MINUTES OF THE MEETING
NATURAL RESOURCES COMMITTEE
MONTANA STATE
HOUSE OF REPRESENTATIVES

February 20, 1985

The meeting of the Natural Resources Committee was called to order at 5:10 p.m. by Chairman Dennis Iverson in Room 312-1 of the State Capitol.

ROLL CALL: All members of the committee were present.

HOUSE BILL 711: House Bill 711 was introduced by sponsor Rep. Ben Cohen, District 3. Rep. Cohen explained that the bill would allow county governing bodies to limit or prohibit the sale of cleaning products that contain phosphorus. Phosphorus, he explained, is a nutrient that stimulates the growth of algae in lakes and streams, and contributes to the deterioration of water quality. The problem of algae growth is particularly severe in areas that depend economically on water quality, such as the Flathead Lake and Whitefish Lake areas, he explained. Rep. Cohen noted that the possible prohibition under HB 711 would apply only to cleaning compounds, and not to phosphorus products used in agriculture. He said phosphate bans have been successful in curbing algae growth problems in the Great Lakes region. He read a telegram in support of HB 711 from the Lake County Board of County Commissioners, a copy of which is attached hereto as Exhibit 1.

Jack Stanford, director of the University of Montana biological station at Yellow Bay on Flathead Lake, appeared in support of HB 711. He said research conducted at Yellow Bay since 1971 shows that Flathead Lake is beginning to suffer from algae blooms as a result of excessive phosphorus entering the lakes. He estimated that 4% to 10% of the phosphorus entering the lake comes from household detergents. That small percentage, he said, is enough to cause an algae bloom in a lake that is at a critical point, such as Flathead. A phosphorus ban could curtail or prevent algae blooms, he said. A copy of Dr. Stanford's testimony is attached as Exhibit 2.

Steve Pilcher spoke in favor of HB 711 on behalf of the Water Quality Bureau of DHES. He said the bill fits in well with the state's strategy of maintaining water quality in the Flathead basin. He said that studies have clearly shown that water quality is impaired by excessive phosphorus. He said that a ban on cleaning compounds containing phosphorus could not be justified in eastern Montana, but since HB 711 allows for prohibition on a county basis, the bill was reasonable. He presented the results of a shelf survey on the phosphorus content of a number of widely available cleaning products, a copy of which is attached as Exhibit 3.

Jim Flynn, director of the Department of Fish, Wildlife and Parks, endorsed HB 711, saying that nutrient loads could threaten bull trout and mackinaw habitat. A phosphate ban, he said, could reduce the chances of undesirable effects on game fish. A copy of his testimony is attached as Exhibit 4.

George Ochenski spoke on behalf of the Environmental Information Center in support of HB 711. He said he had personal knowledge of the problems associated with algae growth, since he lives on Georgetown Lake, which has suffered from an algae bloom as a result of excessive nutrient loading.

Mary Wright, representing Trout Unlimited, spoke in favor of HB 711, saying the problem of phosphorus-caused algae blooms is a local, not statewide issue, and local governments should be given the opportunity to address the problem.

Ann Humphrey, representing the Montana Audubon Council, spoke in favor of HB 711, saying that nutrient loading is a problem for western lakes, which are naturally low in phosphates. HB 711 would allow local governments a means of keeping phosphorus levels in those lakes low, she said. A copy of her testimony is attached as Exhibit 5.

A copy of a letter from Gordon Morris, executive director of the Montana Association of Counties, was presented to the committee, outlining that group's support of HB 711. That letter is attached as Exhibit 7.

There were no further proponents.

Jerome Anderson, an attorney speaking for the Soap and Detergent Association, said that group is joined in its opposition to HB 711 by the Montana retailers, food distributors and stockgrowers. He said the bill provides no standards to guide counties as to the nature and scope of allowable phosphorus regulation. He said he had never seen legislation that gives counties such wide-open power, and questioned whether the bill is constitutional. He said the language of the bill is innacurate in stating that substantial amounts of phosphorus enter the state's water as a result of cleaning compound use. Mr. Anderson told the committee that only 0% to 4% of the phosphorus in the state's waters can be attributed to cleaning compounds. A copy of his testimony is attached as Exhibit 8.

Edwin Matzner, manager of industry environmental affiars for the Monsanto company, spoke against HB 711. He said only 3% of the phosphorus in the nation's lakes comes from cleaning compounds, and that amount is negligible. A ban would only hurt retailers, and not improve water

quality, he said. He said similar legislation in other parts of the country has resulted in no improvement in water quality. A copy of Dr. Matzner's testimony is attached as Exhibit 9.

Barbara Ann White, a clothing and textiles specialist with the Montana Cooperative Extension Service, spoke against HB 711. She outlined the effects of detergents on textiles, and the benefits of phosphorus in laundry compounds. Phosphates are particularly valuable cleaning aids in areas which have hard water, which includes most of Montana, she said. She said that the inavailability of phosphorus-containing laundry compounds could result in greater expense to consumers in terms of the cost and time involved in getting their textiles clean. A copy of her testimony is attached as Exhibit 10.

Carol Jo Thompson, an interior design and household equipment specialist with the Montana Cooperative Extension Service, told the committee about other costs and burdens that would hurt consumers if phosphate cleaning compounds are removed from the market. She said that satisfactory cleaning cannot be achieved without phosphorus when using hard water. She also noted that lack of phosphorus would result in increased service needs on washing machines and water heaters, which would be coated with residue. A copy of her testimony is attached as Exhibit 11.

Frank Capps, representing the Montana Food Distributors Association, said that the group opposes HB 711. He said the bill would cause additional costs and burdens to both retailers and consumers by forcing wholesalers to carry a double-inventory to stay in business in Montana.

Charles Gravely, also representing the Montana Food Distributors, said that a ban on the use of phosphorus-containing cleaning compounds would be unenforceable and therefore useless.

Richard Sedlack spoke against HB 711 on behalf of the Soap and Detergent Association. He said that the only effective means of phosphorus reduction is through sewage treatment plants, and not through bans on consumer products. He presented technical papers on the subject, attached hereto as Exhibits 12 and 13.

A.G. Payne, a representative of the Proctor and Gamble company, told the committee that sewage treatment plants are the place to begin if the state intends to seriously address the problem of diminishing water quality as a result of phosphorus.

Geoge Allen, representing the Montana Retail Association, said that group wanted to go on record in opposition to HB 711.

There were no further opponents of the bill, and the floor was opened to questions from committee.

Rep. Miles asked Rep. Cohen if most of the homes on Flathead and Whitefish lakes were on municipal or private septic systems. Rep. Cohen said that unfortunately, most of those homes are on private systems, which increases the difficulty of maintaining or improving water quality.

Rep. Cobb asked Mr. Pilcher how much phosphorus could be prevented from entering those lakes if the proposed ban were instituted in Flathead and Lake counties, and was told that the reduction could be as much as four tons annually.

Rep. Ream asked Dr. Stanford about the extent of the phosphorus problem in Flathead Lake, and was told that the lake is in good condition, but that water quality is deteriorating. The data collected at Yellow Bay indicates that the lake is on the threshold, Dr. STanford said, at which an increase of as little as .5% in phosphorus levels could result in an algae bloom. Rep. Ream asked if improvements at sewage treatment plants could result in substantial water quality improvement. Dr. Stanford said that upgrading those plants could greatly increase water quality, but at the present time, only the sewage treatment facilities at the Yellow Bay biological station has the state-of-the-art technology to prevent phosphorus loading.

Rep. Moore asked Dr. Stanford if he agreed with the statement of opponents that only 3% of the phosphorus entering Flathead Lake comes from cleaning compounds. Dr. Standford said that 3% is possible, and that the amount is not likely to be more than 10%, but that the lake is in a state in which even .5% is crucial. In response to a question from Rep. Moore, he said that upgrading the technology at sewage treatment plants is the best long-term approach to the problem, but that a phospate ban would be a good start.

Rep. Addy asked Dr. Stanford how many years the state could expect to "buy" with a phosphorus ban. Dr. Stanford said he could give no exact estimate, but maintained that the state could get a substantial number of years of good water quality if the ban were enacted.

Rep. Raney asked the home economists who testified if they believed that consumers would be substantially affected, noting that he has had no problems with either the degree of cleaning power or mineral build-up in his washing machine after several years of using cleaners that contain no phosphorus. Ann Lyng, a home economist and consultant with Proctor and Gamble, maintained that cleaning is not as thorough with non-phosphorus products, and that consumers would spend up to 40% more to get the same degree of efficiency as they would receive from cleaners with phosphorus.

Rep. Cohen closed by saying that now is not the time to refute data presented by industry representatives. He agreed that sewage treatment plants are the best places to address the problem of phosphorus, but that such solutions are expensive to install and operate, and could not be in place for several years. He said HB 711 would be a good step in allowing counties to consider their local options for addressing the phosphorus problem.

HOUSE BILL 846: Rep. Ted Schye, District 18, introduced HB 846, which he sponsored. He said the legislation would direct that adjudication of the Milk River basin be made the highest priority in the adjudication process being carried out by the state's water court. The Milk River, he said, has suffered serious droughts for the past ten years, and the people served by that river "are getting desperate." Adjudication of the basin is crucial, he said. He noted that Judge W.W. Lessley, chief water judge, has expressed no opposition to placing the Milk River at the top of the adjudication list.

No proponents nor opponents rose to testify on the bill.

Rep. Addy asked why no people who would be affected by the adjudication of the Milk River appeared to testify, and Rep. Schye said that some people had intended to do so, but were unable to travel to Helena.

HOUSE BILL 786: HB 786 was introduced by its sponsor, Rep. Dennis Nathe, District 19. He said the bill is a simple piece of legislation that would allow the department of state lands to forfeit deposits for agricultural leases if the bids on such leases have been determined to be frivolous or harassing.

Dennis Hemmer, representing DSL, spoke in favor of HB 786. A copy of his testimony is attached as Exhibit 14.

No other proponents, and no opponents rose to speak on HB 786.

There were no questions from committee, and Rep. Nathe closed without further comment.

HOUSE BILL 766: HB 766 was introduced in committee by the sponsor, Rep. Bob Ream, District 54. He said the bill would allow the department of health and environmental sciences to set up a "mini-superfund" to take action to prevent or alleviate the release of hazardous substances into the environment. He said that the federal superfund administered by the Environmental Protection Agency is not able to address the problems faced in Montana. He noted that 91 sites

in the state have applied for superfund aid, and only 11 sites have been granted money under that federal program. Several states have set up "mini-superfunds" to alleviate the hazards of toxic wastes, he said.

John Wardell, director of the Region 8 office of the EPA in Helena, supported HB 766, saying it fills the gap in federal legislation, and provides better remedial action than the federal program.

Brace Hayden, speaking on behalf of the governor's office, endorsed HB 766, saying it is a short, efficiently written bill that complements existing statutes.

John Drynan, representing the department of health and environmental sciences, said that agency supports HB 766. A copy of his testimony is attached as Exhibit 15.

George Ochenski, speaking for the Montana Environmental Information Center, noted that each representative on the committee comes from a district that contains at least one environmental contamination site that could be addressed under the provisions of HB 766.

Delores Barnaby, representing Montana Peoples' Action, noted that there are five instances of petroleum product contamination affecting residents of Lewis and Clark County. She said the investment that residents have in their homes and property is being lost, and that the state should begin clean-up efforts to aid those people.

Mike Stephens of Helena spoke as a private citizen, noting that he lives on the fringe of an area in which the wells have been contaminated. His neighbors, he said, are hauling their water, and have been doing so for some time. He said he awaits word that his own well is contaminated, and supports state efforts to solve the problem.

Marie McMurray, of Helena, said she has been hauling water since October of 1984, because her well has been contaminated from a source which has not yet been identified. She said the house she bought for $44,000 four years ago, and into which she has put several thousand dollars in improvements, is now worth less than $30,000 because of the contamination.

No opponents rose against HB 766.

Rep. Grady asked Rep. Ream who would be burdened with the cost of cleaning up environmental contamination resulting from 100-year old sites, and was told that there may be instances in which the party responsible cannot be located or made to pay, and that the state will bear the cost.

Rep. Ream closed by saying that the legal process of determining responsibility for environmental contamination could be lengthy and costly, but should not come in the way of remedial action to alleviate the effects of the contamination. He said no appropriation has been made to cover the costs of such action, but said a possible emergency fund might be allocated from the legacy program.

HOUSE BILL 637: Rep. Dennis Iverson, District 12, introduced HB 637, a bill that would revise the procedure for enforcing the annual fee and reporting requirements of the hard-rock mining law. He said the current requirements for notice of violation and citation for violation are expensive and time-consuming, and that HB 637 would allow notice by certified mail, and after a 30-day response period, suspension of permit.

Dennis Hemmer, speaking on behalf of the department of state lands, endorsed HB 637. He said the bill would simplify the department's annual report process. A copy of his testimony is attached as Exhibit 16.

Gary Langley, representing the Montana Mining Association, said that group supports HB 637, which would prevent bad operators from circumventing or breaking the law.

Jeanne-Marie Souvigney, speaking for the Northern Plains Resource Council, said that group would like to go on record in support of HB 637.

George Ochenski spoke on behalf of the Montana Environmental Information Center in support of HB 637.

No opponents rose against HB 637, and Rep. Iverson closed.

HOUSE BILL 638: House Bill 638 was also introduced by sponsor Dennis Iverson, District 12. He said the bill would eliminate two abuses of the small miners exemption to the hard-rock mining act. He said the bill would eliminate the use of the five-acre small miners exclusion to avoid reclamation and eliminate the practice of combinging several small mining operations to form a big operation. The bill would also provide civil action to address the problem, he said.

Dennis Hemmer of the department of state lands spoke in favor of Hb 638. A copy of his testimony is attached as Exhibit 17.

Gary Langley said the Montana Mining Association would like to go on record in support of HB 638.

George Ochenski supported HB 638 for the Environmental Information Center.

Jeanne-Marie Souvigney spoke in favor of HB 638 for the Northern Plains Resource Council.

There were no further proponents, and no opponents. There were no questions from committee.

HOUSE BILL 670: Rep. Dennis Iverson, sponsor of HB 670, introduced the bill, explaining that it would amend the hard-rock mining act to include tailings in the reclamation process.

Dennis Hemmer, of the department of state lands, rose in support ob HB 670, saying it would resolve issues in the hard-rock act that need clarification. A copy of his testimony is attached as Exhibit 18.

Gary Langley endorsed HB 670 on behalf of the Montana Mining Association.

Jeanne-Marie Souvigney supported the bill on behalf of the Norhtern Plains Resource Council.

George Ochenski spoke in support of HB 670 for the Environmental Information Center.

There were no opponents, and no questions from committee.

EXECUTIVE ACTION:

HOUSE BILL 637: Upon motion by Rep. Raney, HB 637 was passed unanimously.

HOUSE BILL 638: Upon motion by Rep. Raney, HB 638 was passed unanimously.

HOUSE BILL 670: Upon motion by Rep. Raney, HB 670 was passed unanimously.

HOUSE BILL 846: Upon motion by Rep. Smith, HB 846 was passed unanimously.

HOUSE BILL 786: Having noted that HB 786 does not increase the amount of deposit required for agricultural uses, Rep. Ream moved to ammend the title of the bill to delete a statement to that effect. On motion by Rep. Raney, the committee unanimously passed HB 786 as amended.

HOUSE BILL 766: Rep. Ream moved DO PASS on HB 766, but then withdrew that motion pending preparation of a statement of intent.

HOUSE BILL 711: Rep. Ream moved DO PASS on HB 711. Rep. Smith said that if he were convinced that a phosphorus ban would make a difference in the water quality of Flathead Lake, he would vote for the bill, but after hearing thes testimony given, he was not convinced that an improvement would result. Rep. Grady said he thought a ban on consumer products was a bad approach to the problem.

Rep. Miles said that failing to address the phosphorus problem because a group of "out of state people" saying markets would be closed is "absurd." She said the bill should be supported as a means of allowing local bodies to address their own problems.

Reps. Raney and Garcia expressed agreement with Rep. Miles.

Reps. Asay and Peterson commented that an educational program in the affected areas might be a better way to address the problems associated with phosphorus use.

Rep. Ream noted that there would be no enforcement problem with the bill because it does not prohibit the use of cleaners containing phosphorus, it simply allows counties to prohibit the sale of such products.

Rep. Cobb asked why such prohibition could not be done through the state water quality bureau now, and researcher Hugh Zackheim said that Rep. Cohen was not interested in drafting a statewide program, but rather a bill that would grant rule-making authority to individual counties.

The committee then voted on Rep. Ream's DO PASS motion, and HB 711 passed 11-7, with Reps. Smith, Cobb, Grady, O'Hara, Addy, Jones and Iverson voting no.

Rep. Kadas moved to pass the statement of intent with the bill, and that motion was approved with Reps. Cobb, Smith, and Grady voting no.

HOUSE BILL 680: Rep. Kadas moved DO PASS on HB 680, the water marketing bill, which was heard in committee on February 18. Deborah Schmidt, director of the Environmental Quality Council, presented two sets of amendments to HB 680, drafted in response to concerns expressed at the hearing. She explained that although most of the amendments were clerical, some were substantial, and related to the provisions of HB 680 dealing with pipelines. It was the intent of the drafters of the bill to include all pipelines in excess of thirty miles and 17" in diameter under the Major Facility Siting Act, exempting oil and gas gathering lines. The amendments clarify that, she said, and have been reviewed and approved by representatives of the oil and gas industry.

Rep. Ream moved the set of amendments presented by Ms. Schmidt. REp. Kadas moved the first four of five amendments suggested by DNRC, and Rep. Grady moved the fifth. All of the amendments were approved by the committee, and are noted on the attached standing committee report.

