle, such as a reduction in genetic diversity, to dramatic, such as a change in population numbers. In some cases, the response may even be specific enough that the species can be used as a biological indicator of a particular pollutant (Newman 1980) or as monitors of pollutant levels (Newman & Schreiber 1984; Wren 1986).

Current Information on Effects on Forest Wildlife

Presently, the best information base on acid precipitation effects on animals is from the aquatic environment, where surface water acidification and resultant impacts on aquatic biota have been demonstrated. The effects on fish have been widely documented (e.g., Baker & Schofield 1985; Haines 1981; Haines & Baker 1986). There is evidence also of effects on forest wildlife that are associated with the aquatic environment at some time in their life history.

One example of these effects involves the ponds and temporary melt-water pools that commonly form in forests in early spring. These aquatic habitats provide breeding sites for a number of amphibian species. In the United States, it is estimated that about 50% of the species of frogs and toads and about 30% of the species of salamanders use ephemeral forest ponds for reproduction (Pough & Wilson 1977). These small pools and ponds can be acidic since they receive snow melt and spring rains that have little contact with the soil buffering system. Studies have shown that a number of amphibian species are adversely affected by pH depression (Table 4; Albers & Prouty 1987; Freda 1986; Freda & Dunson 1986; Tome & Pough 1982). Low pH reduces the reproductive capacity of amphibians in a number of ways (Table 5). The long-term result could well be changes in populations, distribution, and species diversity. In the Hubbard Brook Experimental Forest of New Hampshire, salamanders disappeared from the study area when a section of the forest stream was artificially acidified to a mean pH of 4.0 (Hall & Likens 1980). Other examples of the effects on amphibian populations include the natterjack toad (*Bufo calamita*), which was not found in ponds below pH 5.0 (Beebee & Griffin

Table 2. Examples of incidents involving the adverse effects of airborne pollutants and mammals.

Location	*Species*	*Pollutant*	*Effect*
Germany	Fallow deer	Arsenic	Death
Germany	Red and roe deer, rabbits	Arsenic	Death to 60–70% of individuals
Canada	White-tailed deer	Fluoride	Fluorosis
Czechoslovakia	Hares	SO_2, fly ash	Hypocalcemia & hypoproteinemia
U.S.A.	Bighorn sheep	Oxidants	Blindness
U.S.A.	Voles, mice and shrews	Lead, cadmium, copper	Biological concentrations
U.S.A.	Small mammals	Oxidants	Reduced populations
Poland	Roe deer	SO_2, particulates	Reduced antler quality
England	Wood mice, bank voles	Mercury	Biological concentrations

From Newman, 1980.

Table 3. Examples of incidents involving the adverse effects of airborne pollutants and birds.

Location	Species	Pollutant	Effect
U.S.A.	Small birds	Hydrogen sulfide	Death to large number of birds
England	House martins, swifts	Particulates	Reduced populations
Czechoslovakia	House sparrows	Fluoride	Biological concentrations
U.S.A.	House sparrows	Photochemical oxidants	Respiratory lesions
Canada	Passerine birds	Hydrogen sulfide	Death of hundreds of birds
Japan	Sparrows	Cadmium	Death of birds
Japan	Larks	General air pollution	Reduced populations
England	Sparrowhawks, song thrushes	Cadmium	Food chain magnification
Czechoslovakia	House martins	SO_2, particulates, NO_x, fluoride	Reduced nesting

From Newman, 1980.

1977), and the smooth newt (*Triturus vulgaris*), which was rarely found in ponds below pH 6.0 (Cooke & Frazer 1976). In Sweden, Hagstrom (1977) observed that the common toad (*Bufo bufo*) and common frog (*Rana temporaria*) disappeared when the pH levels fell below 4.5–4.0. Acidification has been suggested as one factor contributing to the decline of certain amphibian species in the Colorado Rocky Mountains (Corn & Bury 1987), although the current impact of acidification in this area appears minimal (Gibson et al. 1983). In forest ecosystems, changes in amphibian populations could have a number of ramifications. Amphibians are important predators and herbivores in these communities and alterations in their abundance or diversity could affect both higher and lower trophic levels. Amphibians, specifically salamanders, represent a significant component of the animal biomass in the forest (Burton & Likens 1975). They are primary energy movers in the ecosystem and provide a high quality food resource for a variety of vertebrate predators, including snakes, birds, and mammals. A reduction in amphibian populations would presumably affect such tertiary consumers and the subsequent cycling of nutrients.

Loss of fish and other aquatic biota from acidified forest lakes, ponds, and wetlands also causes certain shifts in the predator-prey relations of a number of wild-

Table 4. Susceptibility of breeding habitat to pH depression for those amphibians in northeastern North America whose range overlaps areas receiving acidic deposition.

Potential for acidification of egg-laying habitat	Habitat	Common Name
High	Meltwater pools	Yellow-spotted salamander
		Blue-spotted salamander
		Tremblay's salamander
		American toad
		Chorus frog
		Wood frog
		Northern leopard frog
		Northern spring peeper
		Gray tree frog
Moderate	Permanent ponds	Mudpuppy
		Red-spotted newt
		American toad
		Grey tree frog
		Chorus frog
		Bullfrog
		Green frog
		Northern leopard Frog
	Streams	Mink frog
		Northern two-lined salamander
	Lakes	Mudpuppy
		Bullfrog
Low	Bogs	Four-toed salamander
	Logs and stumps	Red-backed salamander

Modified from Clark & Fischer, 1981.

Table 5. Reported effects on amphibians from pH depression

- Embryonic mortalities and deformities
- Decreased egg masses
- Reduced densities
- Increased percentage of dead or molded egg masses
- Ionic-regulatory failure
- Delayed development
- Abnormalities
- Decreased sperm motility

From MOI, 1983.

life species. For example, in Norway it has been suggested that decreases in feral mink (*Mustela vison*) populations are a response to acid precipitation affecting fish, their primary food resource (Bevanger & Albu 1986). This approach has been used to develop relationships between other wildlife species, the potential effects of acid deposition, and their food resources (Clark & Fischer 1981). A cautionary note should be added, however, that these are *for the most part proposed* impacts. There has been limited research conducted concerning the effects on most wildlife species and their associated food webs.

Water birds that prey on fish and aquatic invertebrates are another group of animals that bridge aquatic and terrestrial habitats and may exhibit effects from acid precipitation (Table 6). Acidification of forest ponds and lakes affects the availability of food organisms for wildlife and may also alter habitat that is used for cover and nesting sites (for waterfowl, see review by Hansen, 1987). Preliminary results from Canadian studies indicate that some of the forest lakes and wetland areas that are important breeding areas for waterbirds are vulnerable to acidification (McNicol, Bendell, & McAuley 1987; McNicol, Bendell, & Ross 1987; McNicol, Blancher, & Bendell 1987). Lake acidity is an important factor in determining waterbird habitat quality and the selection of nesting sites by the different species (Des-Granges & Darveau 1985). Longcore, Ross, & Fischer (1987) recently used "risk" criteria to evaluate acidification effects and their severity on migratory birds. From their analyses they estimated approximately 17 percent of the breeding range of seven species of waterbirds (i.e., osprey [*Pandion haliaetus*], common loon [*Gavia immer*], common merganser [*Mergus merganser*], hooded merganser [*Lophodytes cucullatus*], common goldeneye [*Bucephala clangula*], ring-necked duck [*Aythya collaris*], and black duck [*Anas rubripes*]) in eastern North America occurred in areas sensitive to acidification and that 8 to 17 percent of the breeding pairs occupied that range.

Blancher & McAuley (1987), in a comparison of studies, found indications that reproductive success of birds with a diversity of feeding habits (divers, surface feeders, aerial flycatchers, piscivores, insectivores) was adversely affected by wetland acidification. Reduced food abundance appeared to be the primary factor related to poorer reproduction in the low-pH wetlands. Observational data from Ontario indicate that populations of the common loon may be reduced on acid lakes because of the poor food supply (Alvo 1987). In southern Quebec, both the black duck and common loon were found to

Table 6. Avian species most likely to be influenced by a reduction in food resources due to acid precipitation

Potential effect	*Feeding habitat*	*Species*
Reduced biomass of fish, aquatic invertebrates, amphibians	Lakes	Common loon
		Osprey
	Littoral zone	Great blue heron
		American bittern
		Belted kingfisher
		Hooded merganser
		Common merganser
Reduced biomass of aquatic invertebrates	Littoral zone	Common goldeneye
		Red-breasted merganser
		Ring-necked duck
		Black duck
		Virginia rail
	Riparian	Spotted sandpiper
Reduced biomass of aquatic invertebrates with adult stage terrestrial invertebrates	Wetlands	Eastern kingbird
		Eastern phoebe
		Tree swallow
		Barn swallow
		Bank swallow
		Yellow-rumped warbler
		Blackpoll warbler
		Palm warbler
		Common yellowthroat

Modified from Clark & Fischer, 1981.

avoid acid lakes (DesGranges & Darveau 1985). In Ontario the number of broods of the piscivorous common loon and common merganser produced in relation to the number of indicated nesting pairs observed was lower in the acid-stressed area than in the unaffected area (McNicol, Bendell, & McAuley 1987).

For some water birds, the interactions may be complicated by the competition with fish for a diminishing food resource. Acidity may reduce aquatic insect populations that are important to both fish and waterfowl (Bendell & McNicol 1987). Until the level of acidity reduces or eliminates the fish, they compete with duck species for the limited invertebrate prey (DesGranges & Rodrigue 1986). The negative effects of reduced densities of acid-sensitive prey may be partly offset by an increase in other aquatic prey when competing fish populations are reduced or eliminated (McNicol, Bendell, & McAuley 1987; McNicol, Bendell, & Ross 1987). Limited research on artificial wetlands (lacking fish) suggests that black duck ducklings have a higher mortality when raised on acidified versus circumneutral wetlands (Haramis & Chu 1987). Suppressed phytoplankton and algal growth, and reduced invertebrate biomass were reported on the acidified wetlands where duckling growth, physiological condition and survival were affected (Rattner et al. 1987).

Productivity, acidity, and competition with fish may all affect duckling growth and survival (DesGranges & Hunter 1987). Unfortunately present data do not permit us to clearly distinguish the importance of each factor. From the limited number of studies it is evident that more research is required to adequately determine the influence of acid precipitation on water birds. Investigations are continuing in both the United States and Canada on the effect of acidification on waterfowl productivity due to changes in water chemistry and the availability of food items.

Another indirect effect of acidification in woodland ponds and forest streams is the potential for increased bioavailability of toxic metals to wildlife (Fig. 1). Elevated levels of metals such as mercury, cadmium, and lead have been found in lake waters and in biota from acidified areas of North America (Schofield 1976; Scheider, Jeffries, & Dillon 1979; Suns, Curry, & Russell 1980). In regions remote from direct sources of contamination, higher levels of metals are being found in tissues of wildlife associated with acid-stressed as compared to non-acid-stressed habitats. For example, eggs of the common goldeneye collected from an acidified region of Sweden were found to have high mercury concentrations when compared to nearby buffered lakes (Eriksson, Henrikson, & Oscarson 1980) and raccoons (*Procyon lotor*) from the Muskoka area of Ontario were found to have liver mercury levels five times greater than those from a nonacidified area of Ontario (Wren et al. 1980). An analysis of cadmium in tissue samples from

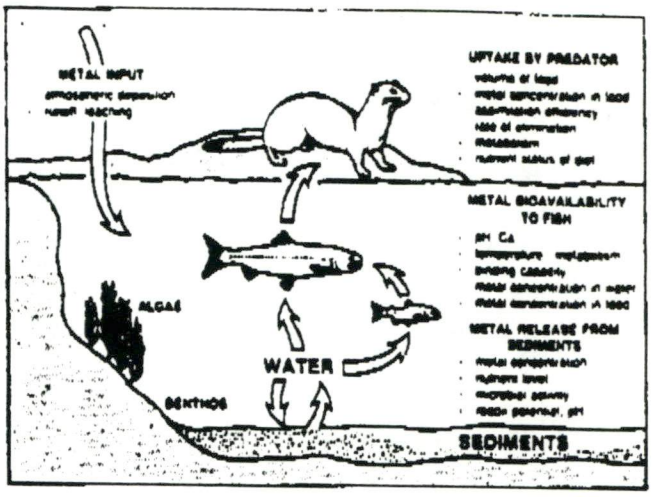

Figure 1. Factors affecting uptake and cycling of metals (from Canadian Wildlife Service, 1985).

38 moose (*Alces alces*) and 56 roe deer (*Capreolus capreolus*) collected in Sweden in areas remote from direct industrial pollution has established an age-dependent increase in this metal (Frank, Petersson, & Morner 1981; Mattsson, Albanus, & Frank 1981). Recent studies in Canada also suggest a link between acid precipitation and cadmium levels in the environment (Crete et al. 1987). In Scandinavia, eggshell impairment has been reported in songbirds that feed on aquatic invertebrates contaminated by aluminum mobilized under acid conditions during spring melt (Nyholm & Myhrberg 1977; Nyholm 1981). However, other studies have not duplicated this finding. In Ontario, a three-year-old study of the eastern kingbird (*Tyrannus tyrannus*), an insectivore, demonstrated that a relationship between lake acidity and kingbird reproduction was measurable, but it was considered minor compared to the influence of genetic and internest variables (Glooschenko et al. 1986). Other investigations using Ring doves (*Streptopelia risoria*) fed a diet supplemented with 0.1% aluminum did not result in any effect on egg production, fertility, or hatchability (Carriere et al. 1986). In another Ontario study, mercury levels in tissues of mink (*Mustela vison*) and otter (*Lutra canadensis*) followed a pattern similar to that of fish and crayfish, indicating bioaccumulation through the aquatic food chain (Wren, Stokes, & Fischer 1986). Generally, however, environmental variables other than pH are suggested as playing the major role in governing the biotic metal levels. Wiener (1987), in a recent review, concluded that although the mechanisms are poorly understood, surface water acidification may enhance the accumulation of methyl mercury, cadmium, and lead by fish in affected areas. The subsequent transfer of these metals to piscivorous wildlife is logical. These observations suggest that the accumulation and movement of toxic metals, mobilized by pH changes, need further quantitative investigation.

Forest streams also become acidic, influencing their use by animals that depend on this aquatic system for food items. Recent research in Wales has demonstrated that the distribution of breeding dippers (*Cinclus cinclus*), a passerine uniquely associated with this lotic environment, is related to the abundance of stream macroinvertebrates, which in turn are shown to be reduced in acidic streams (Ormerod et al. 1986). Delayed clutch initiation, and significantly smaller clutch and brood sizes in dippers breeding along acidic streams as compared to breeding elsewhere (Ormerod & Tyler 1987).

Forests, with their stratified structure, offer a wide diversity of habitats and food resources for wildlife. Any damage from acid precipitation to forest ecosystems interferes with the relationships established between forest plant communities and the wildlife communities associated with these ecosystems. Detecting and understanding these effects is complicated by our lack of understanding concerning the resilience of the forest ecosystem and the compensatory mechanisms of individual species and populations of wildlife. Nevertheless we believe that for terrestrial wildlife, the impact of acidification is most likely to be expressed through changes in soils and vegetation. For example, studies in the San Bernardino forest of California suggest that the abundance and distribution of small mammals were changed by the effects of air pollution on the quality of key vegetation and soil habitat requirements (Miller & Elderman 1977). Evidence from New York, an area particularly sensitive to acid deposition, suggests the distribution and abundance of salamanders may be influenced by soil pH (Wyman & Hawksley-Lescault 1987). Acid deposition can influence forest soil and vegetation in a variety of ways. The level of impact and the interpretation of a change in either habitat or food items depend in part on the availability of suitable alternative habitat or food sources. Species with very narrow habitat requirements or very selective diets are most at risk.

In the broad sense, forest wildlife also includes the invertebrates and microorganisms. Reviews such as the Critical Assessment Document (Altshuller & Linthurst 1983) and others (e.g., Drablos & Tollan 1980; Martin 1987; MOI 1983) provide details on these species, so they are not covered in this overview. It is important to note, however, that these organisms and their level of activity may be the base of the ecosystem support that is initially impacted and that triggers further responses at higher trophic levels. Soil animals such as earthworms and millipedes, for example, have lower populations in acid soils (Altshuller & Linthurst 1983). Species such as these are highly important in the energy flow and nutrient cycling of forests and are important prey items for a variety of vertebrate species. Likewise, forest insects are important in the vertebrate food chain. For example, the density of insectivorous bird species has been found to be correlated with changes in arthropod biomass in the New Jersey Pine Barrens (Brush & Stiles 1986). Direct or indirect impacts by acid deposition on these food sources potentially affect birds. These interactions are not well enough understood to permit assessment at this time.

Degradation of forest habitat from acid deposition can occur in a number of ways, including foliar injury, loss of sensitive plant species, and loss of productivity. Generally, the diversity of animal life is associated with the stratification and growth forms of the plants (MacArthur & MacArthur 1961). Any structural simplification of forest ecosystems that reduces the number of niches has an implied effect on the wildlife. Damage to vegetation may interfere with the specific ecological requirement of a species. For example, the northern parula warbler (*Parula americana*) requires a certain type of lichen for nesting material. *Usnea* sp. lichens are extremely sensitive to air pollution and the reduction of this lichen group in eastern North America appears related to acid precipitation (Arbib 1980). The parula warbler distribution has been reduced with the reduction of the lichen and it is proposed that acid precipitation has been a contributing factor.