Rep. Driscoll moved to amend HB 680 to reinstate the ban on the use of water for coal slurry pipelines, as suggested by James Mular of the Brotherhood of Railway and Airline Clerks. Rep. Iverson resisted that amendment, saying of HB 680, "if we take pieces out, it falls apart." He emphasized that the ban on the use of water for coal slurry provides no guarantee to railroads that coal slurry could not be done using other substances, and opens the state to expensive litigation, which it would lose.

Rep. Miles said she would "love to keep the ban, but its not possible," and resisted the proposed amendment.

Rep. Garcia said that Burlington Northern, as a major employer in the state, deserves support, and endorsed the amendment.

The proposed amendment failed on a 12-5 roll call vote, a copy of which is attached.

Rep. Driscoll moved to amend HB 680 to make sure that a 30-mile pipeline, only part of which lies with Montana's borders, would still be included under the Major Facility Siting Act. That amendment was unanimously approved.

Rep. Kadas asked if the committee should consider amending the bill to make pipelines of less than 17" in diameter fall under the siting act. Rep. Iverson said there would be no point in doing so, and that the 17" limit had been carefully chosen to include water pipelines, but exclude oil and gas lines.

Rep. Iverson said that with the 17" provision, the "chances are slim to none" that coal slurry pipelines could avoid regulation under the siting act, and that there is little risk of including pipelines in the siting act unnecessarily.

The committee then voted on Rep. Kadas's motion of DO PASS AS AMENDED, which was unanimously approved.

There being no further business before the committee, the meeting was adjourned at 9:50 p.m.

Rep. DENNIS IVERSON, Chairman

DAILY ROLL CALL

HOUSE NATURAL RESOURCES COMMITTEE

49th LEGISLATIVE SESSION -- 1985

Date February 20, 1985

NAME	PRESENT	ABSENT	EXCUSED
IVERSON, Dennis (Chairman)	X		
KADAS, Mike (Vice-Chairman)	X		
ADDY, Kelly	X		
ASAY, Tom	X		
COBB, John	X		
DRISCOLL, Jerry	X		
GARCIA, Rodney	X		
GRADY, Edward	X		
HARP, John	X		
JONES, Tom	X		
KRUEGER, Kurt	X		
MILES, Joan	X		
MOORE, Janet	X		
O'HARA, Jesse	X		
PETERSON, Mary Lou	X		
RANEY, Bob	X		
REAM, Bob	X		
SMITH, Clyde	X		

STANDING COMMITTEE REPORT

February 20 19 35

MR. SPEAKER:

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE Bill No. 346

FIRST reading copy (WHITE color)

AN ACT PROVIDING THAT ISSUANCE OF A TEMPORARY PRELIMINARY DECREE IN THE MILK RIVER BASIN BE MADE THE HIGHEST PRIORITY IN THE ADJUDICATION PROCESS BY THE MONTANA WATER COURTS

Respectfully report as follows: That HOUSE Bill No. 346

DO PASS

Chairman.

STATE PUB. CO.
Helena, Mont.

COMMITTEE SECRETARY

STANDING COMMITTEE REPORT

February 20 19 35

MR. SPEAKER:

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE Bill No. 537

FIRST reading copy (WHITE color)

AN ACT REVISING THE PROCEDURE FOR ENFORCEMTN OF THE ANNUAL FEE AND REPORTING REQUIREMENTS UNDER THE HARD-ROCK MINING LAW

Respectfully report as follows: That HOUSE Bill No. 537

DO PASS

DENNIS IVERSON, Chairman.

COMMITTEE SECRETARY

STATE PUB. CO.
Helena, Mont.

STANDING COMMITTEE REPORT

EB February 20 19 35

MR. SPEAKER:

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE Bill No. 638

FIRST reading copy (WHITE color)

AN ACT REVISING THE LAW PROVIDING EXEMPTIONS FOR SMALL MINERS FROM THE HARD-ROCK MINING LAW

Respectfully report as follows: That HOUSE Bill No. 638

DO PASS.

DENNIS IVERSON,
Chairman.

STATE PUB. CO.
Helena, Mont.

COMMITTEE SECRETARY

STANDING COMMITTEE REPORT

February 20 19 85

MR. SPEAKER:

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE Bill No. 670

FIRST reading copy (WHITE color)

AN ACT TO REQUIRE RECLAMATION OF LAND DISTURBED BY HARD-ROCK TAILING, WASTE ROCK, OR ORE PROCESSING OPERATIONS

Respectfully report as follows: That HOUSE Bill No. 670

DO PASS

STATEMENT OF INTENT ATTACHED

DENNIS IVERSON, Chairman.

STATE PUB. CO.
Helena, Mont.

COMMITTEE SECRETARY

February 20, 1985
19

"Statement of Intent House Bill 670"

The purpose of the extension of the rulemaking authority of the department of state lands and board of land commissioners is to allow the existing rules to be amended to include ore processing and reprocessing and extraction of old tailings and waste rock. In addition, the board and department may provide special rules eliminating application and performance standards irrelevant to reprocessing operations or milling operations.

STATE PUB. CO.
Helena, Mont.

Representative Dennis Iverson Chairman.

STANDING COMMITTEE REPORT

February 20 19 35

MR. SPEAKER:

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE Bill No. 680

FIRST reading copy (WHITE color)

AN ACT REVISING STATE WATER POLICY

Respectfully report as follows: That HOUSE Bill No. 680

BE AMENDED AS FOLLOWS:

1) Title, line 16.
Following: line 15
Strike: "75-20-216,"
Following: "75-20-303"
Strike: "75-20-304,"

2) Page 3, line 11.
Following: "[section"
Strike: "14"
Insert: "12"

3) Page 3, line 13.
Following: "[section"
Strike: "14"
Insert: "12"

~~DO PASS~~

Chairman.

STATE PUB. CO.
Helena, Mont.

COMMITTEE SECRETARY

4) Page 5, line 24.
Following: "[section"
Strike: "14"
Insert: "12"

5) Page 8, line 4.
Strike: "under 85-2-311"

6) Page 8, line 23.
Following: "[section"
Strike: "14"
Insert: "12"

7) Page 13, lines 21 and 22.
Strike: "Based upon the criteria listed in 85-2-311, the"
Insert: "The"

8) Page 13, line 24.
Following: "necessary"
Insert: "protect the rights of other persons and"

9) Page 24, line 7.
Strike: "protect the rights of other persons and"

10) Page 25, line 21.
Following: "dams"
Insert: "pipelines,"

11) Page 25, line 25.
Following: "facility"
Insert: ", or a natural gas or crude oil gathering line 17 inches or less in diameter"

12) Page 27, lines 13 through 16.
Following: "refineries"
Strike: the remainder of line 13 through "gas," on line 16

13) Page 28, lines 18 through 22.
Following: line 17
Strike: subsection (c) in its entirety
Renumber subsequent subsections.

14) Page 28, line 23.
Following: "pipeline"
Insert: ",whether partially or wholly within the state,"

Chairman.

STATE PUB. CO.
Helena, Mont.

15) Page 29, line 20 through page 33, line 4.
Following: line 19 on page 29
Strike: section 9 in its entirety
Renumber subsequent sections

16) Page 35, line 14.
Following: "(b)"
Strike: ","
Following: "or"
Insert: "or"
Following: "(c)"
Strike: the remainder of line 14

17) Page 35, line 17.
Following: "(b)"
Strike: the remainder of line 17

18) Page 36, line 6 through page 38, line 23.
Following: line 5 on page 36
Strike: section 12 in its entirety
Renumber subsequent sections.

19) Page 49, line 10.
Following: "[section"
Strike: "14"
Insert: "12"

20) Page 49, line 17.
Following: "(2)"
Strike: "The"
Insert: "Subject to legislative appropriation, the"

21) Page 53, line 1.
Following: "[section"
Strike: "21"
Insert: "19"

22) Page 53, line 16.
Following: "[section"
Strike: "21"
Insert: "19"

23) Page 54, line 9.
Following: "[section"
Strike: "21"
Insert: "19"

Chairman.

STATE PUB. CO.
Helena, Mont.

February 20 19 85

24) Page 56, line 20.
Following: "Sections"
Strike: "14, 17, and 21"
Insert: "12, 15, and 19"

25) Page 56, line 22.
Following: "sections"
Strike: "14, 17, and 21"
Insert: "12, 15, and 19"

AND AS AMENDED,

DO PASS

Chairman.

STATE PUB. CO.
Helena, Mont.

STANDING COMMITTEE REPORT

February 20 19 85

MR. SPEAKER:

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE Bill No. 711

FIRST reading copy (WHITE color)

AN ACT ALLOWING A GOVERNING BODY OF A COUNTY TO PROHIBIT THE SALE AND DISTRIBUTION OF CERTAIN PHOSPHORUS COMPOUNDS USED FOR CLEANING PURPOSES

Respectfully report as follows: That HOUSE Bill No. 711

DO PASS

STATEMENT OF INTENT ATTACHED

DENNIS IVERSON, Chairman.

COMMITTEE SECRETARY

STATE PUB. CO.
Helena, Mont.

"Statement of Intent House Bill 711"

(1) It is the intent of the legislature that the department of health and environmental sciences adopt a model rule with standards that may be adopted and enforced by a governing body of a county to prohibit the sale and distribution of certain phosphorus compounds used for cleaning purposes. The standards in the model rule must be designed to protect water quality and aquatic ecosystems by reducing the amount of phosphorus that enters state waters. In adopting the initial model rule, the department shall demonstrate strong consideration of the following provisions:

(a) Definitions:

(i) "Chemical water conditioner" means a water-softening chemical or other substance containing phosphorus intended to treat water for machine laundry use.

(ii) "Commercial establishment" means any premises used for the purpose of carrying on or exercising any trade, business, profession, vocation, or commercial or charitable activity, including but not limited to laundries, hospitals, hotels, motels, and food or restaurant establishments.

(iii) "Household cleaning product" means any product, including but not limited to soaps and detergents, used for domestic or commercial cleaning purposes, including but not limited to the cleaning of fabrics, dishes, food utensils, and household and commercial premises. Household cleaning product does not mean foods, drugs, cosmetics, or personal care items such as toothpaste, shampoo, or hand soap.

(iv) "Person" means any individual, proprietor of a commercial establishment, corporation, municipality, the state or any department, agency, or subdivision of the state, and any partnership, unincorporated association, or other legal entity.

(v) "Phosphorus" means elemental phosphorus.

(vi) "Trace quantity" means an incidental amount of phosphorus which is not part of the household cleaning product formulation, is present only as a consequence of manufacturing, and does not exceed 0.5% of the content of the product by weight expressed as elemental phosphorus.

(b) Prohibitions and exceptions:

(Continued)

Chairman.

STATE PUB. CO.
Helena, Mont.

Statement of Intent House Bill 711 - Continued

(i) Except as provided in (ii) through (iv), no household cleaning product may be distributed, sold, offered, or exposed for sale if it contains a phosphorus compound in concentrations in excess of a trace quantity.

(ii) No dishwashing detergent may be distributed, sold, offered, or exposed for sale if it contains a phosphorus compound in excess of 8.7% by weight expressed as elemental phosphorus.

(iii) No chemical water conditioner which contains more than 20% phosphorus by weight may be distributed, sold, offered, or exposed for sale.

(iv) Cleaning agents used for industrial processes, cleaning food and beverage processing equipment, cleaning medical or surgical equipment, or cleaning dairy equipment are exempt from the provisions of this rule.

(2) It is the intent of the legislature that an ordinance with standards no less stringent than the standards of the model rule may be adopted at the option of a county government and, if adopted, must be enforced by the county government. Any ordinance applies only in a county that has adopted it through proper procedures. The department of health and environmental sciences may not enforce any standards or provisions of the model rule.

Representative Dennis Iverson Chairman.

STATE PUB. CO.
Helena, Mont.

...DING COMMITTEE REPORT

February 20 19 35

MR. SPEAKER:

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE Bill No. 786

FIRST reading copy (WHITE color)

AN ACT TO GENERALLY REVISE LAWS RELATING TO BID DEPOSITS FOR STATE SURFACE LEASES

Respectfully report as follows: That HOUSE Bill No. 786

BE AMENDED AS FOLLOWS:

1) Title, lines 6 and 7
Following: line 5
Strike: line 6 through "LEASES;" on line 7

AND AS AMENDED,

DO PASS

Chairman.

STATE PUB. CO.
Helena, Mont.

COMMITTEE SECRETARY

ROLL CALL VOTE

HOUSE COMMITTEE NATURAL RESOURCES

DATE Feb. 20 BILL NO. 680 TIME 9 p.m

NAME	AYE	NAY
IVERSON, Dennis (Chairman)		X
KADAS, Mike (Vice-Chairman)		X
ADDY, Kelly		X
ASAY, Tom		X
COBB, John		X
DRISCOLL, Jerry	X	
GARCIA, Rodney	X	
GRADY, Edward		X
HARP, John		X
JONES, Tom	X	
KRUEGER, Kurt	X	
MILES, Joan		X
MOORE, Janet		X
O'HARA, Jesse		X
PETERSON, Mary Lou		X
RANEY, Bob	X	
REAM, Bob		X
SMITH, Clyde		X
	5	12

Secretary Chairman

Motion: Rep. Driscoll - amend HB680 to reinstate ban on use of water for coal slurry.

CS-31

EXHIBIT 1
2/20/85

FEB 20 '85 13:58 WU PTLD OR 8005471371 P01

western union

Telegram

1-017571A051 02/20/85 85 FEB 20 PM 1:37
ICS IPMPTUF PTL
04101 02-20 0101P PST PTUE
ICS IPMPTUZ TELECOPIER 406 442-8407
4-030955S051 02/20/85
REPORT DELIVERY BY MAILGRAM
ICS IPMMTZZ CSP
4068836211 TBMT POLSON MT 12 02-20 0315P EST
PMS REPRESENTATIVE BENJAMIN COHEN RPT DL MGM
STATE CAPITAL
HELENA MT
WE THE BOARD OF LAKE COUNTY COMMISSIONERS SUPPORT HOUSE BILL 711
UNANIMOUSLY
MIKE HUTCHEN
HAROLD FITZNER
DON PETERSON

COUNTY COURTHOUSE
POLSON MT 59860

1532 EST

1605 EST

EXHIBIT 2
2/20/85

TESTIMONY SUPPORTING HB 711

I am Dr. Jack A. Stanford, Director of the Flathead Lake Biological Station, where I have conducted research on water quality of Flathead, Whitefish, and other western Montana lakes since 1971.

My studies clearly show that the growth of algae in these lakes and their tributary streams is controlled by the amount of biologically active phosphorus dissolved in the water. Normally, phosphorus concentrations in western Montana waters are very low, which explains why our lakes and streams are very clean and free of algae. Unfortunately, in the last 20 years phosphorus concentrations in Flathead Lake have increased, due to inputs from urban areas and shoreline homes. In the summer of 1983 I documented the first lakewide bloom of the toxic algae, Anabaena flos aqua; last summer this and other pollution algae bloomed. Whitefish and other area lakes have shown similar, chronic symptoms of phosphorus pollution.

Seventeen percent of the total phosphorus entering Flathead Lake comes from sewage treatment plants (STP's), that are not presently equipped to remove phosphorus. From 4 - 10 % of the phosphorus entering the lake from the STPs comes from phosphate detergents. Based on my research, the Water Quality Bureau has developed a strategy for controlling phosphorus which includes upgrading STP's in the basin to remove phosphorus.

I agree that it may be more cost effective to remove phosphorus at the STPs, rather than from the grocery shelves, but, it may be years before the STPs are fully upgraded.

In the interim, a P-ban for detergents would prevent and possibly even correct the very alarming deterioration of water quality in Flathead Lake.

Moreover, greater than half of the households in the basin are not served by STP's; sewage is disposed in septic drainfields located in glacially modified soils that are easily saturated. Recent research at the Biological Station clearly shows that leachates from saturated drainfields contain high levels of biologically active phosphorus and that such pollution is entering our lakes at numerous locations. If a large proportion of the phosphorus in household wastes was eliminated by use of non-phosphorus detergents the pollution problem in our waters would be significantly reduced and drainfield life prolonged.

I sincerely believe this bill is a significant part of the phorphorus control strategy needed for the Flathead Basin, and perhaps for other areas in western Montana.

Jack Stanford

EXHIBIT 3
2/20/85

PHOSPHORUS CONTENT

RESULTS OF A SHELF SURVEY OF ONE STORE IN HELENA, MONTANA
ON JANUARY 24, 1985 BY ABE HORPESTAD
WATER QUALITY BUREAU, DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

Granular Laundry Products:	% Phosphorus
Fab	6
Bold 3	6.1
Purex	0
White King	0
Dreft	8.2
Tide	8.4
Ivory Snow	0
White King D	0
Buttrey	6.1
Cold Power	2.5
Arm & Hammer	0.25
"Generic"	0
Cheer	8.2
Oxydox	7.4
Fresh Start	14.7
Sun	0
Ajax	2.5
All	0 (less than .5)
Woolite	0

Liquid Laundry Products:	% Phosphorus
Spray and Wash	0
Clorox Prewash	0
Shout	?
Tide	0
ERA Plus	0
Dynamo	0
Purex	0
Wish	0
Yes	0
Arm & Hammer	0
Generic	0
Woolite	0

Cleaning Compunds Liquid:	% Phosphorus
Spic and Span	3.1
Top Job	2.3
409	0
Scrub Free	2.8
Fantastic	0
Grease Relief	0
Tough Act	Not clear from label
Big Wally	0
Lysol	Not clear from label
Soft Scrub	0

Cleaning Compounds Solid:	% Phosphorus
Ajax	0.9
Comet	2.9
Bon Ami	0
Zud	0

Chemical Water Conditioners:	% Phosphorus
White King	0 (?)
Calgon	Some
Rain Drops	Some
Borax	0 (?)

Granular Bleach:	% Phosphorus
Borateem (bleach)	0
Purex (bleach)	0
Biz (bleach)	17.6
Chlorox (bleach)	0

EXHIBIT 4
2/20/85

HB 711

Testimony presented by Jim Flynn, Department of Fish Wildlife and Parks

February 20, 1985

Flathead Lake, Whitefish Lake and many other lakes in western Montana have extremely pristine, clear, high quality, nutrient limited waters. The high quality and clarity of these waters is responsible for the unique fisheries and recreational opportunities that exist there.

Recent studies at Yellow Bay indicate that domestic sources of phosphorus are gradually enriching Flathead Lake. Low phosphorus concentrations in these waters presently prevent the occurrence of extensive algal blooms and subsequent reduction in clarity of the water. Low nutrient levels also prevent bottom waters from becoming anaerobic. Nutrient enrichment, if it continues, will threaten the native bull trout and Mackinaw fisheries and will gradually change the fish species composition of the lake.

HB 711 would prohibit the sale or use of phosphorus cleaning agents if a county or governing body decides that such a ban would serve the best interests of the county. Adoption of this bill will greatly reduce the chances of undesirable nutrient enrichment of lakes in western Montana. In view of the benefits to lake recreation and lake fishing, the Montana Department of Fish, Wildlife and Parks fully supports this bill.

EXHIBIT 5
2/20/85

Montana Audubon Council
Testimony on HB 711
February 20, 1985

Madame Chair and Members of the Committee,

My name is Ann Humphrey, and I am representing the Montana Audubon Council in support of HB 711.

Currently, substantial amounts of phosphorous are being introduced into our lakes and rivers as a result of the use of detergents. This is a problem for certain lakes, particularly those on the west side of the divide which are naturally low in phosphorous, and have historically been clean, oligiotrophic lakes. In a healthy condition these lakes provide a home for an interesting biological community composed of aquatic wildlife species and terrestial wildlife such as waterfowl.

The increased amounts of phosphorous entering these lakes are now threatening the water quality, and so are threatening the biological communities that depend on these lakes. The Montana Audubon Council believes that these natural lakes, and the associated wildlife are valuable resources worth protecting.

We are supporting HB 711 because it takes a step towards protecting these resources. By restricting the use of detergents in counties where the problem exists this step is a very inexpensive, and cost-effective approach to the problem. For these reasons we urge you to give HB 711 a "do pass" recommendation. Thank you.

EXHIBIT 7
2/20/85

MONTANA ASSOCIATION OF COUNTIES

1802 11th Avenue
Helena, Montana 59601
(406) 442-5209

February 20, 1985

TO: Rep. Dennis Iverson, Chairman
Natural Resources Committee

FROM: Gordon Morris, Executive Director

The Montana Association of Counties supports HB 711, which would allow a governing body of a county to prohibit the sale and distribution of phosphorous compounds used in certain detergents.

Many county residents, and their county commissioners, have great concern for the unchecked use of phosphorous compounds which negatively impacts water quality.

MACo supports the concept of local determination as reflected in this proposed legislation, and we are confident that under model rules adopted by the state Department of Health and Environmental Sciences, workable restrictions to protect water quality can be imposed without detriment to consumers or retailers.

EXHIBIT 8
2/20/85

EXPLODING THE THREE MAJOR MYTHS OF

MONTANA HOUSE BILL NO. 711

1. EVERY LITTLE BIT DOESN'T HELP ! This Bill would not help improve Montana water quality.

- More than 95% of the phosphorus that reaches Montana lakes comes from sources other than detergents. Or, stated another way, detergents contribute from about zero to 4% of the total phosphorus loading to Montana lakes. This contribution is too small to affect water quality.

- Reductions in phosphorus loading must be substantial (generally ranging from 45% to 85%) in order to result in improved lake water quality. Large load reductions, however, are not always a guarantee of success as phosphorus reductions even up to 50% in some lakes have not substantially improved water quality.

- Theory predicts and numerous field studies have confirmed that detergent phosphorus bans do not improve water quality. Studies conducted on lakes in Indiana, New York, Minnesota and Wisconsin have shown no measurable improvement in water qualtiy due to detergent phosphorus bans.

2. THERE IS NO FREE LUNCH ! This bill would cost Montana consumers money and time.

- Most non-phosphate detergents neither clean nor maintain overall fabric appearance as well as do phosphate-built detergents.

- The best of the non-phosphate detergents cost about 40% more per use than do phosphate-built detergent powders.

- Consumers in phosphate ban areas recognize the problems associated with non-phosphate detergents and compensate by using more laundry additives and more hot water and by taking extra steps in an effort to get clothes clean.

- In areas where consumers have a free choice, they choose phosphate granular detergents by 4 to 1 over non-phosphate granular detergents or liquid detergents.

- Problems with non-phosphate detergents multiply as water hardness increases. More than 80% of Montana consumers have hard to extremely hard water.

- The major weakness of all non-phosphate detergents is their limited ability to remove and suspend particulate soils (clay, mud, dust, etc.). Montana families involved in farming, ranching, mining and processing of ores, forestry and the production of wood products will be faced with high levels of particulate soils in laundering.

Jerome Anderson

3. THERE IS NO WAY TO MIND THE STORE ! This bill would create havoc for the retail trade and cause disruption to interstate and intrastate commerce.

- Retailers serving both ban and no-ban counties would encounter complex and costly problems because they:
  - Would need to double-stock in their stores and warehouses -- to carry both phosphate and non-phosphate varieties of detergent brands.
  - Would face legal penalties if they accidentally violate the ban.
  - Would face difficulties in placing advertising in media which would accommodate to any county restrictions.
  - Would encounter questions and complaints from confused consumers about the situation in their own county and in other counties where they may visit or shop.
- Retailers serving ban counties:
  - Would face continuing (and growing) consumer dissatisfaction over the non-availability of phosphate detergents.
  - Would face loss of business as dissatisfied consumers go to non-ban counties to get the detergents they want and end up purchasing all of their groceries at the same time and place.
  - Would face legal penalties if they displayed banned products by accident.
- All retailers in the state would find it more costly to order, advertise, promote, stock, ship and sell detergents -- and these greater costs will need to be reflected in higher prices to the consumer.

(Distributed by Jerome Anderson, Barry Hjort and Chad Smith on behalf of the Soap and Detergent Association and Monsanto Chemical in opposition to HB 711.)

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(Distributed by Jerome Anderson, Barry Hjort and Chad Smith on behalf of the Soap and Detergent Association and Monsanto Chemical in opposition to HB 711.)

EXHIBIT 9
2/20/85

Comments of Dr. Edwin A. Matzner
Monsanto Company
St. Louis, Missouri 63167

on Montana House Bill 711
introduced to the 49th Legislature, and entitled
"An Act Allowing a Governing Body of a County to Prohibit
the Sale and Distribution of Certain Phosphorus Compounds
used for Cleaning Purposes; Requiring the Department
of Health and Environmental Sciences to Adopt a Model Rule;
and Providing a Delayed Effective Date.

February 20, 1985

My name is Edwin A. Matzner. I hold three degrees in Biology and Chemistry from the California Institute of Technology and from Yale University. I have worked for the Monsanto Company, St. Louis, MO, for over 20 years, and my present title is Manager, Industry Environmental Affairs.

Monsanto is a multi-national company engaged in the manufacture of widely diversified products such as chemicals, agricultural products, man-made fibers, electronic materials, industrial process controls, and other equipment. We have over 50,000 employees worldwide, and operate over 130 plants and 19 laboratory/technical centers. In the neighboring northwestern state of Idaho, we operate one of the world's largest elemental phosphorus plants, with an employment of around 300 people. It should be noted that, in terms of phosphate rock capacity, **Montana is the 6th most important state** in the U.S., with Florida being first and Idaho second. While Monsanto does not market any detergent consumer products, we are the largest U.S. supplier of detergent ingredients including phosphates, surfactants, sequestrants, NTA, bleaches, and anti-bacterials to those businesses that produce detergents, dishwashing compounds, and other consumer, industrial, and institutional cleaning products.

Many popular reports, and also House Bill No. 711 by inference, imply that phosphates are a toxic man-made ("culturally derived" as it called in the Bill) pollutant that is harmful to life. This is incorrect. Phosphorus is an essential element of life. **It is not toxic, but rather a nutrient for plants, animals and man.** Phosphorus can be found in every single thing which we eat, and in man and animals. Some of the most essential mechanisms of life and muscle energy are based on tripolyphosphate chemicals similar to those used in detergents.

As an example, I want to mention that the elemental phosphorus content of a food such as wheat bran is 1.4% by weight, that lentils, peanuts, and soybeans all contain about 0.5% phosphorus, as do most cheeses, sardines, and barley. Beef, halibut, and wheat bread contain 0.25% phosphorus. Poultry, tuna fish, and eggs contain 0.2% phosphorus. While a washing machine using phosphate detergents produces a daily phosphorus output of 0.96 grams per day and per person, that **same person's phosphorus output in urine and feces is almost twice as much,** 1.74 grams of phosphorus. A single cow produces 285 grams of phosphorus per day, a pig 3.3 grams, a chicken 0.24 grams. The point is that while it is easy to pin the presence of phosphates in natural water on detergents, it is also incorrect.

Assuming that Flathead County has a population of 51,000, one can easily calculate from the above that all the washing machines in Flathead County today put out no **more phosphorus than does a herd of 32 cows.** Lake County, population 19,000, corresponds to 12 cows.

House Bill #711 states that "substantial" amounts of phosphorus enter Montana's aquatic ecosystems as a result of the use of detergents. You can see from page 5 of the 1984 report of the Montana Department of Health and Environmental Sciences "Strategy for Limiting Phosphorus in Flathead Lake" and I quote, "for the case where all phosphorus is biologically available, the current phosphorus load is 0.49 grams of phosphorus per square meter per year, it would be 0.475 with a limit on the use of phosphorus detergent". This is **only a 3% reduction in phosphorus** load achievable by a ban on phosphate detergents. The report further states that if only part of the phosphorus associated with the Flathead rivers turbid spring runoff were bioactive, the reduction achievable by a detergent ban would only be 6%. Three percent and six percent are not "substantial" quantities. We all want a healthy ecology and clean water in Montana, but detergent phosphate limitations will not even contribute to achieving this.

Why are phosphates in detergents? In the old days, people used to wash with soap which gave very unsatisfactory results, with the formation of ample soap curds on the washed clothing. A breakthrough was achieved in 1946 with the invention of synthetic detergents, consisting of a surfactant, or foaming agent, aided by a phosphate whose function it was to help the surfactant remove dirt by having the phosphate control the hardness in the water and soften it. Phosphates also suspend dirt, and provide alkalinity in a detergent. Let me explain what our function is in this market. Monsanto Company has been committed not only to producing phosphates, but to supplying the detergent industry with whatever safe and effective raw materials it required. We have, for over 20 years and at a cost of many tens of millions of dollars, maintained an intensive and unusually large research effort (which I have directed for 15 years) aimed at developing substitutes for phosphates in detergents. The development of such substitutes is an extremely difficult task, as phosphates have a number of superior and unique properties in detergents which none of the substitutes commercially available today, and certainly none of the substitutes marketed in the detergent ban states, can duplicate. Detergent phosphate bans have forced the industry to use sodium carbonate detergents, or to use liquids. **Neither of these products can rival phosphates from a cost performance standpoint.** The very fact that just Monsanto Company today has a research effort of over 50 people directed at finding a phosphate substitute certainly proves that we do not think, and the industry does not think, that there is a satisfactory substitute available today. If such a substitute is found and successfully commercialized, we hope to be the ones to do this. I have many pictures available, which I would be glad to show to you, illustrating the fact that visually, and under widely varying conditions, detergents without phosphates are inferior in cleaning and washing machine performance. I would like to document what I am saying by **exact publication references, which can be obtained and verified by any librarian.** As a single example, let me quote a comparison of phosphate and carbonate built detergents done by Mohamed at the University of Illinois and published in the Textile Chemist and Colorist, Vol. 17, page 37 in 1982, which shows clearly that laundering with phosphate detergents gives significantly higher soil removal after 25 cycles: ditto for appearance: ditto for maintaining fabric strength. It also shows that carbonate detergents cause severe abrasion and deterioration of cotton. The Whirlpool Company, a major manufacturer of washing machines,

has made a study of these phenomena and has reported stiff hard clothes, powdery residue, irritation potential, abrasion damage and early wearout of fabrics, costly damage to machine filters and pumps, and increases in other washing machine service costs.

A detergent removes dirt, and **removing dirt also means removing bacteria and removing fungus.** In work on the microbial survival in dishwashers, Schneider, Busta, and McDuff have published a report in the Journal of Food Protection, volume 41, page 800, in 1978, showing that after fifteen dishwasher cycles, glass dishes washed in **nonphosphate detergents contained films with 4000 times as many Bacillus Subtilis** spores as those washed in a 7% phosphorus dishwashing detergent. It is for this reason that many bans have exempted dishwashers, industrial, institutional, and hospital products and the like, but the net facts are the same, if phosphates are more effective at removing dirt and bacteria, they are also more effective everywhere.

There is a very simple chemical explanation for this. While phosphate controls the hardness in water by keeping it in solution, carbonate will tie up hardness by precipitating it in the washing machine in the form of solid chalk. It is this material which interferes with soil removal, and deposits on clothing. If you wash dark garments, the difference can easily be seen by the naked eye, and the garments look dusty.

House bill No. 711, page 2, lines 9 and 10, states that a detergent phosphorus limitation will not cause additional costs or burdens to consumers and retailers. This is not correct. A **detergent phosphate ban would cost the consumer more** for four reasons:

1. added energy costs from using more hot water,

2. more laundry additives used by the homemaker in an unconscious effort to recapture lost performance,

3. washing machine wearout, and

4. clothes wearout.

A study by Cornell University and Procter & Gamble published in 1982 in the Journal of Consumer Studies and Home Economics, volume 6, page 301, shows, based on a study of 2800 panelists, that phosphate nonavailability increases costs by 2.7¢/load, or approximately $11.30 per household year. In addition to this, washer maintenance costs increase, and in addition to that, wear life of garments decreases. Professor Viscusi of the School of Business of Duke University has analyzed these costs in depth, and published his findings in 1983 and more recently in December 1984 in the AEI Journal on Government and Society, page 53. In calculation for two specific areas, North Carolina and Wisconsin, he reports a detergent ban cost to the consumer (in dollars per household per year) of $23-45 for energy, laundry additives, increased machine repair, and fabric wear. In his opinion, there should be added to these numbers $34 per household per year for laundry time and decreased wash quality for a total of $57-79.

I have tried to document that detergents add only a small part of the phosphate that flows into natural waters. How can these phosphates be controlled? They can be controlled by removal at a sewage treatment plant, a measure that removes not 3 or 6 or 20% of the phosphorus but essentially 100%. Viscusi has

shown that the **cost for such treatment is of the order of $1.50** per household per year in areas where sewage treatment plants exist, and $24 per household per year in areas that do not have any sewage treatment plants. Note however that this $24 easily removes up to 8 times as much phosphorus as a detergent ban, so that the chemical treatment unit cost, that is, **the cost per amount of phosphorus removed, is only $3-4.**

Another measure which is effective in controlling phosphate runoff is the use of no-till farming. The amount of unused fertilizer phosphorus, and unused means phosphorus not used in the production of crops and foods, is more than 35 times as high as that which goes into all detergents. Sewage treatment and no-till farming are effective steps that would improve the quality of Montana's waters while limiting the amount of detergent phosphorus compounds that will enter state waters, contrary to statements in House Bill No. 711, will not.

Again, coming back to the bill, lines 20 to 22 state that many studies have shown that regional restrictions on the use of nonessential detergent phosphorus compounds have protected and enhanced water quality. This is not correct, and I would like to quote to you **several published studies that have shown exactly the contrary.** Professors Etzel and Bell of Purdue University have reported in the Water Sewage Works Journal, volume 9, page 91 (1975) that 18 months of detergent ban in Indiana failed to reduce phosphorus levels in the White and Wabash Rivers. Professor Clesceri of the Rensselaer Polytechnic Institute has reported that the Wisconsin detergent phosphate ban failed to improve significantly the water quality in seven lakes. A small improvement in clarity occurred in Balsam Lake, but both phosphorus and chlorophyll were unimproved. A large increase in chlorophyll occurred in Elk Lake.

A report from Foth and Van Dyke and Associates published in 1981 compared the effect of the phosphorus ban on Wisconsin sewage treatment plants, 1979 compared to 1971. While a reduction of 18-26% in influent P loadings did occur, this did not have the slightest impact on the sewage treatment plant's ability to meet the prescribed limit of one part per million of phosphorus. The total annual chemical savings for the state were $500,000, which equates to 11¢ per capita. The state of Wisconsin's very own Department of Natural Resources, in a report on water quality effects of the detergent phosphate ban by Schuettepelz, Roberts, and Martin, published in 1982, examined 13 Wisconsin stream sites and three lakes, comparing 1981 to 1976. Their clear conclusion is that there was no evidence of water quality improvement in three years of ban. H. M. Runke, of the Environmental Research Group in St. Paul Minnesota examined the effects of the detergent phosphate ban on lake water quality in Minnesota. It was his conclusion that the ban caused no significant water quality improvement for six pairs of Minnesota lakes.

What about the Great Lakes in general? The Greak Lakes Water Quality Board, in their 1981 Great Lakes Surveillance Report to the International Joint Commission, states that, of the total phosphorus entering the Great Lakes, an average of only 14% comes from municipal discharges. Do you think that a tiny decrease in that 14% affected Great Lakes water quality? The U.S. Army Corps of Engineers is surely an impartial body here, and in their summary report of the Lake Erie Waste Water Management Study, dated June 1983, page 4 they state that phosphorus loadings have indeed decreased from about 20,000 metric tons per year to 16,500 metric tons per year **due to the construction of large municipal treatment plants,** and not to any detergent bans which may be politically popular, and may make an impact in the newspapers, but have yet to

result in any water quality improvement that you can demonstrate scientifically. The Corps of Engineers report goes on to say that additional phosphorus reductions must be achieved by no-till farming.