Acid precipitation has been considered a contributing factor in the forest dieback in Europe and North America, affecting spruce, maple, beech, and oak (e.g., Ulrich 1982; Vogelmann 1982). These species have an important value to wildlife (Martin, Zim, & Nelson 1951). A reduction in their abundance could influence the presence and abundance of a number of animal species. For example, recent studies in Canada have shown changes in breeding bird numbers in relation to sugar maple forests' decline (DesGranges, Mauffette, & Gagnon 1987). A number of insectivorous birds living in the overstory were less abundant in dieback-affected maple stands.

There is some evidence that the photosynthetic capability and nutritional value of vegetation used by wildlife may be influenced by acid deposition (Lechowicz 1981; Shaw 1981; Grodzinska 1977). A change in the quality of browse, such as nutrient content or metal contamination, would be reflected in the consumer population. An example of this type of interaction has been reported in Poland. A population of roe deer living in a pine forest affected by sulfur dioxide and particulate emissions exhibited a significant decline in the length, volume, weight, and trophy value of the antlers (Jop 1979; Sawicka-Kapusta 1978, 1979). Another example involves sulfate and selenium in browse species of herbivores (Shaw & Cocks 1982; Shaw 1983). Studies on domestic livestock and their forage show a link between increased sulfate fertilization and reduced selenium content of browse in selenium-deficient soils (Allaway 1970). This relationship might occur with acid deposition. It has been demonstrated that excessive sulfur in a plant community can inhibit the transfer and function of

selenium in the soil-plant-animal food chain (Davies & Watkinson 1966; Gissel-Nielsen 1973; Shaw 1981). Excess sulfate in the diet of herbivores may induce excretion of selenium, which is important in enzymatic and other metabolic functions of the animal (Harr 1978). Symptoms of selenium deficiency documented for domestic herbivores include white muscle disease and reproductive failure, including abortions, infertility, and neonatal mortality (Oldfield 1972; Eisler 1985). Tests of this phenomenon in wild animals are incomplete, although several cases for wild herbivores have been reported (Herbert & Cowan 1971; Stoszek, Kessler, & Willmes 1978).

Summary

In this brief overview, we have discussed a number of concerns about the impact of acidic deposition on terrestrial wildlife. Limited research has shown some impacts may occur through loss or change in the food resources or habitat of certain wildlife species. Bioaccumulation of metals mobilized by the acidification process can also occur. The impact is usually tied to some aspect of the species life history that depends on the aquatic environment. While some effects have been documented, others are only postulated and need to be tested. It remains the charge of the scientific community to develop hypotheses for testing, establish the band of uncertainty associated with a given proposition, and then implement the research required to reduce the uncertainty to acceptable limits and provide information that is able to resolve the issue (IERE 1981). With the completion of current wildlife research and the development of new information by forest ecologists, more of these questions will be answered.

Brungs (1980) has likened an environmental impact such as acid rain to a sometimes selective, sometimes nonselective predator. In the unaffected ecosystem, species diversity is directly related to the efficiency by which predators prevent domination by one or a few species. Some level of predation is acceptable since it reduces the density of a dominant species and promotes diversity. However, if the reduction (or impact of acid rain, in this case) becomes excessive, the resilience of the population is threatened. Under these circumstances the less successful or less tolerant species are reduced or eliminated, selecting for monocultures, less diversity, and, according to general ecological principles, a less desirable ecosystem.

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1988

Annual Report

To the President and Congress

NAPAP

THE NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM

vey. One or more species of fish were caught in 47 of the 49 lakes, which, when extrapolated to the target population, represents an estimated 99.4 percent of the lakes in the region. Yellow perch, which are quite acid tolerant and are commonly caught in waters with pH levels as low as 4.5, were the most common species, caught in 31 of the target lakes. Several minnow and darter species were notably absent from lakes with low pH (≤5.7-6.0), perhaps reflecting an intolerance of acidic conditions. This study provides a comprehensive survey of the present-day status of fish communities in a region of the country with a relatively high frequency of acidic lakes (an estimated 9.8 percent of the lakes have ANC ≤0) and with little existing data on fish community composition in lakes potentially sensitive to acidic deposition.

o Brood and duckling survival of ring-necked ducks was examined in wetland areas of Maine having a range of alkalinity and pH. Brood survival does not appear to be related to wetland pH or alkalinity. While duckling survival also did not differ among wetlands with high and low alkalinity, it does appear to be influenced by pH. The daily survival rate of ducklings was lower on low-pH (<6.0) wetlands than on high-pH (≥6.1) wetlands. Older ducklings (25-45 days old) appeared to be the most sensitive, having both the lowest survival rate when in wetlands with pH <5.5 and the highest survival rate when in wetlands with pH ≥6.5. The response of older ducklings on low-pH wetlands is most likely due to the effects of low pH on the invertebrate food source. The only difference found among the wetlands that could affect survival seems to be the quantity and quality of invertebrate foods. Diets of ducklings from high-pH wetlands were more diverse than those of ducklings on low-pH wetlands, which consumed smaller quantities of invertebrate food from fewer invertebrate taxa. When species diversity is low, ducklings may be forced to feed on less nutritious or more mobile species, and may spend more time and energy foraging to obtain sufficient nutrients for growth and survival. The effect of acidic deposition on the pH of wetlands is not clear at this time.

o Experiments performed by adding acids (nitric, sulfuric, and hydrochloric) and nutrients (phosphate) to large replicate bags suspended in Emerald Lake showed population changes in a number of zooplankton species. Two genera, *Diaptomus* and *Daphnia*, were eliminated from the bags in which the pH was lowered to 4.4. Other species, including *Bosmina* and *Keratella*, did better at intermediate pH levels (pH 5.2), which may indicate that some competitive species had been eliminated by the acid addition. Similarly, experimental acidification of stream channels showed that certain benthic invertebrates which are eaten by trout, e.g., *Baetis*, are adversely affected by low pH, comparable to those recorded in the outflow stream during spring snowmelt. Increased severity and frequency of episodic acidification might, through the loss of important dietary components, affect trout growth and survival in these food-limited systems.

o Completion of a second year of exposure to pH 5.1 produced additional changes in the biota of artificially acidified Little Rock Lake, a seepage lake in north-central Wisconsin. Shifts in invertebrate organism abundance have varied widely: upward and downward; changed in the second but not the first year of each pH increment (5.6 and 5.1); increased abundance but stable diversity among daphnids as compared to stable abundance and reduced diversity of rotifers. Unexpectedly, the *Mougeotia* algal mat and water transparency were reduced, and the growth rate of fishes was increased as compared to the previous year, perhaps related to the unusually warm and dry weather. Laboratory exposure, in situ field exposure, and

Biological Report 88(4)
June 1988

AMERICAN BLACK DUCK BREEDING HABITAT ENHANCEMENT IN THE NORTHEASTERN UNITED STATES: A REVIEW AND SYNTHESIS

Fish and Wildlife Service
U.S. Department of the Interior

disease on free-living black duck populations are meager, but disease is considered directly or indirectly responsible for the largest proportion of nonhunting waterfowl deaths (Bellrose 1978). Unique occurrences of black duck deaths from disease have been noted, such as botulism in New Jersey (Reilly and Boroff 1967) and "red tide" caused by dinoflagellate toxins (Sasner et al. 1974). *Leucocytozoon simondi*, a blood parasite obtained from black fly (primarily *Simulium ruggelsi* and *S. anatinum*) bites, has long been known to infect black ducks (Nelson and Gashwiler 1941; O'Meara 1956). Some ducklings die from this parasitism in laboratory situations, and it is suspected of causing substantial deaths of ducklings in the wild (Bellrose 1978), but the overall consequences on black duck populations are unknown. Whitman (1976) suggested, however, that black duck numbers could be reduced throughout their range because of the effects of this lethal hematozoan and the high rate of infection in black ducks (Bennett 1972; Bennett et al. 1974,1975). Anthropogenic changes in lotic waters of the Northeast have made the black fly vectors of this disease more prevalent and have extended the season of their occurrence (J.R. Longcore, personal communication), suggesting the need for monitoring of the impact of this parasite on black duck populations.

Black ducks have the usual internal parasite burdens (McLaughlin and Burtt 1973, 1979) and skin parasites (Clark and Stotts 1960), but the population consequences of these also are unknown. Bennett et al. (1973) and Whitman (1976) provide discussion of black duck parasitism and suggestions regarding monitoring of disease and parasite vector incidence. Wobeser (1981) and Friend (1987) provide thorough reviews of current knowledge of avian disease identification and management. The National Wildlife Health Research Center, Madison, WI, can provide assistance with specific disease issues.

Contaminants. Longcore and Stendell (1982) showed that black duck reproductive success was probably impaired by DDE in the 1960's and earlier. Although residues of DDE in the environment are now much lower (Prouty and Bunck 1986), no data are available on the effects of other persistent contaminants (pesticides, herbicides, metals, etc.) on free-living black duck populations. The effects of broadcast spraying for spruce budworm (*Choristoneura fumiferana*) control in Canada (Webb 1959) has not been thoroughly evaluated with regard to black ducks. Recent studies of the effects of insecticides on young black ducks showed reduced growth rates as a result of reduction in invertebrate foods (Hunter et al. 1984; Brown and Hunter 1984/85). This suggests that the consequences may be substantial and worthy of further research.

Acidification of wetlands. The effects of industrial and urban emissions of sulfates and nitrous oxides on the biota of aquatic ecosystems have been well documented and are a subject of considerable international concern in North America. Loss of fish, altered prey–predator relations, and loss of acid-sensitive invertebrates in aquatic systems often result in substantial changes in avian trophic relationships following acidification (Mayer et al. 1984; McNicol et al. 1987). Negative correlations between wetland acidity and avian distribution (DesGranges and Darveau 1985) and breeding success (Blancher and McAuley 1987) have been documented, and the results of acidification seem capable of exacerbating the risk to species with low or declining populations, such as the black duck (DesGranges and Hunter 1987; Hansen 1987; Longcore et al. 1987). The major documented effect of acidification on black ducks is loss of food resources for ducklings and thus reduced growth and impaired physiological condition of young (Rattner et al. 1987). The net effects of wetland acidification are difficult to predict because interaction with fish fauna complicates assessment (Desgranges and Hunter 1987) and acid conditions are reversible (Longcore et al. 1987). Black duck managers should be aware of both the short- and long-term consequences of wetland acidification, but currently, suggestions for site-specific management response to acidification have not been developed for breeding habitats of waterfowl in the United States.

Lead poisoning. The U.S. Fish and Wildlife Service's Lead Monitoring Program has identified the Atlantic Flyway as that with the highest percentage of ducks with elevated lead levels. Black ducks have historically had a

Report Links Acid Rain to 30-Year Decline of Black Ducks

By JOHN NOBLE WILFORD

NEW research shows that acid rain may have contributed to the mysterious decline of black ducks in the last three decades and may be causing serious and widespread damage to the breeding grounds of many other water birds, according to a report released today by the Izaak Walton League of America, a private conservation group.

Although the research is preliminary and much of the evidence circumstantial, wildlife biologists familiar with the report said it was the first strong indication that birds as well as fish were suffering from the adverse effects of acid rain on the wetlands and lakes of eastern North America.

"We now know that acid-stressed lakes do not produce many baby ducks," said Kathleen L. Fischer, co-ordinator of research on acid rain at the Canadian Wildlife Service in Ottawa. The Canadian Government has sponsored some of the studies described in the new report.

Kenneth Ross, a biologist with the Canadian Wildlife Service, said that recent studies in the field produced a "fairly reasonable correlation" between acidified lakes and the decline of some fish-eating birds. Research is being conducted to determine the effect on other species, he said.

In a foreword to the Izaak Walton League report, Frank C. Bellrose, a scientist with the Illinois Natural History Survey and an authority on North American waterfowl, said the new study "presents alarming information that acid rain may be a real, and certainly is a potential, source of degradation for waterfowl breeding habitat." The report, written by Paul W. Hansen of the league's Upper Mississippi Regional Office in Minneapolis, concluded that the evidence suggested "that an extensive regional fish and wildlife resource may be put at great risk by further delays in passing measures to control acid rain."

Most in danger, according to the report, appeared to be the black duck, a big, shy, dark-feathered bird with coral-red legs and olive-green bill. This duck is a familiar sight along the East Coast from Cape Breton to the Carolinas. But its number has declined by 60 percent since 1955.

The decline has been attributed to many factors — increasing competition from other ducks, especially mallards; overhunting; human encroachment on habitats; the effects of ingesting lead shotgun pellets, which poison the birds and the effects of pesticides and other environmental contaminants.

Now acid rain is also suspected as being a problem for the black duck. In part the suspicion is based on circumstantial evidence. According to the report, the breeding range of this duck coincides closely with the area of North America where deposits from acid rain are heaviest, and the decline of the black duck since 1955 coincides closely with the increase of acidic industrial emissions in this region.

Moreover, the report noted, the black duck breeding season begins and the birds' nutritional needs are greatest in early spring when snowmelt surges into streams and lakes carrying the accumulation of the winter's acidic precipitation.

One of the studies cited in the Izaac Walton League report was conducted by biologists at the U.S. Government's Patuxent Wildlife Research Center in Maryland, where scientists raised black ducklings in experimental ponds with high and low levels of acidity. G. Michael Haramis, a biologist with the United States Fish and Wildlife Service, reported that the mortality of ducklings raised on acidic wetlands was more than three times higher than that of ducklings raised on non-acidic wetlands.

> 'An extensive regional fish and wildlife resource may be put at great risk' by legislative delay.

Another study, this one conducted in natural areas in Quebec by Dr. Jean-Luc Desgranges of the Canadian Wildlife Service, showed that young black ducks in moderately acidic areas grew at a rate 60 percent slower than those in non-acidic areas. Many of them starved to death, and many survivors suffered from malnutrition.

The black duck belongs to the group of waterfowl known as dabblers. They sit on the water surface and pick up their food there, mostly insects, weeds, seeds and algae.

In breeding season, black duck females eat more insects, mayflies and dragonflies, as well as snails and other invertebrate animals to get the protein and calcium needed for successful reproduction. Studies have shown that ducks on a protein-deficient diet laid half as many eggs as those on a normal diet. Ducklings in the first nine days after hatching also require high-protein diets.

According to the recent studies, increased acidity in lakes decreases the abundance and diversity of the food species available to breeding ducks.

THE NEW YORK TIMES,

TUESDAY, FEBRUARY 17, 1987

395 - 1818 395 - 1815

Charlotte Rosh Communications Director

Arlington Ballroom

Thursday - 1:00

2 day event
250 people
Waterfowl in Crisis
Science + Research + tech people to ~~talk~~
examine probs + solutions
690 people
170 on waitlist

11:00 openning

Luncheon 12:00
12:50 - exec V.P. - keynote remarks
1:00 G.B.

- Field + Stream + other sport media

amb from Canada
Sec. Lujan - head table - no participation
& at head table
Pres of Ddl + Ddl Canada - Exec V.P. Sec Lujan - Amb.

Dl Dl members - Sponsors - Board + Senior People.

60 MCs are sponsors.
20 or 30 will be there.

Nancy Mulloby
Defenderfer
Bob Grady

J. O Hare

Pres is a Sponsor - How long?
Semon + Baker?

Begins on Friday morning - goes on to Saturday

Luncheon on Thursday is pregame

Keynote Luncheon

26 piece Marine Band

Ducks Unlimited

Amb. Derick Burney - Canada
Derick
- Sec. Leyan

Dick Benard
William Clinger
Bill Emerson
Ronnie Flippo
Claude Harris
Allan Mollohan
Jim Quillen
Jon Robinson
Harold Rogers
Jack Rust
Jim Saxon
Richard Schulze
Clay Shaw
Lindsay Thomas
Strom Thurmond
Don Young.

(Lange/Wallace)
June 6, 1989
8:45 a.m.
[DUCKS.DOC]

PRESIDENTIAL REMARKS: DUCKS UNLIMITED -- SIXTH INTERNATIONAL WATERFOWL SYMPOSIUM
CRYSTAL GATEWAY MARRIOTT
THURSDAY, JUNE 8, 1989
1:00 P.M.

[[Thank you, Harry. You know, people often hear from elected officials who say they've "always" supported their audience's particular cause. But I've got a long history of support for your efforts. Even back when I was playing ball in school, I made it a point never to hit a fowl... (LONG PAUSE) ...]]

You know, when my grandson was 10 years old, we went fishing on Wyoming's Jackson Lake, the Tetons soaring up to the sky. A beautiful day, one you see on postcards. Everything sparkled. That day remains fixed in my mind. When I was running for President, I made a promise -- to him, and to every child in America -- that I would be a President committed to conservation.

MB.

It's true, our children will inherit the earth. So any vision of a kinder, gentler America -- any nation concerned about its quality of life, now and forever -- must be concerned about conservation. It will not be enough to merely halt the damage we've done. **Our natural heritage must be recovered and restored.**

We saw it at Mt. St. Helens -- we see it now in Yellowstone Park, and in the growth of Spring -- nature healing its wounds, coming back to life. We can and should be nature's partner. That means an active stewardship of the natural world. It is time to renew the environmental ethic in America -- and to renew U.S. leadership on environmental issues, around the world. **Renewal is the way of nature. It must now become the way of man.**

And that's why I wanted to talk to you today. When this organization was founded over fifty years ago, in the Dust Bowl days, there was just a handful of you committed to preserving and restoring our wetlands. But by now, you've set aside over five million acres as habitat. Raised nearly half a billion dollars. ~~Gotten~~ Established wetlands projects ~~going~~ in each of the fifty states.