Another totally impartial body is the Virginia State Water Control Board task force, which in November 1984, in their bulky report to the Chesapeake Bay Commission, confirmed that a detergent phosphorus ban would cost of the order of $13 per household, and that there was no evidence of water quality improvement in Indiana, no evidence of water quality improvement in Vermont, and no evidence of water quality improvement in Wisconsin that was attributable to detergent phosphate bans in these states. Lee and other workers from the University of Texas at Dallas have published a paper in Environmental Science and Technology, volume 12, page 900 (1978) which claims that sewage treatment can reduce phosphorus to the 1 part per million level at a cost of a fraction of a cent/per person per day, that the improvements in Lake Erie are due to treatment plants, and that a **detergent phosphorus ban causes little or no improvement in water quality.**

A 1982 paper by Jones and Lee in Water Research, volume 16, page 503, contains an unusually complete 13-page review, which documents very well that there is no technical justification for the "every little bit helps" approach to phosphorus load reductions to water bodies, and that this attitude just leads to the public spending of large amounts of money in the name of pollution control with little improvement in water quality. Another major review has been published by Maki, Porcella and Wendt in Water Research, volume 18, page 893 (1984) with a consistent conclusion that elimination of detergent phosphate in several areas has not measurable increased water quality.

I would be glad to discuss in further details any of the points which I have made. In summary, I have tried to show that:

1. phosphate is not a toxic pollutant but a ubiquitous material essential to life,

2. phosphate performs unique and valuable and presently irreplaceable functions in detergents,

3. removal of phosphates from detergents results in loss of quality and increase in costs to the homemaker, and

4. detergent phosphates represent such a small fraction of the total phosphorus that their removal does not help the problem that caused the ban. The problem is clean water. Bans by themselves don't achieve clean water and often delay effective measures. Bans in conjunction with other steps make no difference, just as dabbling at a stain before you take the garment to the dry cleaner makes no difference.

EXHIBIT 10
2/20/85

TESTIMONY BY: Barbara A. White, STATE CLOTHING-TEXTILES SPECIALIST
MONTANA COOPERATIVE EXTENSION SERVICE

HOUSE BILL #711: Proposed Phosphate Ban

My name is Barbara A. White and I am presently the State Clothing and Textile Specialist for the Montana Cooperative Extension Service. My role today and in my capacity as a clothing and textiles specialist is to provide research-based information to the people of Montana, helping them to solve problems in the areas of clothing apparel and household textiles. I come to you, neither as an opponent nor a proponent of the proposed legislation; I suggest, however, that any consideration of environmental effects of a detergent should also include the effect of the detergent on the family clothing and household textiles.

Laundering procedures for clothing and household textiles are not simple tasks; American families wash an average of 8.1 loads of laundry each week. Considerations of fiber type and fabric construction, type of dirt or soil, water hardness, detergent product available, and available additives are all related to the resulting appearance and serviceability of the textile product. The majority of laundry loads are processed in the home; laundry habits and practices are influenced by family size, water hardness, and the availability of phosphate-containing detergents. Of specific concern is the detergent product and the composition of such which enables acceptable cleaning results. Basic laundry products include SOAPS and DETERGENTS with detergents essentially replacing soap because of performance over a broad range of water hardness levels. Detergents are classified as "heavy-duty" (all purpose) or "light-duty" and are available in granule and liquid form. Two major components of laundry detergents are the SURFACTANT and the BUILDER with our attention directed toward the latter since the builder enhances efficiency of the surfactant by deactivating water hardness minerals. Research based on national studies of laundry practices of individuals and families showed differences in the laundering procedures depending on the availability of phosphate detergents. Significant differences were observed in the distribution of wash loads among hot, warm and cool/cold water, and in the number of additional steps and supplies used. Results indicated that when phosphate detergents were available, fewer loads were washed on a hot water setting; when using non-phosphate detergents, more loads were washed with bleach, more fabric softener was used, and more items were given a pre-treatment process, in addition to the increased water temperature needed for acceptable cleaning. EACH OF THESE DIFFERENCES RESULTED IN GREATER EXPENSE IN NON-PHOSPHATE AREAS IN DOLLARS AND IN TIME REQUIRED FOR THE LAUNDERING PROCEDURE.

A key factor in judging the clothing and household textiles laundered in water from the majority of our state (Montana) is WATER HARDNESS. Research data investigating the implied "life of a garment", ie., durability and appearance, suggests the most significant findings to be in those instances where the water used was "hard". Phosphate detergents allow for a "building process" which inactivates water hardness mineral ions without a resulting insoluable residue such as noted with sodium carbonate builders, a known phosphate detergent alternative. Various concerns which have resulted from areas using phosphate alternatives for the laundering of apparel or

household textiles include:

resultant gray, dingy and dirty-appearing textile items
inadequate soil removal
additional abrasive wear resulting in a "worn" appearance, particularly on collars and cuffs
problems with the use of laundry additives, ie., bleach fabric softeners, pre-treatment products
whiteness retention
wrinkle resistance.

Studies suggest an overall increase in dollars and time expended in addition to potential replacement costs of apparel are incurred by the consumer when substituting non-phosphate products in the laundry process especially in HARD WATER regions.

Many factors affect the evaluation of what constitutes an acceptably "clean" apparel or household textile to secure the cleanliness in the absense of an appropriate laundry product, trade-offs must be made by the consumer. These may be relevant to:

1) the level of "usable state" a garment or household textile is returned to after laundering in a non-phosphate detergent
2) replacement of textile item more often due to less acceptable physical appearance
3) increase in energy costs due to use of HOT water temperatures as opposed to warm/cool
4) increased purchase and use of laundry additives, and
5) increased cost due to necessity of installation of water-softening equipment for use with non-phosphate products.

In summary, Montana is a diverse state relevant to occupational alternatives of its residents resulting in a diversity of laundry problems. However, one common thread is apparent throughout the majority of the state: HARDNESS OF WATER. The variation of soil/dirt and contaminants on clothing resulting from the logging industry to the agricultural component as compared to the urban resident and the "backyard gardner", for example, provide just one area in terms of laundering problems faced by the family. All of the forementioned require a heavy-duty detergent and preferably warm/hot water for acceptable cleaning. To achieve this end result, in hard water, phosphate detergents are critical. If the choices are limited with regard to one variable, the consumer will compensate by the choices made with regard to other variables; if the phosphate is removed, higher wash temperature will be a necessity, more additives will be needed, and less acceptable serviceability can be expected from the apparel, household textile items, and equipment.

EXHIBIT 11
2/20/85

Testimony by Carol Jo Thompson
Interior Design & Household Equipment Specialist
Cooperative Extension Service
HB 711, Proposed Phosphate Ban
20 February 1985

My name is Carol Jo Thompson. As a graduate home economist employed by the Montana Cooperative Extension Service I have dealt with consumer information in household equipment selection, use and care for the past 17 years.

I am here this evening to call to your attention information relative to consumer costs and burdens which research shows occur when phosphate cleaning compounds are removed from the marketplace.

Using phosphate detergents it is possible to use hard, cold water and obtain satisfactory cleaning results. For most effective laundry results using non-phosphate detergent one needs soft, hot water.

In Montana more than 80% of the residents deal with hard to very hard water. Installation of a water softening system will lower the number of problems possible in using non-phosphate detergents. Packaged softeners will likely not be an alternative as they are phosphate compounds.

Purchase of a softening system in Montana ranges from about $900 to $2200 or more depending on individual needs and equipment selected. Rental of a softening system can range from about $200 to $400 or more per year. In addition, salt will be a necessary expense three to four times a year, averaging about $25 per time. Cost of maintenance must also be considered.

The Department of Energy testing procedures indicate the current electric energy cost of operating an automatic clothes washer runs 10% for the machine and 90% for heating the water if hot water is used. A new, energy-efficient washing machine would cost about 15-1/2 cents per cycle (for the machine only) to operate in Montana. In addition, cost to heat water electrically would be $1.40 per cycle. Based on 8.1 laundry loads per week, the cost of hot water laundering in Montana would average nearly $655 ($654.97) per family. That cost would be approximately $360 per family if heating water with gas.

Current indications are that washing machines incur service needs within one to four years of the introduction of non-phosphate detergents to the washing machine. Manufacturers report increased service calls in areas having non-phosphate detergents. Parts most often affected when used with non-phosphate detergents and hard water include clogged filters and pumps and, in areas having very hard water (approximately 65% of our residents), agitators and tubs become coated with residue. Coated tubs and agitators abraid textiles so must be kept free of the residue. This costs both money and time.

An average service call costs $35, with parts and labor costing extra. For persons residing in rural areas mileage is often an added extra.

Research shows 45% of American households have automatic dishwashers now and the number is increasing 1 - 2% annually. Only automatic dishwasher detergent can be used in an automatic dishwasher. Other formulations result in oversudsing. Phosphate is used in dishwasher detergent to assist in soil removal and to help prevent spotting and filming on dishes. The lower the phosphate level the more difficult it becomes to have satisfactory results in machine washed dishes. At this point in time, no substitute for phosphate has been found that can be utilized in automatic dishwasher detergents. Thus, if phosphate cleaning compounds are banned, all dishwashing will have to be done by hand.

In summary let me reiterate:

1. The effective use of non-phosphate detergents requires soft, hot water.
2. More than 80% of Montanans have hard to very hard water.
3. Water softening systems in Montana cost $900 - $2200 or more to purchase; $200 - $400 per year to rent plus salt costs.
4. Using hot rather than cold water for laundry will cost a Montana family an average of $360 (gas heated hot water) to $655 (electrically heated hot water) per year for energy alone as opposed to $65 using cold water.
5. Increased service calls are likely.
6. The life of the appliance may be shortened.
7. Dishwashing may have to be done by hand; and
8. Time spent in performing laundry and dishwashing tasks will be increased.

These factors should be kept in mind as you examine the consumer impact of the proposed legislation in HB 711.

EXHIBIT 12
2/20/85

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THE IMPACT OF DETERGENT PHOSPHORUS BANS ON RECEIVING WATER QUALITY

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Abstract—One of the chemicals most clearly exemplifying scientific and political controversy concerning efforts to control its discharge to surface waters is phosphorus and its complexes. These materials are discharged as natural components of domestic wastewaters and include phosphorus from human waste and food waste as well as residual detergent phosphorus. Significant amounts of phosphorus also reach surface waters from non-point sources such as agricultural and urban runoff. This paper presents results of several field and laboratory investigations designed to position the impact of detergent phosphorus contributions to surface water quality. In a number of areas where legislation banned the sale of phosphorus detergents, limnological investigations were carried out to assess the impact of the ban upon receiving water quality. Field studies in natural lakes demonstrate that reductions of phosphorus in wastewaters, even up to 50%, may not substantially improve the trophic status of lakes. The consistent conclusion emerging from these studies is that the elimination of detergent phosphorus has not measurably improved lake water quality.

INTRODUCTION

The problems of eutrophication are the increases in algal and weed populations that cause a loss of clarity of lake waters, algal scums and odors, and interference with potable and recreational uses of water. Chlorophyll *a*, as an estimate of algal biomass, represents the general perception of eutrophication ("greenness") and affects other water quality measurements both directly (clarity) and indirectly (dissolved oxygen, potential for macrophytes, food chain relationships). On the basis of limnological evidence, phosphorus is generally considered the most common limiting nutrient to the biomass of primary producers in lakes and reservoirs.

The relationship between algal growth and dissolved phosphorus in water has been the subject of a myriad of scientific papers, chapters and books. Atkins (1923), one of the first investigators to define this relationship, postulated that the presence of high phosphorus concentrations in surface waters was considered evidence of sewage contamination. Hutchinson (1957) effectively summarized the phosphorus/algal relationship: "Phosphorus is in many ways the element most important to the ecologist, since it is more likely to be deficient, and therefore to limit the biological productivity of any region of the earth's surface, than are the other major biological elements".

This paper presents the results of several field and laboratory investigations designed to position the relative impact of one source of phosphorus, detergent phosphorus, on surface water quality.

SOURCES AND INPUTS OF PHOSPHORUS TO LAKES

Phosphorus (P) sources (in approximate rank order of importance) include such diverse origins as surface runoff, fertilizer applications, phosphate mining, municipal wastewater treatment plant discharges (which include human waste and detergents), atmospheric precipitation, wild and domestic animal wastes, industrial wastes and septic-system leachate. In general, the sources of P are identified and their contributions are measurable. Also, control of these sources, in general, is technologically possible. The importance of these sources and their control are extensively discussed in the literature, yet different conclusions are often reached about the relative effectiveness of control strategies.

Wastewater sources of P affect nearly all large lakes and are the subject of many reports and publications, especially by the International Joint Commission (IJC). IJC reports in the mid-1970s emphasized wastewater P, but recently the emphasis shifted. For example, the 1981 IJC Water Quality Board reported 39 "areas of concern" for the Great Lakes, of which seven involved P enrichment and 37 involved problems not involving P (some areas had both) (Great Lakes Water Quality Board, 1981). This report also noted a 50% reduction of municipal wastewater P loads into the Great Lakes since 1975. As a result, P

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inputs from surface runoff now are at least three times larger than wastewater contributions.

The observed change in the relative magnitude of P sources is largely due to chemical removal of P at wastewater treatment plants. Small lakes may receive wastewater from small municipal treatment plants, and since these treatment plants do not generally practice P removal, the relative magnitude of the two sources is likely to differ.

Laundry detergent P was a major source of wastewater P during the late 1960s, and many researchers and organizations recommended controls to reduce the P content of detergents. Vallentyne and Thomas (1978), as co-chairmen of an IJC Task Group to review P loadings to the Great Lakes, recommended reduction of phosphorus in detergents as one strategy to reduce P loadings. Gakstatter *et al.* (1978) recommended banning phosphates in detergents as an effective method of reducing municipal effluent phosphorus loads by approx. 50%. Their recommendation was based on the National Eutrophication Survey conducted in 1972–1975. The subsequent Great Lakes Water Quality Agreement of 1978 (International Joint Commission, 1978) recommended reduction of P in household detergents to 0.5% where necessary to meet loading allocations.

During the 1970s, detergent manufacturers decreased the P levels in their products. In the U.S., the P content of detergents is now about one-half of 1970 levels. The major source of P to municipal wastewater is now human and food waste with detergents contributing 20–30% (Hartig and Horvath, 1982; Runke, 1982). When detergent P loads are compared to all sources of P loading to a water body, the magnitude of detergent P loads is now very small. For example, if the Michigan ban on P laundry detergents were not in effect the total P entering the Great Lakes adjacent to the state of Michigan would only increase about 2% (Wendt, 1982).

Bioavailability of P species is not well understood by scientists. Lee *et al.* (1980) extensively reviewed the availability of phosphorus to aquatic life and recommended control of algal-available P load. They emphasized the need to use algal assays to estimate available forms of phosphorus. They noted the inaccuracy of chemical techniques in estimating bioavailable P in efluents from domestic wastewater treatment plants. Major regulatory bodies such as the International Joint Commission and the U.S. EPA, however, continue to use total P load because of its simplicity.

Detergent P does not enter the environment directly. Instead, this source passes through municipal or home wastewater treatment systems before entering the environment. In wastewater, detergent P is rapidly converted to orthophosphate. This orthophosphate is readily incorporated into the biomass of an activated sludge plant. If the wastewater plant practices P removal, detergent P will precipitate quickly with iron and aluminum salts when these chemicals are added. The National Eutrophication Survey (NES) (Gakstatter *et al.*, 1978) reported concentrations of total P and ortho P in wastewater effluent in regions where detergent P was banned and in areas without bans. We calculated the percentage of phosphorus in the ortho form from their concentration data in four regions. In the two regions with bans on P detergents, the percentages of ortho P were 62 and 74%. In the two regions without bans, the percentages of ortho P were 67 and 73%. The similarity of these results suggest that detergent P becomes indistinguishable from other sources of P during wastewater treatment.

Internal loading of P to lakes occurs when P is released from sediment. P loading from surface runoff is usually larger than P loading from sediment release, although the seasonal cycles of these two sources are quite different. External loading of P generally reaches a lake during high inflow periods of the year. If the hypolimnion becomes anoxic during low inflow periods, P will be released from the sediments. External loading is usually of greater magnitude, so an apparent net deposition of phosphorus occurs in the bottom sediments. However, the period of release from sediment generally coincides with the period of maximum phytoplankton biomass and maximum public awareness of this nuisance. Shagawa Lake, near Ely, Minnesota, is a classic example of the importance of internal loading. Shagawa Lake experienced very little improvement in water quality (Porcella *et al.*, 1980) following an 80% reduction in point-source phosphorus, apparently due to its internal pool of sediment P. Although epilimnetic available P was depleted in early summer during algal blooms, the concentration of total lake P reached its maximum during August and September (Larsen *et al.*, 1975). This P maximum apparently resulted from a release of sediment P due to low hypolimnetic dissolved oxygen (DO) concentrations (Sonzogni *et al.*, 1977; Larsen *et al.*, 1981). Similar estimations in Lake Erie indicated a sharp increase in sediment P release when the DO was reduced to 0.25 mg l^{-1} (Herdendorf, 1980).

As a practical matter, the calculation of a P budget for a lake usually includes only external sources of P. The release of P from sediment, as well as the effect of thermocline migration, serves to increase productivity without affecting the external P budget. Thus, the external P sources may be less important than expected. As a result, small changes in external P loads may have a smaller-than-expected effect on water quality.

Lorenzen (1979) used a mass balance model and limit line to show that small changes in P loading reduced in-lake total P concentrations in a small number of lakes while chlorophyll *a* and Secchi disc depths were indistinguishable from old values. Although some questions about the chlorophyll model exist (Smith and Shapiro, 1981a), the conclusions have generally been supported (Lorenzen, 1981a).

Nevertheless, disagreements about mass-balance modeling, threshold effects, and chlorophyll *a*/P relationships continue in the literature (Lorenzen, 1981b; Rast and Lee, 1981; Smith and Shapiro, 1981b). These disagreements emphasize the importance of monitoring studies to provide a data base on the interactions and relationships between phosphorus and chlorophyll *a*.

Lee *et al.* (1978) provided new insight on water quality changes that might result from various P control practices. They applied the results of the U.S. OECD eutrophication project and concluded that water quality in lakes is remarkably insensitive to small changes in P loads.

When phosphorus appears to be the controlling nutrient, the ecological question is not whether to control phosphorus loading; the question is a matter of degree. In a lake, how much must the P load be lowered so that the P concentration is reduced sufficiently to cause an observable effect on water quality? The following case histories examine this question.

CASE HISTORIES

In P-limited lakes, P loading reductions, if sufficiently large, generally can be expected to result in an improvement in lake water quality. However, the quantitative relationships are not simple, and the P reductions necessary to achieve a significant improvement may be quite large.

Smith and Shapiro (1981a) critically reviewed and evaluated the response of algal biomass to nutrient reduction in sixteen north temperate lakes. One lake, Lake Washington, was restored to oligotrophic conditions (TP = 10.5 $\mu g\ l^{-1}$, Chl = 3.9 $\mu g\ l^{-1}$) by total wastewater diversion and a subsequent 80% reduction of in-lake P concentrations. Four lakes were restored to mesotrophic conditions (TP $\leqslant$ 20 $\mu g\ l^{-1}$ and Chl $\leqslant$ 5.5 $\mu g\ l^{-1}$ for at least 1 year) either by wastewater diversion, by chemical removal of P from wastewater, or by flushing with low-nutrient water. In these four lakes, the in-lake P concentration was reduced by 45–85%. The other eleven lakes experienced a decrease in in-lake P concentration, although all were still considered to be eutrophic (TP > 20 $\mu g\ l^{-1}$). This latter group of lakes also had regression equations of chlorophyll *a* vs phosphorus with weak statistical relationships. Overall, their review suggested that a large decrease in P concentration must occur in a lake in order to achieve an improvement in trophic status.

Uttormark and Hutchins (1980) described restoration attempts on 23 eutrophic lakes (four were in common with the Smith and Shapiro data set). Loading reductions for these 23 lakes were achieved through diversion of wastewater and construction of new treatment plants. Based on observed trophic conditions, they judged that ten lakes moved into the mesotrophic or oligotrophic categories; these ten had average P loading reductions of 73%. In the other 13 lakes, reductions of P input averaged 49% and were not adequate to shift the trophic status.

Hern *et al.* (1981) examined environmental factors affecting the response of chlorophyll *a* to total P concentration for the 815 NES lakes. A strong correlation existed between total P and chlorophyll *a* for the entire set of lakes, yet for individual lakes, the response of chlorophyll *a* produced per unit of total P varied greatly. The reasons for the variation were thought to be related to light attenuation and sometimes nitrogen concentrations.

A few researchers explored alternative techniques to improve water quality without P control. Shapiro *et al.* (1975) argued that biological interactions, especially with higher organisms, affected the efficacy of restoration techniques. They also proposed management of the fish community as a technique to control algal abundance. Shapiro *et al.* (1982) reviewed a variety of possibilities for biomanipulation such as reduction of benthivores, change of algal species, and increase in herbivorous zooplankton. They reported biomanipulation in small lakes to be a cost-effective approach for lake restoration, both as an adjunct and an alternative to nutrient control. Biomanipulation has already been successfully applied under specific conditions (Henrikson *et al.*, 1979; Shapiro and Wright, 1983).

DETERGENT PHOSPHORUS BAN STUDIES

Legislated bans limiting the phosphorus content of commercial detergents were seen by many as a rapid and effective means to reduce P loadings to surface waters. The Canadian government acted in July, 1970 to limit phosphorus in laundry detergents to less than 8.7% and in 1972 further decreased the limit to 2.2%. The states of Indiana and New York limited detergent phosphorus in their respective 1971 legislative sessions. In addition, laws limiting the P content of detergents were enacted in Minnesota, Michigan, Vermont, Wisconsin, Connecticut, Florida and Maine as well as a number of city and county jurisdictions.

Table 1. Dates of legislated laundry detergent phosphorus limitations

Location	Intermediate ban date and P limit		Date of ban
Connecticut	2/1/72	8.7%	
Florida	12/31/72	8.7%	
Indiana	2/22/72	8.7%	1/1/73
Maine	6/1/72	8.7%	
Michigan	7/1/72	8.7%	10/1/77
Minnesota			8/30/79*
New York	1/1/72	8.7%	6/1/73
Vermont			4/1/78
Wisconsin			7/1/79†

*The ban in Minnesota was instituted in late 1976 although legal challenges delayed the official date until 30 August 1979. Nevertheless, the detergent industry stopped the shipment of phosphate detergents into Minnesota in late 1976.

†The ban in Wisconsin expired on 30 June 1982 and was reinstated on 1 January 1984.

State-wide legislative restrictions on detergent phosphorus are listed in Table 1. These restrictions recently were found to involve hidden costs to consumers (U.S. Department of Commerce, 1982; Purchase *et al.*, 1982; Mohamed, 1982; Spivak *et al.*, 1982). A review of the continuing legislative and technical controversies surrounding detergent phosphorus was recently provided by Flynn (1982).

Nearly all of the published studies typically cited in support of detergent P bans for improvement of water quality are based on the unsupported hypothesis that, if phosphorus is related to eutrophication, then even a small reduction in P loading will improve water quality. Among these often-cited studies are Schelske and Stoermer (1971) where large submerged plastic bags were subjected to various nutrient concentrations and the resultant algal production was monitored. The experiments of Schindler and Fee (1974), also cited in support of detergent P bans, were done in small, whole lake systems. They showed definitively that phosphorus was the limiting nutrient in these lakes but failed to position the relative importance of P contributions from detergent origin or any other source. The publications by Sweeney (1973, 1979) also claimed that bans had a positive ecological impact, but did not include data to substantiate his claim. Hartig and Horvath (1982) also implied a water quality benefit from Michigan's detergent P ban, but did not support their claim with data.

The lake restoration projects described earlier (Smith and Shapiro, 1981a; Uttormark and Hutchins, 1980) indicated that even moderate reductions in P loading may not cause the trophic status of a lake to improve. Several studies have been carried out which investigate the specific question of whether P reductions resulting from detergent P bans approach the magnitude needed to cause a significant shift in water quality. In the following section, the results of these investigations are summarized with both pre- and post-ban field data for analysis and comparison of directional water quality changes. Each geographical area will be discussed in sequence.

Indiana

A detergent P ban was adopted in the State of Indiana in January 1973. Subsequently, several studies were initiated to examine its impact on surface water quality across the state. Etzel *et al.* (1975) conducted a series of laboratory investigations and field monitoring trips of Indiana rivers. Their objective was to determine whether the detergent P ban made phosphorus a growth-limiting nutrient and consequently reduced the algal growth potential in the surface waters of the state. Data for the White River and Wabash River are typical of monitored P concentrations in Indiana during their study (Fig. 1). Average ortho P concentrations throughout the White River during this post-ban period were usually several hundred parts per billion with a maximum of 3650 μg l^{-1}. Mean ortho P concentrations in the Wabash River, although lower than in the White River, were substantially higher than the concentration generally recognized as sufficient to support excessive algal growth in surface waters. These P concentrations were so high that no benefit was expected from a small change in loading. The authors concluded that the legislative ban on detergent P

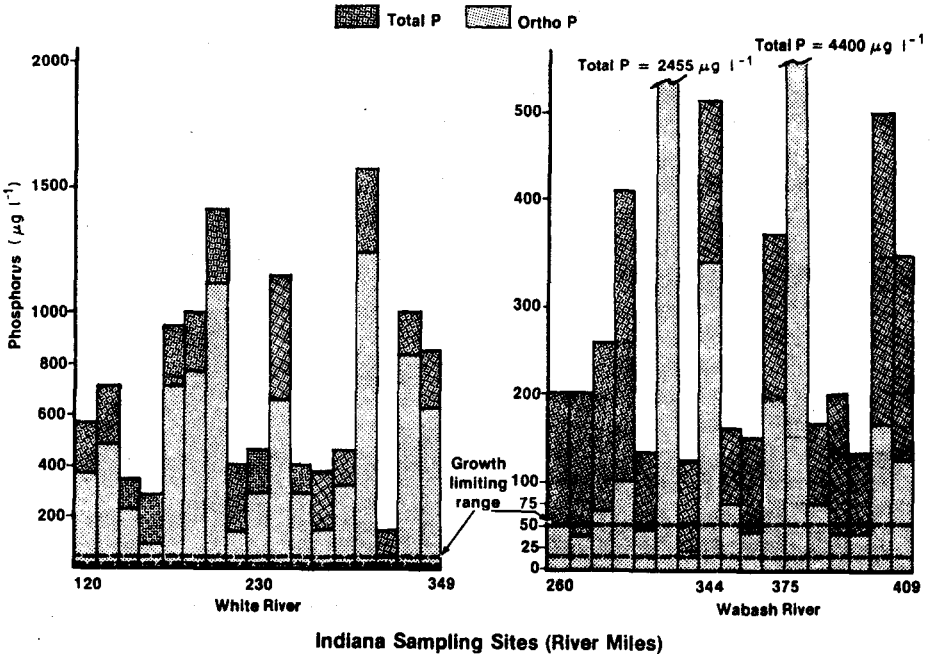

Fig. 1. Total and orthophosphorus data for the White River and Wabash River, Indiana showing presence of excess phosphorus concentrations beyond the growth limiting range (Etzel *et al.*, 1975).

failed to reduce the remaining stream P to levels low enough to be of any biological significance in reducing the potential for algal growth. They also concluded that the environmental and public interests throughout the state would be better served by widespread recognition of the obvious value of nutrient removal at wastewater treatment plants.

Doemel and Brooks (1975) made laboratory measurements on the effects of a detergent P ban on algal growth in Indiana lake water. Wastewater was modified by two techniques: first, by chemically removing half of the total P of the domestic effluent wastewater, and secondly, by supplying a motel complex with a non-P detergent. The wastewaters were then diluted 50-fold with natural lake waters. Using several green and blue-green algal species, they found biomass was not significantly decreased when total wastewater effluent P was reduced by either of these two techniques. Only when effluents were tertiary treated to achieve a 92% reduction was algal growth significantly decreased. The authors concluded their data supported the hypothesis that the removal of phosphorus from detergents was insufficient to reduce algal growth in most bodies of water.

In an intensive study of fifteen Indiana lakes, Bell and Spacie (1978) compared water quality and P concentrations measured in 1977 with those previously found during the 1973 EPA National Eutrophication Survey. They investigated whether any of the lakes had undergone changes in trophic state 4 years after the detergent P ban. Results of the investigation were compared via the trophic state index (TSI) method of Carlson (1977). The value of the TSI may range from 0 to 100 with the higher values being more eutrophic. Bell and Spacie considered changes of less than 5 TSI to be insignificant due to the inherent variability in sampling and water quality between years.

Table 2. Comparison of Indiana lakes using Carlson trophic state index (Bell and Spacie, 1978)

Lake	Year	Total P	Chl. *a*	Secchi	Average change
Bass	73	55.5	65.0	63.0	
	77	58.5	60.5	69.0	+1.5
Cataract	73	64.0	53.0	68.5	
	77	69.5	71.5	68.5	+8.0
Crooked	73	47.5	50.0	46.3	
	77	51.0	46.5	48.0	+0.6
Dallas	73	46.0	54.0	53.0	
	77	56.8	42.0	51.5	−0.9
Geist	73	73.0	70.0	64.5	
	77	73.0	70.0	73.0	+2.8
Hamilton	73	54.4	52.0	55.3	
	77	57.5	54.8	58.8	+3.1
Long	73	70.0	54.0	55.3	
	77	78.5	64.0	63.0	+8.7
Marsh	73	68.0	59.5	56.5	
	77	59.0	56.0	56.3	−4.2
Maxinkuckee	73	43.0	48.0	48.8	
	77	50.5	46.0	49.5	+2.1
Monroe	73	49.5	53.8	56.0	
	77	59.8	58.8	52.5	+5.4
Sylvan	73	75.5	74.8	65.0	
	77	63.0	60.5	63.0	−9.6
Tippecanoe	73	45.0	52.5	45.5	
	77	43.0	49.0	54.0	+1.0
Wawasee	73	40.0	50.2	42.3	
	77	50.5	47.0	45.0	+3.3
Webster	73	39.5	50.2	42.3	
	77	56.0	57.0	60.0	+13.7
Winona	73	50.5	59.0	55.0	
	77	59.5	57.0	57.5	+3.2

Table 3. Chlorophyll *a* concentrations in Indiana lakes (Lee and Archibald, 1980)

Name	1977 Chlorophyll *a* concentration ($\mu g l^{-1}$)	Predicted 1972 Chlorophyll *a* concentration ($\mu g l^{-1}$)
Hamilton	12	12.5
Sylvan	21	25
Monroe	14	15
Cataract	42	43
Long	31	33
Dallas	14	15
Marsh	13	16
Webster	15	16
Bass	21	23
Wawasee	5	5.2
Geist	57	62
Winona	15	15
Crooked	5	5.2
Tippecanoe	7	7
Maxinkuckee	5	5.1

All of the fifteen Indiana lakes studied by Bell and Spacie had sufficiently short residence times that a change in nutrient load in 1973 should have produced an effect by 1977. A comparison of 1973 conditions with those of 1977 indicated that four of the lakes had an overall increase of five or more TSI units (i.e. became more eutrophic) while one showed a decrease (Table 2). The other ten lakes showed only small changes. The authors concluded that the ban of detergent P was not sufficient to produce a significant change in these lakes within four years. They explained that the estimated pre-ban contribution of detergent P to the loadings in these lakes was generally small compared to other sources of phosphorus.

In a further analysis of these data for the fifteen Indiana lakes, Lee and Archibald (1980) summarized results of the Vollenweider–OECD eutrophication modeling approach to evaluate the water quality improvement that potentially could be expected from the 1973 detergent P ban. Estimates of chlorophyll *a* concentrations for pre-ban 1972 were compared with data for 1977, 4 years post-ban (Table 3). The model, as expected, predicted a decrease in the concentration of chlorophyll *a* in every case, but the magnitude of chlorophyll *a* changes between these periods was usually less than 10%.

New York

In Erie County, New York, a ban on detergent P was adopted in January 1972. Smith (1972) determined that the Erie County ban, combined with effects of chemical treatment of wastewaters, resulted in an overall reduction of 0.3 μg P l^{-1} in the receiving water. Compared to typical P concentrations of Niagara River water, Smith concluded that it cannot be proven that the ban significantly decreased the P

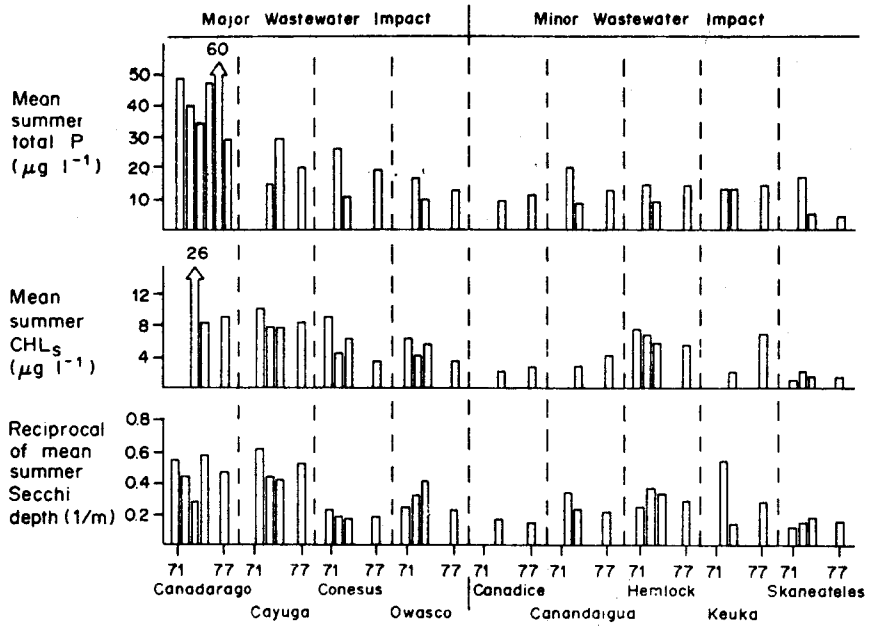

Fig. 2. Water quality data for the ten New York study lakes demonstrating variability in response patterns. The last bar for each lake represents 1977 data (4 years post ban) (Schaffner and Oglesby, 1978).

concentration and that the differences to be expected were of similar magnitude to natural background variation of the Niagara River. The statewide New York detergent P ban was adopted in 1973 and, as in Indiana, a number of studies were conducted to assess its impact on receiving water quality. In an intensive study of phosphorus content of New York influent and effluent wastewaters, Sharfstein *et al.* (1977) reported reductions in total P ranging from 12.5 to 59% in influent wastewater after the ban. However, the authors concluded, while the P ban reduced wastewater P concentrations, the reduction represented an extremely small decrease in the eutrophic potential of the receiving waters.

Schaffner and Oglesby (1978) collected data from a number of New York lakes during 1977. Chlorophyll *a*, Secchi depth and total P concentrations were measured among several other physico-chemical values. Representative deep-water lakes were selected on the basis of pre-ban data for comparison with 1977 data. In some cases changes were slightly positive and, in others, the changes were in the direction of poorer quality. Figure 2 presents the Schaffner and Oglesby (1978) data for the years 1971 to 1977. The lakes, especially those with major wastewater impact, would be expected to show an improvement in all three parameters if the state-wide ban on detergent P were an important factor. No overall improvement in lake water quality was seen. The authors concluded that the P ban resulted in an overall decrease in the phosphorus content of wastewaters but was insufficient to produce a measurable impact on water quality.