The partnerships you've set up with state and federal agencies -- and with conservation groups like the Nature Conservancy -- have been outstanding. You've spread awareness world-wide: convening groups of experts in biology and wildlife management, agriculture, law enforcement, education, and state and federal government -- as you have here today.

That's good news for ducks. [[Let me warn you, though, anybody who looks like a duck... or walks like a duck... is going to hear from Dick Darman. The thought of "Ducks Unlimited" keeps him up at night.]] But your work is even better news for

America. What you're doing represents just the kind of local, on-site, private-sector initiative we must bring to every environmental challenge.

As you know too well, our wetlands are being lost at a rate of nearly half a million acres a year. So every year, fewer mallards and pintails make it to the pothole country. You may remember my pledge, that our national goal would be no net loss of wetlands. **I will keep that pledge. Together, we're going to deliver on the promise of renewal.**

7

I've set up an Interagency Task Force to work with you -- with government at all levels -- and with the private sector -- to stop the destruction of these precious habitats. Their first task is to develop a united federal policy for the North American Waterfowl Management Plan here, and in Canada.

We've also asked for nearly $200 million in new funding for acquisitions under the Land and Water Conservation Fund. For the first time in seven years, some of those dollars will go toward acquiring wetlands. And to keep the wetlands that we do save healthy and pristine, we've also increased funding for coordinated water quality programs. But the federal role, while significant, pales in comparison to the groundswell of state and local talent we must bring to bear.

Lisa Barnea
Divine Fish, 382-7071 - wetlands - Water office 382-5410

We're looking to improve the management of federally-owned wetlands, by leasing them to concerned groups like yours. And, you know, the local momentum is picking up. Just last month, Maryland's Governor Schaefer approved the nation's first state wetlands law. It's an outstanding piece of work, that requires farmers and developers to come up with water-management plans -- and to replace any wetlands that are lost. EPA Administrator Bill Reilly emerged as a key lobbyist for that bill -- and I'm encouraging him to do more.

[[Maybe Bill's told you about that wildlife illustrator, who wanted to paint birds. Seems he was having trouble, because he couldn't tell one duck from another. Turns out he was duck blind... but enough of this fowl humor...]]

Wherever wetlands must give way to farming or development, they will be replaced or expanded elsewhere. It's time to stand the history of wetlands destruction on its head: **from this year forward, anyone who tries to drain the swamp is going to be up to his ears in alligators.**

Our approach to wetlands conservation is driven by a new kind of environmentalism -- a set of principles that apply to all of the environmental challenges we face. Pollution is not the inevitable by-product of progress. So the first principle is that **sound ecology and a strong economy can coexist.**

The fact is, they must. The two are interdependent -- immediately, and ultimately. Environmentalists and entrepreneurs must see how much their interests are held in common. **It's time to harness the power of the marketplace in the service of the environment.**

The second principle is that a true commitment to restoring the nation's environment **requires more than just a federal commitment.** The tradition of purely federal, "top-down" directives will never again be enough. So we're working to promote more creative state and local initiatives, drawing the energy of local communities and the private sector into the cause of conservation. **No one -- no one -- can ever afford to look the other way again.**

Our third principle is obvious, but too rarely acted upon: that **preventing pollution is a far more efficient strategy** than struggling to deal with problems once they've occurred. For too long, we've focused on clean-up and penalties after the damage is already done. It's time to re-orient ourselves using technologies and processes that reduce or prevent pollution -- to stop it before it starts. **Pollution prevention in the 1990s will be the environmental equivalent of a preemptive strike.**

Technology has given us tremendous, awesome power to alter the face of the earth. We must use it to do good. Environmental soundness must be the basis for any industrial design. Rather than being tacked on, it's being built into the process -- every process -- by enlightened industry. They are making -- and must continue to make -- environmental soundness **an essential fact of American industrial life.**

As you know, I've called for the elimination of CFCs by the year 2000. But we've also reviewed the Corporate Average Fuel Economy (CAFE) standards. We're determined to hold firm to the present standard. We're going to promote the use of alternative, "neat" fuel technology. And I've already proposed full funding to develop clean coal technology.

The fourth principle is a recognition that **environmental problems respect no borders.** So we're working with nations around the world, to provide leadership in finding cooperative, international solutions. I've already held meetings with leaders in Japan and Brazil, discussing ways to reverse rainforest devastation. We've recommended a ban on international shipments of hazardous waste, unless strict environmental criteria are met through bilateral agreements.

And in Germany two weeks ago, I announced our intention to provide technical assistance and new technologies for handling

pollution problems to the nations of Eastern Europe. Some of the rivers in those countries are now so polluted, they can't even be used for industrial cooling -- because they're too corrosive.

The fifth and final principle is that existing environmental laws will be **vigorously and firmly enforced.** I've requested funds to hire more environmental prosecutors at the Justice Department. And next week, Administrator Reilly will deliver to Congress a report on overhauling the Superfund project for hazardous waste. It's a package of 50 aggressive recommendations **-- combining the appeal of an open hand with the power of a clenched fist.** We are encouraging citizen participation, but we're backing it with a promise: **Polluters will pay.**

Finally, on Monday, I will unveil the most sweeping changes to the Clean Air Act since it was written twelve years ago. It will allow us to recover and restore hundreds of lakes, and thousands of miles of streams in the Northeast, Mideast, and in eastern Canada. And it will significantly improve every American's quality of life -- whether they live near factories, in cities, or in high woodland country.

Behind all of the studies, the figures, and the debates, environmentalism is a moral issue. For it is <u>wrong</u> to pass on to future generations a world tainted by present thoughtlessness. It is <u>unjust</u> to allow the natural splendor bestowed to us to be

compromised. It is imperative that we preserve the earth and all its blessings -- to **meet the challenge of renewal.**

A man I greatly admire, Theodore Roosevelt, was the first President to act on that ideal. When he set aside the Grand Canyon as a natural, national monument, his words of warning were driven by great personal conviction. "Leave it as it is," he said. "You cannot improve on it. The ages have been at work on it, and man can only mar it. What you can do is to keep it -- for your children, and your children's children..."

Recovery, restoration, and renewal -- that is our moral imperative. From today forward, it is the ethical legacy we must inspire in every American.

Thank you. God bless you. And God bless the United States of America.

(Lange/Wallace)
June 7, 1989
8:00 a.m.
[DUCKS.DOC]

PRESIDENTIAL REMARKS: DUCKS UNLIMITED -- SIXTH INTERNATIONAL WATERFOWL SYMPOSIUM
CRYSTAL GATEWAY MARRIOTT
THURSDAY, JUNE 8, 1989
1:00 P.M.

Thank you, Harry. Ambassador Burney of Canada; Secretary Lujan; Secretary Reilly; members of Congress; friends. You know, when my grandson was 10 years old, we went fishing on Wyoming's Jackson Lake, the Tetons soaring up to the sky. A beautiful day, one you see on postcards. Everything sparkled. That day remains fixed in my mind.

It's true, our children will inherit the earth. So any vision of a kinder, gentler America -- any nation concerned about its quality of life, now and forever -- must be concerned about conservation. It will not be enough to merely halt the damage we've done. **Our natural heritage must be recovered and restored.**

We saw it at Mt. St. Helens -- we see it now in Yellowstone Park, and in the growth of Spring -- nature healing its wounds, coming back to life. We can and should be nature's partner. That means an active stewardship of the natural world. It is time to renew the environmental ethic in America -- and to renew U.S. leadership on environmental issues, around the world. **Renewal is the way of nature. It must now become the way of man.**

And that's why I wanted to talk to you today. When this organization was founded over fifty years ago, in the Dust Bowl days, there was just a handful of you committed to preserving and restoring our wetlands. And just about that time, a few hunters got together and formed a little group called Ducks Unlimited.

Since then, you've set aside over five million acres as habitat. Raised nearly half a billion dollars. Started wetlands projects in each of the fifty states. For a simple reason: 75 percent of the remaining wetlands in the continental U.S. are privately owned. We can't do it without your help.

The partnerships you've set up with state and federal agencies -- and with conservation groups like the Nature Conservancy and the National Wildlife Foundation -- have been outstanding. You've spread awareness world-wide: convening groups of experts in biology and wildlife management, agriculture, law enforcement, education, and state and federal government -- as you have here today.

That's good news for ducks. [[Let me warn you, though, anybody who looks like a duck... or walks like a duck... is going to hear from Dick Darman. The thought of "Ducks Unlimited" keeps him up at night.]] But your work is even better news for America. What you're doing represents just the kind of local,

on-site, private-sector initiative we must bring to every environmental challenge.

As you know too well, our wetlands are being lost at a rate of nearly half a million acres a year. So every year, fewer mallards and pintails make it to the pothole country. You may remember my pledge, that our national goal would be no net loss of wetlands. **I will keep that pledge. Together, we're going to deliver on the promise of renewal.**

- Dave Gibbons OMB

I've set up an Interagency Task Force, under the Domestic Policy Council, to work with you -- with government at all levels -- and with the private sector -- to stop the destruction of these precious habitats. Their first task is to develop a united federal policy for the North American Waterfowl Management Plan here, and in Canada. Canada has lost over 40 percent of her wetlands. **The time has come to say stop.**

To support the Plan, this week Secretary Lujan proposed a new trust fund -- using interest from the Pittman-Robertson Fund -- that would contribute about $10 million dollars. Our goal is to restore a fall flight of more than 100 million birds. We're looking at legislation from Senators Mitchell and Chaffee, and Congressmen Dingell and Conte. There are a few details to be worked out, but the basic thrust of the legislation is sound. I

Dave Gibbons

look forward to signing a bill to conserve North American wetlands this year.

$200 - 15 Dave Gibbons

We've also asked for nearly $200 million in new funding for acquisitions under the Land and Water Conservation Fund. For the first time in seven years, some of those dollars will go toward acquiring wetlands. We've also increased funding for coordinated water quality programs, to protect the wetlands we already have. But we're looking far beyond the federal role. Deana Fish 382-7071

We want to improve the management of federally-owned wetlands, by leasing them to concerned groups like yours. And, you know, the local momentum is picking up. Just last month, Maryland's Governor Schaefer approved the nation's first state non-tidal wetlands law. It's an outstanding piece of work, that requires farmers and developers to come up with water-management plans -- and to replace any wetlands that are lost. EPA Administrator Bill Reilly emerged as a key supporter for that bill -- and I'm encouraging him to do more.

We're working with American farmers through the Farm Bill program, to provide technical assistance for wetland conservation. Wherever wetlands must give way to farming or development, they will be replaced or expanded elsewhere. It's time to stand the history of wetlands destruction on its head:

from this year forward, anyone who tries to drain the swamp is going to be up to his ears in alligators.

Let me spend a few minutes outlining our environmental philosophy. Our approach to wetlands conservation is driven by a new kind of environmentalism -- a set of principles that apply to all of the environmental challenges we face. We believe that pollution is not the inevitable by-product of progress. So the first principle is that **sound ecology and a strong economy can coexist**.

But let's remember: the burden of proof is on man, not nature. The fact is, our ecology and the economy are interdependent -- immediately, and ultimately. Environmentalists and entrepreneurs must see how much their interests are held in common. **It's time to harness the power of the marketplace in the service of the environment.**

The second principle is that a true commitment to restoring the nation's environment **requires more than just a federal commitment**. The tradition of purely federal, "top-down" directives will never again be enough. So we're working to promote more creative state and local initiatives, drawing the energy of local communities and the private sector into the cause of conservation. All of you in this room have made a commitment that every American must now make.

Our third principle is obvious, but too rarely acted upon: that **preventing pollution is a far more efficient strategy** than struggling to deal with problems once they've occurred. For too long, we've focused on clean-up and penalties after the damage is already done. It's time to re-orient ourselves using technologies and processes that reduce or prevent pollution -- to stop it before it starts. **Pollution prevention in the 1990s will go right to the source.**

Technology has given us tremendous, awesome power to alter the face of the earth. We must use it to do good. Environmental soundness must be the basis for any industrial design. Rather than being tacked on, it's being built into the process -- every process -- by enlightened industry. They are making -- and must continue to make -- environmental soundness **an essential fact of American industrial life.**

We've already taken several steps in that direction. As you know, I've called for the elimination of CFCs by the year 2000. We've also reviewed the Corporate Average Fuel Economy (CAFE) standards. We've tightened the standard, as the law originally intended. More efficient cars are good for our environment, and good for our energy security. We're going to promote the use of alternative, "neat" fuel technology. And I've proposed full funding to develop clean coal technology.

The fourth principle is a recognition that **environmental problems respect no borders.** So we're working with nations around the world, to provide leadership in finding cooperative, international solutions. I've already held meetings with leaders in Japan and Brazil, discussing ways to reverse rainforest devastation. We've recommended a ban on international shipments of hazardous waste, unless an agreement is signed that makes sure waste is disposed of safely. Earlier this week I also recommended a ban on all imports of elephant ivory.

And in Germany two weeks ago, I announced our intention to provide technical assistance and new technologies to the nations of Eastern Europe, to help them handle pollution problems. Some of the rivers in those countries are now so polluted, they can't even be used for industrial cooling -- because they're too corrosive.

The fifth and final principle is that existing environmental laws will be **vigorously and firmly enforced.** I've requested funds to hire more environmental prosecutors at the Justice Department. And next week, Administrator Reilly will deliver to Congress a report on overhauling the Superfund Program for hazardous waste. Our message about environmental law is simple: **Polluters will pay.**

Finally, on Monday, I will unveil the most sweeping changes to the Clean Air Act since it was last amended twelve years ago. It will allow us to recover and restore hundreds of lakes, and thousands of miles of streams in the Northeast, Mideast, and in eastern Canada. And it will significantly improve every American's quality of life -- whether they live near factories, in cities, or in high woodland country.

Behind all of the studies, the figures, and the debates, the environment is a moral issue. For it is wrong to pass on to future generations a world tainted by present thoughtlessness. It is unjust to allow the natural splendor bestowed to us to be compromised. It is imperative that we preserve the earth and all its blessings -- to **meet the challenge of renewal.**

Forty-one years ago, a man named Aldo Leopold wrote a book some of you may have heard of. It was called A Sand County Almanac. In it, he talked about values -- values that I think you and I share. "That land is to be loved and respected," Leopold wrote, "is an extension of ethics." That was forty years ago. Since then, millions of acres of wetlands, habitat for so many plants and animals, have disappeared. And they continue to vanish at an alarming rate -- some one-half million acres a year.

I want to ask you today what the generations to follow will say of us forty years from now. It could be that they will

report the loss of many million acres more. The extinction of species. The disappearance of wilderness and wildlife.

Or they could report something else. They could report that, sometime around 1989, things began to change. That we began to hold on to our parks and refuges. That we protected our species. And that, in that year, the seeds of a new policy about our valuable wetlands were sown -- a policy summed up in three simple words: "**No net loss.**" I prefer the second vision of America's environmental future.

A man I greatly admire, Theodore Roosevelt, was the first President to act on that ideal. When he set aside the Grand Canyon as a national monument of nature, his words of warning were driven by great personal conviction. "Leave it as it is," he said. "You cannot improve on it. The ages have been at work on it, and man can only mar it. What you <u>can</u> do is to <u>keep</u> it -- for your children, and your children's children..."

Recovery, restoration, and renewal -- that is our moral imperative. From today forward, it is the ethical legacy we must inspire in every American.

Thank you. God bless you. And God bless the United States of America.

WETLANDS

- Success in addressing the many sources of coastal pollution will require the cooperation of individual citizens, private land owners, developers, farmers, and all levels of government.

POLICIES

To initiate an era of coastal awareness, the President will:

- Direct EPA to negotiate quickly compliance agreements with existing dumpers to end ocean dumping by the end of 1991. EPA will issue no new permits for the ocean dumping of sewage sludge or industrial waste.
- Instruct the FBI and EPA to pursue criminal enforcement actions against illegal dumpers of medical wastes and EPA to issue major fines against ocean discharge permit violators.
- Direct EPA to expedite promulgation of regulations establishing a pilot medical waste tracking program in the Great Lakes and Northeastern states so that the program is in place before the 1989 beach season.
- Work closely with the states to ensure maximum participation in the demonstration tracking program and encourage the voluntary participation of states in other parts of the country.
- Propose legislation to strengthen the Ocean Dumping Act by authorizing felony level criminal sanctions, judicial assessment of civil penalties against medical waste and other dumpers, and issuance of administrative orders requiring compliance.
- Direct the Coast Guard to take a leadership role in upholding and enforcing provisions of international ocean pollution treaties and conventions which restrict shipboard disposal of garbage and persistent marine debris.
- Work with the states to continue to enforce sewage treatment deadlines provided for in the Clean Water Act. Unless specifically exempted, all municipal sewage *must* be treated at the secondary level.

f. Preserving Our Wetlands

OVERVIEW

America must better protect its wetlands, which comprise bogs, marshes, swamps, and other similar areas that produce numerous benefits for society. Wetlands provide habitat for many species of fish and wildlife. They help to maintain water quality by filtering out pollutants and sediments. They serve to control erosion by trapping soil washed from nearby farmlands. They play an important role in reducing flooding problems by temporarily storing large quantities of water and by slowing the velocity of flood waters. Finally, they are sources of recreation, timber, and other natural products for commercial use.