Trautmann *et al.* (1982) reviewed the chlorophyll data reported by Shaffner and Oglesby (1978) and added new chlorophyll data from 1978 for six of the lakes. When statistically analyzed as individual lakes, no change in summer chlorophyll was found. However, when the six lakes were analyzed as a group, the authors reported a significant decrease in chlorophyll concentration after the ban. The decrease occurred over the time period of 1970 to 1978, and Trautmann *et al.* attributed the drop to the ban on detergent phosphorus which began on 1 June, 1973. Our analysis of their approach indicates several problems in reaching this conclusion. First, the chlorophyll data are probably not independent with respect to time as required when using the statistic they employed. Second, control lakes were not used and thus no compensation was made for year-to-year climatic changes. In particular, the passage of Hurricane Agnes through the region in June 1972, was not discussed even though two of the six lakes (Cayuga and Skaneateles) exhibited unusually high chlorophyll levels in 1972. Third, phosphorus-removal facilities were installed at waste-water treatment plants on two of the six lakes (Conesus and Cayuga) during the study period. These factors suggest to us that the assignment of improved chlorophyll levels to the detergent phosphate ban is not supported.

Michigan

The State of Michigan implemented a detergent P ban effective 1 October 1977. In a study of the effects of the ban on municipal wastewater treatment plants, Hartig and Horvath (1982) summarized influent and effluent P concentrations from 58 Michigan wastewater plants. The study considered 1976–1977 as a pre-ban period and 1978–1979 as a post-ban period. Influent phosphorus concentrations decreased by 23% from approx. 6.5 to 5.0 mg l^{-1}. Effluent phosphorus concentrations decreased by 24% from ap-

prox. 2.1 to 1.6 mg l^{-1} due to initiation of chemical removal of P as well as the ban. Monitoring data from western Lake Erie for 1976–1979 showed no decrease in P concentrations after the ban and, in fact, showed a slightly increasing trend with the highest concentrations evident in 1979.

Hartig and Horvath claimed the ban seemed to decrease taste and odor problems in drinking water taken from Saginaw Bay. However, in a later discussion paper, Wendt (1982) showed that P concentrations decreased before the ban and therefore no improvement in water quality could be attributed to the ban. Wendt agreed that the ban caused a decrease in wastewater influent P concentrations, but only affected the P load to adjacent Great Lakes by 2%. Another discussion paper by Berthouex *et al.* (1983) applied more sophisticated time-series analysis to Hartig and Horvath's data. Berthouex *et al.* estimated that Michigan's P detergent ban reduced the influent wastewater P load by 13–15%, not 23% as claimed by Hartig and Horvath.

Minnesota and Wisconsin

Lake studies in Minnesota and Wisconsin were reported by Runke (1982) and by Clesceri (1982), respectively. These studies began before the bans in those states became effective and continued for several years afterward. Two groups of lakes were studied in both Minnesota and in Wisconsin. The first group consisted of point-source lakes that received substantial quantities of municipal wastewater effluent or septic tank seepage. The second group consisted of reference lakes that received no wastewater discharges. By forming pairs of two similar lakes, one each from the point-source and reference groups, changes in water quality attributable to the ban against P-based detergents might be distinguished from changes that would otherwise occur naturally. These two studies are described below.

In late 1976, the Minnesota Pollution Control Agency instituted a ban against P-based detergents. To assess the effect of the proposed ban on water quality, a study was undertaken in 1975 by the Environmental Research Group, Inc., St Paul, Minnesota (Runke, 1982). The study provided data on eleven lakes throughout the State of Minnesota, including those receiving and not receiving municipal wastewater effluent. A detailed limnological study of the selected lakes was made during pre-ban conditions in 1975–1976 and post-ban conditions in 1977–1980. The lakes in the study had phosphorus residence times of less than 0.7 years. External P loading from wastewater treatment plants to the studied lakes averaged 32% (range 4–67%) before the ban. After the ban, the external load decreased by an average of 13% (range 0–35%).

Runke reported one lake pair with significantly lower P concentrations but unchanged chlorophyll-*a* levels and Secchi depth. A second lake pair significantly improved in chlorophyll-*a* concentration and Secchi depth but not P concentration. A third lake pair showed a significant deterioration in chlorophyll-*a* concentration and Secchi depth but no change in P concentration. Three other lake pairs showed no changes. Runke concluded that the ban on phosphate-based detergents did not result in improved lake water quality in Minnesota. He attributed the lack of improvement to the loading reductions being too small relative to the overall phosphorus budget to elicit a water quality response.

An independent analysis of Runke's data was also made for this paper. The results of our analysis of the Minnesota lakes data are shown first in Table 4 as directional changes in water quality and phosphorus concentrations. The table presents the differences between the post-ban responses and the pre-ban responses. A detailed evaluation of the differences shown in Table 4 reveals that several lakes experi-

Table 4. Directional changes in water quality and phosphorus concentrations for the Minnesota lakes

Lake	Mean post-ban values minus mean pre-ban values: Secchi (ft)	Chl-*a* ($\mu g l^{-1}$)	Total-P ($\mu g l^{-1}$)	Ortho-P ($\mu g l^{-1}$)
Lily	0.51	−74.45	−321.14	−82.66
Clear-R	−1.69	48.03	−337.18	−302.63
Green	−0.94	0.11	−0.84	−3.03
Big Birch-R	−0.48	1.74	10.41	−0.23
Koronis	−1.24	8.12	16.27	−3.95
Minnewaska	−0.13	1.69	−18.04	1.10
Reno-R	−1.43	0.03	6.93	−2.98
Blackhoof	−0.29	10.71	25.52	1.78
Eagle-R	0.60	1.82	−1.03	−2.20
Buffalo	0.39	6.70	1.87	−1.16
Maple-R	0.15	9.98	8.41	−0.76

	Summary of directional changes in individual lakes: Secchi		Chl-*a*		Total-P		Ortho-P	
	Ref.	Pt. source	Ref.	Pt. source	Ref.	Pt. source	Ref.	Pt. source
Declining	3	4	0	1	2	3	5	4
Increasing	2	2	5	5	3	3	0	2

R = Reference lake.

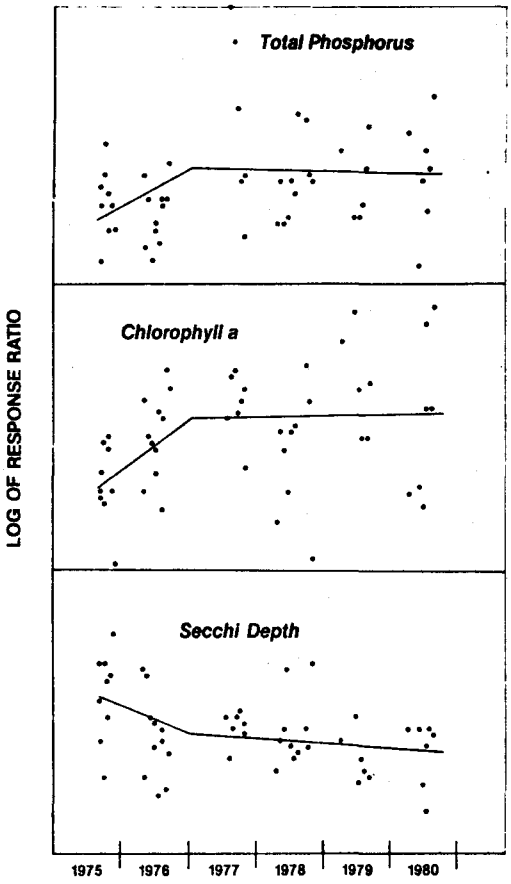

Fig. 3. Water quality data for the Blackhoof–Eagle lake pair, Minnesota demonstrating pre- and post-ban trends. The solid lines are the trends on the segmented-line regression model.

enced an increase in in-lake total P and ortho P after the ban, in contradiction to predictions. These increases reflect the natural fluctuations in these parameters from year to year and emphasize the importance of reference-lake comparisons when evaluating an event such as a detergent P ban. A summary of the directional changes (without regard to magnitude or statistical significance) is shown at the bottom of the table. This summary reveals no directional trends that might be attributed to the detergent P ban. A detailed discussion of the lake responses follows.

Two lakes, Lily and Clear, experienced large decreases in total and ortho P concentrations (see Table 4). The P concentration change in Clear Lake was not related to the ban since Clear Lake received no wastewater. At Lily Lake, the reduction in overall P load due to lower P concentration in wastewater after the ban was 4%, which is too small to cause the large decrease noted in Table 4. Thus, the overall reduction in P concentrations in Lily and Clear lakes was apparently caused by other factors; the detergent P ban could not cause the large change.

An additional detailed statistical analysis was also made on the Minnesota lakes by forming lake pairs. For each observation of a particular response, the data were logarithmically transformed to stabilize variance and averaged across sites for a particular sampling trip and lake. Ratios were formed between the data from each point source lake and its reference lake. The ratios were fitted to a segmented straight-line model with a join point at the date of the ban. Figure 3 illustrates the segmented-line model for the Blackhoof–Eagle lake pair. This model allowed a rigorous test of the hypothesis that a measurable change of a particular variable occurred (or did not occur) after the date of the detergent P ban. This hypothesis was tested by comparing slopes of the lines before and after the ban. The segmented regression model was fitted using the Statistical Analysis System procedure REG (S.A.S., 1979). This technique is similar to that used by Runke except that Runke used a segmented line model in which the pre-ban response coefficient was forced to be zero (i.e. steady state was assumed in the pre-ban period). The slopes of our regression lines are presented in Table 5 along with the results of an F-test. The Durbin–Watson statistic and the 1st-order autocorrelation coefficient were determined in order to test for non-random patterns in the residuals. Some non-random pattern was detected in the residuals of a few of the data sets. However, none of the non-random patterns occurred where the change in slope represented a significant improvement (at $P = 0.12$ or less) in water quality.

The results for the Lily–Clear lake pair indicate the variety of events that may occur in P concentrations and water quality variables over a 6-year study. In this lake pair, chlorophyll a concentration ratios declined significantly in the pre-ban period and then became constant after the ban. The F-test (see Table 5) suggests that the pre- and post-ban chlorophyll a slopes for the Lily–Clear lake pair were significantly different, but close inspection of the raw data revealed that the reference lake experienced an unusual and sudden algal decline in September of 1975. No similar decline occurred in the point-source lake. Thus, the change in slope at the time of the ban was not related to the detergent P ban.

The algal decline in 1975 in Clear Lake also caused Secchi depth ratios to trend upward significantly in the pre-ban period, as noted in Table 5. A slight, but nonsignificant, positive slope coefficient also occurred after the ban, and the change in slope was nearly significant ($P = 0.06$). In terms of water quality, both chlorophyll a and Secchi depth ratios were improving in the reference lake before the ban, and the changes after the ban were toward less desirable trends. Neither of these changes can logically be associated with the ban.

Table 5 shows that both the total P and ortho P concentration ratios in the Lily–Clear lake pair had nonsignificant changes before and after the ban, and that the changes had no statistical significance. Overall, for the Lily–Clear lake pair, the detergent P ban had no effect on lake water P concentration ratios. The changes in chlorophyll a and Secchi depth ratios,

Table 5. Water quality and phosphorus data for Minnesota lake pairs. Negative slopes indicate decreasing trends and positive slopes indicate increasing trends relative to respective reference lakes. The *P*-value indicates the significance of the difference between pre- and post-ban trends

Lake pair	Parameter	Slope of the log ratio of response vs time		*P*-value of difference in slopes
		Pre-ban	Post-ban	
Lily–Clear	Chl-*a*	−0.0026*	0.0001	0.02*
	Secchi	0.0013†	0.0003	0.06
	Total-P	0.0004	−0.0001	0.52
	Ortho P	0.0011	0.0003	0.55
Green–Big Birch	Chl-*a*	0.0005	−0.0002*	0.04*
	Secchi	−0.0003	0.0001	0.12
	Total P	0.0001	−0.0001	0.59
	Ortho P	−0.0009	0.0001	0.11
Koronis–Big Birch	Chl-*a*	0.0001	0.0001	0.73
	Secchi	−0.0002	0.0000	0.57
	Total P	−0.0003	0.0000	0.46
	Ortho P	−0.0008	−0.0001	0.20
Minnewaska–Reno	Chl-*a*	−0.0000	0.0001	0.91
	Secchi	0.0001	0.0000	0.73
	Total P	−0.0004*	−0.0001	0.12
	Ortho P	0.0008	−0.0002	0.11
Blackhoof–Eagle	Chl-*a*	0.0005*	0.0001	0.10
	Secchi	−0.0003	−0.0001	0.20
	Total P	0.0004	−0.0000	0.18
	Ortho P	0.0005	0.0001	0.31
Buffalo–Maple	Chl-*a*	−0.0002	−0.0001	0.85
	Secchi	0.0003	−0.0000	0.34
	Total P	−0.0000	−0.0001	0.78
	Ortho P	0.0010	−0.0001	0.17

Number of lake pairs showing declines and increases

	Chl-*a*		Secchi		Total-P		Ortho-P	
	Decline	Increase	Decline	Increase	Decline	Increase	Decline	Increase
Pre-ban	3	3	3	3	3	3	2	4
Post-ban	2	4	2	4	5	1	3	3

*Significant at $P = 0.05$.
†Significant at $P = 0.01$

although statistically significant, were therefore unrelated to the ban.

For the other lake pairs, only three slope coefficients were significantly different from zero. These three trends were: decreasing total P ratios pre-ban in the Minnewaska–Reno lake pair, increasing chlorophyll *a* ratios pre-ban in the Blackhoof–Eagle lake pair, and decreasing chlorophyll *a* ratios post-ban in the Green–Big Birch lake pair. The ban, of course, could not be the cause of any pre-ban trend. The post-ban trend for chlorophyll *a* ratios in the Green–Big Birch pair represents an improvement in water quality after the ban, but the concentration ratios for total P and ortho P did not change in a consistent manner. This lack of correlation indicates that the ban was not the causative factor of the chlorophyll *a* change.

The absence of effects in Buffalo Lake is of particular importance because Buffalo Lake, preban, received 67% of its input P from wastewater. Even so, the trend of the in-lake total P ratio was virtually unchanged after the ban as were the chlorophyll *a* and Secchi depth ratios. Taken as a set of data, the Buffalo–Maple lake pair observations indicate that the ban on detergent P had no effect on water quality in this highly impacted lake. The reason for the lack of effect was perhaps due to the already high level of P ($\sim 300\ \mu g\ l^{-1}$) and the resulting low N/P ratio (~ 6) in Buffalo Lake. Water quality in this lake was apparently not controlled by P.

The lower half of Table 5 is a summary of the pre- and post-ban trends of the ratios without regard to statistical significance. This summary indicates that in-lake total P was declining after the ban, although ortho P, chlorophyll *a*, and Secchi depth were not changing. Overall, no significant differences between pre- and post-ban water quality measurements could be correlated with P concentrations or with the detergent P ban during this 6-year investigation of eleven Minnesota lakes.

Wisconsin

The state of Wisconsin legislated a limited-term phosphorus detergent ban from 1 July 1979 to 30 June 1982. The purpose of the limited term was to allow time for an assessment of any impact the ban might have on the water quality of Wisconsin lakes.

Two studies were conducted in Wisconsin during the ban period. The Wisconsin Department of Natural Resources (Schueltpelz *et al.*, 1982) studied 16 wastewater treatment plants, 29 stream sites and 3 lakes. They reported the ban reduced the P load in the sanitary sewers of many municipalities. They also reported no direct evidence of water quality improvement in the waters investigated within the time period permitted. For the three lakes receiving waste-

water, a reduction in wastewater P occurred at only one lake after the ban. At the lake with a reduction in wastewater P, they reported that the small reduction in total phosphorus (in wastewater) during the study period was not significant compared to the total annual loading to the impoundment.

A study on Wisconsin lakes was also conducted by Environmental Research Group, Inc., St Paul, Minnesota and reported by Clesceri (1982). A series of Wisconsin point-source and septic-tank lakes were studied as in Minnesota. Nearby reference lakes were also studied. The hydraulic retention times of the Wisconsin point-source lakes ranged from 54 days to an estimate of <2 years. By the summer of 1981, the ban had been in effect for 2 years. Thus, Clesceri studied all of the lakes for a period exceeding one hydraulic retention time, and four of the lakes were studied for a period of 3–13 retention times.

Clesceri noted only one lake, Balsam Lake, experienced a small improvement in water clarity when compared to its reference lake. However, he found this change in Balsam Lake did not correlate with a change in chlorophyll *a* or total P. Overall, Clesceri found no positive water quality improvement assignable to the detergent phosphate ban in any of the study lakes even though the lakes were chosen to be likely to show any possible effects of the ban.

SUMMARY

Large reductions in external P loading or in-lake P concentrations usually cause significant improvements in trophic status and water quality as found by Smith and Shapiro (1981a) and by Uttormark and Hutchins (1980). These authors also noted that moderate P reductions often caused changes in chlorophyll *a* concentrations and Secchi depths that were sufficiently large to measure with reasonable confidence. These moderate changes, however, were usually not sufficient to cause a change in trophic status.

The small changes in external P loading following bans on detergent P have not caused significant water-quality improvements as noted by Bell and Spacie (1978), Schaffner and Oglesby (1978), Wendt (1982), Runke (1982), Clesceri (1982) and Schuettpelz *et al.* (1982). These authors consistently concluded that water-quality changes, if any, occurring after a detergent P ban, were too small to observe experimentally compared to natural variations.

CONCLUSIONS

The problem of eutrophication is influenced by many factors including nutrients, physical-chemical phenomena and biological interactions. This paper examined primarily the factors and effects that are related to P loadings of a magnitude comparable to those of detergent P.

The review of literature as well as the new studies reported in this paper suggest that small changes in P loading will not have a significant effect on water quality. The numerous case studies reviewed here further indicate that detergent P bans represent a very small change in P loading, and no significant water-quality effects have been related to bans.

As noted by Jones and Lee (1982), small reductions in P load without technical justification are not likely to lead to cost-effective programs for control of eutrophication. They urged the use of verified methods to relate P load changes to the response of a water body in terms of beneficial uses and public perception.

Chapra *et al.* (1983) carefully reviewed the options of controlling P loading to the Great Lakes, including the cost effectiveness of these measures. Their analysis found that an optimal P management program included controls of both point and diffuse sources, zoned (rather than uniform) controls, and ranking of control options according to cost effectiveness. Detergent P bans were not discussed. In general, the most cost effective programs were sound land management practices and phosphorus removal at treatment plants to $1.0\ mg\ l^{-1}$.

This paper emphasizes the importance of a quantitative evaluation of eutrophication. This evaluation, in turn, indicates the necessity of large reductions of P loads, and the futility of small P reductions, in order to achieve water quality improvements of the desired magnitude. When P concentration is the primary factor causing eutrophication, water quality benefits cannot be achieved by bans of detergent phosphorus. Such benefits require overall control of both point and non-point sources of phosphorus.

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REFERENCES

Atkins W. R. G. (1923) The phosphate content of fresh and salt waters in its relationship to the growth of the algal population. *J. mar. Biol. Ass. U.K.* **13**, 119–150.

Bell J. M. and Spacie A. (1978) Trophic status of fifteen Indian Lakes in 1977. Report of the School of Civil Engineering, Purdue University, Lafayette, IN.

Berthouex P. M., Pallesen L., Booman K. and Sedlak R. (1983) Discussion of: a preliminary assessment of Michigan's phosphorus detergent ban. *J. Wat. Pollut. Control Fed.* **55**, 323–326.

Carlson R. E. (1977) A trophic state index for lakes. *Limnol. Oceanogr.* **22**, 361–368.

Chapra S. C., Wicke H. D. and Heidtke T. M. (1983) Effectiveness of treatment to meet phosphorus objectives in the great lakes. *J. Wat. Pollut. Control Fed.* **55**, 81–91.

Clesceri N. L. (1982) The impact of banning phosphate-containing detergent on the water quality of Wisconsin lakes. Report to The Soap and Detergent Association, New York.

Doemel W. N. and Brooks A. E. (1975) Detergent phosphorus and algal growth. *Water Res.* **9**, 713–719.

Etzel J. E., Bell J. M., Lindemann E. G. and C. J. Lancelot (1975) Detergent Phosphate Ban Yields Little Phosphorus Reduction, Parts I, II and III. *Water Sewage Wks* **9**, 91–93.

Flynn K. C. (1982) New challenges in the great lakes states to banning phosphorus in detergents. *J. Wat. Pollut. Control Fed.* **54,** 1342–1345.

Gakstatter J. H., Allum M. O., Dominguez S. E. and Crouse M. R. (1978) A survey of phosphorus and nitrogen levels in treated municipal wastewater. *J. Wat. Pollut. Control Fed.* **50,** 718–722.

Great Lakes Water Quality Board (1981) 1981 Report on great lakes water quality. Report to the International Joint Commission, Windsor, Ontario, Canada.

Hartig J. H. and Horvath F. J. (1982) A preliminary assessment of Michigan's phosphorus detergent ban. *J. Wat. Pollut. Control Fed.* **54,** 193–197.

Henrikson L., Nyman H. G., Oscarson H. G. and Stenson J. A. E. (1979) Trophic changes without changes in the external nutrient loading. *Hydrobiology* **68,** 257–263.

Herdendorf C. E. (Ed.) (1980) *Lake Erie Nutrient Control Program*, 354 pp. EPA-600/3-80-062, Duluth, MN.

Hern S. C., Lambou V. W., Williams L. R. and Taylor W. D. (1981) Modifications of models predicting trophic state of lakes. EPA-600/3-81-001, Las Vegas, NV.

Hutchinson G. E. (1957) *A Treatise on Limnology*, Vol. 1, 1015 pp. Wiley, New York.

Jones R. A. and Lee G. F. (1982) Recent advances in assessing impact of phosphorus loads on eutrophication-related water quality. *Water Res.* **16,** 503–515.

International Joint Commission (1978) Great Lakes Water Quality Agreement of 1978. International Joint Commission, Windsor, Ontario, Canada.

Larsen D. P., Schults D. W. and Malueg K. W. (1981) Summer internal phosphorus supplies in Shagawa Lake, Minnesota. *Limnol. Oceanogr.* **26,** 740–753.

Larsen D. P., Malueg K. W., Schults D. W. and Bruce R. M. (1975) Response of eutrophic Shagawa Lake, Minnesota, USA, to point-source, phosphorus reduction. *Verh. int. Verein Limnol.* **19,** 884–892.

Lee G. F. and Archibald E. (1980) Estimated impact of the detergent phosphate ban in the State of Indiana on water quality of selected Indiana Lakes. Draft Report, Department of Civil Engineering, Colorado State University, Ft Collins, CO.

Lee G. F., Jones R. A. and Rast W. (1980) Availability of phosphorus to phytoplankton and its implications for phosphorus management strategies. In *Phosphorus Management Strategies for Lakes*, pp. 259–308. Ann Arbor Science, Ann Arbor, MI.

Lee G. F., Rast W. and Jones R. A. (1978) Eutrophication of water bodies: insights for an age-old problem. *Envir. Sci. Technol.* **12,** 900–908.

Lorenzen M. W. (1979) Effect of phosphorus control options on lake water quality. U.S. EPA Report, EPA-560/11-79-011, Washington, DC.

Lorenzen M. W. (1981a) Workshop of phosphorus-chlorophyll relationships. Final Report, U.S. EPA Contract No. 68-01-6069, Grosse, Ile, MI.

Lorenzen M. W. (1981b) Correspondence. *Envir. Sci. Technol.* **15,** 1508–1509.

Mohamed S. S. (1982) Comparison of phosphate and carbonate built detergents. *Textile Chemist Colorist* **14,** 37–39.

Porcella D. B., Peterson S. A. and Larsen D. P. (1980) Index to evaluate lake restoration. *J. Envir. Engng Div. Am. Soc. Civ. Engs* **106,** 1151–1168.

Purchase M. E., Berning C. K. and Lyng A. L. (1982) Cost of washing clothes: sources of variation. *J. Consum. Stud. Home Econ.* **6,** 301–317.

Rast W. and Lee G. F. (1981) Correspondence. *Envir. Sci. Technol.* **15,** 1509–1510.

Runke H. M. (1982) Effects of detergent phosphorus on lake water quality in Minnesota. Report by Environmental Research Group, St Paul, MN, for the Procter & Gamble Co., Cincinnati, OH.

S.A.S. (1979) *Statistical Analysis System Users Guide* (Edited by Barr A. J., Goodnight J. H., Sall J. P., Blair W. H. and Chilko D. M.), 494 pp. S.A.S. Institute, Raleigh, N.C.

Schaffner W. R. and Oglesby R. T. (1978) A study of New York lakes, summer of 1977. Final Report prepared for Monsanto Industrial Chemicals Co., St Louis, MO.

Schelske C. and Stoermer E. F. (1971) Eutrophication, silica depletion and predicted changes in algal quantity in Lake Michigan. *Science* **174,** 423–424.

Schindler D. W. and Fee E. J. (1974) Experimental lakes area: whole-lake experiments in eutrophication. *J. Fish. Res. Bd. Can.* **27,** 2009–2036.

Schuettpelz D. H., Roberts M. and Martin R. H. (1982) Report on the water quality related effects of restrictions on the use of phosphates in laundry detergents. Wisconsin Department of Natural Resources, Madison, WI.

Shapiro J. and Wright D. I. (1983) Lake restoration by biomanipulation—Round Lake, Minnesota. *Freshwat. Biol.* In press.

Shapiro J., Lamarra V. and Lynch M. (1975) Biomanipulation: an ecosystem approach to lake restoration. In *Water Quality Management Through Biological Control* (Edited by Brezonik P. L. and Fox J. L) pp. 85–96. University of Florida, Tallahassee, FL.

Shapiro J., Forsberg B., Lamarra V., Lindmark G., Lynch M., Smeltzer E. and Zoto G. (1982) Experiments and experiences in biomanipulation. U.S. EPA Report, EPA-600/3-82-096.

Sharfstein B., Roels O. A., Harris V. and Lee V. (1977) Effect of detergent legislation on phosphorus in effluent and receiving waters. *J. Wat. Pollut. Control Fed.* **49,** 2017–2021.

Smith S. E. (1972) Effect of detergent phosphate ban on Erie County sewage treatment plants and the Niagara River. Report of Environment One Corp., Schenectady, New York.

Smith V. H. and Shapiro J. (1981a) Chlorophyll phosphorus relations in individual lakes. Their importance to lake restoration strategies. *Envir. Sci. Technol.* **15,** 444–451.

Smith V. H. and Shapiro J. (1981b) Correspondence. *Envir. Sci. Technol.* **15,** 1510–1511.

Sonzogni W. C., Larsen D. P., Malueg K. W. and Schults M. D. (1977) Use of large submerged chambers to measure sediment-water interactions. *Water Res.* **11,** 461–464.

Spivak S. M., Smith B. F. and Kim. J. O. (1982) Evaluation of phosphate and non-phosphate detergents. University of Maryland report to Procter & Gamble Co., Cincinnati, OH.

Sweeney R. A. (1973) Evaluation of detergent phosphate reductions on water quality—Erie County, N.Y. State University College, Buffalo, NY.

Sweeney R. A. (1979) Environmental impacts of reduction of the phosphate content of detergents in the great lakes basin. State University College, Buffalo, NY.

Trautmann N. M., McCulloch C. E. and Oglesby R. T. (1982) Statistical determination of data requirements for assessment of lake restoration programs. *Can. J. Fish. Aquat. Sci.* **39,** 607–610.

U.S. Department of Commerce (1982) *1982 U.S. Industrial Outlook*, p. 128.

Uttormark P. D. and Hutchins M. L. (1980) Input/output models as decision aids for lake restoration. *Water Resour. Bull.* **16,** 494–500.

Vallentyne J. R. and Thomas N. A. (1978) Fifth year review of Canada–United States great lakes water quality agreement. International Joint Commission, Windsor, Ontario, Canada.

Wendt R. H. (1982) Discussion of: a preliminary assessment of Michigan's phosphorus detergent ban. *J. Wat. Pollut. Control Fed.* **54,** 1425–1427.

EXHIBIT 13
2/20/85

Phosphates and the Environmental Free Lunch

W. Kip Viscusi

THE FREE LUNCH is not without its advantages. Consider, for example, a chance to ameliorate an environmental problem without closing a factory or costing the taxpayer any money. Surely this would be one of those "best things in life" that is free. Free indeed. Until, that is, we get around to examining the price.

My target is a modest one: the increasingly popular practice of banning phosphates from laundry detergents. Phosphates can be environmentally harmful, and banning them seems costless because phosphate-free detergents are available. Attracted by this free-lunch rationale, Wisconsin recently reimposed a ban after spirited debate, joining five other states that also have bans in force. North Carolina, Maryland, and Virginia are currently weighing bans. Many other states have at least flirted with the idea at one time or another.

But is a detergent ban really costless? A look at its implications in two states with very different conditions, North Carolina and Wisconsin, provides a broad perspective on what the free lunch really costs.

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Selling the Free Lunch

The environmental rationale for a detergent-phosphate ban is straightforward enough. Phosphates are pollutants because, ironically enough, they are biodegradable. In fact, living things thrive on them. Excessive phosphate levels in lakes and streams promote rapid growth of algae, and so speed up the natural aging process (called eutrophication) of these waterways. The clarity of the water declines, oxygen levels drop, and in extreme cases fish die. The watershed, in short, can become a swamp—rich in primitive plant and animal life, but not at all like the pristine waters that humans prefer to swim and fish.

What could be more appealing than a legislative ban of phosphates in detergents? The payoff: clearer water at no cost whatsoever to the taxpayer. Indeed, some even suggest that the ban offers a financial *advantage* to consumers, because some generic nonphosphate detergents cost less than the brand-name phosphate detergents consumers now buy. The free lunch, in other words, is freer than free. No wonder some state legislators are eager to dine.

But for those interested in environmental protection, not political pabulum, some irritating seasoning comes along with the meal. First, even if the lunch is free, it is not a substantial repast. Detergent phosphates are only small contributors to the overall phosphate levels. Second, the lunch is not free. A fact apparently overlooked by some state legislatures is that consumers adjust their behavior in response to the phosphate ban. And when all is said and done, washing without phosphates is quantifiably more expensive than washing with them.

The Light Lunch

Detergent phosphates, to start with, are only a minor contributor to waterway eutrophication. Homes that have septic tanks (about half in North Carolina and one-quarter in Wisconsin) contribute little phosphate pollution of any sort, because a properly operating septic tank is an excellent phosphate remover. About half of phosphates that *do* reach waterways come from "non-point sources"—fertilizer runoffs

from farmers' fields, for example. The other half, delivered from "point sources" such as sewer systems, originate mostly from human wastes, and no regulator has yet dared to suggest any restriction on pollution of that type. When all is said and done, no more than 12 to 15 percent of total phosphorus in waterways is attributable to detergents.

And this fact, standing alone, ensures that the environmental benefits of detergent phosphate bans are slight. In two states—Wisconsin and Minnesota—the impact of bans was assessed in follow-up studies, and in both instances no significant effect on water quality was found. Phosphate levels *did* decline, but not enough to make any real difference. A one-seventh reduction in phosphorus levels is rarely enough to reduce eutrophication sufficiently to affect the value of water resources for fishing or recreation. And in Wisconsin the costs of removing phosphorus at wastewater treatment plants dropped very little after the ban, while the amount of phosphorus in water leaving the treatment plants declined perceptibly at less than one-third of the plants.

After the Free Lunch

So much for the environmental benefits of a phosphate-detergent ban. What does the free-lunch ban really cost?

The first cost is as might be expected. Detergent manufacturers do not add phosphates for the exclusive and malicious purpose of eutrophying lakes and streams. Phosphate detergents also provide cleaner clothes. Researchers in academia as well as in the detergent and washing-machine industries have confirmed that sodium carbonate, the usual substitute for phosphates, is less effective at doing what a detergent is supposed to do: releasing and suspending soil and reducing water hardness. Within five to ten washings, the differences between colored shirts washed with phosphate or with nonphosphate granular detergents are readily apparent to any casual observer: the buildup of sodium carbonate residue gives the Brand X shirts a faded appearance that goes far beyond the ring-around-the-collar that TV-homemakers have learned to abhor. As a result, consumers discard their clothes prematurely.

To be sure, liquid nonphosphate detergents do better than granular ones, though still not as well as the phosphate brands. But liquids are much more costly too. The annual cost of switching from the best-selling granular phosphate detergent to the best-selling nonphosphate liquid has been put at $38 per household.

What is the dollar cost to consumers who switch to granular nonphosphate detergents and then endure laundry that is not quite so clean? For those who just glumly contemplate the results, we can only guess. If they value their wash quality only half as much as consumers who decide to take corrective action, the loss from the phosphate ban is, as we shall see, perhaps $30 a year.

The $30 figure is concededly speculative, but the cost of corrective action that other more enterprising consumers *do* take is not. A phosphate ban will impel about 20 percent of consumers to raise water temperature and increase their use of bleach, fabric softener, and wash pretreatments. The resultant annual costs are not trivial—about $11 per household in Wisconsin, $8 in North Carolina (weighted by the fraction of households taking corrective action). Moreover, some of the costs of using nonphosphate detergents arise whether or not the consumer takes corrective action. Carbonate buildups from the granular variety cause washing-machine repair problems and related consumer complaints to be much greater in phosphate-ban states and repair costs to be higher. Based on an appliance industry study, I estimate the present value of annual repair costs to be $12 per household in Wisconsin, $5 in North Carolina. Finally, carbonate buildup on clothes increases fabric wear. Drawing on results obtained by consumer science research-

ESTIMATED PHOSPHATE REDUCTION COSTS
(dollars per household per year)

Method	Wisconsin	North Carolina
DETERGENT BAN		
Energy and laundry additives	11	8
Increased machine repair	12	5
Fabric wear	22	10
	45	23
Laundry time*	4	4
Decreased wash quality*	30	30
Total	79	57
CHEMICAL TREATMENT		
Total cost	1.50	24
Unit cost (based on level of phosphate removed)	1.50	3–4

*Cost estimates for these items are more speculative.

ers at the University of California, I estimate these annual costs to be $22 per household in Wisconsin, $10 in North Carolina. The bottom line: the cost of actual out-of-pocket outlays and after-the-free-lunch corrective action averages $45 a year for Wisconsin households and $23 for North Carolina households. (The cost differences between the two states derive from differences in energy costs and water hardness.)

There's more. Using laundry additives requires extra laundry time, and phosphate-free detergents entail extra ironing as well, because they damage the permanent press qualities of fabrics. Putting a price on this is difficult. One minute a week at a price of $5 per hour should, however, provide a conservative estimate of the annual lost-time cost—$4 per household.

Now it must be conceded that these several costs, summarized in the table, are not likely to bankrupt the average American household. But the advocates of a detergent-phosphate ban miss the mark when they assert that the costs do not exist. Perhaps the implicit assumption is that consumers don't "really" care about cleaner wash, fabric wear, time spent ironing, and so on. But they manifestly do. Detergents containing phosphates are the dominant consumer choice in markets where they are available. After Wisconsin's ban came into effect there was a rapid upsurge in complaints to operators of coin laundries. Washing machine manufacturers also witnessed an increase in complaints about wash quality. Some consumers understood the real cause of the problem and crossed state lines to stockpile phosphate detergents. Prisons and commercial laundries took the more direct route of obtaining statutory exemptions from the ban.

The Cheaper Lunch

When the free lunch turns out to be nothing of the sort, we should inquire if there might be a cheaper one—most particularly, a cheaper one that offers better fare. With phosphate pollution, as luck would have it, there is.