Approximately 215 million acres of wetlands existed in the contiguous United States at the time of the Nation's settlement. By the mid-1980s, about 95 million acres remained, 44 percent of the original wetlands acreage. Annual wetlands losses average about 450,000 acres, an area about half the size of Rhode Island.

"We must bring the private and public sectors together, at the local and State levels, to find ways to conserve wetlands.

"I believe this should be our national goal—no net loss of wetlands. We can't afford to lose the half of America's wetlands that still remains."

George Bush

PRINCIPLES

- The President is committed to the preservation of the Nation's remaining wetlands, working with the States to slow and eventually stop the loss.
- Achievement of the goal of no net loss of wetlands requires strengthening existing Federal programs and regulations that protect, maintain, and restore wetlands.
- The Federal Government also needs a coordinated wetlands policy—each of the agencies involved with wetlands should work in concert to achieve the same goal. Too often, agencies work at cross purposes, with different standards and different goals.
- The Nation must look beyond Federal programs and regulations to encourage wetlands protection. Public understanding of the value of wetlands should be enhanced, and support provided for non-regulatory programs that encourage private, State, and local actions to conserve wetlands.

POLICIES

The President will immediately establish a wetlands inter-agency task force under the Domestic Policy Council. The task force will recommend ways to revise and strengthen the current Presidential executive order on wetlands protection. This will include establishment of no net loss as a national goal and clear direction to Federal agencies to work toward this goal to the extent feasible under current law. The task force will also coordinate and assess implementation of the no-net-loss goal by Federal, State, and local governments and the private sector.

Other wetlands proposals include:

- Redirection or expansion of Federal R&D to maximize efforts aimed at effective wetlands creation, restoration and maintenance.
- Review of options for improving management of federally owned wetlands through privatization whereby private, non-profit conservation and other groups would operate and maintain Federal properties under long-term leases.

The Bush Administration will also vigorously implement and enforce laws enacted over the last several years that contain special provisions designed to conserve wetlands:

- The 1985 Food Security Act, with several new regulatory and non-regulatory conservation provisions, especially the "swampbuster" provision by which Department of Agriculture program benefit payments are prohibited to farmers who plant a program crop in wetlands after 1985.
- The 1986 Water Resources Development Act, which requires mitigation concurrent with Army Corps of Engineers water project construction, and increased cost sharing by Corps of Engineers water project beneficiaries; both provisions should reduce the scope of projects and their adverse environmental impacts—including wetlands destruction.

- The 1986 Tax Reform Act, which eliminated provisions of the Federal tax code that encouraged conversion of wetlands to farmland.
- The 1982 Coastal Barrier Resources Act, which is specifically designed to restrict federally subsidized development of undeveloped coastal barriers and associated wetlands along the Atlantic and Gulf Coasts.

g. Enhancing Water Quality

OVERVIEW

Groundwater and surface water contamination from the normal use of pesticides and fertilizers is a growing concern throughout the country. Both public and private efforts are required to promote the adoption of environmentally sensitive farm production practices and to develop safer chemical and biological pest controls.

> *"The protection of the environment and the conservation and wise management of our natural resources must have a high priority on our national agenda. But given sound research, innovative technology, hard work, sufficient public and private funds, and—most important of all—the necessary political will, we can achieve and maintain the environment that protects the public health and enhances the quality of life for us all."*
>
> George Bush

PRINCIPLES

- The President is committed to protecting the Nation's groundwater resources from contamination by fertilizers and pesticides without jeopardizing the economic vitality of U.S. agriculture.
- Water quality programs must accommodate both the immediate need to halt contamination and the future need to alter fundamental farm production practices.
- Ultimately farmers must be responsible for changing production practices to avoid contaminating ground and surface waters. Federal and state resources can provide valuable information and technical assistance to producers so that environmentally sensitive techniques can be implemented at minimum cost.

POLICIES

This initiative increases existing funding for coordinated water quality programs in the Departments of Agriculture, Commerce, and Interior and the Environmental Protection Agency by $64 million. Building on an interagency base of $226 million, the 1990 programs will address critical needs in water quality assessment, research, and public education. The Department of Agriculture will spend an additional $47 million, mostly on the development and demonstration of farming practices that avoid water quality degradation. Commerce's National Oceanic and Atmospheric Administration will monitor the effects of agricultural run-off on coastal and inland waterways. The Environmental Protection Agency, working with the relevant state and Federal agricultural agencies, will devote an additional $10 million to improving farmers' understanding of their obligations as stewards of water quality. The U.S. Geological Survey will add funds to its ongoing $57 million effort to measure accurately and monitor surface and groundwater quality. The $64 million initiative represents a permanent increase to base funding for water quality programs. In coming years, as more is learned about the causes and

George Bush will place a high priority on protecting our groundwater. Once contaminated, the damage may take generations to correct and cost untold billions of dollars. George Bush believes the federal government should support the states in protecting groundwater through streamlined regulations, faster cleanup of toxic waste and a balanced policy towards the use of pesticides.

- George Bush will speed cleanups under the federal Superfund programs. He will strengthen enforcement of our toxic waste laws and streamline the now cumbersome regulations that hamper toxic waste cleanups.

- George Bush will move to identify contamination, set prevent contamination, and monitor remedial action.

- George Bush will work to reduce the production of hazardous waste -- reducing these wastes at the source is the best way to "dispose" of the problem.

- George Bush will support the development of innovative biotechnology products that will replace some pesticides and create a revolution: improving crop yields, lowering costs, conserving energy and reducing groundwater contamination.

- George Bush will develop rules for the use of pesticides so that both the costs to farmers -- and consumers -- of restrictions and public health benefits of restrictions are rationally balanced.

WETLANDS

Wetlands are one of America's most unappreciated natural resources. They serve an important role in flood control; they help "recycle" water by filtering wastes from water; they provide a source of food and breeding grounds for fish, birds and animals; and they are a recreational resource.

Many wetlands exist on private property, and the pressure to serve other valid human needs often comes in conflict with conservation. As in other areas, George Bush believes we need to take all these interests into account when developing our national environmental policy.

The federal government needs a coordinated wetlands policy -- each of the agencies that regulate wetlands must send the same message. But George Bush believes we must also look beyond regulation to encourage wetland protection. We must enhance the public understanding of the value of wetlands as well as support non-regulatory programs that encourage private, state and local actions to conserve wetlands.

George Bush knows that we have lost 55% of our 215 million acres of wetlands nationwide and continue to lose them at the rate of 450,000 acres per year. George Bush supports efforts like the Conservation Foundation

Wetland Forum. This group found that wetland loss is due to numerous causes -- and programs and new technologies must be effectively targeted to those causes. The Bush Administration will work to slow and eventually stop this loss.

- o George Bush's goal is no net loss of wetlands.

He knows that the federal government can't make this happen without the help of the states. In the last 5 years, the EPA has paid special attention to the challenge of protecting America's wetlands. It vetoed more development plans affecting wetlands than EPA had ever vetoed before in its entire history. George Bush will work with the nation's governors to avoid the need for these vetoes in the future.

PRESERVING OPEN SPACE FOR GENERATIONS TO COME

George Bush is an avid fisherman and hunter. He is committed to protecting and expanding our parks, and strengthening natural resource management, research and training programs.

George Bush is concerned that our national park system, one of the nation's most treasured assets, is rapidly becoming a victim of its own popularity. The huge unanticipated growth in visitors to our national parks--from 33 million in 1950 to over 290 million this year--has caused serious deterioration in the condition of the parks' roads, trails and facilities. Acid rain and pollution have also taken their toll. Today, the national parks are still the pride of America and the envy of the world--but steps must be taken to protect them. Our park system, magnificent as it is, needs help. George Bush promises that as President, he will give high priority to a national parks program providing the necessary maintenance, rehabilitation and land acquisition to preserve this priceless heritage.

On other federal lands, George Bush supports a balanced program, taking into consideration the needs of communities that depend on federal lands for their livelihood as well as the long term preservation of our heritage.

CLEAN WATER, PRISTINE BAYS, SAFE BEACHES

George Bush believes cities and states have no greater duty than obeying the law that requires them to treat and dispose of wastes safely. States must act, if not out of respect for federal law, than to protect public health and our nation's beaches, fisheries and oceans.

George Bush applauds the actions of those Governors who have worked across state and party lines with the federal government, to purify the national treasures they share. For instance, great strides have been made cleaning up the Great Lakes and the Chesapeake Bay.

send to you shortly legislation for a new, more effective, Clean Air Act. It will include a plan to reduce, by date certain, the emissions which cause acid rain -- (applause) -- because the time for study alone has passed, and the time for action is now. (Applause.)

We must make use of clean coal. My budget contains full funding, on schedule, for the clean coal technology agreement that we've made with Canada. (Applause.) We've made that agreement with Canada and we intend to honor that agreement.

We must not neglect our parks. So I'm asking to fund new acquisitions under the Land and Water Conservation Fund. We must protect our oceans. And I support new penalties against those who would dump medical waste and other trash into our oceans. (Applause.) The age of the needle on the beaches must end. (Applause.)

And in some cases, the gulfs and oceans off our shores hold the promise of oil and gas reserves which can make our nation more secure and less dependent on foreign oil. And when those with the most promise can be tapped safely, as with much of the Alaska National Wildlife Refuge, we should proceed. (Applause.) But we must use caution. We must respect the environment.

And so tonight I'm calling for the indefinite postponement of three lease sales which have raised troubling questions -- two off the coast of California, and one which could threaten the Everglades in Florida. (Applause.) Action on these three lease sales will await the conclusion of a special task force set up to measure the potential for environmental damage.

I'm directing the Attorney General and the Administrator of the Environmental Protection Agency to use every tool at their disposal to speed and toughen the enforcement of our laws against toxic waste dumpers. (Applause.) I want faster cleanups and tougher enforcement of penalties against polluters.

In addition to caring for our future, we must care for those around us. A decent society shows compassion for the young, the elderly, the vulnerable, and the poor.

Our first obligation is to the most vulnerable -- infants, poor mothers, children living in poverty -- and my proposed budget recognizes this. I ask for full funding of Medicaid -- an increase of over $3 billion -- and an expansion of the program to include coverage of pregnant women who are near the poverty line. (Applause.)

I believe we should help working families cope with the burden of child care. Our help should be aimed at those who need it most -- low-income families with young children. I support a new child care tax credit that will aim our efforts at exactly those families -- without discriminating against mothers who choose to stay at home. (Applause.)

Now, I know there are competing proposals. But remember this -- the overwhelming majority of all preschool child care is now provided by relatives and neighbors and churches and community groups. Families who choose these options should remain eligible for help. Parents should have choice. (Applause.)

And for those children who are unwanted or abused or whose parents are deceased, we should encourage adoption. I propose to reenact the tax deduction for adoption expenses, and to double it to $3,000. (Applause.) Let's make it easier for these kids to have parents who love them.

We have a moral contract with our senior citizens. And in this budget, Social Security is fully funded, including a full cost-of-living adjustment. We must honor our contract.

IV. MAKING A KINDER, GENTLER NATION

A. Protecting the Environment

The President proposes a nine-part program to protect the environment.

- Strengthening Our Commitment to Cleaner Air: The President will propose legislation to reauthorize the Clean Air Act, ensuring progress toward meeting air quality standards in the Nation's major cities. The President will ask Congress to establish an acid rain program that will obtain significant SO2 and NOx emission reductions, balancing competing interests, by specified dates. The President will work to achieve the worldwide ratification of the historic Montreal Protocol.

- Preserving and Expanding Recreation Lands: America's parks and open spaces are national treasures. The President proposes $200 million for new land acquisitions through the Land and Water Conservation Fund, reversing the policy in the January budget of essentially no new acquisitions.

- Developing Offshore Oil and Gas While Protecting the Environment: The President believes that oil and gas development is necessary; however, drilling will be permitted only in an environmentally sound manner. The President will delay leasing in three sensitive areas pending resolution of environmental concerns by a task force he will establish.

- Speeding Hazardous Waste Cleanup: A reinvigorated Superfund program is the key to resolving the Nation's hazardous waste problems. Polluters unwilling to clean up their wastes will pay triple damages; cost recovery cases will be pursued sooner to end the incentive for delay; and EPA will use its emergency cleanup authority more often.

- Fighting Ocean Pollution: The President is committed to end ocean dumping by the end of 1991, and EPA will issue no new permits for ocean dumping of sludge or industrial waste. The FBI and EPA will be instructed to prosecute illegal dumpers of medical waste and new penalties against medical waste dumpers will be sought.

- Preserving Our Wetlands: The national goal will be no net loss of wetlands. An interagency task force will be established to ensure that all agencies involved in wetlands preservation work toward that goal, and there will be firmer enforcement of present laws aimed at saving wetlands.

- o Enhancing Water Quality: The President proposes an increase in funding of $64 million for coordinated Federal water quality programs in four agencies. Farmers will be aided in their efforts to avoid groundwater contamination from pesticides and fertilizers.

- o Reducing the Growing Volume of Waste: The President is committed to exceeding EPA's current goal of 25 percent reduction in waste. This is primarily a local problem, but Federal assistance will be expanded, including developing a database on successful waste reduction and recycling techniques.

- o Fostering International Cooperation on the Environment: President Bush will promote international cooperation on environmental issues, including global warming, preservation of the oceans, and the loss of tropical rain forests.

B. Combatting Homelessness

- o The President is committed to addressing forcefully -- through public and private action -- the tragedy of men, women, and children living without homes. The President's budget fulfills his pledge to fully fund the McKinney Act at $746 million in FY 1990, and over-all funding directed at homelessness will increase 70 percent to $1 billion.

- o Beyond McKinney, an incremental $50 million will be requested for a new matching grant program, in partnership with state and local agencies and not-for-profit and volunteer organizations. This program will address many facets of homelessness, encouraging and supporting the most promising local solutions for the problem.

C. Enhancing Parental Choice in Child Care

The President proposes a four-part initiative, a key element of which is to preserve the incentive for parents to make their own decisions about what sort of care is best for their children. The cost of the initiative in 1990 is $330 million, rising to more than $2.5 billion by 1993.

- o Enhancing Parental Choice in Child Care: The President proposes a new, refundable tax credit of up to $1000 for each child under four in low-income families, allowing families to select from a wide range of child care options the arrangement that best suits their needs.

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01. Report	Department of Interior Report, "No Net Loss of Wetlands." (5 pp.)	06/02/89	P-5	

Collection:

Record Group: Bush Presidential Records
Office: Speechwriting, White House Office of
Series: Speech File, Backup
Subseries:
WHORM Cat.:
File Location: Ducks Unlimited - Sixth International Waterfowl Symposium 6/8/89 [2]

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NO NET LOSS OF WETLANDS

ISSUE: What approach should be taken to implement the President's goal of no net loss of wetlands?

BACKGROUND: Despite an improved understanding of the multiple functions and values of wetlands and a sizable legal protective framework, wetlands are disappearing and being degraded rapidly. Only 95 million acres (44%) of the original 215 million acres remain in the lower 48 States. Estimates of recent annual losses range from 300,000-458,000 acres. Further, lost acreage does not depict the full nature of the problem. Few wetlands remain in a pristine state, and one recent study estimates that as much as 40% are seriously damaged.

The issue of degradation has received increased attention recently, prompted in part by revelations of contamination on national wildlife refuges and the resulting waterfowl birth defects. Major sources of wetland contamination are chemicals in farm runoff, drain water from irrigation projects, and urban and industrial pollutants (especially in riverine and coastal marshes).

Wetland Conversion, Ownership, and Vulnerability: By far the most important economic sector absorbing wetlands is the agriculture sector. Between the mid-50's and the mid-70's agricultural development accounted for 87% of wetland conversions, urban development for 8%, and other development for only 5% of the losses. The relative importance of these sectors for wetland loss has not changed since the mid-70's, although the percentage accounted for by agriculture has probably declined slightly.

Three-fourths of the remaining wetlands in the continental U.S. are privately owned, and only 0.5% of these have protective covenants on them. About 80 percent of conversions are not covered by Section 404 of the Clean Water Act, the principal regulatory program.

Administrative Responsibilities: As the Nation's largest land manager, Interior purchases and manages wetlands, and oversees the distribution of funds to States for wetland acquisition. Its regulatory role is restricted largely to review, comment, and coordination with other Federal and State agencies to encourage them to exercise their responsibilities and use their authorities to provide better protection to wetlands.

The Corps of Engineers operates the 404 regulatory program, issuing permits for dredging and filling of wetlands when it determines that the benefits of proposed actions outweigh the damage to the wetlands. The Corps is responsible for monitoring permitted activities to assure compliance with permit conditions. The Corps manages wetlands on its property, and conducts mitigation for wetland damage due to the construction and operation of its projects.

Under the Clean Water Act, EPA is responsible for issuing the guidelines establishing the conditions under which 404 permits can be issued. Although it exercises the authority sparingly, EPA can overrule the Corps and rescind 404 permits which it determines violate the guidelines. EPA also has review and consultation responsibilities under a number of authorities.

USDA administers the Swampbuster program, purchases wetland conservation easements, and mitigates for wetland damage due to the construction of SCS projects.

The Changing Federal Role: Historically, many Federal programs and subsidies have encouraged wetland development by increasing the profitability and reducing the riskiness of locating in wet and flood-prone areas. In particular, agricultural subsidies and heavily subsidized irrigation, flood control, and drainage projects have hastened the decline of the nation's wetlands.

Executive Order 11990 (EO), issued in 1977, ended a long-standing official policy of direct Federal assistance for wetland conversion. The EO directed all agencies to minimize wetland impacts to the extent possible in conducting their programs and activities. Since issuance of the EO, several important legislative changes have reduced the incentives for conversion of wetlands. Indirect government assistance for wetland conversion in the form of special income tax provisions was eliminated by the Tax Reform Act of 1986. The "Swampbuster" provision of the 1985 Food Security Act (FSA) made farmers who plant on newly converted wetlands ineligible for most farm program benefits. The 1986 Water Resources Development Act (WRDA) requires increased cost sharing by non-Federal sponsors of water projects and provides for the mitigation of environmental effects of Corps of Engineers projects concurrent with construction.[1]

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[1]These projects make it technically and financially feasible to convert wetlands to agriculture. In a society suffering from

Despite the promise of these market-based steps to reduce wetland conversion, the rate of loss continues to be high. Swampbuster's effectiveness is limited by specific language in the FSA and by the way the regulations have been implemented.[2] Although the WRDA constitutes an important step toward efficiency and equitable financing for water projects, the cost shares specified in the WRDA are negotiated values, and do not confront project beneficiaries with the full cost of providing them with the project output. Further, WRDA applies only to water projects constructed by the Corps, rather than to all Federally cost shared projects no matter who constructs them. Finally, where development pressure is strong, reduced tax concessions may have only a marginal effect.

Maintaining that too much of the wetland resource has been lost, conservation interests within and outside of the government have pressed for additional reforms and increased acquisitions. The National Wetland Priority Plan (required by the Emergency Wetland Resources Act of 1986) and the North American Waterfowl Management Plan (prepared jointly by the United States and Canada) call for increased expenditures to conserve and restore wetlands. The National Wetlands Policy Forum, convened by the Conservation Foundation at the request of EPA, recommended new Federal programs, expanded acquisitions and easements, a revised and broader regulatory program, reduced losses associated with Government activities, and increased incentives for private sector conservation. Collectively, these could prove expensive.

DISCUSSION: There are three basic approaches to conserving wetlands: regulate development; add to the public estate (fee simple or conservation easement); make use of economic incentives (by restricting public programs which subsidize development in significant wetlands and providing inducements

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chronic agricultural surpluses, the benefits of such conversions are at best questionable and most likely zero. Raising the cost borne by the non-Federal sponsors reduces the demand for such projects.

[2]For example, in North Dakota, where there is a State no-net-loss policy and where Swampbuster should be effective because of the high participation rate in farm programs, 30-40 thousand acres of wetlands continue to be lost annually since enactment of the FSA.

to encourage private sector conservation). Any legitimate strategy for conserving wetlands involves each of these elements. No matter what the approach, however, environmental protection and the benefits therefrom involve costs. Ignoring these costs and not pursuing a least cost solution is a prescription for failure.

Regulation: Section 404 is jointly administered by the Corps and EPA, has a turbulent history, and, as currently structured and administered, is generally acknowledged to provide only limited wetland protection. To be effective, its scope and jurisdiction would have to be expanded. This would entail political, economic, and budgetary costs.

Acquisition: With three-fourths of the remaining wetlands in private hands, a conservation strategy relying predominantly on acquisition would be prohibitively expensive. Acquisitions will have to be focussed on the most vulnerable and ecologically most valuable areas.

Economic Incentives: Restricting public programs which encourage economically inefficient and environmentally unsound development in wetland areas has a number of advantages. It helps to eliminate distortions in market signals, improve the allocation of resources, and promote a stronger, more competitive economy. By reducing Federal programs, it fosters budgetary savings. And it conserves wetlands with a minimum of Federal involvement and economic disruption.

With its experience in administering the Coastal Barrier Resources Act, Interior has been among the most ardent proponents of the economic incentives approach to conservation. Last December, Secretary Hodel issued volume one of a two volume, congressionally mandated report, identifying those Federal programs and subsidies which contribute to wetland loss and degradation, and recommending changes to eliminate the inherent contradiction in government policy of programs designed to protect wetlands existing simultaneously with programs which counter the protective efforts by promoting commercial development.

This strategy is not without its costs. Although eliminating subsidies appeals to almost everyone in the abstract, in the particular application it often meets with strenuous resistance. Once established, subsidies are difficult to displace. The beneficiaries tend to view them as entitlements, and defend them fiercely.

RECOMMENDATIONS: Wetlands can be conserved through a careful blending of administrative action in controlling Federal activities that influence wetland existence and quality, judicious use of regulation, and economic incentives to encourage private sector conservation.

Much conservation can be achieved simply by making no net loss a high priority within the Administration. Most agencies have promulgated regulations or issued guidelines under the EO, but in recent years little emphasis has been given to abiding by these strictures. Reaffirmation and enforcement of the wetlands EO would provide clear direction and result in all agencies being more sensitive to the wetland impacts of their activities.

Implementation Considerations: Although some additional regulation may prove necessary, it will have to be orchestrated carefully. EPA has played a leading role in bringing the wetland issue to the attention of the Administration and Congress. EPA's role in identification of wetland degradation and monitoring of community water should continue. However, most remaining wetlands are on farmland, and EPA is often viewed warily by the farm community. An aggressive regulatory role for EPA on agrarian wetlands could undermine efforts to gain support among farmers for wetland conservation, and unleash a backlash against conservation efforts on private land. Thus, the current balance between the Corps and EPA in administering 404 should be retained, although the Corps will need to develop a greater sensitivity to environmental concerns.

Through implementation of the Food Security Act, USDA has already been placed in an awkward position with their traditional constituency. USDA is the best vehicle for convincing the farm community that water is a precious asset, far more important than commodity subsidies and that wetlands are critical to the maintenance of water supplies. Through the relationship that USDA has with the American farmer, no net loss can be marketed.

The Wetlands Inter-Agency Task Force provides an excellent vehicle for reviewing the operation and financing of all Federal programs as they affect wetlands. With a strong mandate from the President, regulatory oversights, poor mitigation efforts, and inappropriate subsidies all can be scrutinized.

measures—e.g., including environmental consideration in multilateral development bank lending policies—that will help preserve the world's remaining tropical forests.

b. Preserving and Expanding Recreation Lands

OVERVIEW

America's parks and open spaces are some of the Nation's most precious resources—they are national treasures. Our national parks, forests, wildlife refuges, and similar areas are not only environmentally significant, they help meet the continuing demand for outdoor recreation. It is the Federal Government's duty to properly care for this land—to effect the wise stewardship the American people expect and deserve.

Great progress has been made in the past eight years in improving the operation and maintenance of existing Federal recreation areas. But, this Administration also supports a program of acquisitions of precious land and water resources for the enjoyment of present and future generations. Therefore, the Administration proposes to proceed with purchases of high-priority lands. A limited, systematic program of Federal land acquisition is a prudent investment for the future, even in our current era of fiscal restraint.

The proper tool for financing Federal land acquisition is the existing Land and Water Conservation Fund (LWCF). Since its establishment in 1965, over $4 billion has been appropriated from the LWCF for this purpose. The program was recently reauthorized by Congress through the year 2015. The LWCF has been a success, and it should continue to give Americans the chance to acquire—and to enjoy—land and water resources.

> *"I am a strong supporter of protecting our parks—they are America's pride and joy. . . . I believe we should continue the Land and Water Conservation Fund, which funds the acquisition of new parklands and wildlife refuges. . . . This is one legacy which we must preserve for generations to come."*
>
> George Bush

PRINCIPLES

- The President supports a limited but sustained program of Federal recreational land acquisition financed by annual appropriations from the LWCF.
- Funds appropriated for land acquisition should be targeted to ensure preservation of our Nation's most valuable natural and cultural resources, as identified by the professionals of the Interior and Agriculture Departments.
- Insofar as possible, acquisition funding should also be targeted to those Federal recreation areas experiencing the sharpest growth in recreation use.
- Parks that will be enjoyed by people should be our top priority. The Administration is particularly committed to the development and expansion of existing national parks in and near urban areas, such as the Santa Monica Mountains National Recreation Area.
- Federal spending to protect and preserve recreational resources should not substitute for continued, vigorous efforts by State and local governments and the private sector to address this need. The Federal Government will continue to provide technical assistance and advice to promote these efforts.

- Appropriations from the LWCF to fund State grants for recreational land acquisition and development should be foregone, until such time as the Federal Government's backlog of authorized, unfunded land acquisition is fully addressed.

POLICIES

Consistent with the objectives of the President's Commission on Americans Outdoors (December 1986), and the Task Force on Outdoor Recreation Resources and Opportunities (July 1988), the President proposes to fund LWCF-financed Federal recreational land acquisition at the 1989 enacted level of $206 million in 1990 and through the outyears. This represents an increase of $182 million from the January budget request for 1990, and a $728 million increase over the 1990–93 period.

As in 1989, funding would be allocated among the Interior Department's National Park Service, Fish and Wildlife Service and Bureau of Land Management, and the Agriculture Department's Forest Service. A detailed proposal describing the allocation of funds between agencies and the specific areas proposed for acquisition will be submitted to Congress shortly.

FUNDING SUMMARY
(In millions of dollars)

	1989	1990	1991	1992	1993
Budget Authority	206	206	206	206	206
Outlays	240	244	204	204	206

c. Developing Offshore Oil and Gas While Protecting the Environment

OVERVIEW

The Administration believes that oil and gas development of America's offshore areas is necessary to ensure a reliable supply of energy and provide for the Nation's economic and national security. However, drilling will be permitted only in an environmentally sound manner. Past experience in Federal OCS leasing has shown the Nation can both produce oil and gas and protect the environment.

The Federal Outer Continental Shelf (OCS) oil and gas program, covering an area starting 3–9 miles offshore to a distance of about 200 miles, is responsible for 12 percent of the Nation's oil production and 26 percent of gas production. Thirty-one million acres are currently under lease, generating $2.7 billion in 1989 Federal receipts from both lease sales and royalties. The program, administered by the Department of the Interior at a cost of $90 million yearly, has leased 55 million acres for exploration and development over the past 35 years, generating over $90 billion in Federal receipts, with an excellent safety and environmental record.

- The 1986 Tax Reform Act, which eliminated provisions of the Federal tax code that encouraged conversion of wetlands to farmland.
- The 1982 Coastal Barrier Resources Act, which is specifically designed to restrict federally subsidized development of undeveloped coastal barriers and associated wetlands along the Atlantic and Gulf Coasts.

g. Enhancing Water Quality

OVERVIEW

Groundwater and surface water contamination from the normal use of pesticides and fertilizers is a growing concern throughout the country. Both public and private efforts are required to promote the adoption of environmentally sensitive farm production practices and to develop safer chemical and biological pest controls.

> *"The protection of the environment and the conservation and wise management of our natural resources must have a high priority on our national agenda. But given sound research, innovative technology, hard work, sufficient public and private funds, and—most important of all—the necessary political will, we can achieve and maintain the environment that protects the public health and enhances the quality of life for us all."*
>
> George Bush

PRINCIPLES

- The President is committed to protecting the Nation's groundwater resources from contamination by fertilizers and pesticides without jeopardizing the economic vitality of U.S. agriculture.
- Water quality programs must accommodate both the immediate need to halt contamination and the future need to alter fundamental farm production practices.
- Ultimately farmers must be responsible for changing production practices to avoid contaminating ground and surface waters. Federal and state resources can provide valuable information and technical assistance to producers so that environmentally sensitive techniques can be implemented at minimum cost.

POLICIES

This initiative increases existing funding for coordinated water quality programs in the Departments of Agriculture, Commerce, and Interior and the Environmental Protection Agency by $64 million. Building on an interagency base of $226 million, the 1990 programs will address critical needs in water quality assessment, research, and public education. The Department of Agriculture will spend an additional $47 million, mostly on the development and demonstration of farming practices that avoid water quality degradation. Commerce's National Oceanic and Atmospheric Administration will monitor the effects of agricultural run-off on coastal and inland waterways. The Environmental Protection Agency, working with the relevant state and Federal agricultural agencies, will devote an additional $10 million to improving farmers' understanding of their obligations as stewards of water quality. The U.S. Geological Survey will add funds to its ongoing $57 million effort to measure accurately and monitor surface and groundwater quality. The $64 million initiative represents a permanent increase to base funding for water quality programs. In coming years, as more is learned about the causes and

consequences of water quality degradation, program emphasis will shift to ensure adoption and use of environmentally sensitive farming practices.

PROPOSED CHANGE
(In millions of dollars)

	1989	1990	Dollar Change	Percent Change
Budget Authority	226	290	+64	+28.3
Outlays	226	290	+64	+28.3

h. Reducing the Growing Volume of Waste

OVERVIEW

America as a nation is filling landfills faster than it can site new ones. Per capita waste production in the United States is greater than in any country in the world. Collectively, this nation produces 160 million tons of garbage a year, and one-half of the municipal landfills in this country will be full by the mid-1990s. The waste problem is not going away. It can no longer be neglected. America can do better.

This country must make every effort to stem the rising tide of garbage and industrial waste through a more aggressive use of waste minimization and recycling practices. In many cases it is in the economic self-interest of industry to avoid polluting by recycling wastes, by minimizing wastes at the source, or by changing to a non-polluting process. The technology is there; what is needed now is the will.

"There is, after all, much that we can do ourselves, individually, to benefit the environment: We can reduce our municipal solid waste problem with a greater commitment to recycling. We can improve the outdoor experience simply by picking up the trash we see and not leaving any of our own behind."

George Bush

PRINCIPLES

- Reducing waste at the source is the best way to deal with the problem.
- The President believes that EPA's current national goal of 25 percent waste reduction, through recycling and reducing wastes at the source, can be exceeded.
- Waste minimization must start at home and in the local communities. Citizens must be willing to reduce their garbage and separate their wastes for recycling purposes, or else be willing to accept nearby incinerators or landfills.
- Effective waste reduction techniques both in industry and in local communities should be shared.

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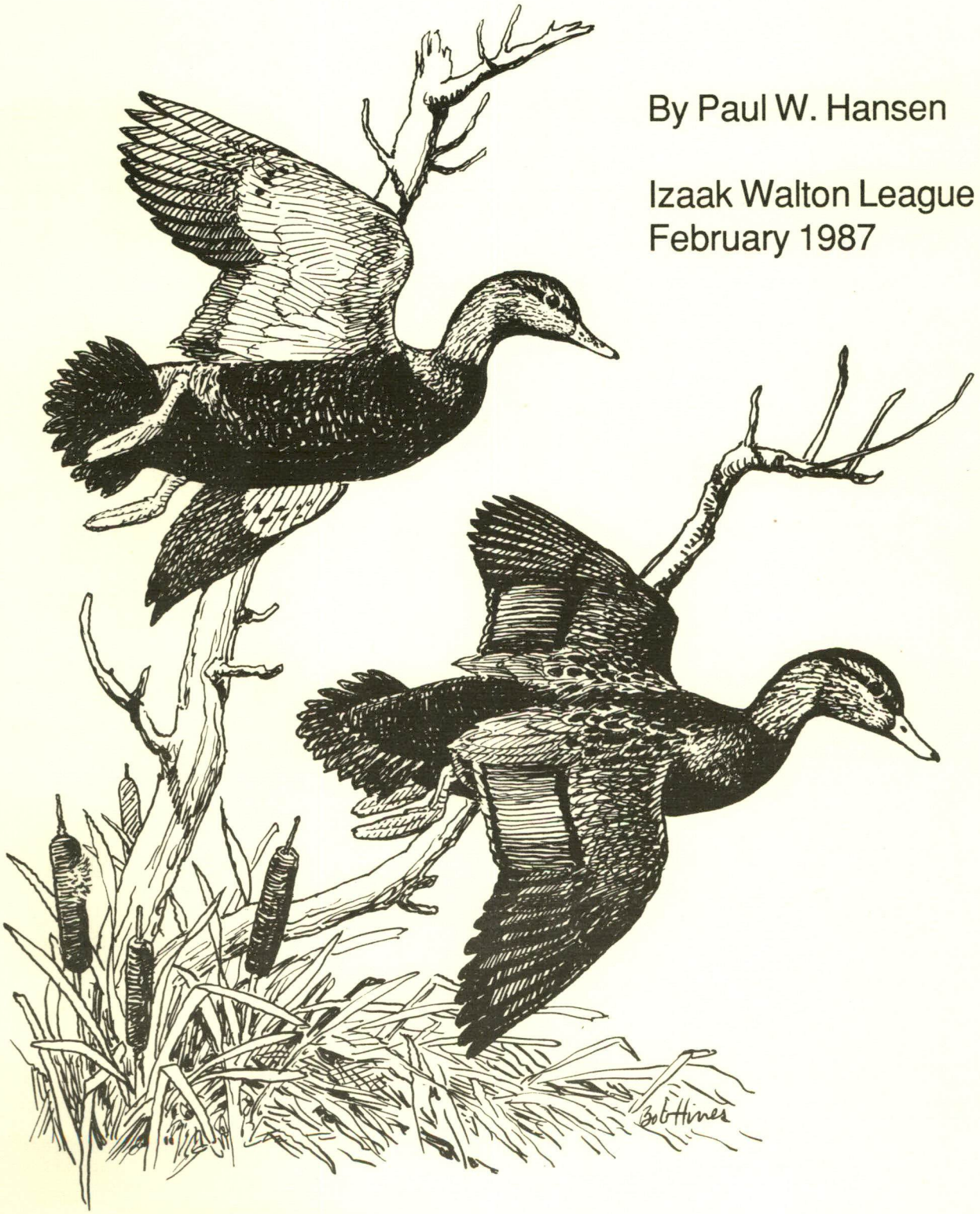
The Case for Concern in North America



By Paul W. Hansen

Izaak Walton League of America
February 1987

ACID RAIN AND WATERFOWL:
The Case for Concern in North America

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Upper Mississippi Regional Representative
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Foreword by: Frank C. Bellrose, Illinois Natural History Survey

February 1987

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This report is the sole responsibility of the Izaak Walton League of America. These supporting organizations, readers, scientists and other officials are in no way responsible for its contents.