The chemical treatment of wastewater can eliminate 90 percent of phosphate levels in sewage—about six times as much, in other words, as a phosphate-detergent ban. And the cost is comparatively modest. In states such as North Carolina, which have not yet invested in central wastewater treatment facilities, the annual cost would be about $24 per household. In Wisconsin, where the needed facilities are already in place, the cost of achieving the same phosphate reduction as a phosphate ban would be about $1.50.

As the table reveals, these figures suggest that wastewater treatment in Wisconsin can remove as much phosphate as a phosphate-detergent ban at about 1/30th of the readily quantifiable costs of the ban. In North Carolina there is a six-fold improvement at about the same price as a phosphate-detergent ban. A very rough extrapolation from the North Carolina and Wisconsin experiences indicates that the national cost of wastewater phosphate treatment might be about $1 billion, while the consumer cost of a phosphate-detergent ban would be about $2.8 billion. In Wisconsin, North Carolina, and nationally, the comparative cost advantages of wastewater treatment is perhaps twice as large again if one also takes into account what I have so far omitted—the costs of increased laundry time and decreased wash quality. And the comparative cost advantage of wastewater treatment increases even more when one looks at what really counts—the dollar cost per unit of pollution removed.

Why then does the expensive free lunch of a phosphate-detergent ban remain so popular? The reasons are not hard to find. The cost of wastewater treatment facilities are visible, and therefore are political as well as economic. By contrast, the costs of a phosphate-detergent ban are not easily attributed to the ban, so the political costs are correspondingly slight. In addition, a ban hits that most popular of political targets, the out-of-state corporate villain. Direct controls on a much more important source of phosphates—the fertilizers used by in-state farmers—would reduce phosphate levels more effectively but at a far higher political cost.

Yet the facts are clear. In the case of phosphate detergents, the "defect" attacked by the ban is in fact a product attribute that is significantly valued by consumers, and for good reason. Banning phosphate detergents is "free" only to the legislator worried about the next election. Treatment plants do not offer any free lunch either, but they do achieve much more pollution control at less or, at worst, comparable cost. And *that*, for once, is indeed pure gravy. ■

EXHIBIT 14
2/20/85

TESTIMONY ON HOUSE BILL 786

FROM DENNIS HEMMER, COMMISSIONER OF STATE LANDS

The Department of State Lands supports the passage of House Bill No. 786 regarding the forfeiture of bid deposits on surface or agricultural competitive bids that are proven to be frivolous, forged, bad faith, or harassment bids.

Over the years the Department has experienced situations on competitive bids on state leases where the bidder is non existent or has exercised bad faith. In one particular instance a bidder used a fictitious name and entered bids on six separate leases in the same year. This constituted a considerable expense to the current lessee to meet the bid as well as participate in a hearing on the competitive bid. In order to preempt these types of activities, a forfeiture of the bid deposit would be a good deterrent.

If the Department found that a bidder exercised bad faith and that the allegations could be proven the Department would give the bidder an opportunity for a hearing in regard to its allegations. A recommendation of forfeiture of any bid deposit would be approved or disapproved based on the findings of the hearing. The Department feels this bill would not stifle competitive bidding. On the contrary, it would provide for better bidding based on actual leasing circumstances.

EXHIBIT 15

ROUGH DRAFT 2/20/85

Testimony by DHES

in Support of

HB 766

The Montana Department of Health & Environmental Sciences would like to voice their support for House Bill 766. Montana, like many other states, finds itself facing a variety of threats to our environmental resources from hazardous wastes. Some of our problems are so significant that they have been designated as Superfund sites by the Environmental Protection Agency while others are more localized but still pose a serious threat to public health and the resources of Montana. It is the later category that this bill is designed to address.

The Montana legislature traditionally has been unwilling to provide funds for unidentifiable problems but as a public health agency, we are seeing a significant increase in hazardous waste problems which demand our immediate attention. Our inability to predict disaster and request appropriate funding does not stop the people of Montana from expecting assistance from our agency. We may in fact be seeing only the so-called "tip of the iceberg" with respect to hazardous waste problems.

Hazardous wastes most frequently impact our groundwater resources and threaten the beneficial use thereof. During the last 48 months, our agency has documented approximately 50 incidents of groundwater contamination at 40 different locations in Montana. These locations cover the entire state and are not limited to major municipalities. I will not take up your time by going through each incident, but would like to review with you a couple that are typical and justify the need for the authority provided by this bill.

In August 1984 a fire destroyed a film stripping operation in the Helena Valley. An unknown quantity of cyanide used in the chemical process was lost into the groundwater. Cyanide is extremely toxic to humans. Several domestic

wells including one serving East Helena were downgradient of the contamination site. We were able to force the owner to install one monitoring well but he claimed to have no money to do any further work. Sampling of the well indicated cyanide concentrations nearly 100 times the level considered safe for drinking. Our agency did not have the resources to install additional wells and determine the extent of resource damage. We finally received help from EPA to install monitoring wells to monitor contamination. To date, no domestic wells have shown signs of contamination but the threat continues.

In another incident, the people are not so fortunate. In September of last year, we received a complaint of a gasoline odor in the Judith Gap water system. Subsequent investigations found that two of the town's three municipal wells were contaminated with petroleum products. Since that time the third well has shown similar contamination, leaving the community without a safe domestic water supply. The source of the contamination is thought to be one or more of several existing and abandoned fuel storage tanks in town. Again we lack the resources to assist the community in solving this problem.

When a hazardous waste threatens groundwater, several things are obvious.

1) Immediate response is necessary to minimize natural resource damage and protect the public health of the people.

2) Remedial action may be very costly.

The proposed legislation would establish a mechanism whereby the Department could, after notification of potentially responsible parties, proceed with remedial action as necessary to protect public health and natural resources.

The bill is intended to compliment existing legal authority such as the Montana Water Quality Act rather than duplicate that effort. Once a responsible party is identified, civil proceedings may be initiated to recover costs, damages, or penalties.

Our agency has a good "track record" for obtaining civil penalties in conjunction with past enforcement actions. Civil penalties collected under the Water Quality Act alone resulted in over $30,000 being paid to the State general fund. It is our hope that in time, recovered costs would be more than adequate to fund the program.

In summary, the proposed legislation would fill an important void in our environmental program and provide us with the resources to adequately respond to the needs of the people in this state. It is intended to be a burden only on those persons responsible for resource damage rather than on any industry as a whole. We ask your favorable consideration of this important legislation.

EXHIBIT 16
2/20/85

TESTIMONY ON HOUSE BILL 637

FROM DENNIS HEMMER, COMMISSIONER OF STATE LANDS

The Department of State Lands supports H.B. 637 to amend the Montana Metal Mine Reclamation Act. This amendment would allow the Department to suspend an operating permit, after 30 days notice, if the operator fails to file an annual report rather than pursuing a violation and civil penalty. After the annual report is filed the Department may reinstate the permit.

Under the existing law, if an operator fails to file an annual report, the only recourse the Department has is to pursue a Notice of Violation and the subsequent civil penalty. Although this is adequate, it is costly and time consuming and does not resolve the real problem, and that is, it is the operator's responsibility to make the annual report and keep his permit up-to-date. Additionally we may be trying to prosecute someone who is long gone. Another problem is that when an annual report is not filed, the Department does not know whether the permit has been abandoned or if it is just an oversight on the part of the operator.

In summary, the Department requests your support of this amendment because it allows the Department to require that an annual report be filed by the operator, but if it isn't the permit is suspended and no mining activities can take place until the suspension is lifted. This bill allows a streamlining of the violation-civil penalty system for both the operator and the state, while at the same time giving the Department the flexibility to know the status of a mining operation while eliminating an unnecessary violation and civil penalty for the operator.

I urge your support of the bill.

EXHIBIT 17
2/20/85

TESTIMONY FOR HOUSE BILL 638

FROM DENNIS HEMMER, COMMISSIONER OF STATE LANDS

The Department of State Lands supports House Bill 638 to amend the Metal Mine Reclamation Act for the following reasons:

1. Section 82-4-303(10)(b) needs to be amended to eliminate the possibility of conducting exploration activities under a Small Miners Exclusion Statement. If exploration activities are contemplated, there is specific language in the Act (Section 82-4-331) to address those concerns. Exploration under the exclusion statement will result in a large number of unreclaimed disturbances not contemplated under the exclusion's original intent.

2. Section 82-4-305(2) needs to be amended to eliminate a current oversight in the Act that presently allows an individual to have several Small Miners Exclusion Statements which is in direct conflict with the definition of a "Small Miner." At the present time, there are numerous mining operations that are owned and operated by the same person or group of persons operating under multiple Small Miners Exclusions by simply changing the name of the mine owners, partners or corporate structure. This practice is clearly in violation of the intent of the Small Miners Exclusion provision and privilege under the Act. The result is disturbances in excess of those allowed going unreclaimed.

3. Section 82-4-361(1) needs to be amended to include violations of the Small Miners Exclusion Statement requirements under the general provision for violations and penalties as currently provided for in the Act. The present system for pursuing violation of the SMES under Section 82-4-305(2) requires that the County Attorney pursue misdemeanor which is a criminal offense against the Small Miner. This amendment would enable the Department to pursue a violation as a civil penalty, thus simplifying the current procedure. This would also relieve the County Attorney of the additional responsibility of pursuing misdemeanor offenses against Small Miners.

The Small Miner Exclusion statement was intended to help those truly small miners. These amendments will protect the exclusion statements from abuse while preserving the advantage for those who truly qualify.

EXHIBIT 18
2/20/85

TESTIMONY ON HOUSE BILL 670

FROM DENNIS HEMMER, COMMISSIONER OF STATE LANDS

The Department of State Lands supports House Bill 670 to amend sections 82-4-303, 82-4-304, 82-4-335, 82-4-336, 82-4-337, 82-4-340, and 82-4-351, MCA, of the Montana Metal Mine Reclamation Act because the amendment provides a solution to several issues that need additional clarification.

The first issue deals with the remining and reprocessing of old tailings and waste rock. At the present time, many mining companies are examining old historic tailings piles and waste rock dumps to determine the mineral values that remain. As a result, these companies have proposed reprocessing of those materials to recover those values. Under the existing provisions of the Metal Mine Reclamation Act, the remining and reprocessing are not included. They should be, however, because the potential impacts to the public and the environment can be the same as that of a new mine development. Often times the old tailings have reached equilibrium. Remining redisturbs the area resulting in a new potential for environmental problems. In addition, if those remined areas are required to be permitted, the opportunity to improve an area where historic environmental problems exist due to mining becomes available. It should be noted that the operator would not be required to reclaim the area to a better condition than existed prior to the effective date of this bill and the promulgation of rules.

The second issue deals with the permitting of custom mills that process ore mined by other various mine operators and mine specific mills that are owned and operated by individual mining operations, but are located away from the permitted mine site. The present interpretation of the Montana Metal Mine Reclamation Act is that these types of mills are not necessarily covered and therefore an operating permit is not required. This interpretation needs to be amended because the potential impact on the public and the environment is the same for these types of mills as they are for mills that are permitted at a mine site. The issues of mill siting, tailings pond siting, design, stability and impact on ground and surface wastes needs to be thoroughly evaluated before construction. It should be noted that this amendment would only apply to those mills that are constructed or expanded upon after promulgation of the rules.

In summary, I urge your support of these amendments to resolve these issues and provide additional protection of the public and the environment by requiring the permitting of off mine site and custom mills and the reprocessing of old tailings.

VISITOR'S REGISTER

HOUSE NATURAL RESOURCES COMMITTEE

BILL 711 - DATE 2/20/85

SPONSOR COHEN

NAME	RESIDENCE	REPRESENTING	SUPPORT	OPPOSE
K.M. Kelly	Helena	Mont. Irrigators		X
BAEllis	Helena	Mont Water Development		X
Jerome Anderson	Bozeman	Soap & Detergent Ass		X
Anne Lyng	Cincinnati, OH	Consultant Procter + Gamble		X
Larry Beddle	Great Falls,	Procter & Gamble		X
Richard Sedlak	New York	Soap & Detergent Assoc.		X
A.G. Payne	Cincinnati, OH	Procter + Gamble Co.		X
Bruce McGregor	Bozeman MT	MSU Coop Ext. Service		
Dick White	" "	MT. Coop. Extn Serv.		
~~Carl~~ Jo Thompson	" "	Montana Coop Ext Serv		
E.A. Matzner	St Louis MO	Monsanto Co.		X
Chas Smitha	Helena dent	Monsanto Co		X
Barry L. Hjort	Helena, MT.	Soap & Detergent Assn		X
George Allen	Helena MT	MT. Retail Assn		X
Frank Copps	Montana Food Distributors Assn Helena	Nat Food Wholesalers Assn		X
Peter Petit III	Helena Montana	wholesale grocers		X
Illegible	Helena	[illegible]		X
GEO. OCHENSKI	HELENA	ENV. INF. CENTER	X	
JACK STANFORD	BIGFORK		X	
Ann Humphrey	~~Montana Audubon Council~~ Helena → Mt. Audubon Council			

IF YOU CARE TO WRITE COMMENTS, ASK SECRETARY FOR LONGER FORM.

WHEN TESTIFYING PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

FORM CS-33

VISITORS' REGISTER

H Nat Res COMMITTEE

BILL NO. 711 DATE 2/20

SPONSOR Cohen

NAME (please print)	RESIDENCE	SUPPORT	OPPOSE
Mary Wright	Livingston	X	
Mike Mecone	Helena		X
Janet Ellis – Audubon	Helena	X	
Jim FLYNN	HELENA	X	
Bonnie Ellis - Biol. Sta.	Bigfork	X	
Chuck Dragovich	Helena		X
Steve Pilcher	Helena DHES	X	

IF YOU CARE TO WRITE COMMENTS, ASK SECRETARY FOR WITNESS STATEMENT FORM

PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

VISITOR'S REGISTER

HOUSE NATURAL RESOURCES COMMITTEE

BILL HB 766 DATE 2/20

SPONSOR REAM

NAME	RESIDENCE	REPRESENTING	SUPPORT	OPPOSE
R.A Ellis	Helena	Montana Water Develop	X	
GEO. OCHENSKI	HELENA	ENV. INF. CENTER	X	
Steve Pilcher	Helena	DHES	X	
John E. Wardell	Helena	EPA	X	
Joseph Vaccaro	Helena	DHES	X	
Karolyne Redding	Helena	Me & my contaminated well.	X	
Marie McMurray	Helena	Me	X	
Brenda Lewis	Helena	myself	X	
Joel Redding	Helena	Me & my contaminated well	X	
Don Redding	Helena	Me	X	
Judie Silcox	Helena	self	X	
Al Redding	"	"	X	
Delores Barnaby	Helena	Peoples Action	X	
Becky Nash	Helena	self	X	
Muriel Hulett	E. Hel.	self	X	
Leann Hulett	East Helena	self	X	
Brien Thane	Helena	Peoples Action	X	
KATHLEEN HELAND	Helena	Peoples Action	X	
Jim McMurray	Helena	self	X	
Mrs OW Lane	Helena	self	X	
Mike Stephens	Helena	self	X	

IF YOU CARE TO WRITE COMMENTS, ASK SECRETARY FOR LONGER FORM.

WHEN TESTIFYING PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

FORM CS-33

VISITOR'S REGISTER

HOUSE NATURAL RESOURCES COMMITTEE

BILL HB 786 DATE 2/20

SPONSOR NATHE

NAME	RESIDENCE	REPRESENTING	SUP-PORT	OP-POSE
Kelly Blake	Helena	Dept. of State Lands	✓	
Dennis Hemmer	Helena	Dept. of State Lands	✓	
Mons Teigen	Helena	Mt Stockgrowers, Wildlife Federation, Conservation Voters	✓	

IF YOU CARE TO WRITE COMMENTS, ASK SECRETARY FOR LONGER FORM.

WHEN TESTIFYING PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

FORM CS-33

VISITOR'S REGISTER

HOUSE NATURAL RESOURCES COMMITTEE

BILL 670 DATE 2/20

SPONSOR IVERSON

NAME	RESIDENCE	REPRESENTING	SUP-PORT	OP-POSE
Dennis Hemmer	Helena	DSL	✓	
Gary Amestoy	Helena	DSL	✓	
Jeff Collins	Troy	ASARCO	✓	
Mary A Langley	Helena	MT. MINING ASSN.	✓	
Joanne Sowerwine	Helena	NPRC	✓	
Geo. Ochenski	HELENA	EIC	✓	

IF YOU CARE TO WRITE COMMENTS, ASK SECRETARY FOR LONGER FORM.

WHEN TESTIFYING PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

FORM CS-33

VISITOR'S REGISTER

HOUSE NATURAL RESOURCES COMMITTEE

BILL 637 DATE 2/20

SPONSOR IVERSON

NAME	RESIDENCE	REPRESENTING	SUP-PORT	OP-POSE
Dennis Hemmer	Helena	DSL	✓	
Gary Amestoy	Helena	DSL	✓	
Mary A Langley	Helena	MT. MINING ASSN.	✓	
T. M. Rollins	T Rivy	ASARCO	✓	
Jeanne Swingley	Helena	NPRC	✓	
Geo. Ochenski	Helena	EIC	✓	

IF YOU CARE TO WRITE COMMENTS, ASK SECRETARY FOR LONGER FORM.

WHEN TESTIFYING PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

FORM CS-33

VISITOR'S REGISTER

HOUSE NATURAL RESOURCES COMMITTEE

BILL 638 DATE 2/20

SPONSOR IVERSON

NAME	RESIDENCE	REPRESENTING	SUP-PORT	OP-POSE
Dennis Hemmer	Helena	DSL	✓	
Gary Amestoy	Helena	DSL	✓	
Tom Collins	Troy	ASARCO	2	
Mark A Langley	Helena	MT. MINING ASSN.	✓	
Jeanne Sawyer	Helena	~~DNRC~~ INPRS	✓	
Geo. Ochenski	HELENA	EIC	✓	

IF YOU CARE TO WRITE COMMENTS, ASK SECRETARY FOR LONGER FORM.

WHEN TESTIFYING PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

FORM CS-33