Cover Art: BLACK DUCKS, HEN--DRAKE, by Bob Hines, 1987.

ACID RAIN AND WATERFOWL

Foreword

Acid rain was only recently made a part of our lexicon by concerned environmentalists, even though the term was first coined by a British chemist way back in 1872. Only a few years ago the mention of acid rain conjured up the image of a few fishless lakes in the Adirondacks and in certain regions of Ontario and Quebec. However, recent studies have greatly expanded the scope and regional amplitude of acid rain to include forests and buildings, and concerns now embrace a large part of eastern North America.

Now comes this report by Paul W. Hansen of the Izaak Walton League of America, pointing to the involvement of acid rain in the welfare of breeding ducks. Based upon preliminary research by Canadian and United States biologists, this report presents sobering information on the adverse effects of acid rain on Black Duck and other duck populations.

The mysterious decline of the Black Duck for three decades has defied a sound explanation in spite of much research. Prior to this report the only explanation that made sense was the swamping of the Black Duck gene pool by that of the Mallard. However, this report raises a second possibility: Acidification in the wetlands of the Black Duck's breeding range may be adversely affecting its production of young. As Mr. Hansen points out, there is a considerable body of research that shows acidification reduces the diversity and abundance of invertebrate populations that provide the nutritional needs of laying hens and growing young. Without proper nutrition, females lay fewer eggs and brood losses increase.

The Black Duck, the Wood Duck, Pintail, Blue-winged and Green-winged Teals, Ring-necked Duck, Common Goldeneye, Bufflehead, Hooded and Common Mergansers breed in the region of known wetland acidification. Breeding females of all these species and their broods would be adversely affected by acidification through adverse impacts on their food resources.

This report, even though based on preliminary research findings, presents alarming information that acid rain may be a real, and certainly is a potential, source of degradation for waterfowl breeding habitat. Thus waterfowl appear to have suffered, or may suffer in the future, from the acidification of wetlands caused or accentuated by acid rain.

It behooves the environmental community to use this report as a catalyst for intensified action on acid rain--action to further research on evaluating the parameters of its effect upon waterfowl and action to begin limiting the emissions of sulfur dioxide.

Frank C. Bellrose
Principal Scientist and Wildlife Specialist

Illinois Natural History Survey
February 1987

INTRODUCTION AND EXECUTIVE SUMMARY

The impact of acid rain on waterfowl may be as serious and widespread as its now well-documented effect on fisheries, according to new and ongoing research from the U.S. and Canada. Acidity destroys critical food organisms and can be linked to waterfowl population declines.

Over the past few decades, a number of important waterfowl species have suffered rapid population declines. According to the United States and Canadian 1986 Status of Waterfowl and Fall Flight Forecast, populations of Black Ducks, Mallards, American Wigeons, Northern Pintails and Canvasback ducks all have dropped significantly since 1955. Black Duck populations have declined most dramatically--dropping 60 percent in that time period.

Many factors have been suggested as causes of the decline of the Black Duck and other species. Hybridization, interspecies competition, habitat loss, overhunting, the effects of lead shot ingestion, and environmental contaminants are all frequently mentioned. An extensive review of published studies, draft reports and interviews with scores of experts has led the Izaak Walton League to conclude that acid rain must now also be given serious consideration as a factor in the decline of the Black Duck and other waterfowl.

Two decades of acid precipitation research, from throughout the world, show clearly that truly acidic lakes--such as those found in the Adirondacks, Scandinavia and the La Cloche Mountains in Ontario--support only sparse and limited biota.

These lakes are incapable of supporting the nutritional needs of breeding waterfowl ("waterfowl" includes loons for the purposes of this report). More moderate levels of acidification, which now occur from North Dakota east to the Atlantic, threaten a number of duck species. According to Don McNicol, lead researcher on the effects of acid precipitation on waterfowl for the Canadian Wildlife Service, "The limited amount of research that has been conducted in Canada, the U.S. and Europe on acid rain/waterfowl impacts shows convincingly that a large segment of our waterfowl resource may be at risk from the effects of acid rain, particularly in combination with the many other forms of habitat degradation that currently threaten the resource" (Personal Communication, November 1986).

Our "case for concern" is based on evidence from a variety of sources:

1) Many eastern areas where waterfowl breed are especially sensitive to the effects of acid rain and are receiving the heaviest levels of deposition in North America. The Black Duck, which is second only to the Canada Goose in the esteem of hunters, is of special concern because the breeding range of this species coincides closely with this critical area. The decline of the Black Duck since 1955 coincides closely with the increase of acidic emissions and acidic deposition in this region.

Moreover, Black Ducks breed early in the spring, which makes them more vulnerable to "acid shock"--severe increases in acidity that occur when early spring runoff dumps the bulk of the winter's precipitation and acid into lakes, streams and wetlands within a short period of time. These acid surges resulting from snowmelt are now common throughout much of

eastern North America in April and early May. As the Black Duck breeding season begins and the birds' nutritional needs are greatest, acid levels and the impacts on food sources are also highest.

2) Research on naturally acidic lakes, experimentally acidified lakes, and lakes acidified by acid precipitation all indicates that waterfowl production, breeding success, and duckling survival are all markedly lower on acidic waters than on relatively non-acidic waters. As Kathleen Fischer, coordinator of Canada's research on acid rain's effects on wildlife, told us: "We now know that acid stressed lakes do not produce many baby ducks" (Personal Communication, August 1986).

In one study performed at the Patuxent Wildlife Research Center in Laurel, Maryland, in 1985, the mortality of Black Duck young raised on acidic wetlands was over three times higher than the mortality of ducklings raised on non-acidic control wetlands. According to the researchers, "These results present strong evidence of the potential deleterious effect of wetland acidification on the productivity of free-ranging Black Ducks and possibly other populations of dabbling ducks inhabiting areas affected by acid precipitation" (Haramis and Chu, 1986).

In Quebec, researchers have found that Black Duck ducklings grew 60 percent more slowly in moderately acidic areas, where fish were present, than in non-acidic areas. The lead researcher in Quebec stated, "Time is running out. Acid rain must be stopped or the fish and duck populations of the Laurentian Shield may suffer irreparable harm" (DesGranges, 1985).

In Ontario, researchers are finding that in areas with lakes acidified by pollutants, waterfowl reproductive success is lower than in a similar study area that has fewer acidic lakes. Species of concern include: Ring-necked Duck, Common Goldeneye, Common and Hooded Mergansers, Mallard, Green-winged and Blue-winged Teal, Wood Duck and Common Loon.

3) Many of the most important insects and other aquatic animals that are urgently needed by young and breeding waterfowl for successful reproduction, disappear rapidly as acidity increases. Reductions of these critical duck food species are thought to be the primary cause of reduced productivity, growth and survival of young ducks on acidic wetlands.

4) Even ducks breeding on prairie potholes in North Dakota and the Upper Midwest, some of the best duck breeding habitat in North America, may also be facing habitat degradation and reduced productivity due to local sources of acidic pollutants. Researchers working in this region fear that a large amount of very important habitat for early spring feeding could be lost in this region.

While it is not within the scope of this report to prove unequivocally that acid rain is killing ducks or contributing to the population declines now effecting several species, this examination of the growing body of evidence led us to conclude that acid rain could be adversely affecting a number of duck species. Although it is unlikely that acid rain is killing adult ducks directly, it is highly likely that it is reducing the reproductive success of a number of species by limiting egg laying and duckling survival.

This new evidence also supports the view that an extensive regional fish and wildlife resource may be put at great risk by further delays in passing measures to control acid rain. Waterfowl enthusiasts and others who care about the future of duck populations throughout eastern North American will now find ample reason to be involved in the public debate on the need for acid rain controls.

A REVIEW OF THE RESEARCH

The Geographical and Temporal Evidence

Areas of North America where acid deposition has increased most severely since 1955 coincide closely with the breeding range of the Black Duck, whose population has declined by 60 percent over the same time period.

Temporal Relationships

Until recently, the Black Duck was called the Crown Prince of the Atlantic flyway and ranked second only to the Canada Goose in the esteem of hunters. Since 1955, however, Black Duck numbers have declined by 60 percent. This decline coincides closely with the intensification of acid rain during the same period, as measured by rainfall pH (Figure 1) or by increases in sulfur dioxide and nitrogen oxide emissions (Figure 2).

Although the reliability of data on temporal trends of rainfall pH in eastern North America (Figure 1) continues to be debated, in 1983 the National Academy of Sciences concluded that trends in acidic sulfate and nitrate deposition should approximate trends in emissions over large regions (National Research Council, 1983). In other words, the amount of pollutants that come down in the rain are directly proportional to the amounts that are emitted by our industrial society. Others have confirmed this observation for western regions in the United States (Oppenheimer and Yunke, 1984). A look at emissions over the past 30 years gives us a close approximation of the trend

in deposition over the same time--a trend which many observers believe is confirmed by the data on increasing pH in Figure 1.

However, two trends are indisputable: 1) between 1955 and 1970 acidic emissions increased by 45-50 percent in the U.S. (figures on Canadian emissions are quite similar), and 2) the population of the Black Duck in the Atlantic flyway dropped by almost exactly the same percentage over the same period of time (U.S. Fish and Wildlife Service Office of Migratory Bird Management, 1986).

Geographical Relationships

The Black Duck, as well as the Ring-necked Duck and several other important species, breed over almost exactly the same region of eastern Canada and the northeastern United States where soil and water are low in alkalinity and where damage from acid rain is most pronounced. Figure 3 shows the geographic relationship of:

-the breeding range of the Black Duck,

-the regions known to be most sensitive to acid deposition, and

-the region now receiving the heaviest levels of deposition in North America.

As noted earlier, Black Ducks are among the first species of ducks to breed in the spring, which could make them even more vulnerable to impacts from the severe pH depressions of highly acidic snowmelt.

Figure 1

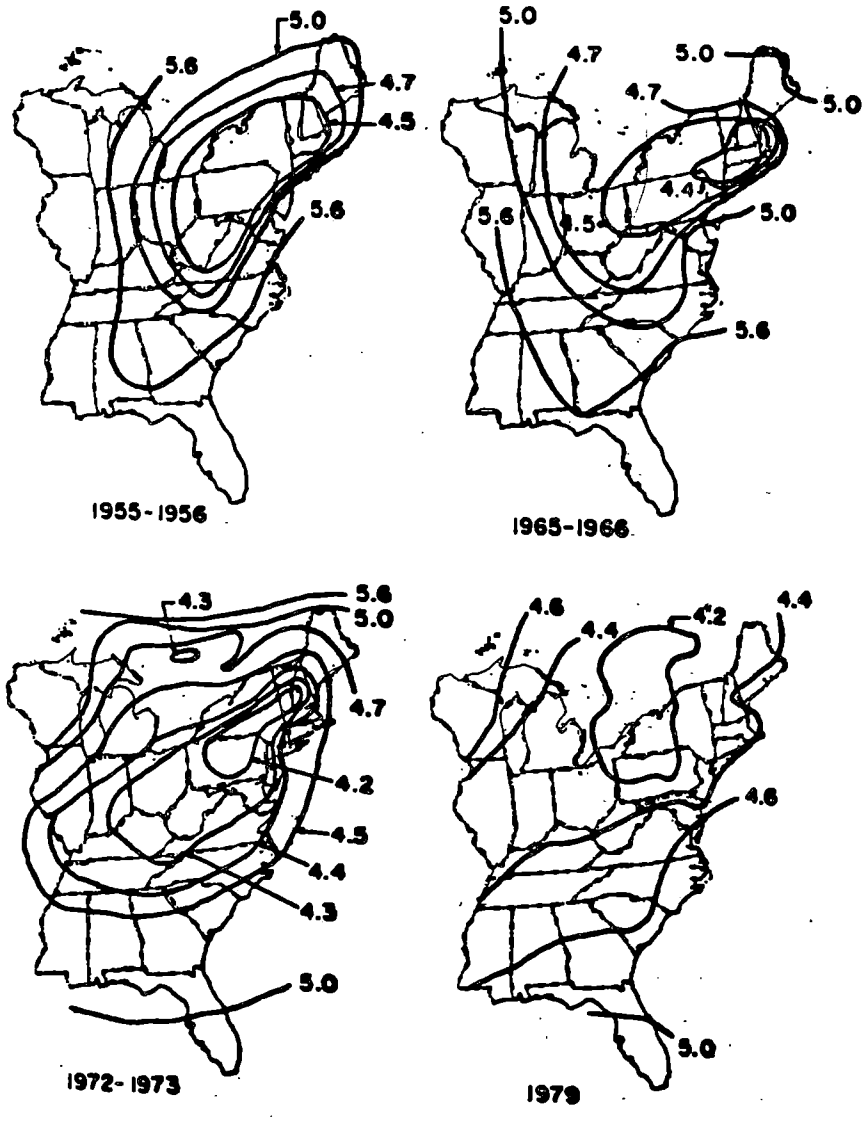

Figure 1.--Sharp declines in the mean annual pH of precipitation, 1955-1979, over the eastern U.S. indicate a substantial increase in precipitation acidity over much of the breeding range of the Black Duck since 1955. During this time, the Black Duck population in the Atlantic flyway have declined by 60 percent. The pH scale is logarithmic, so a decrease of 0.5 pH means acidity increased by three times, a 1.0 pH decrease means that acidity increased by ten times.

Adapted from Cogbill (1976) in Haines (1981).

Figure 2

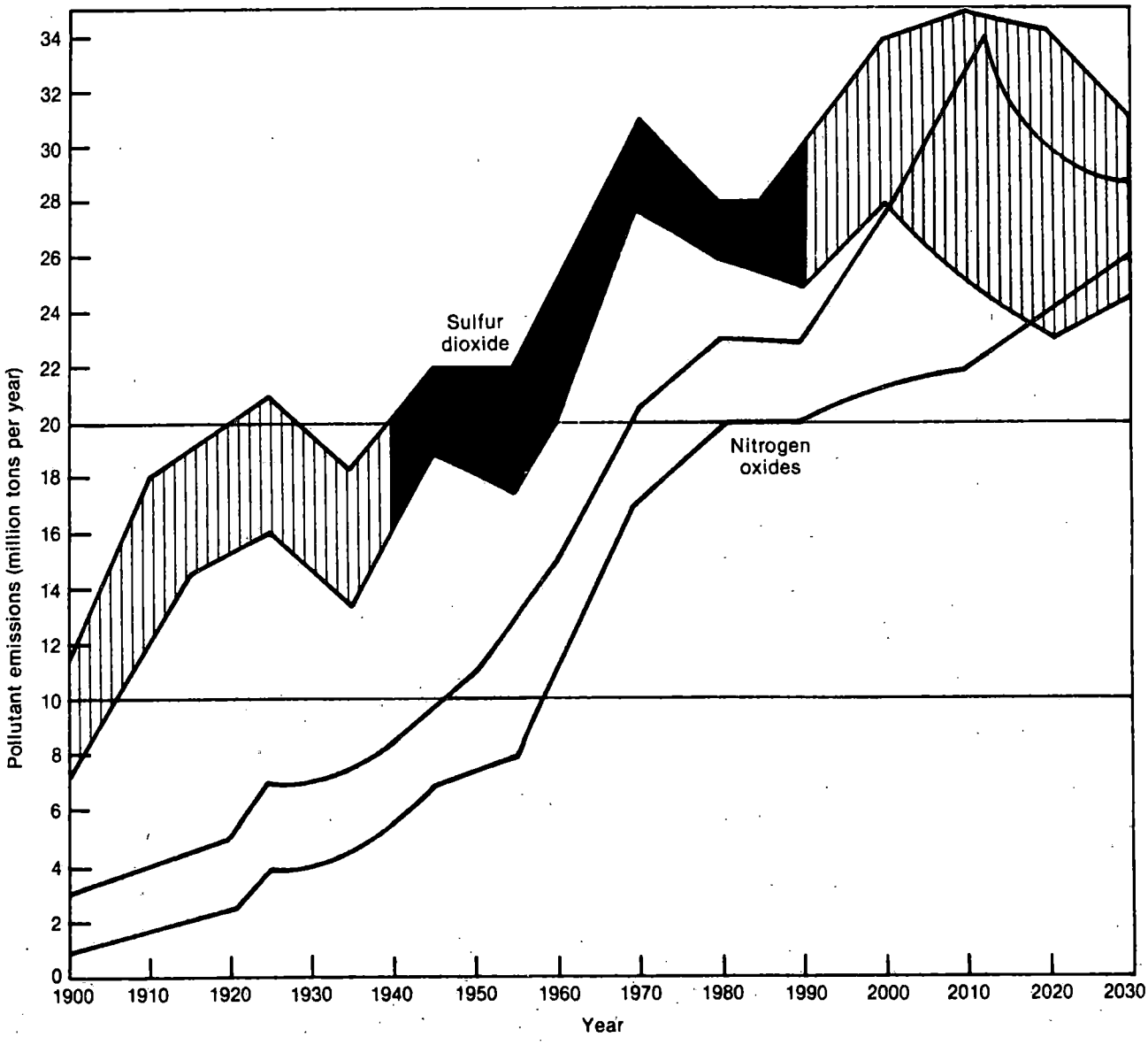

Figure 2.--The graph above displays historical emissions and projections of emissions of sulfur and nitrogen oxides in the U.S. Since 1955, which marks the onset of a marked increase in sulfur dioxide emissions, the Black Duck population has decreased by 60 percent.

Graph from: Congress of the United States Office of Technology Assessment (1984).

Figure 3

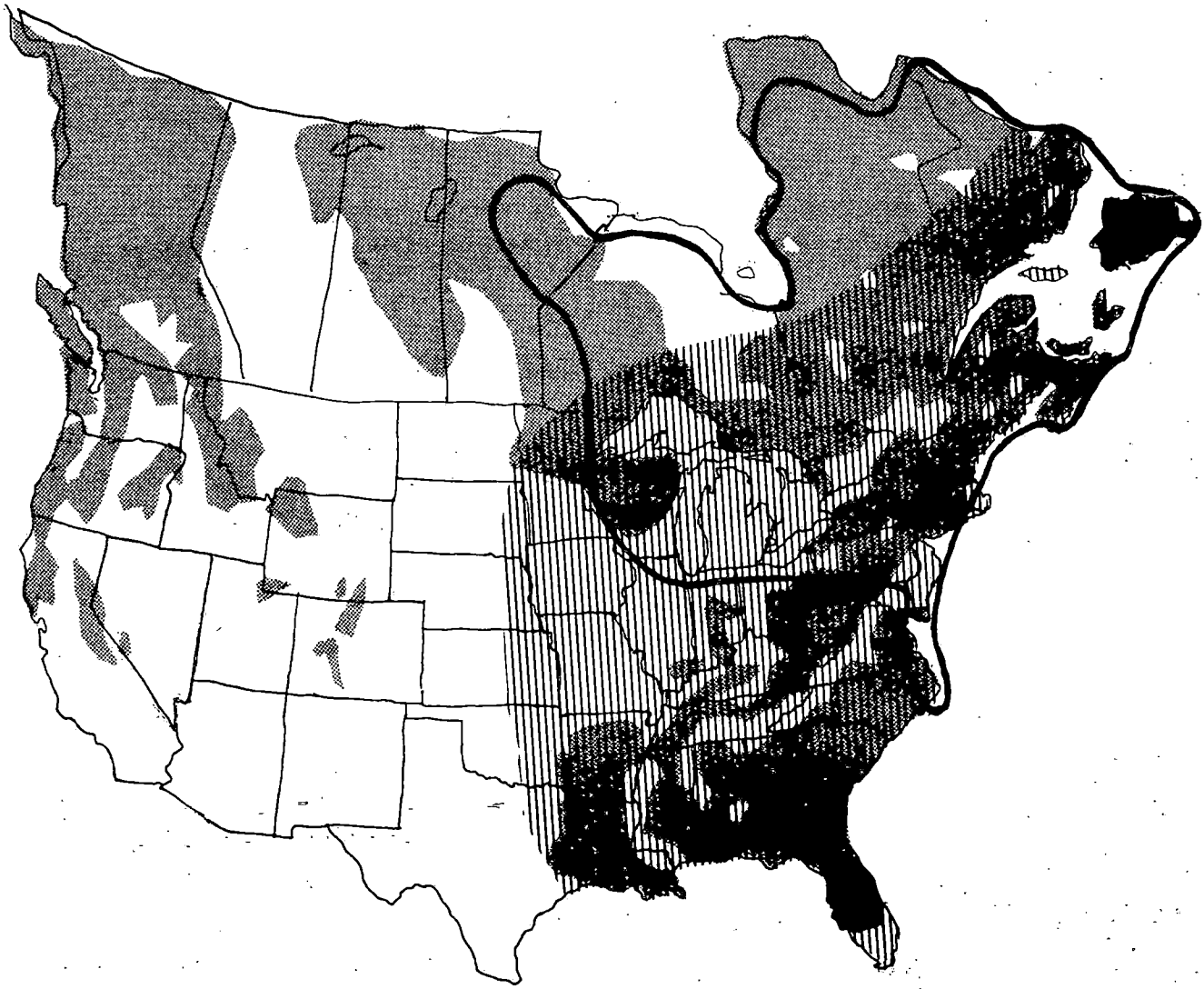

Figure 3.--This map identifies the region most threatened by acid precipition by comparing areas with high sensitivity to acid rain (in gray) with areas receiving acid precipitation at levels below pH 4.6 (verticle lines). Much of the breeding range of the Black Duck, which is outlined by the bold line, is within the region of worst acidification.

Adapted from: Canadian Embassy Fact Sheet on Acid Rain, (1984). Black Duck breeding range from Bellrose, (1980).

Highly acidic snowmelt events are now common throughout eastern North America during April and early May. Snow core pH values may be five times more acidic than average annual pH values for any given location (D. Thornton, Personal Communication, October 1986). High concentrations of several months of this highly acidic deposition can be introduced to a watershed within just a few days. In Norway, the first 30 percent of meltwater contains 50-80 percent of the total amount of acid in the snowpack (Gjessling, 1976). In Ontario, 36-77 percent of the total export of hydrogen ion (a measure of acidity) occurred in April (Jefferies, et al, 1979). The high acidity of the early spring snowmelt is widely documented and is one of the best understood aspects of the acid rain problem.

The Relationship Between Acid Rain and Waterfowl Productivity

Recent studies indicate that waterfowl productivity, breeding success and duckling survival are all markedly lower on acidic lakes, wetlands and ponds. This holds true for all types of acidic waters, including those that are experimentally acidified, naturally acidic or acidified by manmade pollutants.

Experimentally Acidified Habitats

A study conducted at the Patuxent Wildlife Research Center in Laurel, Maryland, found that Black Duck broods raised on manmade experimental wetlands experienced impaired growth and reduced survival rates (Haramis and Chu, 1985). In the study, nine broods, each consisting of a female and four 10-day-old ducklings, were placed for 10-day trial periods on acidic wetlands with a pH of 5.0. Nine other broods were placed on

control wetlands with a nearly neutral pH of 6.8. Fifty percent of the 36 ducklings exposed to acidified wetlands died, while only 14 percent died on the non-acidic wetlands. In other words, the mortality of Black Duck ducklings raised on experimentally acidified wetlands was over three times higher than the mortality of ducklings raised on non-acidic wetlands.

Of the surviving ducklings, only two on the acidic wetland gained more than 5 percent of their original body weight, but on the control wetlands 23 ducklings gained more than 5 percent of their original weight. According to the research biologists, blood analysis of the surviving ducklings from the acidic wetland showed "clear physiological evidence of inanition." In other words, even the surviving ducklings from the acidic wetland were starving. (Rattner, et al, 1985; M. Haramis, Personal Communication, September 1986).

Naturally Acidic Habitats

Several studies on naturally occuring acidic wetlands have found this habitat type to be less suitable for ducks than more neutral, or non-acidic waters.

1) In Quebec, researchers have found that on naturally acidic lakes, fish and duck diets converge on the limited aquatic prey species available (DesGranges and Roderique, in press). Fish and ducklings are forced to compete for the reduced prey species. Because fish are more mobile and efficient aquatic predators, they out-compete ducklings for the available food. Black Duck young grew 60% more slowly on the acidic (pH 5.0) lakes where fish remained, than they did on the non-acidic lakes or the acidic lakes with no fish. Ducklings on the

acidic lake with fish spent more time searching for food and gained less weight than the ducklings on the other lakes. These researchers stated that their findings show more and more clearly that acidity contributes to reduced lake productivity.

In general, the Quebec research team concluded that lakes with a pH above 5.5 constitute superior breeding sites for most waterfowl (DesGranges, 1985), with one significant exception. The Common Goldeneye, a highly mobile diving duck, actually seems to prefer some acidic lakes where fish are totally absent--presumably because of the lack of competition from fish for this highly mobile diving duck (DesGranges and Darveau, 1985).

Other researchers questioned how long this competitive advantage to the Common Goldeye would last as acidification increased (McNicol, et al., 1985). Researchers in Western Ontario's Experimental Lakes Area have found that adult fish are among the last species to disappear from an intentionally acidified lake (D.W. Schlinder et al., 1984. The presence of both acidity and fish appear to be the least preferred habitat for ducks, so lakes acidified by manmade pollutants could become unsuitable for all ducks, including the Common Goldeneye.

2) In a larger set of lakes in Ontario, waterfowl biologists also found fish in competition for food with Common Goldeneyes, Hooded Mergansers, Ring-necked Ducks and Black Ducks, with a greater reliance on a few acid-tolerant aquatic insects by all of these ducks (McNicol, et al, 1986). Competition with fish could limit food availability for these waterfowl as well.

3) In Maine, a three-year study just completed found that

acid-sensitive wetlands are important habitat for 22 species of birds, including several species of waterfowl (J. Longcore, Personal Communication, December 1986). Due to the heavy utilization of these vulnerable wetlands, these researchers feel that the potential for significant impacts due to the acidification of these areas could be great (Longcore and Stromberg, undated). Another part of the Maine study found that brood survival of the Ring-necked Duck was clearly lower on the naturally acidic wetlands. According to these biologists, findings for the Ring-necked Duck and the Black Duck are comparable because the two species share habitat preference. More data from Maine are now being reviewed and should be available in Spring of 1987.

Habitats Acidified by Pollutants

In areas where lakes and wetlands have been acidified by pollutants, researchers are finding lower reproductive rates for all waterfowl species, including those that eat fish (piscivores), those that eat insects (insectivores) and those that eat both (omnivores).

In central and northern Ontario, a survey of lakes in two areas affected by acidic pollutants showed that waterfowl reproductive performance was lower on headwater lakes receiving moderately high levels (greater than 30 kilograms of sulfate per hectare per year) of acidic sulfate pollutants. Researchers compared two areas, Wanapitei, where 66 percent of the the lakes were acidic (pH less than 5.5) and Ranger, where only 10 percent of the lakes were acidic. They found that the ratio of broods to breeding pairs was generally lower for all ducks in the acid-stressed area and dramatically lower for

fish-eating waterfowl and loons (McNicol, et al, 1985). Figure 4 shows that the more acidic lakes of Ontario's Wanapitei region have much lower brood to pair ratio than the less acidic Ranger Lake region, indicating poor reproductive performace in this area.

These researchers speculated that this poor reproductive performance in Wanapitei was due to reduced food availability in the acidic, fishless lakes as compared to the food available in naturally fishless lakes found in the control area. Although their study area represents an acid-stressed system, these scientists cautioned that it may not be completely correct to use these results to predict acidification processes in other regions (D. McNicol, Personal Communication, October 1986).

Ontario researchers have also developed preliminary estimates that 105,000 breeding pairs of waterfowl (including loons) are threatened in the acid-sensitive region of Ontario (McNicol et al, 1985). These are ducks that live on waters that are both sensitive to acid rain and that are receiving levels of acid rain known to cause acidification (less than pH 4.5). Species potentially most threatened include: Black Duck, Ring-necked Duck, Common Goldeneye, Common and Hooded Mergansers, Mallard, Teal, Wood Duck, and Common Loon (McNicol, et al 1985).

Figure 4

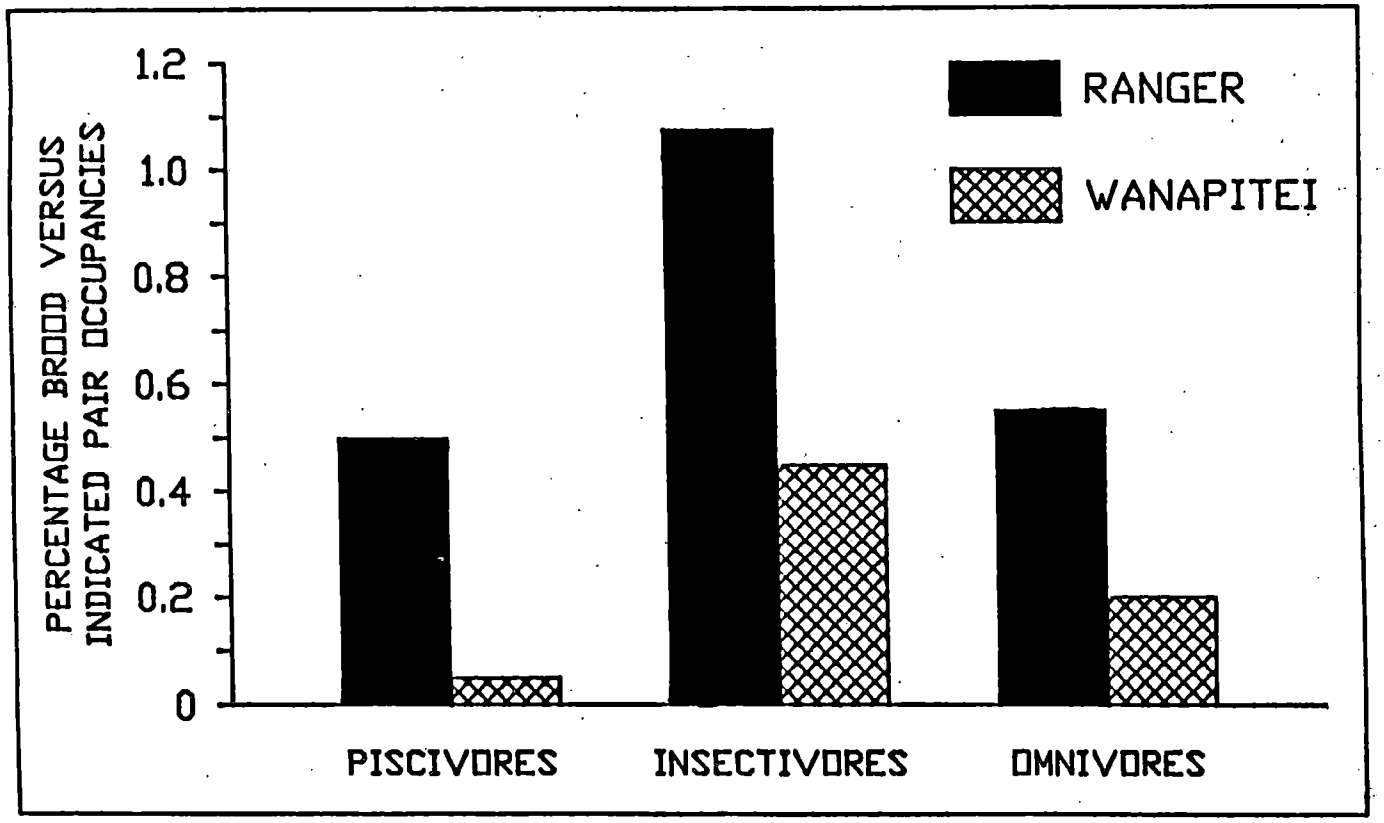

Figure 4.--This graph compares the reproductive performance of three types of ducks on an area with 66 percent acidic lakes (Wanapitei) and an area with only 10 percent acidic lakes. The ratio of broods to breeding pairs is lower for all ducks in the more acidic (Wanapitei) area and markedly lower for fish-eating waterfowl and loons.

From: D. McNicol et al. (1987, in press).

THE RELATIONSHIP BETWEEN ACIDITY AND WATERFOWL NUTRITION

The detrimental effect of acidity on waterfowl food resources is the primary explanation put forward by biologists to explain why waterfowl production, breeding success and duckling survival rates are all markedly lower on acidic lakes, wetlands and ponds.

The Importance of Adequate Nutrition

Adequate nutrition, particularly supplies of protein and calcium, is critical for waterfowl reproduction and breeding success.

Many experts emphasize that these nutrients are of critical importance to the laying hen. In fact, protein availability during the time of egg synthesis is so essential that it provides a regulatory influence on clutch size (Lack, 1967; Drobney and Frederickson, 1985). In one study, captive-bred mallards who were fed a protein deficient diet (14 percent protein) produced half as many eggs as a control group on a 29 percent protein diet and ovulated at irregular intervals (Krapu, 1979). The relationship between the 52 percent reduction in dietary protein and the 50 percent reduction in egg production is a particularly dramatic example of the close relationship between duck food availability and breeding success.

Duckling survival rates seem to be equally dependent on food availability. Ducklings are typically dependent on the female

to guide them to rich feeding areas with food high in protein. The most critical life stage for food availability is the first to fourteenth day after hatching. Abundant sources of high protein food species must be available in the brood area close to the nest during this time (D. McNicol; F. Bellrose; Personal Communication, October 1986).

An adequate protein food base is especially essential for the significant number of waterfowl that must endure the added stress of renesting due to clutch losses from predators and weather.

Effects of Acidity on Duck Food

The most critical effect of acid rain on waterfowl may be the high toll acidity takes on duck food species, especially several important mollusc and insect species.

As noted earlier, ducks depend heavily on abundant animal food, primarily aquatic insects, to reach and maintain breeding-level nutrition. There is little doubt that increased acidity decreases species diversity, which lowers the variety of food species available to breeding ducks (Eilers, et al, 1983). Figure 5 demonstrates the rapid decrease in the number of species that occurs as acidity increases. Leeches, molluscs, sponges, and insects are all important duck foods, and all disappear completely at acidity levels now found in surface waters throughout eastern North America during spring snowmelt.

The solid bar in Figure 5 indicates the median minimum pH. This point, at which half of the food species are not found, lies between pH 6.7 to pH 6.3 for all four of these groups of

Figure 5

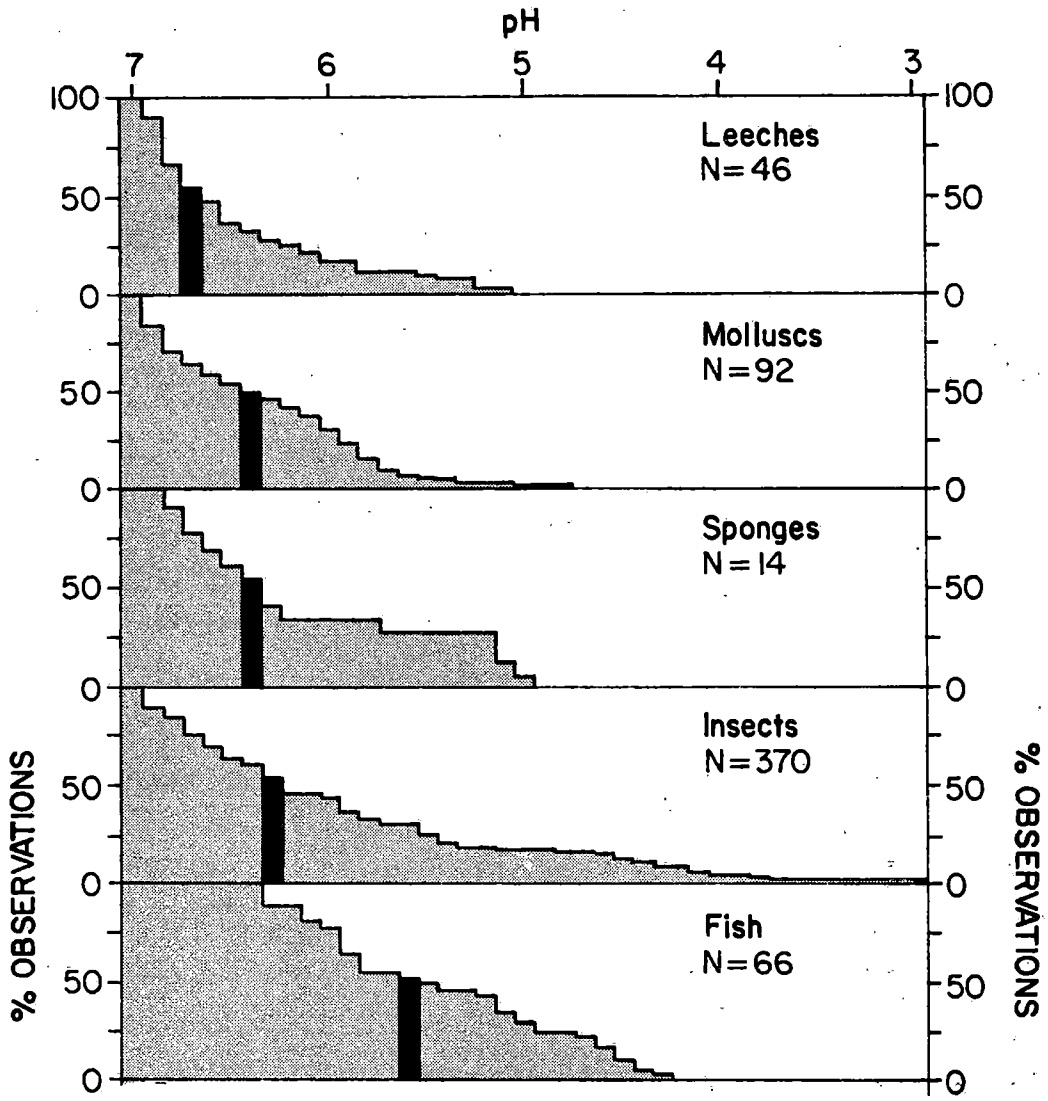

Figure 5.--These graphs show the decline in availability of several groups of organisms that are important duck foods. The graph measures the percent reduction of species as pH declines (acidity increases). The point at which half the species are not found, is indicated by the solid bar. Because many of these organisms are not found at acid levels now common in eastern North America, it is possible that a number of critical food species are already experiencing rapid declines.

Adapted from: J. Eilers et al., (1984).

aquatic organisms. This pH level is well within the range now commonly found on sensitive surface waters throughout eastern North America, so it is possible that a number of critical duck food species are already experiencing rapid declines at current levels of acidic precipitation.

While it is well established that several of the most critical duck food species simply do not exist in even moderately acidic conditions, it is less clear whether the total amount of food actually decreases. As a lake or wetland acidifies, acid-tolerant species may experience some increase in number, resulting in a shift in the species composition of the pond or wetland, but not in a loss of total biomass of food species. However, scientists question whether the acid-tolerant species are nutritionally equivalent to the preferred species they would replace and whether such a shift in diet could occur without adverse effects on laying females and ducklings. For example, mayflies are heavily used by Black Duck ducklings but are not found in acid lakes. In general biological terms, trends which limit species diversity negatively impact the consumers of those groups of species.

Calcium-rich gastropods, a large class of molluscs including freshwater snails and slugs, are known to be particularly important to the diet of laying female ducks. The lack of free calcium in acidic environments could limit the availability of adequate calcium for eggshell formation and endanger the egg laying capability of ducks in acid-sensitive regions of North America identified in Figure 3. Several studies have shown that the survival of any species of gastropod is doubtful below a pH of only 5.5 to 6.0 (Gavre, 1980; Okland, 1980), so the future abundance of these organisms throughout this entire region is uncertain.

Insects that appear early in the spring are vital to the nutrition of the laying female. According to several researchers, any adverse effect on early emerging dragonflies, mayflies or other insects would be harmful because of their importance to the diets of both young and adult ducks during the early spring (D. McNicol; K. Fischer; J. Longcore; Personal Communication, Fall 1986).

SPECIAL THREATS POSED TO WETLAND HABITAT AND FOOD SOURCES

Acid precipitation may also seriously affect some of the small, often temporary, prairie pothole wetlands throughout the Upper Midwest, which provide some of the most important waterfowl breeding habitat in North America. In early spring, when the ground is still frozen, these wetlands provide one of the only places ducks can feed at a time when the female's nutritional needs are at their highest. This prairie pothole region annually produces about 5 million ducks (Bellrose, 1980).

Seasonal Wetlands

Depending on their characteristics, these wetlands are variously referred to as seasonal, vernal, ephemeral, temporary, or seasonally flooded palustrine emergent wetlands. For purposes of this report, we will refer to the entire group as "seasonal" wetlands. These wetlands consist of shallow depressions (potholes) in the landscape and possess very small watersheds which neither feed nor discharge into other waters. They are typically perched above the local groundwater table, where they are isolated from groundwater influence, and tend to hold very little water at the onset of snowmelt. Meltwater flowing into these wetlands may receive little or no buffering if the terrain it passes over is frozen or saturated, particularly in areas of these states where soils tend to be low in bicarbonates and possess little buffering capacity. All of these characteristics tend to intensify the acid-sensitivity of these wetlands, which typically support an early spring irruption of aquatic life of extreme importance to the

reproductive success of numerous waterfowl species (Smith, 1984).

Seasonal wetlands in Minnesota, Wisconsin, Michigan and North Dakota are of particular concern. The average annual pH of rainfall in Minnesota, Wisconsin and Michigan is below 4.6--a level which is known to cause acidification of lakes and wetlands. Figure 6, a map of waterfowl habitat under state control, gives an idea of the extent of important habitat in the areas of concern in Wisconsin, Minnesota and Michigan. Preliminary sampling of wetlands in Minnesota, which has the least acidic precipitation of the three states, is showing alarmingly low pH levels in seasonal wetlands during spring runoff (S. Smith; R. Lorenz; Personal Communication, October 1986).

North Dakota Potholes--A Special Concern

Although, seasonal wetlands are extremely abundant and important for ducks in South Dakota, Manitoba, Saskatchewan and Alberta, these areas are not normally considered threatened by acid rain. Due to the proliferation of local emissions sources and the potential effect of concentrated acidic snowmelt on the region's valuable "pothole" wetlands, acid deposition is causing concern in North Dakota. Officials from both the state of North Dakota (M. Deutschman, Personal Communication, September 1986) and the Lostwood Fish and Wildlife Refuge in North Dakota (K. Smith, Personal Communication, January 1987) fear extensive habitat loss from the potential effects of acid rain on these wetlands. Preliminary study in 1986 by the U.S. Fish and Wildlife Service staff at the Lostwood NWR found pH levels of seasonal wetlands to be "abnormal" and "lower than

expected." More comprehensive sampling of the acidity of deposition, snowmelt, precipitation and wetlands will be performed in 1987.

The loss or reduction in quality of seasonal wetlands in even part of the pothole country range could potentially cause serious declines in duck populations that rely on this habitat.

Figure 6

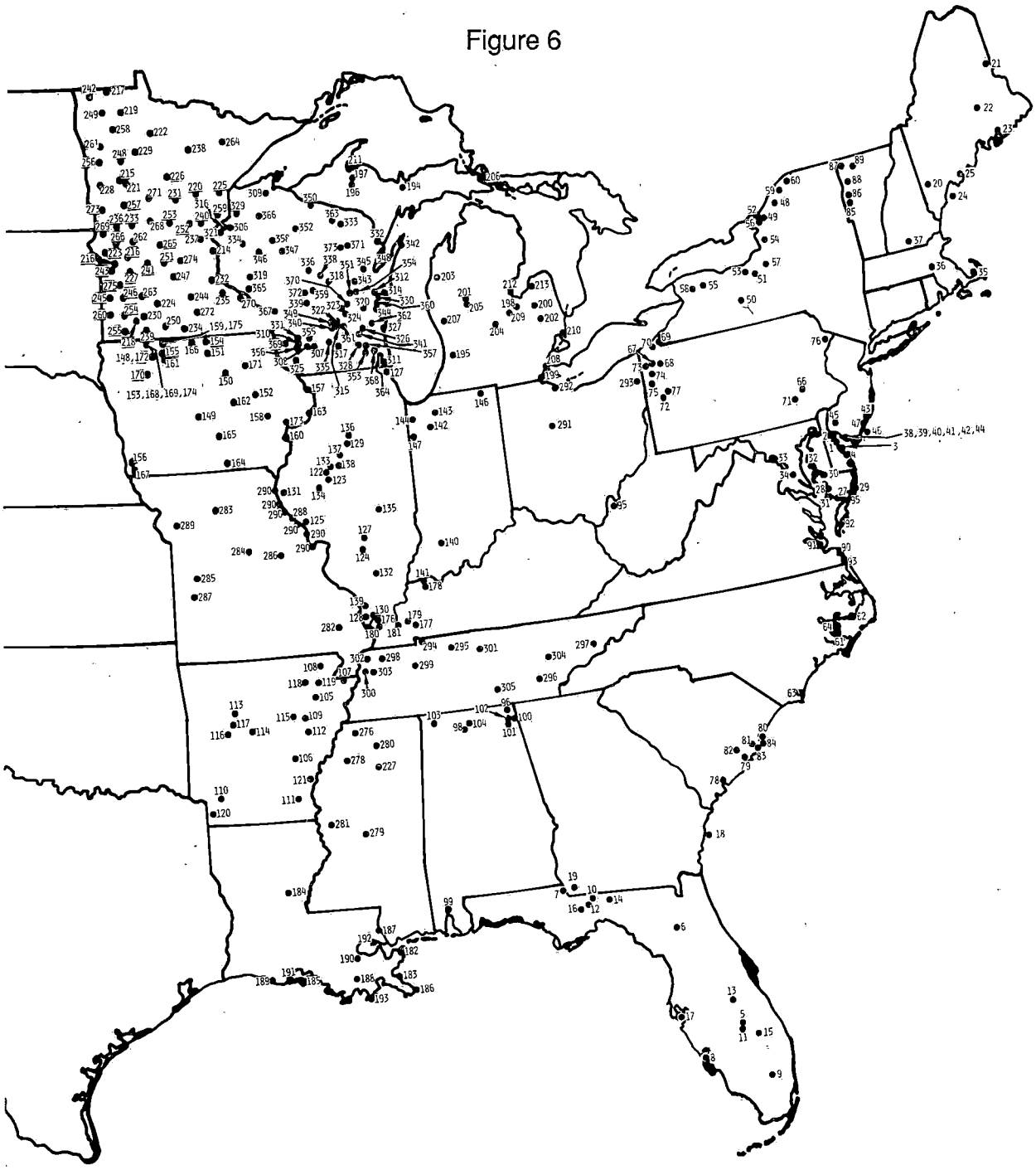

Figure 6. Locations of waterfowl habitat under state control as of January 1, 1975. Only the areas of 1,000 acres or more are shown.

From: Bellrose. (1980).

OTHER ACID RAIN EFFECTS

In this report, we have focused primarily on the impacts of acidification on food supplies critical to the breeding success of several species of dabbling ducks. However, acid rain can affect ducks and other species of birds by: 1) increasing exposure to toxic metals, which are mobilized by acidity from the surrounding bedrock and soils, and 2) reducing fish populations--the major food of many fish-eating birds.

Toxic Metals

Metals in bedrock and soil dissolve more readily in runoff with a lowered pH, which releases more of these metals into the food chain. Increased levels of heavy metals have been reported among fish and insects in acidic waters (Eriksson, 1984). Birds often occupy a position high in the food chain where toxins accumulate more readily, which makes the risk of contamination more likely (Eriksson, et al, 1980). Passerines (perching birds) breeding near the shores of acidified lakes have been found to suffer from impaired reproductive success, probably from the effects of toxic aluminum found in the aquatic insects they feed on (Nyholm, 1981). Other studies in Europe and North America have found detrimental reproductive effects including reduced eggshell quality, clutch size, growth rates, and reduced hatching and fledgling success on birds living near acidified waterways.

Reduced Food Sources for Fish-eating Birds

Predictably, fish-eating (or piscivorous) birds are threatened in regions where fish are disappearing due to acidification.

The American Bald Eagle is threatened by acid rain, according to researchers in the New York Department of Environmental Conservation's Endangered Species Unit. They point out that "acid rain can obviously lead to decreasing fish populations, the food breeding bald eagles most depend on" and call acid rain "a serious threat to eagles" (Eagle Rare, 1983).

The Osprey, a raptor which feeds almost exclusively on fish, is thought to be the species most severely threatened by acid rain in Sweden. Researchers there are finding reduced production of young Ospreys in the vicinity of slightly acidified lakes, while no change in reproduction was found in pairs breeding in non-acidified lakes during the same period (Eriksson, 1984). Unfortunately, little data exists on the fate of the Osprey in North America.

Diving ducks, mergansers and loons that depend heavily on small fish are also a major concern. One researcher in Ontario found that 62 percent of the broods of the Common Loon died on acidic lakes, while only 14 percent died in the non-acidic lakes in the study (Alvo, 1986). Another study in Ontario found that the Common Loon and Common Merganser produced 5-8 times fewer young in areas of high acid deposition. The reproductive success rate for these birds was very low in the acidified area. The researchers concluded that acidity may be responsible for the observed decline of loons in Ontario, and of both loons and mergansers in Sweden (McNicol, et al, 1987). In New York State, however, researchers have found that some

loons can raise young on acidic lakes by shifting their diets to aquatic insects and red-spotted newts (Parker, 1985).

CONCLUSIONS

Studies completed to date indicate that acid rain could be posing a significant threat to the future of America's waterfowl and loons. Waterfowl enthusiasts and others who care about the future of duck populations throughout North America now have ample reason to be involved in the public debate on the need for acid rain controls.

Over the past five years, critics have charged that the Reagan Administration avoids research into areas where results might increase the call for acid rain controls. Clearly, there is a need for more research that would give us a better understanding of the complex and subtle ways in which acid rain is affecting the habitat and food species that waterfowl, and other species, depend on. The effects of acid rain on ducks and other species are being vigorously researched in Canada and Europe. However, even though the Reagan Administration has spent over $300 million on acid rain research over the past five years, only a few studies into the effects on ducks have been funded. In spite of the alarming results of the previous studies, the Administration's $58 million research budget for 1987 does not contain any significant funding for further studies on the effects of acidity on ducks.

As Frank Bellrose stated so succinctly in the Foreword, further research and action to begin limiting the emissions of sulfur dioxide are now more necessary than ever.

Billions of dollars are now being spent in North America to purchase, manage, restore, protect and otherwise maintain the

aquatic areas on which the survival of America's waterfowl depends. To protect this investment and this resource, we now need to work as vigorously to limit the acidic pollutants threatening our nation's fish and wildlife.

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Ducks Unlimited expresses its deep gratitude to GMC Truck Division for its outstanding support in sponsoring The Welcome Luncheon.

THE WELCOME LUNCHEON

THURSDAY, JUNE 8, 1989
CRYSTAL GATEWAY MARRIOTT
ARLINGTON, VIRGINIA

DUCKS UNLIMITED'S
6TH INTERNATIONAL
WATERFOWL
SYMPOSIUM

Menu

Salad "Composee"
with Vinaigrette Dressing

Turkey Ambassador

Spinach Fettuccine

Glazed Carrots

Rolls and Butter

White Chocolate Mousse

Coffee, Tea,
Decaffeinated Coffee